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Arupjyoti Saikia

Mosquitoes, Malaria, and Malnutrition: The Making of the Assam Tea Plantations

While the history of Assam tea plantations is usually told as a heroic narrative of fulfillment of capitalist desire, the discovery of tea in the wilderness of Assam also resulted in a never-ending war with nature and tea plants, placing immense pressure on a complex forest system. This paper seeks to reconstruct the interaction between humans and various nonhuman agents on the tea plantations. It will focus particularly on three interconnected phenomena: the changes made to the environment and the landscape, the high prevalence of mosquitoes and malaria, and the effects of disease and malnutrition upon the human laborers.

The East India Company's search for tea plants in India goes back to the later decades of the eighteenth century. Early in the nineteenth century, a massive search was underway to find places of tea growth elsewhere in the British Empire. Robert Bruce noticed the growth of wild tea plants in the eastern hills of newly occupied Assam between 1821 and 1826, and subsequently in Manipur. But nothing significant happened till January 1834, when Lord William Bentinck, Governor-General of India, warmly took up the matter of Indian tea cultivation. A scientific committee favorably reported on the most hopeful situations for future tea cultivation. Within a few years, the Assam tea, as it came to be charismatically known over the course of the century, was in great demand, catering to the English domestic taste. By the end of the nineteenth century, tea planters had acquired just under half-a-million acres of land in Assam.

The tea-growers in India faced two choices: either the wild tea plants had to be domesticated, or proven species from China needed to be acclimatized in the environment of Assam. This would take years and require the transformation of a complex natural system. The choice between local wild species and domesticated species from China led to intense scientific debate. At the same time, experimental gardening done with plants available locally—now widely known as indigenous tea plants—near river banks in eastern Assam did not survive, and a company official with years of experience in Assam reiterated that "the soil, which was alluvial, was unadapted for the cultivation." Charles Bruce, the East India Company official normally credited with the earliest discovery of

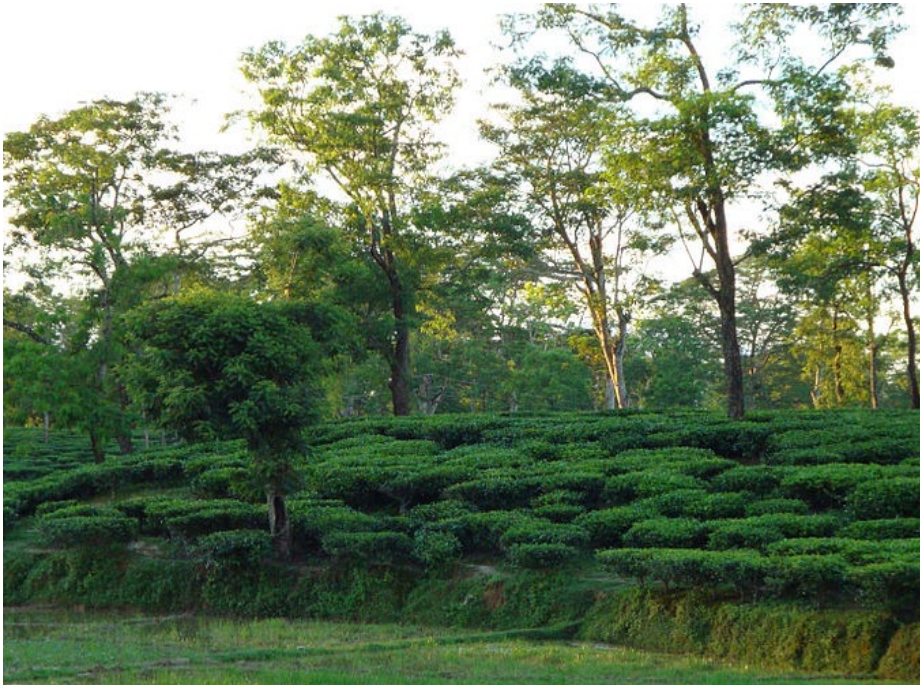
wild tea plants in Assam, noticed how tea plants grew along the riverine banks a short distance from inundated areas. But within half a century, the spatial distribution of tea growing had changed. A dramatic shift took place from the riverbanks to more secured areas in the highlands where the danger of flooding was reduced.

