PRACTICAL ASPECTS OF REPLANTING

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In the past few years many companies have considered opening up new clearings, with particular reference to uprooting old and uneconomic tea. Various methods of uprooting tea have been tried with varying success on St. Coombs; most of these methods have been tested in an endeavour to prove that the replanting of old tea can be done at a reasonable cost. I propose to mention briefly these various methods.

Uprooting by hand has been tried by some estates. While this type of uprooting is possible, it is highly unsatisfactory in that labourers are prone to leave almost as many roots in the ground as they remove, thereby increasing the risk of root disease appearing subsequent to the replanting. In any event the cost of such uprooting is inclined to be rather high.

A small area of approximately 2 acres of old tea was removed with a Trewhella 'hand' grubber or 'monkey' grubber on St. Coombs. This machine was quite satisfactory in that it is capable of pulling out even very large tea, but the cost per acre was high. Four labourers working as a team were only capable of removing 22 bushes each per day. For small areas where the slope of the land is not too acute, this method can be recommended since the initial capital expenditure on equipment is small, but in thick tea on steep slopes, I think it unlikely that the machine could be satisfactorily operated without a severe reduction in task. For any large area, of more than 4 or 5 acres, the time taken to remove the tea would make this method far too slow.

The Trewhella 'mechanical' or 'horse' grubber was used on St. Coombs for some considerable time and in the early stages appeared to be a possible solution to the problem. This machine consists of a small but powerful motor driving by means of a belt a series of gears directly coupled to a small drum with cable attachment. It is heavy and extremely immobile. Uprooting tea in light friable soil, the machine was capable of removing up to 300 bushes per day, providing the lie of the land was not too steep, but in a heavier soil and on steep land the moving parts tended to wear very rapidly and the cost of repairs became exorbitant. Rs. 127/- per acre over 12 acres was the actual cost for repairs alone. While this machine was an improvement it was not as good as expected.

A power winch seemed to offer better possibilities. There are two power winches, which would appear to be satisfactory for uprooting tea on a large scale, and both require a tractor for the power-take-off. The Fordson 'Major' tractor and Boughton winch has been used with success on an estate in the Dimbula District on the most difficult of terrain, but there is one slight disadvantage in that the winch itself is a semi-permanent fitting to the tractor and takes a considerable time to fit and remove, in the event of the tractor being required for any other work at short notice. At the present moment a Fordson 'Major' tractor with the Hesford Hercules winch is being operated on St. Coombs. The winch itself is of a trailer type and can be connected or disconnected in a matter of a few minutes, thereby making it possible for the tractor to quickly carry out other work, should the necessity arise. A further advantage is the fact that any medium sized tractor with a power-take-off can be used with this particular winch. The winch has 300 feet of $\frac{3}{4}$ inch diameter

wire rope attached to the drum and this is used in conjunction with a pulley and a ground anchor, thereby reducing the load. Small lengths of wire rope or chains, with a hook and shackle attached to each, are fastened round the bushes, which in turn are hooked on to the main length of wire rope. The machine is controlled by the tractor driver, in that the speed of the winch is regulated by the speed of the tractor engine. A safety clutch is fitted between the tractor and winch on the main power shaft, which can be pre-set to slip at a specified load. Approximately 10 labourers are capable of uprooting between 350 and 400 bushes per 6-hour day. On one occasion as many as 475 bushes were removed. The advantage of uprooting tea by this method is that fewer large roots are left in the ground, thereby eliminating to some extent the possibility of root diseases appearing in the new clearing.

I now propose to run through the various works required to complete the clearing up to the time of the tea coming into bearing. In most cases after old tea has been removed, new drains will have to be cut, in conjunction with the lining up on the contour in preparation for the formation of the final terrace. It has been found in practice that intervals of 4-5 feet measured horizontally between the rows give the best results. The use of a standard length rod and plumb line does away with the necessity of differences between contours as measured along the slope arising through variations in slope. It is not always possible to maintain perfect contour lining, but small compromises will have to be made to eliminate as far as possible short rows.

Trenches should now be cut on the contour line 18 inches deep by a foot wide and Guatemala grass cuttings planted along the top side of the trench in preparation for soil rejuvenation. After a few months, when the Guatemala grass has produced some maintenance foliage, it is recommended that a suitable manure mixture be applied above the Guatemala grass and dibbled in with small weeding scrapers.

