

A photograph of a tea plantation in a hilly region. In the foreground, a person wearing a blue shirt is bent over, harvesting tea leaves from a dense bush. The middle ground shows rows of tea bushes on a slope. In the background, there are more hills covered in tea plants and some tall, thin evergreen trees. The sky is overcast with grey clouds. A large, stylized white leaf icon is positioned at the top center of the text area, and another similar icon is at the bottom center.

HOPE BREWING

**KOTAGIRI TO KACHIBARI
CASE STUDIES ON ECOLOGICAL
TEA CULTIVATION**

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CONTENTS

4-6

INTRODUCTION

8-15

CASE STUDY I

MAKAIBARI TEA ESTATE

KURSEONG, DARJEELING DISTRICT, WEST BENGAL

16-23

CASE STUDY II

BAMANDANGA AND TONDOO TEA ESTATE

NAGRAKATA, JALPAIHURI, WEST BENGAL

24-31

CASE STUDY III

TENZING BODOSA

KACHIBARI VILLAGE, UDALGIRI DISTRICT, ASSAM

32-39

CASE STUDY IV

ORGANIC BY TRADITION

TEA GROWING IN MEGHALAYA

40-47

CASE STUDY V

ECO TEAS

KOTAGIRI, NILGIRIS DISTRICT, TAMIL NADU

50-53

CONCLUSION

INTRODUCTION



The introduction of chemical fertilisers and chemical pesticides resulted in an increase in production in the early years, but by the 1990s and early 2000s, yields had begun to stagnate.

The first commercial tea plantation started in Assam in the 1830s. Ever since tea cultivation has spread across India - from the north-east to the extreme south-west, across various agro-climatic zones. After 180 years, India is the second largest producer of tea in the world after China and the fourth largest exporter. In 2013, India produced 1.2 billion kilograms of processed tea and it also provided direct and indirect employment to almost 3 million Indians. The bulk of tea grown in India is on 1,686 large plantations and small growers, with land holdings of less than 10.12 hectares, numbering around 150,000.¹

The total tea production levels in India have been increasing in the recent years due to the expansion of the area under tea cultivation. But the tea industry is also facing several problems. Many of these have been well documented, including the stagnation of tea production, climate change, habitat destruction, water pollution and soil erosion.²

One such serious problem which poses an immediate threat to both cultivators, tea workers, consumers, and the environment, is the increasing and rampant use of chemical inputs like pesticides.³

The Indian tea sector sees very high pesticide application compared to several other crops in India. The tea plantations in the Assam Valley and Cachar apply around 11.5 kilograms of pesticides per hectare of tea; the Dooars and Terai regions of West Bengal apply around 16.75 kilograms per hectare.³

Until the early 1970s, chemical pesticide and chemical fertiliser used in tea was along the lines of most other crops in India and was minimal. The introduction of chemical fertilisers and chemical pesticides resulted in an increase in production in the early years, but by the 1990s and early 2000s, yields had begun to stagnate.^{4,5}

The increased use of chemical pesticide has resulted in growing incidents of pest resistance⁶ which has compelled growers to increase use of chemical pesticides placing a strain on overall margins, and this has been compounded by the vagaries in the pricing of tea in the domestic and international markets. It is also relevant to note that industrial chemical practices significantly contribute to climate change⁷, the effects of which are highly visible in many of India's tea plantations, which remain primarily rain fed, with most tea growing regions facing changing rainfall patterns and unpredictable weather events which inevitably wreak havoc with the regular flush periods of tea production in certain times of the year.

For sustainable, economically viable tea production to take place in India these chemical inputs - specifically pesticides - have to be gradually phased out and ecological farming needs to be adopted. Ecological Farming is used here to mean farming (in this case tea farming) that relies on and protects nature by making use of natural ecosystem functions and agro-biodiversity integrating these into agro-ecological systems that ensure agricultural resilience, food security and food sovereignty, and sustainable farmer livelihoods.

The increased use of chemical pesticide has resulted in growing incidents of pest resistance which has compelled growers to increase use of chemical pesticides placing a strain on overall margins, and this has been compounded by the vagaries in the pricing of tea in the domestic and international markets.

This is not to be confused with premium driven certified organic farming.

Two glaring aspects which often stand out when a plantation goes organic are the overnight cessation of all chemical inputs and a simple switch over to biological inputs without addressing the concerns regarding health of the ecosystem, which is often degraded through intensive farming over several decades. The first is necessitated by the requirements for certification by organic certification bodies and the second is caused by the immediate need to find alternatives to the chemical inputs which were in use.

In this scenario, what is often ignored is the fact that the stress (abiotic and biotic) management potential and hence the productivity of the farm is often dependent on various components of the ecosystem such as soil health, biodiversity, physiological health of the plants etc, and their interactions. Most of our tea farms have a degraded ecosystem.⁴ So what is important is to adopt an approach that rebuilds and rejuvenates the ecosystem.

¹ Department Related standing Committee on Commerce. (2012). Performance of the Plantation sector - Tea and Coffee Industry -, 102nd Report, 9th August 2012. <http://www.teaboard.gov.in/pdf/notice/Parliamentary%20Standing%20Committee%20Report.pdf>

² Trouble Brewing. 2014. Greenpeace India

³ B.C. Barbora and A. K. Biswas. (1996). Use pattern pesticides in tea estates of N.E. India. Two and A Bud, Vol. 42(2) : 4-14

⁴ Panigrahi, P.K. (1993) Biological assessment of soil degradation under high input agro-ecosystem (tea) from south India.

⁵ B.K. Senapati, P. Lavelle, P.K. Panigrahi, S. Giri and G.G. Brown. 2002. Restoring soil fertility and enhancing productivity in Indian tea plantations with earthworms and organic fertilizers. International technical workshop on biological management of soil ecosystems for sustainable agriculture, Brazilian Agril. Research Corp, Brazil.

⁶ Dhiraj Saha and Ananda Mukhopadhyay. (2013). Insecticide resistance mechanisms in three sucking insect pests of tea with reference to North-East India: an appraisal. International Journal of Tropical Insect Science, 33, pp 46-70. doi: 10.1017/S1742758412000380.

⁷ Paustian, K., et al., 2004: Climate Change and Greenhouse Gas Mitigation: Challenges and Opportunities for Agriculture. Task Force Report No. 141. Council for Agricultural Science and Technology.

These case studies are not an attempt to compile a definitive list of alternative pest control techniques used on tea in India but they do tell stories of success

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In India, we have a vast indigenous knowledge base which can offer solutions to pest control. This should then be combined with a holistic ecological farming approach that improves soil health, plant physiology and rebuild the biodiversity. The conventional approaches towards sustainability currently are farm centric, and are focused on improving individual micro ecosystems while the wider region and the ecology remain mired in conventional chemical intensive practices hence hampering the growth of micro systems created. The best way forward for sustainability would be an inclusive approach where entire regions/ areas are brought under the ambit of ecological practices, creating a mechanism which would provide widespread support to the local ecology and also create mechanisms for symbiotic dependence between the local farmers.

The journey to document plantations, which truly stand out as beacons of hope in the abyss of the chemical treadmill, has taken us from the hills of Darjeeling to the plains of the Terai and the Dooars and across the Brahmaputra into the Bodo Territorial Administration region, to Meghalaya and finally down south to the Nilgiris. The stories shared in the following case studies talk about tea growers, their perseverance and techniques they have adopted to make the tea they grow, truly sustainable.

These case studies are not an attempt to compile a definitive list of alternative pest control techniques used on tea in India but they do tell stories of success, restored biodiversity and prosperity from regions where pests and chemical usage have impoverished thousands of farmers. They also highlight the diversity of pest control measures across our nation and share the common narrative of hope - of how the pesticides treadmill can be tackled effectively.

FEMALE WORKER HAND PLUCKING AT MAKABARI TEA ESTATE, DARJEELING IN WEST BENGAL, INDIA.
© SUDHANSHU MALHOTRA / GREENPEACE

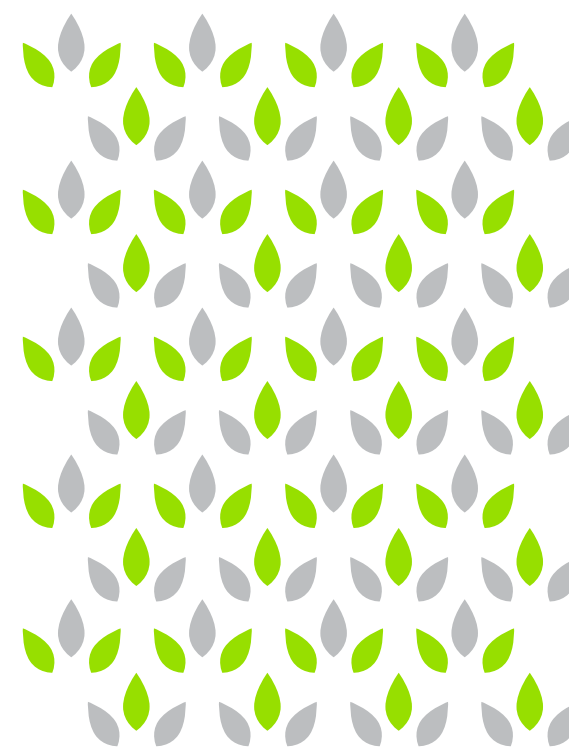




MAKAIBARI TEA ESTATE

KURSEONG, DARJEELING DISTRICT,
WEST BENGAL

The first plantation to shun chemical pesticides and chemical fertilizers, Makaibari is an icon for tea estates around the world. It shows that growing tea in a sustainable ecosystem can not only result in great benefits commercially but also give a very unique flavor to tea. Tea in this estate is grown without chemicals because of the remarkable biodiversity and the health of the soil and the pest populations are controlled naturally. The objective should be to create a holistic and sustainable ecosystem rather than passing the test of certifying agencies.



In a nail-biting auction in 2003, Makaibari Tea & Trading Company, from Kurseong in North Bengal, broke the world record by selling Darjeeling tea for Rs. 18,000 per kilo. Their patented Silver Tips Imperial, hand-plucked during the second flush by the light of a full moon, still holds the title for the most expensive tea produced from India.

Tea from Darjeeling gardens is known across the world as the 'champagne of teas' for its delicate and complex flavors, but even amongst these formidable peers Makaibari stands out. The estate boasts many distinctions in addition to its price record - it is the oldest estate in Darjeeling, the world's first tea factory - but perhaps the greatest accomplishment of this 770-hectare garden is the giant ecosystem within which the tea leaves develop their acclaimed taste.

Makaibari was also the first large tea plantation in India to shun the use of chemical pesticides and fertilizers.

