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A SURVEY OF DROUGHT DAMAGE TO TEA IN THE MID-COUNTRY IN 1992

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INTRODUCTION

The tea growing area of the mid-country is mainly spread in the administrative districts of Matale and Kandy; the Matale district is the most northerly tea growing area in Sri Lanka. Its tea growing area lies from Elkaduwa to the north of Rattota with an average elevation of 600 m amsl. The tea area of the Kandy district lies along the northern and western slopes of the central hills which includes Kandy, Kadugannawa, Hewaheta, Gampola and Nawalapitiya regions where the elevation ranges from 300 to 1400 m, but most of the tea is grown around 900 m amsl.

Out of the 62 planting subdistricts identified by the Planters' Association of Ceylon, 22 subdistricts fall within the mid-country tea growing areas, three subdistricts namely Dumbara, Nitre-cave and Matale West do not have any tea estates managed by the two state organizations, while subdistrict Galagedara has a small tea extent managed by

J.E.D.B. IV, Kegalle region. Details of planting subdistricts, number of estates in each subdistrict managed by the two state organizations (J.E.D.B VI - Kandy region and S.L.S.P.C VI - Matale region) as at January 1992 and the total extent of these estates are given in Table 1.

SOIL AND CLIMATE

The tea growing areas of the mid-country are spread in the Wet Mid-land WM 2 and WM 3, Intermediate Upland IU 1, IU 2 and Intermediate Mid-land IM 1 in the agro-ecological map of Sri Lanka. The larger part of the district WM 2 and WM 3 has a distinct dry period during January to April; the average rainfall during this period is between 50 to 100 mm per month which is considered to be the minimum requirement for tea cultivation. In the regions falling under IU 2 and IM 1 the dry period is between June to September. Estates in the region IU 1 receive a fair amount of rainfall throughout the year, but experience strong winds during the first half of the year. The lower elevations of Hewaheta, Rangalla and Wattegama experience strong winds in the dry season, i.e. January to April. These winds cause physical damage to young tea and increase the evapotranspiration losses in both young and mature tea. The subdistricts of lower Hewaheta, Nillambe and Medamahanuwara experience heavy blowing during the South-West monsoon which causes severe damage to young tea.

TABLE 1 - Planting sub-districts in the mid-country, number of estates managed by JEDB VI and SLSPC VI and the total extents of tea in each sub-district

Sub-district	No.of Estates	Total extent under tea (ha)
Alagola/Kadugannawa	01	178
Dolosbage	04	954
Hantane	02	783
Hewahetta - Lower	04	1206
Hewahetta - Upper	04	1232
Hunnasgiriya	03	862
Kelebokke	05	2267
Knuckles	04	1021
Kotmale	10	2405
Matale North	01	114
Matale South	01	604
Matale East/Laggala	08	2110
Medamahanuwara	03	1159
Nillambe	01	518
Pussellawa	13	3221
Rangala	03	1190
Wattegama	01	535
Yakdessa	01	167

The soil in most parts of the mid-country is considered to be satisfactory for cultivation of tea. They are well to moderately drained, moderately fine textured with moderate water holding capacity, except for a few areas in the Matale district where the soil is shallow, rocky and eroded. The soil depth in the rest of the area varies considerably according to location; the topography is generally hilly and contains fair amount of stones, rocks and surface boulders in most places.

The agro-ecological characters of the mid-country tea growing area is shown in Table 2.

TEA

As at 1990 the total extent under tea in the mid-country, including small holdings is 76,258 ha. Of this area about 25% is under clonal tea and the balance is in seedling tea, which are more than 50 years old. Most of the seed tea in the area is of mixed jat type with a small percentage of China or Low Jat tea. The China jat tea is predominant in the subdistricts of Lower Hewaheta, Hunnasgiriya, Medamahanuwara, Nillambe, Rangalla and Knuckles where strong winds are experienced. Almost all seedling fields have vacancies, some reaching alarming levels of 40 to 50%. It appears that no systematic attention has been paid for infilling in the past 20 to 25 years. As a consequence the ground cover is extremely poor leading to increased soil erosion which in turn affects cultivation of tea both in terms of production as well as decreasing the chances of surviving adverse

