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As Assam Tea completes 200 glorious years, we look back at few of its major milestones, including some pioneering contributions of TRA Tocklai, which have been critical in shaping the tea industry.











To Do List for Tea Plantations - January

Field

LAND PREPARATION • Fill up the pits and old subsidiary drains. • Complete land profile survey. • Avoid ploughing in locations marked for main and submain drain. • Ameliorate the soil based on soil test. • Follow a sequence of ploughing-cross harrowing-sub soiling-cross harrowing-levelling.

TEA NURSERY • Prepare the beds. • Water the autumn propagated cuttings judiciously. • Complete sowing of seeds and cover with thin mulch.

SHADE NURSERY • Apply organic manure @2.5kg, 200g Dolomite and 125g SSP per M² during bed preparation. • Cover the beds with fast degradable mulching material. • Make the drains 60cm deep in between the beds and 90 cm deep in the periphery.

YOUNG TEA PRUNING • Do the operation at a height where the same is due.

MATURE TEA PRUNING/SKIFFING • Medium prune: Complete by middle of the month. • Light prune & Deep skiff: Complete by early of the month. • Medium skiff: Complete by mid of the month. • Light skiff & level skiff: Complete by end of the month and avoid in droughty areas. • Cleaning: Complete hand de-banjhi and KCO.

MANURING • Continue foliar application of MOP and Magnesium sulphate.

PLUCKING • Level the plucking surface and pluck off banjhis.

MULCHING • Mulch all newly planted areas.

WEED CONTROL & CULTIVATION • Uproot the ferns, creepers and hardy woody perennials. • Fork/light hoe after LP/MP in heavy textured soil. • Complete ground leveling wherever is necessary.

PEST & DISEASE CONTROL • Control on spot the initial infestation of pests.

• Fork the soil to collect Chrysalids of Looper and Bunch caterpillar. • Give alkaline wash on bush frame and control termite.

Factory

CTC - 1) Withering trough: Check and service Motors, Welded Mesh & Netlon, Dampers, Dial thermometer. 2) CTC: Check diameter of the Segments, service Roller Bearing Journals, Roller & Conveyor Bearing, Gear Box, shaft, Motors. 3) Ghooghe: Check & service all bearings, Motors, rectify Vibration. 4) CFM: Check the perforated PU Belt, drive shafts and bearings, air ducts and humidification systems, run through time. 5) Dryer: a) Conventional dryer: Check and service feeder trays, perforated trays, tray carrying Chain, dryer Shafts & bushes, Scrapper chain, Sprockets, Feed & Auxilliary Spreader, Baffles, Tray Runners, Inlet/Outlet Thermometers, FD Fan, DF Heater & Gas Burners, Hot Air Evacuation, Circuit Speed Ratio. b) VFBD: Check and service Dustractor Fan 1, 2.& 3. Cyclone, Teflon Bellow, Grid Plate, Vibro Drive, Feed Conveyor and Ball Breaker Unit. 6) Heater: Check I.D. fan and stove, change chimney segment if perforated. 7) Sorting: a) Hobro system: Check all bearings, wash, grease and refit or replace if necessary. Check connecting Rod Bins, service/ replace magnetic felt Pads, sprockets and chain. Check, tighten/replace all SS Meshes. Check meshes nos and grade sign. Check & repair conveyors. b) Vibro screen sorter: Check motor position angle, desired tension, size and weaving of wire mesh, appropriate gauge size of the wire. Check and service storage bin, batch weighing machine, ventilation and exhaust fans. Repair floor.

ORTHODOX (ASSAM) - 1) Check and service all Barrels and Tables, Asymmetric Wells, Operation of Well Doors, Pressure Caps, R.P.M, Motors, Gear Box Pinions, Vee Pulley and Vee Belts. Service cranks, posts. Grease the bearings and replace if requires. 2) Check all main Switch and Starters, Rung Trolleys, Motor Guards. 3) Check and service orthodox Ghoogies.

ORTHODOX (DARJEELING) – 1) Overhauling or replacement will continue for pulley, bearing, bushes, fan belt and V-belt etc. using food grade grease 2) Check leakage of chimney, change chimney segment if having too many holes. 3) D.G set, Hydro Turbine, etc. to be thoroughly checked and serviced. 4) Upkeepment of infrastructure like factory building, doors, stairs, window pans and cleaning of entire factory floor and wall. 5) Paint machineries with non toxic acrylic emulsion paint and food grade epoxy enamel paint for floor and rolling areas.

GREEN TEAS – Overhauling of the Boiler, Roaster, Rolling tables, Dryers, Myddleton, Arnot

sorter, Balanced pucca sorter, Savage cutter, Hexagonal ghooghe etc. to be completed.



Planters, 2023

January

Sun	Mon	Tue	Wed	Thu	Fri	Sat
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
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Singphos – The first known tea drinkers in India

Tea has been an integral part of the tribal societies in Northeast India, especially those of Assam, Manipur and Arunachal Pradesh. The *Singphos* residing in parts of Northeast India, Myanmar, and China, are believed to be amongst India's first tea drinkers. They would mount elephant backs to pluck tea leaves from the tea shrubs growing wild in the forests. They preserved a traditional but unique tea processing technique for generations, producing a herbal tea drink named *Phalap*.



To Do List for Tea Plantations - February

Field

LAND PREPARATION • Lay the subsidiary, sub-main and main drains. • Complete final ground levelling.

REHABILITATION • *Mimosa invisa* seeds are to be drilled in alternate rows of Guatemala to be planted. • Plant Guatemala cuttings in non droughty areas at the end of the month.

INTERCROPPING • Sow Crotalaria seeds in between alternate tea rows in proposed as well as newly planted teas.

NURSERY • Complete bed preparation, sleeve filling and overhead shade. •Regularly water on the sleeves allowing the soil to settle. • The depression in the sleeves to be filled up.

TEA PLANTING • Start planting towards the later part of the month subject to availability of rain/irrigation.

SHADE PLANTING • Plant shade saplings following rains. • Ensure proper ramming during planting

PRUNING/SKIFFING • Complete frame forming prune by early of the month. •Thumb prune or de-centre the early autumn planted plants if declares fit.

MANURING • Spray MOP and Magnesium Sulphate as foliar if drought prevails.

PLUCKING • Hand level the plucking table.

MULCHING • Mulch the newly planted areas.

