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TEA PRODUCTION IN MALAWI[1]

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Malawi is a friendly landlocked country situated south of equator between 9 and 16 parallel. Her area is 118,000 sq. km of which 28,678 sq. km is occupied by the Lake Malawi. Malawi shares borders with Zambia, Tanzania and Mozambique.

Tea is Malawi's second biggest foreign exchange earner after tobacco. The tea industry provides employment to thousand of Malawians.

Tea is grown in three areas of Malawi e.g. Mulanje, Thyolo and Nkhata-Bay, where average rainfall is well over 1200 mm per annum. These areas are situated between 500 - 850m above sea level. Mean daily min. temp. December: 18 - 19°C, June 11 - 13°C.

Tea was first grown in Malawi in late 19th century and at present the total area under tea is 18,800 ha of which 12% is cultivated by the smallholders and the remainder is owned by foregin owned private estates.

Most of the old tea gardens are of seedling origin whereas new plantings, in newly planted as well as in replanted areas, are of clonal origin.

Type of tea	Area (%) under cultivation
China hybrid (Local jat)	30
Indian hybrid	45
Polyclonal	15
Clonal	10

1. LAND USE

A topographical lay-out is suggested and although many old plantings are in straight lines, planting along the contours is recommended, because of the head for soil and work consideration.

2. PROPAGATION

(a) Planting with seed is not done very often anymore. Only polyclonal seed is planted and seedlings are raised in pots (22.5cm × 8.5cm).
(b) Stump planting is non-existent.
(c) Vegetative propagation: It is TRF's responsibility to provide improved planting material to its members. There is no research work by the Estate sector.

Four types of clones are released:
(a) Field clones are good rooters and have high yield potential. They are either from field selections or selected from plants raised from the cross pollination of two parent bushes.
(b) Rootstock clones are vigorous and easy rooters and have drought tolerance.

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(c) Scion clones are clones of high quality, pluckability, tolerance to pest but they are not good rooters.
(d) Generative clones are used for seed production.

Cuttings:

Single node cuttings (one leaf and bud and 3 - 6 cm leafless stem) take 18 - 20 months to grow into a plant ready for planting.
Binode cuttings (two leaves and their buds and 3 - 5 cm stem below) take 8 - 10 months to grow into a plant ready for planting.
V.P. nurseries are shaded with grass or plastic shade, the latter being more expensive.
Potting soil: subsoil for rooting - pH below 4.5 ($CaCl_2$) 5.0 (water).
Top soil: good loam or a mixture of tea compost plus subsoil (1:5) pH 5 -5.5 (water).

Propagation of cuttings: – (Two methods)

(a) Under polythene tents in standard pots: (22.5 cm × 8.5 cm)
Upper 20 mm = subsoil
Middle 30 mm = mixture of sub and top soil
Lower 100 mm = topsoil
(b) By misting:
Cuttings are planted in minipots (125 × 85 mm) containing subsoil only, and frequently sprayed with water to keep the leaf surface moist.
The cuttings root in 4 - 5 months are are then transferred into bigger pots containing topsoil only.
Sometimes cuttings are planted direct in standard pots and are misted.
This method dispenses with polythene which is expensive.

Fertilizer in nursery:

Sulphate of Ammonia - 500g/200 litres of water, 5 litres of this solution.
Pruning:
No pruning is recommended in the nursery; it inhibits the root growth. However, plants should be moved at 8, 12 and 16 months to prevent roots growing into soil.
Chip budding:
This is grafting, in which one bud and a small bark section with or without wood are joined to a rootstock, so that the two unite and continue to grow as one plant. Advantages are obvious: vigorous rootstocks and quality scions are combined. The practice to raise composite plants like this is on the increase.

3. PLANTING:

Optimum time of planting is restricted to the main rainy season.
i.e. Mid November to mid February (southern Malawi)
Mid December to mid April (Northern Malawi).

