

TEA MANUFACTURING IN BANGLADESH: PROBLEMS AND PROSPECTS

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Abstract Tea industry is an agro-based export oriented industry in Bangladesh for over a century. Started from establishing Malnicherra Tea Estate in 1857 in Sylhet, now the number of tea estates have reached at 158 and tea industry has spread over Moulvibazar, Habigonj, Rangamati and Brahmanbaria. We produce only 2% of global tea production and we are earning near about two hundred crore taka in every year. The various stages of tea manufacturing are: Withering, Rolling, Fermenting, Drying/Firing, Sorting & grading, Tea tasting, Packaging etc. Now tea estates are facing various problems, which must be solved to save the tea industry. Tea is a safe and healthy beverage, which has also medicinal value. We have to intensify our race to reach a target of 1500 Kg/ha by 2010 A.D. to produce 90 million Kg made tea and to increase our area by about 1650 ha. This will satisfy our increasing domestic need and at least maintain the present ratio of the export of tea. We have to make quality tea, which must satisfy the prescribed criterion of the European countries to restore its name and fame. This must be done for the sake of increasing export volume and its existence. This paper includes introduction, global scenario, specification for black tea-ISO standard 3720, manufacturing of black tea, problems of the tea industries in Bangladesh, remedies and recommendations, prospects of the tea industry in Bangladesh, tea: its use as a medicine, conclusion, and references.

INTRODUCTION

Now-a-days tea is the most popular drink all over the world. Modern man can not think of starting a day without having a cup of tea. It refreshes the mind and gives energy. Almost all people take tea once or twice a day. Tea is the oldest and most popular non-alcoholic beverage known to man since three centuries B. C. in China. Until 17th century, Coffee was the sole beverage known to Europe and it was only 1657 that the first tea packet was sold in Galway House in London. About 100 years later, 1784-1789 tea drinking become widespread in the world.

GLOBAL SCENARIO

In the world thirty countries are producing more than 2.50 billion kilogram of teas annually (including 0.56 billion kg of green teas manufactured by eight countries) from 2.56 million hectares of plantation. After meeting their domestic consumption, 28 countries export about 1.02 billion kg of tea annually (ITC, 1997). Bangladesh is producing more than 55 million kg of tea annually from about 48000 hectares of land. It can earn foreign exchange equivalent to about 1775 million Taka annually by exporting about 25 million kg of tea. Tea cultivation in Bangladesh is spread over the hilly zones on the eastern part mainly in four districts (Sylhet,

Moulvibazar, Habigonj & Chittagong). About 96% annual production (of which 63% of Moulvibazar district) is contributed by greater Sylhet obtained from - 93% (of which 62% of Moulvibazar district) of plantation area. It is to be noted that Sterling companies produce about 50% of annual crop from about 42% of plantation area.

Table-1: Comparative Production of world's major producer countries of tea

Sl. No.	Country	% of World production
1	India	29.89%
2	China	22.72%
3	Sri Lanka	9.92%
4	Kenya	9.85%
5	Indonesia	5.52%
6	Turkey	4.41%
7	Japan	3.41%
8	Bangladesh	2.11%
9	Others	12.17%

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Table-2: Comparative productivity of crop (kg/ha)

SL No.	Country	Productivity (kg/ha)
1	Kenya	2274
2	India	1797
3	Japan	1679
4	Turkey	1494
5	Sri Lanka	1167
6	Bangladesh	1146

TEA PROCESSING

Tea leaves are processed in the tea factories to produce an acceptable product for human consumption. There are various kinds of tea, such as – Black tea, Green tea, Oolong tea, Flavoured tea etc. in the world tea market. Since black tea is widely consumed beverage, so my discussion will be confined only upon black tea.

SPECIFICATION FOR BLACK TEA-ISO STANDARD

ISO defines black tea as “Tea derived solely and exclusively and produced by acceptable processes, notably fermentation and drying from the leaves, buds and tender stems of varieties of species *Camellia sinensis*”. The tea shall be clean and reasonably free from extraneous matters and it should comply with the requirements specified in the table below. Tea exporting countries also have their own standard specification for tea which in most cases conform with ISO standard.

