



TEA IN NORTH EAST INDIA

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TEA IN NORTH-EAST INDIA

In the eighteenth century, China provided England with her tea, but political conditions were growing more difficult, and the Directors of the East India Company felt that alternative sources of supply must be found. In 1788, Sir Joseph Banks, the President of the Royal Society, advised the Directors that tea could probably be grown in north-east India. The Directors do not seem to have followed up Sir Joseph's advice, but for the next thirty years reports kept coming in to Calcutta that tea was in fact already growing in the Brahmaputra Valley.

In 1825, after the first Burmese War, Assam was annexed to the Company, and the brothers R. and C. A. Bruce planted in Sadiya, some seed which they had secured from a local chief in the town of Sibsagar. The tea did not do well, but Lord William Bentinck, the Governor General, felt that Sir Joseph's earlier suggestion was worth pursuing, and appointed his "Commission on Tea". The members of the Commission set out by country boat from Calcutta in 1835, and reached Sadiya four and a half months' later. There they found tea growing in its natural state, and reported with surprising foresight that "they had no hesitation in declaring this discovery of the tea shrub in Upper Assam to be by far the most important and valuable that has ever been made in matters connected with the Agricultural and commercial resources of this Empire".

It was therefore decided that "Government Tea Forests" should be laid out in the Brahmaputra Valley, and in 1839 the first Indian tea was sold by auction in London, after an eight months' journey round the Cape. The quantity was only 350 pounds, but a century later the trade had increased a million-fold, and Tea is now India's largest export industry, and its biggest employer of organised labour.

Lord William had no intention of establishing a state industry ; his object was to show the way to private enterprise ; and when the commercial possibilities of the undertaking had been demonstrated the Tea Forests were sold to the newly-formed Assam Company, the first Superintendent of which was Mr. Masters. The Assam Company is the oldest tea company in India, and is now known as Assam and

African Holdings Limited, with the Hon. Peter Remnant (until recently Conservative M. P. for Wokingham), as Chairman of the Board of Directors.

One of the greatest difficulties faced by all tea companies in their early days was the recruitment of sufficient labour. Land was there in plenty, but it was uninhabited virgin forest, and there was no one locally available to clear the jungle and to cultivate the tea. It has been said that the Burmese troops who had ravaged Assam before they were expelled by General Morrison in the first Burmese War had either massacred or deported most of the subjects of the Ahom Kings, and though this is an exaggeration, it has been found necessary, for over a hundred years, to recruit workers from other parts of India, notably from Behar, Orissa and the Central Provinces.

The early efforts at recruitment were haphazard and often disastrous, and in 1863 the first of the recruitment acts was passed, which required the licensing of labour contractors and the registration of recruits by Government officials of their home districts, to ensure that they went, not as forced labour, but as volunteers. Since then there has been a series of acts, aimed at protecting the recruit, who was medically examined before he left his home: who travelled along approved routes, which had rest houses at intervals: and who had the right of repatriation when his agreed term of service was over. As recently as 1950 over 30,000 recruits entered Assam, but with the rise in population and vitality which has followed the virtual conquest of malaria upon tea estates, and with the growing knowledge that working conditions upon estates are better than in agriculture generally, repatriation is rare, and recruitment from outside has now virtually ceased. The problem, indeed, is now one of surplus labour rather than of the need to recruit.

Despite appalling difficulties, the earlier companies eventually prospered. Everything was charged to "revenue" as distinct from "capital", and new areas were brought under cultivation, not by raising new capital but by ploughing back profits: a policy which was eminently sound for the nineteenth century but which has often resulted in a paid-up capital at unrealistic levels in modern conditions. The successes of the pioneers encouraged the speculators, and in 1865 the bubble burst, the panic

reaching its climax in 1866 “when only the substantial concerns remain with any health or life in them, and even they are shaken by the ordeal through which they have passed Although Tea has the reputation of furnishing a beverage which cheers but does not inebriate, its cultivation in some districts exercises the most strangely intoxicating influences on those engaged in it”. (David Crole)

Slowly the industry revived: slowly communications with Assam improved. “The Hill Section”, a railway which was to take teas from Upper Assam to Chittagong, was started in 1891, and was finished 13 years later. The partition of India, and the differing fiscal arrangements of the Republic and of Pakistan have put an end to the export of Indian tea through Chittagong, but the Hill Section still serves to connect the Brahmaputra Valley with the Surma Valley, and the Pakistan district of Sylhet with Dacca and the sea. The Joint River Steamer Companies have steadily increased their services, and their Tea Specials now make the 1200 mile river journey from Assam to Calcutta in under five days: (the upward journeys, against the prevailing current, would normally take twelve).

