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Located within the Eastern Himalaya biodiversity hotspot, Darjeeling Himalaya has immense biodiversity and cultural values. A variety of ecosystems has provided and nurtured people, flora and fauna for years. Water that flows as springs, streams and rivers from the mountains has been the lifeline for mountain communities and those living far beyond. The forests provide food, firewood, fodder, medicinal plants, timber and other produce while safeguarding communities also from disaster risks. Traditional agricultural systems have also sustained mountain communities with nutrition enriched food, with a diverse heritage of indigenous food culture. On the other hand, the aesthetic value of the Darjeeling Himalaya has drawn millions of visitors to regale in the beauty of the landscape.

This biodiversity rich landscape is fast changing. Infrastructural investment such as roads, hydropower, tourism projects, etc. have increased over the years resulting in land use change across the landscape. This has led to loss of forest cover and biodiversity, increased disaster risk and impacted water flows. Changes in farming practices with more focus on converting land to monocultures of cash crop production has also been detrimental to mountain ecosystems.

Rapid urbanisation has also accelerated land use change, and it also puts tremendous pressure on natural resources, impacting overall well being of people. Rising tourist footfalls add further pressure to the fragile mountain ecosystem with the need for infrastructure development, increased vehicles, and challenges of waste disposal. Changes in production and consumption systems have pushed people into adopting a throwaway culture, which is leading to over exploitation of resources on one hand and creating a huge challenge of waste on the other.

Understanding on the biodiversity values of the landscape and acknowledgement about the region's ecological fragility in policy and practise is very much needed.

ABOUT PROJECT SERVE

Project SERVE has been committed to conserving the natural and cultural heritage of the Darjeeling Hills for the last 25 years. Since 1996, the project has been spearheaded by WWF India in the landscape and has been working on restoring degraded areas, species and habitat conservation, building community stewardship, as well as educating young minds.

REFORESTATION has been one of the main objectives of the project since its initiation in 1996. Around 500 hectares of land have been covered since 1996, with a total of 3 million indigenous saplings planted and nurtured across the Darjeeling region.





OVERVIEW OF PROJECT SERVE'S REFORESTATION INITIATIVE



TOTAL AREA COVERED 510 Hectares



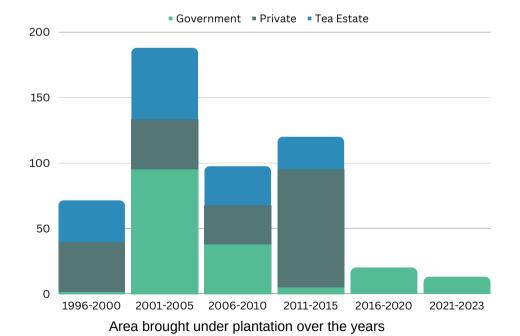
NO. of SAPLINGS 30,00,000+

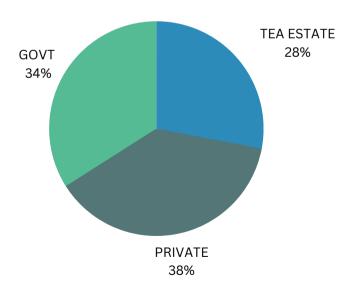


PARTNERS
Tea Estates
Forest Department
Community Based organisations

Project SERVE has been implemented by WWF India to restore degraded areas in the Darjeeling Himalaya since 1996. This massive reforestation activity has been conducted in collaboration with tea estates, community based organisations and the Forest Department depending on the area of intervention. This initiative has provided employment and income generation opportunities to local communities through nurseries that were set up as well as directly through the plantation activity, and its maintenance. In many instances, communities have also provided voluntary support for the plantation.

Nurseries were established that raised the sapling requirements for the plantation initiative. Local indigenous species are raised by the nurseries which are selected according to their altitudinal suitability and availability. Post planting, Project SERVE supports every plantation site for 3 consecutive years for maintenance and weeding to ensure maximum survival of the saplings.