Table – 3: chemical requirements for black tea

Sl. No	Characteristics	ISO requirement	Bangladesh
1	Water extract, % (m/m)	Min. 32	32
2	Total ash, % (m/m)	Max. 8 Min 4	8 4
3	Water soluble ash, as % of total ash	Min. 45	42
4	Alkalinity of water soluble ash [as KOH, % (m/m)]	Min. 1.0 Max. 3	1.0 3
5	Acid in soluble ash, % (m/m)	Max. 1	1
6	Crude fibre, % (m/m)	Max. 16.5	16.5
7	Caffeine, % (m/m)	Min. ----	2
8	Tanin, % (m/m)	Min ----	10

MANUFACTURING OF BLACK TEA

Tea manufacturing is a continuous process of removed of the moisture content from the freshly plucked tea leaves in different stages where physical and chemical changes take place.

a) Salient feature of tea manufacturing

The salient feature of black tea manufacture involves the following operations, viz. plucking and handling of tea shoots, withering, processing (rolling), fermentation, drying/firing, sorting and packaging. Tea quality is assessed by the appearance of the leaf before and after ‘infusion with boiling water’ and overall organoleptic impact of the resultant liquor.

b) Plucking Standard

Two leaves and a bud are desirable as plucking standard, because this type of leave contains high amount of tea catechins, caffeine, fermenting enzyme and less moisture that can produce grainy and bloomy tea responsible for giving strong, brisk, bright red and aromatic brew under satisfactory manufacturing conditions. Recommended standard of plucking: At least 70 % fine leaf (by Ballometer count).

(i) Withering. It is a process of moisture removal from leaf by the help of exhaust fan or any other means. Many bio-chemical and physical changes occur during the withering period. Main bio-chemical changes which have been substantiated during withering are: 1) Increase of polyphenoloxidase activity, 2) Increase in caffeine and permeability of cell membrane, 3) Breakdown of chlorophyll and protein to amino acids, 4) Change in carotenoids and levels of organic acids. There are two types of withering: 1) Natural withering, 2) Controlled withering.

(ii) Processing/ Rolling. Processing is nothing but the leaf distortion of the withered leaf. The withered leaf is sifted through green leaf sifter to remove extraneous material before it is processed. The process of leaf distortion is aimed at bringing contact of the chemical compound; polyphenols with copper based enzyme, polyphenoxidase in the leaf cell. There are various types of tea processing in vogue in tea growing countries, viz. Orthodox, Rotorvane, CTC, LTP etc. In Bangladesh, the following types of tea processing are practiced: a) Orthodox manufacture or conventional method, b) Un-orthodox manufacture or non-conventional method. In Bangladesh widely used method is Un-orthodox or non-conventional method, which includes: i) Rotorvane, ii) CTC (crush, tear, curl), iii) BLC (Barbora Leaf Conditioner). In Bangladesh, generally used combination is between two types of machines, e.g.— Roller-CTC, Rotorvane—CTC, BLC—CTC etc.

Un-orthodox manufacture

i) BLC (Barbora Leaf Conditioner). It looks like Rotorvane and it is used like Rotorvane. Generally its diameter is about 38 cm and 70 cm long. It is made by soft metal, like MS and its inner cylinder consists of a lining made by brass. There is a bracket connected at one end of the cylinder, which is made by CS, called gable. The discharge end consists of adjustable pressure plates. If feeding of green leaves have done at the mouth of BLC, then feedworm derives the leaves to the processing zone, where twisting of leaves are done. Due to collision with battens, the leaves are become ready for CTC machine use. Due to high pressure juice of the leaves comes out and again mixed with the leaves. The discharge of the leaves are controlled by adjusting pressure plates. It is considered as best pre-processing machine due to its high capability and other outstanding characteristics. Generally 70—75 % withering is considered best for processing of green leaves (1200—1500) kg /hr.

ii) CT C (Crush, Tear, Curl) It consists of a pair of horizontally mounted contra-rotating stainless steel rollers initially 210 mm in diameter. The surface of each roller is engraved with a series of teeth (8 TPI or 10 TPI) in the axial direction and 50 or 60 helical grooves. The rollers are so mounted that their teeth mesh together, the gap between them being adjustable. The leaf falls on the apex of slow moving roller rotating at 70 rpm. The fast roller rotating at 700 rpm in the opposite direction imparts a relative motion between the surface the two rollers with leaf in between . The leaf comes out through the bottom crushed, torn and curled. The rollers gradually wear with passage of time, and this wear should be limited to 0.012 inch of tooth height. It is advisable to re-sharpen the rollers after processing every 1630 kg withered leaf (Standard 70 % wither) per inch (2.54 cm) of roller length. The available CTC machine maybe 60 cm (24"), 76 cm (30"), 91 cm (36") and 112 cm (48"). Generally three or four cuts are given and the moisture contents in the region of 67—72 % may be employed. Dauracherra tea estate (A property of the Bangladesh Tea Board) uses four cuts of CTC machine, whereas a neighbouring sterling garden, namely Mertinga tea estate uses six / seven cuts or even more for CTC machine.