DRAINAGE • Complete cleaning, deepening, re-grading of the drains.

CULTIVATION PRACTICES • Fill up the collar depression and level the ground.

PEST & DISEASE CONTROL • Monitor incidence of pests and spray on spot.
•Helopeltis infested patches should be plucked black ensuring thorough removal of infested shoots. • Hand-collect/light traps the moths of Looper and Red Slug. • Undertake insecticidal spraying in seed bari. • Complete control measure against Termite.

Factory

CTC-1) Check Ceramic Bar Magnets and Conveyor belts. 2) All the Vibro sorter's rollers need to be polished and the entire roller's scrapper to be checked and repaired. 3) Repair all Leaf trailers 4) Paint all machineries 5) Service & paint transformers 6) Paint fermenting floor 7) Service exhaust fan.

ORTHODOX (ASSAM) – Both Fine & Coarse line Ghoogie/ Myddleton/ Arnott/ TTB and conveyors should be serviced on the same line as CTC sorting. Colour Sorters need to be serviced by Authorized dealer.

ORTHODOX (DARJEELING) – Trial run for each machine to ensure the zero breakdowns during the season. Keep the factory ready in all respect from second fortnight of February.

GREEN TEAS – Overhauling mentioned in the month of January should be continued.



Maniram Dutta Barbhandar Barua, later Dewan, was one of the most prominent Assamese elites during the early part of the British rule. Although the discovery of the indigenous tea plant is attributed to Major Robert William Bruce, a Scottish explorer, merchant and ex-Major in the Bengal Artillery, the role played by Maniram Dewan in the discovery was equally noteworthy. Maniram informed Robert Bruce about the wild tea plants of

Assam and later accompanied him to the areas where the tea plants were found to have been growing wild. Dewan also introduced him to the chief of the local Singpho tribe, Bessa Gaum who served them Phalap or the local tea drink of the Singphos. Maniram Dewan is also credited to have established the first Indian-owned tea garden at Cinnamara near Jorhat. He was executed in 1858 due to his role in the Indian freedom movement.

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Planters' Calendar 2023



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To Do List for Tea Plantations - March

Field

NURSERY • Propagate cuttings from ready primaries. • Transfer the rooted cuttingsfrom bed to sleeve. • Water the sleeves judiciously.

SHADE • Sow the seeds and cover with a thin layer of mulch. • Keep the sleeves/beds moist. • Complete infilling of shade in mature tea after availing rainfall.

PLANTING • Do planting/infilling subject to satisfactory level of soil moisture. • Mark out the space for planting permanent shade.

MULCHING • Mulch newly planted areas.

MANURING • Apply first split of manure in UP teas under adequate soil moisture. • Apply YTD mixture in young tea. • Apply YTD and sand mixture (1:9) in sleeves with cuttings of 4-5 leaves.

PLUCKING • Continue janam plucking of UP teas at shorter interval. • Adopt liberal plucking in teas defoliated/ died back.

REHABILITATION & GREEN CROP • Complete planting of rehabilitation crop. • Sow the seeds of crotalaria in newly planted tea.

WEED CONTROL • Apply pre-emergent herbicide on moist soil if programmed. • Apply post-emergent weedicides depending on weed growth.

CULTIVATION • Fork/ light hoe LP/ MP teas in heavy textured soil of droughty areas.

PEST & DISEASE CONTROL • Monitor pest incidence and control on spot.
• Neem or other botanical pesticides and bio-control agents should be applied. • Spray insecticides on shade up to manageable height. • Remove second year green crop. • Hand collect caterpillar pest and light trap the moths. • Spray COC in Red rust/Black rot infected areas. • Spray pesticide in seed bari.

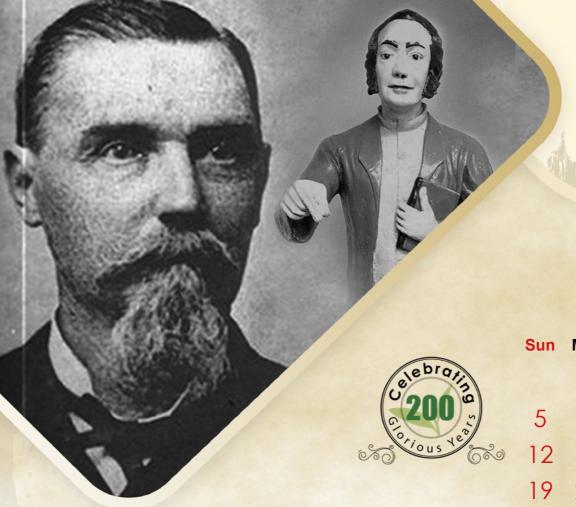
Factory

CTC – 1) Spread leaf as thin for longer period of natural withering and run one fan or alternate fan periodically. Reverse fanning is hardly required. 2) Avoid high fire. 3) While cleaning and sorting, lesser number of fibre extracting rollers may be required to run.

ORTHODOX (ASSAM) - 1) Degree of withering will vary from seed jat to clonal leaf and type of rolling table and target market. 2) Leaf on the trough should be spread @1.5 kg per sq. ft maintaining a thickness of 5-6 inches. Hot air should be best avoided. 3) Aim to get 70% fine after 2nd roll. If fine percentage of leaf is around 60%, each roll can be of 30 mints duration. The coarse grade is as good as fine. 4) The fermentation time will vary from 2.50 to 3 hrs for both fine and coarse. 5) Withered to made tea ratio should be around 37%.

ORTHODOX (DARJEELING) – 1) Loading of Assam, china, clonal leaves in separate troughs is important. Application of hot air is best avoided. Generally, 60 to 62% withering (expression is opposite to CTC) is taken depending up on the leaves. 2) Only one roll and the total rolling time will be 20 to 30 mints with open and touch pressure. The rolled leaf should be cool to touch. Cooling by fanning and spreading on floor for 10 to 15 minutes. 3) No oxidation of the rolled leaves is to be allowed. 4) While drying, maintain 235°F to 245°F as inlet temperature maintaining 70-75°F difference between inlet and outlet temperature. Drying time should be around 20-22 minutes. 5) Grading should be done through Myddleton mainly.

GREEN TEAS – Droughty spell almost being regular leading to lack of desired succulence in the shoots harvested from unprune sections and there being hardly any leaf from LP and DS sections. So, green tea is not made usually. However, one can make green teas if sufficient early rainfall is received, pruning and deep skiffing done early and free flushing activity resumes.