The story of how Makaibari came to be organic has taken on a thing of fable in the fields and feature stories of the estate. A young Rajah Banerjee was visiting home from his studies in London. His father, a hunter and the third generation owner of Makaibari, was a man who pursued his passions with a vengeance, so the chance of having a conversation with his progeny was not much, says Banerjee. Now in his sixties, this fourth generation owner of the estate still has an animated and unconstrained energy that has become as much part of Makaibari's brand as the taste of the tea itself.

The young visitor fell from his horse while riding and realized what he refers to as his calling in life: to save trees. For a young man who had no intention of spending his life on the family tea estate, and for whom a gentle love of nature had not been in his upbringing - taxidermic carcasses of a tiger and leopard still decorate the Makaibari head office, in an uncomfortable reminder of times gone by - this was a life-changing moment.

From 1971 Rajah Banerjee began the process of transforming Makaibari into an integrated, sustainable ecosystem. As one of the first gardens to make the switch over to organic - "it's not a switch over, it's an evolution," he counters - it took him several years to research the theories and develop the bio-pesticides and natural growth promoters the estate now uses.

Changing Makaibari to an organic estate was "initially very difficult and very lonely," says Banerjee, who found himself contradicted and belittled both inside and outside the plantation's tall gates for wanting to find alternatives to the chemical fertilizers and pesticides that were being marketed. "It took me ten years to crack it," he says, "but the mantra was very clear." That mantra was to support and encourage the estate's remarkable biodiversity, in a natural balance that would nurture some of the finest tea in India.

Today Makaibari controls the tea mosquito using the roots of karkush, a plant growing in the forest. They find it to be so effective that Banerjee will pay the locals who plant it Rs. 100-200 for a single sapling. They also use *Artemisia vulgaris*, whose Nepali name "titapatti" means bitter leaf, and *Chromolaena odorata* known as "banmarra" locally, a plant also used by local communities to heal cuts.



RAJAH BANERJEE- OWNER OF MAKAIBARI TEA ESTATE, DARJEELING IN WEST BENGAL, INDIA.
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They use physical methods such as smoke and light traps to repel the tea mosquito, and plant a type of small corn to attract the green lacewing, an insect predator of the tea mosquito as well as thrips and many other soft-bodied insect tea pests.

They use physical methods such as smoke and light traps to repel the tea mosquito, and plant a type of small corn to attract the green lacewing, an insect predator of the tea mosquito as well as thrips and many other soft-bodied insect tea pests. One of the best methods to control the tea mosquito is to hard pluck leaves the bug has fed on, then burn them and suspend the ashes in water. The mixture can be sprayed back over the tea plant, where it works as a repellent for tea mosquitoes. "That works, but it's a long process," says Siddhartha Subba, a field assistant with masterful knowledge of local plants and their uses.

Subba shows us the sites where Makaibari creates its own pest controllers and bio fertilizers: there are five administrative divisions in the estate, and each is responsible for sourcing and making their own preparations. Against red spider mite they use a solution of rathniyola (*Polygonum hydropiper*), or a mix of a soft-tissue jungle weed called ghetu, *Clerodendrum infortunatum*, which grows plentifully on the roadsides. Seeds of the sil timber tree, which has been traditionally used in the Himalayan foothills to treat dental disorders, fever and bowel problems, is used against pests, as is dandelion.

Almost everything Makaibari uses they make themselves, and creating the supply chains for the concoctions within the farm was as much of an institutional change as establishing the processes of making them. Eventually the estate gifted cows to the families of resident workers, creating a steady stream of dung and urine that could be purchased from within the estate, for low rates and minimal transportation costs.

Since 1997 Makaibari has also been operating on the principles of biodynamic farming as developed by Rudolf Steiner. They use biodynamic preparations BD500 and BD501 to improve the root and general health of plant and soil. While mixtures BD502-507 are compost preparations from medicinal herbs, including nettle, yarrow and chamomile, they are considered to promote the development of humus in the compost. These are added to vermicompost made from cow dung, water and green matter, and left to ferment under bamboo roofs to give the earthworms cool shade. Guatemala (*Tripsacum laxum*), a leguminous forest grass, is grown as green cover and used for mulching, to improve microbial content and it also fixes nitrogen.



FEMALE WORKER HAND PLUCKING AT MAKAIBARI TEA ESTATE, DARJEELING IN WEST BENGAL, INDIA.
© SUDHANSHU MALHOTRA / GREENPEACE

Cow Pat Pit (CPP) is a special type of compost advocated in biodynamic farming, in which cow manure is fermented with crushed egg shell and basalt dust for 3-4 months in a 12-foot deep brick-lined pit. As well as general compost use, for which it is combined with BD502-507, in Makaibari, CPP is applied to freshly pruned branches in conventional tea gardens.

According to all workers at the plantation level, managements and also the biodynamic promotion organizations, CPP gives the same results as copper oxychloride based pesticides, preventing fungal infection and stem rot. Makaibari was the first tea plantation to be verified by Demeter, the biodynamic agriculture certification body.

Weeding in Makaibari is performed by hand, and after a worker slices it the weed is left lying on the ground where it grew, to act as mulch. Weeding, gathering herbs and mulching have all become part of the labor duties on the estate, in addition to the usual plucking and manufacturing. This huge plantation employs 700 workers each day.

It is no small undertaking to create and distribute these bio pesticides and fertilizers across such a large estate. Yet the effect of these efforts is palpable, according to Rajah Banerjee: whereas once the thin topsoil around the tea bushes would wash away in heavy rainstorms, taking Makabari’s wealth with it, now the soil is a thick, springy mulch that retains water, copes better with drought, suppresses weeds and cultivates the microbes that perform the uptake of nutrients to the plant. Run-off in rainfall is clear water, like the runoff from the forests. It is the excellent health of this soil, says Banerjee, that produces their record-breaking teas.

Makaibari now produces 120,000 kilos of made tea per year at its factory: not particularly high, but the staff say they could increase the crop yet choose not to because their mandate is for quality over quantity.

“When it rains, you’re creating a special humus,” he explains of the organic soil at Makaibari, “and that turns into fertility. You’re creating prime conditions for microbial organisms to multiply. And more importantly, this soil has a special personality. You drink this tea and you can taste it.”

“Sourcing of the finest ingredients is always the key to flavor.”

Makaibari is an interesting case, as their focus since the 1970s has been on creating a holistically healthy, sustainable ecosystem on the estate, rather than passing the examinations of the certifying bodies.

As such, it was 17 years from their starting point in 1971 until Makaibari was certified as organic by Control Union. Banerjee says it could have of course been obtained in a much shorter time, had he been aiming for certification rather than the bigger picture. “Wouldn’t have given a wack,” he declares, “if it hadn’t have been for my collaborator in England. And she was very clever.” Following its certification as organic in 1988, Makaibari was able to export tea to the EU and fetch the associated higher prices.

Makaibari now produces 120,000 kilos of made tea per year at its factory: not particularly high, but the staff say they could increase the crop yet choose not to because their mandate is for quality over quantity. “Even before conversion, this garden was never a high-yielding garden,” says Sanjay Das, the manager of Makaibari. “It was an average yield garden with top quality leaf.” All plucking is done manually, strictly taking only the top two leaves and a bud.

They grow and harvest tea only for specific buyers, as the quality and price of their product is so assured they have no need for auction. Plucked green leaf is turned into made tea in less than 24 hours, in a clean, humming factory smelling richly of gently roasted tea leaf.

Rajah Banerjee also explains that all elements of Makaibari’s agriculture are closely woven together, keeping the plantation in a carefully-balanced ecosystem in which pest populations are naturally controlled, the soil is rich and the tea is a nectar to the taste buds.

THEY CULTIVATE ALONG THE PRINCIPLES OF PERMACULTURE, in which the tea bush is one of four levels or stages, which Makaibari has increased to six:

- > **RAINFOREST** - unusually, Makaibari has over two hectares of forest for every hectare of planted tea: nearly 70 per cent of the plantation is tropical forest. Falling foliage from the forest is used as free mulch for the tea plants. Provides habitat for the larger animals of the Makaibari ecosystem, including python, king cobra, monkeys, leopard and tiger. “Everything except elephant,” says Banerjee proudly. Makaibari employs 15 forest rangers.
- > **SHADE TREES** – permanent leguminous varieties such as siris (Albizia stipulate, Albizia odorattissima etc) also have the advantage of a sticky sap to trap insects. Shade trees help protect against red spider mite, lowering the temperature for the benefit of both the plant and the plucker.
- > **FRUIT TREES** – Makaibari grows a variety of fruit trees including neem, amla and mango. Bananas are used for composting. The fruit trees attract birds, which in turn eat the insects that attack tea.
- > **LEGUMINOUS TREES** – Makaibari sows 12,000-13,000 of leguminous plants each year.
- > **TEA PLANTS** – varieties of Camellia sinensis cover velvet green hills, divided into six divisions and by swathes of verdant forest.
- > **GROUND FLORA** – one acre of grasses is sown for every ten acres of plantation. The grasses are cut and used as mulch. Weeds are cut and left on the ground as mulch for the same area.

Despite Makaibari’s huge advances, the garden is still evolving, and remains dynamic in every sense of the word. Banerjee and his team are currently searching for new ways to fix potash into the soil using products naturally produced by the farm, such as the areca nut.

Banerjee is a rarity in that he lives on his plantation: most others are owned by people who live elsewhere, which places undue pressure on the managers to produce high yields at low prices, an unsustainable model which leads to high synthetic pesticide and fertilizer use and, inevitably and ironically, ultimately leads to lower yields. Makaibari is not just proof that agriculture can both succeed commercially and benefit the environment: the plantation’s high-value tea and legendary status are a direct result of their commitment to sustainable agriculture.

“It’s very easy to write it down and say oh, take some ginger, some chilli, some onions...” says Das, waving his hands dismissively. “But making it is a different matter. Have you sprayed that? Well we ARE spraying that. And we’ve been doing it for the last twenty years.”

The result of their efforts is a record-breaking quality tea, and a large fertility reserve in the soil

that allows the tea gardens to survive vagaries in weather, increasing with climate change in recent years, with more resilience than those that rely on synthetic pesticides and fertilizers. When we visit Darjeeling, it is in drought, waiting thirstily for the first rains, but the tea bushes of Makaibari are greener than those in many of the surrounding plantations.

“The moment you become organic, truly organic,” finishes Banerjee, “by which I mean holistically sustainable, the quality of life jumps up at every level.”

Makaibari is not just proof that agriculture can both succeed commercially and benefit the environment: the plantation’s high-value tea and legendary status are a result of their commitment to sustainable agriculture.