“Man has made great strides, remarkable strides, in this Province” said Lord Curzon in 1901. “Some years ago your industries were hardly known, but a few years hence, will not your teas be drunk and appreciated all over the world?” His Excellency’s observations were profoundly correct and today the teas of Assam share with those of Darjeeling the reputation of being amongst the best in the world with the additional advantage of a higher yield per acre.

The organisation of the Industry was also making strides. In 1881 there was formed the Indian Tea Association, which had, in the beginning, nothing more than increased exports of tea to Australia as its objective. This objective was achieved: exports increased tenfold: and the I. T. A. members followed up the success by establishing the Calcutta Tea Traders Association, which was to organise and regulate the sale of members’ teas on the Calcutta Auctions. In 1896, the I. T. A. recommended that a cess should be levied on its teas, the proceeds of which were to promote the sale of Indian Tea in foreign markets. In 1903 Government accepted this proposal. and the “Tea Cess

Committee" was set up, which, under the successive titles of the Indian Tea Market Expansion Board and the Central Tea Board, has developed into the statutory Tea Board of today. In 1933, again through the I.T.A.'s initiative, the International Tea Agreement and the International Tea Market Expansion Board were brought into being ; the former to regulate exports from the major tea producing countries of the world, and the latter to promote world consumption of tea. In the 1950s, the producing countries failed to agree upon terms for the renewal of the International Agreement, while the Expansion Board broke up, Ceylon taking over the Board's British assets which included the Tea Centre in Lower Regent Street : but the I.T.A. is still struggling to re-establish these examples of international co-operation.

The vigorous steps which were taken to popularise tea at the beginning of the twentieth century were matched by a steady increase in production, and when the Great War started, India's exports were 300,000,000 lbs. annually. The 1914 war presented relatively few difficulties to the Industry, for Japan was an ally, and shipping space was the main problem. The "Emden" had appeared briefly in the Hooghly in September 1914 and had shelled Madras, but thereafter the war had been a long way from India's shores.

The nineteen twenties were years of general prosperity, but the world depression of the early thirties hit Tea badly, and it was necessary for India, Java and Ceylon not only to restrict exports but also, by a "Gentleman's Agreement", to restrict production. These measures, coinciding with an improvement in world economic conditions, helped to raise the price from an average of 9½d a pound in 1932 to 15 pence in 1935. The wisdom of restrictive practices was questioned even in those days, for though there were no doubts as to their efficacy or legality it has been suggested that the regulation of the 1930s kept in being many companies which would otherwise have gone bankrupt and which have been a problem ever since.

Then came the War. The London Auctions were closed on the 24th August, 1939, and were not re-opened until 1951. All India's exportable surplus of Tea was handled by the British Ministry of Food, the producer getting a price which was based on the average of export sales of the preceding three years with provision

for an allowance to take regard of increased costs of production. Again shipping presented a problem, but the entry of Japan into the war on the side of the fascists created a situation which had had no parallel in 1914. Now, with amazing rapidity, the Japanese were at India's eastern gateways, and by March 1942 the Planting Community in the Brahmaputra Valley and in Cachar and Sylhet aided by managers from the tea districts of West Bengal, was already engaged upon the "Projects": that is, upon building of roads and of aerodromes, including those at Tezpur and Jorhat. In these efforts the General Committee of the Association in Calcutta played the role of co-ordinators and planners.

"And so it happened" wrote Geoffrey Tyson in his book 'Forgotten Frontier', that when the call for succour came from across the Burma border, the Indian Tea Association's forces in the field were already disposed in the direction of those very gaps in the mountains through which distressed humanity was to pour in its thousands in the next few months". Gradually the defeated armies reformed, gradually the planters and their wives sorted out and sent to safety the thousands of civilians who had trekked out of Burma, gradually the new roads and aerodromes were completed, till the tide turned and victory was won.

