



Government of India
Ministry of Commerce and Industry



TEA GARDEN ATLAS

Dibrugarh District, Assam

(Based on Satellite Remote Sensing Data)



Tea Board, Kolkata

Ministry of Commerce and Industry
Govt. of India
New Delhi



Regional Remote Sensing Centre–East

National Remote Sensing Centre
ISRO, Department of Space
New Town, Kolkata - 700154

October, 2015



Government of India
Ministry of Commerce and Industry

TEA GARDEN ATLAS

Dibrugarh District, West Bengal

(Based on Satellite Remote Sensing Data)

चाय बगान मानचित्रावली

डिब्रूगढ़ जिला, असम

(उपग्रह सुदूर संवेदन डेटा के आधार पर)



Tea Board, Kolkata
Ministry of Commerce and Industry
Govt. of India
New Delhi



Regional Remote Sensing Centre – East
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Use of Remote Sensing and GIS for Development and Management of Tea Gardens

A collaborative project between Tea Board and ISRO

यह प्रकाशन निम्नलिखित परियोजना का एक हिस्सा है

**चाय बगानों के विकास और प्रबंधन के लिए सुदूर संवेदन और
भौगोलिक सूचना प्रणाली का प्रयोग**

टी बोर्ड और इसरो के बीच एक सहयोगी परियोजना

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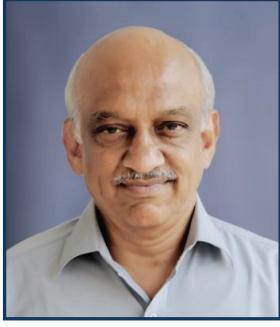
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FOREWORD

India ranks second in tea production with about 11,28,458 people employed in the Tea Industry. While the first tea garden was established in Chabua in 1837 and tea industry is supported by its own research infrastructure and adaptation of geospatial technologies has not been significant. Such adaptation is important for competitive edge in Indian tea industry. The customized software package Tea GIS-MIS will facilitate web enabled services to the various stakeholders related with tea industry with its server located at vantage location. This aims not only to provide spatial database pertaining to tea gardens viz. garden landuse, shade tree density, slope and aspect, drainage, degraded tea areas, uprooted areas, pruning types but also to generate an interface for populating the MIS database for time series analysis, dynamic linking with GIS for rendering, decision making and customized tools for preparation of reports, maps etc.

First phase of study, encompassing the state of Assam and West Bengal, has been completed using 5/2.5meter resolution satellite data. The spatial database includes not only satellite based information on tea gardens but also large number of legacy data for referencing and spatial analysis. The primary census information pertaining to the gardens have been appended as a ready reference.

The 'Tea Garden Atlas – Based on Remote Sensing Data' as one of the inventories of tea gardens that includes big, medium and small tea growers, its present land use, shade tree density and primary information pertaining to the gardens, is first such exercise in the country and will be of immense use to all stakeholders.

I compliment the Tea Board and look forward for further engagement to enhance the scope and utility of TeaGIS.

आ सी किरण कुमार

A. S. Kiran Kumar

Secretary, Department of Space, Govt. of India, Bengaluru



सिद्धार्थ
Siddharth



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PREFACE

India is the world's second largest producer of tea and export of tea has been an important foreign exchange earner for the country. Realizing the need for quality tea production and its export, Tea Board has been providing financial support to the growers for uprooting of older bushes and re-plantation through one of its flagship programme. It is a mammoth task to replace the older and degraded bushes with new improved cultivar in phased manner and also to monitor the uprooted areas in the ground with limited manpower. High resolution satellite data by virtue of its multispectral, synoptic and periodic viewing can significantly overcome the problem of monitoring by minimizing manual survey as well as natural resources inventory in the tea growing areas for intelligent decision support. However, presently there is lack of comprehensive geospatial data base on organized and small tea gardens for spatial analysis and monitoring of bush health and dynamic activities within the tea gardens. To realize the goal Tea Board and ISRO initiated Space based services during the 11th FYP in the form of nationwide project “Tea area development and management using Remote Sensing and GIS” using Indian Remote Sensing Satellite data from LISS IV and Cartosat-1.

The tea garden maps received during the period of study, have been converted into digital database and brought under same platform using GIS technology. Various aspect of garden management viz. land utilization, river bank erosion, waterlogged areas, degraded bushes, uprooted areas and shade cover density in each section have been analysed with great degree of details. The information generated under the project has been ingested into an Information System called Tea GIS-MIS, which facilitates visualization, spatial analysis, dynamic data linking between GIS and MIS, rendering, spatial analysis and output generation. To ensure the outreach of the database generated under this project, Tea GIS-MIS portal has been powered by web enabled services.

I am sure, that the database generated under this project will prove extremely useful in providing scientific inputs for planning development and monitoring of tea gardens. I complement the efforts of the Scientists of RRSC-East/NRSC and NESAC-Shillong towards successful completion of this stupendous task in stipulated time frame.

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डॉ. विनय कुमार डदवाल
Dr. Vinay Kumar Dadhwal



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PREFACE

Availability of a reliable database on the tea gardens is pre-requisite for embarking upon planning strategies for their development. Information on the extent, type and location of the tea gardens helps in mobilizing resources for the wholistic development of the tea growing areas. It is the initiative of the Tea Board, Kolkata to generate a nationwide spatial database containing present status of major, medium and small tea gardens especially the unorganized sector. The project aims at generating spatial database pertaining to tea gardens along with their management details and relevant natural resources. The customized software package will facilitate web enabled services to the various stakeholders related with tea industry with its server located at Tea Board. This aims not only to provide spatial database pertaining to tea gardens viz. garden landuse, shade tree density, slope and aspect, drainage, degraded tea areas, uprooted areas, pruning types but also to generate an interface for populating the MIS database for time series analysis, dynamic linking with GIS for rendering, decision making and customized tools for preparation of reports, maps etc. The Tea Board portal will ensure seamless data flow across the registered users and spatial analysis at client end.

First phase of the study, encompassing the state of Assam and West Bengal, has been completed using high resolution satellite data acquired by IRS LISS IV and Cartosat-1 of 2007-2009. The spatial database includes not only satellite based information on tea gardens but also large number of legacy data for referencing and spatial analysis. The primary census information pertaining to the gardens has been appended as a ready reference.

I appreciate the efforts put in by RRSC-East/NRSC and Tea Board for completing the study and making available the results in the form of 'Tea Garden Atlas - Based on Remote Sensing Data'. I hope the publication will be useful for the planners in government and non-governmental organisations involved in implementing various resources development programmes in the tea growing areas of the country.

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डॉ. जसवंत राज शर्मा

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PREAMBLE

India is the world's second biggest producer of tea after China and its export has been an important foreign exchange earner for the country. The Tea industry is about 170 years old and known for its aroma and taste. In the year of 2011 the export was about 193 million kg valued at Rs. 2595 crore. Conducive environment and high return led to progressive increase in the area and number of small growers. To encourage export promotion, Tea Board launched its flagship programme in the year of 2007 by providing subsidy for uprooting of old bushes and re-plantation after adequate soil rehabilitation. Need was felt to replace the old bushes with new plantation in a phased manner. However, monitoring of the uprooted areas was considered to be a challenge. The data received from High Resolution Satellites has the potential to address resources potential and limitation in the tea growing areas, creation of inventory and monitoring the activities including uprooting in the tea gardens in a periodic manner for management decision support in local and regional perspective. The remote sensing technology along with Geographic Information System (GIS) helped creation of geographic database in pre-defined designed standards wherein natural resources information and descriptive data pertaining to tea gardens can be stored together and analysed to derive simple and complex queries involving large number of thematic and descriptive inputs. The information system, developed in the present study, contain several modules to address the information need across various stake holders along with capability to customized output generation. The tea GIS-MIS nested within the portal to be hosted at Tea Board along with other supporting modules viz. data entry module, tea garden census module, etc. In addition to tea garden related database the GIS contains large number of legacy layers as complementary information and to support decision planning. The integrated Tea GIS-MIS enables seamless data flow across both the modules and rendering of MIS information in geographic perspective.

It would be simple to find the sections of the gardens undergone uprooting and re-plantation, one of the major requirements of Tea Board, using the section boundary vectors of the gardens overlaid on satellite data. In satellite data uprooted areas appear as characteristics tone and pattern and detailed listing of the uprooted areas within the sections can be listed along with area. The database can be used as baseline information in terms of garden inventory, land utilization within the leased area and various activities occurring within the gardens per se. One sampled district of Assam viz. Dibrugarh has been taken up to showcase the database generated under the project and its utility. The garden and section boundaries and attribute information are based on the data received from the tea gardens and Tea Board only. This is the first ever endeavour to bring most of the tea garden information in a single platform to fulfil diverse requirements and analysis.

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ACKNOWLEDGEMENT

Realizing the need for rejuvenation of the countries age old tea gardens by uprooting and replantaiton and monitoring of upcoming small tea gardens, Tea Board, Kolkata and Regional Remote Sensing Centre-East, NRSC have jointly conceptualized and executed the project Tea GIS-MIS aimed at providing large scale updated spatial information of tea gardens of the country and data sharing across various stakeholders and industries for sustainable deveopment. This Atlas is one of the endeavour under Tea GIS-MIS project wherein finer details of the gardens have been captured using high resolution satellite data showing present status of land utilization, shade tree density, degraded areas, uprooted areas supplemented with fundamental information of gardens as descriptive data.

The Project Team would like to acknowledge with great appreciation for the initiative and unstinted support extended by Shri Siddharth, IAS, Chairman, Tea Board of India, Shri M.G.V.K. Bhanu, IAS, and Shri Basudev Banerjee, IAS, Former Chairman, Tea Board and evincing keen interest throughout the study.

The Project Team sincerely acknowledges the guidance and support given by Shri A.S. Kiran Kumar, Secretary, Department of Space and Chairman, ISRO and Dr K. Radhakrishnan, Former Chairman, ISRO and Secretary, Department of Space.

Thanks are due to Dr V.K. Dadhwal, Director, NRSC, and Former Director, NRSC, Dr V. Jayaraman, Dr P.P. Nageswara Rao and Dr S. Sudharkar, Former Directors, NESAC for their support and guidance in realizing the project in time.

The Team would like to place on record the valuable support extended by Dr J.R. Sharma, Former Chief General Manager (RC's), Shri G. Boriah, Former Director of Tea Development, Shri Subir Hazra, Dy Director of Tea Development and Shri Gaganesh Sharma, Dy Director of Tea Development in completing the project.

The Project Team gratefully acknowledges the contributions of Dr Y.V.N. Krishna Murthy, Scientific Secretary (ISRO), who had been the guiding force since the conceptualization of the project to continuous support during the course of the study.

The team wishes to put into record the untiring effort taken by the Tea GIS-MIS project team towards creation and organization of spatial and attribute data pertaining to tea growing areas of the country and enabling its ourreach through web enabled services, which is pre-requisite for holistic development of tea gardens and perspective planning. Thanks are also due to all the tea garden managers, TRI officials, TRA scientists and all the officials of Tea Board, Kolkata and Regional offices for their logistic support, apt cooperation and data sharing without their support the project would not have been complete.

डॉ. दिव्येंदु दत्ता

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श्री एस. सौंदरराजन

Shri S. Soundararajan

On behalf of the Project Team





निष्पादित सारांश

चाय भारत का प्रमुख विदेशी मुद्रा अर्जित करने के सबसे महत्वपूर्ण क्षेत्रों में से एक है। भारत विश्व में चाय का दूसरा सबसे बड़ा उत्पादक है। उत्तर-पूर्वी भारतीय राज्यों में से असम, पश्चिम बंगाल, मेघालय, त्रिपुरा, सिक्किम और दक्षिण में तमिलनाडु, कर्नाटक और केरल देश के संपूर्ण उत्पादन में महत्वपूर्ण रूप से सहायक हैं। वर्तमान में राष्ट्रीय स्तर पर सभी प्रमुख, मध्य और छोटे चाय क्षेत्रों और संसाधनों की संभावनाओं और सीमाओं तथा उद्यान स्तर पर स्थानिक वितरण के बारे में कोई भी सरंचित भू-स्थानिक डाटाबेस उपलब्ध नहीं है। उद्यान भू-उपयोग, नदी के तट के कटाव क्षेत्र, खाली क्षेत्रों, चाय झाड़ियों आदि के स्वास्थ्य को दूर से पहचान तथा उखाड़ क्षेत्र और पुनःरोपण की निगरानी तन्त्र नहीं है। अब तक यह विशुद्ध रूप से मानव सर्वेक्षण है जो कठिन और काफी समय लेने वाला है।

सुदूर संवेदन प्रौद्योगिकी एक काफी उच्च स्थानिक विभेदन और सूक्ष्म स्तर पर उनके कालिक गतिशीलता द्वारा बगीचा विवरण लेने के लिए अपनी बहु वर्णक्रमीय और संक्षिप्त देखने के रूप में अच्छी तरह के कवरेज की क्षमता के आधार द्वारा एक व्यावहारिक उपकरण है। उपग्रह सुदूर संवेदन के माध्यम से प्राप्त जानकारी भू-डाटाबेस, जो पुनः प्राप्त किया जा सकता है, संगलग्न अध्ययन और आवश्यकता पर आधारित मोडेलिंग के रूप में संगृहीत किया जा सकता है। सुदूर संवेदन तकनीक भौगोलिक सूचना प्रणाली, जो मूल रूप से डाटा प्रबंधन प्रणाली डाटा सेट हैं, के साथ मिलकर भौगोलिक या विवरणात्मक और निर्णय समर्थन के लिए अलग परिदृश्य की व्याख्या और पीढ़ी के विमीयता वृद्धि करने में सक्षम हैं।

सुदूर संवेदन डाटा और भौगोलिक सूचना प्रणाली प्राकृतिक संसाधनों के विश्लेषण और मोडेलिंग पर जानकारी प्राप्त करने के लिए एक लचीला, कुशल, तेजी से, लागत प्रभावी और विश्वसनीय प्रौद्योगिकी के रूप में उभर रहा है। यह प्रयोग करने की क्रिया में डाटा प्रबंधन का अभिन्न अंग है।

31 जुलाई 2006 को नई दिल्ली और परवर्ती बैठक बंगलोर में 22 अगस्त 2006 को इसरो और चाय बोर्ड के बीच भागीदारी के बारे में तथा 11वीं पंचवर्षीय योजना के दौरान अंतरिक्ष आधारित सेवाओं का लाभ उठाने के लिए इसरो और चाय बोर्ड के उच्च अधिकारियों के बीच एक बैठक आयोजित की गयी थी। फलतः 31 जुलाई 2006 को इसरो ने और सुदूर संवेदन केंद्र (पूर्व), कोलकाता में प्रस्तुतियों पर चाय बोर्ड के साथ विचार-विमर्श किया।

उपग्रह प्रौद्योगिकी की शक्ति के प्रदर्शन के लिए उत्तर बंगाल में बागडोगरा क्षेत्र में एक प्रायोगिक अध्ययन हुआ। चाय क्षेत्र के विकास और भौगोलिक सूचना प्रणाली क्षमता बहु वर्णक्रमीय और बहुविभेदन उपग्रह डाटा और भू सत्यापन के द्वारा समर्पित डाटा का उपयोग कर चाय बागानों का सटीक मानचित्रण, अनुभाग विवरण, छटाई प्रकार, छाया पेड़ घनत्व, बगीचा भू उपयोग इत्यादि का पता किया गया। प्रायोगिक योजना के उत्साहजनक परिणाम के आधार पर चाय बोर्ड "चाय क्षेत्र के विकास और संचालन सुदूर संवेदन और भौगोलिक सूचना प्रणाली के द्वारा" परियोजना पर औपचारिक रूप से सहमत हुए। तदनुसार एक परियोजना प्रस्ताव को संचालन और आवश्यकताओं के स्तर पर साथ ही साथ उद्यान स्तर और विभिन्न उद्देश्यों को ध्यान में रखते हुए बनाया गया। जबकि भारतीय उपग्रह के उच्च विभेदन डाटा जैसे आई.आर.एस-लिस-4 और कार्टोसैट-1 परियोजना के उद्देश्यों के दायरे के भीतर विभिन्न घटकों के मानचित्रण के लिए प्रयोग किया जाएगा। इस प्रयास में चाय बोर्ड उद्यान नक्शों और प्रासंगिक डाटा के संग्रह क्षेत्र का सर्वेक्षण और बगीचा प्रबन्धकों के साथ बातचीत की सुविधा कराएगा।





परियोजना का प्रमुख उद्देश्य नीचे दिया गया है:

1. चाय क्षेत्रों के मानचित्रण (प्रमुख, मध्यम और छोटे सूची के निर्माण के लिए) ।
2. चाय बगान के नक्शे के भू संदर्भित तथा उद्यान और अनुभाग सीमाओं का उपग्रह डेटा पर प्रदर्शन ।
3. चाय बगान के भूमि उपयोग का विश्लेषण और मानचित्रण ।
4. चाय बगानों में छाया पेड़ के घनत्व का विश्लेषण ।
5. विभिन्न बुनियादी सुविधाओं के डाटाबेस का निर्माण ।
6. चाय बगानों के लिए वेब सक्षम जीआईएस एमआईएस का विकास तथा चाय बोर्ड, चाय अनुसंधान संस्थानों और चाय बगानों के बीच बेहतर प्रबंधन के लिए नेटवर्क स्थापित करने और चाय बगानों के लिए तकनीकी सहायता प्रदान करने के लिए मददगार साबित होगा ।





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1. INTRODUCTION

India is the second largest producer of tea in the world and major foreign exchange earner. The states of West Bengal in the east, Assam, Meghalaya, Tripura and Sikkim in the north-east and Tamil Nadu, Karnataka and Kerala in the south contribute significantly to the overall tea production in the country. Although the large and medium tea gardens are well established but in recent decade large number of small tea growing areas have been added in the tea geography of the country especially from north-eastern India. Contribution of the small growers are significant to commensurate the demand within the country and abroad and is sustained source of green tea leaves to the big gardens. Tea Board through its flagship programme is aimed at providing best support facilities to the small growers in one hand and facilitating uprooting the old bushes and re-planting in phased manner to rejuvenate and enhance the made tea quality. However, presently there is no structured geo-spatial database available at national level on spatial distribution of existing major, medium and small tea gardens and upcoming new areas under tea cultivation. For perspective planning at Tea Board level detailed information regarding tea estate landuse, health of bushes, degraded tea areas, status of infrastructure within the estate, shade tree density, areas having natural resources constraints and prospects are required along with mechanism for field level monitoring of uprooting and re-planting activities in periodic manner, from a vantage point, for decision making and implementation keeping in view export potential of Indian tea.

Remote sensing technology is a pragmatic tool by virtue of its multi-spectral and synoptic viewing capability as well as repetitive coverage to capture estate details at a fairly high spatial resolution and their temporal dynamics at micro level. Remote Sensing data and Geographic Information System (GIS), is emerging as a flexible, efficient, speedy, cost-effective and reliable technology for obtaining information on natural resources analysis and modeling. The information acquired through satellite remote sensing can be converted into knowledge base which can be retrieved, appended, updated and modeled using cognitive intelligence based upon the requirement. Remote sensing technology dovetailed with Geographic Information System, which is basically data management system, is capable of integrating diverse geographic and / or descriptive source data irrespective of scales. Using multi-layered information the problem can be addressed in a more scientific manner and decision making can become more rational.

The project emerged as an outcome of the meeting held between ISRO and Tea Board at New Delhi on 31st July, 2006 and subsequent meeting at Bangalore on 21st August, 2006 regarding **“Partnership between ISRO and Tea Board to avail the Space based services during the 11th FYP”**. To demonstrate the capability of satellite remote sensing a pilot study was carried out in Bagdogra area of North Bengal to address the capability of Remote Sensing and Geographic Information System in tea area development using state of the art multi-spectral and multi-resolution satellite data supported by ground intelligence to address precise mapping of the tea estates with section details, pruning types, shade tree density, estate landuse and gap areas. Based upon the encouraging results of the pilot study a nationwide project on **“Tea area development and management using Remote Sensing and GIS”** was formed jointly by Tea Board and ISRO. The first phase of the project including Assam and West Bengal was completed in 3 years and the entire database (spatial and non-spatial) made ready for outreach through web-hosting.

After web-hosting it is expected that the information system package with enable quick information will flow across various stake holders especially tea growers, tea industries, Tea Research Institute, Tea Research Association, Tea Board and also wide spectrum of users from academics and non-governmental agencies involved in development work.





2. DISTRICT PROFILE

2.1 Location

The Dibrugarh district is located in the eastern part of Assam and north eastern corner of upper Brahmaputra valley extends from 27°05'38" N to 27°42'30" N latitude and 94°33'46" E to 95°29'8" E longitude, covering an area of 3381 sq km (Fig. 1). Dibrugarh name is formed from the combination of two words 'Dibru' and 'Garh', which together means the fort (garh) on the bank of river Dibru. This fort was built by the British to repel any invasion by the hill tribes. The District was created on October 2, 1971 through bifurcation of the then district of Lakhimpur. It is surrounded by Dhemaji district and part of Lakhimpur district in the north, Tinsukia on the east, Tirap district of Arunachal district on the south-east and Sibsagar on the north and south-west. The Brahmaputra river flows in the north. The area stretches from the north bank of the mighty Brahmaputra, which flows a length of 95 km through the northern margin of the district, to the Patkai foothills on the south. The Burhi Dihing, a major tributary of the Brahmaputra with its network of tributaries and wetlands flows through the district from east to west. Average altitude varies between 99 and 474 m above mean sea level.

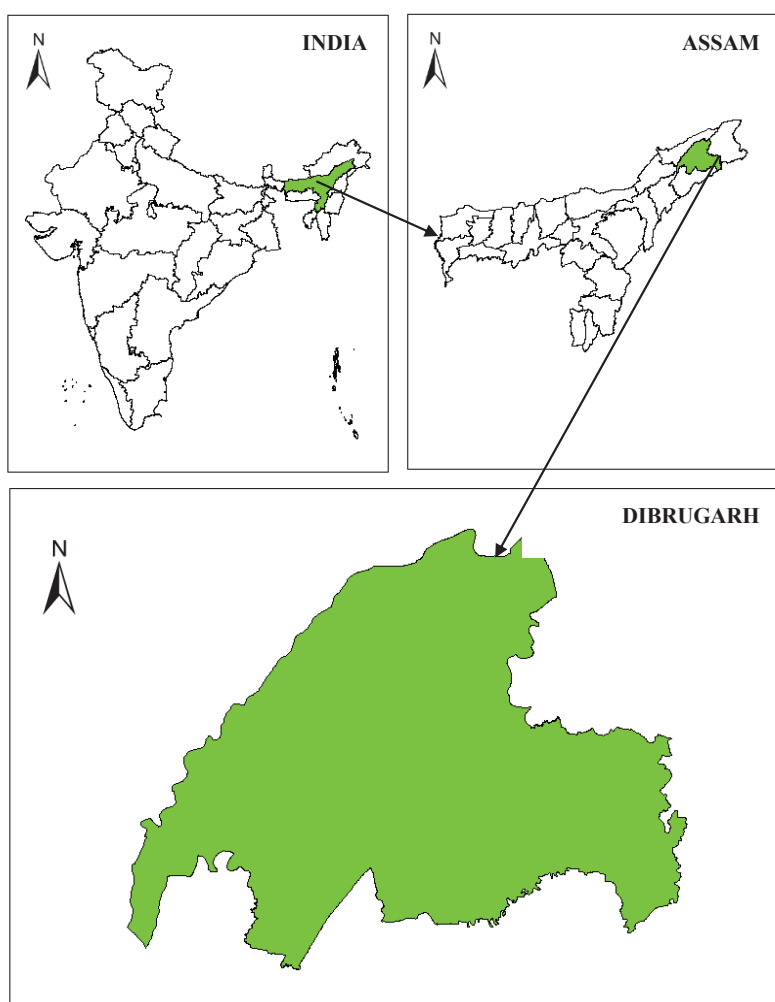


Fig. 1: Location of the Study Area

50% of India's Assam tea. It is an important commercial centre, a port, and a rail terminus known for its industries which include tea processing, rice and oilseed milling. Adjoining major cities include Mohanbari (17 km), Sibsagar (80 km), Digboi (65 km) and Jorhat (136 km). Altogether 63 numbers of estate maps from organized sectors were received which are presented in the Atlas. The estate names along with the geographic extent, Survey of India incidence and area are presented in Table 1.

Dibrugarh town is the districts headquarter, situated on the southern bank of the Brahmaputra, in upper Assam, located 443 km north of Guwahati and connected by broad gauge railway line of NF railway to the rest of the state and the country through Tinsukia. The NH-37 is the major road running through the district. Mohanbari airport is located at a distance of about 16 km from Dibrugarh town, which serves the upper Assam districts of Dibrugarh, Tinsukia, Sivasagar and Arunachal Pradesh and is linked with Guwahati, Kolkata, and Delhi.

Surrounded by tea gardens with the misty outlines of the Himalayas in the background, Dibrugarh is the largest tea exporting town in India. It is the gateway to the three tea producing districts viz. Tinsukia, Dibrugarh, and Sivasagar. These three districts account for approximately





Table 1: Geographic Extent of the Tea Estates with SOI Topomap Number and Area

Sl no.	Estate name	Latitude		Longitude		SOI Topomap no.	Area (ha)
		From (dd mm ss)	To (dd mm ss)	From (dd mm ss)	To (dd mm ss)		
1	Achabam	27 13 51	27 15 27	95 14 13	95 16 55	83M03, 83M04, 83M07, 83M08	616.60
2	Azizbagh	27 11 51	27 13 32	95 06 37	95 07 47	83M04	354.88
3	Balijan	27 21 59	27 24 35	95 14 17	95 16 01	83M03	854.08
4	Balijan north	27 30 57	27 33 24	95 07 31	95 11 50	83M02	1150.34
5	Basmatia	27 20 45	27 23 12	95 03 22	95 05 08	83M03	429.92
6	Baughpara	27 25 40	27 27 34	94 55 41	94 57 11	83I15	379.95
7	Belbari	27 20 42	27 21 03	95 06 07	95 07 11	83M03, 83M07	20.77
8	Bijlibari	27 22 14	27 23 31	95 18 38	95 19 32	83M07	204.46
9	Borbari	27 29 54	27 30 40	95 11 11	95 11 58	83M02	63.31
10	Chubwa	27 26 09	27 28 57	95 08 51	95 11 53	83M03	1386.30
11	Desam	27 14 36	27 16 07	95 13 26	95 17 11	83M03, 83M04, 83M07	490.44
12	Dikom	27 24 29	27 28 22	95 04 15	95 07 42	83M03	972.00
13	Dilli	27 08 31	27 10 52	95 21 18	95 22 44	83M08	369.07
14	Dinjan	27 31 43	27 34 01	95 15 40	95 17 31	83M06	582.74
15	Dinjoye	27 29 18	27 30 32	95 10 10	95 11 27	83M02, 83M03	179.00
16	Dirai	27 09 09	27 12 39	95 00 57	95 03 28	83M04	1165.39
17	Dirial	27 21 27	27 24 47	95 15 29	95 18 32	83M07	934.12
18	Duliabam	27 15 43	27 16 58	94 54 43	94 55 55	83I15	226.96
19	Durgapur	27 22 54	27 23 49	94 51 47	94 52 35	83I15	60.59
20	Ethelwold	27 29 19	27 30 06	94 56 13	94 57 34	83I14, 83I15	186.32
21	Ghograjan	27 23 02	27 24 21	95 01 04	95 02 11	83M03	173.53
22	Ghooronia	27 20 27	27 22 13	94 51 55	94 52 36	83I15	149.94
23	Goneshbari	27 28 18	27 29 41	95 02 23	95 04 06	83M03	253.68
24	Greenwood	27 29 27	27 31 29	94 59 50	95 03 57	83M02, 83M03	832.32
25	Hattialli	27 25 22	27 27 58	95 06 23	95 08 22	83M03	637.40
26	Hazelbank	27 29 05	27 30 33	95 03 55	95 06 07	83M02, 83M03	440.94
27	Jamirah	27 24 07	27 25 25	94 49 54	94 52 29	83I15	477.90
28	Joonkotolee	27 07 46	27 09 32	95 03 01	95 06 04	83M04	604.52
29	Jutlibari	27 22 44	27 24 31	95 20 53	95 23 11	83M07	728.42
30	Kamakhyabari	27 30 08	27 30 53	95 02 13	95 03 55	83M02	187.59
31	Kenduguri	27 12 15	27 13 53	95 03 11	95 05 54	83M04	440.35
32	Kharjan	27 29 25	27 33 05	95 11 30	95 14 41	83M02, 83M03	984.77
33	Korangani	27 09 45	27 11 30	95 07 10	95 08 47	83M04	308.88
34	Lepetkatta	27 18 47	27 23 47	94 49 27	94 54 37	83I15	675.50
35	Madhuting	27 20 13	27 23 04	95 22 36	95 27 18	83M07	677.16
36	Mahabirbari	27 30 13	27 30 59	95 10 29	95 11 18	83M02	89.87
37	Mahadeobari	27 22 59	27 24 02	95 18 18	95 19 37	83M07	144.01
38	Maijan	27 28 59	27 31 49	94 56 44	95 01 30	83I14, 83I15, 83M02	872.66
39	Manabarie	27 29 42	27 30 26	95 06 16	95 07 18	83M02, 83M03	127.89
40	Mancotta	27 25 22	27 26 49	94 53 59	94 55 26	83I15	323.93
41	Maud	27 25 55	27 26 54	95 12 52	95 14 43	83M03	198.14
42	Mokalbari	27 29 34	27 31 52	95 02 14	95 06 20	83M02, 83M03	704.18





Sl no.	Estate name	Latitude		Longitude		SOI Topomap no.	Area (ha)
		From (dd mm ss)	To (dd mm ss)	From (dd mm ss)	To (dd mm ss)		
43	Moran	27 08 20	27 12 17	94 50 19	94 53 58	83I16	1100.82
44	Nahorkutia	27 15 20	27 17 08	95 19 26	95 21 13	83M07	387.86
45	Nahortoli	27 27 26	27 29 31	95 03 59	95 07 07	83M03	874.75
46	Namroop	27 11 04	27 12 37	95 17 23	95 20 25	83M08	728.54
47	Nudwa	27 28 25	27 31 37	95 03 27	95 07 50	83M02,83M03	388.30
48	Ouphulia	27 10 10	27 11 47	94 58 57	95 01 36	83I16,83M04	511.94
49	Pipratoly	27 29 34	27 32 16	95 11 27	95 14 10	83M02	183.38
50	Rajahalli	27 20 25	27 22 06	95 15 12	95 17 17	83M07	444.98
51	Rajgarh	27 10 39	27 12 26	95 05 33	95 07 23	83M04	457.34
52	Romai	27 21 47	27 23 41	95 01 44	95 03 11	83M03	248.43
53	Santi	27 17 44	27 18 41	95 23 51	95 25 35	83M07	464.55
54	Sarojini	27 10 34	27 13 37	95 07 27	95 08 42	83M04	335.76
55	Sealkotee	27 25 10	27 29 03	95 07 41	95 09 44	83M03	852.18
56	Sepon	27 05 52	27 08 46	94 49 20	94 52 13	83I16	877.77
57	Sessa	27 22 58	27 24 44	94 54 39	94 59 23	83I15	753.92
58	Teenali	27 14 36	27 16 31	95 08 46	95 11 26	83M03, 83M04	672.46
59	Teloijan	27 13 16	27 15 20	94 56 25	94 58 30	83I15, 83I16	625.06
60	Thanai	27 30 14	27 32 40	95 06 31	95 09 26	83M02	674.86
61	Tinkong	27 09 38	27 14 40	95 08 39	95 11 13	83M04	719.31
62	Umatara	27 12 14	27 13 32	95 14 12	95 15 43	83M04, 83M08	335.21
63	Zaloni	27 20 13	27 22 29	95 20 34	95 23 15	83M07	640.56

2.2 Climate

The area experiences subtropical monsoon climate with mild winter, warm and humid summer. Rainfall decreases from south to north and east to west in the area. The average rainfall in the district is 2343.81 mm with average temperature of 27.9°C and average relative humidity of 95%. The average annual rainfall of the Dibrugarh city in the north is 2760 mm with a total number of 193 rainy days, while at Naharkatia in the south; it is 1630 mm with 147 rainy days. The temperature generally decreases from south to north. The average annual temperature in Dibrugarh and Naharkatia is 23.9°C and 24.3°C, respectively. Located on the bank of the Brahmaputra, the Dibrugarh city experiences mild climate with low temperature and high rainfall as compared to Chubwa in the east and Moran in the west. The average annual temperature in Chubwa and Moran is 28°C and 32°C, respectively. Rainfall records show a decreasing trend towards east and west of Dibrugarh city. The annual amount of rainfall in Chubwa and Moran is 2500 mm and 1710 mm, respectively. On the basis of the climatic characteristics such as distribution of temperature, rainfall, rainy days, humidity, presence of fogs and thunderstorms, the climate of the area may be classified into four seasons viz. (a) winter, (b) pre-monsoon, (c) monsoon and (d) retreating monsoon. The winter constitutes the months of December, January and February. Fair weather prevails during this time occasionally associated with fogs and haze. December and January are the driest months and January is the coldest. The minimum temperature ranges between 10°C and 12°C and the maximum between 27°C and 29°C. The average rainfall is 200 mm. The months of March, April and May constitute the pre-monsoon season. From March the land surface gets steadily heated and the temperature starts rising. Strong convection develops due to the local depressions formed especially in the afternoon. The norwesters locally called Bordoichilla





appears during the period. Rainfall ranges between 590 cm and 1600 mm and maximum temperature ranges between 28°C and 32°C. This season is, in fact, a transitional phase between the dry cool winter and the warm moist monsoon. With the onset of monsoon in early June, heavy rainfall occurs. Widespread low clouds and high humidity together maintain almost uniform temperature over the area. The maximum temperature ranges between 33°C and 37°C. The average annual rainfall during the period is 3000 mm. The occurrence of thunderstorms is the most conspicuous characteristics of the monsoon weather. This is the season of dominant agricultural operation. The monsoon withdraws from the area in the last week of September or first week of October. The cool north-easterly winds originating over the lofty mountains of the Arunachal Himalayas brings the temperature down. The orographic low is replaced by high pressure and a flat pressure gradient occurs. Rainfall decreases abruptly and the sky becomes progressively clear. Sunny days prevail till the end of November. Month wise normal maximum and minimum temperature are given in Table 2 and the normal rainfall in Table 3.