Planters, 2023

March

Sun	Mon	Tue	Wed	Thu	Fri	Sat
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5	6	7	8	9	10	11
12	13	14	15	16	17	18
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26	27	28	29	30	31	

The Bruce Brothers

Robert William Bruce established an experimental tea nursery at Sadia, but his untimely death in 1824 paved the way for his brother Charles Alexander Bruce to successfully grow tea plants in the experimental plots at Sadia and nearby areas. C.A. Bruce located 80 tracts of natural tea forests in the Muttak country, 12 in the Singpho areas, and another 28 in the west of the river Buri Dihing at Namsang, Tipam, Jaipur and in the neighbourhoods of Sivasagar and Gabharuparbat.



To Do List for Tea Plantations - April

Field

NURSERY • Continue propagation of cuttings. • Remove the weeds and fill up if depression exists with sandy soil. • Complete sowing of shade tree seeds. • Ensure that the sleeve/beds where tea seed was sown do not go dry.

PLANTING • Continue planting and infilling. • Complete shade planting. • Ensure proper ramming while planting.

MANURING • Apply YTD and sand mixture to the sleeves with plants of 4-5 leaves. • Apply first dose of NPK manuring in young and mature teas. • Apply Urea and Zinc Sulphate as foliar on weaker teas.

PLUCKING • Pluck close to janam and remove banjhi from UP teas. • Tip the DS and LP teas at appropriate measure at shorter interval. • Raise a leaf in debilitated unprune teas towards the end of first flush. • Unprune teas suffered from drought should be plucked liberally.

REHABILITATION & GREEN CROP • Complete planting and sowing of rehabilitation and green crop.

DRAINAGE • Clean the drains by removing the silt.

WEED CONTROL • Apply weedicides on active growth depending on type of weed. • Avoid application of weedicides in 0 and + 1 year tea. If unavoidable spray using protective shield. • Sickle between the rows and hand weed the collar in young tea. • The re-growth of woody perennial and creepers should be uprooted manually.

PEST & DISEASE CONTROL • As far as possible use of pesticides to spot. • Use only PPC approved pesticides at appropriate dilution on target. •Restrict use of hard pesticide to safeguard the predators. • Apply pesticides on shade tree trunk against Borer and Looper. • Spray copper fungicides against Red rust and Black rot.

Factory

CTC – 1) During banjhi period, little under withering for unprune and MS leaf while 68% to 70% withering for LP and DS leaf is desirable. Avoid application of hot air as far as possible. Reverse running of fans should preferably be done during evening only. 2) For uniform appearance and liquor, mix withered leaves of unprune and LP/ DS together in desirable proportion while feeding into the rotorvane. 3) RPM of the ghooghe of standard 6 ft dia x 8 ft long will be around 18 for Assam. The same will be about with 7 ft dia x 12-14 ft long for Dooars and Cachar which will run at 24 rpm. Clean ghooghe at regular interval.

ORTHODOX (ASSAM) – 1) Percentage of banji and coarse leaf should not exceed10-15%. Take relatively harder, say around 62% wither. 2) The rolling pressure should be harder to wrap up with the juices to all leaves and also for desired style. 3) Take 3 rolls of around 45 minutes duration each. Aim to have around 20% fine after 1st roll, 30% after 2nd roll and 20% after 3rd roll. Around 50% whole leaf grades is expected. 4) If percentage of banji is high, it is better to take 2nd fine only.

ORTHODOX (DARJEELING) – 1) Processing parameters will be maintained within the same range as mentioned for the month of March. Banji may appear in some sections by end April. 2) Rolling time will increase to 30 to 40 minutes. Proper cooling devices should be installed for faster cooling of the leaves. 3) Drying temp will be 240 to 245°F. Throughput time will be 22 to 24 mints. 4) Machine sorting will be required because of higher volume. Proper grading and cleaning is must. Leaf grade should be around 70 to 75%.

GREEN TEAS - 1) Production for green teas is not suitable because of higher percentage of Banji, less sap content in the shoot and higher percentage of yellow leaf grade. 2) Check functioning of all boilers, roaster and pressure for steam being close to 6 to 7 kg/cm².





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23	24	25	26	27	28	29
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Hitting the market

The 'Tea Committee' was formed in January 1834, while a 'Scientific Deputation' sent to Assam in the early months of 1835 reported on the possibility of large-scale commercial tea cultivation in Assam. In May 1838, for the first time, tea made from the experimental plots in Assam was shipped to England for sale. The chests reached London in November 1838. Eight chests containing Assam tea were offered for public sale. On 10th January 1839, the consignment was sold in the Commercial Sales Rooms in Mincing Lane, London by the East India Company. These eight chests of Assam tea were the first commercial consignment of Indian tea to be sold.

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Planters' Calendar 2023

To Do List for Tea Plantations - May

Field

NURSERY • Continue planting of cuttings. • Repair the drip damage. • Spray pesticides against pests. • Complete preparation of beds for autumn by mid May and keep under mulch cover.

PLANTING • Continue planting.

MANURING • Apply Urea (1%) and Zinc sulphate (1%) in plantation having banhji problem. • Complete application of first dose of manuring in young and mature tea. Y.T. MANAGEMENT • De-centre/thumb prunes the established plants. • Re-centre the strong central branches within 30cm.

PLUCKING • Remove banjhi and maintain a flat plucking surface. • Do not allow creep in LP/DS teas. • Tip the MP/ RP teas at 30 cm above the pruning height.

REHABILITATION & GREEN CROP • Do weeding if necessary. • Green crop should be thinned out. • Apply NPK mixture (2:1:2) containing 60kg N, 30kg P_2O_5 and 60kg K_2O per hectare in Guatemala.

WEED CONTROL • Complete first round of weedicide application. • Sickle the weeds in between the rows and hand clean around collar in young teas.

PESTS & DISEASES CONTROL • Restrict use of chemical pesticides to spot. • For blanket application use Botanicals including Neem, Sulphur and biocontrol agents. • Spray copper fungicides against Red rust, Black rot and nursery diseases. • Control *Fusarium* dieback with two rounds of Hexaconazole (1:1000HV) at fortnightly interval.