When the war was over, Colonel Pilcher who was then Chairman of the Assam Branch of the Indian Tea Association wrote a book "Navvies to the Fourteenth Army" which described some of the Industry's activities. The Foreword to the book is by Field Marshal Viscount Slim, who wrote:—

"To raise, organise, direct, move and maintain so vast a labour force against every difficulty of climate and terrain was a magnificent achievement. It was only made possible by the unselfish co-operation of the whole Planter community, and above all by the cheerful steadfast courage and resource of those planters who came with their labour as the forward officers of the force. They had the complete confidence of their men, and this confidence alone made the operation possible. The labourers themselves showed a steadiness, industry, discipline and loyalty that evoked the admiration of all of us who dealt with them".

Meanwhile, the short-staffed planting community was simultaneously striving to make good the shortage in world supplies of tea which had followed the Japanese occupation of Java, a country which had previously produced 200,000,000 lbs. of tea, and which, incidentally, even now has been unable to return to more than half her pre-war production. In the effort to make good the shortfall, India and Ceylon were successful, albeit with some loss of quality, due to less discrimination in the plucking of leaf, to the absence of planters on service or on the "Projects", to the inexperience of new labour, and to the growing difficulty of replacing worn out machinery.

Peace, and the partition of the country, brought new problems to the Industry in North East India. The lines of communication between the tea gardens and the ports, laboriously built up over a century, were totally disrupted. The port of Chittagong was in "foreign" territory, the normal railway route to Assam ran through Eastern Pakistan, and, it was a long time before the necessary skilled staff to man the numerous customs barriers and frontier posts could be appointed and trained. There were no bonded warehouses, and customs machinery had to be established along many hundred of miles of new frontier.

In addition, there were the refugees who provided the two Bengals and Assam with administrative burdens which even now lie heavy upon them. Trade and commerce were disorganised, fields were left uncultivated, the granaries of East Bengal no longer served the needs of the cities of West Bengal, and in 1951 there were food shortages all over Assam. Throughout the war, the Indian Tea Association had arranged for the supply of foodgrains and of basic foodstuffs to its workers and their families, selling them at "concessional" or pre-war prices, and hoping that sooner or later things would return to normal. In fact, the food problem grew more intractable, and the Association was ultimately obliged to spend nearly £ 500,000 in 1951 on an airlift to take rice to its workers. It is believed that this is the biggest airlift of foodstuffs ever undertaken by a non-official body, but only by air could the grain have reached Assam and North Bengal in time.

There was also the growing spate of labour legislation to which to attend. Managers had always played the part of father and mother to their workers and to

their workers' families, but now the vague and varying relationship was to be regularised and incorporated in a series of statutes. Workers had always lived in houses provided by the management: now these houses were to be built to detailed specifications. Medical attention was also generally provided, of varying excellence: now it was carefully prescribed, with so many beds, doctors and nurses for every hundred workers. Wages were settled by agreement at tripartite discussions between the employers, the workers and Government. Labour disputes were decided in industrial courts. All were to have annual leave with wages. Provident Funds were introduced — (the workers in Assam already have some £ 12,000,000 in their fund, which was only started six years ago). While all these things were being introduced, with the masses of registers which they involved, the planting community had also to attune itself to changed political circumstances, and it speaks volumes for the adaptability of the community and for the sympathy and wisdom of Governments that the transition has been so smooth.

In 1952 there came the slump, due in part to a belief that teas would be surplus to requirements and in part to the fact that with the ending of rationing in Britain, people decided to use up their stocks of tea before they bought any more. Producers of "common" teas the world over suffered badly, some African teas selling in London at prices which did not cover the cost of the chest in which the teas were packed.

The slump continued for the best part of a year: and was memorable for the enormous losses which companies sustained, and for the fact that in the worst affected areas the Labour Unions agreed after discussions with the Association to cuts in the minimum wages which they had recently secured. Several estates changed hands, several thousands of workers were on short time or — most unusual in tea — actually unemployed, though of course they remained in residence in company houses on the estates.

At the end of 1953, things started to improve. By the end of 1954, the Industry was enjoying a period of prosperity unparalleled in its history. The buyers had found that stocks were not as plentiful as they had expected: severe floods in North

Bengal breached the sole railway line in nearly fifty places, putting it out of commission for three months: when despatches were resumed, the London Dock strike effectively held up delivery to the British consumer. Teas were again at a premium, for Britain had only sixty million pounds in stock: just six weeks' requirements. Prices soared.