Plant Population:
Most old plantings are at 121 × 121 cm spacing i.e 6730 plants/ha. The populations recommended for new plantings in dry land conditions:

Spacing	Population/ha
120 × 70	11905
120 × 75	11111
120 × 80	10417

Mulching:
The importance of mulch is being stressed. Guatemala grass *(Tripsacum laxum)* is grown as mulch. Three ha of tea require one ha of mulch fertilized at the same rate as tea.
Infilling of mature tea:
Infilling is advocated. Healthy well grown plants of vigorous clones raised in large pots are used.
Shade:
Tea is not shaded in Malawi.

4. REPLANTING

Most of the planting is to replace old unproductive tea with high quality, high yielding clones. Very few new areas are opened.
Three way are practised:
(a) Plough, rip and plant
(b) Minimum tillage where roots of old tea are left in situ
(c) Rehabilitation for one or two years with Guatemala grass before planting. We advocate rehabilitation for its many advantages.

5. IRRIGATION

At present there is nominal irrigation in estates which have gravity lines. Hand watering of young plants, especially in periods of drought is common.
Experiments have shown that a full scale irrigation is economically viable and effective. Some estates are considering installing irrigation.

6. NUTRITION

Fertilizer is applied.
(a) by hand broadcasting
(b) or by air
Major elements
(a) Nitrogen:
Sources:
Urea: mostly used in mature tea.
Ammonium sulphate: during first 7 years and then 50kg of N requirement to supply 5 kg of sulphur annually.
Others Calcium ammonium nitrate and Ammonium nitrate are not very often used.

(b) Phosphate:
As single or triple super phosphate.

(c) Potash:
Source: Muriate of Potash, or as Potassium Sulphate.
Remedial or booster.
Application is based on soil and leaf samples which estates are advised to take.

Leaf samples: 3rd leaf in second flush i.e. in January/February, analysed for N, P, K, Mg, Cu, Zn, Ca and Mn.
Deficiency Levels: N 3.9 - 4.30%
P 0.25 - 0.30%
K 1.60 - 2.0%
Soil Analysis : pH outside the range 5 - 3.8 ($CaCl_2$)
pH outside the range 5.8 - 4.2 (H_2O)
P = less than 5 ppm
K = less than 0.2 m eq%
Levels of fertilizer of all three major elements (i.e. N P K) are based on age of seedling tea rather than on the quantity of leaf plucked/ha per field/per annum. Mostly they are applied as mixtures. Recommended ratio is 15:3:5. The following table shows rates of fertilizer depending upon age of tea in (fertile soils):

Age	N	P_2O_5	K_2O
1	20	—	—
3	40	8	13
5	60	12	20
7	80	16	27
10	120	24	40
10-12	150	30	50
13-14	150	30	50
20-25	170	34	57
46-50	230	46	77
66-70	250	50	83

Fertilizer application time is October to December. Usually one application is applied, but sometimes it is split into two applications; the second then is applied in February.

Minor elements:

(a) Sulphur: Deficiency of sulphur leads to sulphur yellows "ten yellows". Ammonium sulphate is applied as source of N and S over a period of first 7 years to build up 100 - 110 Kg sulphur/ha.
There often 50 kg of N requirement is applied as Ammonium sulphate every year.

(b) Zinc : Zinc is not deficient in Malawi soils but it promotes growth of more shoots, and sprayed fields, yield up to 10% extra crop.
Zinc is applied as Zinc oxide at 1.25 kg/ZnO per ha, four times a year i.e. end August, mid November, 3 weeks after first flush i.e. January and 6 weeks after first peak i.e. in February. Application is by air.

(c) Copper : Copper is essential for fermentation and sometimes it is required in areas with black humic soil i.e. near Mulanje Mountain.
Copper sulphate 0.5 or 1.0% solution, or copper oxychloride 1 kg/ha.
Copper oxychloride is mixed with Zinc oxide and applied by air.

(d) Magnesium: Magnesium deficiency occurs mostly in replanted fields. To correct 2% solution of Magnesium sulphate (Epsom salt) is used.