Table 2: Month wise Normal Maximum and Minimum Temperature (°C)

Month	Max	Min	Month	Max	Min
January	24	12	July	32	25
February	27	15	August	32	25
March	30	18	September	34	25
April	32	21	October	30	21
May	31	23	November	30	16
June	33	24	December	28	13

<http://www.delhitourism.com/climate-dibrugarh.htm>

Table 3: Month wise Rainfall Distribution (mm) in Different Years

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2006	1.6	158.3	64.5	319.6	285.2	307.2	458.6	270.6	291.5	57.2	26.1	14.2	2254.6
2007	2.3	56.2	17.7	330.3	162	431.5	631.8	258	367.7	98.1	13.8	8.2	2377.6
2008	35.7	17.4	180.1	190.3	254.4	487.4	517.9	441.8	229	82.3	6.8	5.4	2448.5
2009	20.2	34	36.3	196.9	153.4	359.8	416.6	530.9	268.4	134.9	24.1	7.6	2183.1
2010	1.3	9.8	143.1	436.7	334.5	333.7	447.2	397.3	398	90.4	35.4	6.5	2633.9
Normal	1.3	7.9	143.1	457.3	304.9	333.7	447.2	410.1	385.2	90.4	30.4	6.5	2618

Source: India Meteorological Department

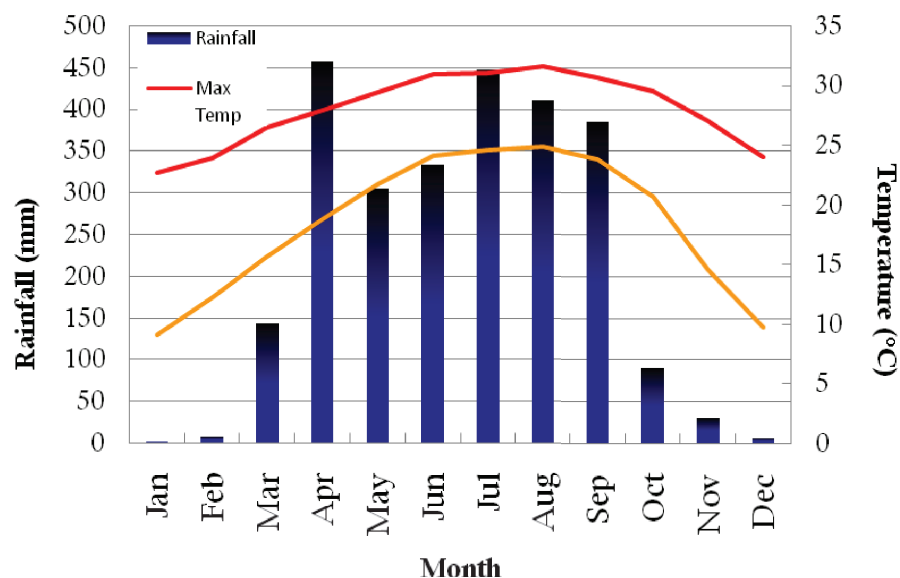


Fig. 2: Normal Monthly Mean Maximum, Minimum Temperature and Rainfall





2.3 Physiography, Slope and Aspect

2.3.1 Physiography

The district has been constituted by extensive plain formed by the Brahmaputra river and its major tributary viz. Burhi Dihing and is situated in the north eastern corner of the upper Brahmaputra valley with an elevation ranging between 99 and 474 meters. Physiographically, the district is a plain area with occasional highlands, flood plain, beels, swamps and foothills of the Barail range. A number of rivers and rivulets with their tributaries and streams flow through the district. The northern boundary of the district is bounded by river Brahmaputra which is fairly wide with average width of 10 km. The general gradient of the district is from south-east to north-west. The altitude of the south-eastern most corner covering the Hapjan Parvat and Hilika Parvat of the Barail foot hills is 200 m. The height decreases gradually from this corner to the mouth of the Burhi Dihing River where the altitude is 99 m. However, the northern belt of the area has a gentle slope from east to west. The altitude of the eastern part is 115 m, while it is 99 m in the western part. Average elevation of the district is 94 m and mean east-west slope is 152 cm per km. Because of the relatively high slope and large volume of water, the Brahmaputra flows with a high velocity causing significant bank erosion in the area. The digital elevation model (DEM) of the district is given in Fig. 3.

The area may be divided into three distinct physiographic zones stretching parallel to the Brahmaputra River. These are (i) The active floodplain and 'charland', (ii) the middle plain and (iii) the southern foothills. The

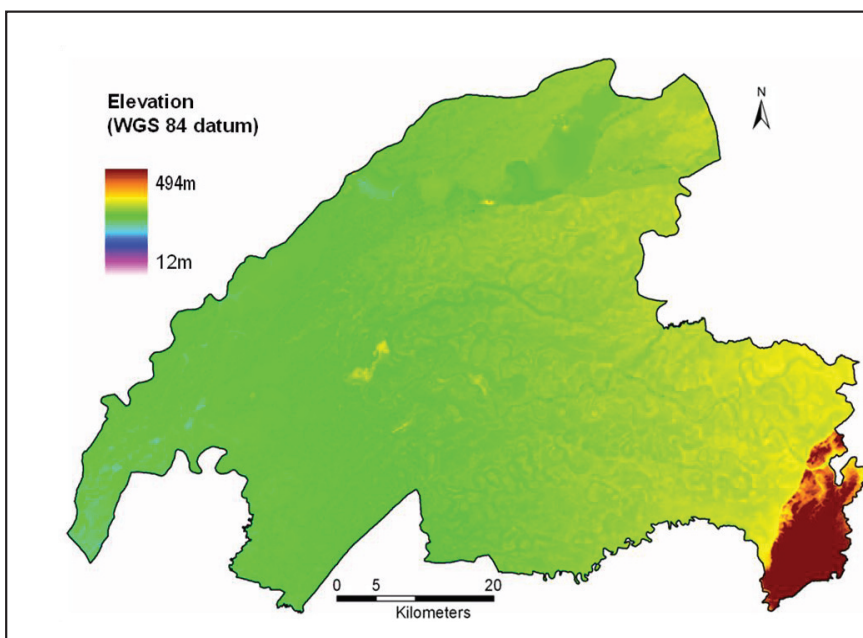


Fig. 3: Digital Elevation

first zone is an extensive and active floodplain of the Brahmaputra. The 'charlands' (sandbars) have also been included in this zone. The charlands are suitable for grazing during the winter season. The second zone is extensive because of the presence of fairly large tributaries like the Dibru (which has now merged with the Brahmaputra) and the Burhi Dihing through their headward erosion added alluvial land substantially to the great plain of the Brahmaputra. This plain contains the

rich belts of tea and rice cultivation. The highly meandered course of the Burhi Dihing has left cut off as many as 39 wetlands in the form of oxbow lakes and swamps. The foothill zone on the other hand consists of isolated hillocks interspersed with plain areas extending into the Naga Hills. The high lands of this zone is composed mostly of lateritic soils are covered by tea gardens or dense forests.

On the northern margin of the Dibrugarh district lies river Brahmaputra which basically drains the whole area. Near Dibrugarh city the river is 10 km wide with a large number of sandbars. Burhi Dihing river flows from almost east to west through the area. It has many tributaries such as Digboi, Tingrai, Tipling, Telpani, Deherang and Sessa in the north bank and Tipam and Disam in the south bank. In addition to the tributaries of the Burhi Dihing, there are three other tributaries of the Disang river namely Gela Disam, Tiolo and Demow.





2.3.2 Slope and Aspect

Most of the area (about 75% area) of the district is plain, i.e. slope varies between 0-1% interspaced with slope of 1-3%. In the eastern part under Jaipur reserve forest steeper slopes are prevalent where the slope is as high as >35%. Maximum elevation is 494 m and minimum is 44 m with average value of 113.75 m as per SRTM digital elevation model with WGS 84 datum. The aspect direction is distributed almost uniformly all across the district. The distribution of various slope types and aspect direction of the district is given in Table 4, Fig. 4 and 5, respectively.

Table 4: Slope and Aspect Distribution

Slope				Aspect			
Sl no.	% slope	Area (sq km)	% of district	Sl no.	Aspect	Area (sq km)	% of district
1	0-1	1833.54	54.23	1	N	402.60	11.91
2	1-3	756.85	22.39	2	NNE	282.02	8.34
3	3-5	36.84	1.09	3	E	343.81	10.17
4	5-10	11.72	0.35	4	ESE	322.40	9.54
5	10-15	13.04	0.39	5	S	358.92	10.62
6	15-35	11.45	0.34	6	SSW	323.31	9.56
7	> 35	7.07	0.21	7	W	380.79	11.26
Water	-	710.49	21.01	8	NNW	256.69	7.59
				9	Water	710.49	21.01

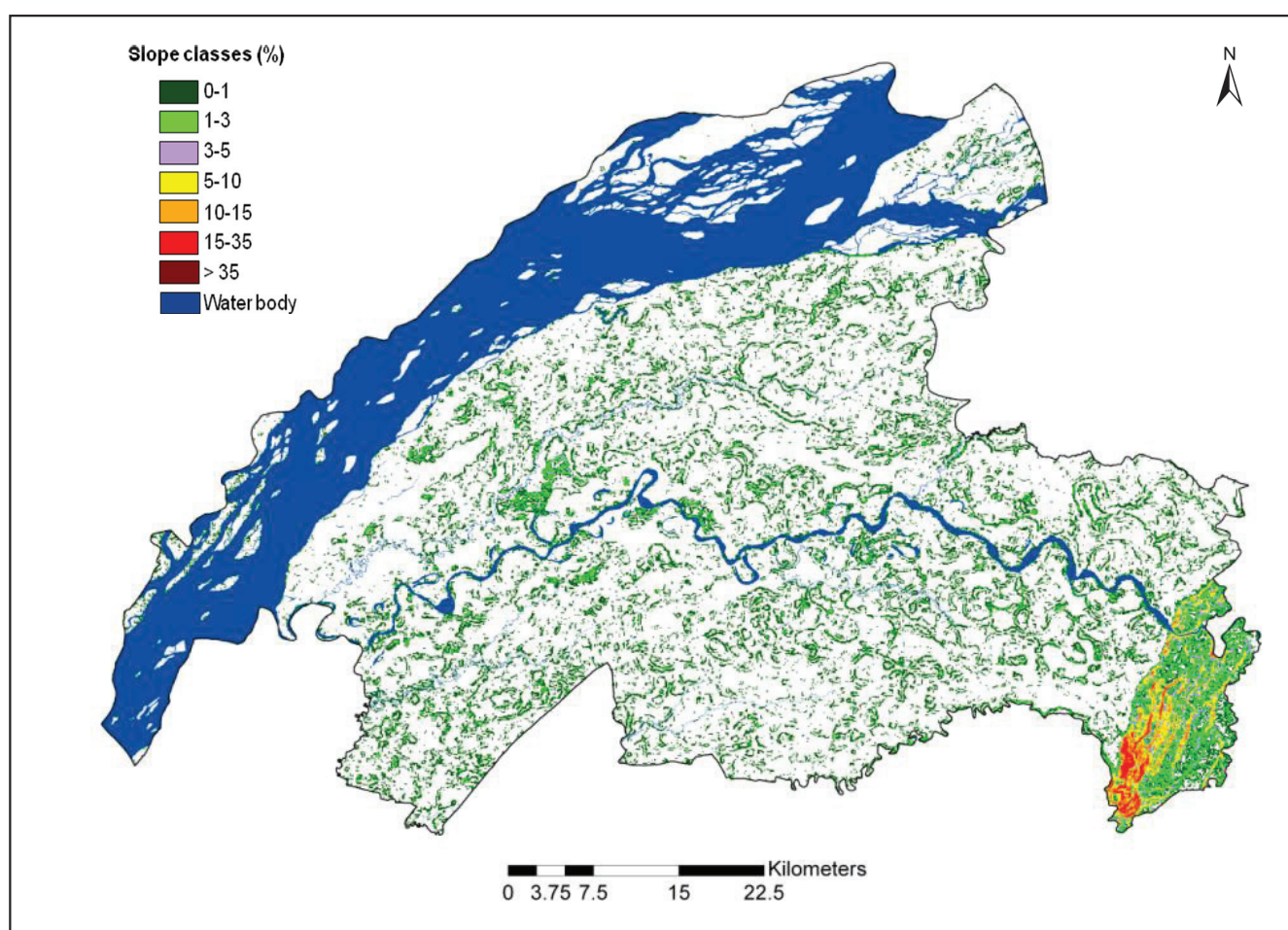


Fig. 4: Slope Classes in Percentage



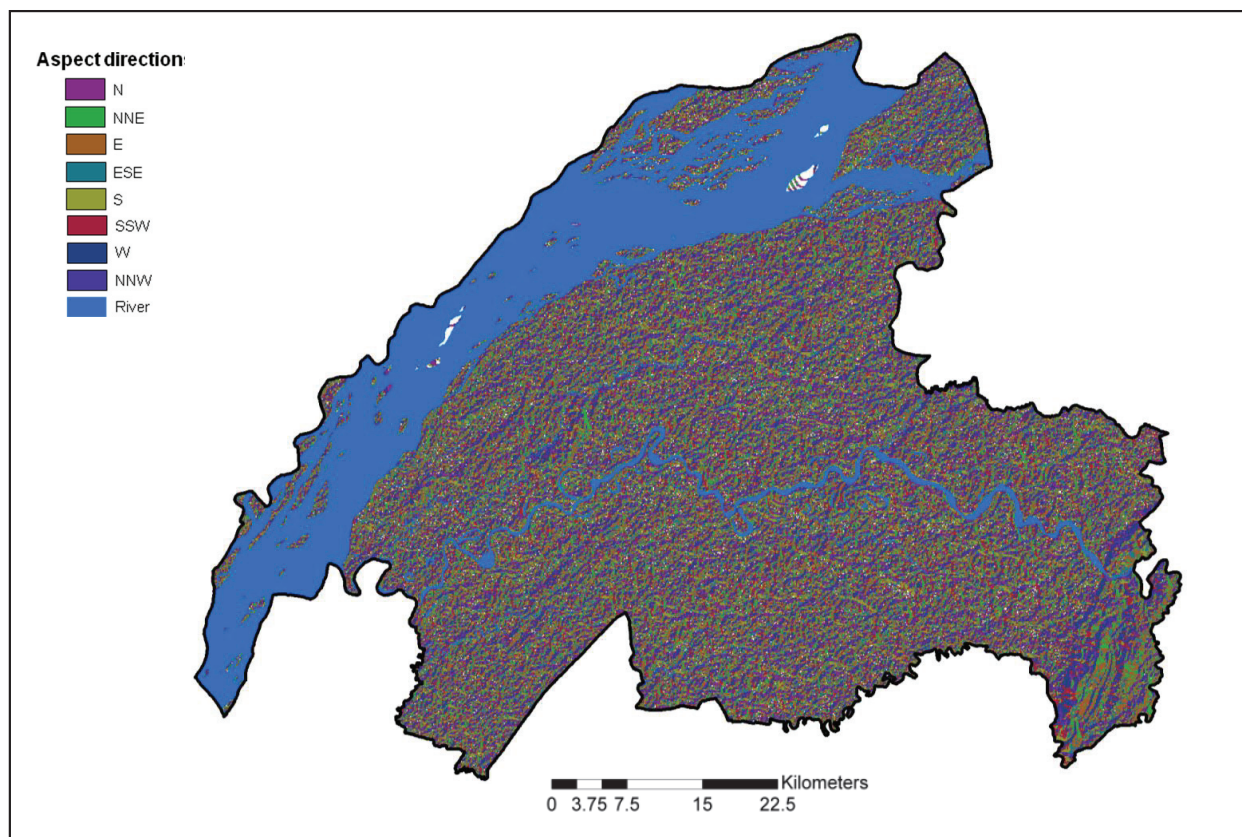


Fig. 5: Aspect

Estate wise maximum, minimum and mean elevation is given in Table 5.

Table 5: Estate wise Maximum, Minimum and Mean Elevation

Sl no.	Estate name	Max (m)	Min (m)	Mean (m)	Sl no.	Estate name	Max (m)	Min (m)	Mean (m)
1	Achabam	124	114	119.14	33	Kharjan	124	114	118.77
2	Azizbagh	116	108	111.65	34	Lepetkatta	112	99	104.10
3	Balijan	124	111	118.59	35	Madhuting	133	120	127.01
4	Balijan North	126	111	117.78	36	Mahabirbari	120	114	116.79
5	Basmatia	118	106	111.48	37	Mahadeobari	125	118	121.53
6	Baughpara	116	105	109.25	38	Maijan	117	99	110.43
7	Belbari	118	110	112.99	39	Manabarie	122	112	116.98
8	Bijlibari	125	118	121.73	40	Mancotta	113	103	106.99
9	Borbari	125	115	118.42	41	Maud	123	115	118.80
10	Chubwa	122	109	115.41	42	Mokalbari	120	110	115.45
11	Desam	124	114	119.20	43	Moran	109	97	102.93
12	Dikom	121	107	113.38	44	Nahorkutia	129	118	124.09
13	Dilli	141	120	127.91	45	Nahartoli	121	107	114.12
14	Dinjan	127	112	119.95	46	Namrup	127	112	121.80
15	Dinjoye	122	113	116.29	47	Nudwa	121	108	115.09
16	Dirai	114	102	107.27	48	Ouphulia	111	100	105.47





Sl no.	Estate name	Max (m)	Min (m)	Mean (m)	Sl no.	Estate name	Max (m)	Min (m)	Mean (m)
17	Dirial	128	114	120.64	49	Pipratoly	123	114	118.80
18	Duliabam	112	100	105.35	50	Rajahalli	126	115	119.94
19	Durgapur	111	103	106.79	51	Rajgargh	115	106	110.44
20	Ethelwold	115	107	109.93	52	Romai	115	106	110.30
21	Ghograjan	118	105	110.53	53	Santi	131	119	125.01
22	Ghooronia	109	101	105.00	54	Sarojini	118	109	111.78
23	Goneshbari	118	109	114.62	55	Sealkotee	122	109	114.34
24	Greenwood	119	107	112.82	56	Sepon	107	94	101.28
25	Hattialli	120	107	113.44	57	Sessa	125	100	106.74
26	Hazelbank	119	109	114.83	58	Teenali	121	110	114.14
27	Jamirah	112	101	104.27	59	Teloijan	112	101	106.20
28	Joonkotolee	116	106	109.72	60	Thanai	122	110	115.78
29	Jutlibari	131	121	123.68	61	Tinkong	120	110	115.10
30	Kamakhyabari	120	109	113.41	62	Umatara	125	114	120.37
31	Kenduguri	113	104	109.98	63	Zaloni	133	118	126.67
32	Korangani	118	108	112.08					

The elevation values are based on SRTM data with WGS 84 datum

2.4 Soils

The soils of the area are basically the products of the fluvial processes of the Brahmaputra and its tributaries and composed of sand and clay in varying proportion. The high grounds of this zone composed mostly of lateritic soils and are covered by tea gardens and dense forests. The plains are composed of alluvium which may be classified as new and old. The new alluvium varies mostly from clayey to sandy loam in texture and is slightly acidic in reaction, deficient in phosphoric acid, nitrogen and humus, but rich in lime and potash. It is found in the vast plain of the district along the river valleys, especially in their lower courses. The old alluvium on the other hand occurs in the upper and middle parts of the valleys in the form of terrace deposits. These deposits contain alternating beds of pebbles, gravel or boulder with loose sand and clays. In certain parts, both the old and new alluvium are so combined that it is difficult to distinguish them.

The old alluvium has relatively high percentage of acid and soluble magnesium accompanied by calcium in general, its hydrochloric acid soluble material contents are lower and the percentage of MgO is higher. The pH value ranges between 4.2 and 5.5 with very low quantity of exchangeable calcium which varies from 0.1 to 5.0 mg per 100 gm of soil. The new alluvium is less acidic as compared to the old alluvium. Its pH value varies from 5.5 to 9.0. These soils are rich in PO₄, K and Ca (6 to 21 mg per 100 gms of soil), but its nitrogen content is somewhat low, being 0.1 percent. Tea is abundantly grown in the old alluvium as it has high percentage of acid. The tea estates are located over relatively high lands covering mainly the mouzas of Chubwa, Bogdung, Rahmaria, Tengakhat, Tipling, Kheremia, Gharbandi, Lahoal, Moderkhat, Mancotta, Jamira, Joypur and Tipling with discernible slopes containing both old and new alluvium. Heavy clays, with high percentage of nitrogen are suitable for rice cultivation. The silty river banks lying in Lengri, Khowang, Mancotta and Larua are favourable for pulses and vegetables.





The river banks bear texturally three types of soil, i.e. sandy loam, loam and clayey loam. These favour cultivation of winter rice, mustard, pea, vegetables, etc. Of the total river bank area, 82.0% is arable, 7.0% is non arable land and 11.0% is not available for cultivation. As per the soil taxonomy classification of NBSS and LUP, the soils are classified as association and grouped under 9 soil mapping units. The description of different mapping units along with percent area covered is given below:

Soil mapping unit 34 (*Coarse loamy Aeric Fluvaquents and Fine Loamy Typic Haplaquepts*): Very deep, well drained, coarse loamy soils occurring on very gently sloping flood plain having loamy surface with moderate erosion and moderate flooding associated with very deep, moderately well drained fine loamy soils occurring on level to nearly level flood plain with slight erosion and moderate flooding.

Soil mapping unit 35 (*Coarse Silty Mollic Fluvaquents and Coarse Loamy Aquic Udifluvents*): Deep well drained, coarse silty soils occurring on river islands of active flood plain having loamy surface with very severe flooding, associated with moderately shallow, well drained coarse loamy soils with severe flooding.

Soil mapping unit 37 (*Fine Typic Kanhapludalfs and Fine Loamy Umbric Dystrochrepts*): Deep well drained, fine soils occurring on moderately sloping side slopes of hills having loamy surface with moderate erosion, associated with deep, well drained, loamy soils occurring on moderately sloping hill slopes with moderate erosion.

Soil mapping unit 40 (*Fine Loamy Typic Dystrochrepts and Clayey Typic Hapludults*): Very deep, well drained, fine loamy soils occurring on gently sloping to undulating upland having loamy surface with moderate erosion, associated with very deep, well drained, clayey soils occurring on undulating plain with slight erosion.

Soil mapping unit 41 (*Fine Loamy Umbric Dystrochrepts and Clayey Typic Hapludults*): Very deep, Well drained, fine loamy soils occurring in undulating uplands having loamy surface with slight erosion, associated with very deep well drained clayey soils occurring on undulating upland with moderate erosion.

Soil mapping unit 42 (*Coarse Loamy Typic Dystrochrepts and Fine Loamy Typic Dystrochrepts*): Very deep, well drained, coarse loamy soils occurring on undulating uplands having sandy surface with moderate erosion associated with very deep moderately well drained fine loamy soils occurring on gently sloping plain with slight erosion.

Soil mapping unit 56 (*Sandy Typic Udifluvents and Coarse Loamy Aquic Udifluvents*): Deep well drained, sandy soils occurring on level to nearly level active flood plain having loamy surface with moderate erosion and severe flooding associated with very deep well drained coarse loamy soils with severe erosion and severe flooding.

Soil mapping unit 59 (*Coarse Silty Aquic Udifluvents and Fine Loamy Typic Halplaquents*): Very deep, imperfectly drained coarse silty soils occurring on level to nearly level active flood plain having loamy surface with very slight erosion and severe flooding associated with deep, poorly drained, fine loamy soils with slight erosion and severe flooding.





Soil mapping unit 61 (*Coarse Loamy Mollic Fluvaquents and Coarse Silty Aeric Fluvaquents*): Moderately deep, moderately well drained coarse loamy soils occurring in level to nearly level active flood plain and on stable river islands having sandy surface with ground water table below 1 m of the surface and very severe flooding associated with deep imperfectly drained coarse silty soils occurring on nearly level active flood plain with moderate erosion and very severe flooding.

Different soil types along with geographic distribution are given in Table 6 and Fig. 6.

Table 6: Distribution of Different Soil Types

SMU	Soil Taxonomy	Area (sq km)	% of total area
34	Coarse loamy Aeric Fluvaquents, Fine Loamy Typic Haplaquepts	100.25	2.97
35	Coarse Silty Mollic Fluvaquents, Coarse Loamy Aquic Udifluvents	32.69	0.97
37	Fine Typic Kanhapludalfs, Fine Loamy Umbric Dystochrepts	57.19	1.69
40	Fine loamy Typic Dystochrepts, Clayey Typic Hapludults	159.67	4.72
41	Fine Loamy Umbric Dystochrepts, Clayey Typic Hapludults	1127.26	33.34
42	Coarse Loamy Typic Dystochrepts, Fine Loamy Typic Dystochrepts)	352.56	10.43
56	Sandy Typic Udifluvents, Coase Loamy Aquic Udifluvents	179.49	5.31
59	Coarse Silty Aquic Udifluvents, Fine Loamy Typic Halplaquents	180.49	5.34
61	Coarse Loamy Mollic Fluvaquents, Coarse Silty Aeric Fluvaquents)	480.92	14.22
200	Water body	710.49	21.01

SMU = soil mapping unit

Source: NBSS and LUP Soil map of 1:250,000 scale

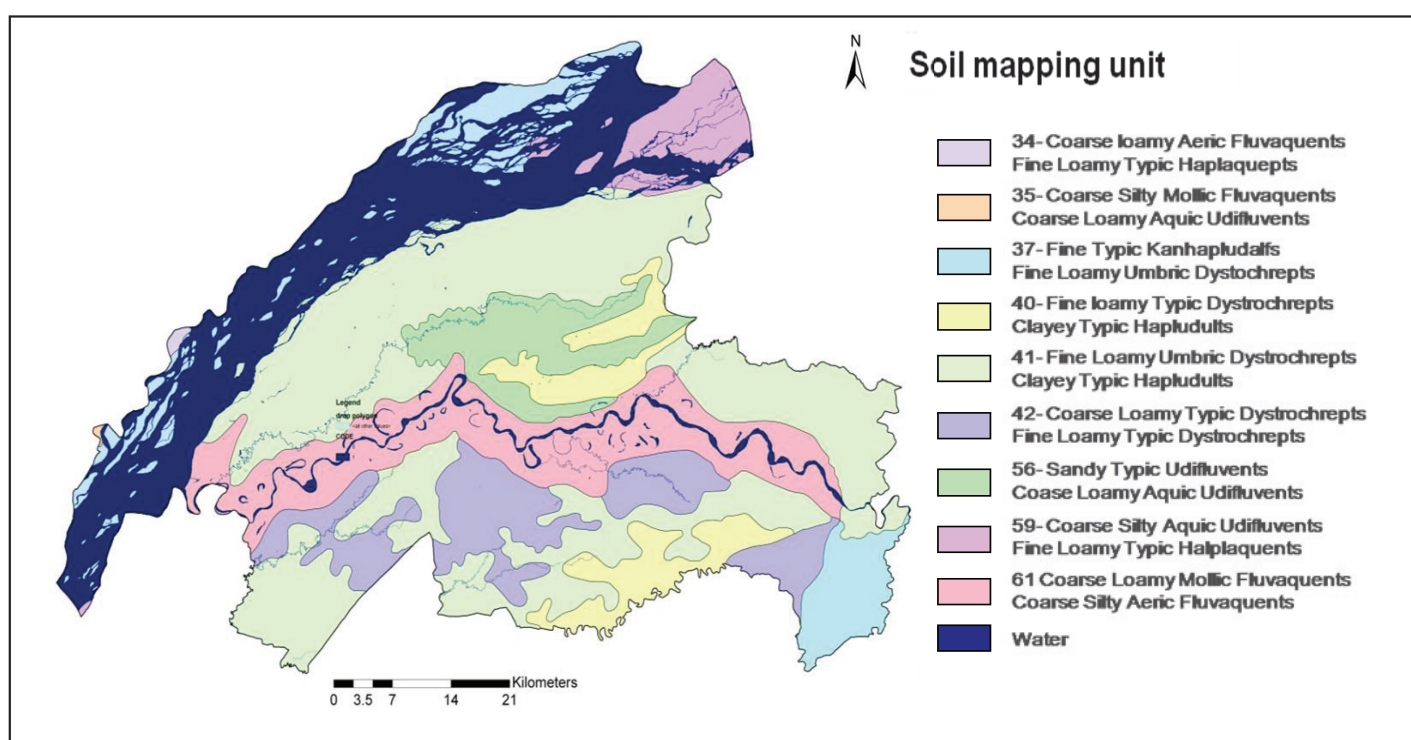


Fig. 6: Soil Taxonomic Map





2.5 Landuse Pattern

Based on satellite data (IRS LISS III) the land utilisation pattern of the district is marked by preponderance of agriculture. The area under cultivation is 34.46% of the total geographical area of the district. About 13.44% area is under tea plantation. Tea area and crop land is interspersed in the entire district barring the central portion along river Burhi Dihing. Forest land in the district is about 6.69%. As per Tea Board of India in 2008, 200 small growers registered with 503.20 ha area under cultivation. Wasteland is negligible in the district accounting only 1.49%. The river Brahmaputra flows along the northern and western boundary of the district and is very wide in places. Total area under rivers and major waterbodies includes 21.37% of the district. The landuse / landcover distribution is given in Table 7.

Table 7: Landuse Statistics

Landuse	Area (sq km)	% of district	Landuse	Area (sq km)	% of district
Built up	31.04	0.92	Wasteland	50.32	1.49
Cropland	1165.16	34.46	Others	731.46	21.63
Tea Bushes	454.38	13.44	Waterbody	722.40	21.37
Forest	226.24	6.69			

Source: Natural Resources Census, NRSC, 2010

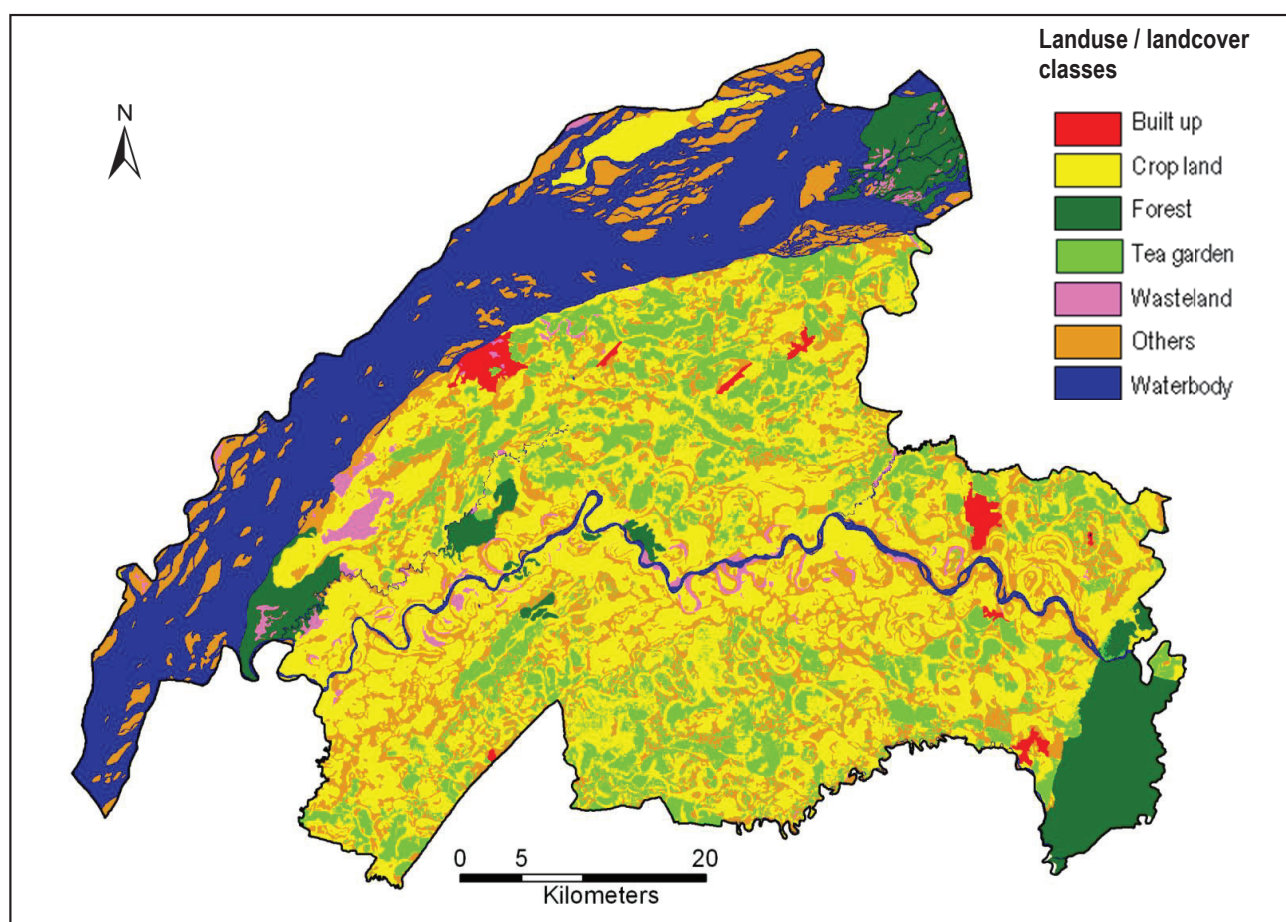


Fig. 7: Landuse / landcover Distribution

The changes in the area, production and yield over the years is given in Table 8.