As a result of this boom, new taxes were imposed and old taxes were increased. There was a demand for bonuses from all sections of the workers, on the plea that those who had made sacrifices in times of distress should share in the unexpected prosperity. The Association voluntarily refunded to workers all the wage cuts which they had accepted in 1952-3, but this was not enough, and the first of a series of bonus agreements was signed, covering the period from 1953 to 1956.

When labour was cheap, there was no particular incentive to alter time-honoured methods, but as workers grew more expensive, as taxation increased and as machinery and supplies became more costly, the Association paid greater attention to the invention of new machines. One of the most successful of these machines—the McTear Rotorvane—has been in commercial production for about eighteen months, and where it has been introduced has resulted in great potential economies in space and in power requirements, with no loss—indeed, with an improvement—in the quality of made tea.

The Industry's present problems are to keep its costs of production at a level which will enable it to meet its fiscal and labour obligations, and at the same time to sell its teas at rates which will enable it to compete with Ceylon and with the newer estates in Africa and other parts of the world. It must also continue to play its role as the Industry which earns most foreign exchange, and must endeavour, by increasing production and exports, to assist even more in providing funds for India's Third Five Year Plan.

THE GROWING, MANUFACTURE AND MARKETING OF TEA

The tea bush is grown either from seed or from clones, the young bush being transplanted onto prepared plots or "sections" when it is about a year old. When it is five years old, it comes into full bearing, and its leaf is plucked throughout the season at intervals of between seven and ten days. An exceptionally well cared for bush may have an economic life of eighty or a hundred years, but sixty years is "normal". If the bush were not regularly pruned, it could grow into a full-sized tree.

The leaf is taken from the section to the place of weighing, the worker being paid on the amount of leaf which he or she has plucked. Thereafter the leaf is generally withered, by being spread in withering lofts. After the leaf has been withered — usually for the night after it has been plucked — it is rolled, a process which breaks up the leaf and starts the process of fermentation. After rolling, the leaf is sifted and then transported to the fermenting room, where oxidation takes place to the required degree, the leaf becoming coppery in colour.

The still moist leaf is then taken to the tea driers, which stop further fermentation, and which bring the leaf into the condition in which it is generally known: dark brown or black. One pound of tea can be made from some 4½ pounds of leaf. Thereafter, the tea is "sorted" into different grades: packed in chests; and despatched by air, river, road or rail to its destination: generally Calcutta in respect of north-east Indian teas. (Very little tea is sold direct from the estate itself).

In Calcutta, the tea may be sold on the Calcutta Auctions, either for consumption in India or for export by the purchasers; or it may be sold by "private contract": or it may be despatched by the producer, "unsold", for sale on the London Auctions.

TEA PRODUCTION AND ACREAGE IN INDIA

1885 — 1959

Year	Production (Kilograms)	Acreage	Yield per acre (Kilograms)
1885	32,435,341	283,762	114
1889	48,548,278	333,529	146
1899	82,340,218	514,268	160
1909	117,059,347	553,612	211
1919	170,966,752	690,068	248
1929	196,404,564	788,842	249
1939	205,294,245	833,245	246
1949	265,365,315	770,570	344
1959	326,441,832	809,556	403

TEA PRODUCTION AND EXPORTS

1950 — 1960

Year	Production	India's (In Kilograms)	Exports	Value of tea exports as % of India's exports of all Commodities
1950-51	275,474,829		200,779,954	13·81
1951-52	290,788,562		194,684,580	13·32
1952-53	306,297,340		193,859,041	14·49
1953-54	267,044,814		213,496,871	19·59
1954-55	293,194,416		208,458,820	25·26
1955-56	288,193,106		183,765,703	18·59
1956-57	308,719,523		233,084,351	23·94
1957-58	310,802,873		191,751,651	18·33
1958-59	325,225,751		217,318,840	22·73
1959-60	326,441,832		213,097,710	20·45