(iii) Fermentation. Fermentation of tea leaf is the process of oxidation of various chemical constituents of tea leaf through a series of chemical reaction. According to scientist D.L. Sana —“ No micro-organisms are involved in the so-called ‘fermentation’, but the term is probably too firmly established to change it despite its inaccuracy.” This is the stage of enzymic oxidation. Colour, strength and briskness are developed during this stage. During fermentation, the tea catechins or the polyphenols and oxygen react in presence of fermenting enzymes, the polyphenol oxidases, requiring four copper atoms to form a group of compounds called

theaflavins and thearubigins. The moisture in withered leaf, the better is the fermentation. High percentage of relative humidity(R.H.) has a positive effect on fermentation. There are various methods of fermentation as follows: 1. Floor fermentation, 2. Rack fermentation, 3. Bawl fermentation, 4. Trough fermentation/ machine fermentation. The most widely used method is floor fermentation.

(iv) Drying/Firing. The last stage of tea manufacturing is Drying/Firing. The main objectives of drying are as follows: a) Drying of moisture content in the processed tea leaf or reduction of moisture content upto 2—3 %, which is suitable for storage and transportation, b) To arrest the fermentation, c) To make quality tea. At the commencement of drying, the fermentation reactions proceed at an accelerate rate. Enzymic reactions decline steadily and cease, when the moisture content falls to around 20 %. The change of colour of the ‘dhool’ (fermenting raw material) from brown to black tea of commerce is due to a variety of reactions, viz. the breakdown of chlorophyll, formation of theaflavin etc. A high proportion (about 40%) of volatile compounds that are responsible for tea aroma is lost during firing. Other reactions, the neutralisation of harshness of liquor and destruction of micro-organisms that play an important role in producing better quality, are also involved during firing. There are many types dryers, such as – Paragon Circuit Dryer, Quality dryer, ECP 3 Circuit (6 rows) dryer, two stage dryer etc. Modern dryers are Fluid bed dryer and Vibratory Fluid bed Dryer. Fluid bed dryers are operated on the theory of fluidization, where the ‘dhool’ (fermenting raw material) floats over a layer of air and the leaf is subjected to decrease temperature. Drying of ‘dhool’ has been done in a tunnel in fluid bed dryer. Base of tunnel is made by perforated stainless steel plate. Hot air flows below the perforated plate and ‘dhool’ flows over the perforated plate. ‘Dhool’ has transformed into fluid bed and it flows into the tunnel. It accelerates the drying of ‘dhool’ and air flow gradually drives the dry tea to the front of tunnel. Cyclone helps both drying and fibre extraction. Density of tea has been increased in fluid bed dryer. Vibrating fluid bed dryer is the most popular dryer in Bangladesh.

(v) Sorting and Grading. After firing, teas are cooled off quickly; If bulked hot, tea will loose briskness and may taste bakey /stewey. Main objective of sorting is to produce a series of black tea having even sized particles without any visible pale coloured stalk or fibre. Finer fibre and smaller stalk in CTC/ LTP/ Orthodox are generally removed by means of electrostatic attraction of the fibre extractor machine and the teas being passed beneath a series of charged rollers. Passage of the tea through a series of sieves in various sorters, viz. Myddleton, McIntosh, Trinick sorter, vibroscreen etc. produces a number of grades with more or less evenly sized particle. Moisture content of graded tea should be within 2—3 %. All grades must be of uniform size

throughout the year.

Tea Grades

Table—4: A tentative guide for sorting teas

SL No.	Name of the grade	Mesh size No.	Mesh size No.
		Below	Above
1	FP(Flowery Pekoe)	8	10
2	FBOP(Flowery Broken Orange Pekoe)	10	12
3	BOP(Broken Orange Pekoe)	12	14
4	GBOP(Golden Broken Orange Pekoe)	14	16
5	OF (Orange Fanning)	16	18
6	FOF(Flowery Orange Pekoe)	18	20
7	PD(Pekoe Dust)	20	24
8	RD(Red Dust)	24	30
9	Dust	30	40
10	CD(Churamoni Dust)	40	60

(vi) Packing, Storage.