Table 8: Area, Production and Yield of Tea during 2000 to 2007





	2000	2001	2002	2003	2004	2005	2006	2007
Area (ha)	93076	93484	93698	95118	95118	114435	120489	122514
Production (Thousand kg)	167047	159006	175339	178352	211376	223876	225321	167047
Yield (kg/ha)	1756	1787	1697	1843	1875	1847	1858	1839

Source: Tea Board, Guwahati

2.6 Watershed and Drainage

As per AIS and LUS Watershed Atlas of India, the watersheds of Dibrugarh districts fall under Water Resources Region of 3 which consists of Brahmaputra and rivers of north-eastern states. The area consists of 2 basins, i.e. right and left bank of Brahmaputra, 2 catchments (3B3 – Dhansiri to Lohit confluence and 3A5 – Lower Dihang and parts along Brahmaputra) and 3 sub-catchments (3A5A – right bank of Brahmaputra, 3B3E – Disang – Tisa and 3B3F – Burhi Dihing). All together there are 11 watersheds falling in the district viz. 3A5A4 (Sisi), 3A5A5 (Durhi, Suti), 3A5A7 (right bank of Brahmaputra), 3B3E1 (Dimau, Dirai), 3B3E3 (Disang), 3B3E5 (Tisa), 3B3F1 (right bank of Burhi Dihing, Sesa), 3B3F2 (left bank of Burhi Dihing, Disam), 3B3F3 (Tibling), 3B3F4 (Namsang) and 3B3F6 (Dibru). The watershed hierarchy is given in Fig. 8. On the northern margin of the district lies the river Brahmaputra with braided water course drains the whole area. The Dibru is a main tributary of the Brahmaputra, the confluence of it being at about 18 km east of Dibrugarh city.

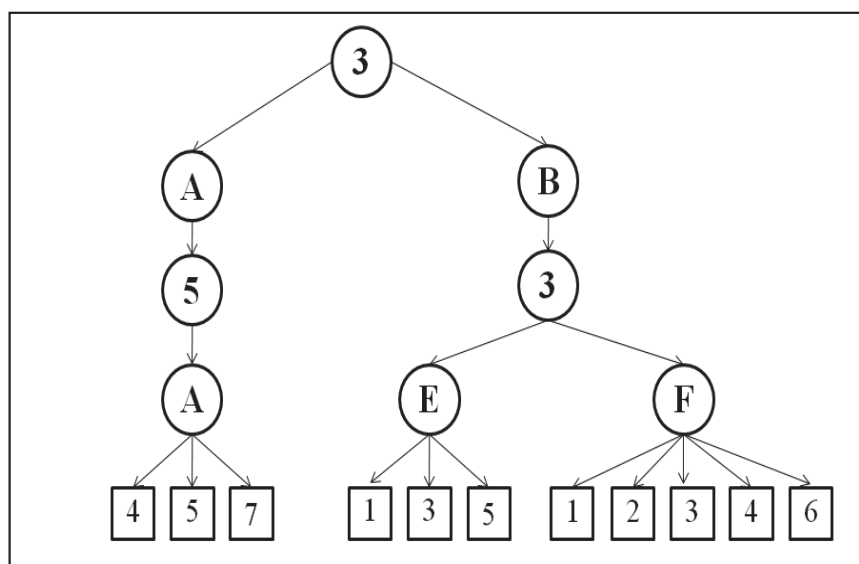


Fig. 8: Watershed Hierarchy

Maijan stream, a tributary of the former Dibru, has become a tributary to the Brahmaputra. The river Burhi Dihing flows from almost east to west direction across the area. It has many tributaries viz. Digboi, Tingrai, Tipling, Telpani, Deherang and Sessa in the north bank and Tipam and Disam in the south bank. In addition to the tributaries of the Burhi Dihing, there are three other tributaries of the Disang river namely Gela Disam, Tiolo and Demow flowing mainly from the Tingkhong mouza. Burhi Dihing flows for 90 km through the Patkai hills before it comes down to the foot hill zone. Thereafter, it flows in a south-west direction for 20 km before meeting the Khaikhe and Meganton. The area of district falling under different watersheds is given in Table 9 and their spatial distribution is given in Fig. 9.





Table 9: The Area of the District Falling under Different Watersheds

Watershed	Area (sq km)	% of the District	Watershed	Area (sq km)	% of the District
3A5A4	14.92	0.44	3B3F1	682.93	20.20
3A5A5	116.16	3.44	3B3F2	681.34	20.15
3A5A7	103.21	3.05	3B3F3	295.61	8.74
3B3E1	404.15	11.95	3B3F4	44.93	1.33
3B3E3	82.77	2.45	3B3F6	953.44	28.20
3B3E5	1.50	0.04			

On the northern margin of the district lies the river Brahmaputra with braided water course drains the whole area. Near the Dibrugarh city the river is about 10 km wide with a large number of sandbars. Till the great earthquake of 1950, the north easternmost corner was drained by the river Dibru. The Dibru was a main tributary of the Brahmaputra the confluence of it being at about 18 km east of Dibrugarh city. By raising the bed of the Brahmaputra, the earthquake caused severe erosion on its south bank and as a result the river Dibru got merged with its master stream near Rahmaria mouza. Maijan stream, a tributary of the former Dibru has become a tributary to the Brahmaputra. Earlier, the interfluves of the Brahmaputra and the Dibru were on an average 6-8 km wide within the district.

Another river viz. Burhi Dihing flows from almost east to west direction across the area. It has many tributaries such as Digboi, Tingrai, Tipling, Telpani, Deherang and Sessa in the north bank and Tipam and Disam in the south bank. In addition to the tributaries of the Burhi Dihing, there are three other tributaries of the Disang river (in Sibsagar district) namely Gela Disam, Tiolo and Demow flowing mainly from the Tingkong mouza. Burhi Dihing flows for 90 km through the Patkai hills before it comes down to the foot hill zone. Thereafter, it flows in a south-west direction for 20 km before meeting the Khaikhe and Meganton. The Burhi Dihing meanders through the plains, facing Patkai hills for a length of 50 km, enters into Joypur-Digboi low hill range. It then comes out near Joypur to flow through the plains for a length of 120 km and finally joins the Brahmaputra at about 32 km south-west of Dibrugarh city. The rivers and drainage network is presented in Fig.10.

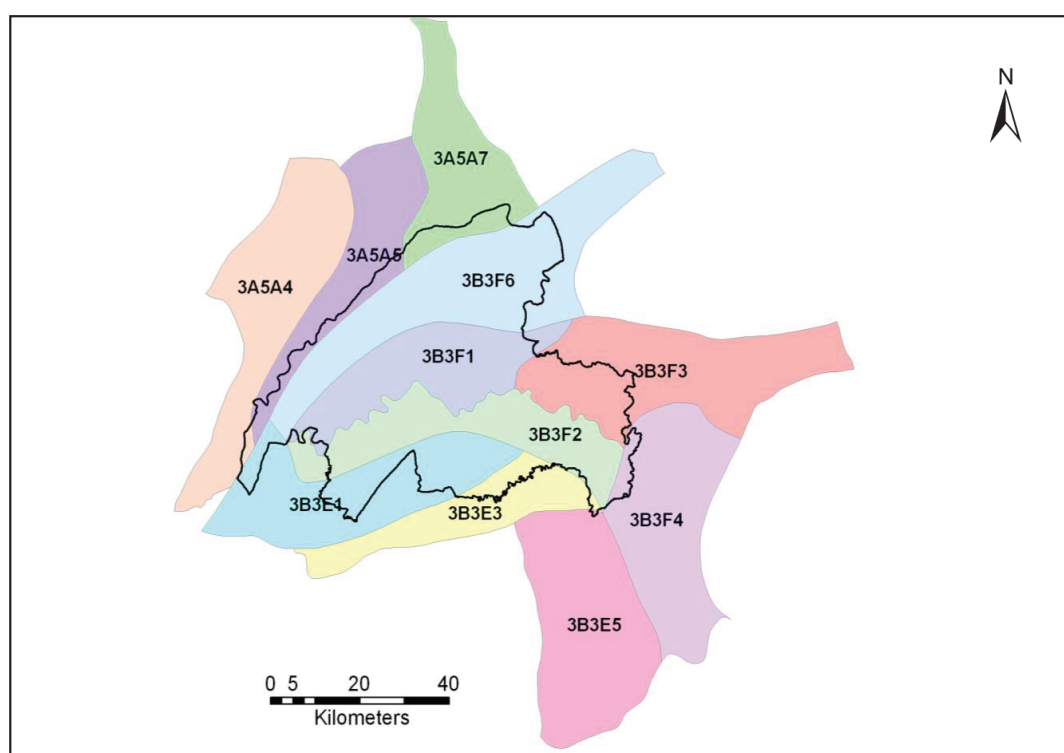


Fig. 9: Watersheds Falling in the District (as per AIS and LUS)



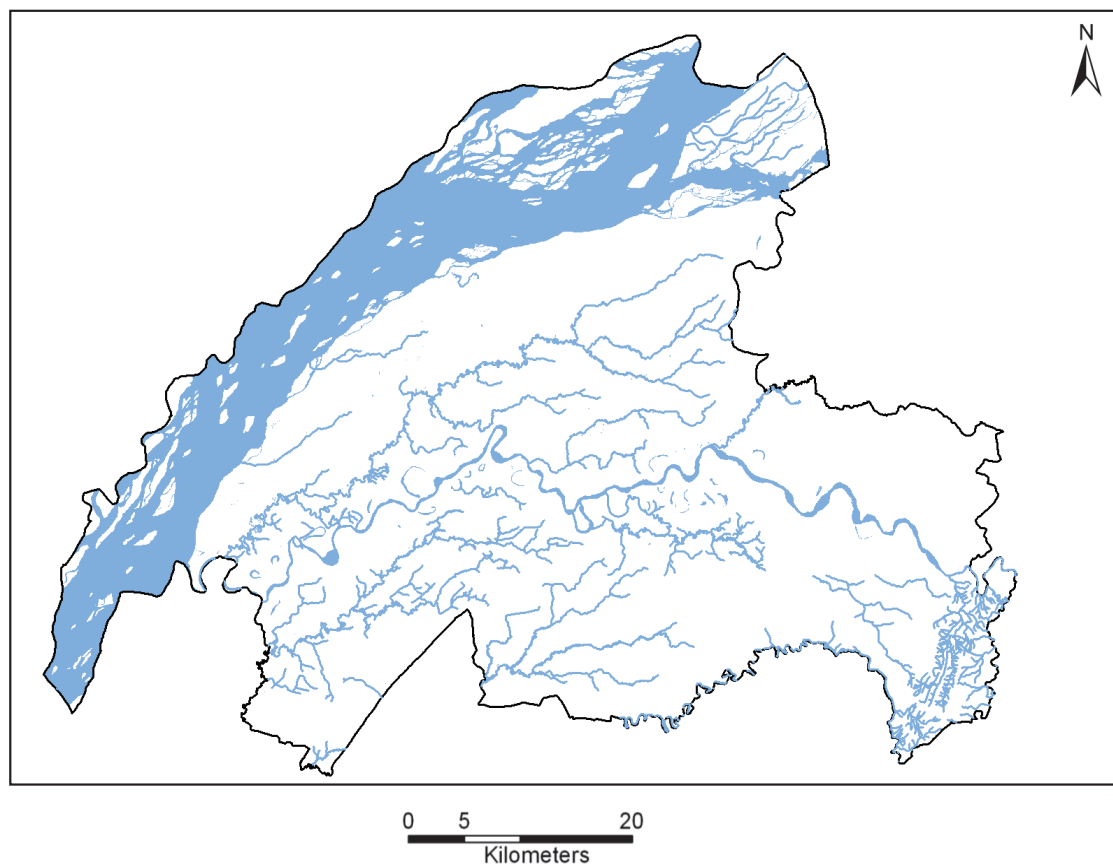


Fig. 10: Rivers and drainage Network

2.7 Flora and Fauna

As per Forest Survey of India (2005) total area under forest in Dibrugarh is 754 sq km which constitutes 22.30% of the district area, out of which very dense forest consists of 26 sq km, moderately dense forest 173 sq km and open forest 555 sq km. In 1999, Dibrugarh district became home to Dibru-Saikhowa National Park, which has an area of 340 km². It shares the park with Tinsukia district. It is also home to the Padumani-Bherjan-Borajan Wildlife Sanctuary, which was established in 1999 and has an area of 7.2 sq km. Dibru-Saikhowa biosphere reserve includes Dibru-Saikhowa wild life sanctuary and biogeographically exhibits the properties of both the Indian and Malayan sub-regions. It consists of a number of “ecotones” between floral communities of riparian and grassland habitats as well as deciduous forest and wet evergreen forest types. It is the home of over 502 species of birds. The endangered white-winged duck, found in Dibru-Saikhowa national park. Wetland, meadows, grasslands, semi evergreen forest and varied vegetation in the park provide excellent habitat for large number of species of birds. Number of rivers, rivulets and tributaries create number of wetlands and water bodies which attract thousands of migratory birds in the biosphere reserve. Dibru-Saikhowa is a critical refuge of many endangered, rare and threatened birds of the world. Twenty five percent of endangered bird species of India have been recorded in the park. Some of the rare species found in the biosphere reserve are bengal florican, white winged duck, greater adjutant, hoolock gibbon, wild buffalo, several species of turtles, gangetic dolphin, golden mahaseer etc. White rumped vulture, slender-billed vulture and red-headed vulture are commonly sighted in Dibru-Saikhowa. There has been loss of habitat of birds in Dibru-Saikhowa in recent years, as a result population of several bird species are decreasing gradually. The seasonal and perennial lentic water bodies and variable forest types favour a prosperous amphibian community which is unique to this riverine island park. A great influence of both chinese and burmese fauna can be seen here. So far, eighteen species of frogs in ten genera have been recorded from the park. The himalayan tree frog is a unique species mainly found in primary forest. Another congeneric species, the six lined brown tree frog is fully arboreal. The beautiful striped pygmy tree frog can be seen during the monsoon in large numbers on ferns and bushes. The bhamo frog is found in and around lentic water sources primarily in open areas with short grasses, amidst grassland, marshes and woodland. The tiny ornamented pygmy frog is another appealing amphibian found mostly in moist leaf litter and



grasses. The anthropophilous or disturbance tolerant species like the common asian toad, terai cricket frog, indian bull frog, syhadra frog, indian skipping frog and taiphe frog mostly occur near the forest camps and forest villages. Further, considering the nature of the canopy here, a large number of canopy dwelling amphibians are expected to be found here.

2.8 Transport Network

National highway no. 37 crosses the district and connects with other major towns of Assam. Dibrugarh is connected with major cities viz. Delhi, Kolkata and Guwahati. By rail the district is linked with Guwahati by a broad gauge line. There are long-distance luxury buses plying between important destinations within Assam and other neighbouring states, popularly known as Day-Super and Night-Super, depending on the time of operation. Total length of the road is 4350.91km, of which major roads (national highways and state highways) constitutes 200.84 km, metalled district road is 312 km, unmetalled district road is 223 km, metalled village and road is 293 km, unmetalled village road is 3177 km and others include 142 km. The road network with major type is given in Fig. 11.

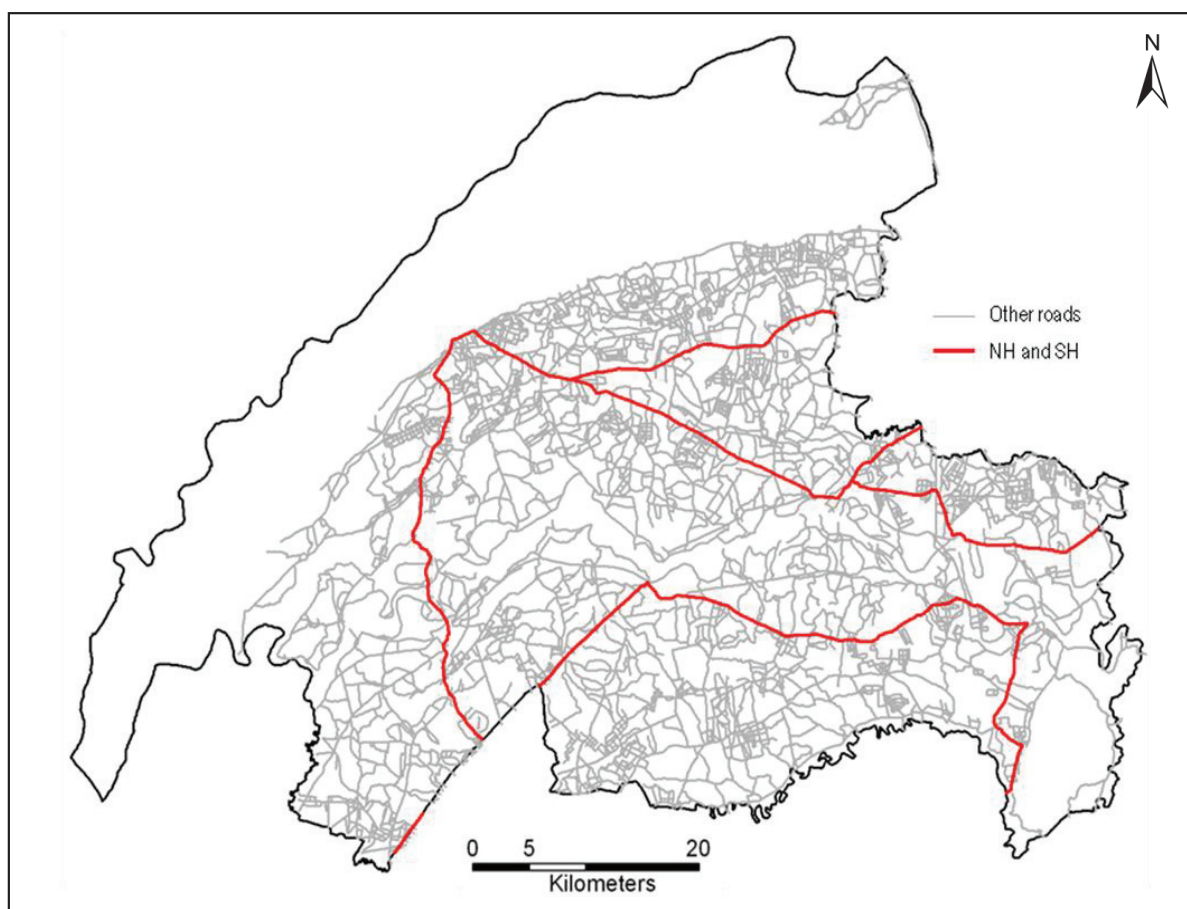


Fig. 11: Transport Network

2.9 Economy

Primary sector including plantation, is major contributing sector to the economy of the district. Nearly 50% of the district GDP comes from this sector. Paddy is the major food crop grown all over the district extensively. The district produces horticultural crops including banana, areca nut, pineapple, papaya, coconut and orange. It also produces spices like chillies, turmeric, ginger and black pepper. Tea is another important crop of the district and it plays an important role in the district's economy. About 95,118 ha of land are presently under tea plantation with nearly 400 small growers and over 800 tea gardens in the district. Fishery is another sector, which can play a distinctive role in the economy of the district. There are number





of rivers and water bodies that favour pisciculture in the district. The total production of fish seed in 2007-2008 was 6.5 million tones and production of fish was 8865 tones. The district is rich in minerals and consequently is one of the most industrialised districts in the state. Industries in the district are mainly based on petroleum, coal, tea and forests. Coal and petroleum products are the mostly traded commodities in the district. It was in Digboi that first time oil well was dug during the British era. Duliajan, Hugrijan and Moran are the key locations for oil and gas industry in the district. Duliajan also happens to be the headquarters of the Public Sector Undertaking Oil India Limited. Besides, plywood and timber products used to be a source of income for the district. Both whole sale and retail trading are centred on these products. The sector contributes 15.47% to the district GDP. As per available data, till 2005, there are 331 registered factories in the district, of which more than half are related to food products and food processing. There are 5216 small scale industries in the district (2006). Sericulture has a promising stake in the economy of the district. Eri, Muga and Mulberry sector of the district is thriving ahead as per the vision document prepared by the district sericulture department. There are 430 sericulture villages with nearly 15,000 families engaged in cultivation/reeling activities. Handloom and textile is the other sector which holds enormous potential of contributing to the district's economy. Cottage industries specializing in production of Assam silk, Phulam Gamosa, and Mekhala Chadar are also in vogue. The Fertiliser Corporation of India and Assam Petro-Chemicals Ltd. at Namrup, The Assam Gas Company at Duliajan and NEEPCO near Duliajan are some of the other major industries in the district. Service sector in the district comprises of both government and private sectors jobs, transport and communication services, construction and processing services.

2.10 Education

Dibrugarh is the education hub of upper Assam. With Kanoi College, Dibrugarh University, Assam Medical College and numerous other institutes of repute it is a major contributor to the education infrastructure in Assam. The John Bery White Medical School established in 1898 was the first centre for formal medical education in north-east India. This institution (named after its founder) was upgraded to a Medical College on the 3rd of November 1947. The district also has a university and 14 colleges. A new engineering college, known as Dibrugarh University Institute of Engineering and Technology (DUIET), has been established under Dibrugarh University to promote engineering and technology in Upper Assam. Average literacy rate of Dibrugarh in 2011 were 76.22 compared to 68.96 of 2001. Male literacy (82.59%) is higher than female literacy (69.52%).

2.11 Demography

According to the 2011 census, Dibrugarh district has a population of 1,327,748 of which male and female were 680,114 (51.22%) and 647,634 (48.77%) respectively with a sex ratio of 952 females for every 1000 males. The district has a population density of 393 inhabitants per sq km and its population growth rate over the decade 2001-2011 was 12.04 %. Hindu, Muslim and Christian populations comprise of 1,075,878, 53,306 and 45,040 individuals, respectively. The main communities inhabiting the district include Ahoms, Tea tribes, Sonowal Kacharis, Sutiya, Muttock, Moran etc. There are also some Tai speaking Buddhist communities like Tai Phake, Khamti and Khamyang. Languages commonly used in the district are Assamese, English, Hindi and Bengali.





Accordingly to 2001 census out, of the total population 60.51% belongs to the age group of 15 to 59 years while about 14.6% belongs to the age of 6 years and less. Rural population is 80.72%, whereas urban population is only 19.27%. Total number of the villages in the district is 1345, of which 36 villages are uninhabited. So far as the social composition of the population is concerned, it could be seen from the Census 2001 that about 4% of the population of the district are scheduled caste and about 7% of the population are scheduled tribes. Total workers as per Census 2001 are 472419, of which the number of main workers is 342708, marginal workers 129711, non-workers are 712653, cultivators are 137008, agricultural labourers are 35862, household industrial workers are 10660 and other workers are 288889. The district profile at a glance is given in Annexure 1.

3. ANALYSIS OF TEA ESTATES

3.1 Tea Area Inventory

Tea growing areas appears distinctly on the high resolution satellite data (LISS IV and Cartosat-1) by virtue of its tone, texture, pattern and extent. On satellite data large and medium gardens are characterized by rectangular/ square/trapezoidal sections, coarse texture attributed to co-existence of shade trees, processing factory, and quarters. The dynamic garden management practices viz. pruning activities also gives distinct appearance on the image in comparison to unpruned areas of the same garden. The tone in the multispectral images appears as dark greenish black to light reddish blue depending upon the depth of pruning. In the present study, all the tea growing areas have been picked up. The tea areas have been classified into two categories viz. confirm tea area where there is standing tea bush on the ground and the 2nd category include the land which is being prepared for tea and uprooted area. A random sampling approach was adopted to verify the confirm areas, areas undergoing land transformation for tea and some doubtful areas. The spatial distribution of tea growing areas is given in Fig. 12 and the organized estate boundaries in Fig. 13. Based upon IRS LISS IV and Cartosat-1 data, total tea growing area of the district is 454.80 sq km, i.e. 13.45% of the district.

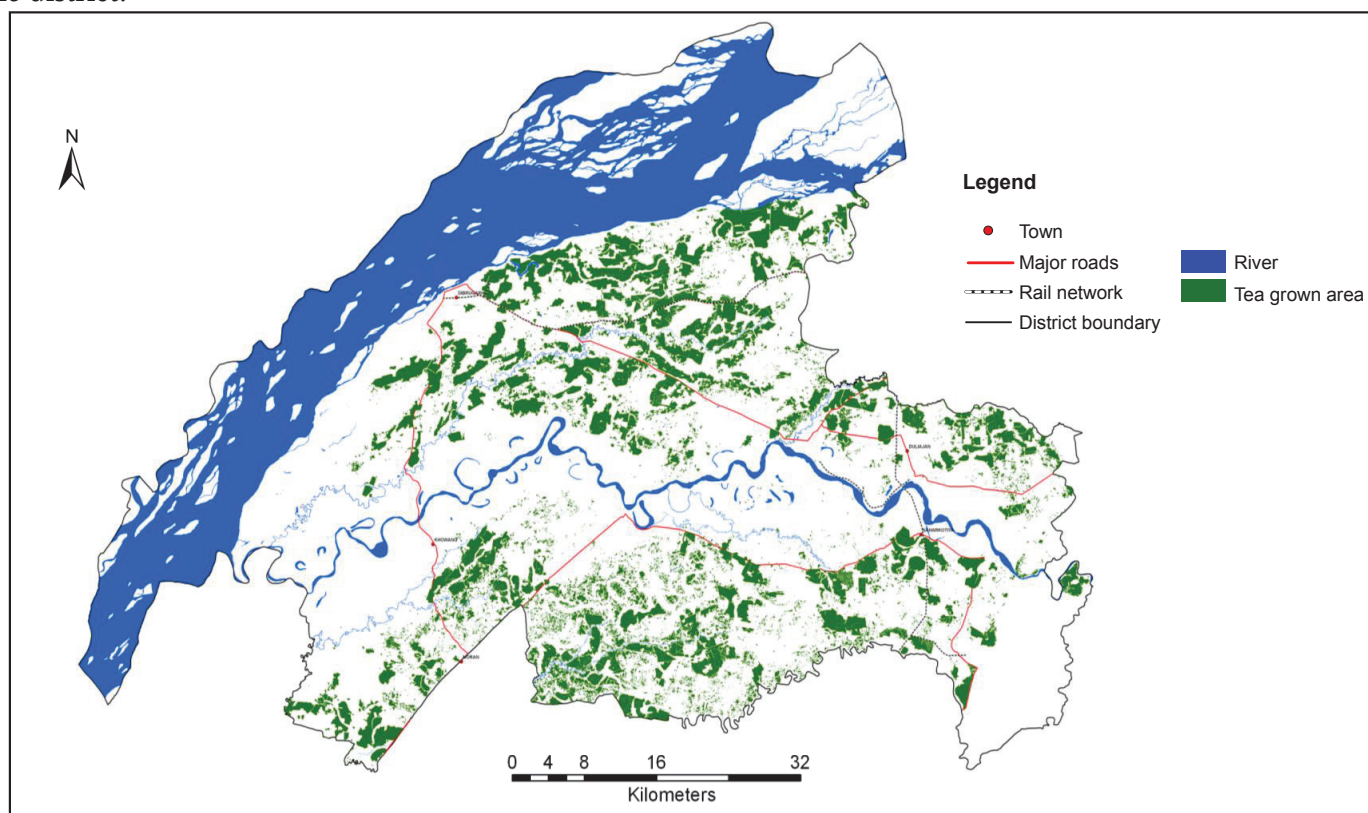


Fig. 12: Spatial Distribution of the Tea Growing Areas



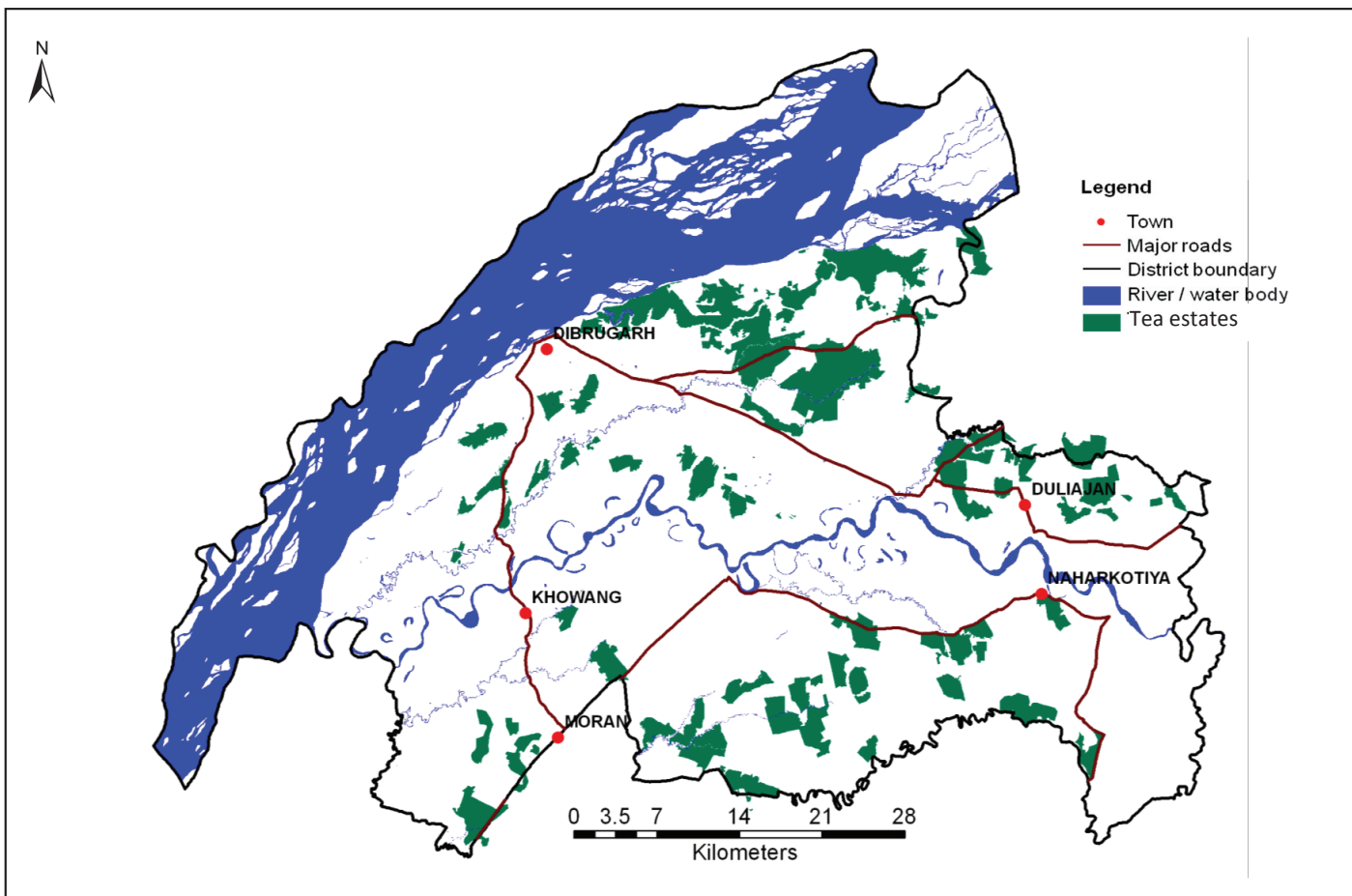


Fig. 13: Spatial Distribution of the Organized Tea Estates

3.2 Tea Estate Landuse

The tea estate landuse is fairly complicated with board categories include tea grown area, functional built up area, facilities, agriculture / crop land, area under afforestation, vacant land, nursery, grassland, soil rehabilitation, wasteland and water body / river. When putting all the landuse classes together mentioned in the estate map it accounts 293 number. The attributes have been regrouped into two levels in the database wherein first level keeps all the classes as is mentioned in the estate map. In the second level, all the landuse classes have been generalized as per the NNRMS standard and categorized into 9 classes viz. built up land, agricultural /crop land, wasteland, grassland, nursery, plantation, tea, waterbody and others. The landuse statistics generalized at second level is given in Table 10.