When the grass is well established and has reached a height of 8 to 10 feet it should be lopped not lower than 9 or 10 inches from the ground and the loppings put in to the trenches. It is possible that a certain amount of wash will have occurred before the Guatemala grass becomes established and the trenches may therefore have to be cleaned out immediately prior to the first lopping of Guatemala grass. The grass should then be lopped at intervals of a few months depending upon the growth, and manured each time, approximately 3 weeks after lopping.

It is recommended that the cleared area should remain under Guatemala grass or some similar bush green manure for 2 years and certainly not less than 18 months. At the end of this time the grass should be cut across at a little below ground level with a sharpened mamoty, incorporating as much of the cut material into the trenches as possible. The trenches should then be filled and levelled to form a series of small terraces, any balance green material being used as a thatch. Along the edge of the contour where the Guatemala grass originally grew, *Tephrosia vogelii* or some similar green manure should then be planted with a view to forming a windbreak and shade, in preparation for the young tea plants, the idea being to reproduce, as nearly as possible, conditions similar to the nursery conditions under which the plants have been growing in the few months prior to planting. It must be clearly understood, however, that this green manure must not be allowed to grow so large as to interfere in any way with the growth of the young tea plants, and it will therefore be necessary for this bush green manure to be uprooted and replaced from time to time, until the tea plants have developed to such an extent that they are capable of preventing wash and have provided sufficient ground cover by their natural spread.

It is recommended that a suitable artificial fertiliser mixture be applied to the *Tephrosia vogelii* to encourage its growth. This may be given as soon as plants have reached a height of 3 or 4 inches and should be dibbled in along the top side of the row with a small weeding scraper. At the time of planting the green manure

shade trees can be planted in the contour rows to enable them to become well established with a view to affording some shade by the time the tea plants come into bearing.

With the start of the rainy season the *Tephrosia vogelii* or the green manure, should be sufficiently tall to give the necessary protection for the planting of tea. The spacing we have found suitable for the young tea plants is 2 feet apart in the centre of the small terrace in the actual trench into which Guatemala grass had been lopped. The drain edge on the top side and all road banks should finally be supplied with any available tea plants, planted as closely as possible, ultimately to form a hedge to prevent soil erosion.

Young tea plants once established, should be manured every 3 months at approximately 1 ounce per bush of T/175 mixture. These applications to continue for 18 months to 2 years, gradually increasing the application rate until the plants are capable of taking up the normal T/488 mixture, which in the case of a vigorous clonal plant might even be less than 18 months.

The small plants should be tipped 3 to 4 times a year, with a view to encouraging growth from low down on the central stem, this to continue for approximately 2 years or until the bush can safely be brought into bearing. Normal field works such as draining, supplying vacancies, weeding, blister blight control and trimming of green manure and shade trees should continue.

I now propose to give a brief summary of the costs per acre based on labourers' gross wages at Rs. 2/30 per day. All costs are calculated on the ground being fallow under Guatemala grass for 2 years, with a further 2 years from planting of the tea to coming into bearing. Most of the costs are taken from actual new clearing work on St. Coombs, while other figures are based on estimates, but in any event they refer to a rather steep lie of land containing considerable rock. They therefore represent a possible maximum and do not mean that new clearings must inevitably entail an outlay as high as these figures seem to indicate. The expenditure incurred in uprooting tea based on a figure of 5,000 bushes to the acre proves conclusively that a power winch is by far the cheapest method.

Uprooting costs with the Trewhella 'mechanical' grubber on difficult terrain amounted to Rs. 1,339/97 against an estimated figure of Rs. 735/50 per acre using the Trewhella 'hand' grubber or 'monkey' grubber, while the power winch costs are Rs. 463/50 per acre. The estimated cost therefore of replanting uneconomic tea using the easiest and cheapest method of uprooting, works out at Rs. 5,250/00 per acre.

Detailed costs of all work necessary for the opening of a new clearing are shown in appendix A, and appendix B gives the various manurial mixtures recommended.