NAME
MAKAIBARI

AREA
KURSEONG, DARJEELING

SIZE OF PLANTATION
**248.18Ha of tea bushes,
520.7Ha of forest cover**

YEAR OF FIRST CERTIFICATION
1988



ANNUAL PRODUCTION
120,000 Kgs of made tea

YIELD
450 Kg/ Ha of made tea

AVERAGE YIELDS IN
THE REGION
500 Kg/ Ha

**LOCAL PEST CONTROL
AND GROWTH PROMOTION
METHODS:**

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Thrips control: a type of small corn is planted to attract the green lace wing, an insect predator of thrips and many other soft-bodied insect tea pests.

Red spider mite control: solution of Polygonum hydropiper or concoction made from Clerodendrum infortunatum.

Tea mosquito bug (Helopeltis theivora) control: The roots of karkush plant. Also concoctions made from Artemisia vulgaris, whose Nepali name “titapatti” means bitter leaf, Chromolaena odorata know as “banmarra” and citronella. They also use physical methods such as smoke and light traps to repel tea mosquitoes.

General pest control: concoction from the seeds of the sil timber (Zanthoxylum acanthopodium DC seeds), dandelion.

Improving the root and general health of plant and soil: Biodynamic preparations BD500 (Manure of a lactating cow buried underground) and BD501 (Crushed quartz mixed with rainwater buried underground) .

Biodynamic preparations applied to vermicompost to speed up the composting process:
1.BD502- Made from the flowers of yarrow (Achillea millifolium)
2.BD 503- Made from dried chamomile flowers (Matricuria chamomilla)
3.BD 504- Made from the Himalayan stinging nettle (Urtica parviflora).
4.BD 505- Made from the outer bark of the oak tree (in India, the Himalayan oak Quercus glauca can be used)
5.BD 506- Made from the wilted flowers of dandelion (Taraxicum officinalis)
6.BD 507- Made from the stored juice of Valerian flowers (Valeriana officinalis)
Added to vermicompost made from cow dung, water and green matter.

Improving microbial content and nitrogen fixation: Guatemala (Tripsacum laxum), a leguminous forest grass, is grown as green cover and used for mulching. Guatemala is also planted during an enforced waiting period after existing tea bushes are uprooted and before planting of new tea bushes takes places. It is used as soil binder and organic-matter builder in tea estates.

Preventing fungal infections and stem rot: Cow Pat Pit (CPP) is a special type of compost advocated in biodynamic farming, in which cow manure is fermented with crushed egg shell and basalt dust. It is combined with BD502-507 to freshly pruned branches.



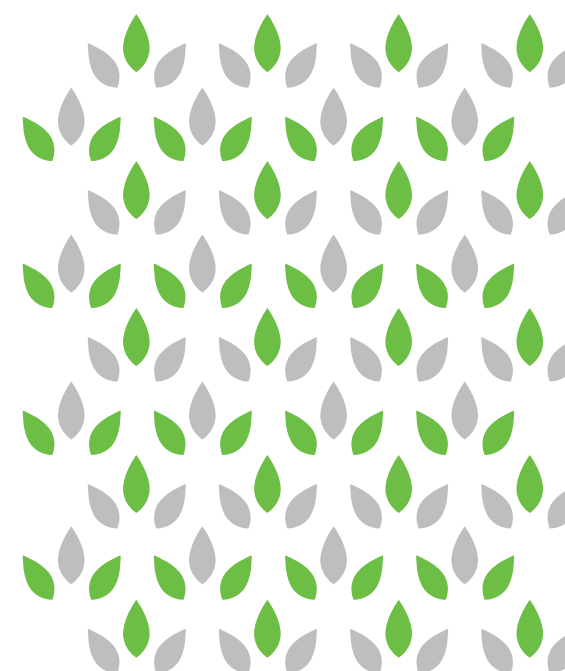
BAMANDANGA AND TONDoo TEA ESTATE

NAGRAKATA, JALPAIGURI,
WEST BENGAL

BAMANDANGA AND TONDoo TEA ESTATE

NAGRAKATA, JALPAIGURI, WEST BENGAL

A scientific based approach that focuses on understanding pest cycles, and developing bio-pest controllers using traditional knowledge, along with a soil management plan and improving plant physiology can be successful in avoiding chemical pesticides and fertilizers in tea gardens. The Bamandanga and Tondoo tea estate is an example of a success story of a large plantation that has recovered from a 5-year close-down with good yields and in some cases better than average yields in the region, using principles of ecological farming and proving to be much more cost-effective than conventional chemical tea gardens.



Bamandanga and Tondoo Tea Estate was one of the flush of tea plantations in North Bengal that closed in the last decade, and when the PCM group took it over in 2010 it had been shut for five years. Untended, the land was barren and 50,000 tea bushes on the 450 hectare estate had perished.

Vijay Singh Parmar, the CEO of the tea division of PCM Group of Industries, made a decision to restart the estate as an organic tea plantation, along with another 900 hectares Dooars garden called Samsing & Yongtong, which had also experienced a spell of closure and the company had purchased at the same time.

Instead of using chemical pesticides and fertilizers, the estates would produce tea using natural composts and herbal concoctions as bio-pesticides. They would be the only tea gardens in Dooars and Terai to do so on such a large scale.

The task was a challenging one, but there was perhaps no better person to deliver it. Parmar has 38 years' experience in the tea trade, during which he has converted 16 large tea gardens from conventional farming methods to organic. The first was in 1985 for Goodricke; he subsequently spent many years advising Chamong Group of Gardens, which began converting their tea gardens to organic in 1994. Chamong now produce around 18- 20% of the world's Darjeeling tea, and all of it is organic. He is not a scientist but a field researcher, and over many years of experimentation in organic tea growing has developed an almost encyclopedic knowledge of local plants and their uses.

"Every plant is useful," Parmar says, of devising bio pest controllers for tea. "In fact, just look for any weed that doesn't get attacked by insects – that will be a good weed to use."

Parmar's personal experiments in bio pest controllers started with trials of fungal and bacterial formulations to deter common pests. In 2007 he switched to the mixtures of the Asian Agri-History Foundation (AAHF), who had in their possession a translation of an ancient Sanskrit text called Vrikshayurveda: a holistic advice manual on all aspects of tree planting and cultivation, including prescriptions for natural pesticides and fertilizers. "It's an old sort of science," says Parmar, "but from there we picked up some very useful concoctions." From the broad descriptions given in the Vrikshayurveda text, and with the support of the AAHF, of which he is the West Bengal chapter Chairman, Parmar along with senior agricultural scientists Dr. Y.L.Nene, AAHF founder and Dr. S.L Choudhary, secretary of the AAHF, have standardized many of them to produce easily replicated recipes and ratios for others to make bio pest controllers and growth promoters in their own tea gardens.

Parmar's standard recommendation is Ind-Safari, a combination of fish waste and cow urine left to ferment for 15 days to 1 month depending on the temperatures. By the time the process is complete, the liquid is odorless. It is then diluted further and sprayed on foliage for control against all sorts of insect pests, and in particular the looper caterpillar. It's also a nitrogen source, and promotes growth via the amino acids from the protein in the fish, broken down by the fermentation process. Crucially, it's also cheap: one drum of Ind-safari will protect 40 ha of tea plants, and costs less than 1000 rupees.



V.S. PARMAR, CHIEF ADVISOR TO BAMANDANGA AND TONDOD TEA ESTATE AND ORGANIC TEA SECTOR VETERAN. © SUDHANSHU MALHOTRA / GREENPEACE

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¹ http://asianagrihistory.org/research/Full_article_-_Managing_Tea_Plantation_Using_Vrikshayurveda_F.pdf

Red spider mite is a massive problem for tea plantations all over and Parmar says that the most effective method of control is to ferment *Polygonum*, a weed with swollen knobby joints up its stem that is found in abundance in the tea-growing regions of the Northeast, in cow urine and spraying the solution.

To control the tea mosquito Parmar recommends a fermented solution of *Vitex negundo*, a plant commonly found growing by the roadside across Bengal, Nepal and the north-east. This concoction is so effective at controlling *Helopeltis theivora*, formerly the bane of his tea plantations, that Parmar calls it a "magic plant".

Although these concoctions drive the pests away, "the best thing," says Parmar, "is to make the bush immune. Nothing is better than that." In Darjeeling blister blight is an even bigger problem than the tea mosquito, and to control that Parmar has developed a formula for boiled equisetum, foliage of the *Casuarina* tree, rice husk or anything else containing silica. Boiling releases the silica into the solution, which then coats the leaves when sprayed. It acts as a barrier to the dreaded fungus.

Years of trial and error has allowed Parmar to refine the recipes to the point of greatest effectiveness. "There are nuances to these preparations," he explains. "The concoctions have to be done a particular way, sprayed at the right time and so on." Spraying against *Helopeltis* should happen in the very early hours of the morning, for example, before the sun has risen. That's when the tea mosquito feeds on the new leaves of the tea bush, and will be exposed to the applications.

In general, spraying of pest controllers in Bamandanga and Tondoo Tea Estate is done over 14 days each month, the seven before and seven following the full moon. "That's when the plant has the most moisture and is the most delicious to insects," explains Parmar. As a result, the pests are found at the top of the plant and are most easily targeted with spray.

Farming according to the moon is knowledge developed indigenously many generations ago, and the herbal concoctions also have many traditional elements: Parmar has found that the best way to prepare the herbs is in the traditional rice crusher, the *dheki*, which crushes the material.

Parmar's concoctions have refined indigenous wisdom with a modern scientific approach.

This is often crucial for starting the breakdown process while retaining the active ingredients of the plants: for example, when neem seeds are crushed open it allows azadirachtin, an antifeedant and growth disruptor for insects, to escape. Parmar has a concoction of neem seeds and fermented cow urine that can be used as a general insect repellent.

Like neem, many of the herb ingredients are already known to farmers for their agricultural or medicinal uses, in knowledge passed to them by ancestors. Leaves of *Vitex negundo*, for example, have long been used as *pakora*, i.e., a cake by locals to treat fever during the rainy season.

However, Parmar's concoctions have refined this indigenous wisdom with a modern scientific approach. Another organization he works closely with on Bamandanga and Samsing is Inhana Biosciences, a Kolkata based research organization, led by Dr. Das Biswas, which is doing pioneering work on a holistic soil health and plant physiological approach to organic farming.

Their first step when converting a tea garden to organic is to conduct a laboratory analysis of the soil in each section of the plantation, and create a soil management plan and apply manure accordingly.