Table 10: Distribution of Tea Estate Landuse

Sl no.	Estate name	Area (ha)	AL	BUL	GL	NUR	OTH	PLA	TEA	WB	WL
1	Achabam	616.64	77.70	64.70	3.31		35.74	0	422.30	3.29	9.60
			(12.6)	(10.49)	(0.54)	(0)	(5.8)	(0)	(68.48)	(0.53)	(12.6)
2	Azizbagh	354.90	56.44	34.85	0		22.91	0.89	239.81	0	0
			(15.9)	(9.82)	(0)	(0)	(6.45)	(0.25)	(67.57)	(0)	(0)
3	Balijan	855.20	148.55	136.79	5.07		34.04	0	484.66	3.81	42.28
			(17.37)	(16)	(0.59)	(0)	(3.98)	(0)	(56.67)	(0.45)	(4.94)
4	Balijan North	1150.33	86.60	162.40	15.11		0.31	0	847.59	1.65	36.68
			(7.53)	(14.12)	(1.31)	(0)	(0.03)	(0)	(73.68)	(0.14)	(3.19)
5	Basmatia	430.19	87.54	50.63	4.93		0.71	0	285.56	0	0.82
			(20.35)	(11.77)	(1.15)	(0)	(0.16)	(0)	(66.38)	(0)	(0.19)
6	Baughpara	379.96	18.53	46.17	0.58		1.45	2.90	310.33	0	0
			(4.88)	(12.15)	(0.15)	(0)	(0.38)	(0.76)	(81.68)	(0)	(0)



Sl no.	Estate name	Area (ha)	AL	BUL	GL	NUR	OTH	PLA	TEA	WB	WL
7	Belbari	20.76	0	0.30	0		0.05	0.25	19.27	0	0.89
			(0)	(1.43)	(0)	(0)	(0.23)	(1.22)	(92.84)	(0)	(4.27)
8	Bijlibari	204.45	15.60	44.36	2.47		2.23	0	137.32	1.16	1.31
			(7.63)	(21.7)	(1.21)	(0)	(1.09)	(0)	(67.17)	(0.57)	(0.64)
9	Borbari	63.39	2.02	3.35	0		0.54	0	57.46	0	0.04
			(3.18)	(5.28)	(0)	(0)	(0.84)	(0)	(90.64)	(0)	(0.06)
10	Chubwa	1386.42	297.01	186.86	10.65		18.44	0	829.70	3.93	39.84
			(21.42)	(13.48)	(0.77)	(0)	(1.33)	(0)	(59.84)	(0.28)	(2.87)
11	Desam	490.41	78.25	51.96	7.01		3.81	2.60	344.96	0.61	1.23
			(15.96)	(10.59)	(1.43)	(0)	(0.78)	(0.53)	(70.34)	(0.12)	(0.25)
12	Dikom	972.11	16.88	206.11	7.28		6.54	1.69	708.99	0.62	24.00
			(1.74)	(21.2)	(0.75)	(0)	(0.67)	(0.17)	(72.93)	(0.06)	(2.47)
13	Dilli	369.16	0	49.53	1.17		10.98	0	304.19	0	3.28
			(0)	(13.42)	(0.32)	(0)	(2.98)	(0)	(82.4)	(0)	(0.89)
14	Dinjan	582.76	13.39	72.38	2.66		5.21	2.45	449.30	0	37.37
			(2.3)	(12.42)	(0.46)	(0)	(0.89)	(0.42)	(77.1)	(0)	(6.41)
15	Dinjoye	178.87	2.40	22.10	1.36		0.32	0.48	147.07	0	5.13
			(1.34)	(12.36)	(0.76)	(0)	(0.18)	(0.27)	(82.22)	(0)	(2.87)
16	Dirai	1168.14	200.39	147.62	5.03		25.37	11.45	759.07	4.53	14.70
			(17.15)	(12.64)	(0.43)	(0)	(2.17)	(0.98)	(64.98)	(0.39)	(1.26)
17	Dirial	934.22	42.96	185.33	6.00		32.48	3.09	635.84	0	28.50
			(4.6)	(19.84)	(0.64)	(0)	(3.48)	(0.33)	(68.06)	(0)	(3.05)
18	Duliabam	226.96	17.06	27.05	1.20		0	0	181.65	0	0
			(7.52)	(11.92)	(0.53)	(0)	(0)	(0)	(80.04)	(0)	(0)
19	Durgapur	60.59	0.91	11.43	0		0.81	0.17	47.26	0	0
			(1.5)	(18.87)	(0)	(0)	(1.34)	(0.28)	(78)	(0)	(0)
20	Ethelwold	186.31	0	16.28	3.15		0.25	0	166.64	0	0
			(0)	(8.74)	(1.69)	(0)	(0.13)	(0)	(89.44)	(0)	(0)
21	Ghograjan	173.53	13.21	19.02	0.34		0.81	3.65	129.78	0	6.73
			(7.61)	(10.96)	(0.19)	(0)	(0.47)	(2.11)	(74.79)	(0)	(3.88)
22	Ghooronia	149.94	0	16.40	1.90		0	0	131.64	0	0
			(0)	(10.94)	(1.27)	(0)	(0)	(0)	(87.8)	(0)	(0)
23	Goneshbari	253.68	0.73	25.23	0.96		0	0.19	226.57	0	0
			(0.29)	(9.95)	(0.38)	(0)	(0)	(0.07)	(89.31)	(0)	(0)
24	Greenwood	831.73	48.53	82.48	25.74		38.09	0	614.34	1.87	20.70
			(5.83)	(9.92)	(3.09)	(0)	(4.58)	(0)	(73.86)	(0.22)	(2.49)
25	Hattialli	637.77	77.20	110.33	3.83		6.56	8.18	429.10	0	2.57
			(12.1)	(17.3)	(0.6)	(0)	(1.03)	(1.28)	(67.28)	(0)	(0.4)
26	Hazelbank	441.42	22.33	77.35	1.34	4.48	2.74	2.65	323.37	2.81	4.34
			(5.06)	(17.52)	(0.3)	(1.02)	(0.62)	(0.6)	(73.26)	(0.64)	(0.98)
27	Jamirah	478.34	2.04	65.27	1.31	0	9.20	0	398.87	0	1.65
			(0.43)	(13.65)	(0.27)	(0)	(1.92)	(0)	(83.39)	(0)	(0.35)
28	Joonktolee	604.53	59.77	54.67	0.21	0	10.64	3.88	473.53	0	1.82
			(9.89)	(9.04)	(0.03)	(0)	(1.76)	(0.64)	(78.33)	(0)	(0.3)
29	Jutlibari	728.42	35.91	82.87	2.27	0	22.20	3.22	575.02	1.61	5.32
			(4.93)	(11.38)	(0.31)	(0)	(3.05)	(0.44)	(78.94)	(0.22)	(0.73)
30	Kamakhyabari	187.58	6.12	14.10	6.30	0	0.43	1.03	159.59	0	0
			(3.26)	(7.52)	(3.36)	(0)	(0.23)	(0.55)	(85.08)	(0)	(0)
31	Kenduguri	440.35	51.34	40.00	0.66	1.44	2.88	4.54	328.82	10.68	51.34
			(11.66)	(9.08)	(0.15)	(0.33)	(0.65)	(1.03)	(74.67)	(2.42)	(11.66)
32	Kharjan	985.13	42.99	182.32	21.11	0	5.70	0	695.85	2.64	34.51
			(4.36)	(18.51)	(2.14)	(0)	(0.58)	(0)	(70.64)	(0.27)	(3.5)
33	Korangani	308.91	21.47	39.85	1.62	0	4.13	0	228.28	13.55	0





Sl no.	Estate name	Area (ha)	AL	BUL	GL	NUR	OTH	PLA	TEA	WB	WL
			(6.95)	(12.9)	(0.52)	(0)	(1.34)	(0)	(73.9)	(4.39)	(0)
34	Lepetkatta	675.54	42.63	107.50	3.16	0	4.23	1.22	516.56	0	0.23
			(6.31)	(15.91)	(0.47)	(0)	(0.63)	(0.18)	(76.47)	(0)	(0.03)
35	Madhuting	677.46	1.97	67.75	2.08	0	40.68	2.37	550.54	0	12.07
			(0.29)	(10)	(0.31)	(0)	(6)	(0.35)	(81.27)	(0)	(1.78)
36	Mahabirbari	90.62	1.01	5.62	0	0	0.40	0	83.59	0	0
			(1.12)	(6.2)	(0)	(0)	(0.44)	(0)	(92.24)	(0)	(0)
37	Mahadeobari	144.01	0	14.41	0	0	6.40	0	97.62	1.48	24.10
			(0)	(10.01)	(0)	(0)	(4.44)	(0)	(67.78)	(1.03)	(16.74)
38	Maijan	872.80	137.19	114.50	4.82	0	19.22	0	588.35	5.48	3.23
			(15.72)	(13.12)	(0.55)	(0)	(2.2)	(0)	(67.41)	(0.63)	(0.37)
39	Manabarie	127.89	0	0	0	0	0	1.16	108.50	0	18.23
			(0)	(0)	(0)	(0)	(0)	(0.9)	(84.84)	(0)	(14.26)
40	Mancotta	326.33	31.05	47.95	0	0	2.10	2.52	237.26	0	5.45
			(9.51)	(14.69)	(0)	(0)	(0.64)	(0.77)	(72.71)	(0)	(1.67)
41	Maud	198.13	3.13	27.60	0	0	3.66	0.67	163.07	0	0
			(1.58)	(13.93)	(0)	(0)	(1.85)	(0.34)	(82.3)	(0)	(0)
42	Mokalbari	704.51	49.34	66.04	0.98	0	16.41	2.27	565.99	0	3.49
			(7)	(9.37)	(0.14)	(0)	(2.33)	(0.32)	(80.34)	(0)	(0.5)
43	Moran	1100.85	211.32	157.86	7.63	0	27.90	4.58	683.39	0	8.18
			(19.2)	(14.34)	(0.69)	(0)	(2.53)	(0.42)	(62.08)	(0)	(0.74)
44	Nahorkutia	387.87	14.41	77.20	1.31	0	8.76	0	284.26	0	1.94
			(3.71)	(19.9)	(0.34)	(0)	(2.26)	(0)	(73.29)	(0)	(0.5)
45	Nahortoli	874.87	154.23	139.47	9.54	0	22.79	1.97	534.25	1.80	10.83
			(17.63)	(15.94)	(1.09)	(0)	(2.6)	(0.22)	(61.07)	(0.21)	(1.24)
46	Namroop	728.53	78.02	157.57	0	0	36.70	0	439.60	7.49	9.15
			(10.71)	(21.63)	(0)	(0)	(5.04)	(0)	(60.34)	(1.03)	(1.26)
47	Nudwa	388.08	40.26	34.01	2.01	0	14.37	1.01	284.83	0.06	11.52
			(10.37)	(8.76)	(0.52)	(0)	(3.7)	(0.26)	(73.4)	(0.02)	(2.97)
48	Ouphulia	512.38	47.76	57.51	1.79	0	13.74	1.04	380.80	0.74	8.99
			(9.32)	(11.22)	(0.35)	(0)	(2.68)	(0.2)	(74.32)	(0.14)	(1.76)
49	Pipratoly	183.44	5.73	10.81	0.60	0	1.23	0.17	164.28	0	0.62
			(3.12)	(5.89)	(0.33)	(0)	(0.67)	(0.09)	(89.56)	(0)	(3.12)
50	Rajahalli	445.00	57.73	57.74	1.61	0	29.59	0	296.46	0	1.86
			(12.97)	(12.98)	(0.36)	(0)	(6.65)	(0)	(66.62)	(0)	(0.42)
51	Rajgarh	457.36	29.43	72.90	2.23	0	36.08	0.59	306.11	0	10.02
			(6.43)	(15.94)	(0.49)	(0)	(7.89)	(0.13)	(66.93)	(0)	(2.19)
52	Romai	464.53	31.25	95.22	7.65	0	5.05	1.34	324.02	0	0
			(6.73)	(20.5)	(1.65)	(0)	(1.09)	(0.29)	(69.75)	(0)	(0)
53	Santi	248.44	14.71	19.98	0.50	0	21.18	0.57	173.24	0	18.26
			(5.92)	(8.04)	(0.2)	(0)	(8.52)	(0.23)	(69.73)	(0)	(7.35)
54	Sarojini	334.47	5.11	26.85	2.09	0	20.50	0	265.36	4.99	9.57
			(1.53)	(8.03)	(0.62)	(0)	(6.13)	(0)	(79.34)	(1.49)	(2.86)
55	Sealkotee	851.74	104.13	195.09	6.70	0	13.66	0	507.74	0	24.42
			(12.23)	(22.9)	(0.79)	(0)	(1.6)	(0)	(59.61)	(0)	(2.87)
56	Sepon	881.12	25.41	100.61	4.76	1.29	51.80	0.39	662.33	0	34.53
			(2.88)	(11.42)	(0.54)	(0.15)	(5.88)	(0.04)	(75.17)	(0)	(3.92)
57	Sessa	753.93	191.96	69.32	2.42	0	20.97	2.77	456.58	4.66	5.25
			(25.46)	(9.19)	(0.32)	(0)	(2.78)	(0.37)	(60.56)	(0.62)	(0.7)
58	Teenali	672.45	121.43	109.93	4.20	0	13.54	1.04	420.88	0	1.43
			(18.06)	(16.35)	(0.62)	(0)	(2.01)	(0.15)	(62.59)	(0)	(0.21)
59	Teloijan	625.59	0.12	54.57	0	0	151.46	0	419.43	0	0
			(0.02)	(8.72)	(0)	(0)	(24.21)	(0)	(67.05)	(0)	(0)





Sl no.	Estate name	Area (ha)	AL	BUL	GL	NUR	OTH	PLA	TEA	WB	WL
60	Thanai	674.88	87.53 (12.97)	83.78 (12.41)	11.33 (1.68)	1.29 (0.19)	0.22 (0.03)	1.37 (0.2)	487.38 (72.22)	0 (0)	1.99 (0.29)
61	Tinkong	719.34	48.59 (6.75)	104.40 (14.51)	2.85 (0.4)	0 (0)	7.88 (1.09)	2.89 (0.4)	549.81 (76.43)	0 (0)	2.93 (0.41)
62	Umatara	335.21	10.59 (3.16)	20.20 (6.02)	0 (0)	0 (0)	3.75 (1.12)	0 (0)	295.00 (88)	0 (0)	5.68 (1.69)
63	Zaloni	640.57	32.31 (5.04)	130.51 (20.37)	3.10 (0.48)	0 (0)	4.67 (0.73)	0 (0)	458.92 (71.64)	0 (0)	11.06 (1.73)

AL – agricultural land, BUL – built up land, GL – grass land, NUR – nursery, OTH – others, PLA – plantation, WB – water body, WL – wastelands

*Figures in the parenthesis indicate the percent of estate area.

3.3 Shade Tree Density

Shade trees are grown as companion tree along with tea bushes and almost an integral part of the tea gardens. It helps in complementary resources sharing in shaded perennial agro-forestry system. Its unique leaves effectively filter light and provide enough shade during the dry months. The major advantages of shade tree include maintaining soil moisture, and canopy temperature, help in increasing humidity, addition of organic matter as leaf litter, lessening fluctuations in soil temperature which harms root growth, favours increased production and high leaf chlorophyll content by reducing leaf temperature, suppressing the weed growth and lowering the infestation of pests and helping in producing soft and dark green tea shoots that produces premier quality green tea. In the present study shade tree density was estimated using Cartosat-1 data where the shade tree canopies appear distinctly as coarse texture coupled with shadow casting on the ground, the extent of which depends upon illumination geometry from the satellite. Advanced image processing technique viz. image segmentation was carried out to capture only the shade tree canopies, the cumulative area of which was calculated for given section and expressed as percent cover over the section area. The figures are dynamic and vary with date of satellite image acquisition. Large variation is observed across the gardens and the percent cover varies from as low as 1.12% to as high as 32.49%. The number of the estates that have less than 10% canopy cover accounts for 41 estates, 71 estates have density between 10% to 20% and only 16 estates have shade tree density of more than 20%. Estate wise overall shade tree density within the tea growing areas is given in Table 11.

Table 11: Estate wise Overall Shade Tree Density

Sl no.	Estate name	% area under shade tree	Sl no.	Estate name	% area under shade tree
1	Aibheel	32.49	65	Kumargram	21.84
2	Amarpur	4.67	66	Kumlai	6.84
3	Ambari	15.99	67	Kurti	11.07
4	Anandapur	7.87	68	Lakhikanta	14.79
5	Bagrakote	5.87	69	Lakhipara	22.64
6	Baintgoorie	3.24	70	Lankapara	19.61
7	Bamandanga Tondoo	8.65	71	Lessriver	13.56
8	Banarhat	11.76	72	Looksun	5.60
9	Baradighi	4.37	73	Madhu	16.40
10	Batabari	6.41	74	Majherdabri	21.30





Sl no.	Estate name	% area under shade tree	Sl no.	Estate name	% area under shade tree
11	Beech	8.24	75	Malnuddy	12.95
12	Bhandiguri	1.66	76	Manabarie	10.91
13	Bharnobari	9.79	77	Matelli	15.33
14	Bhatkowa	8.58	78	Mathura	13.74
15	Bhatpara	9.20	79	Mechapara	20.52
16	Bhogotpore	7.15	80	Meenglass	9.33
17	Binaguri	10.15	81	Mogalkata	21.59
18	Birpara	16.13	82	Moraghat	23.33
19	Carron	10.21	83	Mujnai	13.94
20	Central Dooars	14.39	84	Nagrakata	12.45
21	Chalouni	12.34	85	Nangdala	11.83
22	Chinchula	15.67	86	Nedam	13.10
23	Choonabhuti	22.79	87	Nepuchapur	7.97
24	Chuapara	16.33	88	New Dooars	15.50
25	Chuniajhora	14.55	89	New lands	13.36
26	Dalgaon	10.34	90	Newglenceco	11.10
27	Damdim	13.45	91	Nimtijhora	18.78
28	Debipur	6.59	92	Nowera nuddy	11.54
29	Debpara	16.22	93	Oodlabari	8.63
30	Demdima	16.73	94	Palashbari	16.80
31	Denguajhar	12.12	95	Patkapara	11.65
32	Dharanipur	8.23	96	Phaskowa	20.79
33	Dhowlajhora	13.31	97	Putharjhora	18.26
34	Dima	13.01	98	Radharani	3.46
35	Dumchipara	16.23	99	Raghuutkarsh	1.32
36	Ellenbarie	20.21	100	Rahimabad	10.95
37	Engo	11.20	101	Rahimpur	12.32
38	Ethelbarie	9.27	102	Raipur	1.12
39	Gairkhata	8.40	103	Raja	5.63
40	Gandrapara	20.25	104	Rheabari	12.98
41	Garganda	24.11	105	Rydak	15.11
42	Goodhope	4.49	106	Samsing	6.38
43	Gopalpur	12.07	107	Sankos	16.70
44	Gopimohan	14.47	108	Saraswatipur	8.89
45	Gurjangjhora	2.74	109	Sarugaon	10.60
46	Haldibari	13.50	110	Satali	13.33
47	Hantapara	15.56	111	Shikarpur	1.47
48	Hope	18.76	112	Singhania	7.61
49	Indong	7.47	113	Sonali	14.86
50	Jadabpur	8.89	114	Soongachi	10.30
51	Jainti	6.40	115	Srinathpur	8.35



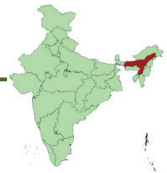


Sl no.	Estate name	% area under shade tree	Sl no.	Estate name	% area under shade tree
52	Jaldacca altadanga	9.72	116	Subhasini	10.97
53	Jalpara	27.64	117	Sylee	5.43
54	Jiti	12.19	118	Tasati	13.23
55	Jogesh Chandra	8.49	119	Telepara	16.17
56	Joybirpara	13.85	120	Toonbarie	20.33
57	Kailashpur	6.76	121	Torsa	10.25
58	Kalabari	17.57	122	Totapara	19.69
59	Karala valley	2.98	123	Tulsipara	21.86
60	Karbala	13.06	124	Turturi	14.80
61	Kartick	20.88	125	Uttarsalbari	10.60
62	Kathaldhura	12.54	126	Washabarie	18.31
63	Killcott	18.32	127	Yongtong	10.06
64	Kohinoor	14.66	128	Zurantee	15.97

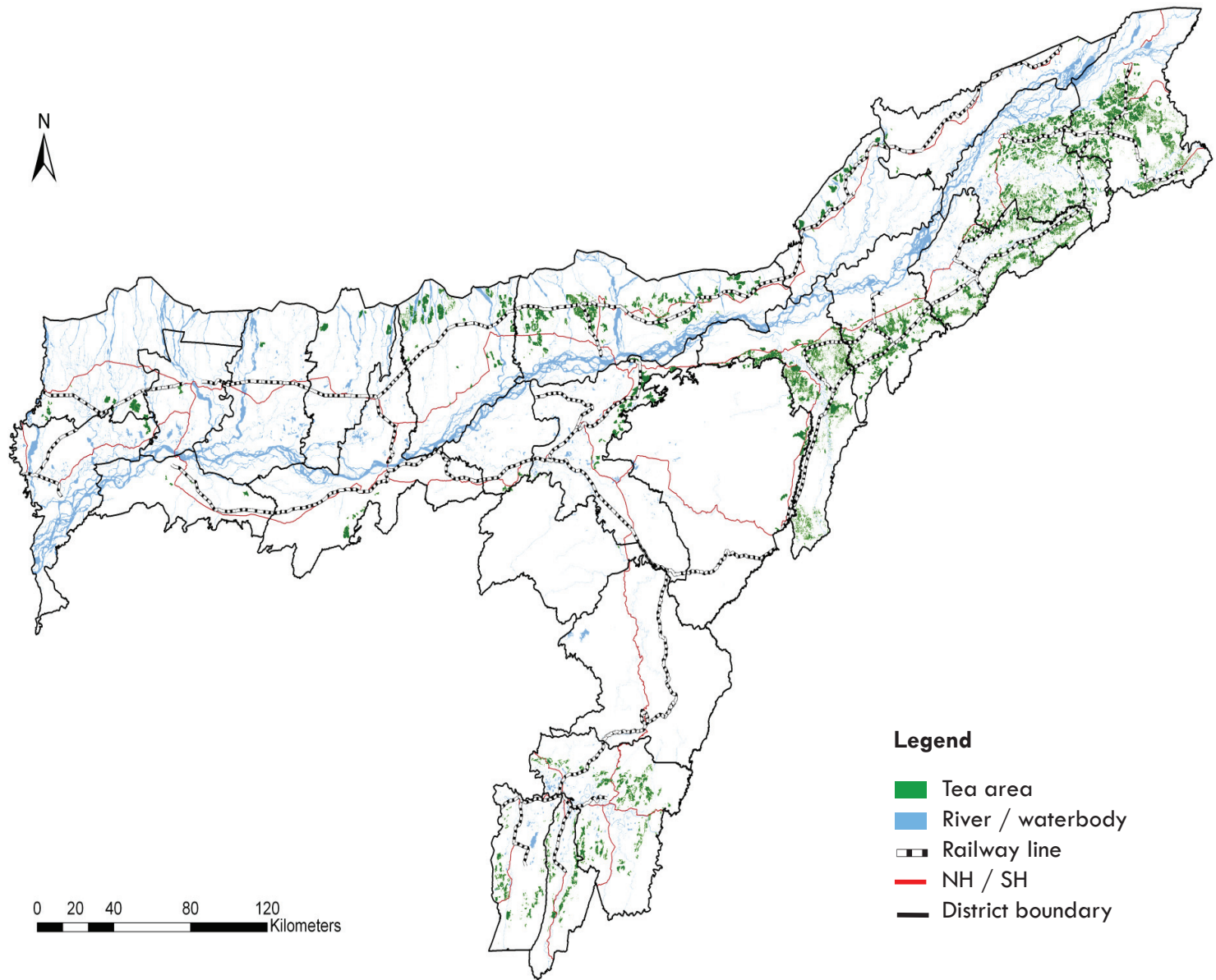




P1: Tea Growing Areas of Assam



Based on IRS LISS-IV and Cartosat-1



Legend

- Tea area
- River / waterbody
- Railway line
- NH / SH
- District boundary

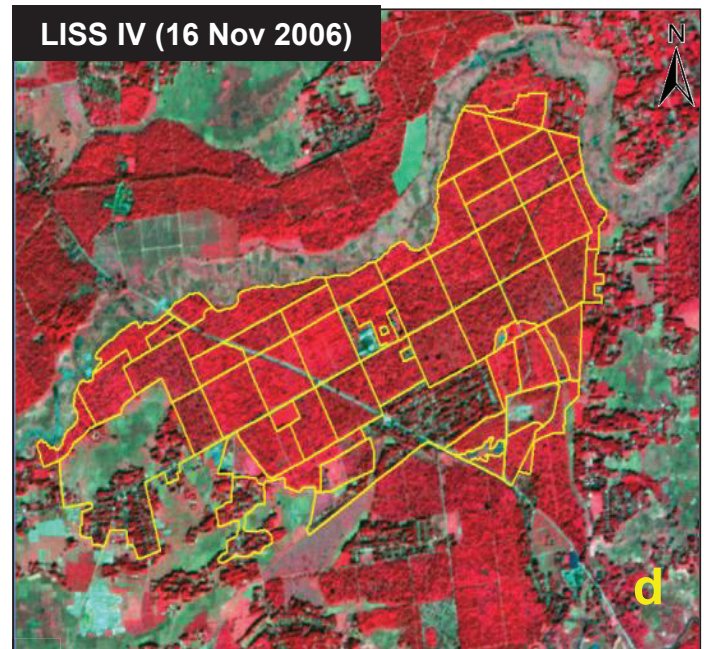
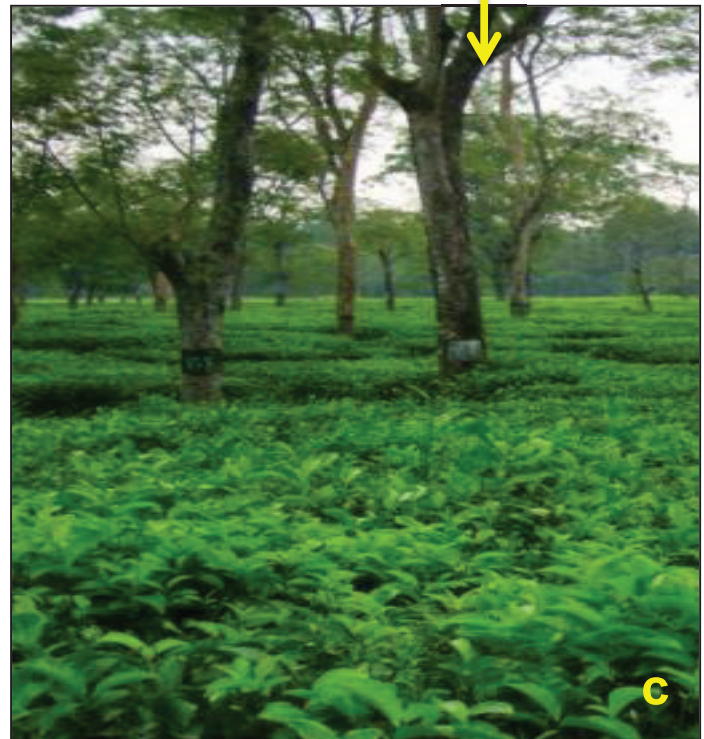
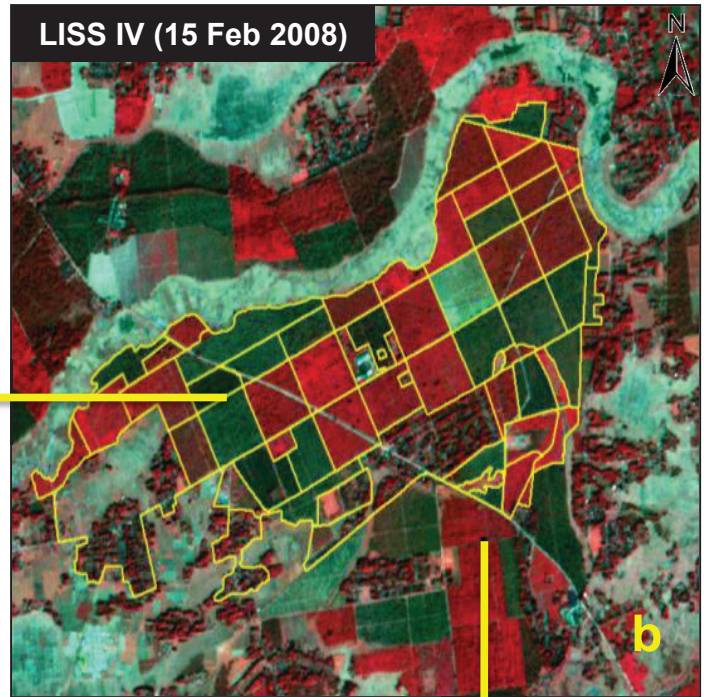
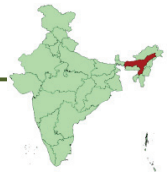
District	Tea Area (sq km)	% of District
Barpeta	4.16	0.13
Bongaigaon	7.77	0.41
Cachar	206.53	5.46
Darrang	156.04	4.42
Dhemaji	9.68	0.38
Dhubri	25.47	0.94
Dibrugarh	455.50	13.47
Goalpara	30.05	1.49
Golaghat	377.27	10.66
Hailakandi	69.89	5.26
Jorhat	259.81	9.17
Kamrup	26.71	0.61

District	Tea Area (sq km)	% of District
Kabianglong (Diphu)	59.58	0.81
Kabianglong (Hamren)	7.88	0.25
Karimganj	77.69	4.18
Kokrajhar	80.91	2.19
Lakhimpur	67.88	2.34
Marigaon	10.85	0.71
Nagaon	146.08	3.65
Nalbari	24.45	1.04
North cachar hills	Nil	Nil
Sibsagar	330.27	12.56
Sonitpur	479.57	9.08
Tinsukia	551.80	14.37





P2: Tea Estates as Viewed by IRS LISS IV



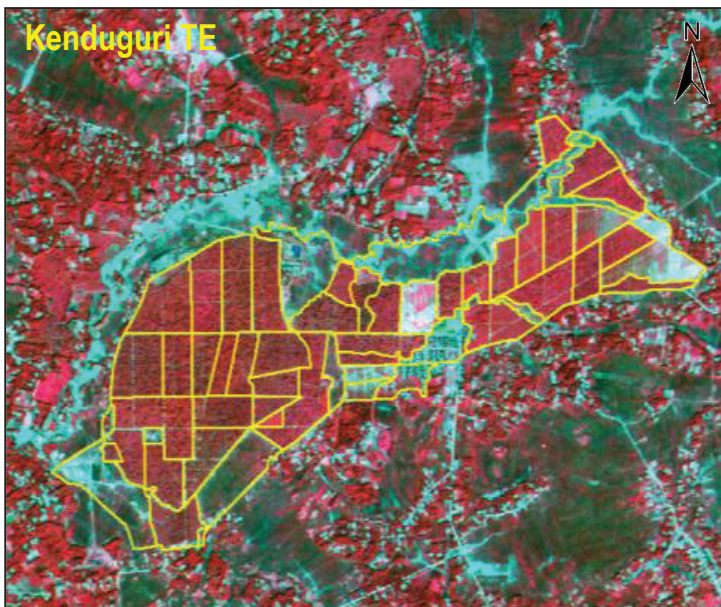
The satellite image depicts Hazelbank TE of Dibrugarh district of Assam. In the post monsoon data (d) there is no pruning activities visible in the image. In the lean period (winter) the tea bushes are pruned section-wise (as is visible by greenish colour in the image b) to maintain table height for ease of plucking and also to allow new flushes to come up which are superior in quality.

- a. Pruned Tea bushes.
- b. Pruning activities captured by satellite data of IRS LISS IV during February, 2008.
- c. Unpruned Tea bushes
- d. Section boundaries of the Tea Estate superimpose on IRS LISS IV data of November, 2006.