Packing. Quality should be assessed before packing: a) Moisture content should not exceed 3% on packing, b) Temperature of final firing, if required 85—95° C, c) Chest marking must be clear and according to standard practice.

Storage. Tea is an unstable and very hygroscopic product, which deteriorates during storage. Several chemical changes occur during storage. The rate of deterioration depends principally on the moisture content and temperature. The maintenance of quality during storage can be made by: i) Effective drying condition during drying, ii) Prevention of moisture content during processing, sorting etc. Teas that are sorted and packed with a minimum delay in the tea chests lined with Aluminium foil may be stored in good quality for a considerable time. All the packed teas, chests or gunny bags or both are sent to the ware houses and then sold in auction centre through some brokers.

(vii) Tea tasting and quality control. Now -a -days, each and every commodity has to be tested (either in laboratory or by tasting with the help of tongue) whether it is food or beverage to ensure its quality before its sales promotion or marketing of the product. Tea is the most popular non-alcoholic beverage to both the rich and the poor. Since it is a beverage, so quality must be maintained before and after manufacturing. It must be manufactured in a hygienic atmosphere. Tea tasting is an art and the professional tea tasters possess the knowledge of market demand with respect to grade, appearance, taste and liquoring characteristics of tea. Tasting and valuation are carried out by Professional tea

tasters (they may be registered brokers). Tea samples brought and sold in auctions are tested and evaluated by the brokers and buyers. The main considerations to a tea tasters are – appearance (colour & size), infusion and liquor. Tasters and blenders have over hundred special terms, which describe the test and tasting e.g. – brownish-black, blackish, even or uneven size, fibrous or neat, brisk or dull, etc.

PROBLEMS OF THE TEA INDUSTRIES IN BANGLADESH

There are many problems in the tea estates of Bangladesh, these problems can be furnished as follows: a) Factory: problems related with withering, processing (rolling), fermenting, drying/firing, sorting and grading, packaging & storage, tea tasting and quality control and overall managerial problems, b) Field/ Tea Estate: problems related to the field and the surrounding and also managerial problems. But, I have discussed here only the existing overall problems and remedies of the tea estates, which seemed to me important for successful tea culture. According to me, these are some of the main problems prevailing in the tea estates:

1. Unexpected natural calamity, such as—drought. The tea industry of Bangladesh had experienced a severe and prolonged drought from Nov’ 98 to till the end of April’ 99 and also around the year 1999,
2. Deterioration of law and order situation of the tea estates, e.g.—log stealing, shade tree cutting, illegal occupation of land, lack of security both for the management and the labourer, political or outsider influence on their internal arrangements, pilferage of tea from the factory etc.
3. Shortage of medicine and lack of other facilities in the hospital. The labourer (Kuli) have no faith on hospital or existing staff or doctor. Mortality rate even for Diarrhoea is also very high,
4. Lack of pure water and purification process, no hygienic latrine in labourer quarters. Unhealthy atmosphere prevails in the labour line,
5. Rate of addicted person of wine is very high. The labourer are consuming near about 1 lakh gallon wine only in Moulvibazar and Hobigonj district. There are many bars of wine namely ‘Patta’, which were legal bars since British rule,
6. Lack of infrastucture, e.g.- roads, labour line quarters, water supply network are not sufficient,
7. Lack of capital and modern machineries in various gardens.
8. Lower market value of made tea in comparison to increasing production cost,
9. Lower yield per hectare in comparison to increasing domestic need,
10. MRL value or maximum residue limit on pesticides has not been followed strictly. The European countries have declared that they will not buy Bangladeshi tea, if they found the MRL value beyond the prescribed level since 1998 (Ittefaq report, 4, Dec. 2000),
11. An allegation is often heard on the air that many owners of the tea gardens are not using Govt. loans properly, e.g.—they are interested about forestation of valuable trees (according to timber value), horticulture and some of them are giving up tea culture due to high investment of money and low return/slow

return. So, weekly payment is not regular or timely in many gardens. Workers afraid about losing their jobs,¹².Lack of perennial water source for irrigation during dry season and also in prolonged drought,¹³.Lack of educational institutions/infrastructure and that is why literacy rate is poor,¹⁴.The children of the labourer have been suffering from malnutrition. So, they are growing up with ill health.