Achieving good soil health, says Parmar, is only possible through organic cultivation practices. Inhana had recently come out with a white paper on the basis of 3 years of research on 'Finding out an effective pathway for sustainable Organic Tea cultivation', a Project funded by the Food and Agriculture Organization, in Assam with the primary objectives being to establish a package of practices towards increasing total production of sustainable organic tea & increasing the number of producers (including small growers) able to make use of the available knowledge.



TEA FACTORY AT THE BAMANDANGA AND TONDODU TEA ESTATE. © SUDHANSHU MALHOTRA / GREENPEACE

If a tea plantation has been subjected to chemical pesticides or fertilizers, the microbial content of the soil will be far lower. Another aspect which he believes very strongly in is the need for revival of bio diversity in the plantation, in which again he is deeply influenced by Dr. Das Biswas. The plantation regularly monitors and gauges the biodiversity markers in the plantation and uses that as a fundamental yardstick to measure the progress of their work.

Yet despite this, the sections of the estate that are relatively new, bushes younger than 20 years, are already producing excellent yields: at least a dozen yield over 2600 kg/ha, which is at the top end of yield for the Dooars region. One 14-hectare section yields 3000 kg/ha, which far exceeds the average yield of the surrounding tea plantations, all of which use chemical pesticides and fertilizers. The average for the dooars is around 1800/ha. In total, 40 per cent of the garden is giving an average yield of 2000 kg/ha, and the remaining 60 per cent have a yield of around 1000kg/ha. They are currently witnessing a YoY increase in production of atleast 30% since 2011. The yield for the plantation as a whole averages out at 1500 kg/ha, but “come back in three years,” Parmar says.

“Then it will be 2200 kg/ha.” The plantation is already producing more tea per year than when it was a conventional tea plantation using agrochemicals.

Some of the other capacity considerations are the manufacture of the requisite amount of manure, including management of the dairy farm and moving the heavier bulk manures around the estate. Pest infestations can be controlled through the herbal concoctions outlined in the ecological fertilization and pest management methods in the annexure. Additional labor might be needed to prepare the bio-pest controllers and manure and to do manual weeding, but Parmar says this is more a question of effective management of workers, rather than needing more labor. Most important for the people making the switchover, he says, is the development of a conscious organic culture, right down to the grass root level.

Cow urine features heavily in most of the concoctions, as does cow dung. Cow urine is a particular star product as it is a bio enhancer increasing nitrogen in the plant and soil and is also an effective pest control product.

Parmar specifies that the cow should be the humped desi cow, and ideally lactating when the products are collected. “And none of the urine or fish waste goes into the tea leaf,” he points out. “Everything is broken down to its constituent nutrients.” Some modern vegetarians have qualms about the use of animal matter in farming, but he points out that biological matter has been used in farming for generations: blood, bone and fish meal are common organic soil fertilizers.

Years of field research has also quantified the amount of manure required for tea bushes based on the percentage of polyphenols present in the shoots. Parmar also uses a composting method developed by Inhana Biosciences which turns manure into compost in just 21 days as opposed to the usual three and a half months. It’s a radical development for organic farming. The secret is the periodic application of a mixture of three ingredients - Cynodon dactylon, Sidacordifolia L. and Ocimum basciliacum., as the compost ferments, and regular churning, combined with a pit of the right depth to create the appropriate temperature and pressure for the decomposition process.

This year he’s making 6,000 tonnes of compost. The compost heaps line the back of Bamandanga and the herbs are crushed next to round drums used for fermenting the herbs

Bamandanga purchases cow dung and fish waste for one and seven rupees per kilo, respectively, and cow urine for four rupees per liter. This makes it vastly cheaper than purchasing chemical pesticide equivalents. “Conventional gardens have spraying costs of 15,000 rupees per hectare,” says Parmar. The Bamandanga and Tondoo Tea Estate is 450 hectares, so it would cost a minimum of 67.5 lakh rupees to spray with chemical pesticides, and costs are ever-rising.

In contrast, ingredients for the herbal homemade concoctions can be sourced cheaply or for free, making pest control much more economical. Yet despite its basis in traditional knowledge, the irony is that “organic science is very new,” Parmar points out. “Very few people are aware of it and it’s very sad our research associations don’t have much to contribute towards organic cultivation.”

Ingredients for the herbal homemade concoctions can be sourced cheaply or for free, making pest control much more economical. Yet despite its basis in traditional knowledge, the irony is that “organic science is very new,” Parmar points out. “Very few people are aware of it and it’s very sad our research associations don’t have much to contribute towards organic cultivation.”

GROWTH PROMOTER MADE FROM FISH WASTE FERMENTED IN COW URINE BEING SPRAYED. © SUDHANSHU MALHOTRA / GREENPEACE



NAME

BAMANDANGA AND TONDOO TEA ESTATE

AREA
**NAGRAKATA, DOOARS,
JALPAIGURI DT,
WEST BENGAL**

SIZE OF PLANTATION
450 Ha

YEAR OF CONVERSION
2011

ANNUAL PRODUCTION
600,000kg

PRODUCTION PRIOR TO
CONVERSION
450,000 Kg

YIELD
**1500 Kg/ Ha (some sections
have a yield of 3000 Kg/ Ha)**

AVERAGE YIELDS IN THE REGION
1800- 2000 Kg/ Ha



LOCAL PEST CONTROL AND GROWTH PROMOTION METHODS:

Looper caterpillar and general pest control: Ind-Safari, a combination of fish waste and cow urine- Foliar Spray. Also nitrogen source, and promotes growth via the amino acids from the protein in the fish, broken down by the fermentation process.

Red spider mite control: ferment Polygonum hydropiper in cow urine and spray the solution. Clerodendrum infortunatum is also used after fermentation in cow urine for red spider mite control.

Tea mosquito bug (Helopeltis theivora) control: fermented solution of Vitex negundo.

Blister blight control: Boiled equisetum, foliage of the Casuarina tree, rice husk or anything else containing silica.

General insect repellent: concoction of neem seeds and fermented cow urine.

Novcom compost: Compost of plant waste prepared with periodic application of a mixture of three ingredients - Cynodon dactylon, Sida cordifolia L. and Ocimum basilicum.

Improving soil health: Mix dried mimosa with mulch to improve soil fertility. Also helps control pests.

Improving plant health: Vrikshayurveda recommends usage of Hibiscus rosa-sinensis, after fermentation in water, for improving plant health.



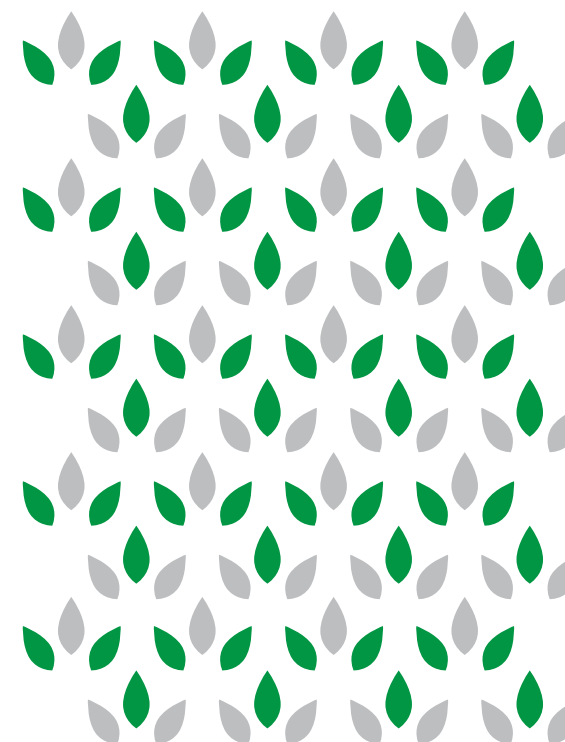
TENZING BODOSA CASE STUDY

KACHIBARI VILLAGE,
UDALGIRI DISTRICT, ASSAM

TENZING BODOSA CASE STUDY

KACHIBARI VILLAGE, UDALGIRI DISTRICT, ASSAM

Small tea grower in Assam who went on a quest to stop using chemical pesticides and fertilizers was able to do so with the help of a Canadian NGO, Fertile Ground. Today he prepares his own bio-pesticides and has an understanding of assessing soil and applying appropriate treatments. But unlike in his case, the biggest block for small tea growers to adopt ecological farming is the absence of a knowledge base and marketing channels. Tenzing's experience should be a sign for the Tea Board to assist Small Tea Growers to move away from chemicals by providing them the right kind of support systems.



"When I am spraying some chemical pesticides in my garden, I feel always unhappy," says Tenzing Bodosa, a tea grower with a small plantation in the Bodoland Territorial Area District, Assam. "When I'm working here after spraying the chemical pesticides, the air becomes totally poisoning, and I feel headaches, I have vomiting. Many of the villagers do also, because the air is being poisoned for 20 or 30 hours."

The crunch for Tenzing came when one day, after spraying his tea bushes with the usual synthetic pesticides, he came back to the house to clean his clothes at a small tube well. After rinsing them, he threw the wash water out onto the grass. His farm is in a forest area, ten kilometers from the Bhutan border, and a lot of animals pass through it. Five days after throwing out the pesticide water, he saw that the grass where it had landed had died. Some rabbits and fish were also found dead, and he suspected this might be connected to the pesticides sprayed on the tea plantation.

“So I think how people, anywhere, when a guest comes, respect them by offering them a glass of water, or a cup of tea. So I’m growing the tea, and if I’m using highly chemical pesticides and fertilizers, how are people drinking this tea? Totally poisoning. I wanted an alternate way.”

Tenzing began to travel to try and find methods of growing his tea and other crops without using chemicals. He read about a senior organic farmer on the other side of Assam, and travelled over 400kms to go there. “He was the one who told me to go to an organic training centre in Digboi,” says Tenzing. The centre is established by the Canadian NGO Fertile Ground, where a woman told him about organic farming, and taught him how to make compost.

Tenzing returned to his farm and completely stopped using all synthetic fertilizers and pesticides on his farm, including on his tea bushes, in 2008. “I thought, ‘Let me see what happens’.” Still unschooled in organic farming, initially he used little more than cow urine, cow dung and goat dung, but still found that slowly his garden came under control and that the tea bushes were healthy and verdant.

Later on he travelled to the outskirts of Bangalore to meet another established organic farmer, who then came to Assam and taught Tenzing to make growth promoters, fertilizers out of natural materials. He mixes one solution of equal parts molasses and fish waste and ferments them in cow urine before diluting in water and applying; they improve the carbon content in the soil, nourish soil microbes and provide nutrients to the plant. The farmer also taught Tenzing to cultivate indigenous microorganisms (IMO) by packing cooked rice into a shoot of freshly-cut bamboo and leaving it in a cool forest or grass area near the farm for up to 60 hours.