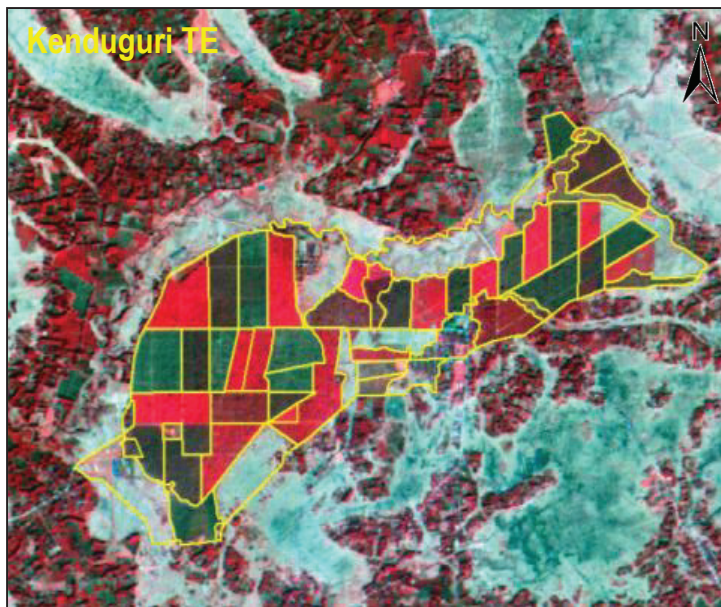




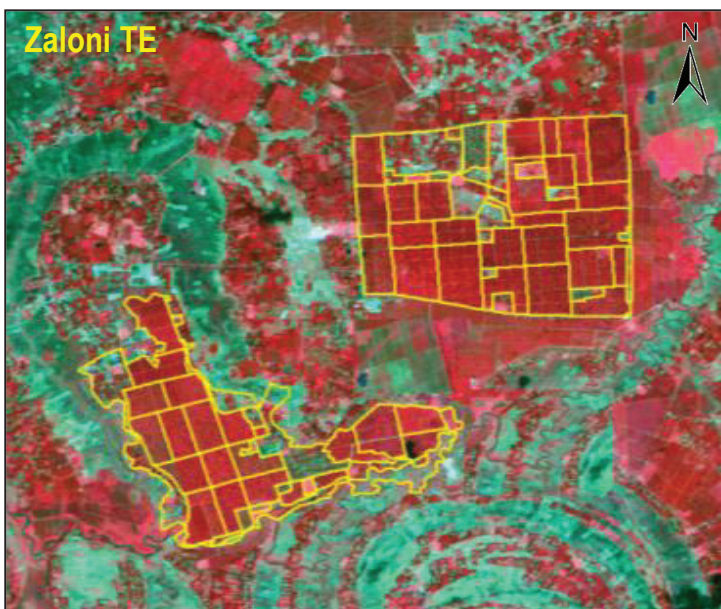
P3: Seasonal Variability in Tea Gardens



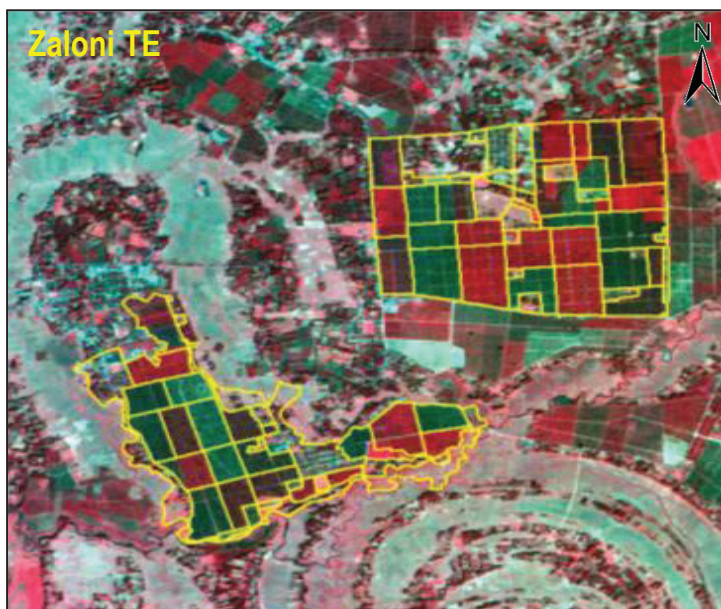
LISS IV (24 Sep 2007)



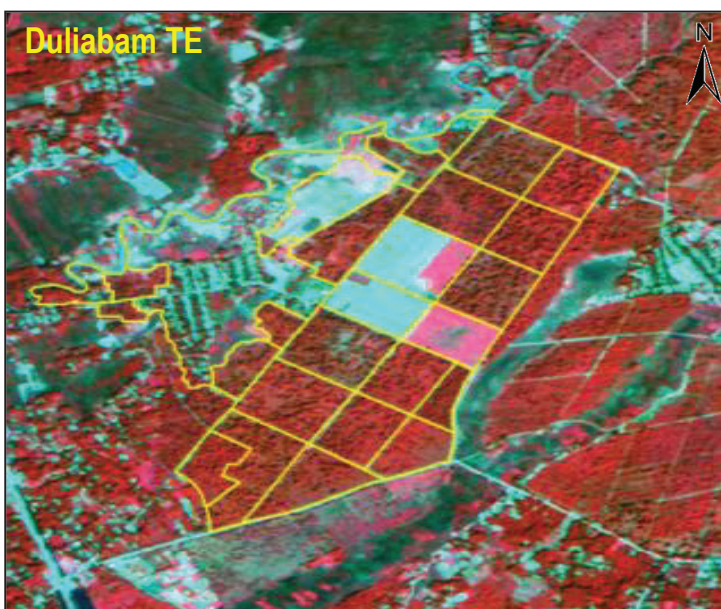
LISS IV (15 Feb 2008)



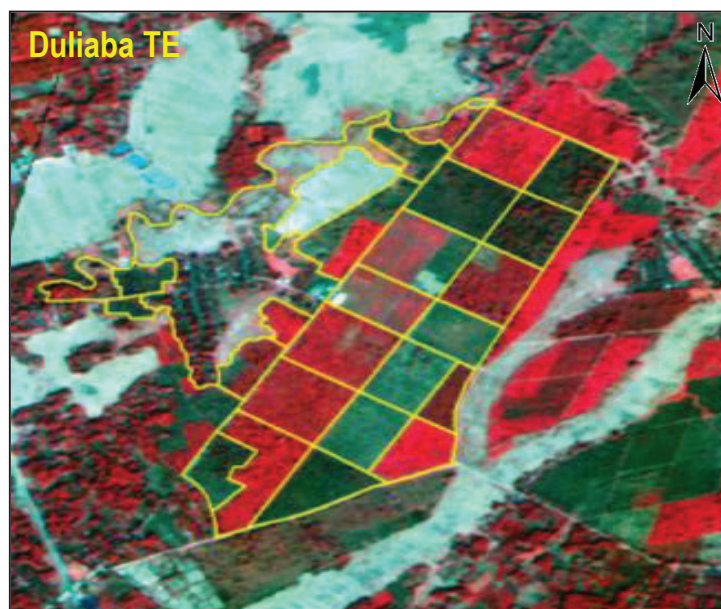
LISS IV (08 May 2006)



LISS IV (10 Mar 2008)



LISS IV (24 Sep 2007)

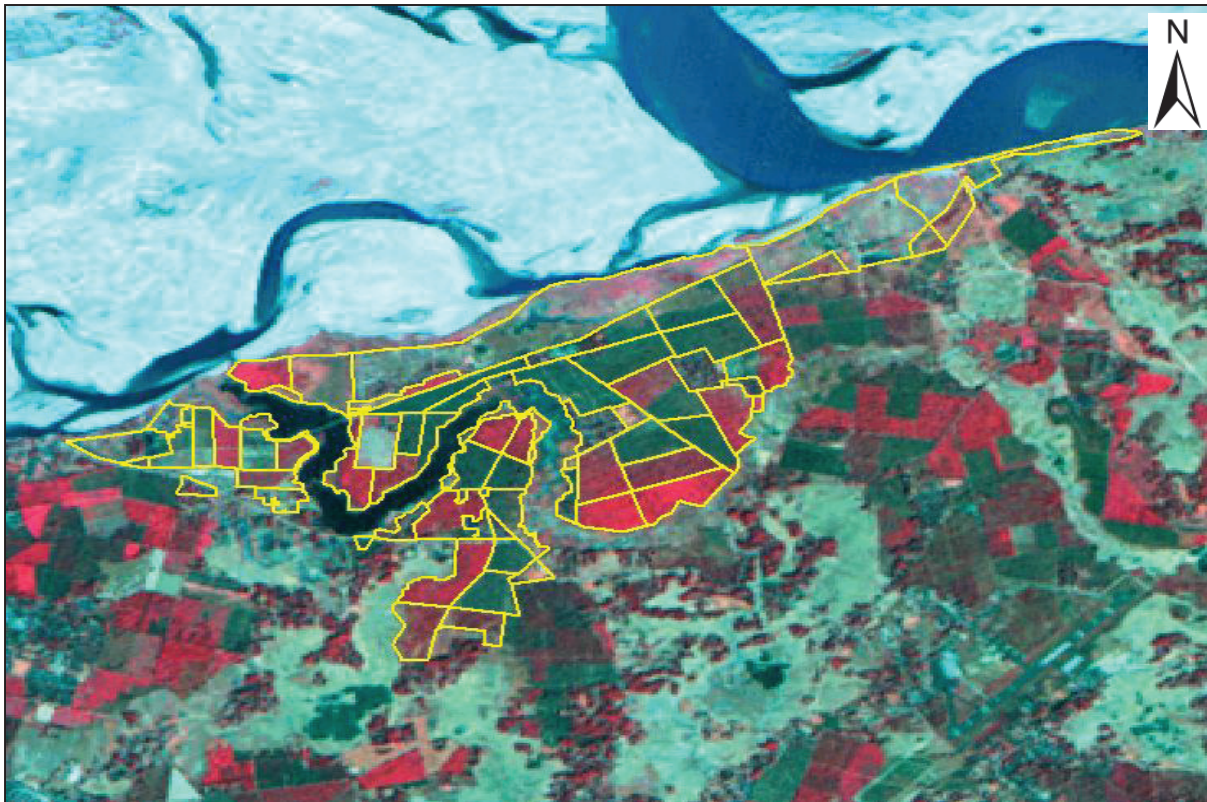
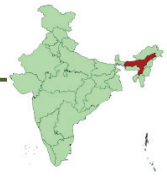


LISS IV (15 Feb 2008)

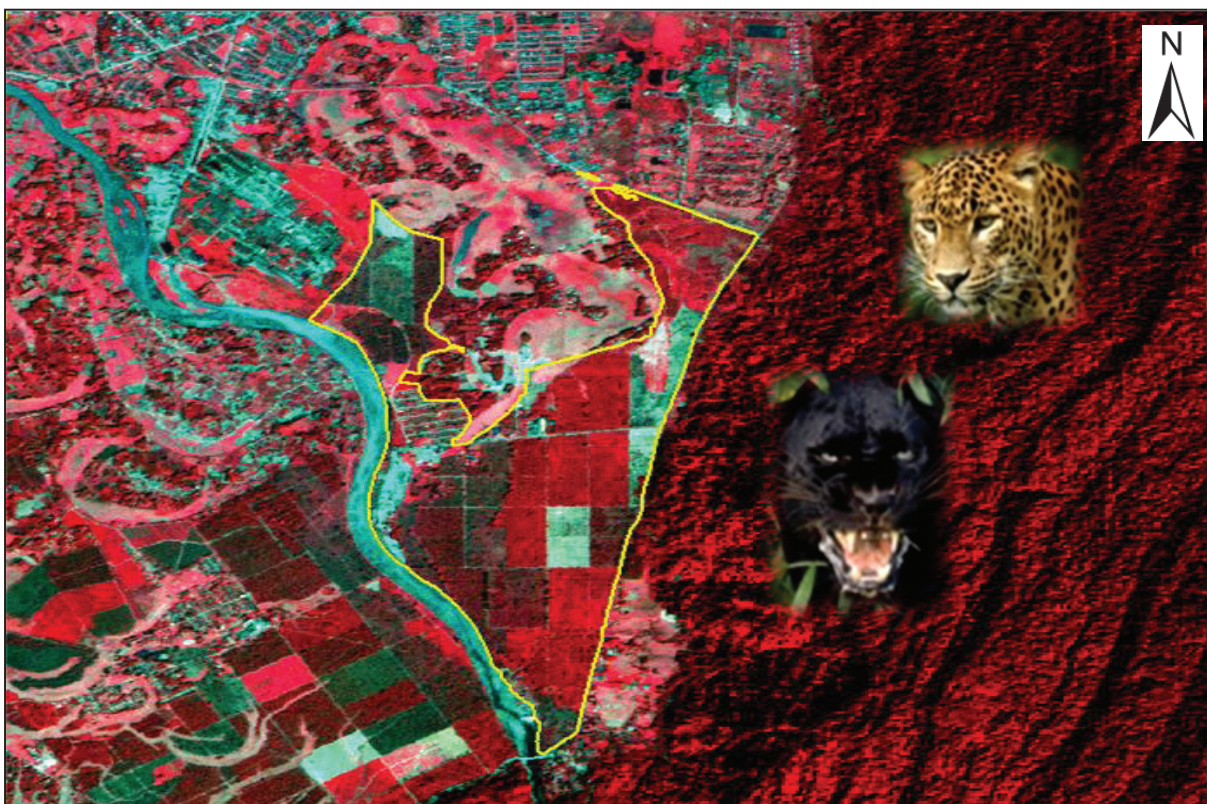




P4: Tea Estates have Erosion and Wildlife Problem



The above image is of Maijan TE of Dibrugarh district of Assam. The north boundary of the estate is close to river Brahmaputra which causes frequent flooding and bank erosion during monsoon.

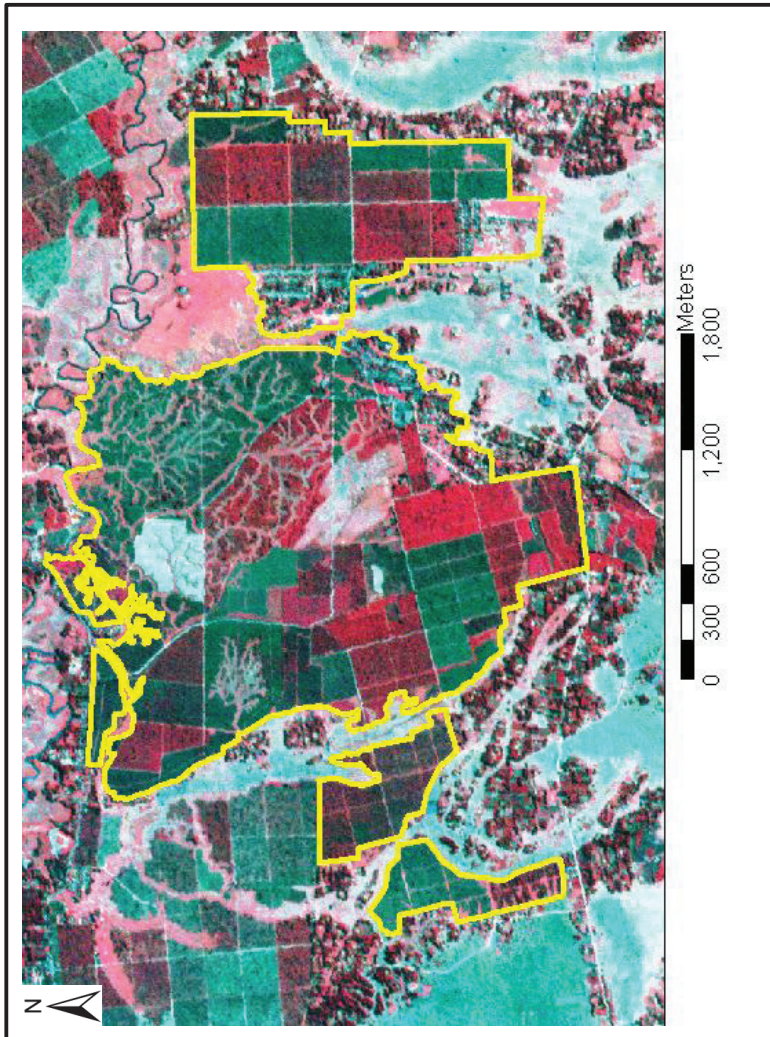


The above image is of Dilli TE of Dibrugarh district of Assam. Proximity of Joypur Reserve Forest causes frequent man – animal conflict in the estate.

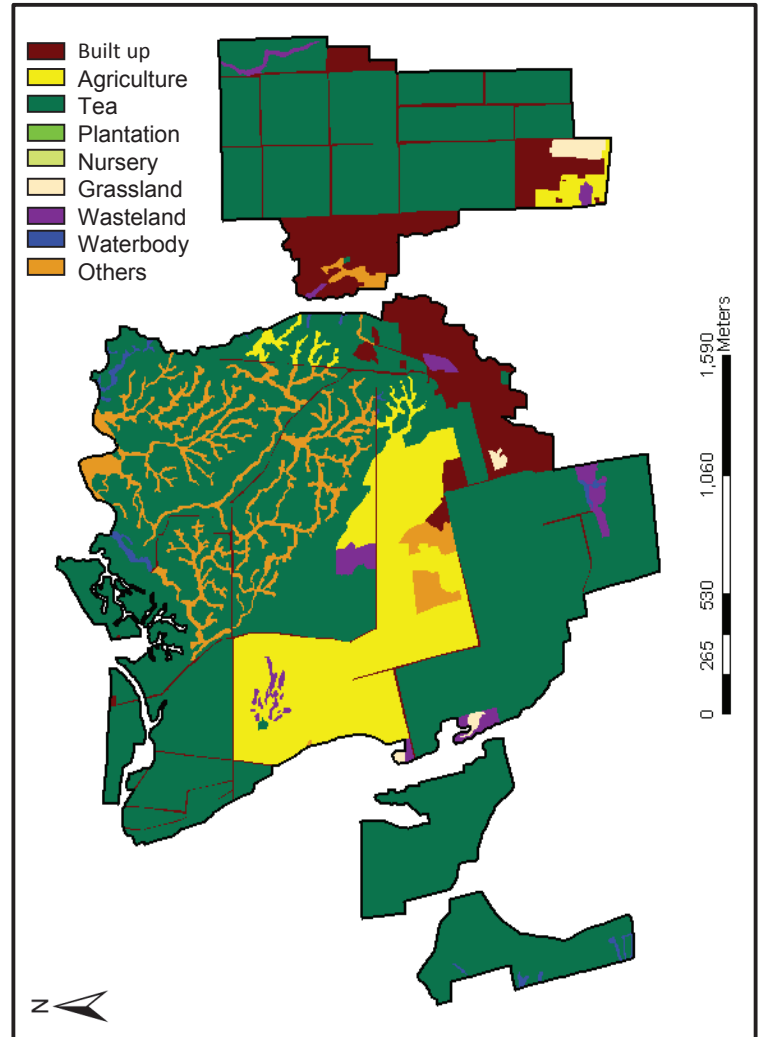




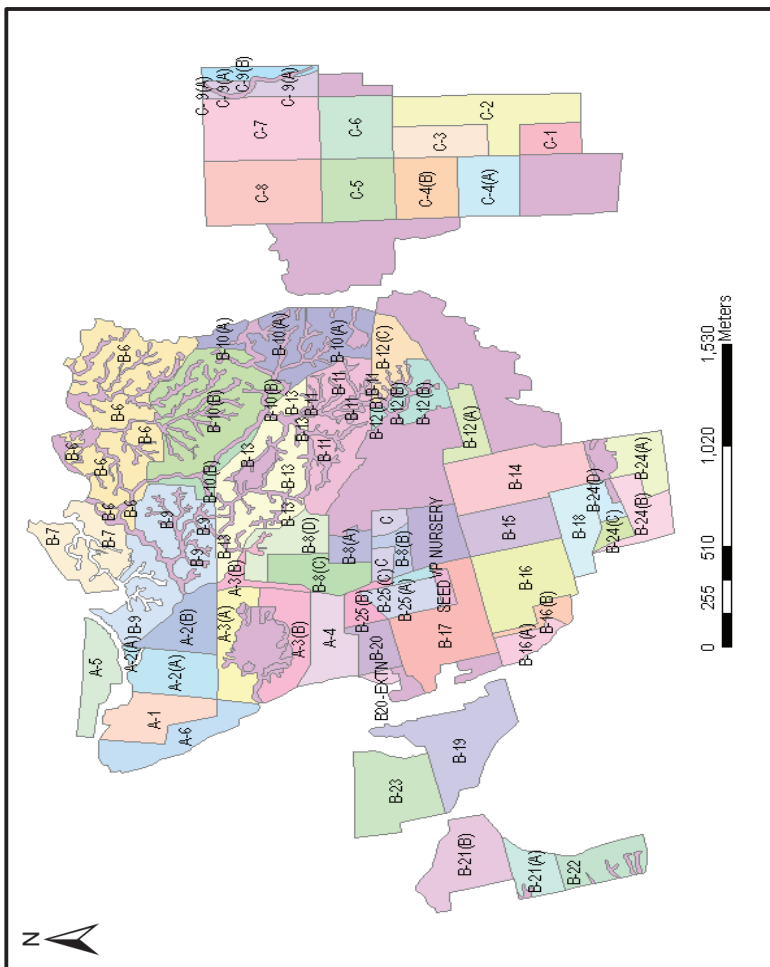
P5: ACHABAM TE



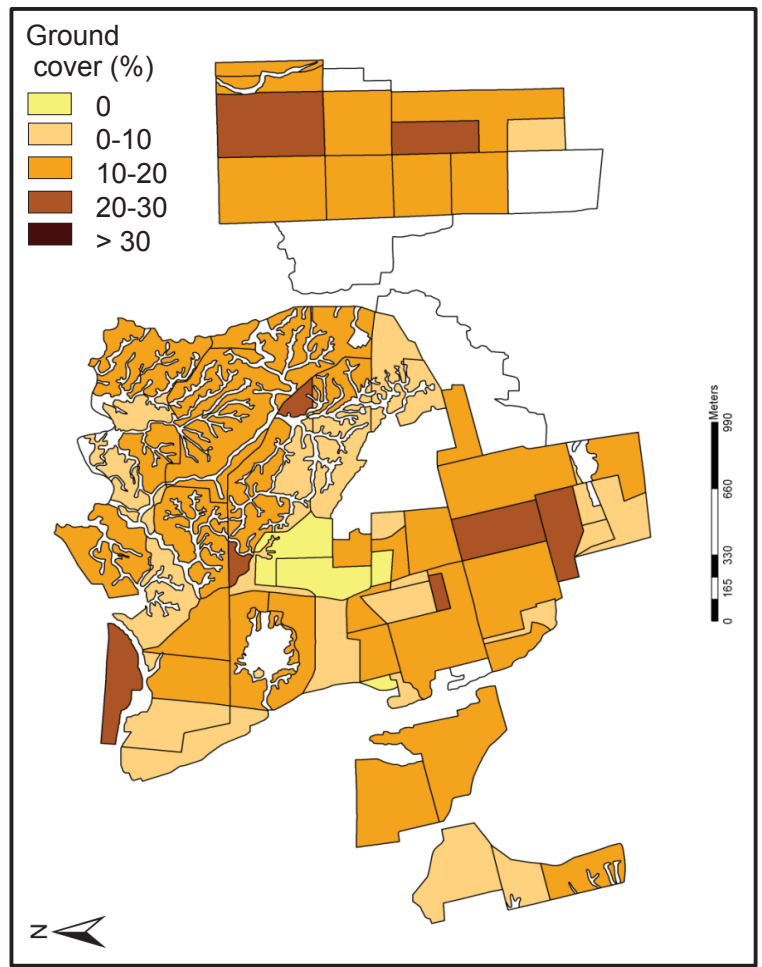
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

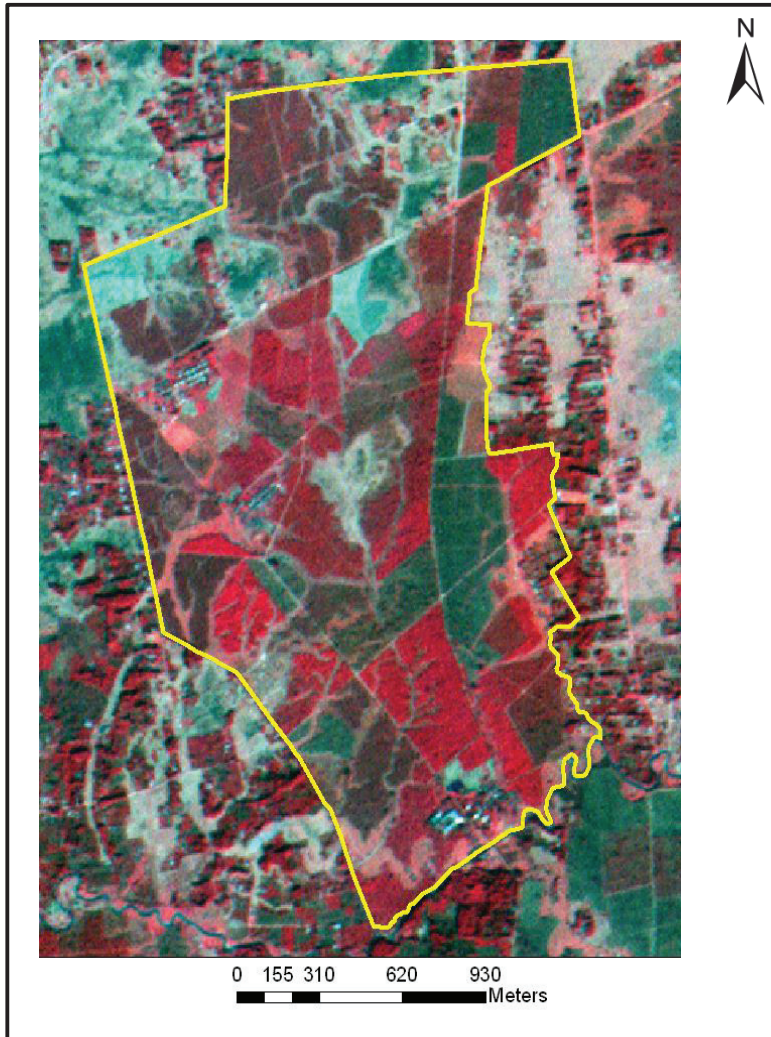




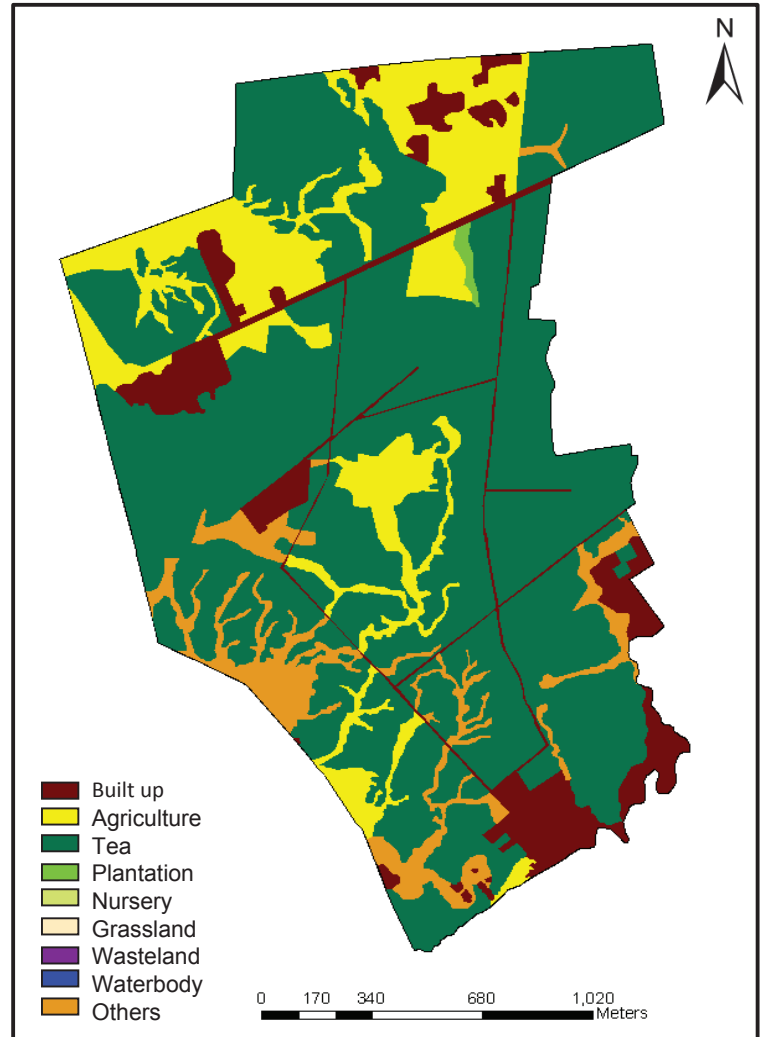
e. General Information

1. General		5. Natural resources constraints	
Contact address	PO: Naharkatia, Dist: Dibrugarh PIN: 786610	Drainage congestion and water logging	Yes
Contact phone	0374-2570060	Scarcity of water during summer	No
Name of the company	Amalgamated Plantations	River bank erosion	No
Name of the village where it falls	Achabam	Major diseases and duration	Black Rot
Leased area of the estate (ha)	701.8	Major pests and duration	<i>Helopeltis</i> , Red Spider Mites
Tea grown area of the estate (ha)	399.03	Damage due to wildlife	No
No. of divisions / sections	1 div / 55 sec	6. Yield / production	
Year of establishment	1921	Peak plucking periods	Jul - Oct
Type of tea produced	CTC, Orthodox	Annual green leaf yield	9883.67 kg/ha
2. Infrastructure		Annual production of processed tea	889124 kg
Availability of processing factory	Yes	7. Pruning	
Availability of workers colony	Yes	Time of pruning	Dec - Jan
Availability of internet facility / e-mail id	Yes	Pruning cycle	4 yrs
Meteorological observations taken	Tmax, Tmin, Rainfall	Types of pruning	CA-UP-DS-MS, CA-UP-DS-UP
3. Amenities		8. Fertilizer use	
Availability of health care / dispensary	Yes	Types of N, P, K fertilizers used	Urea, RP, MOP
Availability of school	Yes	Dose of Nitrogen (kg/ha)	119
4. Shade trees		Dose of Phosphorous (kg/ha)	38
Shade tree density (garden level)	Medium	Dose of Potash (kg/ha)	101
Plant to plant spacing (m)	0.75 X 0.75	Whether lime is applied, if yes dose	No
Row to row spacing (m)	1.05 x 1.05		

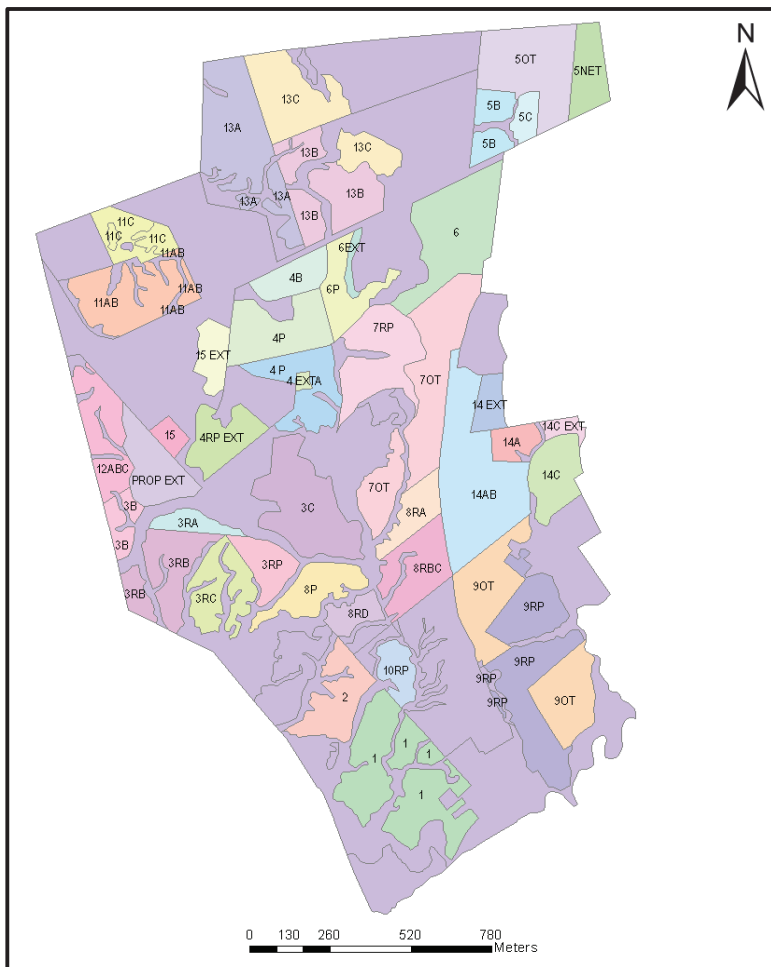




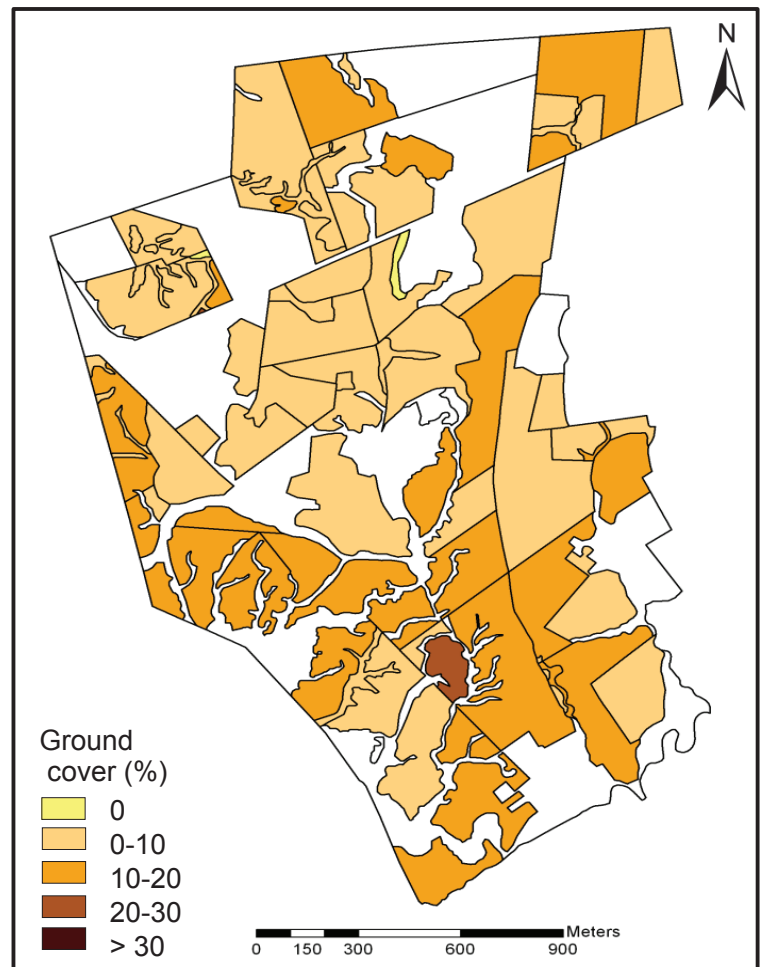
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse

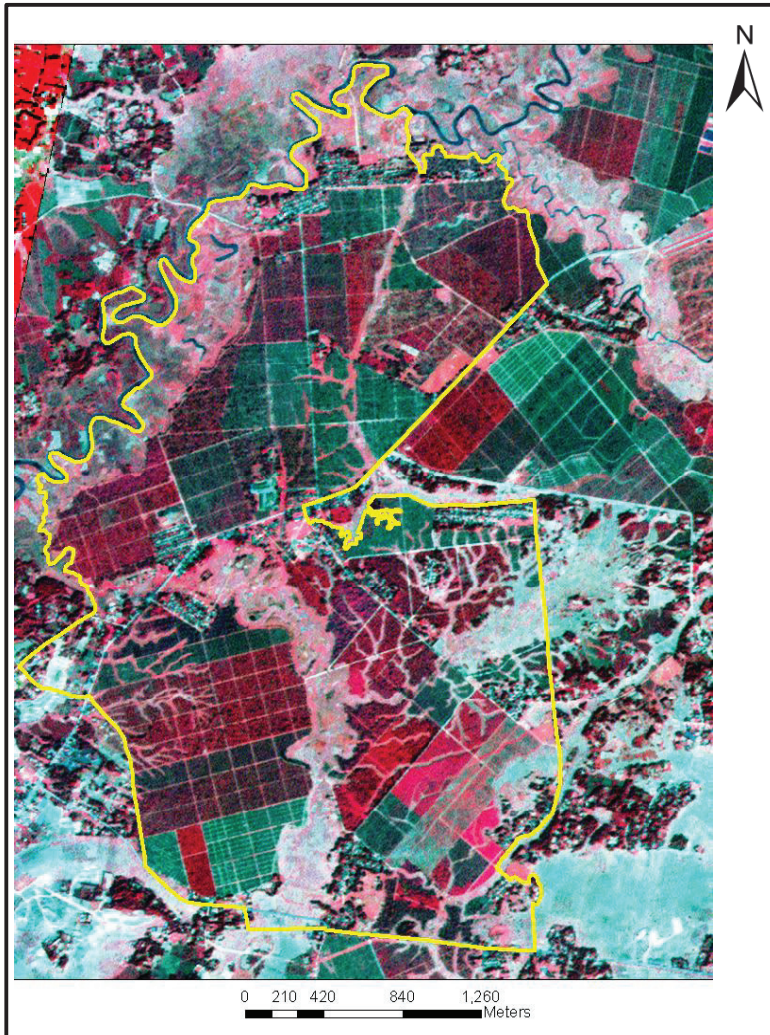


c. Section Boundaries of the Estate

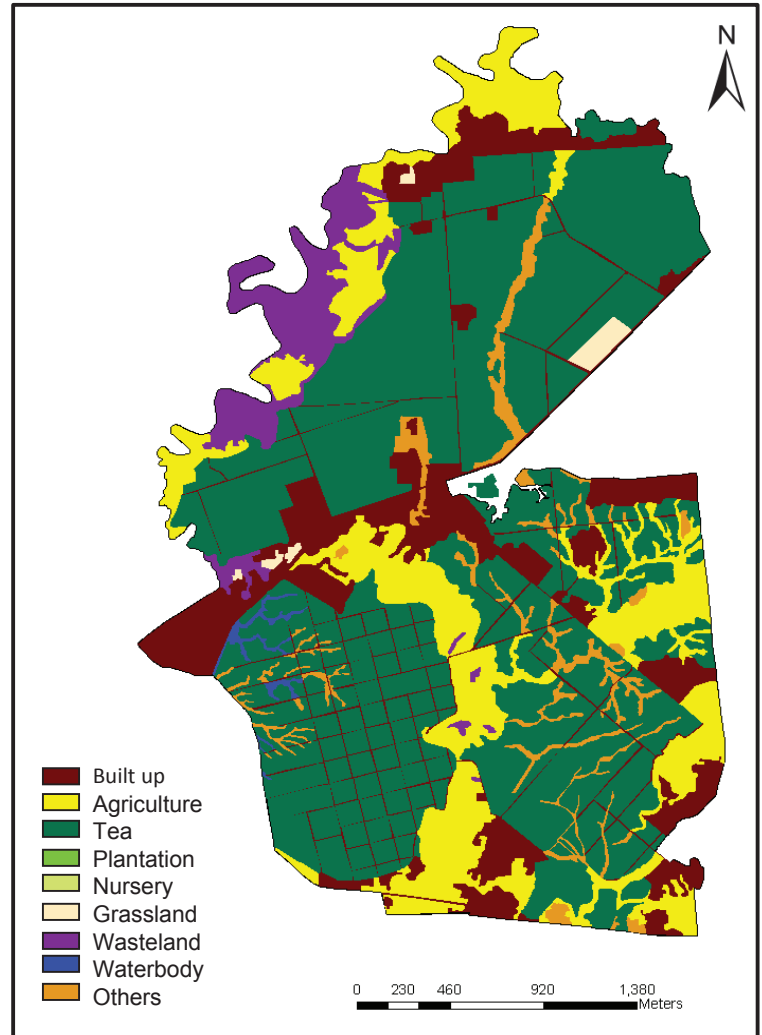


d. Shade Tree Density in Sections

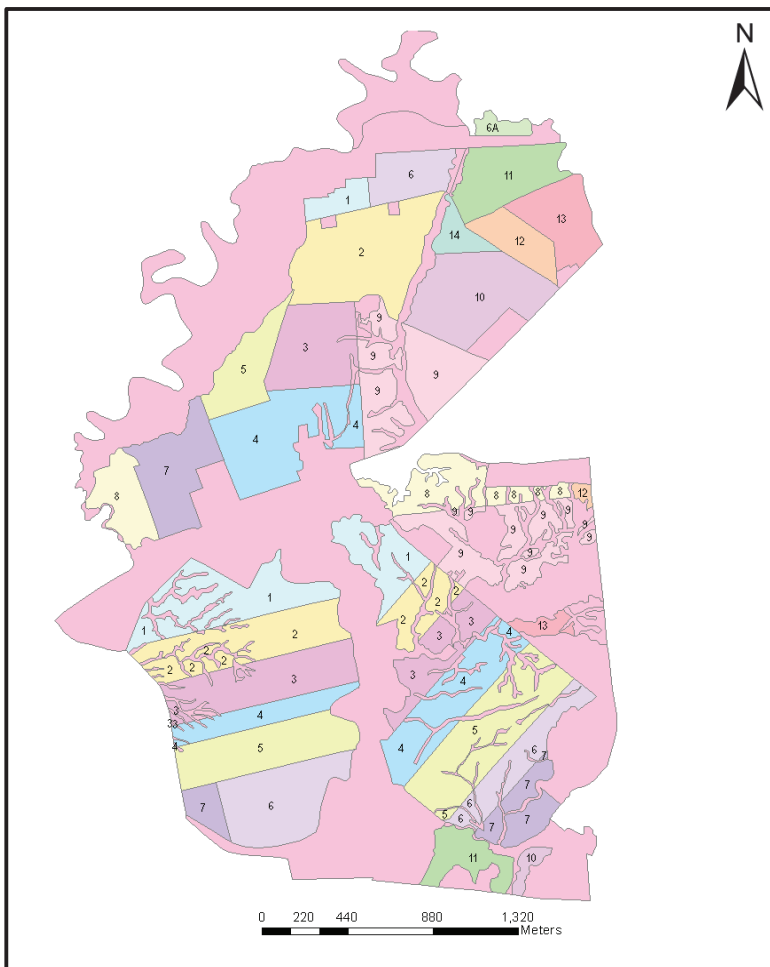




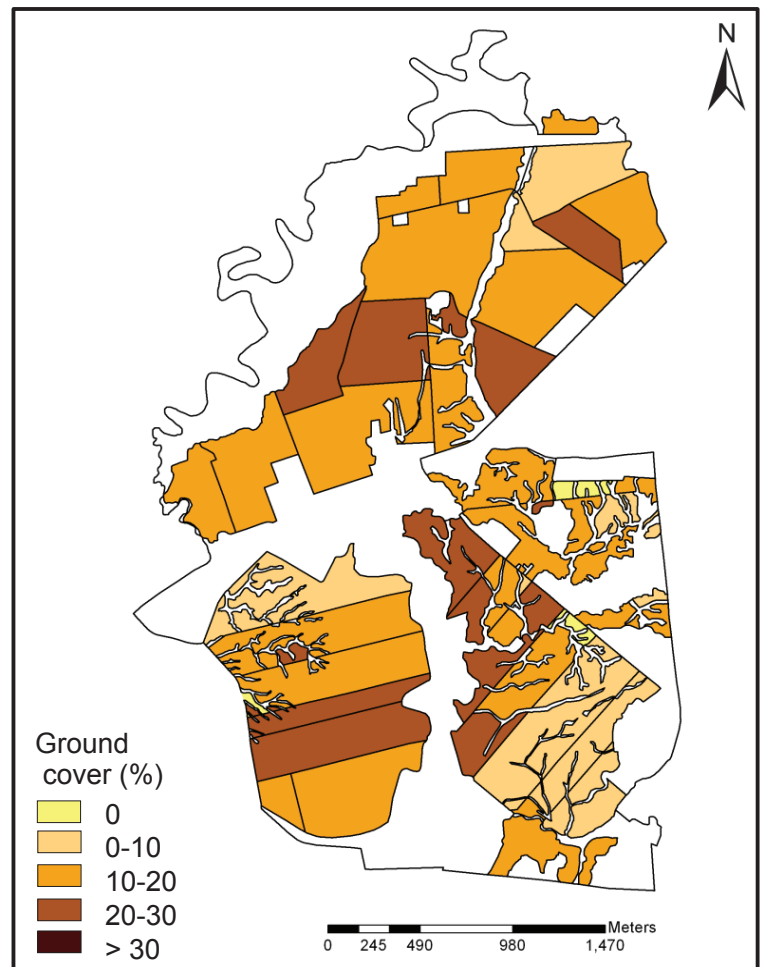
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse

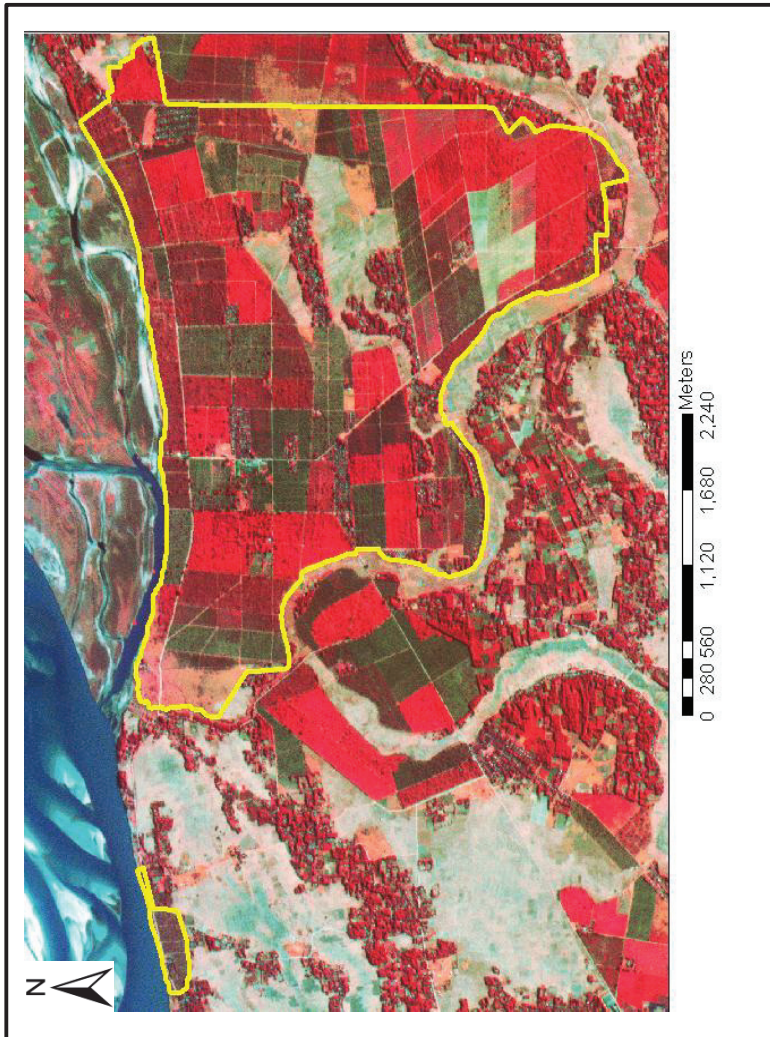


c. Section Boundaries of the Estate

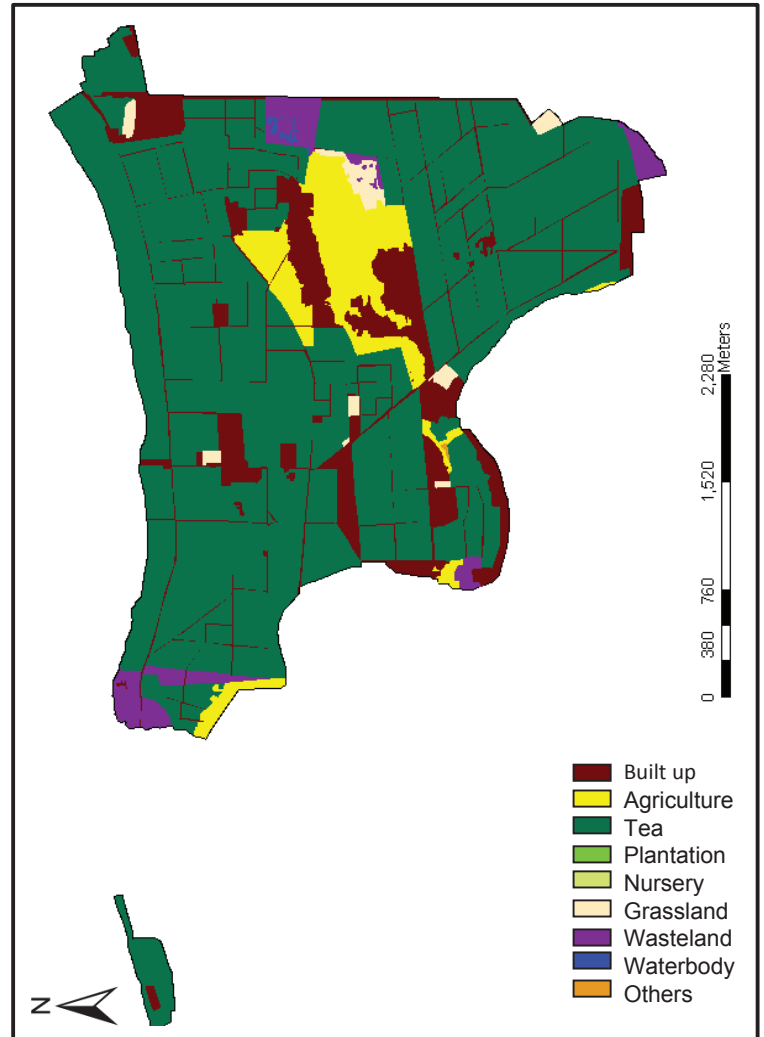


d. Shade Tree Density in Sections

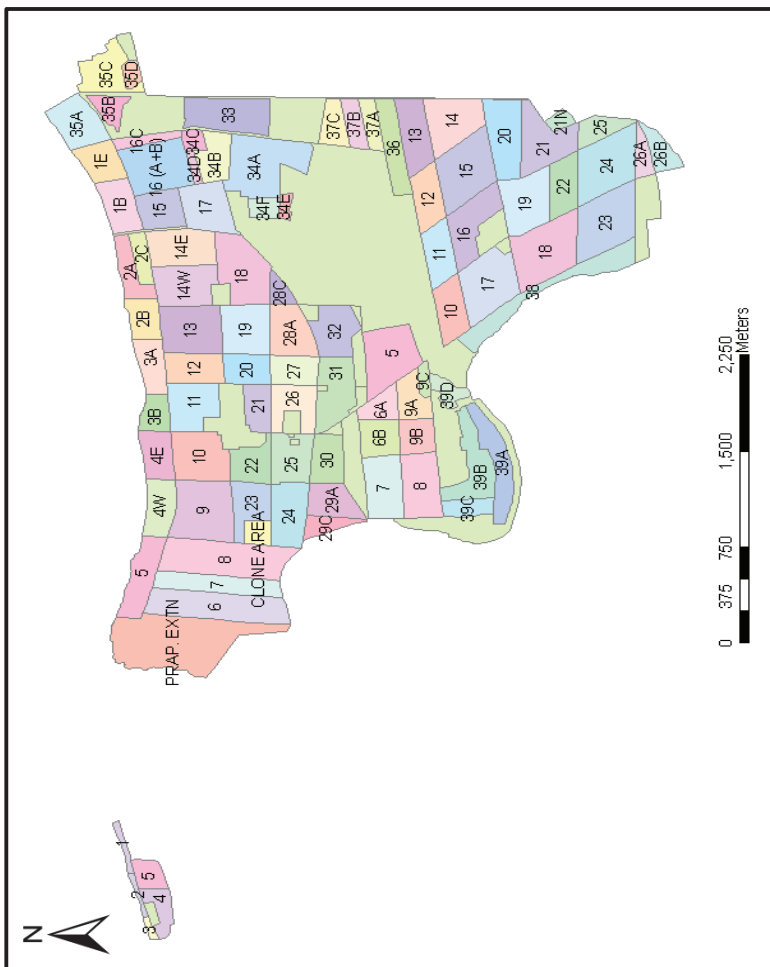




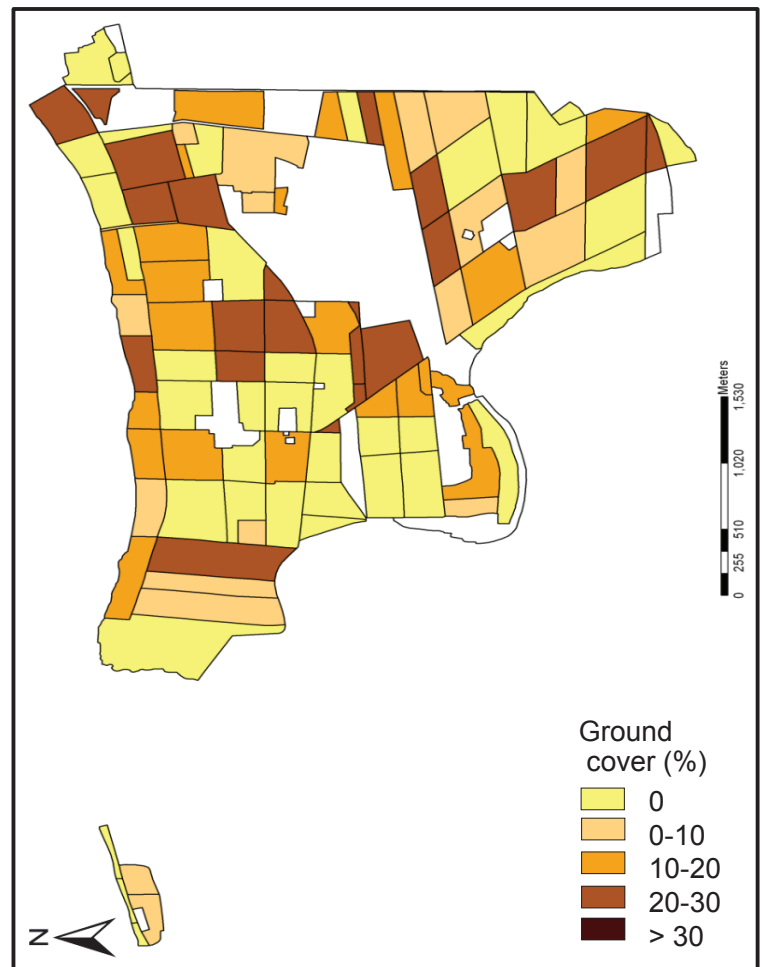
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate

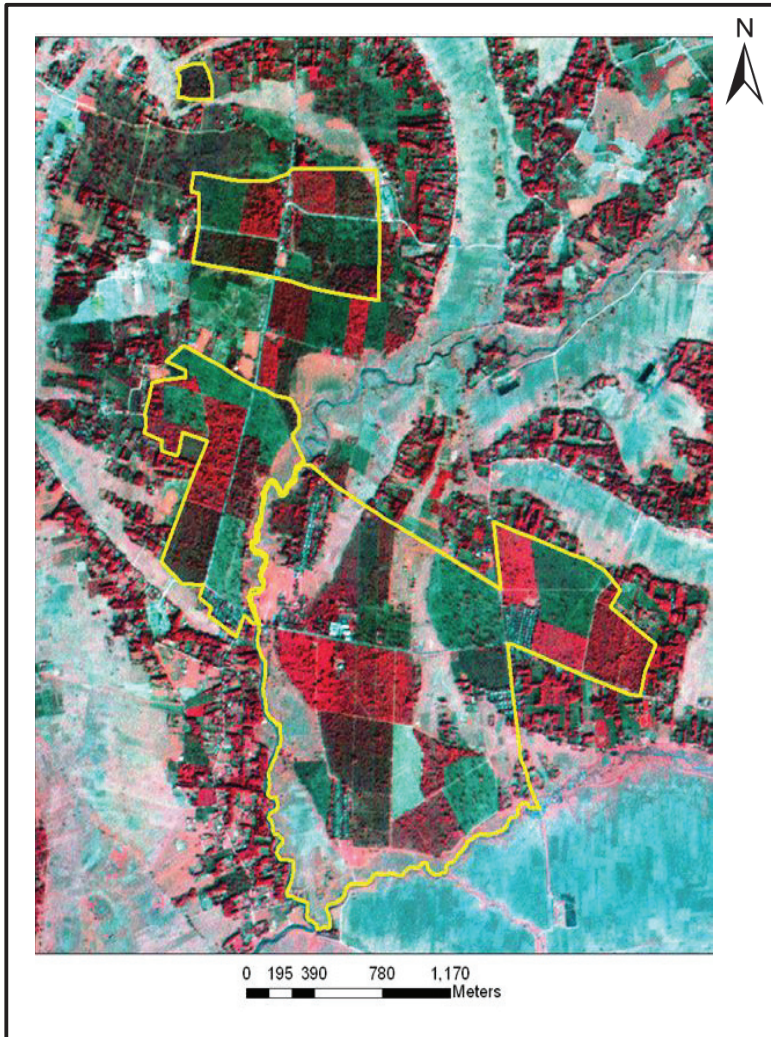


d. Shade Tree Density in Sections

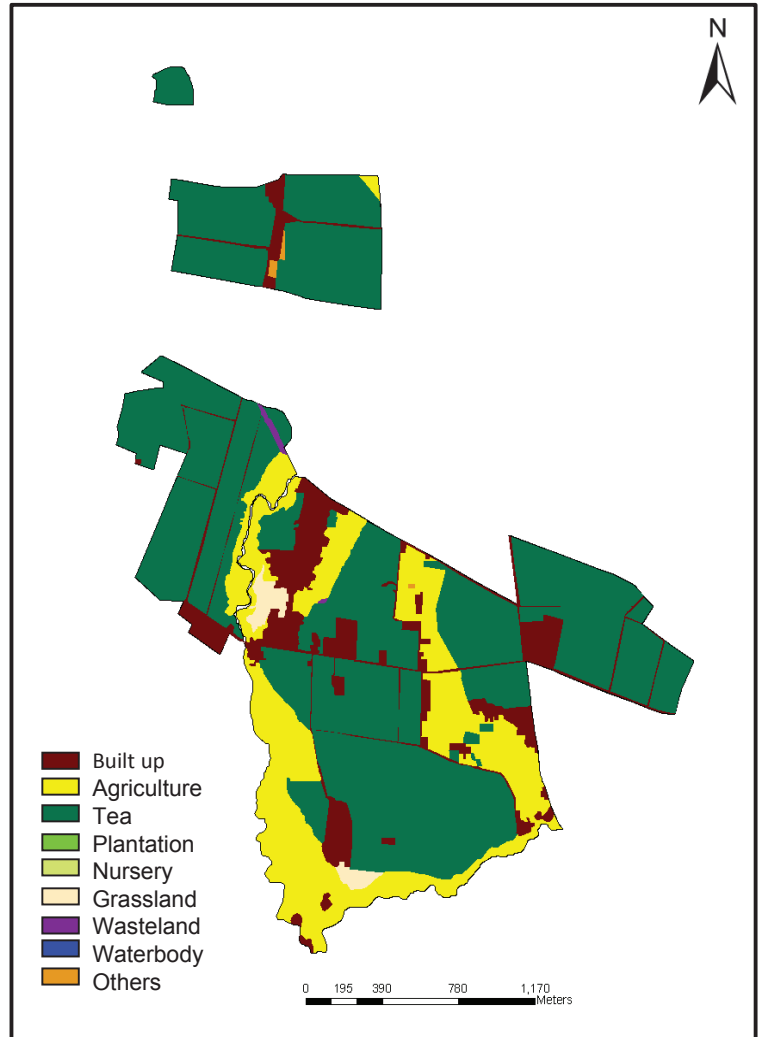




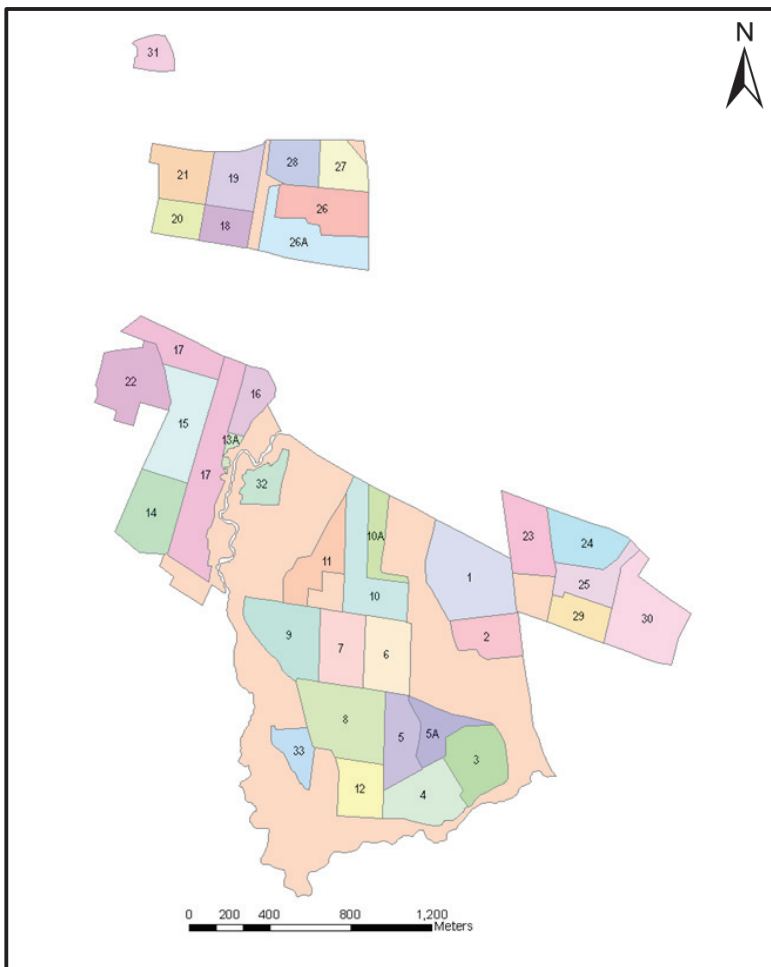
P9: BASMATIA TE



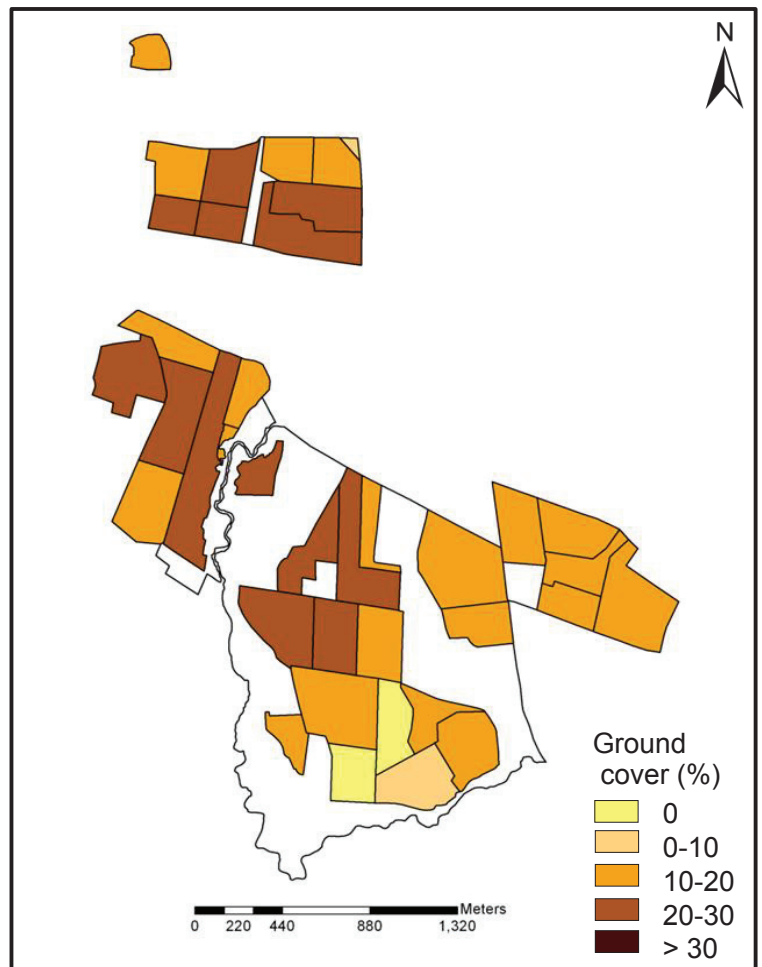
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate

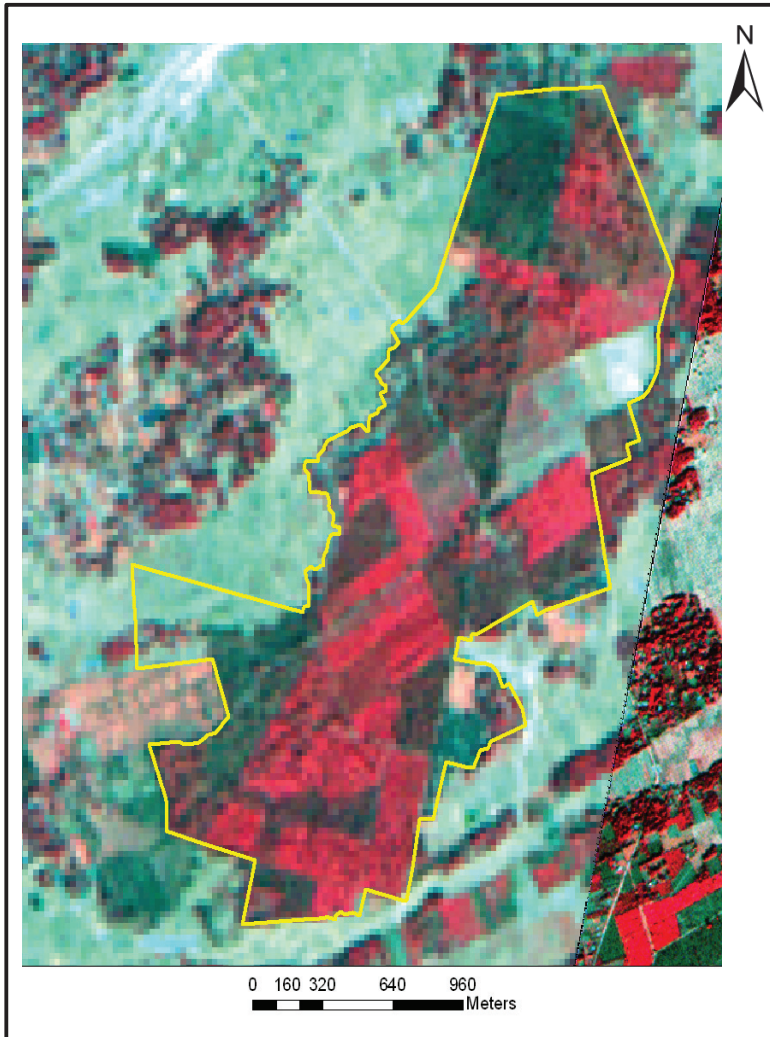


d. Shade Tree Density in Sections

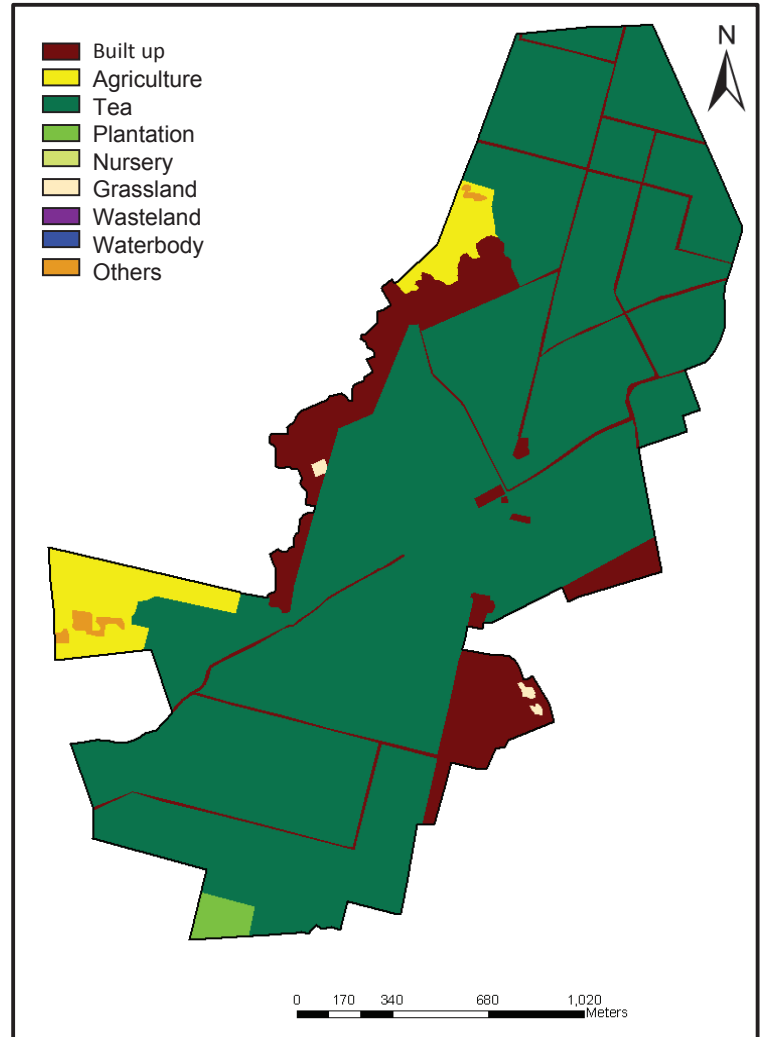




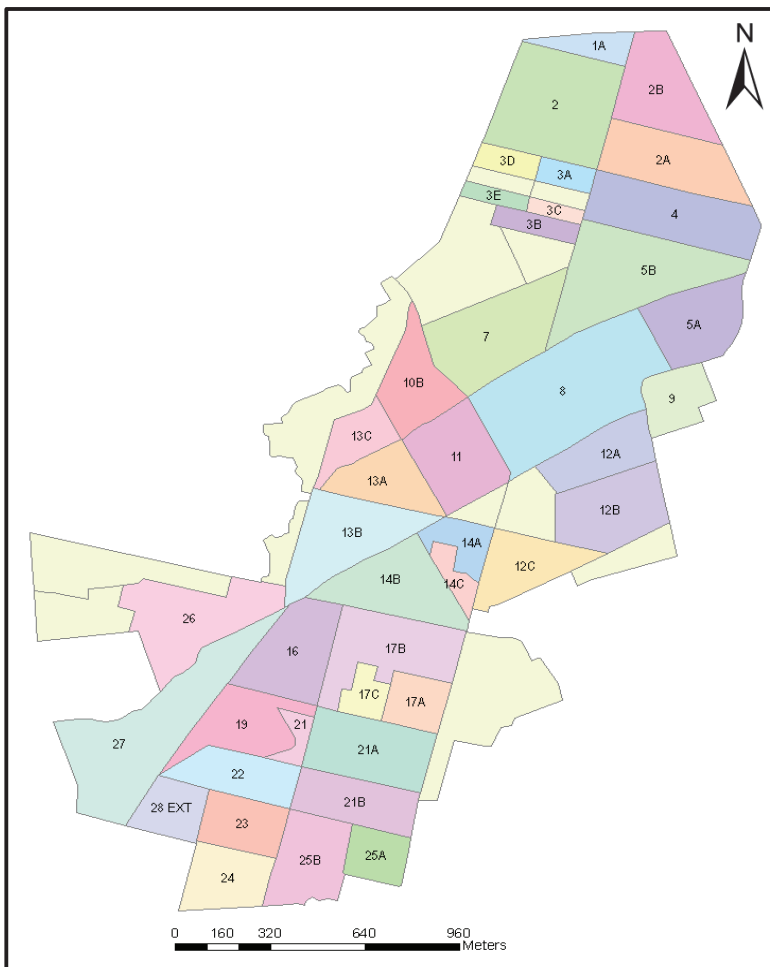
P10: BAUGHPARA TE



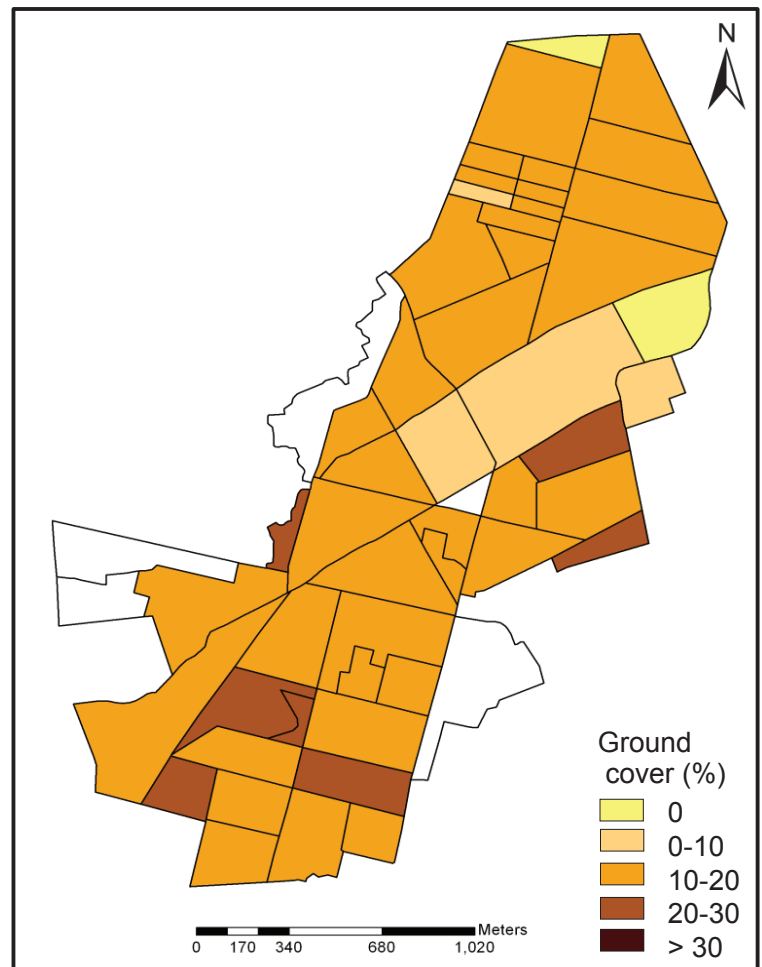
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse

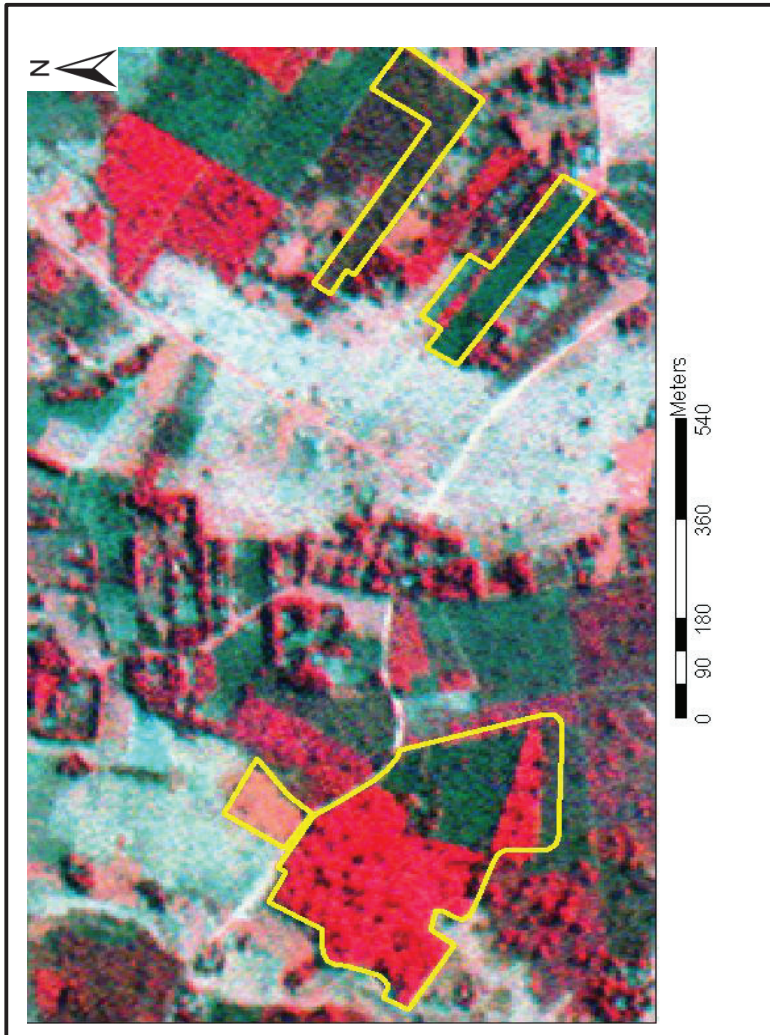


c. Section Boundaries of the Estate

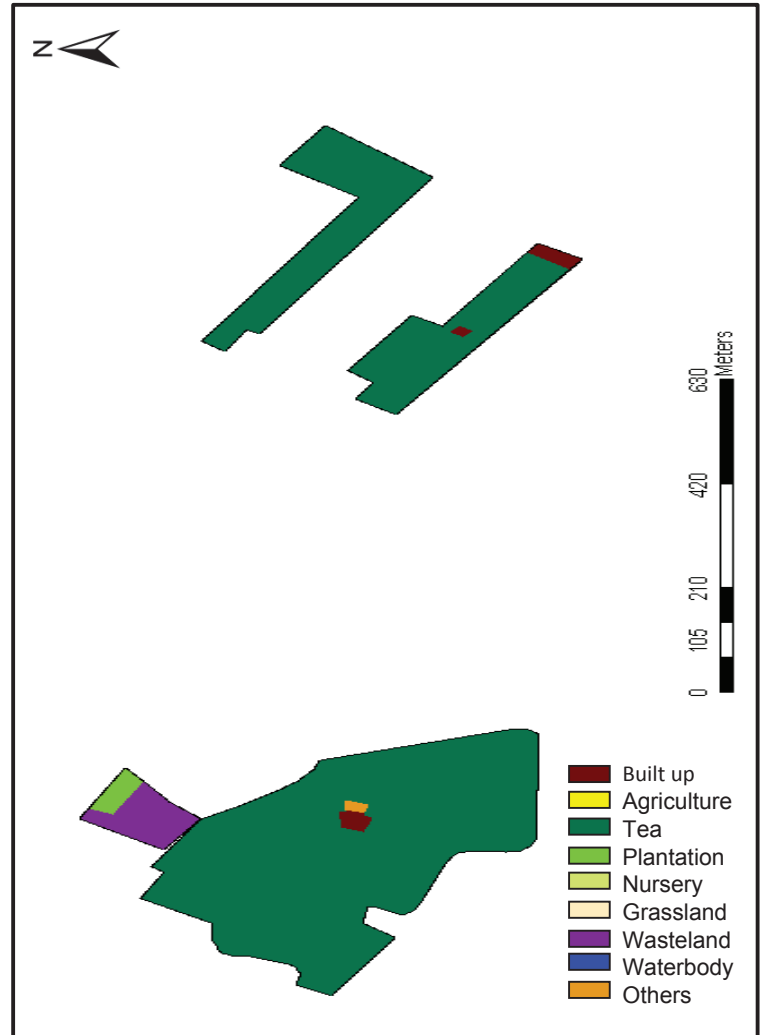


d. Shade Tree Density in Sections

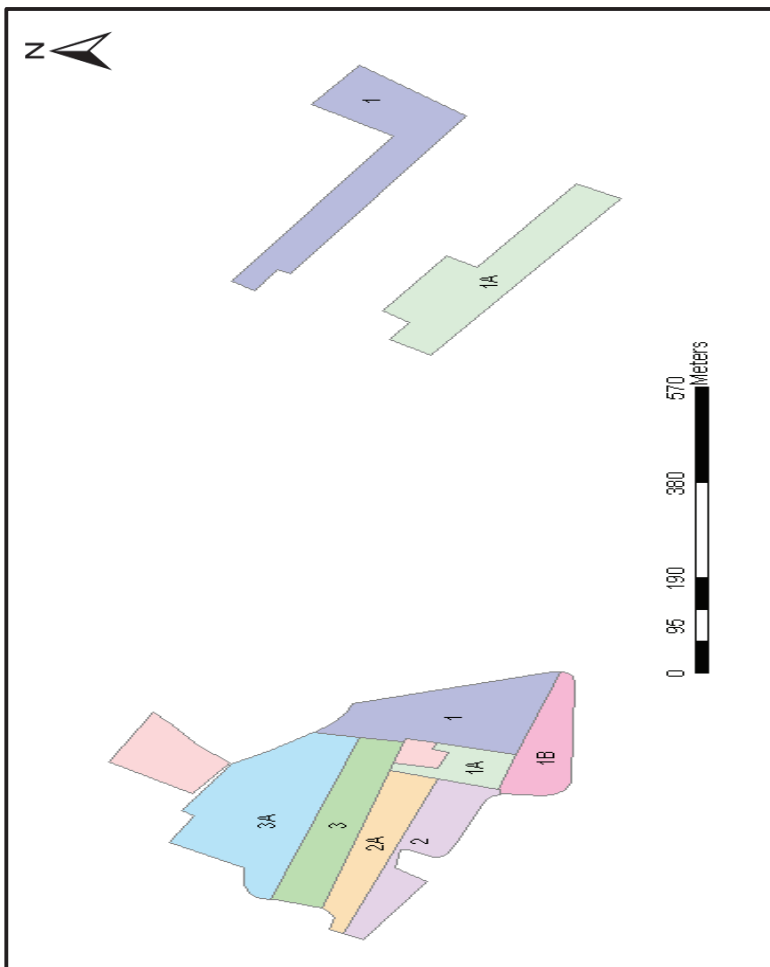




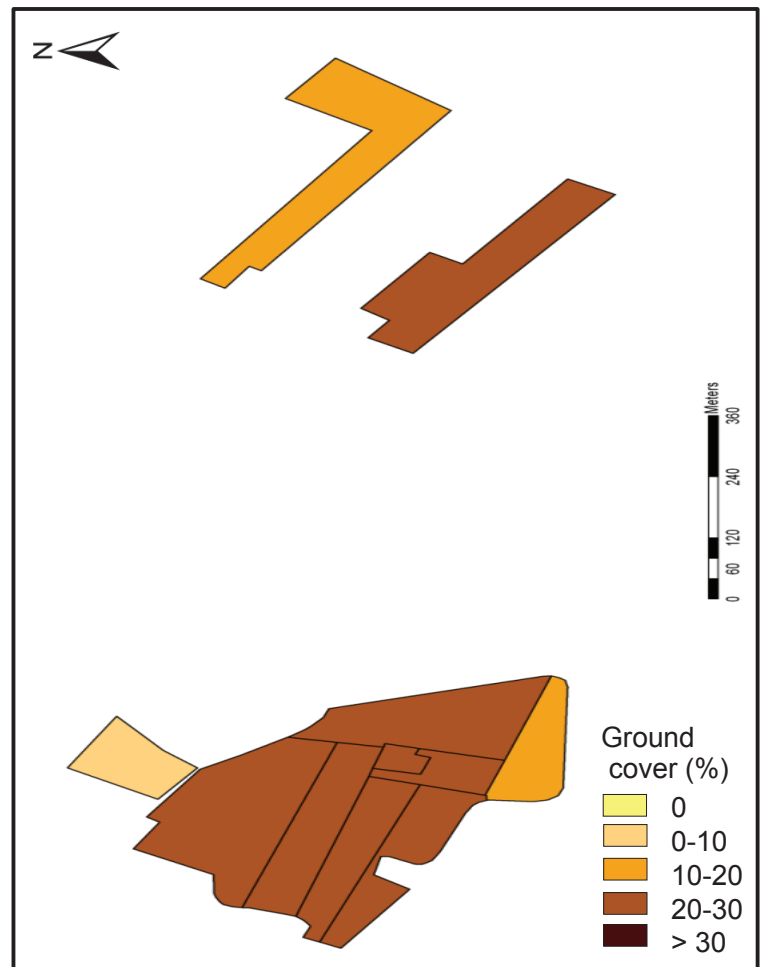
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

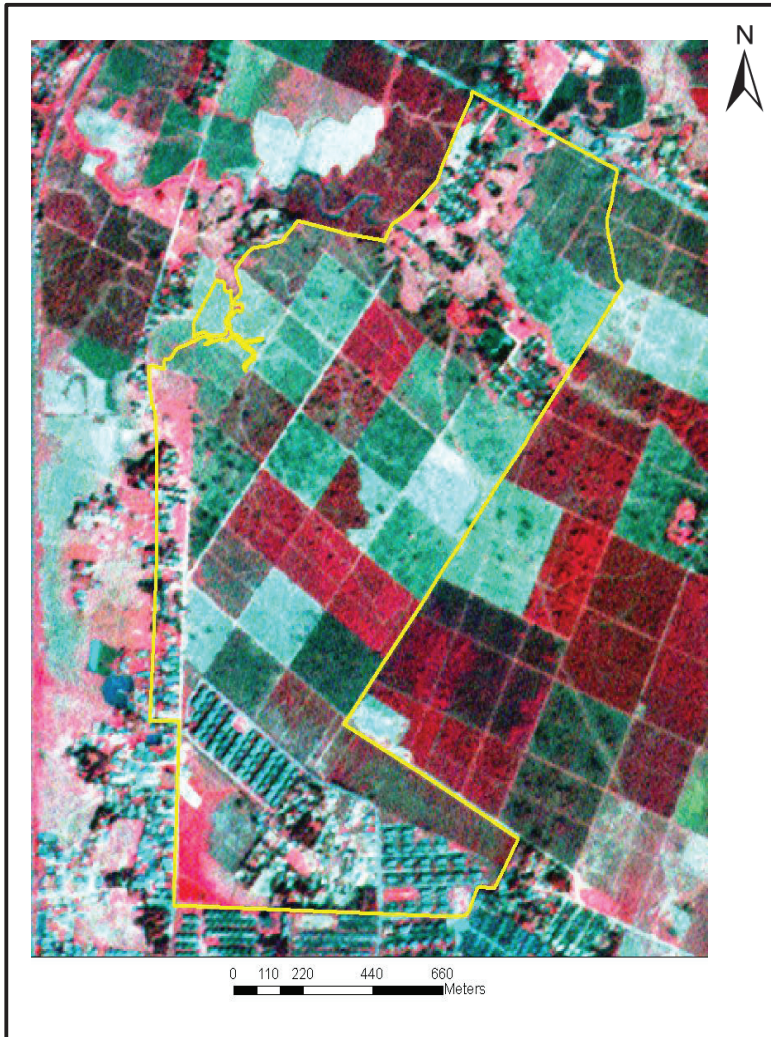




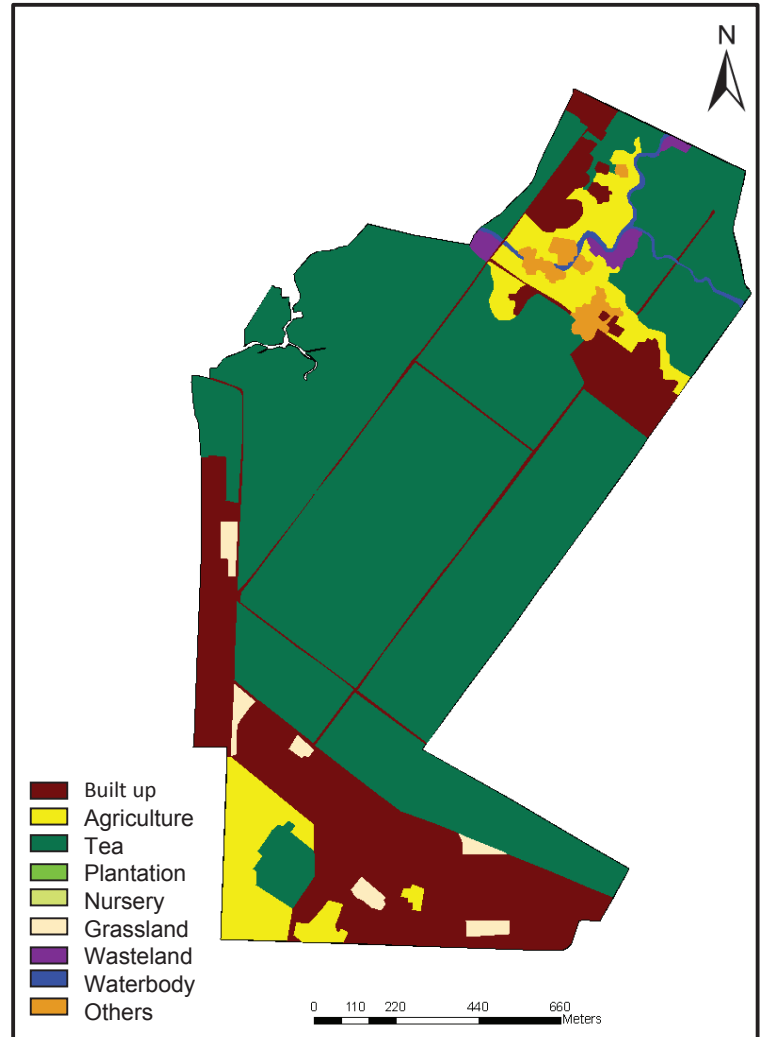
e. General Information

1. General		5. Natural resources constraints	
Contact address	HO: Graham Bazar, Jain Temple Road, Dist: Dibrugarh PIN: 786101	Drainage congestion and water logging	Yes
Contact phone	0373-2324968, 2320770	Scarcity of water during summer	No
Name of the company	Highland Farming Company	River bank erosion	No
Name of the village where it falls	No.2, Basmatia Grant gaon	Major diseases and duration	--
Leased area of the estate (ha)	19.32	Major pests and duration	--
Tea grown area of the estate (ha)	17.18	Damage due to wildlife	
No. of divisions / sections	2 div / 9 sec	6. Yield / production	
Year of establishment	1974	Peak plucking periods	May - Sep
Type of tea produced	--	Annual green leaf yield	756.69 kg/ha
2. Infrastructure		Annual production of processed tea	225000 kg
Availability of processing factory	No	7. Pruning	
Availability of workers colony	No	Time of pruning	Dec - Jan
Availability of internet facility / e-mail id	No	Pruning cycle	4 yrs
Meteorological observations taken	--	Types of pruning	--
3. Amenities		8. Fertilizer use	
Availability of health care / dispensary	No	Types of N, P, K fertilizers used	--
Availability of school	No	Dose of Nitrogen (kg/ha)	380
4. Shade trees		Dose of Phosphorous (kg/ha)	235
Shade tree density (garden level)	Medium	Dose of Potash (kg/ha)	250
Plant to plant spacing (m)	--	Whether lime is applied, if yes dose	--
Row to row spacing (m)	12 X 12		

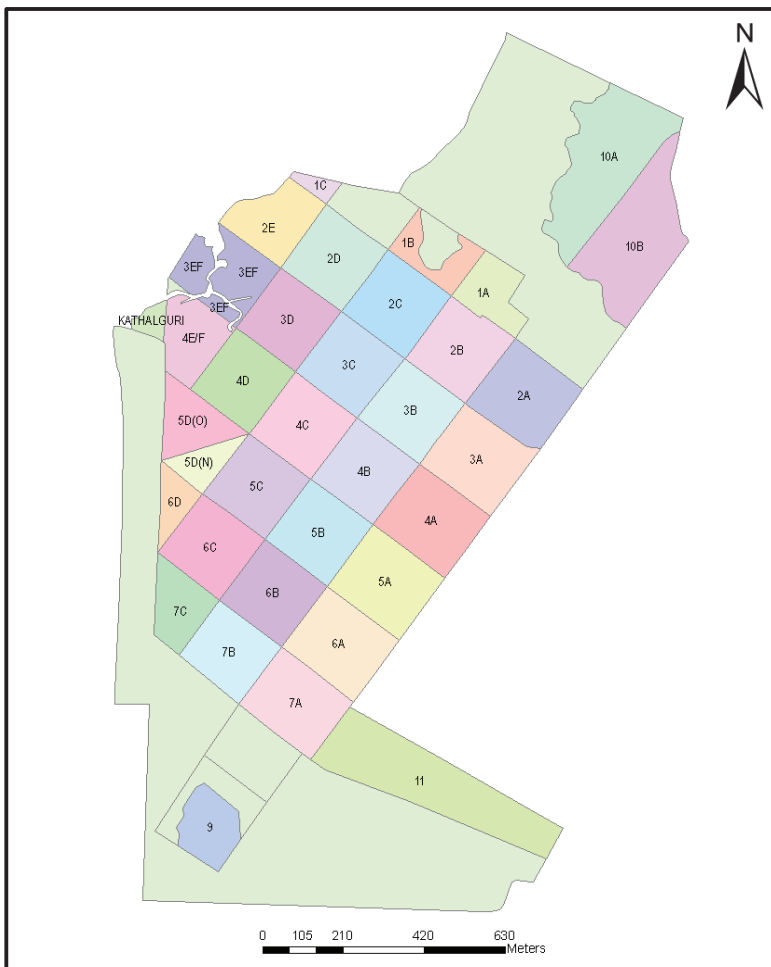




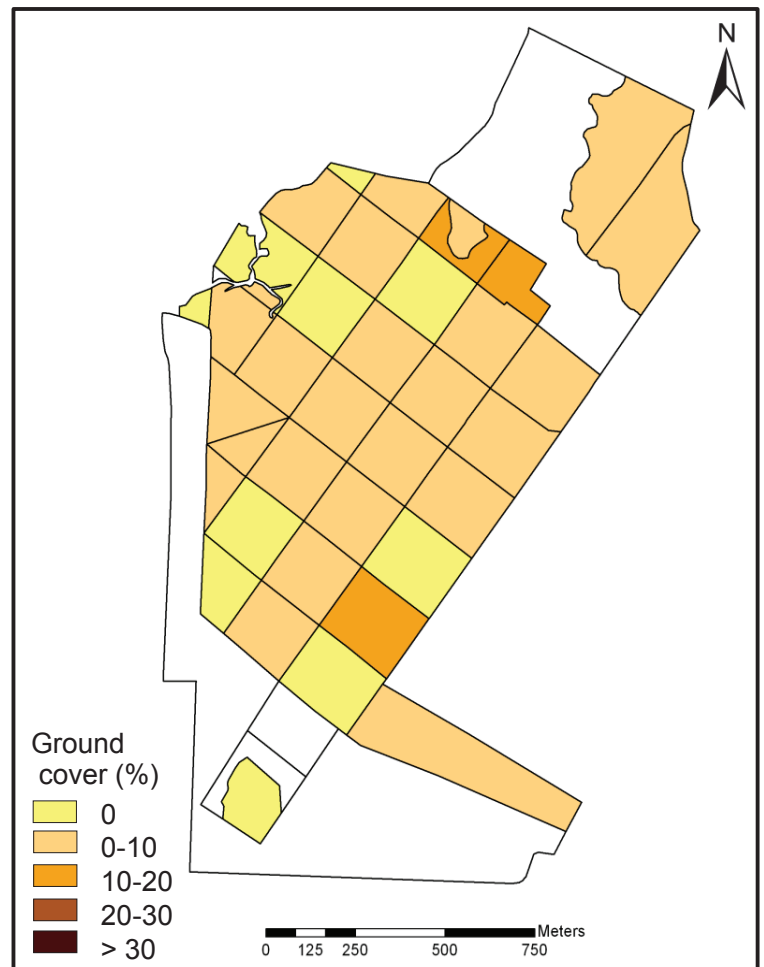
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

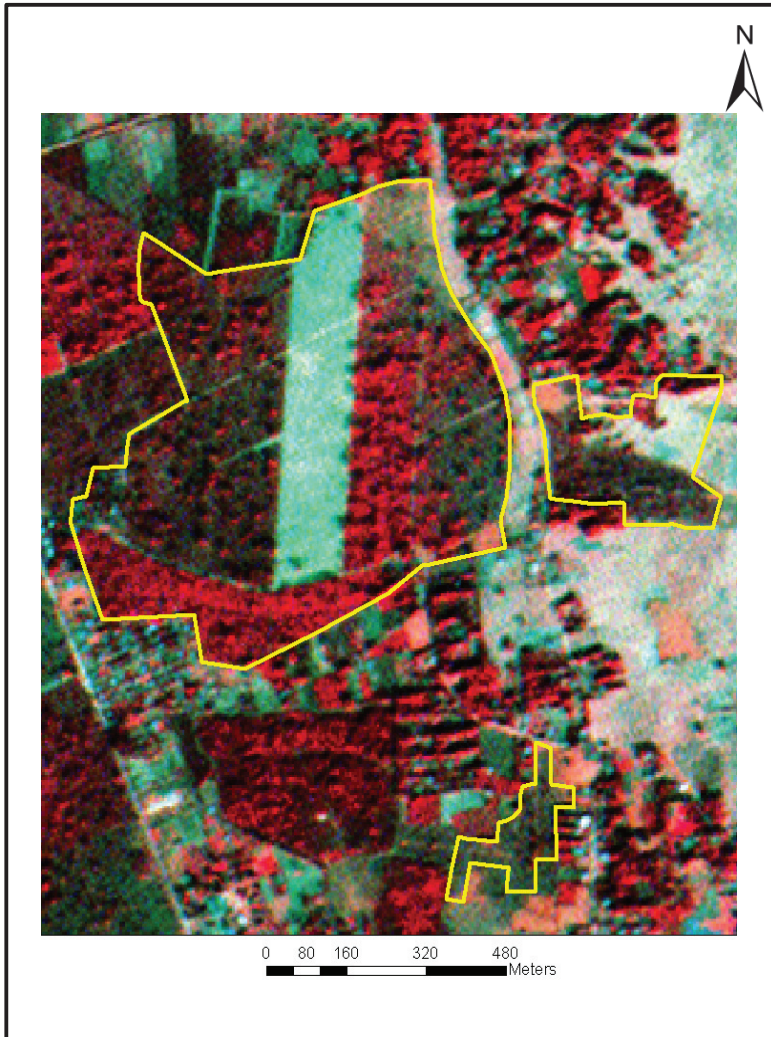




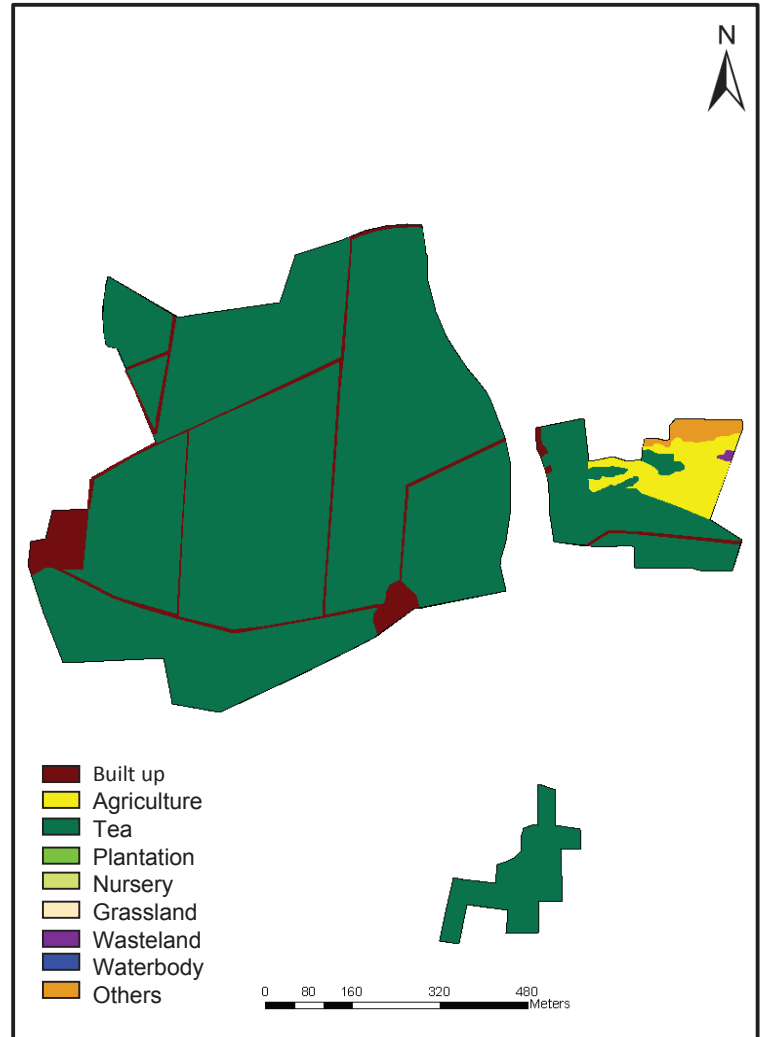
e. General Information

1. General		5. Natural resources constraints	
Contact address	PO: Hoogrijan, Dist: Dibrugarh	Drainage congestion and water logging	Yes
Contact phone	0950-8110812	Scarcity of water during summer	No
Name of the company	Shivdham Industries Pvt Ltd	River bank erosion	Yes
Name of the village where it falls	Bordutri	Major diseases and duration	Root (Red Rust)
Leased area of the estate (ha)	198.32	Major pests and duration	Red Spider Mite, <i>Helopeltis</i> , Other Mites
Tea grown area of the estate (ha)	129.62	Damage due to wildlife	No
No. of divisions / sections	1 div/34 sec	6. Yield / production	
Year of establishment	1840	Peak plucking periods	Jun-Oct
Type of tea produced	CTC	Annual green leaf yield	54.40 kg/ha
2. Infrastructure		Annual production of processed tea	182855 kg
Availability of processing factory	Yes	7. Pruning	
Availability of workers colony	Yes	Time of pruning	Nov - Jan
Availability of internet facility / e-mail id	No	Pruning cycle	4 yrs
Meteorological observations taken	Rainfall	Types of pruning	--
3. Amenities		8. Fertilizer use	
Availability of health care / dispensary	Yes	Types of N, P, K fertilizers used	Urea, MOP, RP
Availability of school	Yes	Dose of Nitrogen (kg/ha)	140
4. Shade trees		Dose of Phosphorous (kg/ha)	40
Shade tree density (garden level)	Low	Dose of Potash (kg/ha)	100
Plant to plant spacing (m)	12 x 12	Whether lime is applied, if yes dose	No
Row to row spacing (m)	12 x 12		