7. PRUNING

All pruning is done by hand with a pruning knife.

(a) Young tea
- (i) First prune 6-7 months after planting followed by 4 annual prunes, or
- (ii) no prune is first year. followed by five annual prunes. This practice is followed when the plants are initially small.

(b) Mature tea

Pruning cycle:
- (i) Two year pruning cycle for 7 - 10 year old tea.
- (ii) Two year pruning cycle Local tea (China hybrid) and Clones are pruned after evry two years.
- (iii) Three year pruning cycle - Indian hybrid is pruned every three years.
- (iv) Four year Pruning cycle Prune, Skiff and prune. Some estates practise this Pruning cycle on all types of tea.

Pruning time:

Young tea	July and June
Mature tea	May mid June
Down Prune	March, First week of April.

Shading of Pruned bushes is recommended to protect frame from sunscorch. Pruning litter is left in situ and sanatory removal of damaged branches is rarely practised.

8. PLUCKING

(a) All plucking is done by hand. Some estates are experimenting plucking with hand-held machines and shears.

(b) Most of the pluckers are men.

(c) Two plucking systems are followed:
- (i) Gang plucking is the most common system. A field is allocated to a gang.
- (ii) Programme scheme plucking in which each plucker is allocated a set number of plots which he alone plucks. PSP fixes the number of pluckers; round length and area in the beginning of the season; working hours are flexible.
  This system controls unauthorised absenteeism and has many other advantages.
  This system of plucking is successfully implemented by many estates now.

(d) Wages for 42 kg green leaf plucked in the main season are K1.74.
(e) Productivity in the main season per plucker varies from 40 kg.
(f) Policy is to pluck selectively 2 + b and 3 + b. The estates are advised to check pluckers' productivity/plucking standard daily by counting pieces per Kg of green leaf.
(g) Plucking procedure is 'palms up'. This increases selectivity.
(h) Pluckers are instructed to use bamboo wands (2.5 - 3.5m long) to keep tables flat.
(i) The leaf is collected in bamboo baskets.
(j) Expected annual raise in table is 10 cm.
(k) Plucking round:
- 10 - 11 days or 14 days round in main season.
- 14 - 28 days round in cold and dry season.
This is based on growth of tea shoot which takes 42 (475 day degrees) days to reach pluckable size in the main season.

9. WEED CONTROL

Manual and Chemical. Cost approx K50 - 150 per ha/annum.
Gramoxone (paraquat) is widely used and others are:
Roundup (glyphosate)
Fusilade (fluazifop-butyl) for young tea
Goal (metalochlor)
Ronstar (oxadiazon)
Oxyfluorfen
Dowpon (dalapon)
MSMA

10. PESTS OF TEA

Common name	Scientific name	Remarks
Insect pests		
Mopsquito-bug	Helopeltis schoutedeni	Major
Thrips	Scirtothrips aurantii	major
Carpenter month	Teragra quadrangula	minor
Jelly grub	Niphadolepis alianta	sporadic
Tea leaf weevil	Systates smeii	sporadic
Scale insects	Coccus spp	common on young tea
Aphids	Toxoptera aurantii	minor
Stinging caterpillars	Parasa vivida and others	minor and rare
Grasshoppers	Zonocerus sp	occasional
Mite pests		
Red spider mite	Oliqonychus coffeae	major
Yellow tea mite	Polyphagotarsonemus latus	important in nurseries
Purple mite	Calacarus carinatus	rare
Scarlet mite	Brevipalpus phoenicis B. obovatus	minor

11. DISEASES OF TEA REPORTED FROM MALAWI

Common name	Scientific name	Remarks
Rot diseases		
Armillaria root rot	Armillaria heimii near A. mellea	Major
Pale root rot	Psendophaeolus baudonii	localised in one field
Violet root rot	Sphaerostilbe repens	Occasional in water logged soils
Charcoal stump rot	Ustulina deusta	very rare
Stem diseases		
Stem and branch canker	Phomopsis theae	major, confined to clonal plantings
Wood rot	Hypoxylon serpens	newly reported, incidence being studied
Thorny stem blight	Tunstallia aculeata	newly reported, incidence being studied
Leaf diseases		
Brown blight	Glomerella cingulata	common
Grey blight	Pestalotiopsis theae	”
Eye spot	Pseudocercospora ocellata	common but not serious