Land ownership of areas brought under plantation

PROJECT SERVE NURSERIES

Project SERVE has been supporting community members on nursery management for raising the saplings that are required for reforestation. Technical inputs, support for setting up along with training on nursery management are provided to community members. Currently two main nurseries are being supported under the project.

in Chatakpur Village, Lochan Rai, a 43-year-old farmer along with his wife, Kalpana has been raising saplings for the plantation work of Project SERVE since 2001. The other nursery is maintained by Sumi Sherpa in Paschim Village on the fringes of Senchal Wildlife Sanctuary. Sumi is a single mother, who took over the nursery management after her husband passed away. They have been trained in sapling raising - from collecting good seeds from the forest areas, raising the seedlings till maturity for their ultimate transfer to the final plantation site. It is a labour intensive work, and all preparation has to be done in a timely manner. There are further challenges of pests, diseases, and even wildlife depredation.

Annually the nurseries supply between thirty to forty thousand tree saplings to Project SERVE, and also to other NGOs, schools, forest department and tea estates making the nurseries a viable income generation activity. Lochan is also a master trainer, and the nurseries are also used for providing training on nursery management to many others who are interested in taking this forward.







KEY PLANTATION SITES



TOTAL AREA COVERED 225.9 Hectares



NO. of SAPLINGS 130450+

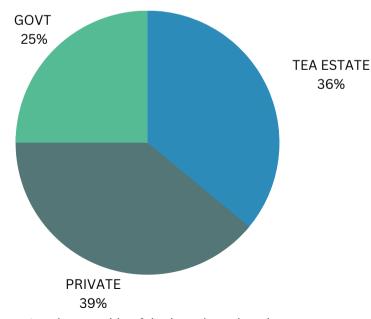


PARTNERS
Tea Estates
Forest Department
Community Based organisations
Educational Institutions
Cantonment Boards

This report covers details from 10 key areas that have been reforested under Project SERVE spanning across the past 25 years. These cover areas that are under Government, private and tea estates so as to have representation of the entire area that have been covered.

These 10 key areas constitute 51 % (260.9 ha) of the total area covered under plantation till date. The report features success stories, experiences and impacts shared by Project SERVE collaborators and team members from the following key sites -

- 1. Mineral Spring (Harsing Dabaipani)
- 2. Goethals
- 3. Gorabari
- 4. Badamtam Tea Estate
- 5. Margaret's Hope Tea Estate
- 6. Chatakpur Forest
- 7. Phoobsering Tea Estate
- 8. Lanku Valley
- 9. Singell Tea Estate
- 10. Lebong Cantonment



Land ownership of the key plantation sites





The plantation at Mineral Springs (Dabai Pani) was one of the first interventions of Project SERVE undertaken in 1996 in collaboration with the Mineral Spring Sanjukta Vikas Sanstha (MSSVS) and DLR Prerna. MSSVS is a small farmer collective that is certified organic and also growing polyculture tea. The members of the MSSVS contributed partial costs of food and labour for the plantation, and also maintained the plantation for three years to ensure its success.

The plantation was done in Lower Harsing on private lands covering an area of 5 hectares on a patch where a new road was being built. It is now famously known as S-Golai or bend (where the road bends like the letter S).

Sailesh Sharma, former employee of Project SERVE and advisor to MSSVS, reminisces about what the area looked like in the past. "The S-Golai was a dry and hot stretch of road. There used to be very few vehicles back then and hiking during the summers along these roads was exhausting. That is why we chose this site for the plantation."

The S-Golai now meanders under the thick canopy of forest cover providing shelter to migratory birds and home to many other animals. The plantation is now a thriving forest filled with different tree species. Spring discharge of Harsing below the plantation area has also improved.

Mineral Springs plantation case study showcases the ownership taken by community members. Sailesh adds "The partnership with MSSVS was crucial to the success of the plantation as they took care of the plantation. There are no major threats to the plantation although it is on private land. Some fodder and fuelwood are collected from the plantation area, but large scale tree felling is not allowed."