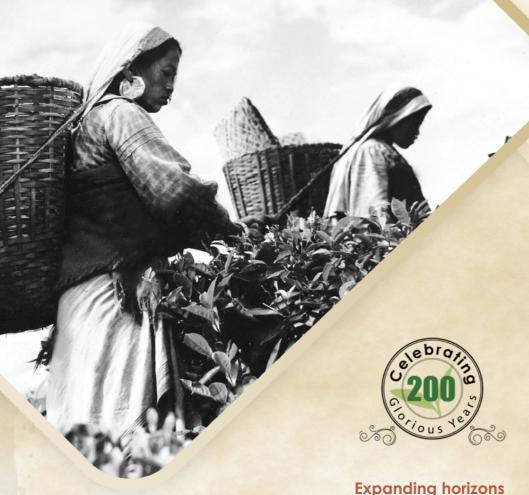
Factory

CTC – 1) CTC cut should be lighter during 2nd flush. 2) Processing parameters for withering, CTC, fermentation and drying will vary for LP, DS and unprune of clonal and seed jat sections and also for percentage of fineness of leaves. 3) Ghooghe is usually avoided in Assam but for Dooars and Cachar the rpm should be around 24 and slope to be 6".

ORTHODOX (ASSAM) - 1) Transport leaf as quick as possible avoiding damage of hot days. Application of hot air is best avoided but if necessary it should not exceed 6°F h.d. 2) Take around 60-62% wither to achieve nearly 70% fine grade with more whole leaf following 3 rolling of 40-40-30 minutes duration for Middle East market. But for export to Germany, try to make around 45-50% brokens with bright golden tips by taking soft wither as 62-65% following 50-40-30 minutes rolling. Rpm of the rolling table can go up to 48. After 1st rolling at least 25% extraction of fine and after 2nd rolling, minimum 40% to 45% extraction should be achieved. 3) Drying time is around 26 minutes.

ORTHODOX (DARJEELING) – 1) Withering will be within the range from 60 to 70%. Overwithered leaves should be re-conditioned by opening the window of the withering areas to avoid breakage of leaves during rolling. 2) 36" rolling table should be charged with 70 to 80 kgs of leaf whereas the same will be 100 to 120kgs for 46" rolling table. If require, it will be double rolled for unprune and banji leaves to get better twist of the leaf and cup quality. Duration of 1st roll will be 45 to 50 mints. Shifting is needed before 2nd roll. Duration of 2nd roll will be 25 mints. But Single roll of 45 mints should be given to LP & DS leaves. 3) Including rolling time, fermentation time for the leaves following first roll will be 2 hrs 45 mints to 3 hours depending upon quality of the leaves and elevation. Thickness of leaf should be of 3.5" to 4". Fermentation time of the leaves following 2nd roll should vary from 50 to 60 mints. H. D. of the fermenting room should be maintained at 2°F always. 4) Drying temp will vary from 245 to 250°F. Difference between drying and exhaust should be 85 to 90°F. Throughput time is around 24 to 26 mints. Refiring or gapping is needed for 2nd flush type of tea to enhance the tea quality as well as keeping quality.

GREEN TEAS – 1) Ensure quick transportation of green leaf from field to factory.2) Maximize production during 2nd flush from unprune leaves as the same is ideal for better make of green teas. 3) Big heaps of leaf is to be avoided on the storage platform. 4) Keep strict tab on all parameters specially steam pressure, roasting and rolling time. While roasting, do not over-steam the green leaves as the same will damage the tips. Do not give excess pressure while rolling as the same will lead to loss of tips. 5) Percentage of fine leaves should always be higher than 50%.



Planters, 2023

May

Sun	Mon	Tue	Wed	Thu	Fri	Sat
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

In the mid-1850s, the Assam model of industrial-scale tea plantations spread to Cachar, Chittagong, Darjeeling, Terai, and Dooars regions, and many locations in south India and Sri Lanka. In 1860, the British established a tea plantation in the Kangra Valley of Himachal Pradesh. From 1862 to 1867, commercial tea cultivation started in Chotta Nagpur, Punjab, Pakistan and other locations in British India where favourable geo-climatic conditions existed for tea cultivation. Within a few decades, China's dominance of tea production faded, and India and Sri Lanka dominated the global tea trade and export. The discovery of the Assam variety of the tea plant (Camellia Assamica) in 1823 revolutionised the world tea trade and business with a significant impact on millions of lives in the world.

Tea Research Association

Planters' Calendar 2023



To Do List for Tea Plantations - June

Field

NURSERY • Continue planting of cuttings. • Repair drip damage. • Thin out the shed over the seedlings and fill up the vacancies. • Keep the beds weed free. •Adjust overhead shed to maintain adequate slope.

PLANTING • Complete planting of tea and infills.

PRUNING & SKIFFING • Thumb prune/de-centre the established tea plant and infills. • De-bud the weaker (single stemmer) Plants. • Complete recentering of strong branches.

PLUCKING • Maintain a uniform plucking surface. • Allow the pockets in the plucking table to fill up.

MANURING • Apply second dose of YTD moisture in young tea nursery. • In mature unprune teas apply second dose of NPK fertilizer. • In weak and waterlogged teas, apply Urea, DAP and MOP as foliar.

WEED CONTROL • Apply second round of weedicide as per need. • Resort to sickling and hand-weeding of collar region in young tea. • Avoid damage to lower branches and collar depression from manual weeding.

PESTS & DISEASES CONTROL • Monitor pest incidence and adopt control measures on spot. • Ensure proper supervision while spraying. • Hand-collect the late instar caterpillars before spraying pesticide. • Avoid repetition of same pesticide. • Use fungicides against Red rust & Black rot. • Improve ventilation in Helopeltis infested areas by lopping lower branches of shade and side branches of tea bush.

Factory

CTC–Same as May. Slightly under fermentation is better than over fermentation. Avoid high fire and drying with 5°C low temperatures is desirable for better liquor. Around 31/32% recovery from withered to made tea is desirable.

ORTHODOX (ASSAM) – 1) Quality of shoots improves during peak 2nd flush with significant quantities of harvest from unprune, prune and deep skiff sections. It is better to wither tippy clones like N 436 & P 126 separately. 2) During 2nd flush, broken grade also fetches similar price like whole leaf. To have more brokens, withering should be lighter to the range of 65-68% so that while rolling some juice will come out. 3) To get more brokens, increase rolling time to 120 minutes with 45-30-45 minutes duration. For seed jat, a rung roll without pressure for 25 minutes may be required for coarser leaf. 4) Burn machine and ghooghe with bluish flame at hourly interval or hot water and flame after washing as chance of bacterial contamination is fairly high.