APPENDIX A

1. Cost of clearing land of tea with a power winch

(Based on Rs. 2/30 per day per labourer)

	Rs. cts.	
Labour at 10 per day at 11½ days per acre = 115 labourers @ Rs. 2/30	264.50	per acre
Driver's pay at Rs. 6/- per day	69.00	,, ,,
Kangany's pay	30.00	,, ,,
Oil, petrol and kerosene and general maintenance ...	30.00	,, ,,
Uprooting missed tea	80.00	,, ,,
Rs.	473.50	per acre

2. Cost of clearing land of tea with a 'hand' grubber:—

		Rs. cts.
Labour at 4 per day and 1 kangany, uproot 88 bushes per day. At 5,000 bushes per acre = 57 days per acre = 285 labourers. @ Rs. 2/30 per day		655.50 per acre
Uprooting missed tea		80.00 ,, ,,
	Rs.	735.50 per acre

3. Cost of clearing land of tea with a Trewhella 'mechanical' winch

		Rs. cts.
Labour at 6 per day and 1 kangany, taken on actual cost over 12 acres = 464 labourers per acre at Rs. 2/30 ...		1,067.20 per acre
Petrol at 18½ gallons per acre		48.20 ,, ,,
Oil		17.62 ,, ,,
Repairs		126.95 ,, ,,
Uprooting missed tea		80.00 ,, ,,
	Rs.	1,339.97 per acre

1A. Cost of clearing land of tea with a power winch & replanting (4 years)

		Rs. cts.
Clearing land of tea with a power winch ...		473.50 per acre
Cutting new drains — 60' per labourer cutting reversed slope drains—20 labourers per acre @ Rs. 2/30		46.00 ,, ,,
Lining on contour — Cutting pegs — 3 labourers @ Rs. 2/30	6.90	
Pegging on contour—3 labourers ...	6.90	
Transport to field	.50	14.30 ,, ,,
Cutting trenches — 1 feet wide by 1½ feet deep, 120 feet per labourer per day		350.00 ,, ,,
Planting Guatemala grass — Planting Guatemala grass cuttings on the contour—6,000 cuttings @ -/05 cts.	300.00	
7 labourers @ Rs. 2/30	16.10	316.10 ,, ,,
Lopping Guatemala grass — 10 labourers and kangany per acre, twice a year for 2 years—44 labourers per acre @ Rs. 2/30 ...	101.20	
Clearing trenches prior to first lopping of Guatemala—44 labourers & 2 kanganies @ Rs. 2/30	105.80	207.00 ,, ,,
Manuring Guatemala grass — 4 applications at 2 cwts. per acre over 2 years @ Rs. 343/- per ton	136.00	
Application @ 5 labourers per acre ...	46.00	182.00 ,, ,,
Weeding — Monthly weeding @ 5 labourers per acre for 4 years, *i.e.* to the time of the tea coming into bearing 48 rounds = 240 labourers @ Rs. 2/30		552.00 ,, ,,

Cutting Guatemala grass at ground level and levelling on contour

		Rs. cts.
This item is almost impossible to estimate, due to differences in terrain, etc., but on a fairly steep area with above average rock outcrops, where stone terracing may be necessary in places, an approximate figure of Rs. 360/- may be required		360.00 per acre

Planting bush green manures and uprooting over 2 years

Planting *Tephrosia vogelii* at 20 lbs. per acre plus labour at 8 per acre, small application of manure mixture @ Rs. 300/- per ton, application rate of 16 oz. to 10 yds. of *Tehprosia vogelii* row—approximately 300 lbs. per acre. Application at 4 labourers per acre over 2 years, replacing *Tephrosia vogelii* twice in that period, gives the following costs, including uprooting old *Tephrosia vogelii*:—

Cost of seed	50.00		
16 labourers @ Rs. 2/30 for planting ...	36.80		
Cost of manure	80.00		
8 labourers @ Rs. 2/30 applying manure ...	18.40		
26 labourers @ Rs. 2/30 uprooting old *vogelii*	59.80	245.00	„ „

Lopping bush green manures—Lopping *vogelii* 3 times per year for 2 years @ 6 labourers per acre —36 labourers @ Rs. 2/30 ... ... 81.80 „ „

Shade trees — To hole and supply grevilleas, *Albizzia sumatrana* and dadaps as follows:—

Grevillea @ 18 per acre @ -/80 cts. ...	14.40		
Albizzia sumatrana 27 per acre @ -/80 cts. ...	21.60		
Dadaps 111 per acre	2.00		
2 labourers to hole and supply above ...	4.60		
Protection baskets	4.00		
Resupply vacancies	12.00		
Trimming	4.60	63.20	„ „

Holing & supplying tea — 4,200 plants per acre @ -/20 cts. will be required, planting 5′ rows by 2′ between plants 840.00

Protection baskets for same @ -/10 cts. per basket 420.00

Holing @ 200 holes per man=21 labourers and 1 kangany 47.60

Supplying @ 100 plants per labourer ... 92.90

Transport charges 2.00

Hand watering plants, in the event of drought @ 3 labourers per acre per round for approximately 10 days ... ... 69.00 1,471.50 „ „