AREA COVERED 5 Hectares



LOCATION N 26°54'00.57" E 088°17'09.62"



ELEVATION 1595 m



LAND TYPE
Private



NO. of SAPLINGS 25000+



SIGNIFICANCE
Contiguity with Senchel WLS
Important watershed

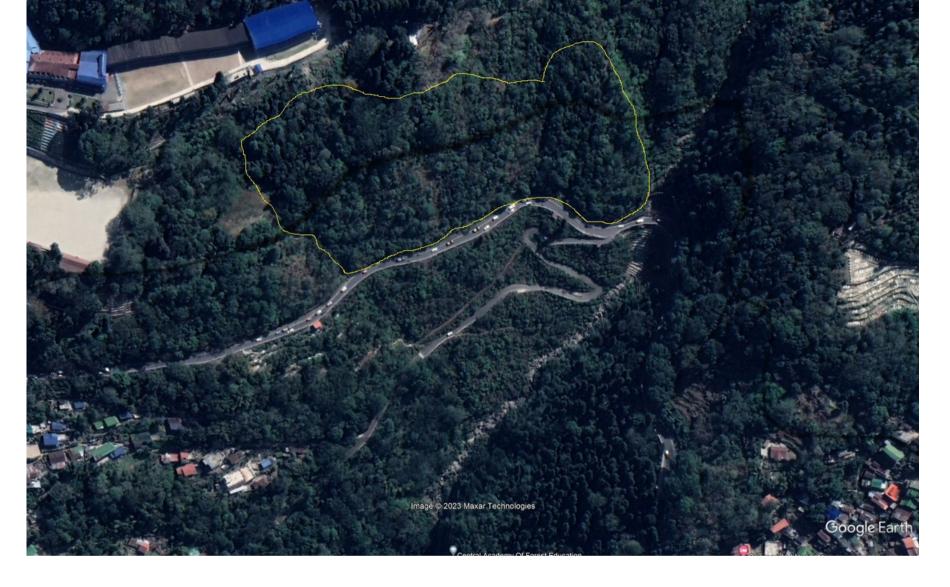


PARTNER
Goethals School
Community members



KEY IMPACTS
Soil erosion control
Green cover increase





The Goethals plantation site spreads across 5 hectares and was initiated by Project SERVE in 1996. The area lies above the National Highway 55 around 5 kms before. the town of Kurseong. This plantation drive was conducted in collaboration with the Goethals Memorial School with involvement of the community around the school.

The school provided the area for plantation from within their land. The 5 hectares is cordoned off now and is a thriving piece of forest maintained by the school.







The Gorabari plantation site that spreads across 53 hectares, is one of the largest area that was covered by Project SERVE over a number of years. The area lies on both sides of the National Highway 55 that links Darjeeling to Siliguri. A big chunk of the steep terrain was under the Forest Department (the western fringe of the Senchal Wildlife Sanctuary) and certain parts were privately owned. To over see the reforestation activity, Project SERVE set up the Gorabari Block Forest Committee constituting of community members from around the plantation area. This committee played the most important role of mobilising people as well as in monitoring and maintenance throughout the years.

The degraded area that was highly exposed to soil erosion in the past, is now a thriving forest that provides good cover reducing run off, and the threat of landslides. The entire plantation area with multiple steep ravines is a water catchment, with drainage lines emerging into streams below the site.

Mani Kumar Lama who had led the Gorabari Block Forest Committee in 2009 to undertake the plantation. recounts how the area was steep and prone to landslide before the plantation, and even planting the saplings on the slope was a challenging task. in 2016, the trees that had grown bigger acted as barricade and prevented a car from the President's convoy from falling into the deep gorge. After that incident, Mani Kumar Lama was interviewed by several media agencies and the plantation work done by them came into the limelight, receiving praise from all quarters.

In the recent past, certain section of this plantation is under threat from waste disposal from the adjoining settlements of Sonada and Gorabari. Untreated mixed waste is being rolled down the hill which is leading to land degradation and also a challenge for the wildlife, which are seen foraging on the waste heaps. Some area adjacent to the highway are also affected due to the rapid expansion of settlements and roads.