ORTHODOX (DARJEELING) – Same as mentioned for the month of May. To improve the economy of the garden, some specialty teas like oolong tea, white tea etc. are made during different seasons based on the demand.

GREEN TEAS – 1) Follow the principles as mentioned above for the month of May being in 2nd flush. 2) Keep the plucked shoots under cover of shed while carrying as surface moisture, in event of rain, will lead to build-up of high temperature affecting quality. 3) Ideally, 75% of produce should be of primary and rest 25% of secondary grade. Among the primaries, the ideal grade percentage should be Mogra 1= 25%, Mogra 2= 10%, Mogra (Sm) = 5%, Super fine=3%, Fine=5%, Lachha= 3%, GOF=2%, Mazdana = 7%, Hyson= 4%. Among the secondaries, Yellow leaves= 4%, Soomee =7%, Twanky=6%, Gun powder=3%, Stalk= 4%.



the Imperial government introduced the Indenture System of labour recruitment to bring workers from other provinces of Central India. These migrant labour communities eventually became permanent settlers in the tea

estates.

TOCKLAI

To Do List for Tea Plantations - July

Field

NURSERY • Repair drip damaged sleeves. • Thin out the green crop in between the beds from seed nursery. • Give a round of weeding in shade nursery.

PRUNING & SKIFFING • Deep skiff the mother bushes. • Thumb prune/decentre young teas if not deferred. • Go for an airy skiff in UP teas with uneven plucking surface.

MANURING • In waterlogged areas defer application to August/ September. • Apply foliar NPK mixture in waterlogged and weaker teas.

PLUCKING • Pluck at shorter interval regularly. • Maintain uniformity of plucking surface. • Pluck black in the event of excessive banjhi formation.

REHABILITATION & GREEN CROP • Lop the well grown Guatemala grass at 30cm. • Lop periodically Mimosa in a mixed stand. • Lop the lower branches of Crotalaria.

DRAINAGE • Ensure free flow of drains. • Record water table build-up in waterlogged areas. • Record the average flood level in outlets.

WEED CONTROL • Spray weedicide on spot depending on weed flora. • Sickle the weeds in very young tea avoiding injury to the plants.

PEST & DISEASE CONTROL • Monitor and apply pesticides on spot at the initial infestation. • Ineffective pesticide should not be repeated. • Lop the lower branches of tea and shade in Helopeltis infested areas. • Proper supervision from mixing of pesticides throughout its application is required. •Fungicides should be applied in Red rust and Black rot infected teas.

Factory

CTC-1) For wet leaf, reduce thickness of spread by 30% than normal. Withering should be around 70 -71% for rain tea. Except removal of excess moisture from the wet leaves, avoid hot air in enclosed troughs. 2) regulate the flow of humidified air in to the CFM during rainy season so that liquor is not affected and fermentation is not delayed. 3) In VFBD dryer, T1 may go up to 125° and T5 to 90° C as flow of leaf is high leading to under wither. 4) Percentage of bally grade should not exceed 4-5%. 5) Keep damper of Duplex cyclone of dryer as fully open during rainy season if percentage of coarse leaf is high.

ORTHODOX (ASSAM) – Percentage of moisture is more i.e. around 80% in leaf which need to be brought down to 60% by proper withering. Longer withering with ambient air or giving light hot air gives best result. Try to pluck same sized shoots from DS, unprune and LP sections. This will reduce the coarse percentages. Better leaves will give better withering and roll. Duration of rolling should preferably be 45-45-30 minutes. If size of the shoot is uniform and percentage of fine does not drop below 70%, one can follow the rolling sequence as 40-35-30 mints.

ORTHODOX (DARJEELING) – For low elevation garden, one should try to make 1st flush type of tea while mid and high elevation gardens should try to make in between 1st and 2nd flush type for better economics. For rain flush, cup quality and infusion will also be in between 1st and 2nd flush. For high elevation gardens, late flushing gardens, in LP and DS sections, processing of 2nd flush type of tea will be continued till end July. The leaf quality may be coarse to some extent. Withering is very vital part. By using hot air, try to take at least 60 to 65% wither leaving around 36% moisture in the leaf.

GREEN TEAS - 1) Percentage of unwanted yellow leave grades may increase. Keep plucking rounds strictly at 6-7 days interval. 2) Maximize whole leaf grades (primaries)following standard processing techniques. 3) In Darjeeling, green tea is better produced in Assam type of leaves as juices come out easily than chinary leaves. Green tea drying is essentially by 2 firing. 70% drying is completed after by 1st firing at 210 to 220°F for 15 to 18 mints and rest of the drying is completed after 2^{nd} firing at 250^{o} F for 22 to 24 mints.



Estate near Jorhat in 1904 and another Entomological Laboratory at Kannykoory in Cachar in 1906.

Tea Research Association | Planters' Calendar 2023

To Do List for Tea Plantations - August

Field

NURSERY • Repair drip damage. • Hand weeding in tea and shade nursery. • Thin out the overhead shade if necessary. • Scrap the mossy growth and fork lightly on top surface of the sleeves. • Remove green crop from seed nursery. • Spray appropriate insecticides as and when required.

YOUNG TEA • Check and fill up the collar depression.

MANURING • Apply second dose of fertilizer. • Apply a round of YTD and sand mixture (1:9) in the sleeve. • Apply YTD mixture at recommended dose and method in young tea. • Apply NPK manure to deep skiffed mother bushes. • Apply foliar NPK mixture to waterlogged teas.

PLUCKING • Avoid creep and maintain a flat plucking surface. • Pluck at shorter interval leaving smaller shoots.

REHABILITATION & GREEN CROP • Lop the well grown Guatemala grass at 30cm.• Lop Mimosa in a mixed stand if situation arise. • Lop the lower branches of Crotalaria.

DRAINAGE • Ensure free flow of drains.

WEED CONTROL • Repeat application of weedicide where necessary. • Avoid spraying weedicides on drain edge. • Repeat sickling and hand weeding of collar region in very young tea.

PEST & DISEASE CONTROL • Use acaricides and insecticides only on infested patches. • Adopt cultural control measures side by side with the chemical control. • Hand collect or light trap moths of looper. • Spray two rounds of COC/ Hexaconazole at 15 days interval against Black rot. • Skiff the severely Helopeltis infested patches before pesticides application. • Improve ventilation by lopping lower branches of shade and tea bush.