Tenzing makes all of his own bio-pesticides, though these days he has no need to do it in any great volume, as the incidence of pests on his farm is low from the peak when he was using chemicals.

Microbes will take up home in the rice, which can then be fermented with cheap molasses and applied to the plants, or added to a digester tank. It is excellent for growth promotion, says Tenzing. He now tests his soil for nutrients and microbial activity by sending samples to a lab in Guwahati.

The Bangalore farmer also told Tenzing that high rainfall in Assam has led to Assamese soil having low levels of exchangeable calcium and taught him a technique of burning bone and suspending the char in water for 10 to 15 days. The liquid can then be applied to the soil as a calcium donor. To buy, this would be prohibitively expensive: Rs. 40,000 per kg. But Tenzing collects the bones of animals that have died of natural causes, such as two elephants who died on his land the year before, and uses those for free. The bones of any deceased animal will do: pig, dog, buffalo. Similarly, he has no need to purchase cow urine or dung because he exchanges with his cow-owning neighbors in return for tea or something similar, and so the small village economy provides a balanced flow of goods for those who need them.

Tenzing makes all of his own bio-pesticides, though these days he has no need to do it in any great volume, as the incidence of pests on his farm is low from the peak when he was using chemicals. He currently attributes the low incidence of pests to the pristine ecosystem he has created and mentions how neighboring plantations and farms still see high pest infestations.

In the first year Tenzing switched to organic, red spider mites and tea mosquitoes attacked his tea bushes. He mixed *Polygonum hydropiper* with a variety of neem, leaves of the siris tree and left them to ferment in cow urine for 15 days. Spraying the mixture chased away the pests. “I learned this mixture from wise people in the village,” he says. “He recalls stories of how his forefathers used *hydropiper* to catch fish. They hit the leaves to break them up and threw them in the water. It would give the fish some problem, like an eye irritation, and they would come to the surface and be caught easily.”

Tenzing’s pest problems only persisted for the first two or three years of his switchover to organic, “and during that time you have to be careful,” he admits. “But after four or five years, nature will establish its own balance and then there are much less attacks.”

Today he feeds his tea bushes with IMO and the molasses and fish waste mixture, and finds that the occurrence of pests is very low. “Nature is working itself, no?” he asks. “It is becoming very strong. When I am using these chemicals before, plants are becoming very weak.” Now he only needs to spray his concoctions every 25-30 days, as natural defense systems have been re-established.

In the case of a tea mosquito attack Tenzing’s remedy is to mix fish waste with neem, *Polygonum hydropiper* and cow urine and leave it to ferment for 10-15 days before spraying. Again, this is a mixture devised partly from ancestral knowledge, partly from experimentation, and partly from common sense. “It’s easy to see which plants to use for pest control,” he points out. “Just look for the ones the cows aren’t eating.” Bitter ferns are growing in the drainage ditch next to his field of tea: problems and their remedies are often to be found growing side-by-side in nature.

Almost all the ingredients Tenzing uses for pest control are the same as those being used by organic tea growers in other areas, albeit without the research-based standardization of the large estates of Vijay Parmar or Rajah Banerjee. There are some exceptions, such as the white-flowering plant the Bodo call *Mwkhana Bilai* (*Hygrophila auriculata*), which Tenzing uses for bug control. As with most of the plants, its anti-pest properties are not its only use: this one is also used locally to make rice beer.

Tenzing was the first farmer in his family to take up tea; he now farms a total of 88 bigha of the crop and is planting more each year. Although tea can be lucrative, for small growers living in such remote places as Kachibari village, the recompense of the crop depends very much on being able to access the right manufacture and marketing links. This is especially true for organic small tea growers: if no organic manufacture or marketing chain is available, green leaf is sold at an auction via the usual mechanisms, and from there sent to the bought leaf factory. It is treated as tea grown with chemical pesticides and fertilizers, and purchased for the same, lower price.

Considering his production levels are at par with most conventional plantations, he does not mind the lower prices but he does mind his tea being mixed with chemical laden tea from other plantations.



MICRO TEA PROCESSING UNIT RUN BY TENZING BODOSA AT HIS PLANTATION. © SUDHANSHU MALHOTRA / GREENPEACE

To avoid this, initially Tenzing processed a part of his green leaves by hand. In 2012 he purchased micro-processing units from Punjab: a tea dryer for six lakhs, a roller for two and a half lakhs and a withering tray for one and a half lakh rupees, including transport costs. Kachibari village was without electricity, so eight months ago he paid for the electric lines to bring electricity to the village, and allow him to install the machines next to his house. If the power is out, he uses a diesel generator. He’s an innovative person and seems to be the pioneer of his village: he is trilingual, was the first in the village to drive a motor vehicle, and the first to go organic. “Lots of things are possible,” he says. “You just need the bravery to try.” All of these purchases he has made from his own pocket, without receiving any financial support from schemes or loans.

He has also been quite adept at marketing his produce. He currently sells a part of his produce (100- 150 kgs) of tea to a Canadian buyer at a premium but the bulk of his produce is sold domestically; we see tea packets stacked in his store with stickers with images of Tenzing beaming in his fields stuck on them - he is not just selling a product, he is selling an idea.

While Assam tea is known the world over, the occurrence of certified organic growers from the state is low. Organic tea is a nascent industry here, but it has great potential: the climate is excellent for the plant, producing good-quality leaf, and unlike Darjeeling or the Dooars there is no labor problem in Tenzing's area.

"But marketing is a big problem for organic tea in the north-east in the absence of any significant Government or Tea Board support," says Tenzing. The gardens are often very remote, and many of the growers speak only the Bodo or Assamese language, both of which hinder them in interacting with potential buyers. Tenzing has been able to negotiate it because he speaks good English, and the representatives of the Canadian company travel yearly to his home to make their purchase.

"The organic movement is gaining steam and people are getting very interested," says Tenzing. But most are confused about marketing.

"The organic movement is gaining steam and people are getting very interested,"

"We are at the very beginning stages of this. It's only been going for four or five years. That's why it's very slow."

Earlier this year, the farmers launched the Organic Small Tea Growers Association of North East India, with the support of Fertile Ground. It's an association of about 30 growers from across Assam, as well as from Nagaland, Arunachal Pradesh and Tripura. There are a few examples of large-scale organic tea growing in the north-east - a big plantation in Arunachal Pradesh, for example, but for the small growers accessing knowledge can also be a major hurdle to organic tea growing.

Literacy in Udalgiri district is only 34 per cent, which restricts the possibilities of accessing knowledge through documents or online, and in terms of direct learning Tenzing found that many people are hiding the knowledge, not sharing it - perhaps to safeguard the 'exclusivity' of organic tea and the higher margins that accompany it.



TENZING BODOSA, TEA GROWER EXTRAORDINAIRE FROM BODOLAND, ASSAM © SUDHANSHU MALHOTRA / GREENPEACE



TENZING BODOSA'S TEA PLANTATION NEAR DIMAKUCHI VILLAGE IN BODOLAND, ASSAM. © SUDHANSHU MALHOTRA / GREENPEACE

"Most farmers aren't sure what is organic, they think they have to do something different or buy some things. Organic is just doing nature."

"If one good organic centre with the Tea Board or Government support were to come here, to give the knowledge, to handle the packaging, then we would be able to sell to the global and the burgeoning health conscious domestic markets at a good price. And the small growers will get the good benefit. Knowledge, packaging, marketing... it's a lot to manage, actually."

Ironically, for most small tea growers in the north-east organic growing is instinctive. The tribals and others around Tenzing's area, and he claims even in most of the north-east, have no knowledge of synthetic fertilizers and pesticides and are not accustomed to using them.

Yet, with limited access to knowledge about sustained organic practices, they approach existing conventional tea growers and even pesticides sales agents who provide advice that ends up ensnaring the growers in a vicious

chemical cycle, with a heavy cost both to their finances and the health of the soil. "Every year crops are decreasing," says Tenzing, shaking his head, "and people don't have sufficient knowledge of how to improve the soil quality."

"Other people [big companies and plantations] are using the highly chemical fertilizers and it's coming to our fields, by water and stream. Every year they're using tonnes and tonnes of chemical fertilizers and chemical pesticides," he says. "In this area there was lots of orange, mosambi, many types, but now many plants have died or diseases are coming."

"Most farmers aren't sure what is organic, they think they have to do something different or buy some things. Organic is just doing nature. The older mechanism of soil is micro-organisms."

NAME **TENZING BODOSA**

AREA
KACHIBARI VILLAGE, ASSAM

SIZE OF PLANTATION
**7.5 Acres of tea and 15
Acres in total**

ANNUAL PRODUCTION
Around 5,200 kg

PRODUCTION PRIOR TO
CONVERSION
450,000 Kg

YIELD
1700 Kg/ Ha

AVERAGE YIELDS IN ASSAM
1700- 1800 Kg/ Ha



LOCAL PEST CONTROL AND GROWTH PROMOTION METHODS:

Improving carbon content and soil microbium and addition of nutrients: solution of equal parts molasses and fish waste and fermented in cow urine

Introducing Indigenous Microorganisms (IMO): cooked rice packed into shoots of freshly-cut bamboo and left for 60 hours, later fermented with cheap molasses and applied to the plants, or added to a digester tank.

Increasing exchangeable calcium levels: burning bone matter and suspending the char in water for 10 to 15 days.

Red spider mite control: fermenting Polygonum hydropiper with a variety of neem, leaves of the siris tree in cow urine and spraying.

Tea mosquito bug (Helopeltis Theivora): Fish waste mixed with neem, Polygonum hydropiper and cow urine and fermented and sprayed.

General pest control: white-flowering plant called Mwkhana Bilai (Hygrophila auriculata).