TABLE 2 - Agroecological characters of the mid-country tea growing areas

Zone	Agro/Ecological region	75% Expectancy value of annual rainfall	75% Expectancy of dryness for particular month									Major soil groups	Terrain
			Ja.	Fe.	Mar.	Apr.	M	Jn.	Jl.	Au.	Sep.		
	Mid-country WM 2	55	J 1/2	F	1/2M		*	*	*	*	*	Reddish Brown Latosolic Soils, Immature Brown Loams & Red Yellow Podzolic Soils	Steepy dissected hilly and rolling
Wet Zone													
	WM 3	50	J 1/2	F	1/2 M		*	*	*	A 1/2	*	Reddish Brown Latosolic Soils, Immature Brown Loams & Red Yellow Podzolic Soils	Steepy dissected hilly, rolling and undulating
	Up-country IU 1	85	*	*	1/2 M		*	*	J 1/2	A	1/2S	Red Yellow Podzolic Soils & Mountain Regosols	Moutainous, steepy dissected, hilly and rolling
Intermediate Zone													
	IU 2	55	*	F 1/2	1/2 M		M 1/2	J	Jl	Au	S	Red Yellow Podzolic Soils & Mountain Regosols	Mountainous, steepy dissected, hilly and rolling
	Mid-country IM 1	55	*	*	M		M 1/2	J	Jl	Au	1/2S	Reddish Brown Earth & Immature Brown Loams	Rolling, hilly and steep

* Denotes wetness
J 1/2 - Denotes second half of month, etc.
1/2 M - Denotes first half of month, etc.

Source - Agro-ecological regions of Sri Lanka compiled by Land & Water Use Division, Department of Agriculture, Peradeniya

weather conditions. The main reason for the death of bushes is poor maintenance and wood rot.

More than 80% of the clonal tea grown in the district are of the popular 2000 series TRI clones. In the past, due consideration has not been paid in selecting clones suitable for particular locations, climate or soil type and as a result yield per hectare in most places is poor. In some estates there are fields which have more than 20% vacancies. However, in the recent past more estates have begun to use drought resistant clones like Diyagama N, CY 9 and the Balangoda clones DG 7, DG 39 and a clone selected from Craighead estate, CH 13. Apart from shot-hole borer which is a major pest in Matale and parts of the Kandy district, there are no serious pests or major diseases which affect cultivation of tea.

EFFECTS OF DROUGHT ON TEA

Severe drought was experienced during the first three months of 1992 causing extensive damage to tea plantations. Most of the mature fields were wilted and defoliated while plants in new clearings were severely affected. Some of the new clearings planted during 1991 were wiped out entirely due to the drought. A survey was conducted in the mid-country estates to evaluate the damage caused by the drought. Eighteen estates were selected from both state organisations (JEDB VI and SLSPC VI) and included in the survey. Estates were selected by the respective Directors and were from the different subdistricts. Details of the estates selected for this survey are given in Table 3. The rainfall and number of wet

TABLE 3 - Estates selected to evaluate extent of drought damage

Estate	Sub-district	Elevation (m)	Extent (ha) Seedling	Clonal
JEDB VI				
Mooloya	Hewaheta	1500	134.25	146.00
Le Vallon	Nillambe	1067	368.25	98.50
Imboolpitiya	Kotmale	2000	82.75	169.75
Kataboola	Kotmale	1020	276.50	108.50
Westhall	Kotmale	1250	66.00	137.25
Craighead	Dolosbage	1000	142.89	191.59
Hantane	Hantane	915	466.42	72.20
Stellenberg	Pussellawa	1300	211.00	64.25
Melfort	Pussellawa	975	113.34	70.80
SLSPC VI				
Cottaganga	Rangalla	978	240.75	29.90
Rangalla	Rangalla	915	253.00	46.70
Waitalawa	Medamahanuwara	905	320.75	31.84
Galphele	Wattegama	710	205.25	70.03
Opalgalla	Matale east	1217	281.00	23.40
Pitakande	Matale east	880	202.00	120.89
Gammaduwa	Matale east	1700	183.00	-
Kallebokke	Kallabokke	1035	514.35	161.40
Pansalatenne	Matale south	824	172.48	150.15

days during the first three months of 1991 and that for the corresponding period in 1992 are given in Table 4.