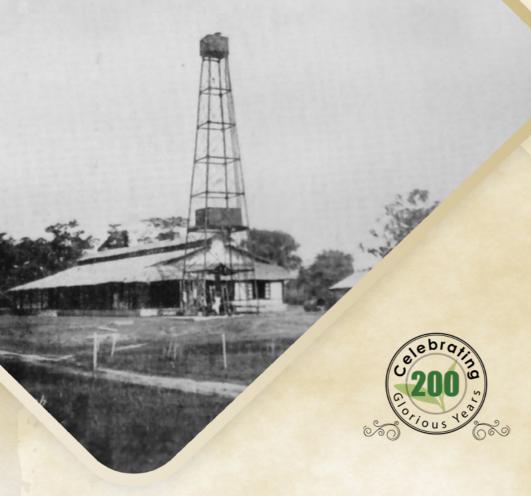
Factory

CTC – 1) For extremely wet and dripping leaf, the leaf is to be fluffed more and hot air of around 104° F (40° C) is to be given with the H.D. between 8 to 10°F for 45 mints to 1 hour. Degree of wither depend upon the percentage of fineness. 2) Regulate feed rate, change rollers at right time. Better to keep ball below 5%. 3) Regulate flow of humidified air into the CFM during rainy season. 4) While drying tea in VFBD dryer, T1 for rain flush teas should be around 125°C and T4/T5 will be around 90° C.

ORTHODOX (ASSAM) – Better leaves will give better roll. Spread well in troughs. Degree & quality of wither depends upon the percentage of fineness and h. d. of ambient air. As tips gradually reduce from early August, make heavier tea. Be careful of flakes produced from poor quality of harvested leaf. Pluck minimal 3 + Bud during this period. Maintain day to day sorting and packing. Do not allow unsorted tea to increase.

ORTHODOX (DARJEELING) – 1) Manufacturing process is either 1st flush or 2nd flush type. Because of heavy crop, loading in the trough can go up to 1.5 kgs to 2.0 kgs/ sq ft. Rain soaked leaf should be spread as thin to break the plucker's bunch. 2) Roll for around 30 minutes to make tea with light, bright greenish liquor somewhat similar to 1st flush. 3) First drying will be at 235 to 240°F. Refire all teas before packing and the temperature of the same will be 240 to 245°F. 4) True to size grading and proper cleaning is needed. Stalks should be removed. Avoid mixing of grade.

GREEN TEAS – During 2nd roll, keep a check on rolling pressure to reduce formation of large balls.



Planters, 2023

August

Sun	Mon	Tue	Wed	Thu	Fri	Sat
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

Establishment of the Tocklai Experimental Station

In 1911, the two laboratories at Heeleakah and Kannykoory were shut and a Tea Experimental Station was established at the loop of the rivulet Tocklai to the south of Jorhat and in the centre of the Assam valley. Dr. G.D. Hope was appointed as the Chief Scientific Officer and he was assisted by P.H. Carpenter, Asst. Scientific Officer, (Mycologist), A.C. Tunstall (Entomologist) and C.A. Andrews. The Tea Research Association was formed in 1964 to take over the management of Tocklai Experimental Station and its outstations. In 2014 Tocklai Experimental Station was rechristened as Tocklai Tea Research Institute.



To Do List for Tea Plantations - September

Field

NURSERY • To harden the plants for autumn propagated, thin out the overhead shade. • Keep the shade and seed nursery free from weeds.

PLUCKING • Fill up the pockets by plucking up to the average level of creep. •Introduce black plucking in the event of excessive banhjiness. • Contain creep in LP/DS teas within the permissible limit. • Allow the peripheral shoots to come up to the level of the table.

PRUNING • Lop the side branches of MP/ RP bushes if vacancy infilling was done.

MANURING • Apply second split of NPK fertilizer in waterlogged mature tea. • Apply a round of NPK (2:1:2) mixture @ 30kg N/ha in young tea. • Apply additional dose of 60 kg P_2O_5 / ha in tea proposed for MP/ RP. •

REHABILITATION & GREEN CROP • Lop Guatemala at 30 cm above the last cut mark. • Cut the rehabilitation and cover crop from the areas to be planted.

MULCHING • Collect and apply mulch material in young tea.

WEED CONTROL • Apply weedicides as per need. • Hand-weed the young tea areas. • Sickle the weeds at ground level to restrict flowering.

PEST & DISEASE CONTROL • Apply acaricide where chances of resurgence of mite are more. • Assess the level of Helopeltis infestation to adopt proper control strategies. • Apply COC or Hexaconazole depending on the persistence of Black rot. • Spray appropriate termiticide in young tea. • Spray insecticides against caterpillar and borer in young shade trees. • Undertake insecticidal spray in seed baries. • Hand-collect or light trap the moths of looper & Red slug.

Factory

CTC – 1) For partially wet leaf, the leaf will be fluffed properly and temperature of hot air should ideally be kept around 90 to 100° F (32 to 37.77° C) for 45 mints to 1 hour, keeping h. d. at 7 to 8° F. Thereafter, turn the leaf and follow same again. 2) RPM of the Rotorvane should ideally be 18 to 20. CTC cut should be relatively harder. 3) Try to complete sorting of primary and secondary teas daily. 4) Calculate daily sorting capacity to finish secondary sorting and packing before end November.

ORTHODOX (ASSAM) – Same as August. Even withering is essential for better roll. Check quantity of flakes and stalks content in third fine and coarse and do not force poor leaf for orthodox production. Percentage of coarse at any time should not increase more than 20-24%.

ORTHODOX (DARJEELING) - Same as mentioned for the month of August.

GREEN TEAS – From mid September, better to avoid manufacturing green teas as very high percentages of secondary grades are usually produced.



Tocklai and the Invention of the CTC machine

In 1931, Sir William McKercher, the then Superintendent of the Amgoorie Tea Estate invented the CTC (acronym for Crush Tear Curl) Machine. McKercher worked closely with the scientists of Tocklai over the next fifteen years and standardised the CTC manufacturing process. McKercher's invention revolutionized the technology behind tea making as CTC manufacturing resulted in more infusion than what was possible with the orthodox technology and the resultant increase in cuppage and overall quality made CTC tea very popular both in India as well as worldwide.