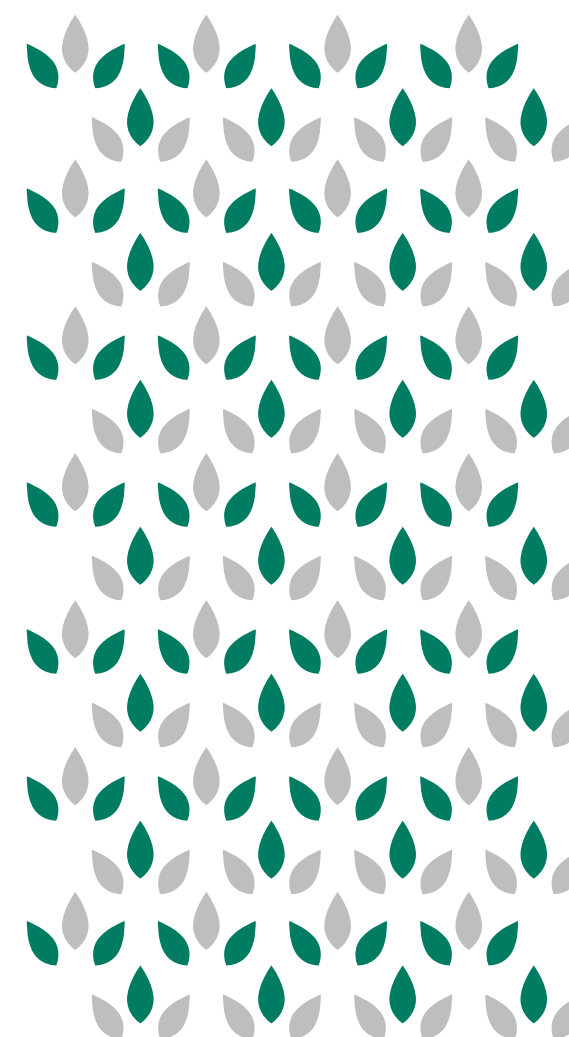
ORGANIC BY TRADITION

TEA GROWING IN MEGHALAYA

ORGANIC BY TRADITION

TEA GROWING IN MEGHALAYA

Preserving traditional knowledge and practices and maintaining soil health has helped tea growers in this region keep away from chemical pesticides. The added support and guidance from the State Government for organic tea cultivation has helped farmers in Meghalaya reap rich dividends.



“The only thing the Meghalaya small tea growers can do,” says Maqbool Lyngdoh Suiam, “the only niche for them between the Tatas and the big growers and the Darjeeling and the Assam tea, is quality. They can make quality tea.”

Meghalaya might not yet be known for its tea, but the sloping hills of the state affectionately known as the Abode of Clouds nurture a nascent tea industry whose taste is said to vie with those of the long-established Indian brews. With both low plains and high elevations, high rainfall and fertile soil, the climate of Meghalaya is perfectly suited to the cultivation of both the delicate Darjeeling and the more robust Assam varieties. Their way forward in this crowded marketplace, as they know, is by the meticulous pursuance of quality. And in Meghalaya, quality tea means organic tea.

“The tea industry in Darjeeling and Assam are far ahead of us, and we are new to it,” admits Suiam, a Horticulture Development Officer in Meghalaya. “But we are catching up to the standard of Darjeeling now.”

What’s particularly exciting about the organic tea industry in Meghalaya is that it’s being vigorously promoted and supported by the Government. Seeking to lead by example, the Directorate of Horticulture converted four hectares of conventional tea plantation to organic at its Tea Development Centre in Umsning, Ri-Bhoi district.

“We maintain top quality standards of plucking,” Suiam explains of the orthodox tea that is produced from the development centre.

“Because when you talk about organic, it has to be of a certain standard, and when you talk about orthodox you have to think about the quality of plucking. It has to be,” he pauses to enunciate. “The. Best.”

Having provided a showcase, for the last four years the Department of Horticulture has been encouraging small tea growers of Meghalaya to follow their example and switch to organic. Of a total of 1500 ha of Government-supported tea grown in Meghalaya¹, 150 ha has so far been switched to certified organic, so far all in the Ri-Bhoi and East Khasi Hills districts. In the next phase of the staged process, another 100 ha (50 ha in each of the same two districts) will also shun chemical pesticides and fertilizers.

The farmers have formed an organic tea growers’ self help group: ARSLA Organic Tea Growers and Producers’ Cooperative Society – of Ri-Bhoi district has about 100 members, and to members the Government provides support both financially and in terms of administration. They have covered the costs of a group organic certification, (three lakh rupees per hundred growers) and almost every one of the projects that has switched so far is now certified as organic.

Suiam acknowledges the importance of support groups such as this in uplifting the organic pioneers and enforcing the importance of quality. He explains that “right from the grassroots they have to understand the concept of organic farming.” In addition to the certification costs, the Government provides training, and is planning to provide support for three years for organic inputs for tea cultivation.

“Capacity building is no. 1,” says Suiam. “And we want to put more into input support. We would like them to be given not just the certification costs but income support too.”

Weeds can be a “major issue” for organic tea growers initially, says Suiam, as of course they are not permitted to use weedicides but must do all operations manually. Once the tea garden is established, i.e., the eco system regenerates, weeds become less of a problem.

“Some say Meghalaya is organic by default, but I would say it is organic by tradition. It is only the green revolution which has given us the idea that we have to use these things,”

Yet generally, the uptake of organic tea cultivation is not as significant a change in Meghalaya as it may be in other states. The level of use of synthetic pesticides and fertilizers in Meghalaya has always been relatively low: this year, Suiam has received applications for fertilizer from only two small tea growers out of a total of 600, and that too for small amounts. “Even the conventional farmers, I don’t see them procure a lot of the hard stuff from outside,” he says. Pesticides are mainly applied in response to a pest attack, rather than preemptively.

“Some say Meghalaya is organic by default, but I would say it is organic by tradition. It is only the green revolution which has given us the idea that we have to use these things,” says Suiam of chemical pesticides. “But you go to the remote parts of the state and people do not know they exist.”

Wkur Bahwang Biang, a Ri-Bhoi tea grower, agrees. “Our forefathers taught us never to harm the soil,” he says. He has two and a half hectares of tea bushes amongst 0.7 ha of tree cover, none of which he has ever exposed to pesticides. He applied for the organic certificate three years ago with Government support, and he expects it to be issued in the next year. His yield is 550kg of made tea per hectare, which is the average for the organic gardens in the region.

Suiam has introduced Government schemes this year to encourage inputs of bio pest controllers on tea farms. “Whether you are an organic farmer or a conventional farmer, I am trying to inject into the minds of the farmers, ‘you need to use this one now’.”

¹ In addition, Meghalaya also has about 1200 ha of tea grown by private small tea growers.



MAQBOOL LYNGDOH, HORTICULTURAL OFFICER, DEPT OF HORTICULTURE, MEGHALAYA GOVT. © SUDHANSHU MALHOTRA / GREENPEACE

The concoctions that the organic tea farmers make in Meghalaya are not particularly complex. “Organic practice is not tough, I tell you,” says Suiam. “You have some idea, you try it... so long as it doesn’t hurt the soil its fine.” Many of the ideas come from the rich traditional knowledge that the Meghalaya farmers have of medicinal herbs and plants. “We people in the hills, we understand that if your child falls down and he gets a bruise or something, you just apply some local herbs, as a paste. It helps. Our people know which leaves are good for which things.”

In the tea gardens, nettle leaves are crushed and mixed with cow urine, and sprayed both as a growth promoter and a fungicide. Lantana camara mixed with cow urine is sprayed as a general pest deterrent, as are neem and even cannabis leaves occasionally which grow freely in the wild. Called Sohpanghlieh in Khasi, the lantana is also mixed with jaggery, water and kept for a week before spraying, again as a general pest deterrent.

² N. Kumar, R. Rai and B. Bera. 2012. Impact of organic farming on the biochemical constituents and quality parameters of Darjeeling tea (*Camellia sinensis* (L) O. Kuntze

³ http://tcdc2.undp.org/GSSDAcademy/SIE/Docs/Vol4/Nadep_method.pdf

Green manure crops and marigolds are grown as border crops; the latter has been reported to attract thrips, so deterring them from the tea bush. Some of the farmers also make bamboo vinegar (pyroligneous acid), by burning bamboo in reduced oxygen (otherwise known as a hole in the ground) and condensing the smoke. It’s applied for soil improvement, pest control and growth promotion.

“You can also use what we call mechanical control,” says Suiam, with a smile. “You see a pest; just go for a hard pluck.”

Blister blight occurs generally in October, but they cause lesser damage through their pest control methods and also because the flushing season is winding down. “One major pest that we face here is red spider mite,” says Suiam. “And by the time the rains come it will be gone. In the main season here, from May to September, we don’t have a pest problem as such. Pests I think vary with the elevation. The level of natural resistance to pests is also perhaps the result of an ecosystem that has not been too damaged by excessive use of chemical pesticides and fertilizers, meaning the soil retain higher levels of fertility.”²



COWS AT WKUR BWANG BIANG'S PLANTATION.
© SUDHANSHU MALHOTRA / GREENPEACE

The Government plantation creates both vermiwash, a tiered set up whereby water trickles through layers of cow dung, worms and green matter before being sprayed on foliage as a growth promoter; and vermicompost. Since becoming organic the plantation has also started rearing cattle, and gives any dung and urine that they are not using to the organic tea growers. "People think buying compost is not cheaper, but easier."

But I feel that if you can have your own composting units in your own backyard, that's the best," says Suiam. "And you can't wait for the Government to be giving you one cow, no. You have to start on your own, at the same time, and have your own composting too." In recent years a young man from Meghalaya was sent to Japan for a year to learn how to create Bokashi compost, a Japanese method of composting that uses micro organisms (mostly of the shelf essential micro organism solutions) to assist decay. Some organic tea gardens now make that; others make nadeb compost.³

Establishing manufacturing and marketing links for small tea growers who live in such remote areas such as the Meghalaya farmers would be an excellent opportunity for the Tea Board of India, but as of yet such support seems to be lacking.

If Meghalaya tea is the best-kept secret of the tea world, teetering on the brink of recognition, the final missing pieces of the puzzle are in manufacture and marketing. Two years ago the Government plantation invested 50 lakh rupees and installed an LPG-fired roaster, two withering trays, two rolling tables and a three-stage, wood-fired dryer so it could manufacture the tea it makes on site.

They produce orthodox tea in a ratio of 60% green, 20% black and 20% oolong, under the name MegTea: Meghalaya's own organic tea brand. With the basic grade currently sold at 800 rupees a kilo, MegTea might just be the cheapest organic green tea on the market. Yet the quality is high, and it has a lot of potential if wider marketing links are established. It is refreshing, too, to find a quality tea sold domestically when so much of the high-quality leaf of India is produced for export markets. The MegTea unit also processes tea leaves for a few of the other local small tea growers.

But for most of the small organic tea growers, however, manufacture remains an obstacle. Guwahati doesn't have separate channels for organic products, and even in Calcutta, most organic produce doesn't come via the auction channels through which small tea growers sell their leaves.

Establishing manufacturing and marketing links for small tea growers who live in such remote areas such as the Meghalaya farmers would be an excellent opportunity for the Tea Board of India, but as of yet such support seems to be lacking.

³ http://tcdc2.undp.org/GSSDAcademy/SIE/Docs/Vol4/Nadeb_method.pdf

The farmers are also trying various routes to get a micro-processing factory for their organic green leaf.

"Once we can get [the organic small tea growers] set up with a factory, and they have their own processing unit, the whole thing will change," says Suiam.