12. CONTROL OF DISEASES

(a) Root diseases:

Incidence of *Armillaria* root rot and other root diseases is reduced by ringbarking shade and other trees 18 months prior to felling. This reduces starch reserves and depleted roots are colonised by other saprophytic fungi before Armillaria has a chance to establish.

Stem diseases

Phomopsis stem and branch canker is due to water stress and any cultural practices which reduce water stress help to reduce the incidence of this disease. Some clones are more tolerant to this disease than others.

Leaf diseases

Grey and brown blights are common but do not require spraying. Eye spot is rarely serious on tea in plucking.

(b) Control of pests

Thrips

Controlled by a combination of cultural (i.e. alteration of pruning time) and chemical control. Synthetic pyrethroids are very effective.

Mosquito bug

Application of chemicals is recommended based on threshold level of damage-which is monitored by counting damaged and healthy shoots in the field throughout the year. Preventive sprays are recommended at bud break.

Other insect pests
Sporadic attacks of all other pests are curtailed with chemicals.
Mite pests
Acaricides are frequently sprayed to control mite pests in young tea. Some estates spray to control red spider mite.

13. SPRAYING EQUIPMENT

Manually operated knapsacks are commonly used, as motorised mistablowers are expensive to run and maintain.

14. RECOMMENDED PESTICIDES

Common name	Rate g a.i. ha-1
Insecticides	
Alfacypermethrin	5 - 10
Carbaryl	850
Cyfluthrin	5 - 10
Cypermethrin	20 - 25
Deltamethrin	2.5 - 6.25
Dimethoate	400
Endosulfan	350
Fenitrothion	500
Lambdacyhalothrin	2.5 - 6.25
Pirimiphos methyl	500
Malathion	1000
Acaricides	
Calcium polysulphide	25 ml/litre
Dicofol	370
Tetradifon	160
Fungicides	
Captan	lg/litre
Copper oxychloride	2-5g/litre

15. MANUFACTURE

Plucked leaf is carried to the factories in bags, baskets, trays in tractor trailors or lorries. Tea is processed with Lawrie Tea Processor (LTP), fermented on a moving fermentation

bed and dried in fluid bed driers. The estates produce their own fuel wood which is mostly *Euclyptus grandis*. There are 22 factories in the South and 1 in the North of Malawi. Malawi only produces black tea most of which is exported through the Limbe auction. It is packed in paper sacks. Malawi tea is of medium quality.

16. THE TEA RESEARCH FOUNDATION (CENTRAL AFRICA)

It is an independent body established in 1966 although tea research in the area goes back to 1930. It serves an area of 31,400 ha which produces 68 million Kg tea (1988).
Aim: Its aim is to promote research into all matters concerned with the production of tea in the region of Central Africa and other areas with similar climate.
Countries covered: Malawi, Zimbabwe, Zambia and Southern Africa.
Sources of Funds:
- One third from sale of our products e.g. V.P. plants and cuttings; made tea and green leaf.
- Rest contribution from members and also aid from the British Govt (DDA) and EEC and UNDP.

Research Sections:
- Agronomy
- Plant Improvement
- Horticulture
- Plant Protection
- Biochemistry
- Process Engineering

Advisory duties are shared by the Advisory Officer and other research officers. Most of the experiments are sited at three research stations. Agronomy and Plant protection sections also have trials on the estates.
Publications:
- Annual Report
- Quarterly Newsletter
- Tea Planters' Handbook

Services:
- Advisory
- Soil and leaf analysis
- Identification of pests and diseases

Coffee Research:
Agreement with the Govt of Malawi since 1987 to do coffee research.
Senior Staff:
Tea = 15 and Coffee = 3