AREA COVERED
17 Hectares





ELEVATION 1203 m



LAND TYPE
Tea Estate



NO. of SAPLINGS 85,000+



SIGNIFICANCE
Pangolin habitat
Organic tea estate



PARTNER
Singell Tea Estate
Community members



KEY IMPACT
Spring rejuvenation
Pangolin habitat
conservation



The plantation at Singell was conducted from 1996 onwards in collaboration with the Singell Tea Estate, and over the years 17 hectares was brought under forest cover. The plantation conducted under Project SERVE added to the total forest area of the estate, which is important for their organic certification. With the reforestation initiative, currently 20 percent of the total land under the tea estate is forested.

Mr. Yogesh Yonzon, manager of the Singell Tea Estate who has been engaged in the plantation initiative, mentioned about the importance of forests in the tea landscape, and also how the reforestation has improved the discharge from springs located downstream. Wild animal sightings in the forested area were reported to have increased. Singell is also located in the pangolin belt, and Project SERVE interventions have also worked towards awareness generation on this endangered species, with the rescue and release of two pangolins facilitated by the manager.

A big portion of the valley is now seen covered by the lush green plantation forest adjacent to the estate. The organic status of the estate is also a good incentive for the garden to conserve and maintain the forest area. Mr. Yogesh says "Our collaboration with Project Serve WWF has been very fruitful. They have innovative approaches and we look forward to future collaborations with them."







AREA COVERED **45** Hectares



LOCATION N 26°56'45.98" E 88°17'11.59"



ELEVATION 1789 m



LAND TYPE Private & Government land



NO. of SAPLINGS 224,500+



SIGNIFICANCE Contiguity with Senchel WLS Key wildlife habitat



PARTNER Forest Department Prakriti Sangh Community Members



KEY IMPACT Spring rejuvenation **Habitat improvement**



The Chatakpur plantation was initiated in 1996 through collaboration with the Forest Department and community members. The Prakriti Sangh was initially one of the main partners. The plantation was done on forest land covering an area of 7.5 hectares while the rest was on private lands. Before the plantation the area was open land in which Broomstick was cultivated. The plantation is now a thriving mixed forest of different species like Maya, Champ, Kafal, Chandan and Uttis. The plantation forest is now frequented by wild boar, leopard, deer and a variety of birds.

Springs have been rejuvenated in the area because of the plantation, providing water even during the dry season of march to around 60 households. During the survey, Sancha Bahadur Rai, a member of the community, showed us footprints of a deer and leopard near a watering hole, as well as scratches on a tree of a wild boar. Sancha Bahadur took us to a ridge inside the plantation which was a hotspot for birding.

The Chatakpur plantation is not threatened at present. The forests are in good health and visible signs of tree felling, and grazing were minimal.







Badamtam Tea Estate is among the older tea estates of Darjeeling and its partnership with Project SERVE goes back to 2000 with a collaboration initiated by the Badamtam Sai Samitee mainly for conservation of their spring.

Reminiscing about the condition of the forests, MB Rai who was then the convenor of the Samitee mentions that large scale tree felling took place during the period of the Gorkhaland agitation. As the forests disappeared, so did water in the springs leading to a major water shortage in the village, as well as the tea factory. This alarming situation prompted the villagers to look for solutions, and the partnership with Project SERVE under the able guidance of Harish Mukhia began.



The reforestation work at Badamtam covering a total of 38 hectares was soon initiated which continued until 2010. The catchment of the main spring that provided water to Badamtam was brought under forest cover with the objective of rejuvenating the spring. Volunteers of the Badamtam Sai Samitee engaged themselves in the plantation work, while the tea management provided support for transporting the saplings that were provided Project SERVE nurseries. The Sai Samitee ensured the survival of the saplings by preventing any grazing in the plantation area and very close monitoring.

The impact of this reforestation effort is now clearly evident. The spring water source has rejuvenated and flows even during the lean winter season providing water to the village below. The whole of Badamtam would have faced water scarcity if the plantation had not been conducted. The plantation area is dense and in good health, and also provides fuelwood and fodder for the locals.





The reforestation initiative at Margaret's Hope is truly a story of hope. The plantation was done as part of a larger intervention that was led by the Panchayats and with the support of the Navachetna Youth club of the area for reviving a wetland, which was home to the Himalayan salamander. The salamander, a living fossil is an endangered species of the Darjeeling region, and one of the best habitats was in the marshy areas of the Margaret's Hope Tea Estate. The wetland area had over the years, been filled up due to a landslide.