What was needed for healthy and yielding tea plantations were virgin forest lands. Officials and prospective planters agreed that the forested land would produce higher yields of tea compared to the alluvial low-lying areas. As official policies were framed between 1838 and 1860s for land grants to the tea planters, the highland forests became the center of attention. The government also demanded that all tea planters clear forests in the land allotted to them irrespective of whether land was actually needed for tea cultivation or not. This led to enormous swaths of forest being cleared. This was not an easy task either; clearing dense forests with huge roots was a great trouble. A nineteenth-century textbook on tea cultivation agreed that: "The huge roots in forest clearances are a terrible nuisance, and they are often so close together that they must be got rid of at any cost at the very commencement, otherwise the staking and planting out would be materially interfered with" (Crole, 1897).

It is difficult to quantify the total loss of timber and other vegetation that were cleared in this process, but the eagerness and necessity to clear all vegetation before planting could begin was itself an important indication of the massive damage caused to the nature. The planters' preference for forested soil rather than grassland was well-known, as the former had a much higher yield. The massive forest clearance could be understood if we take into account the combined clearances for tea and agricultural expansion in Assam. One study informs us that between 1870 and 1970, this clearance converted 1.5 million hectares (one-fifth of the state's geographical area) from natural vegetation to agriculture and human settlement. By far the greatest land conversion took place in the dense forest and woodland areas. Large tracts of grassland and shrubland in the river valley and tropical broad-leaved humid species accounted for over one-third of the depletion. The change in landscape occurred due to clearing large amounts of forest, not just for tea, but for other agricultural purposes as well.

Over the years, a manicured landscape replaced the complex forest system. The manicured landscape further altered the soil underneath it, too. Indeed, soil exhaustion in the plantation turned out to be of a serious nature. Unlike the floodplain and jute cultivation,

where the nutrients were often replenished annually, this did not happen on land used for growing tea, resulting in constant pressure on the soils. Additionally, excessive hoeing facilitated the growth of uniform weed instead of mixed weeds. This broken, loose, and empty soil harbored seed brought by the wind and other agencies far more than a soil with its natural herbage would. Foreign weeds were greater danger to agriculture than indigenous growth, and empty soil is sure to become clothed with some exotic weeds. The artificial character of weeds in Assam tea plantation became a matter of much concern for visiting botanists.



Badulipara tea garden in Golaghat, Assam. (Courtesy of Anshuman, via Wikimedia Commons.)

Forest clearance and weeds were not the only causes of concern for the planters. Even more worrisome was the world of the insects. The plantations of indigenous tea plants were subject to pests and blights, which became an increasing problem towards the end of the nineteenth century. In 1895, the foremost investigation of the pest problem took place. George Watt of the Royal Horticultural Society of England admitted that it was a much bigger problem than he had previously thought. Many people had

believed that the Chinese tea plant was responsible for the pest problems (i.e., when it was introduced, other diseases were brought with it, which the local variety had no resistance to). Watt convincingly argued that the increasing proliferation of pest attacks on the tea plants was due to the nature of tea plant cultivation. He also found no trace of any such pest attacks on the tea plants in the wild. Watt argued that the susceptibility to disease was a result of domestication: while there were a number of varieties of tea plants in the wild, the cultivation of tea plants produced plants that departed greatly from the wild pattern and reduced their hardiness. While tea plants could grow in any place where vegetation could survive, their aroma depended on the soil and specific ecological setting.

The Assam wild plant afforded only some 4–5 flushes during the season, while the domesticated one yielded 20–30 flushes, losing its power of flowering and fruiting. Its whole energies had been concentrated in the flushing, or production of a complete new set of shoots every seven to ten days; each shoot bears a terminal bud and three to seven harvestable leaves depending on the system of plucking. Not only had the leaves become soft and pale green, but, together with the whole of the young shoots, they were very tender and only slightly lignified. The plantation economy came to depend on these two leaves and one bud—a fitting symbol of the fragility and uncertainty to which the enterprise was subject.