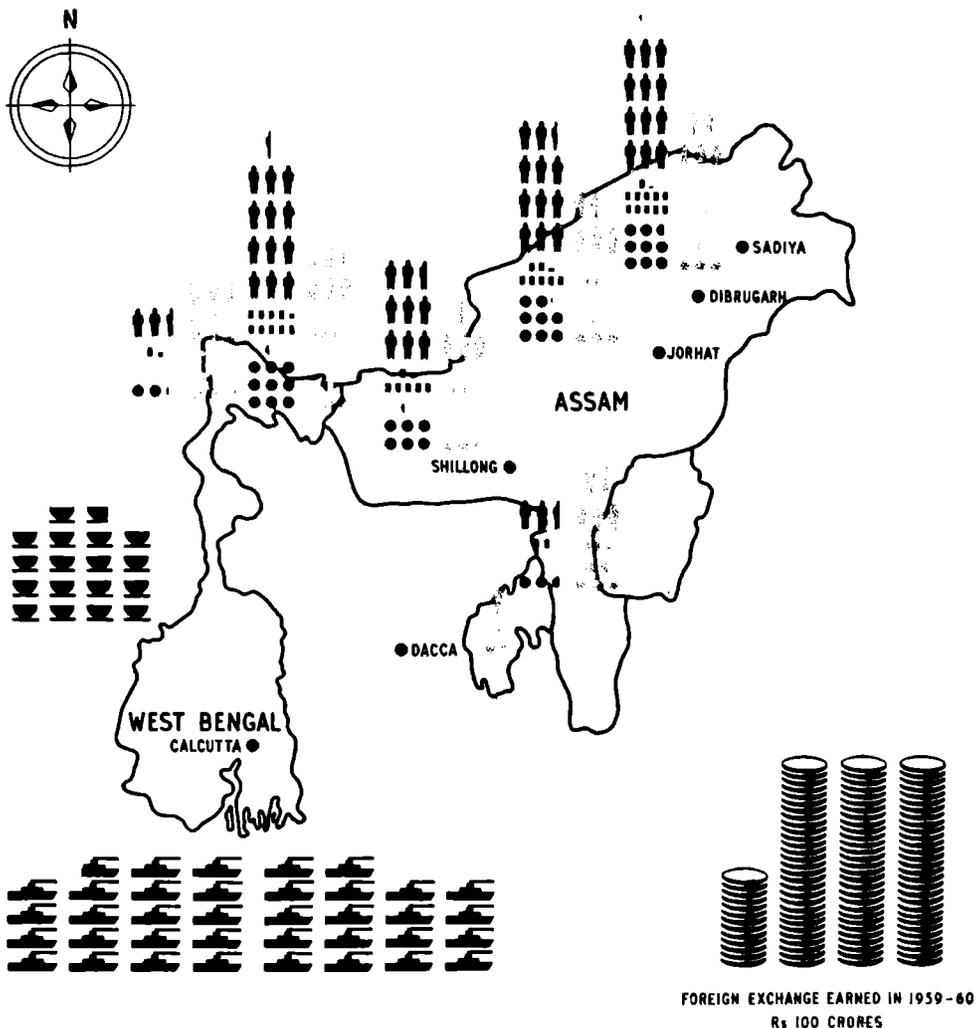
**I. T. A. SHARE OF PRODUCTION, ACREAGE UNDER TEA,
AND RESIDENT LABOUR**

Year	Production of I.T.A. Members (Kilograms)	I.T.A. Acreage	Resident Garden Labour employed by I.T.A. Members (Numbers)
1950	192,818,553	462,539	635,926
1951	191,293,854	461,655	641,636
1952	186,469,919	440,993	610,258
1953	175,652,953	434,398	570,607
1954	180,409,662	415,773	551,461
1955	185,393,665	407,354	563,228
1956	180,408,133	398,293	547,469
1957	171,604,104	394,664	527,870
1958	175,610,111	385,995	498,930
1959	173,460,263	372,276	482,426

THE TEA INDUSTRY

IN NORTH EAST INDIA

SCALE 1 INCH = 75 MILES



I.T.A. OTHERS

- EACH ● REPRESENTS TEN THOUSAND ACRES UNDER TEA
- EACH ■ REPRESENTS TEN MILLION POUNDS OF TEA PRODUCED
- EACH ̄ REPRESENTS TEN THOUSAND WORKERS EMPLOYED
- EACH ▲ REPRESENTS TEN MILLION POUNDS OF TEA EXPORTED
- EACH ☵ REPRESENTS TEN MILLION POUNDS OF TEA CONSUMED IN INDIA

THE ORGANISATION OF THE INDIAN TEA ASSOCIATION

In Calcutta there is the General Committee of twelve honorary officers elected by the representatives of the Tea Companies with estates in North East India. This General Committee exercises control over the affairs of member estates throughout North East India, and is served by a paid secretariat provided by the Bengal Chamber of Commerce and Industry, by the Association's stipendiary officials and by sub-committees which deal with specific aspects of the Industry's work.