In 2001, the community members under the leadership of the Panchayat, Jagat Syangbo and Satyam Tamang came up with the plan of reviving the wetland area by removing the reeds that had filled it up. A massive campaign was initiated which had the involvement of all the community members. This initiative was supported by WWF India and the tea estate management to some exent.

The reforestation work at Margaret' Hope covered around 25 hectares of the area surrounding the wetland spanning over 5 years. Currently it is one of the best conserved salamander habitat in the region.







Phoobsering tea estate that lies towards the northern part of Darjeeling town was a key site for Project SERVE's reforestation initiative between 2011-13. The main partner here to spearhead the work in the field was the Sunakhari Self Help Group, formed by mostly retired tea estate workers. Concerned about the degradation of the forest around them, members of the Sunakhari SHG, approached WWF India for providing support, which led to the forging of a strong partnership.

Ranjeet Gurung, Lakhbahadur Chettri and Krishna Kumar Thakuri the most active members of the group are all in their 70s now, and excited to talk about the work they had done. Their satisfaction and happiness at the success of the intervention shows in their expression when they say -

"People look up to us for the plantation work we have done. Some feel amazed that a retired group of men could accomplish such a feat. It was a really proud moment for us when visitors came to see our work. Our names are now etched in people's memories."

The forest is now home to many wild animals and birds. The spring discharge has also increased over the years as observed by the community members. With most people switching to LPG cylinders and a decline in cattle rearing, the plantation does not have any major threats.

Besides being engaged in reforestation activities, the Sunakhari group members also were actively involved in bee keeping and bio-briquette initiative. As the members have grown older, their engagement has reduced but they take solace and pride in their accomplishments with the hope that the next generation will tread on their footsteps.







Lanku Valley is located in the Sittong belt of Kurseong block. The entire belt over the years, has turned into a popular tourist destination for birding especially know for hornbill sighting. The reforestation initiative in this area was therefore conducted primarily for hornbill conservation in collaboration with the Lanku Valley Biodiversity Conservation Committee.

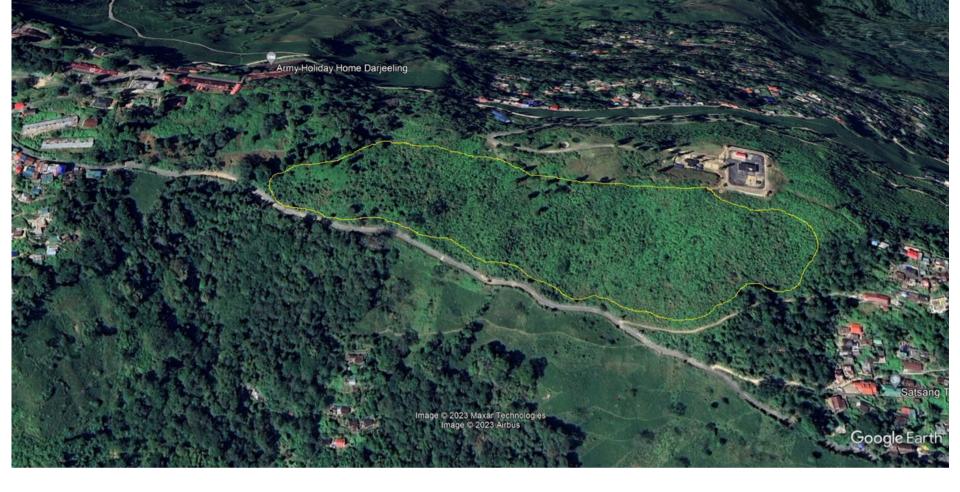
Bishnu Thapa, a local school teacher who is also a trained bird guide under WWF India's education programme led the plantation initiative in Lanku Valley. The area for plantation was mostly under private holding in fields that had been left fallow due to crop depredation by wild animals. Mainly fruit bearing species were selected for the plantation initiative.

As part of the initiative, training on bird watching have also been conducted by WWF India for the community members. 74 species of birds have been identified by the birders in the village who want to promote the village as a birding destination. Mr Deokumar Mangar, said that, "The plantation drive has improved bird sightings. I spotted a hornbill that has never been sighted in the area before.