Sun	Mon	Tue	Wed	Thu	Fri	Sat
					1	2
3	4	5	6	7	8	9
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17	18	19	20	21	22	23
24	25	26	27	28	29	30



To Do List for Tea Plantations - October

Field

LAND PREPARATION • Use jungle jim for pulverizing Guatemala. • Minor depression should be filled up.

NURSERY • Start autumn propagation of cuttings. • Allow the ready plants to be hardened after sorting out. • Start filling up the sleeves for seed nursery. • Handweed the shade nursery.

PLANTING • Start autumn planting of tea at the end of the month.

MANURING • Apply last dose of YTD mixture in sleeve plants. • Apply foliar Urea and Zinc Sulphate at fortnightly interval.

PLUCKING • Maintain plucking round particularly in proposed UP teas. • Step up by a leaf in the proposed UP teas if status of maintenance foliage is inadequate. • Rest the bushes severely damaged by Black rot as well as the teas to be medium pruned.

MULCHING • Mulch the newly planted tea.

WEED CONTROL • Hand-weed the creepers and woody perennials. • Only spotapplication is required. • Sickle the weeds where manual control is practiced.

PESTS & DISEASES CONTROL • Spray pesticides on spot. • Apply bio-pesticides like *Beauveria bassiana* against Helopeltis and *Bacillus subtilis* against Black rot at fortnightly interval. • Apply termiticide in the plantation having termite infestation. • Continue application of acaricide in the sections being vulnerable to mite attack.

Factory

CTC – 1) Excess flow of leaf than capacity of the factory will be in many occasions due to strike, bonus settlement, absenteeism and puja holidays. If leaf load on troughs is high, run fan as forward for 3-4 hrs first and thereafter forward and reverse as 1:1. 2) RPM of the ghooghe may go up to 26-28 as style and appearance is important for backend season for Dooars & Cachar. 3) Complete cleaning and sorting of side rejections at earliest if carried over from past weeks/months. 4) In VFBD dryer, reduce the r.p.m. of the ball breaker to 350 or less so that percentage of brokens is not reduced.

ORTHODOX (ASSAM) - 1) Same as September. Withering will be at 60-62% for better rolling. 2) For good roll, usually more rolling duration and high pressure will be required at 50-40-40 or 40-30-30 minutes depending upon the quality of shoots. Coarse is likely to be around 35%. 3) Separate sorting line for fine and coarse will be highly beneficial to complete the carry-over unsorted teas. Plan for plucking of Puja flush following absenteeism after availing bonus and Puja.

ORTHODOX (DARJEELING) – 1) Withering should be 55 to 60% depending upon the leaves. Based on the fine percentage of leaf, set rolling and drying parameters. If leaf is hard and coarser, take low wither and maintain setting of rain flush for rolling and drying. If the leaf is good and soft, rolling and drying parameters are to be oriented more towards 2nd flush type from mid October (after Puja flush) as autumnal character in the leaves is more evident. 2) Second roll is always advisable to get better twist. Use of Kachha shifter will be helpful to segregate broken and fannings after 1st roll. Duration of 1st roll is 30 to 35 mints and second roll is 25 to 30 mints.

GREEN TEAS – All secondary grades and residues of green teas are to be sizedand sorted.



shoots in the soil. This eventually led to a new concept of Vegetative Propagation in tea. In 1949, Tocklai released three

vegetatively propagated clones (TV1, TV2 and TV3), which marked a revolution in tea cultivation across the globe.

Tea Research Association |

Planters' Calendar 2023

To Do List for Tea Plantations - November

Field

LAND PREPARATION • Uproot tea and shade. • Fill up the pits formed from uprooted tea bush and shade tree. • Fill up subsidiary and sub main drains.

NURSERY • Complete autumn planting of cuttings. • Water the sleeves/ rooting bed with hand sprayer. • Sow the cracked seeds in the sleeves/ beds and cover with a fast degradable mulch.

PLANTING • Complete planting tea.

PRUNING & SKIFFING • Start pruning and deep skiffing of mature tea from second fortnight. Prune clonal mother bushes and knife clean thoroughly.
•Apply alkaline wash or Trichoderma 5% suspension on the bush frame.

MANURING • Apply foliar MOP at fortnightly interval in all proposed UP teas. • Spray MOP (2%) two rounds at fortnightly interval in proposed MP areas.

PLUCKING • Complete stepping up of the table wherever necessary to keep unprune. • Pluck off the banjhi from the table regularly. • Keep proposed medium prune teas and Black rot infected bushes under rest.

MULCHING • Mulch the newly planted teas.

PESTS & DISEASES CONTROL • Restrict use of acaricides and insecticides to theinfested patches only. • For blanket application, use only Neem or other botanical products and sulphur formulation. • Apply bio-pesticide like Beauveria bassiana against Helopeltis and Bacillus subtilis against Black rot if not applied in the previous month. • Treat the Black rot infected areas with two fortnightly rounds of COC. • All Helopeltis infested shoots should be plucked off.

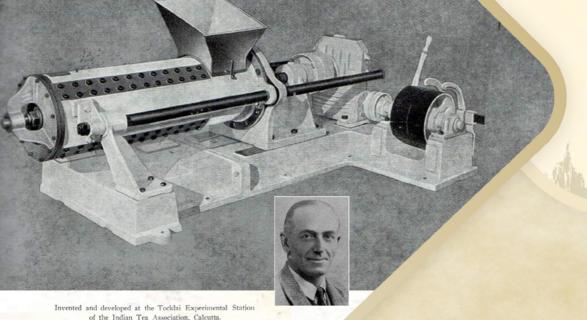
Factory

CTC-1) Load thin for natural withering as hardly any effect of running fan during night. 2) Lay thicker on floor and CFM. In CFM, regulate flow of humidified air and the same will be bare minimum if necessary. Avoid raking be it CFM or Floor. 3) To increase broken%, the RPM of the ghooghe can be increased to 24-26 with 3" inclination for Dooars and Cachar.

ORTHODOX (ASSAM) - 1) Withering will be a bit harder as 58-60% for good rolling as market demands for black and cleaner teas. 2) For good roll, usually more rolling duration and high pressure will be required as 50-40-40 minutes or 40-30-30 depending upon the quality of shoots. Coarse is likely to be around 35%. 3) Fermentation will be of longer duration say around 3 to 3 hrs 10 mints at early morning. With progression of the day, the time will be reduced. Do not force poor leaf for orthodox production.