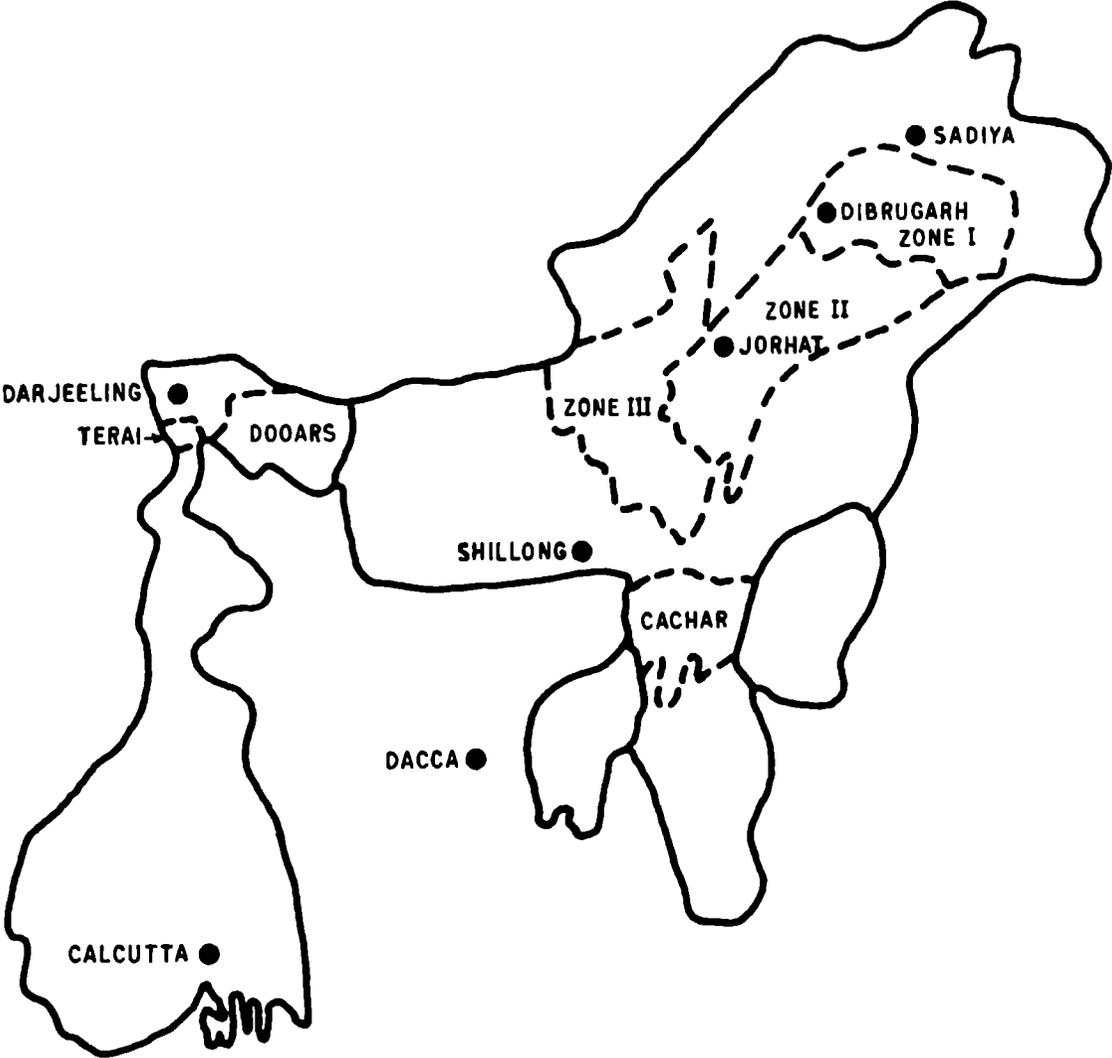
The Association has four up-country Branches and one up-country affiliated Association. Each of these bodies has a clearly defined territorial jurisdiction, and is managed by a General Committee, served by stipendiaries of the Association who are seconded to the different areas. The largest Branch is that of the Assam Valley, which for convenience of administration is divided into three zones: one north of the Brahmaputra: one south of the river (with offices at Jorhat): and one in Upper Assam. The Branch Headquarters are at Dikom, about one hundred miles east of Jorhat.