"Our tea is as good as Darjeeling's. We will struggle initially, but the moment we have good market avenues..." he claps his hands. Done.

"We want to declare Meghalaya an organic state like Sikkim," the horticulture officer finishes. "By 2020 it should be an organic state. It's the only way we can survive now, because we are fed up with all these chemicals."

Despite the backing of the Department of Agriculture, seventy-four applications for registration have been made to the Tea Board in the last two years, with no results. The farmers are also trying various routes to get a micro-processing factory for their organic green leaf.

"We approached Calcutta two years back for a factory," says Ketrick Chyne, Secretary of the Ri-Bhoi Tea Growers Association and of the Meghalaya Small Tea Growers' Association. Chyne has his own organic tea garden, and is a vociferous proponent of the practice. "But nothing has happened. So you get fed up." They have now applied to the State Government for the funds to set up a micro processing unit for the small growers and are awaiting the response.

In the meantime there have been small advances: a stall of Meghalaya tea at a recent organic expo in Bangalore received critical acclaim, and they have recently received enquiries about purchasing their tea from Chennai and Bangalore.



WORKERS AT WKUR BWANG BIANG'S PLANTATION.



KETRICK CHYNE, HEAD OF THE SMALL TEA GROWERS ASSOCIATION OF MEGHALAYA.
© SUDHANSHU MALHOTRA / GREENPEACE



NAME
**WKUR BAHWANG
BIANG**

.....

AREA
**UMRAN, NIANGBYRNAI,
MEGHALAYA**

SIZE OF PLANTATION
**6.25 Acres of tea and
1.75 Acres of tree cover
maintained**

ANNUAL PRODUCTION
6000 Kgs of green leaf

YIELD
550 Kg/ Ha

AVERAGE YIELDS IN THE REGION
500-600 Kg/ Ha



**LOCAL PEST CONTROL
AND GROWTH PROMOTION
METHODS:**

.....

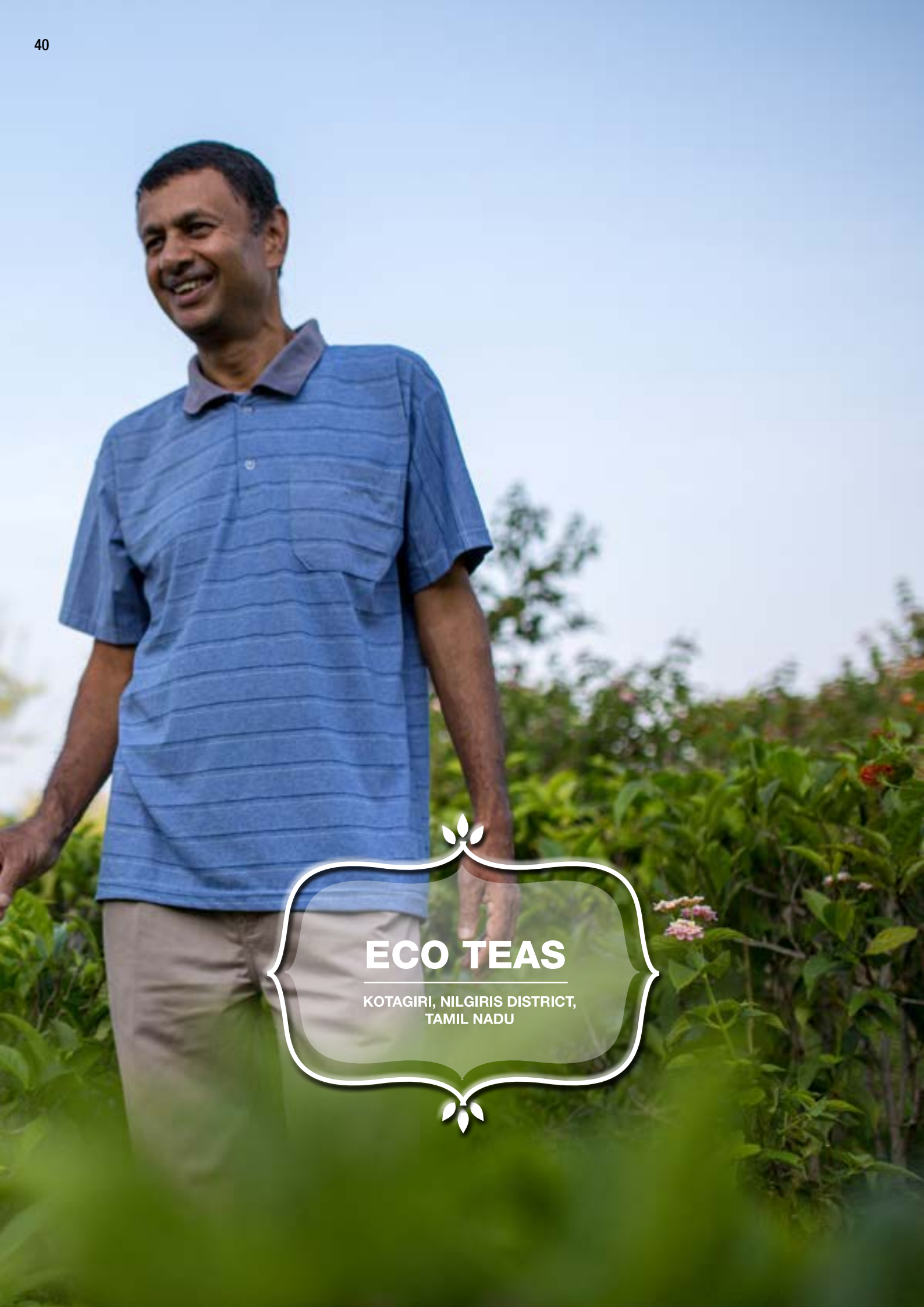
Fungicidal action and growth promoter:
nettle leaves crushed and mixed with
cow urine, and sprayed.

General pest control: Lantana camara
mixed with cow urine is sprayed as a
general pest deterrent, as are neem
and even cannabis leaves occasionally
which grow freely in the wild. Called
Sohpangkhlieh in Khasi, the lantana is
also mixed with jaggery, water and kept
for a week before spraying, again as a
general pest deterrent.

Border crops: Green manure crops and
marigolds are grown as border crops;
the latter has been reported to attract
thrips, so deterring them from the tea
bush.

Bamboo vinegar (pyroligneous acid), by
burning bamboo in reduced oxygen (in
a hole in the ground) and condensing
the smoke. It's applied for soil
improvement, pest control and growth
promotion.

Nadep Compost



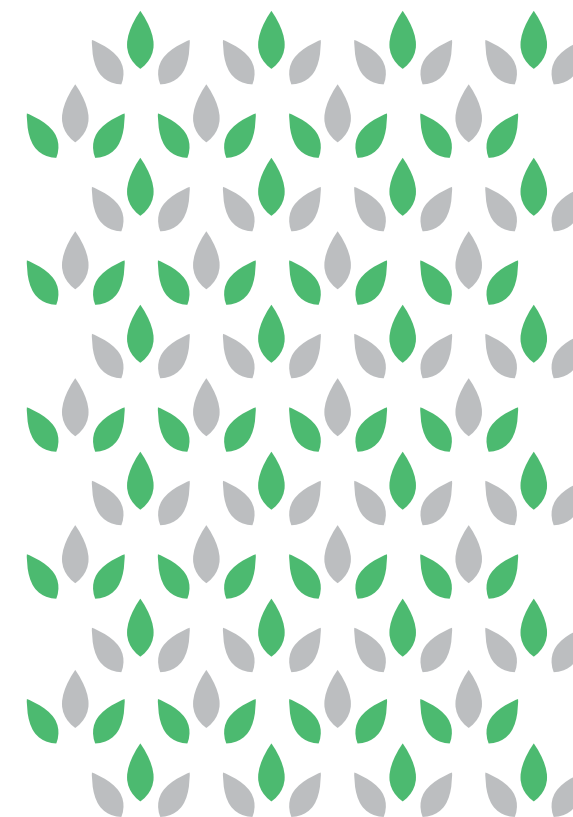
ECO TEAS

KOTAGIRI, NILGIRIS DISTRICT,
TAMIL NADU

ECO TEAS

KOTAGIRI, NILGIRIS DISTRICT,
TAMIL NADU

Ramesh Babu decided to pursue ecological farming as he believed that is the conventional farming unlike chemical intensive models. Growing tea in a well balanced ecosystem and an approach that focuses on soil health and bio-pesticides has ensured that his yield of tea is higher than the average of the area. As one of the first certified organic tea grower of the region, he is an advocate of a contiguous area based approach as that is the best way to build resilience in the system and in that context support systems for tea growers from the Government is a necessity



How long does a tradition stay in the collective memory, before a modern method overtakes it and establishes itself as the 'correct' way to do things?

When Ramesh Babu first announced he was going to farm tea organically on his ten acres in the Nilgiri hills, people said he was crazy. Even his own wife thought he was mad. The Irula workers on his plantation, one of the tribes native to the Nilgiri hills, came up to him to tell him he was farming his tea in the wrong way, and offered to show him the right way: by applying the pesticides and fertilizers that had come into fashion in the 1970s.

"This entire area is filled with pesticides," says Ramesh, sweeping his hand out towards the jewel-colored undulations of the Nilgiri hills. "I won't call that type of farming the 'conventional' methods, because to me, conventional means what my great-grandfather was doing. Chemicals and pesticides are not conventional. For me, conventional means organic. Pesticides and other chemicals: inorganic."

Ramesh Babu's estate currently produces around 6,000kg of green leaf per hectare. Quite an accomplishment considering that the average in the region has dropped to 3500kg of green leaf.

For the last seven years, Ramesh has been on a one-man mission to set up an organic tea processing factory on his land so that he can encourage and bring together more organic small growers in the region. Despite the famed biodiversity of the Nilgiris (the nil in the name is thought to refer to the delicate blue of the kurinji flowers that blossom in the hills just once every twelve years), there is very little by way of organic tea growing in the region. In terms of small tea growers with a deliberate organic approach, there are next to none.

"There are different levels of chemical usage in the Nilgiris tea industry, and generally the smaller the plantation the less chemicals they are using," explains Ramesh. "By default, yes some of them are organic. And there are people who cannot afford fertilizers."

One major disappointment that this fourth generation tea grower holds is the fact that his carefully grown tea goes into the supply chain mixed with chemical pesticide laced tea leaves. In the Nilgiris, there is no avenue available to process the tea as a higher-quality, higher-value product. All bought leaf factories have a single tier system of processing, with no segregation for organic leaf, and the majority of tea grown by small farmers in this famous region of the south is now produced by the cut, tear and curl (CTC) method. This fetches a lower price than orthodox tea, and so it becomes important for the farmers to force as high yields as possible from their land.