ORTHODOX (DARJEELING) – 1) Harvest reduces significantly from mid of November. Plucking continues till mid of November and character is of autumn flush. So manufacturing practices should be as stated above. 2) From mid of the month, plan for overhauling of the machineries during winter. Have a complete critical examination of machineries from each section. List out the work to be done from mid of November. 3) Prepare the indent, float quotations and formalize the order to be placed for spares, inputs and accessories which are to be outsourced.

GREEN TEAS – Recovery in green tea is higher by 1% than black tea in Darjeeling. Overhauling of the machineries like dryer, rolling table, sorting machine etc. should be started.



Planters, 2023

November

The McTEAR "ROTORVANE"

CONTINUOUS TEA ROLLER

(PATENTED)

PORT ENGINEERING WORKS LTD.



The McTear Rotorvane

In 1957, Ian McTear, Special Resident Engineer at Tocklai Experimental Station developed the Rotorvane machine for continuous tea manufacture. The Rotorvane consists of a horizontal barrel with a feed hopper at one end and a partial opening at the other. Forced through the barrel by a screw-type rotating shaft fitted with vanes at the centre, the leaf is distorted by resistor plates on the inner surface of the barrel and is cut at the end plate. The Rotorvane remains one of Tocklai's most important contributions in the field of tea processing.

Sun	Mon	Tue	Wed	Thu	Fri	Sat
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

To Do List for Tea Plantations - December

Field

LAND PREPARATION • Mark the location of sub-main and main drains to avoid ploughing. • Soil should be tested tor necessary amelioration.

• Follow a sequence of ploughing cross harrowing-sub soiling-cross harrowing-levelling.

NURSERY • Do watering as and when necessary in both tea and shade nursery. • Continue sowing of tea seeds and cover the sleeve or bed with a thin layer of dry mulch.

LIGHT PRUNE & DEEP SKIFF: • Continue pruning, skiffing and knife cleaning operation.

MEDIUM PRUNE • Start the operation from mid of the month and complete preferably by the end of the month. • Apply thick paste of COC or Trichoderma 20% paste on cut surface quickly after prune. • Leave a healthy breather in each bush.

PRUNING (MOTHER BUSH) • Prune mother bushes for spring propagation. • Thorough knife cleaning is essential.

BUSH SANITATION • Complete hand de-banjhi, knife cleaning out operations in already pruned and skirled teas. • Apply alkaline wash.

MANURING • Continue foliar application of MOP and Magnesium Sulphate. • Collect soil samples for analysis for soil amelioration and to make manuring programme.

PLUCKING • Maintain a flat plucking surface. • Bushes suffering from moisture stress should not be plucked.

DRAINAGE • Deepen and re-grade the drains. • Complete contour survey of areas to be planted in next spring.

PEST & DISEASE CONTROL • Only spot spray if infestation is noticed.
• Take control measure for termite removing the earth runs and dead branches. • Collect Chrysalides of Bunch and Red slug caterpillars from dried leaves on the ground as well as from fork of the bush. • Hand-collect or light trap the moths of Red slug.

Factory

CTC – 1) Natural withering is better. If one fan runs occasionally, open the side windows partially to release some inlet air. 2) Dryer mouth tea should not have less than 2.8 to 3% moisture. 3) Complete sorting of excess composed of vibro collected lighter teas mixed with fibres, dryer fluffs and blown outs teas etc. after gapping before the deadline set. 4) Stock-taking should be done correctly after adjusting the excess.

ORTHODOX (ASSAM) - 1) Avoid orthodox production as green leaves are not suitable. Clear unsorted orthodox teas. 2) Like CTC, avoid carrying over unsorted teas, be fine, coarse, mixed with stalks to next season. Take final stocks after adjusting the excess.

ORTHODOX (DARJEELING) – 1) At the most, harvest continues till first week of December and requires a limited number of machineries during this period. 2) Start overhauling (Check/ clean/ service) of a) Withering troughs: Motors, switch and starter in batches which are not in use. If required, motor could be varnished. Undertake the wooden work required in withering troughs including repairing of sagged welded mesh, torn/ cut netlon if require. b) Rolling table: Moving parts like ball bearing, leg bushes, greasing, and correction of asymmetric well, discharge door, pressure plate, pressure screw to be done at factory workshop or at commercial engineering workshop if major overhauling requires. c) Dryer: Check and service feeder Trays, perforated Trays, tray carrying Chain, driving shafts, rail chain, Scrapper chain, Sprockets, Feed & Auxilliary Spreader, Baffles, Tray Runners, Inlet/ Outlet Thermometers d) Heater: Thorough cleaning of carbon shoots, replacement of bent/ broken stove tube, tube banks, forward fan, FD Fan, DF Heater & Gas Burners, Hot Air Evacuation, Circuit Speed Ratio. e) Sorting: Check and service all the driving parts, wire mesh tray and discharge shoots.

GREEN TEAS – Overhauling of the machineries like rolling table, dryer, sorting machine etc. should be started.



Plantors, 2023

December



- The Tea Board India was established as a statutory body with its headquarters at Calcutta on 1st April 1954, to look after the overall
- development of the tea plantations and tea trade in India.
 The TRAGNEXT QualiteaProfiler was invented in 2019. The machine makes use of Artificial Intelligence to instantly analyse tea quality.

- In 2020, research on the anti-viral properties of tea received worldwide acceptance during the Covid pandemic.
 TRA Tocklai played a major role in getting May 21 declared as International Tea Day by the UN.
 In 2020, the small tea growers of India produced 51% of the total tea production in the country, thereby exceeding the quantum produced by the organized tea sector.
- In 2022, TRA Tocklai launched the world's first R&D backed sustainability standards called tCertified GAP GMP.



31



www.tocklai.org

A new era of scientific innovation

From a meagre 4632.09 kg in 1840, covering a total plantation area of 750ha, Indian tea production has risen exponentially to 1343 million kg, covering an area of 6,19,773 ha in 2021. From humble beginnings, India is today the second largest tea producer globally.

As we gear up to welcome another century of producing the most healthy beverage known to us, we stand committed to embrace new technological interventions for a sustainable and healthier future.

Inputs from Joydeep Phukan, Dr. Pradip Baruah, B. Chakravarty and Rituraj Sharma, all from TRA, is gratefully acknowledged.