The committee has been active in environmental awareness and plantation drives with schools and community. Besides plantation, springshed conservation measures were also conducted to rejuvenate springs, which are being monitored by the community members. The discharge of the springs have improved over the years.







The Lebong Cantonment is a large area that is located below the Darjeeling town at a distance of around 8 Kms. This is where the Project SERVE's reforestation has been focussing on in the recent years. The area comes under the jurisdiction of the Indian Army. The initial collaboration was facilitated by WWF India after the land was identified for plantation by the Sunakhari Self Help Group of Phoobsering Tea Estate.

With an agreement with the Lebong Cantonment Board to restore the degraded patches in their area, work began in full swing in 2015. The members of Sunakhari SHG mobilised community members to cover around 5 hectares of land initially. Later the plantation was done by community members from the same area.

Around 190,000 saplings were planted in the area between 2015 to 2022 to cover around 38 hectares. Discharge measurement of springs in the vicinity are also being captured regularly for better understanding of impacts in the future. This collaboration with the Lebong Cantonment has been a very fruitful one and an ongoing collaboration to plan for the future.



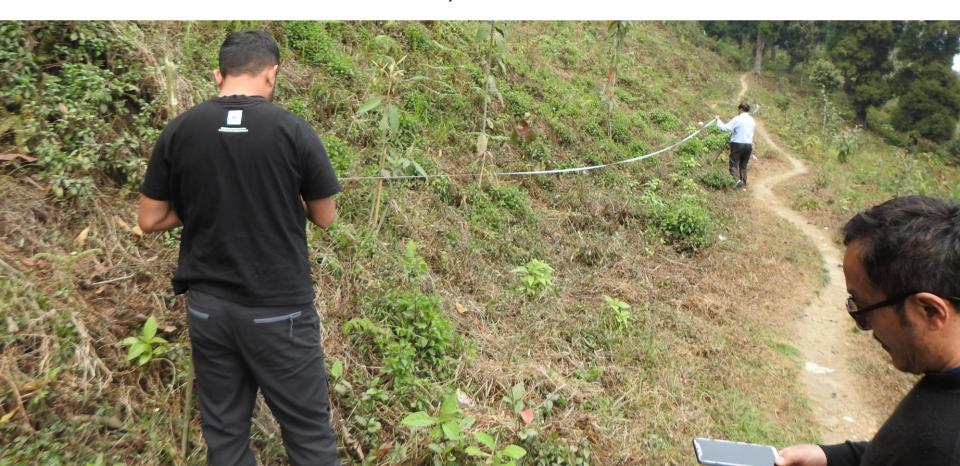
PLANTATION SURVIVAL RATE STUDY

Understanding the survival rate of the plantations is essential to take stock of the impact, and to plan for future action for supplementing the lost saplings. These survival studies have been conducted at regular intervals following set methodology. The Lebong plantation survival rate study was conducted in March 2023, which is presented in this section.

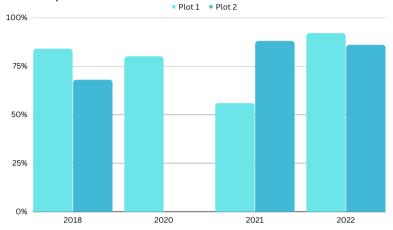
The survival study is done in 10 by 10 m plots that are selected randomly within the plantation area. Two plots are identified for each year's plantation based on accessibility. One plot identified is closer to roads and human settlements, and the other plot taken was relatively less accessible. For 2020 plantation, only one plot could be studied.

The survival count is done species wise and the total number is tallied with the number that was initially planted in 10 by 10 plots. The baseline for each plot was kept at 25 saplings per 10x10 m plots for areas where saplings were planted 1 meter apart, to 36 saplings where saplings were planted closer.

Survival criteria was based on new shoots, green leaves, and flexibility of the main stem of the standing saplings. The height of the saplings was also measured to eliminate the count of naturally regenerated saplings. Only saplings falling within the height range of the plots were considered in the survival study.