The Association also has a stipendiary Adviser in Shillong, who is, in addition to other duties, the Association's representative with the Government of Assam.

The functions of the Association are to represent the interests of member estates before the Central and State Governments: to assist in the prevention and settlement of labour disputes: to advise in labour matters both generally and through the Association's labour advisers situated in the tea districts: to help in the provision of supplies — e.g., oil, coal, foodstuffs, fertilisers — and in the transportation and marketing of teas: to provide scientific advice on the cultivation and manufacture of tea: to attempt to devise new processes: and to provide representatives for the Industry on statutory committees, wage fixation bodies, export production committees, and similar public bodies relating not solely to tea but covering the public life of the areas in which the members have interests.

The cost of the Association's General and Scientific sections now averages some Rs. 50,00,000 a year (£ 375,000) and the money is raised by an Association subscription upon the quantity of tea which each Member's estates produce. The present rate is 1.38 naye paise a pound — (there are one hundred naye paise to the rupee) — i.e., about a farthing a pound.

INDIAN TEA ASSOCIATION ADMINISTRATIVE AREAS



THE RESEARCH STATION

More than sixty years ago the Indian Tea Association realised the part which science should play in the growing and manufacture of tea, and, in 1900, appointed Dr. H. H. Mann as its first Scientific Officer.

From these beginnings have developed the present Scientific Department of the Indian Tea Association with its headquarters at the Tocklai Experimental Station in Assam. At the time of writing, Tocklai is the largest research station in the world dedicated entirely to tea. While the station is entirely financed by the Indian Tea Association, and though it is run primarily for the benefit of members of the Association, the results obtained have been made available to the whole North East Indian Tea Industry, and have played a very significant part in the development of this industry over the last fifty years.

Dr. Mann's research headquarters was in the Museum in Calcutta, though much of his work was done in the tea districts. Later experimental and research stations were opened in the tea districts themselves, first at Heelikah tea estate near Mariani, and then at the present Tocklai Experimental Station near Jorhat.

The research organisation set up by the Indian Tea Association has expanded steadily, and in the course of time has had to solve new problems, and, with increasing knowledge, more intricate and detailed aspects of old problems. As fundamental knowledge accumulated it became necessary to test out research findings in practice, and to disseminate the results of research and practical experiments to tea growers. For these purposes an experimental tea garden was opened and an advisory service started. Other important additions to the research organisation were the institution of an Engineering Development Unit with pilot factory and workshop at Tocklai, and a laboratory in London to study the basic chemistry of tea.

The work of the Scientific Department is now conducted in ten branches, which are kept separate for the administration of their research and advisory programmes, but which otherwise work together as parts of an integrated whole. These include

four branches which are basically research in their purpose, four which are experimental and two which are advisory.

The four basically research branches are the Physico-Chemical Branch, the Botany Branch, the Plant Pathology Branch and the Biochemistry Branch, which do research respectively on the environment in which tea is grown, on the tea bush, on its pests and diseases, and on the made tea. In the last case there is very close co-operation between the laboratories at Tocklai and London. The basically experimental branches comprise the Agricultural Branch, the Engineering Development Branch, the Tea Tasting Branch and the Statistical Branch. The function of the Agricultural Branch is to develop improved cultural methods, often based on research in other branches, and to test them out under field conditions, while the function of the Engineering Development Branch is to do the same for methods of manufacture. The research branches "feed" these experimental branches with results, and these branches pass back problems to the research branches for solution. An important adjunct to the Agricultural Branch is the Borbhetta Experimental Garden where practical field experiments are carried out. This garden is about 200 acres in extent with 150 acres of tea. Similarly, the Engineering Development Branch has a well equipped workshop and a Pilot Factory in which new machines are fabricated and tested.