REMEDIES AND RECOMMENDATIONS

1. Law and order situation of the tea estates must be improved. It is in an alarming stage in various gardens. Security of both executives and labourer must be ensured. Shade tree cutting, log stealing, illegal occupation of land, pilferage of tea and disturbance from the surrounding 'Basti' must be stopped in order to proper functioning the estates.

2.M.B.B.S. doctor and supporting staff must be appointed in various gardens to ensure proper medical facility. Suitable fund must be allocated for medicine, fooding, health education etc.

3. To set up sufficient number of deep and shallow tube wells in the labour line is a demand of time to ensure pure water. Purification of water for existing tube wells is also important .Unhealthy atmosphere in the labour line must be eliminated by introducing hygienic latrine and by stopping defecation elsewhere.

4.Wine consumption in the labour line must be reduced gradually to some extent, with a target to make it zero. Health education can be carried out through Toki cinema (bioscope) regarding family planning, health & hygiene by the Govt. information dept. or any other N.G.O.

5. Housing problems of the labourer must be improved and solved. Unmetalled roads must be transformed to metalled road and adequate water supply network must be made.

6.The executives of the tea estates must be conscious about health hazards due to pesticide residue in black tea. Still we have no measuring instrument to measure 'maximum residue level' of various pesticides. It will create a serious problem on export volume or sales promotion, since European countries (especially the west European countries) are very much conscious about their health and hygiene.

7.Production cost variables are many, e.g.—wages of labourer, fertilizer, pesticide, management and staff salary, electricity, gas, depreciation of machinery, packaging material, storage & despatch cost, etc. So, it is a tough job to reduce production cost. Now, we have two ways--- quality and yield. If we produce quality tea with eye catching bright orange-red colour liquor with flavour or to increase yield. Yield of conventional

seedling is very poor. So, we have to make clone tea with high yielding variety and also have good quality. But which is the most contradictory situation in tea culture. Because of quality and yield do not exist simultaneously. It is an irony of fate in everywhere. Dream and reality can not be the same around the world (Except perhaps in heaven!).

8. Shortage of capital and modern machinery can be solved by Govt. loan. But this loan should be used only for tea culture. Forestation of valuable trees, horticulture should be stopped in the tea field for the sake of tea culture and for the traditional labourer, who can not quit from the scene, who do not know any other technical work. Govt. loan should not be used in housing or any other industrial purpose.

9. Tea industry of Bangladesh had experienced a severe and prolonged drought in the beginning of the year 1999. The average rainfall during January to April in 1999 was 4.99" as against 10 years average rainfall 18.34" in the same period. In order to face this natural calamity, we should adopt both short term and long term measures. Construction of more dams /reservoirs, set up of more deep tube wells with water network system are the short term ways to combat losses of drought. We should take some long term measures as follows: a) Mulching of young tea should be properly done in dry season, b) The pH of top soil of the tea area should be increased by adding Dolomite and lime, so that water holding capacity of the soil is increased by increasing structure of soil, c) Systematic cattle farming may be undertaken in the tea estates to get maximum quantity of cow dung to be applied for raising organic matter in the soil, d) For root development of the plants drainage status should be improved ,e) Drought resistant variety of tea should be evolved by the BTRI scientists. More shade trees should be planted, f) To discourage forestry extraction in tea estates in order to avoid any variation of rainfall in the region, g) Weather forecasting should be projected in order to avoid eventuality of future drought.

10.To establish sufficient number of educational institutions to improve literacy rate, to eliminate superstition, ignorance etc. They should be conscious about cleanliness, health and hygiene, over consumption of wine.