By the last quarter of the nineteenth century, the planters were haunted by an additional problem: the poor health and diseases of the workers. Planters could not afford to risk the loss of life of one single laborer, and yet mortality increased during this time due to malaria and cholera. Statistics available for the period 1877 and 1920 clearly indicate that on an average one-tenth of deaths were caused by malaria. Originally the planters blamed the spread of malaria on the poor hygiene of the workers. Ronald Ross's discovery of *Anopheles* mosquitoes as the carrier of the malaria parasite in 1897 did not immediately cause the planters to take preventive measures, however.

Did the expansion of the tea plantations encourage the growth of mosquito populations in Assam? Partial answers to this can be found in the changes in the hydrological character of the soils in Assam after the expansion of tea plantations. Intensive agriculture and deforestation reduced the absorptive capacity of the soil, disturbed the natural drainage system, and resulted in an irregular river flow characterized by the abrupt

flushing and pooling of streams. In low-lying areas, by contrast, regular floods would wash away debris and contaminated water and replenish the soil.

These changes in the environmental conditions of the tea plantations—especially the changes in soil texture and structure caused by deforming and destroying the macropores and soil pore network—dramatically influenced mosquitoes' survival and distribution. As soil lost its total porosity, the resultant increase in surface runoff led to waterlogging. Tea plantations changed the distribution of forests and fields. Lands at higher levels, virgin jungle with heavy shade, had previously always remained healthy. As plantations required clearance of these landscapes, streamlets and streams were exposed. Undulating or flat plateau land surrounded by natural depressions and intersected by streamlets or tea garden drains were invariably highly malarious, for this type of landscape acted as a safe summer resort for malaria carrying mosquitoes. Planters resorted to construction of drainage for the successful cultivation of tea bush, and these drains with their slow-moving water became the most prevalent breeding areas of mosquitoes. On the other hand the low-lying flood plain areas which the tea planters had abandoned are inhospitable to the mosquitoes and their reproductive system. Flooding and flushing make these low-lying paddy lands free from the dangers of mosquitoes. Thus, when the tea planters cleared the forests and reshaped the landscape for their plantations, they unknowingly created ideal conditions for the malaria-carrying mosquitoes that plagued the plantation workers. But there was also a third factor that came into play and exacerbated the malaria problem: malnutrition.

Malnutrition amongst the tea garden workers made them more susceptible to malaria and other diseases. Most plantation workers survived on rice; they were entitled to only less than a half kilo of rice per day at a subsidized rate. Rice, an official agreed, only satisfied the sense of hunger. Other commonly used food stuffs like lentil, cereals, and oil—main sources of nitrogen—were beyond the reach of these workers. The results were devastating. Poor quality food did not contain the nutrients necessary for replenishment of their exhausted body tissues. An official report of 1877 admitted that a "considerable amount of sickness and mortality among the tea-coolies was due to their inability to procure a sufficiency of nitrogenous and oleaginous food, owing to the excessive dearness of the articles which usually supply the important elements of nitrogen and oil in the coolies' diet" (Annual Report of the Sanitary Commissioner, Assam, 1877–1878). The "extreme emaciation of many of the coolies" struck many observers. The nitrogen intake of a

plantation worker in Assam could be a mere 84 to 112 grains compared to 349 grains consumed by Irish farmers at that time. The general assumption was that a hard-working laborer needed around 250 grains of nitrogen daily. The combination of excessive physical labor and excessive malnutrition greatly reduced the workers' immunity. Unlike the plantation workers, the Assamese villagers were able to eat a balanced diet.

By the 1930s, there was a virtual war against the mosquitoes. The intensity of malaria- and cholera-induced deaths began to slow down only in the 1930s. This happened when the planter found aid in the increasing availability of quinine for distribution amongst the workers. Malaria did not spare the rich and the planters, either, even if the malnourished workers were more susceptible to it. Self-defense against malaria became prerequisite for the British planters in India. A decade later, mosquito-breeding areas around drinking wells became the target of the tea planters. By the middle of the twentieth century, many planters would agree that the situation had markedly improved, but no one could win the war against mosquitoes and malaria—a war that was at least in part the product of the changes the planters themselves had made upon the landscape in their quest to domesticate the wild Assam tea plants.

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