The function of the Tea Tasting Unit is to ensure that no new cultural or manufacturing practice will adversely affect quality, and to trace and to correct faults in manufacture which lead to loss of quality. The Statistical Branch, as in all research establishments, has the important function of estimating the value and importance which can be set on research and experimental findings, and in collecting and assessing the other data required to extend the knowledge of tea culture and manufacture.

There are Advisory Branches centred at Tocklai in Assam, and Nagrakata in West Bengal. The former has officers stationed at Tocklai itself, in Cachar, and on the North Bank of the Brahmaputra ; and the latter in Darjeeling as well as in the Dooars. Advisory Officers provide Garden Managers with advice on all aspects of tea

culture and assist in conducting the experiments required to test out Tocklai findings under local conditions.

In addition to this advice of a general nature, specialist advice in tea propagation and in tea manufacture is given by specialist advisory officers, and research officers provide specialist advice on their own subjects whenever this is required.

The results obtained at Tocklai are passed on continuously to the tea industry, so that the improvement of cultural and manufacturing methods has often been imperceptible rather than by obvious single large advances. It is therefore difficult to do full justice to the contribution which Tocklai has made to the Tea Industry. However the spectacular increase in tea yields over the last thirty years gives an overall measure of the achievements of Tocklai. The average yield in North East India in that time has increased from approximately 480 pounds of made tea per acre to nearly twice that amount. Some plains tea gardens now achieve as much as 1,600 pounds an acre. These improved methods have in large part originated from Tocklai, though, of course, their adoption and application have been due to the initiative and enterprise of the tea companies themselves.

As mentioned above much of the achievement of Tocklai has resulted from unobtrusive progress, and present day practices in the cultivation, manuring, pruning and plucking of tea have developed in this way. If advances in this connection have to be high-lighted, the following might be mentioned; the discovery that tea requires a highly acid soil and that lime is harmful to it; the discovery that deep cultivation is usually of little value to tea and that this expensive operation is unnecessary; the discovery that in N. E. India nitrogen is the plant food mainly required by tea and that this can be best supplied by sulphate of ammonia; the discovery that there are optimum heights for pruning and plucking tea above or below which yields are reduced: the discovery that shade increases the yield of tea and that there is an interaction between shade and manure and kind of tea.

The long term effects of cultural practices are kept under continuous observation, so that knowledge is being accumulated on the factors which benefit tea, not only for one or two seasons, but throughout its life.

The life histories of tea pests and diseases have been studied and methods of control tested, with the result that many of the pests and diseases of tea are no longer a menace. Amongst those for which research has found a satisfactory cure are Blister Blight and Tea Mosquito, both of which could cause a great loss. The present position is such that now-a-days epidemics likely to cause disastrous losses can be avoided.

Much improvement of the tea bush itself has been achieved by Tocklai both as regards yield and quality. The quickest results in this respect have been achieved by selection of the best bushes followed by vegetative propagation of these bushes. In this way clones of superior yield and quality have been developed. The breeding of improved varieties of tea to be grown from seed is a much slower process, but in this respect progress at Tocklai is far ahead of that in any other tea growing country in South East Asia, and much progress has been made.

Improvement in manufacturing processes has resulted from the elucidation of the chemical changes which take place after tea is plucked and while it is being manufactured. Amongst the special contributions to this knowledge made by Tocklai must be mentioned the study of the polyphenols (tannins) and the caffeine of tea which contribute respectively to the refreshing and stimulating qualities of the beverage. Chemists at the Tocklai and London laboratories of the Association were able to show how manufacturing processes should be controlled to ensure the optimum content of these products in the made tea.

The most spectacular achievements at Tocklai are undoubtedly those which have resulted in the development of new types of machinery. The overall objective of the programme of the Engineering Branch at Tocklai is the development of a continuous manufacturing system by which tea passes continuously from one phase of manufacture to the next. This would greatly facilitate control of the whole process, and would avoid batching and handling of the tea, which if badly done, have a harmful effect on the quality of the product. The major part of this programme involved the designing, constructing and testing of individual continuous processing machines, which could later be linked together into a single continuous system. Much progress has been

made in this direction and several machines have been produced which are not only continuous in operation, but which on their own merits produce tea superior to that made by comparative orthodox processes. The tea industry has already benefitted from these machines. *One* McTear Rotorvane, for example, which is now in commercial production, can do the work which previously needed *ten* rollers, with an 80% saving in B.H.P. requirements, and of a third in factory space.