PROSPECTS OF THE TEA INDUSTRY IN BANGLADESH

Tea is the second highest foreign exchange earner agro-based commodity of Bangladesh. At present tea gardens comprise of 48,587 hectares of land and a total number of 158 gardens are producing 16 crore 6121 thousand kgs of tea every year (upto 1998). More than 1 lakh 25 thousand of people are employed in this industry. Bangladesh annually produces about 55 million kgs of tea and our share to world production is

only 2%. The share in world export is 3%, average earning is around 1500 to 2000 million Taka, share in national export is 1.2% and contribution towards GDP is 0.81%. Our national average yield is 1146 kg/ha. We hope to increase our annual production to 90 million kgs by 2010. Our yield has increased per hectare from 700-kg to 1146 kg due to implementation of BTRP. So, we hope to increase our production further more within a few years. Kenya's per ha yield is 2274 kgs, India's 1797 kgs and Sri Lanka's 1167 kgs (according to Ahmed, Amiruddin it is 1430kgs). As such, we must increase our production at least to 1500 kgs per hectare on an average to retain the existing export target after meeting the increased trend of internal consumption. If we produce quality tea with flavour and which is tested and certified by the BTRI (Bangladesh Tea Research Institute) that pesticide residue level of teas are within the prescribed level of EEC/EU, then the health & hygiene conscious European countries will accept our teas without confusion, like Sri Lankan teas. Sri Lankan Tea Research Institute (TRI) has established their teas as the cleanest teas of the world in respect of pesticide residue. So far as I know, our BTRI still does not possess any measuring instrument regarding measurement of pesticide residue. It is a matter of hope that the process to procure measuring instrument is going on (Ittefaq, 4 Dec, 2000).

TEA: ITS USE AS A MEDICINE

Since 500 A.D. tea is principally used as a medicine, which has an exerting action on the central nervous system, kidney and muscles. Tea is known to produce a condition of wakefulness and increase mental activity. No other beverage has such power to calm as it stimulates; tea is known to dispel weakness, prevent drowsiness, relieve fatigue, refresh body and mind. Wine may be the drink of conviviality and coffee of the mid night scholar, but tea brings tranquility to both body and mind.

The glorification of tea drinking has also been put forth by some great English poets. The great English poet of 18th century, William Cowper mentioned a cup of tea as ---"The cup that cheers, but does not inebriate". Another poet, Nicholas Brawdy has also been glorified a step more, in his poem 'The tea table', mentioned as - "The sovereign drink of pleasure and health". The great English poet, Alexander Pope mentioned tea as ---"The beverage with royalty in the person of Queen Anne of England; a confirmed tea fancier". In the recent times, tea drinking is being advocated in many countries, e.g.- Russia, Japan, Sri Lanka, for the treatment of dental caries, asthma, rheumatism, inflammation and even arthro-sclerosis (hardening of arteries), which leads to attack of coronary thrombosis. It is also claimed that theaflavin and thearubigin of tea oppose the activity of bradykinin, a compound implicated in shock and painful state. Japanese scientists are hopeful about tea, which can be used for the treatment of radiation sickness

resulting from harmful effects of strontium-90, the most dangerous isotope in radioactive fallout. Tea leaves contain several chemical compounds having medicinal properties, e.g.—Caffeine, catechin (polyphenol), and alkaloid. Other non addictive drugs, e.g.—theobromine, theophylline, useful fluorides, volatile oils, and vitamin B are also present. Tea catechins (polyphenols) are the colourless chemical compounds of bitter taste. These constituents form black product with iron; contribute to colour, briskness, taste, depth and tea characteristics of aromatic flavour of black tea. Caffeine is a white amorphous powder of nitrogenous base. It is an alkaloid. It stimulates central nervous system effecting better heart functions, blood circulation, respiration and removal of fatigue.

CONCLUSION

Tea is the most popular non- alcoholic beverage, which is the second highest foreign exchange earner agro-based commodity of Bangladesh. Tea industries in Bangladesh are facing various problems, such as - security problems of the executives, unexpected natural calamity, deterioration of law and order situation of the tea estates, log stealing, political or outsider influence on their internal arrangements, illegal occupation of land by the outsiders, lack of medical facilities, unhealthy atmosphere in the labour lines, over consumption of wine by the labourer, lack of infrastructure (road, quarter, water supply network etc), lack of capital and modern machineries, lower market value of made tea in comparison to increasing production cost, lower yield per hectare in comparison to increasing domestic need, lack of instrument for measuring MRL value, some owners of the tea gardens are not using Govt. loans properly, lack of perennial water source for irrigation during dry season and also in prolonged drought, lack of educational institutions, malnutrition among the children of the labour line. For successful tea culture the above problems must be solved. To reduce production cost we have to produce quality tea with eye catching bright orange-red colour liquor with flavour or have to increase yield. We have to make clone tea with high yielding variety also have good quality. We must remove the screen of distrust and suspicion of the European countries by establishing a clean image like Sri Lankan Tea Research Institute.

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