"Earlier Nilgiris was second only to Darjeeling tea, for the flavor," he says. "But the nature of CTC production was like computer language: garbage in, garbage out. Orthodox tea production means good quality tea. CTC means systemize it – just put anything in there. It's become a big issue. People are using mechanized plucking and cutting the tea much lower than they normally should. So you get bad quality, but they are also losing yield: under the misconception that as you pluck the leaves faster and also lower, the faster the young shoots come which is not the case."

Ramesh has been producing a little orthodox tea with 5-10 per cent of his crop, picking the top leaves and bud carefully and processing it in his own small organic rollers that he made himself. This tea sells at a good price – for 300 rupees per twenty grams of made tea to an organic store in Chennai and some international buyers – and signals potential for the marketing of high quality Nilgiris tea.

From a background of environmental activism, Ramesh is driven by his concern of what's 'good for mother earth'. The ten acres of land that he purchased for his organic experiment, in the Kotagiri hills, is a beautiful and wild-looking estate edged with forest on two sides and run through by an underground stream.

With no pesticide or fertilizer inputs, the natural systems of balance have been reestablished, and the soil is rich and occurrences of pests are currently at its lowest.



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He has developed his own brand of natural farming that even Fukuoka would be proud of. He's also so far not built any fencing, to allow free movement of the bison, elephants and leopards that inhabit the hills. "The land belongs to the wildlife," he says, pointing out a herd of hulking bison moving through the misty distance. "I am just its custodian." Jackfruit, mango, silk, cotton, guava and jamun trees stud the sloping fields, left alone by workers under Ramesh's strict instruction. Coffee plants trail thick strings of ripening red beans amidst the *Camellia sinensis*. Lantana too has made its home on the slopes, controlled by slash weeding, it is used to add to the layer of mulch. "The result of that is that today I can happily look out and it is all irrigated," says Ramesh with pleasure. "Partly rain fed, the layer of mulch too has played a key role in retaining water throughout the year."

Ramesh Babu's estate currently produces around 6,000kg of green leaf per hectare. Quite an accomplishment considering that the average in the region has dropped to 3500kg of green leaf. With no pesticide or fertilizer inputs, the natural systems of balance have been reestablished, and the soil is rich and occurrences of pests are currently at its lowest.

The tea mosquito and other common pests visit occasionally, but the biggest problem is red spider mite, and that usually arrives in the dry spells, by which time most of the tea has been harvested anyway. Ramesh mostly uses azotobacter and azospirillum for nitrogen fixation and improving soil fertility. Panchagavya, a formulation of cow dung, milk, cow urine, curd, ghee (clarified butter), and dashagavya, a formulation which adds sugarcane juice, banana paste and toddy or grape juice to the panchagavya formulation, are used for general soil health improvement too and these have been proven to be quite effective and are also available off the shelf at many bio-fertilizer stores. He has also been well supported at one time or the other by both the Tea Board and the Tamil Nadu government. "The Tamil Nadu government has a small programme of organic cultivation," Ramesh says.

Through an NGO called Earth Trust, which is associated with the Biodynamic Association of India, the Government also had given the estate BD preparations 501– 507 (preparation details included in the annexure).

“To the best of our knowledge we are S. India’s first small tea growers who are certified organic and are actually producing tea.” Ramesh chose to go with a certification from the Organic Farming association of India, based in Goa, as the foreign certification agencies he found prohibitively expensive.

The purpose of Ramesh’s factory is entirely about collectivization. Once the unit is operational, he hopes to be able to offer his neighbors an irresistible incentive to go organic and slowly change the markets of the Nilgiris to a hub of top-quality, organic tea leaf. “But who becomes organic depends on their mindset.” For a start, he hopes to persuade his neighboring tea estate, who has a bought leaf factory and has an enlightened approach. He ultimately wants to go organic.

The effect of a group of neighbors going organic can be greater than the sum of its parts, as the larger the area in which a natural system is able to re-establish itself, the more resilient that system will be. This contiguous area based approach is much more viable in eco system development and in building pest resilience among crops and mitigation of pest attacks. The risk of run-off from an estate using fertilizer and pesticides to an organic estate next door will also be reduced.

Ramesh’s factory is almost complete. He’s built a long brick construction, with a combination of machines made locally and purchased from afar. The withering trough he commissioned in the neighborhood, and has hand-rollers made of wood and metal, sourcing the metal parts from local craftsmen. Finding out what exactly a tea factory required was a degree of trial-and-error: other factories in the area refused to let him see their machinery, although eventually one farmer let him in.

The effect of a group of neighbors going organic can be greater than the sum of its parts, as the larger the area in which a natural system is able to re-establish itself, the more resilient that system will be. This contiguous area based approach is much more viable in eco system development.



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“I need to prove that small tea processing is economically viable, and also that organic tea processing – even on the small scale – is viable.”

Once the unit is operational, he will begin to involve the Tea Board of India beyond the organic and biodynamic preparations they contribute to his farm. “At first they didn’t understand,” Ramesh says of his process to establish the factory. “It took me four years to get permission for this unit - and without their permission it would have been pointless. Even after that we had to go to the bank to raise the money!” Rather than investor funds, Ramesh chose to build his factory using an ordinary bank loan of Rs. 25 lakhs in proof that his model is feasible. “I need to prove that small tea processing is economically viable, and also that organic tea processing – even on the small scale – is viable.”

“One way or another, everything got delayed,” says Ramesh, laughing. “But now we are on track. By the grace of God, in another two months the factory will be through, after that I have no work over there and I can be here. The time that will be required for our daily processing will be only two hours.

“We’ll take only two leaves or three leaves and a bud. It’s a question of the tenderness. This area is warm, and the growth is fast, so we can do ten day to 14-day plucking rounds. None of the type of leaf that goes into CTC machines. It’s going to be good tea.”



NAME ECO TEAS

AREA
KOTAGIRI, NILGIRIS DISTRICT

SIZE OF PLANTATION
10 Acres

ANNUAL PRODUCTION
6000 Kgs

YIELD
1500Kg/ Ha of made tea

AVERAGE YIELDS IN THE REGION
800 Kg/ Ha



LOCAL PEST CONTROL AND GROWTH PROMOTION METHODS:

Improving the root and general health of plant and soil: Biodynamic preparations BD500 and BD501 and panchagavya and dashagavya formulations.

Pest control: Biodynamic preparations BD502-507- preparations from medicinal herbs, including nettle, yarrow and chamomile; cow urine and neem formulations.

Nitrogen fixation: Azatobactor and Azospirillum.

There is strong evidence of the willingness of growers to move away from the pesticide treadmill towards ecological approaches and create a healthier ecosystem that is more resilient to pest attacks and climate change.



CONCLUSION

There is a wealth of knowledge on alternative practices for pest control as well as improving soil health and biodiversity with some tea growers that need to be compiled and made accessible.

The documented case studies by Greenpeace are a very small sub-set of tea growers in India both large and small who are practicing ecological farming.

But it is strong evidence of the willingness of growers to move away from the pesticide treadmill towards ecological approaches and create a healthier ecosystem that is more resilient to pest attacks and climate change.

The quest for alternative models of tea cultivation took us to the states of Assam, West Bengal and Tamil Nadu where it is more than evident that ecological farming in tea is not only possible but it is also an economically viable option. One of the main reasons for success is that there is no single way of eliminating the system from chemicals but there is a diversity of methods and one needs to assess the best after examining the health of their tea garden and the surrounding environment. There is a wealth of knowledge on alternative practices for pest control as well as improving soil health and biodiversity with some tea growers that need to be compiled and made accessible.

The small tea gardens documented by Greenpeace whether it is Ramesh Babu in Nilgiris district, Tamil Nadu, Tenzing Bodosa in Udalgiri district in Assam and Suia in Meghalya have applied rich traditional knowledge to move out of the pesticide treadmill. The basis of many of their formulations is inexpensive and easily available, they have also applied techniques to improve soil health or have realised that this effort has reduced pest incidences.

While they have also earned rich dividends because of their determination to practice tea cultivation using the approaches of ecological farming, these case studies also reveal major gaps in policy and support for small tea growers in the form of infrastructure, knowledge transfer and marketing channels that make them dependent on chemicals.

The main components of ecological farming should be improving soil health and plant physiology, understanding pest behaviour and pest cycles and improving and using biodiversity in tea cultivation.

The two case studies documented on larger plantation of Makaibari in Darjeeling and the Bamandanga in Jalpaiguri put a very strong case for elimination of chemicals in larger tea plantations and gradual movement towards an approach of ecological farming. While Makaibari boasts of its rich biodiversity and a healthy ecosystem that has given the world one of the finest teas, Bamandanga is the story of the revival of an estate using ecological practices.

While Greenpeace only documented a handful of studies, it is a clear indication that a holistic, integrated, ecosystem approach is the right direction for the tea sector in India and needs to be replicated in smaller and larger plantations.

This cannot be limited to a single approach but a diversity of approaches based on the principles of ecological farming and this shift cannot be overnight as practiced in certified organic tea cultivation. The main components of this should be: improving soil health and plant physiology, understanding pest behaviour and pest cycles and improving and using biodiversity in tea cultivation.



In order to support this move of the tea sector towards an ecosystem based approach, GREENPEACE CALLS ON THE GOVERNMENT OF INDIA TO URGENTLY TAKE THE FOLLOWING STEPS:

-
- > The Tea Board of India along with the Ministry of Commerce and Industry needs to draft a policy that facilitates and encourages the movement of the tea sector away from the pesticide treadmill towards Non Pesticide Management, as a first step towards ecological farming. This policy should also be inclusive and be evolved due to participation of all stakeholders.
 - > There should be a substantial amount of funding in research that should be shifted towards ecological approaches like Non Pesticide Management and a knowledge base created that can be easily accessed by all tea growers.
 - > A road-map should be created for small tea growers to move away from chemicals towards ecological farming. This road-map should include the building of support systems like creation of grass root institutions (self help groups and co-operatives) which will act as the conduit of two way knowledge transfer (between research institutions and farmers), co-evolution of ecological technologies and provide a base for integration with marketing channels. The first concrete step to this road-map would be pilots in different tea growing districts.
 - > The Government should provide support to the tea companies and big tea estates to create a road-map to phase out pesticides. Again the first concrete step to this road-map would be pilots along with stakeholders in their supply chain.



Greenpeace is a global organisation that uses non-violent direct action to tackle the most crucial threats to our planet's biodiversity and environment. Greenpeace is a non-profit organisation, present in 40 countries across Europe, The Americas, Asia and the Pacific.

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