DAMAGE TO MATURE TEA

1) **Seedling tea**

The total seed tea area covered by the survey was 4234 ha. Of this extent, 1862 ha was managed by the JEDB and 2372 ha by the SLSPC. Evaluation of drought damage was done by visual observations starting from May and by that time the rains had set in and very little permanant damage caused by the drought was observed in seed tea. Most of the fields which were wilted and defoliated had recovered and only few fields with dead bushes were noticed. The dead tea bushes in most fields were scattered and seen mostly in areas where the soil physical characters were poor. The establishment of shade trees were also found to be poor in these areas. Only a few fields had both high and low shade. In most of the seed tea fields only high shade was observed. Low shade trees were either not planted in these fields or were very poorly established. High casualties were seen in areas which had exposed surface rocks, and in fields where the ground cover was poor. Casualties were low in the fields pruned in the first half of 1991. Recovery from the adverse effects of drought was also quicker and satisfactory in these fields. A large number of V.P. plants infilled during the past two years were also found to be dead as a result of the drought. The loss in yield in these seed tea fields due to the drought is shown in Table 5.

TABLE 4 - Rainfall data of estates surveyed

Estate	Jan.'91		Feb.'91		Mar.'91		Jan.'92		Feb.'92		Mar.'92	
	RF	WD	RF	WD	RF	WD	RF	WD	RF	WD	RF	WD
JEDB VI												
Mooloya	531	17	80	05	214	08	181	15	-	-	-	-
Le Vallon	262	10	20	03	97	05	96	11	-	-	-	-
Imboolpitiya	290	08	77	03	257	09	-	-	-	-	-	-
Kataboola	129	11	17	02	41	09	13	04	-	-	-	-
Westhall	70	09	18	02	129	12	19	05	-	-	-	-
Craighead	68	09	28	02	128	07	09	02	-	-	04	01
Hantane	19	09	33	02	14	01	08	05	-	-	-	-
Stellenberg	222	10	26	06	126	09	114	06	-	-	-	-
Melfort	262	10	23	06	274	11	20	07	-	-	06	01
SLSPC VI												
Cottaganga	460	14	41	04	205	09	225	13	-	-	-	-
Rangalla	387	12	22	02	159	08	137	11	-	-	-	-
Waitalawa	373	10	28	02	162	10	65	06	-	-	-	-
Galphele	275	10	12	02	85	07	33	04	-	-	-	-
Opalgalla	431	11	39	05	150	08	296	18	-	-	-	-
Pitakande	360	10	74	02	103	07	171	13	-	-	-	-
Gammaduwa	583	10	76	04	143	06	296	11	-	-	-	-
Kallebokke	294	11	15	02	139	08	197	08	-	-	-	-
Pansalatenne	188	10	08	02	34	02	111	06	-	-	-	-

RF = Rainfall (mm)
WD = No.of wet days per month

TABLE 5 – Effect of drought on the yield of seed tea

	JEDB VI	SLSPC VI
No. of Estates	09	09
Area under seed tea	1862 ha	2372 ha
Total yield in first three months of 1991 (Made tea)	39208 kg	67181 kg
Total yield in first three months of 1992 (Made tea)	25503 kg	46486 kg
Decrease in yield	13705 kg	20696 kg
% Decrease	34.95	30.80

2) **V.P. tea**

As in seedling tea very little permanent damage was observed in mature V.P. tea. Unlike seedling tea most of the dead bushes in V.P. tea fields were in blocks. This may be due to the following reasons:

1. *Localised poor soil conditions:* Soil in the areas where bushes were dead was found to be either of a poor structure or very shallow compared to the rest of the field.