Supplying tea hedges—To supply tea hedges on road banks and top side of drains ... ... 23.00 „ „

Manuring tea plants—Application every 3 months @ 1 oz. per bush of T/175 mixture=approximately 1 ton over 2 years 350.00

Application @ 8 labourers per acre per round for 2 years	147.20	Rs. cts. 497.20 per acre	
Resupplying vacancies—To resupply approximately 20 per cent. loss		178.00	,, ,,
Tipping—To tip 3 times a year at an average of 3 labourers per acre per round=18 labourers per acre for 2 years @ Rs. 2/30 ...		41.40	,, ,,
Draining—To clean out drains once a year for 2 years @ 5 labourers per acre=10 labourers per acre @ Rs. 2/30		23.00	,, ,,
Spraying against blister blight—34 rounds per year for 2 years at 3 acres per round including transport and cost of fungicide, etc., approximately Rs. 1/80 per round=for 2 years ...		122.40	,, ,,
	Rs.	5,247.40	,, ,,

2A. Cost of clearing land of tea with a 'hand' grubber and replanting.

Rs. 5,247.40—473.50=Rs. 4,773.90+735.50 ... Rs. 5,509.40 ,, ,,

3A. Cost of clearing land of tea with a 'Trewhella' mechanical winch and replanting.

Rs. 5,247.40—473.50=Rs. 4,773.90+1,339.97 Rs. 6,113.87 ,, ,,

Presuming the land to be cleared is jungle and no soil rejuvenation is required, the following items would not appear:—

		Rs. cts.	
Cutting trenches	...	350.00	
Planting Guatemala grass	...	316.10	
Lopping Guatemala grass	...	207.00	
Manuring Guatemala grass	...	182.00	
Half weeding costs	...	276.00	
Cutting Guatemala grass at ground level	...	240.00	approximately
	Rs.	1,571.10	

Therefore the total cost per acre, excluding clearing jungle, would be Rs. 4,773.90—1,571.10=Rs. 3,202.80

Expenditure on equipment

(To be depreciated each year)

Trewhella 'monkey' grubber

The Trewhella 'monkey' grubber 24 tons capacity complete with transport wheels, grubber and handle, snatch block, grab, 50 feet special drum rope and pull ropes 80 feet, 40 feet, and 15 feet anchor rope	Rs.	1,250.00

Trewhella 'mechanical' or 'horse' grubber

The Trewhella 'mechanical' or 'horse' grubber complete with the necessary reduction gearing—belts & pulleys—3 h.p. benzine engine—70′ × 2½′ cirm. drum rope—60′, 40′ and 20′ × 3½′ cirm. pull ropes and 20 feet anchor rope ... Rs. 4,150.00

Hesford hercules 2-speed trailer winch

Hesford hercules 2-speed trailer winch on pneumatic tyres, with power-take-off, universal jointed shaft, rope guide rollers and sprag	£313–0–0	
1—300′ × ⅝′ diameter wire ropes	17–0–5	
1— 50′ × ⅝′ diameter rope with 6 rings	19–16–4	
6—6′ long ropes with 'D' shaped shackles fitted	26– 8–0	
2—Ground anchors and spikes	8– 0–0	
	£384– 4–9	
Plus 5 per cent. on the gross amount for packing and delivery charges to steamer	£ 19– 4–3	
	£403– 9–0	
Plus freight and insurance ...	20– 1–0	
	£423–10–0	*Rs. 5,645.25

(*Calculated at Rs. 13/33 to the £)

Fordson tractor		Rs.	9,913.60
Boughton winch	(approximately)	Rs.	5,500.00

APPENDIX B

1. Guatemala grass manure mixture:—

5 parts sulphate of ammonia
3 parts superphoshpate (20%)
2 parts muriate of potash (60%)
} To be applied at 2 cwt. per acre.

2. Tephrosia vogelii or green manure:—

4 lbs. sulphate of ammonia
6 lbs. saphos phosphate
6 lbs. muriate of potash (50%)
} To be applied at approximately 300 lbs. per acre.

3. Shade trees:—

As per plan ... Grevilleas at 18 to the acre.
Albizzia sumatrana at 27 to the acre
Dadaps or *Albizzia moluccana* at 111 to the acre

4. Manure mixture T/175 for young tea plants:—

100 lbs. sulphate of ammonia
50 lbs. saphos phosphate
25 lbs. muriate of potash (60%)