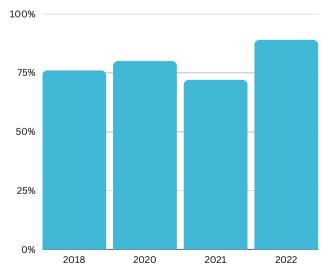
The study has shown that the plantation at Lebong has a maximum survival rate of 92 percent (2022, plot 1) and minimum survival rate was 56 percent(2021, plot 1). There were no differences in plots that were easily accessible and the plots that were deeper inside the plantation area. This meant the average survival rate for Lebong plantation is 82 percent.



Plot wise survival rate for Lebong plantation

Survival Rate of saplings at Lebong

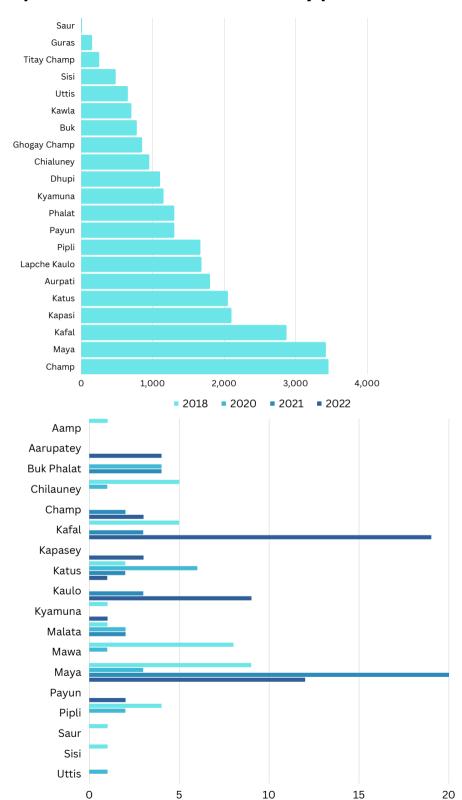
The combined survival rate for each year's plantation from the two different plots is captured in the graph below.



Year wise survival rate for Lebong plantation



Species distribution in survival study plots



These graphs show the total number of species planted over the years in Lebong area vs the occurrence of these different species in the survey plots recorded for every year by numbers. Disaggregated data per plot is not recorded, and only a broader understanding of species wise survival could be inferred at this stage.

Annexure 1 - Total plantation sites of Project SERVE

	NAME OF SITE	TOTAL AREA	YEAR
1	Aloo Bari	2	2007
2	Avon	1.5	2007
3	Badamtam	38	2000-2010
4	Bungkulung	5	2007
5	Chatakpur	50	1996-2015
6	Dhajey	4	2003
7	Dhoteray	5	2000
8	Ghoom-Bhanjyang	10	2003
9	Ghumti	2	1996
10	Goethals	5	1998
11	Gorabari	73	1996-2009
12	Harsingh-Dabaipani	5	1997
13	Kumai	5	2004
14	Lanku	15	2013-2015
15	Makai Bari	2.5	2007
16	Mall Road	1	1997
17	Miling	10	1996-1997
18	Nagari Farm	5	2012
19	Naya Busty	40	2011-2015
20	Paschim	80	2002-2006
21	Phoobsering	20	2011-2014
22	Pugung	10	2003
23	Pulungdung	5	1997
24	Rajahatta	2	1996
25	Rajbari	2	1996
26	Rangeroon	2	1996
27	Singell	17	1996-2002
28	Teesta Valley	1	2007
29	Tonglu	2	2011
30	Upper Mamring	23	2002-2007
31	Tukvar	2	1996
31	Castleton Tea Estate	7	1998-2001
33	Margaret's Hope	25	2001-2006
34	Lebong	38	2015-2023
		510	





Project SERVE has been committed to protecting the ecological diversity of the Darjeeling Hills for the last 25 years. Initiated in 1992 by Teekampagne and spearheaded by WWF India since 1996, the project has worked on reforesting degraded areas to prevent soil erosion and landslides, to protect water catchments and rejuvenate springs. Working with communities on livelihood issues and conservation, as well as environment education and awareness have also been the main objectives of the project.