2. *Poor shade*: Shade was found to be poorly established or absent in these areas.

3. *Exposed to wind damage:* There were heavy casualties in areas prone to wind damage. Very few of these fields had permanent wind belts established.

4. *Substandard plants used in the clearings*: There were some areas where the soil physical characters were satisfactory but bushes had died during the drought. These deaths may be due to poor standard of plants used in these blocks. There is a possibility of unsatisfactory plants from one nursery bed going into these areas.

5. *Exposed rocks and boulders:* We found heavy casualties in areas around exposed rocks and boulders.

6. *Poor ground cover*: Casualties were more in fields which had poor ground cover. This may be due to surface roots getting affected as a result of increase in soil temperature.

As in the seed tea fields, casualties were less in fields which were pruned in the first half of 1991 and recovery was also quicker.

3) **Yield**

Most of the V.P. fields were rested during the drought or if plucked, the rounds were far apart. During the drought the plants had adopted natural defensive methods like going into banji condition or shedding of leaves. The loss in crop of the estates managed by JEDB VI and SLSPC VI for the first three months of 1991 and 1992 is given in Table 6.

Recovery from the drought

As mentioned earlier permanent damage to V.P. as well as seed tea in the mid-country was very little. Most of the defoliated bushes recovered and was brought into plucking, 2-3 weeks after the rains commenced. Recovery was quicker in the fields which were rested during the drought.

Damage to young tea

The effect of drought was observed to be very severe in the first and second year fields. The total hectarage of new clearings planted by the two organizations in their plantations during 1990 and 1991 and the effect of drought on these clearings are shown in Tables 7 and 8.

Altogether in the 18 estates covered by the survey 17 estates had done replanting in 1990 and 1991. In 1990 the extent planted was

TABLE 6 - Effect of drought on yield of V.P. tea

	JEDB VI	SLSPC VI
No.of estates	09	09
Area under V.P. tea	1058.75 ha	635.31 ha
Total yield for the 1st three months of 1991 (Made tea)	77166 kg	28979 kg
Total yield for the 1st three months of 1992 (Made tea)	45790 kg	24405 kg
Decrease in yield	31376 kg	4575 kg
% Decrease	40.65	15.78

TABLE 7 - Extent of new clearings and casualties - JEDB VI

	1990	1991	Total (1990+1991)
Extent planted (ha)	39.43	49.00	88.43
No.of plants put out	492,875	612,500	1,105,375
No.of casualties as at May 1991	157,441 (12.59 ha)	-	-
Percentage loss	31.94	-	-
No.of casualties as at May 1992	117,627 (9.41 ha)	320,973 (25.67 ha)	438,600 (35.08 ha)
Percentage loss	23.86	52.40	39.67

No.of plants per hectare - 12,500

TABLE 8 - Extent of new clearings and casualties - SLSPC VI

	1990	1991	Total (1990+1991)
Extent planted (ha)	32.00	57.53	89.93
No.of plants put out	400,000	719,125	1,119,125
No.of casualties as at May 1991	99,015 (7.92 ha)	-	-
Percentage loss	24.75	-	-
No.of casualties as at May 1992	251,365 (20.10 ha)	605,844 (48.46 ha)	857,209 (68.57 ha)
Percentage loss	62.84	84.24	76.59

No.of plants per hectare - 12,500

71.43 ha and the casualties in 1991 was 256,456 which is equal to 20.51 ha or 29% of the total number planted.

During 1990 and 1991 both organizations planted 177.96 ha and the total number of casualties in their fields were 1,295,809 which is equal to 103.66 ha or 58% of the total number planted.

Causes for high casualties

The causes for the high rate of casualties observed in these fields may be due to one or more of the following practices:

1. *Bad selection of land:* In some clearings the soil was of very poor structure. In a few clearings the topography of the land was not satisfactory. Steep and eroded areas had been selected for replanting, and in a few clearings there were surface rocks which covered more than 20% of the land area. No attempt had been made to isolate localised unsatisfactory areas in many of the clearings inspected. In some areas where wind is a problem, wind belts had not been established.

2. *Bad land preparation:* In most clearings planted in 1990 and 1991, initial land preparation was found to be very unsatisfactory. It appears that deep forking and removing of stones were not done properly as a large number of small stones were seen in the first 15-30 cm of soil. In two new clearings it was seen that slab rock areas were included within the planting areas which could have been isolated and avoided, if proper land preparation was done. In steep areas, soil conservation methods adopted were

inadequate. In some clearings it was observed that stones were heaped up at various places which is not a good practice. Plants around these heaped up stones died perhaps due to the radiating heat from the stones.

3. *Inadequate rehabilitation of land :* Most of the new clearings inspected were inadequately rehabilitated. In most estates it was seen that the land was not kept under rehabilitation grasses at least for the minimum period of 1 1/2 years recommended. It was also noted that most of the estates completed planting grasses in late August or September. In a few areas the grass was planted with the onset of the North-East monsoon. Under good management the grass takes 3-4 months to establish and form a good ground cover, and as a result of delayed planting the land is subject to heavy erosion of top soil during the first year. In most fields only one lopping was possible during the first year due to late planting and poor establishment.

4. *Poor planting material:* Quite a number of plants put out in the clearings were unsatisfactory. In some cases, mature pot bound plants had been used for planting. New root development is very slow in such plants and the plants die-off easily during water stress. On the other hand, in some clearings small plants with 4-5 leaves were used for planting. Several dead plants uprooted and inspected by us had inadequate roots or root systems that were very poorly developed. Some estates had to get plants from outside as they

did not have sufficient plants in their nurseries and were of poor quality.

Mulching and cover crops

The practice of keeping the ground covered by providing thatching materials had not been carried out properly by most of the estates. Mulching had been done only at the initial planting stage, and in some cases the thickness of the mulch was inadequate. No attempt had been made to keep the ground covered once the initial mulching material had decomposed and in some estates tender loppings from rehabilitation fields had been used for thatching new clearings. This is not a correct practice as loppings which should be used to add organic matter to the rehabilitating fields themselves are taken out from that field; further the use of tender loppings as thatching materials in new clearings would decompose early. All estates complained about the difficulty in getting thatching material. No estate had adequate thatch banks as recommended i.e. 2 ha of grass for each ha of tea planted. In most cases even the initial thatching had been done at the tail end of the monsoon when planting was completed or when the drought had commenced. In most places it was noted that funds provided were insufficient to do more than one thatching. It is advisable to keep the ground well covered till the newly planted V.P. tea is established as this will prevent the valuable top soil from being eroded. It will also help to increase the water infiltration rate, conserve soil moisture and supress weed growth in new clearings.

It was also seen that incorrect practices were adopted where cover crops were grown. Cover crops were not lopped before the rain tails off and were allowed to grow freely. As a result it was seen that the tea on either side of the cover crop row had died.

Shade/Wind-Belts

In almost all new clearings inspected, the practice of establishing shade trees were not carried out properly. Plants used as high shade and stumps for low shade were planted only at the time of planting tea or if planted with grasses were not properly maintained. As a result there was hardly any shade cast by these trees in the clearings during the drought period. Establishment of wind belts in areas prone to wind damage were also not satisfactory. In some clearings *Crotalaria* had been planted in every other row as a temporary wind belt. These were not lopped before the drought and had done more damage to the tea by competing for moisture during the drought.

Improper agricultural practices adopted in clearings

During the survey it was also possible to note some incorrect agricultural practices adopted in the new clearings. In some cases no proper planting holes had been dug and the plants had been put out before the soil had properly consolidated resulting in sinking of the plants. In some fields centering had not been done at the correct time, and the plants

were allowed to grow freely. Such incorrect practices led to a greater number of casualties.

Time of planting

More casualties were seen in some clearings planted with the North-East monsoon rains. It should be noted that in mid-country it is only the estates in the upper Hewaheta and Matale east that could adopt the practice of planting during the North-East monsoon rains.

Every attempt should be made to commence planting with the onset of the monsoon and complete the operation before the rain tails off.

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