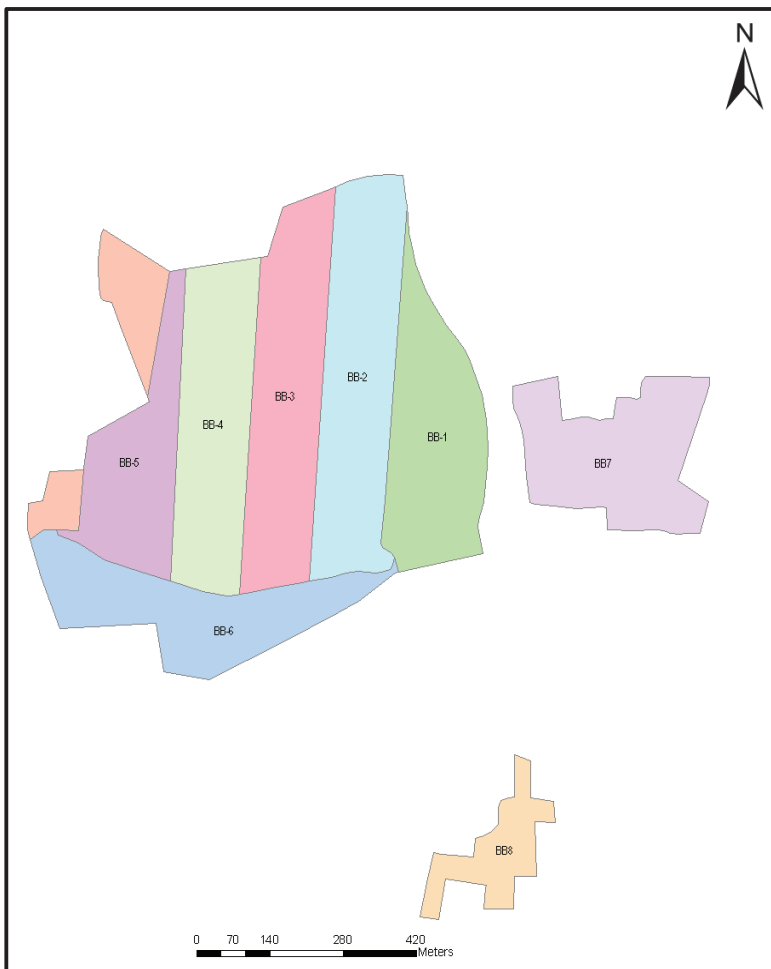




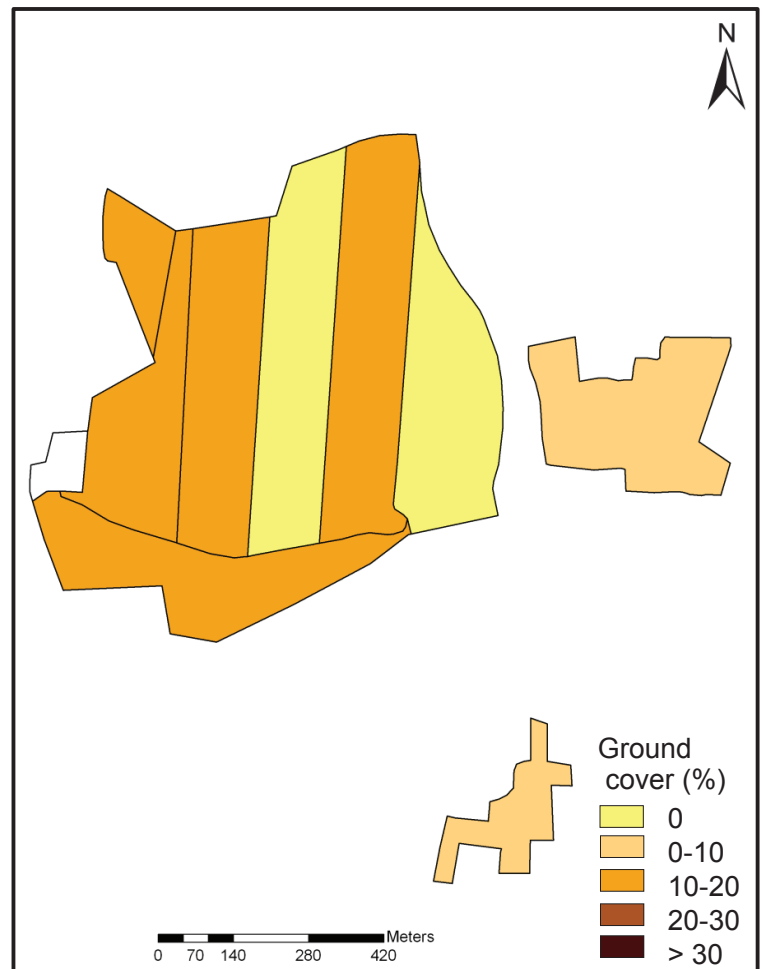
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

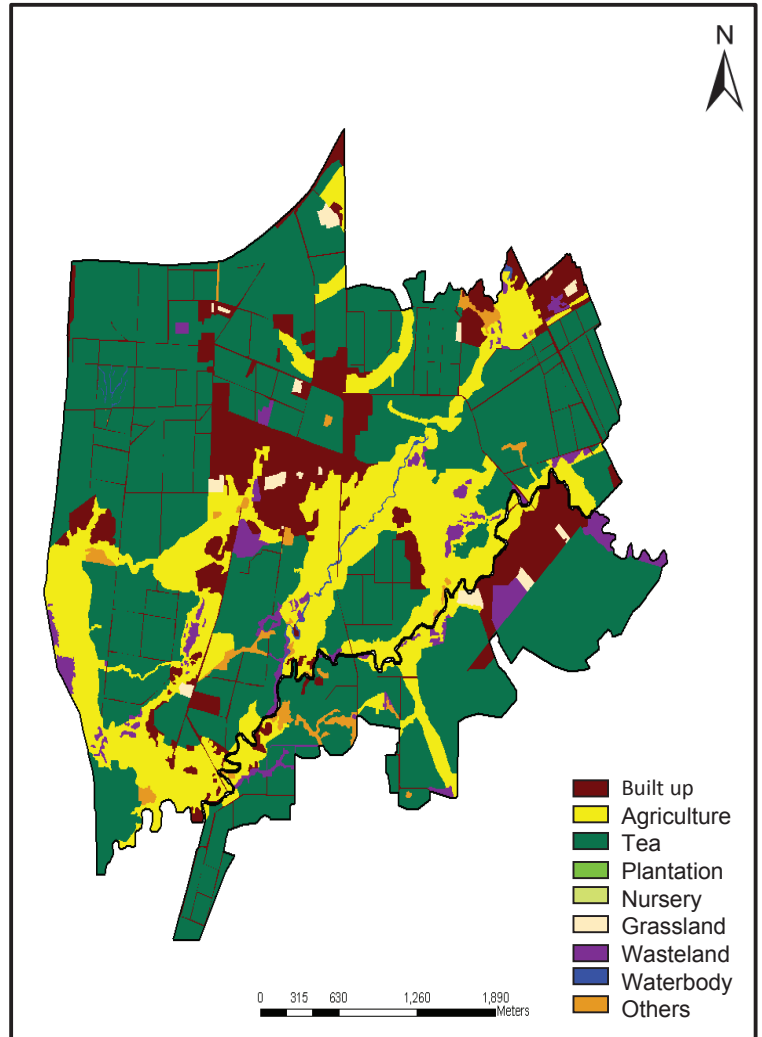




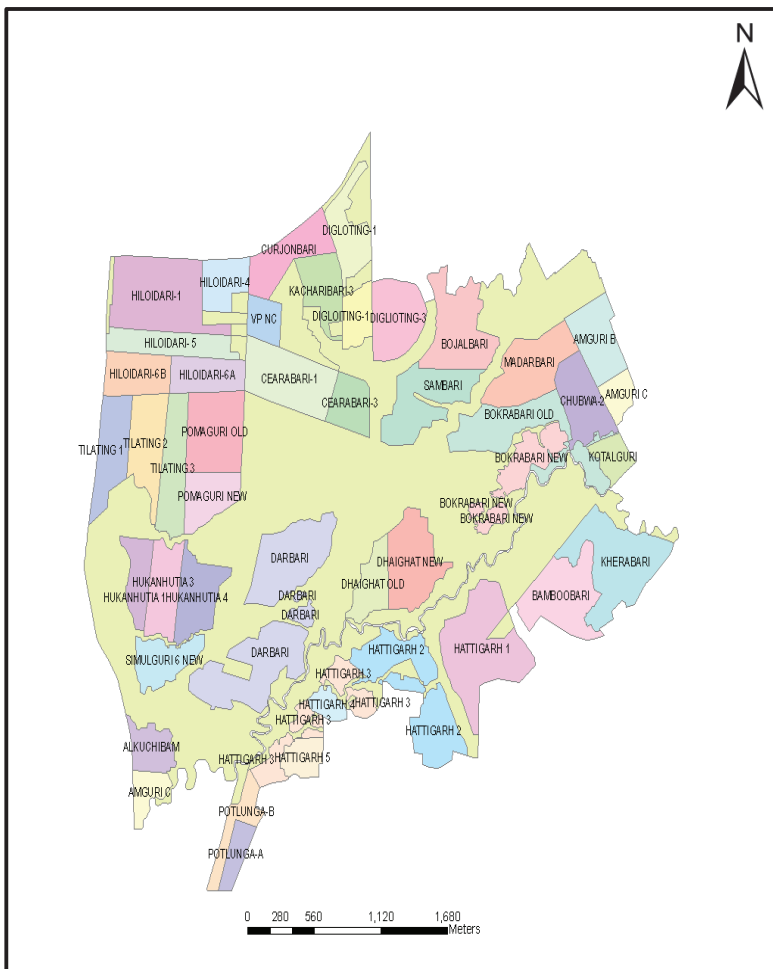
P14: CHUBWA TE



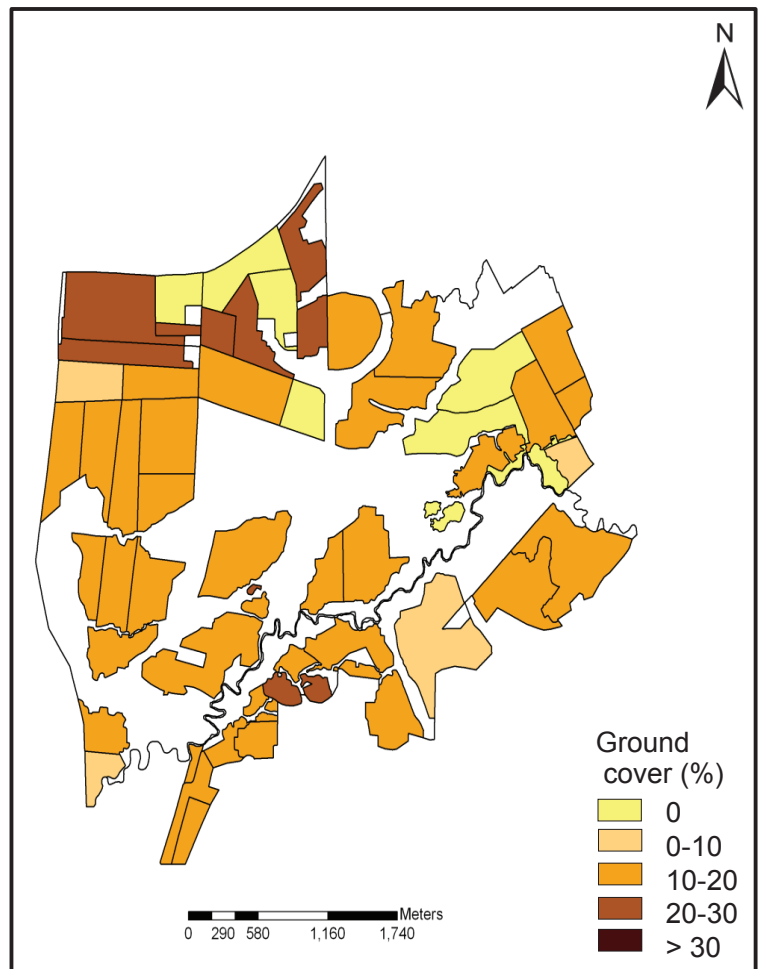
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

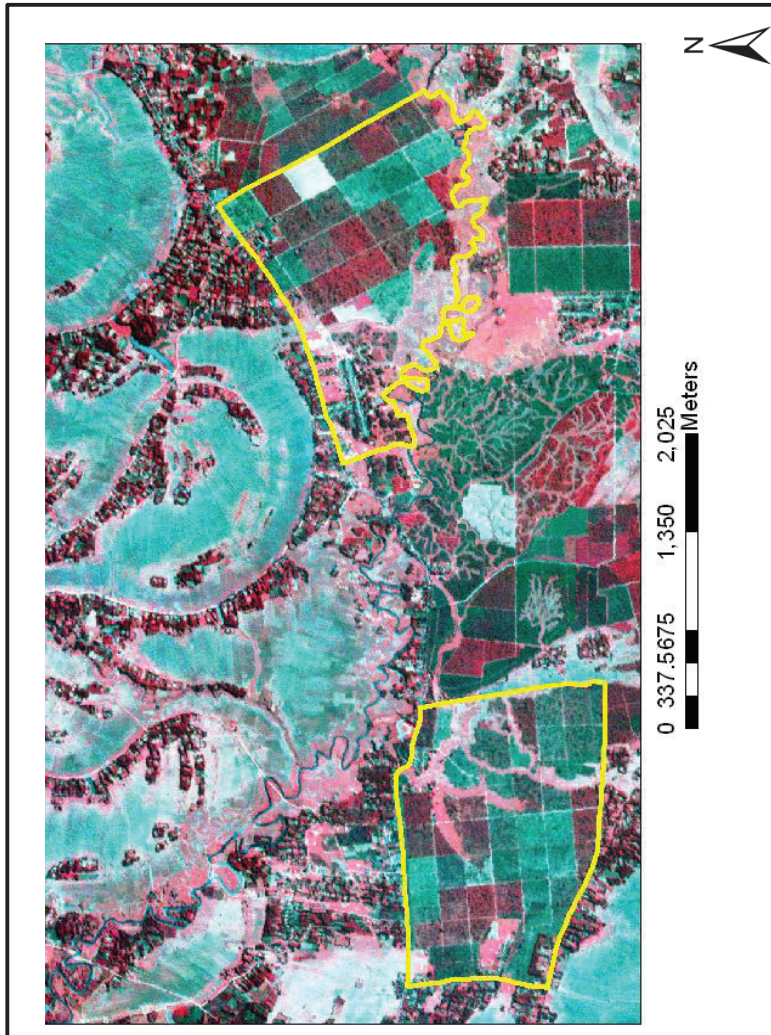




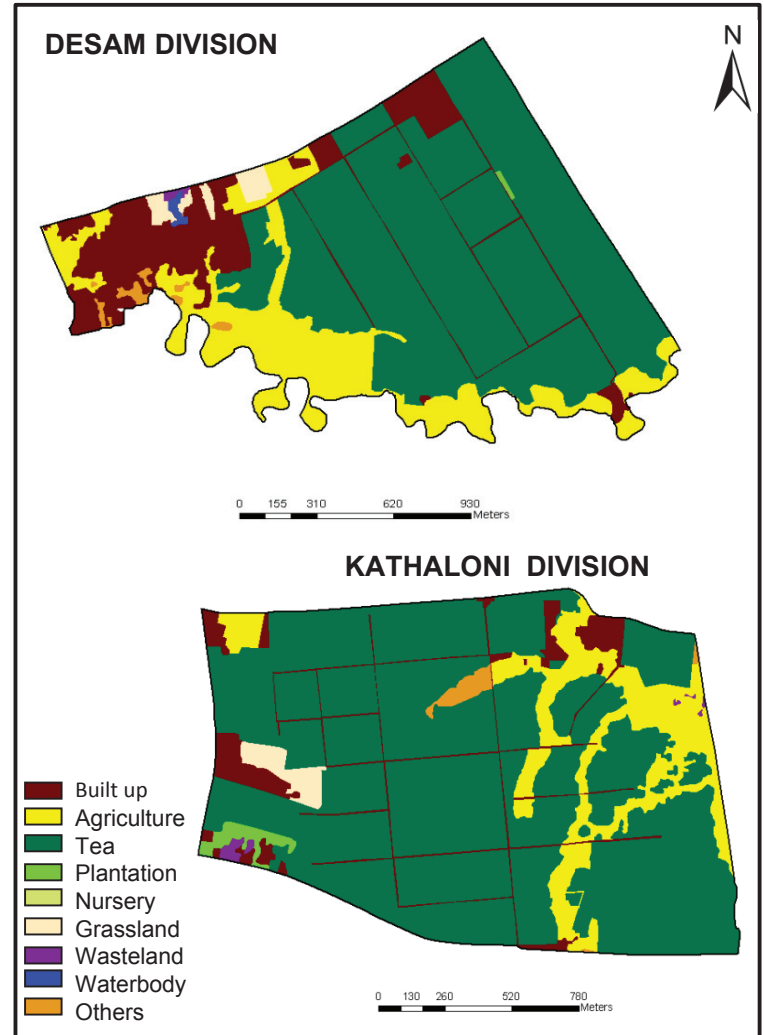
e. General Information

1. General		5. Natural resources constraints	
Contact address	PO: Chabua, Dist: Dibrugarh PIN: 786184	Drainage congestion and water logging	No
Contact phone	0373-2864526	Scarcity of water during summer	No
Name of the company	Amalgamated Plantations	River bank erosion	No
Name of the village where it falls	Hatkhola Bongali gaon	Major diseases and duration	Black Rot, Red Rust
Leased area of the estate (ha)	1309.76	Major pests and duration	<i>Helopeltis</i> , RSM
Tea grown area of the estate (ha)	759.84	Damage due to wildlife	No
No. of divisions / sections	2 div / 46 sec	6. Yield / production	
Year of establishment	--	Peak plucking periods	Medium
Type of tea produced	CTC, Orthodox	Annual green leaf yield	--
2. Infrastructure		Annual production of processed tea	--
Availability of processing factory	Yes	7. Pruning	
Availability of workers colony	Yes	Time of pruning	Dec – Jan
Availability of internet facility / e-mail id	Yes	Pruning cycle	3 yrs
Meteorological observations taken	Tmax, Tmin, Rainfall	Types of pruning	CA-UP-DS
3. Amenities		8. Fertilizer use	
Availability of health care / dispensary	Yes	Types of N, P, K fertilizers used	Urea, RP, MOP
Availability of school	Yes	Dose of Nitrogen (kg/ha)	128
4. Shade trees		Dose of Phosphorous (kg/ha)	37
Shade tree density (garden level)	Medium	Dose of Potash (kg/ha)	100
Plant to plant spacing (m)	12 x 12	Whether lime is applied, if yes dose	No
Row to row spacing (m)	10.6 x 10.6		

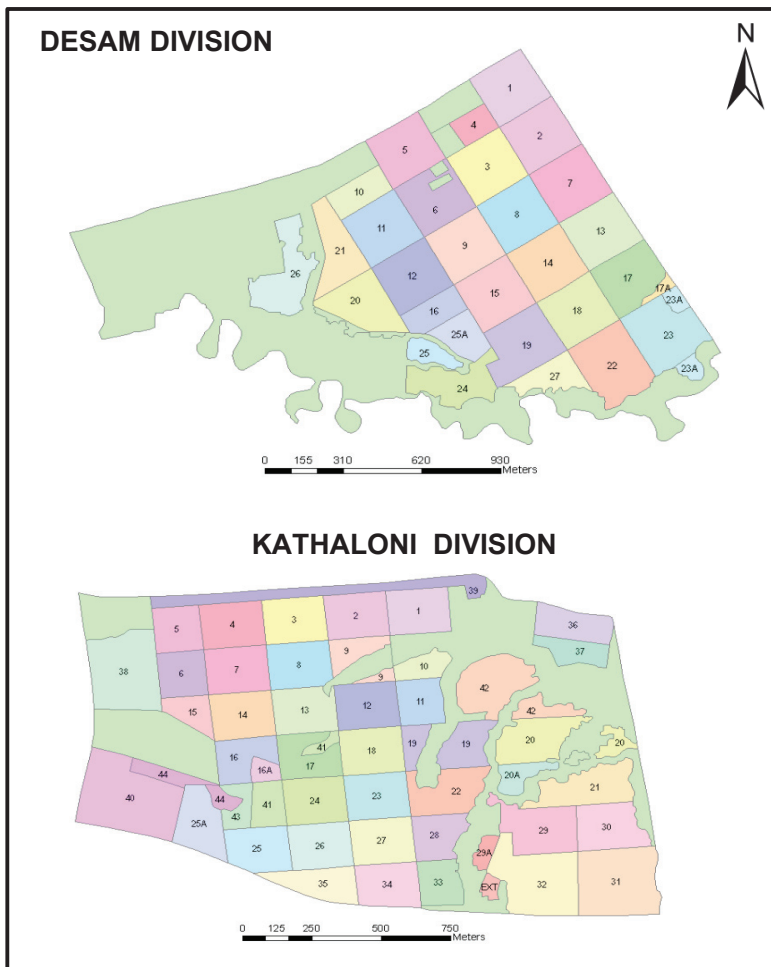




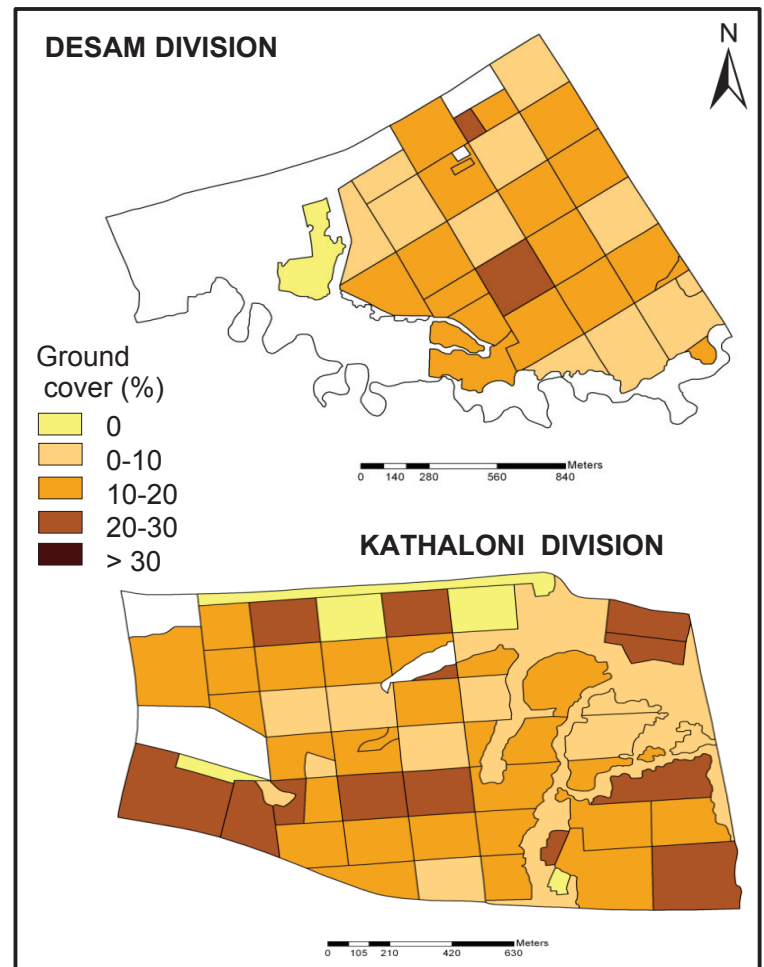
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

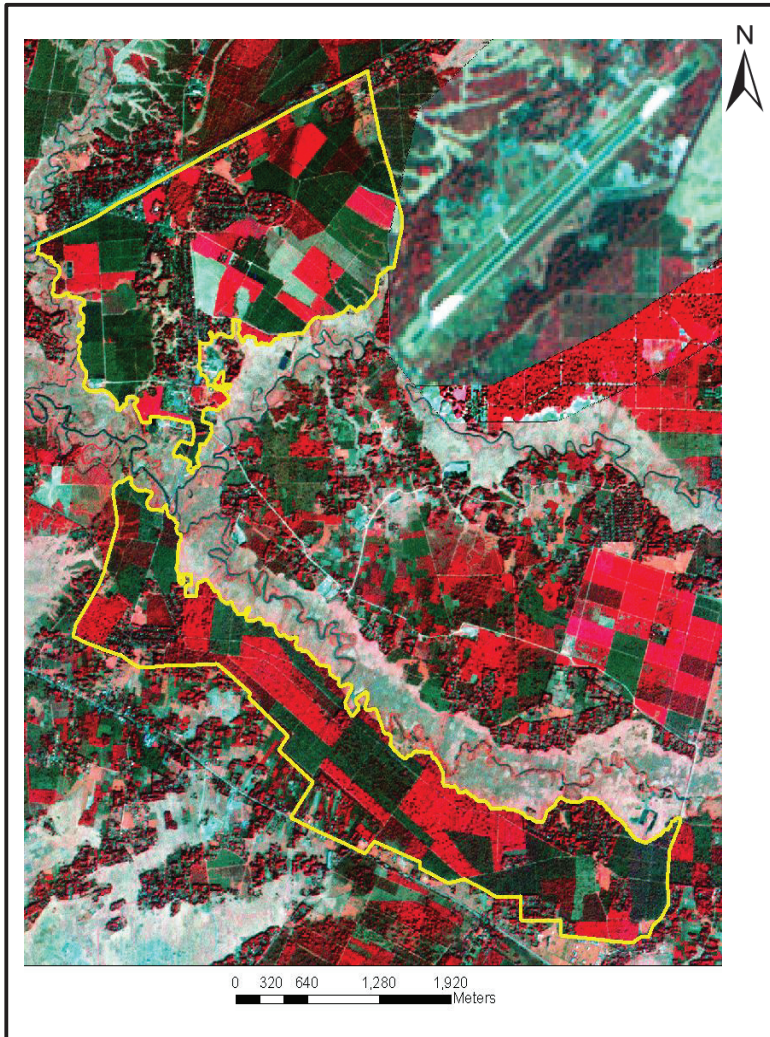




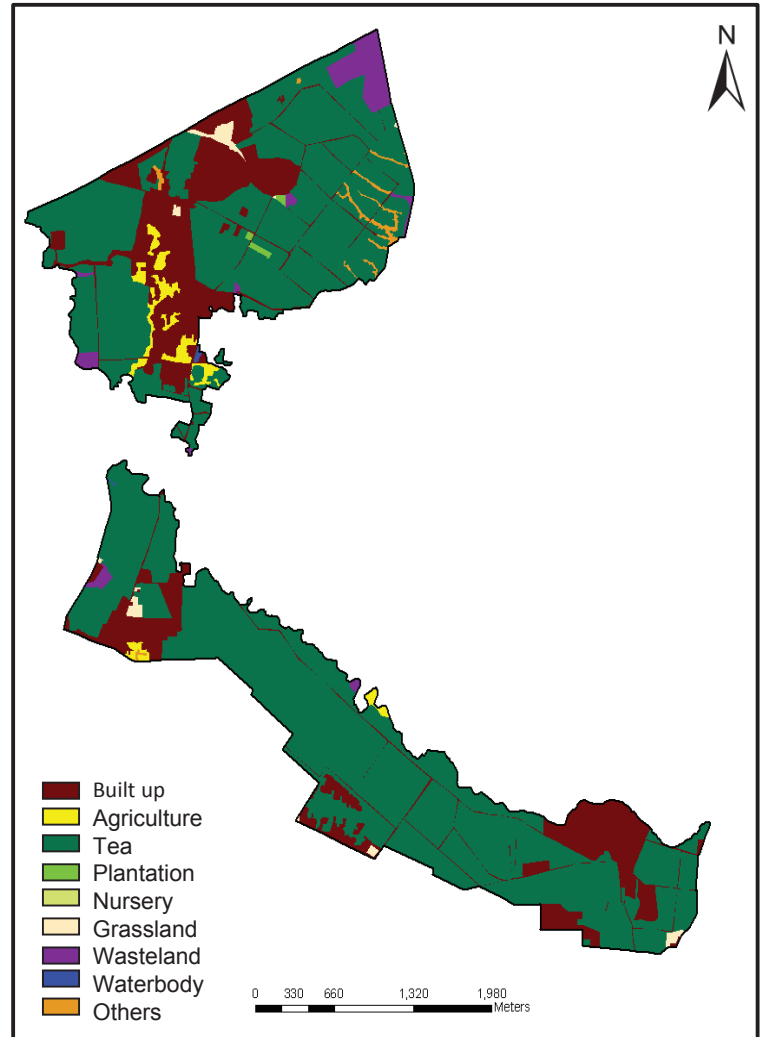
e. General Information

1. General		5. Natural resources constraints	
Contact address	PO: Naharkatia, Dist: Dibrugarh, PIN: 786 610	Drainage congestion and water logging	Yes
Contact phone	0374-2912645	Scarcity of water during summer	Yes
Name of the company	Andrew Yule & Company Limited	River bank erosion	No
Name of the village where it falls	Naharkatia	Major diseases and duration	No major diseases
Leased area of the estate (ha)	477.97	Major pests and duration	<i>Helopeltis</i> (whole year)
Tea grown area of the estate (ha)	327.71	Damage due to wildlife	No
No. of divisions / sections	2 div / 81sec	6. Yield / production	
Year of establishment	1928	Peak plucking periods	May - Oct
Type of tea produced	CTC, Orthodox	Annual green leaf yield	1927.2 kg/ ha
2. Infrastructure		Annual production of processed tea	618304.8 kg
Availability of processing factory	Yes	7. Pruning	
Availability of workers colony	Yes	Time of pruning	Nov – Jan
Availability of internet facility / e-mail id	Yes	Pruning cycle	3 yrs
Meteorological observations taken	Tmin, Rainfall	Types of pruning	--
3. Amenities		8. Fertilizer use	
Availability of health care / dispensary	Yes	Types of N, P, K fertilizers used	Urea, MOP, RP
Availability of school	Yes	Dose of Nitrogen (kg/ha)	130
4. Shade trees		Dose of Phosphorous (kg/ha)	40
Shade tree density (garden level)	Medium	Dose of Potash (kg/ha)	120
Plant to plant spacing (m)	6 X 6	Whether lime is applied, if yes dose	No
Row to row spacing (m)	--		

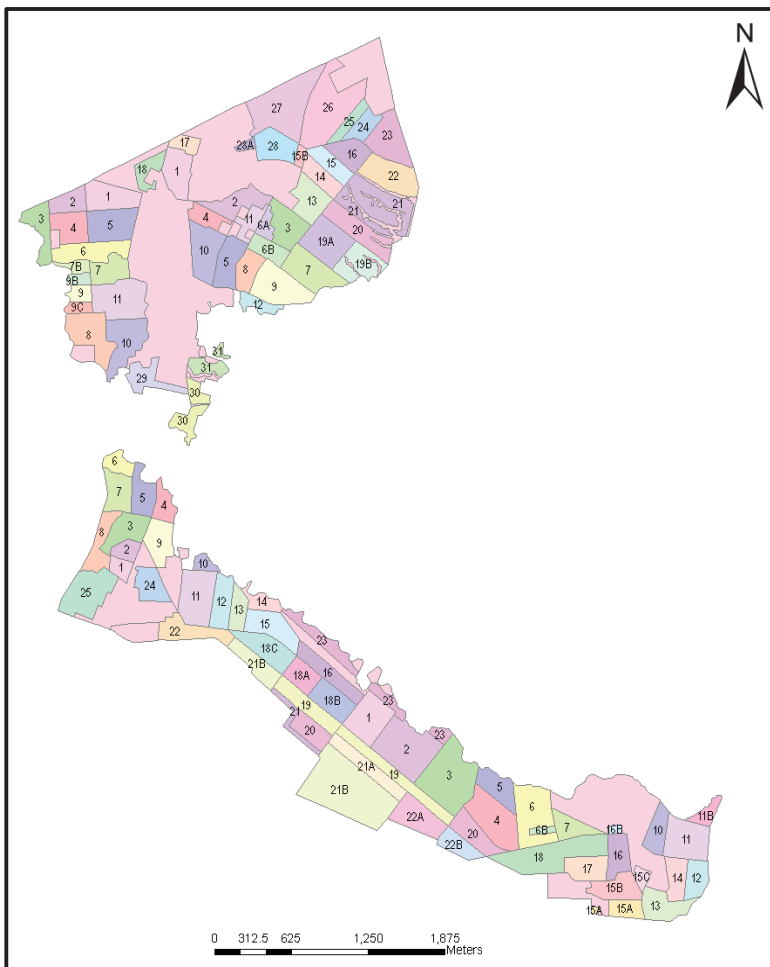




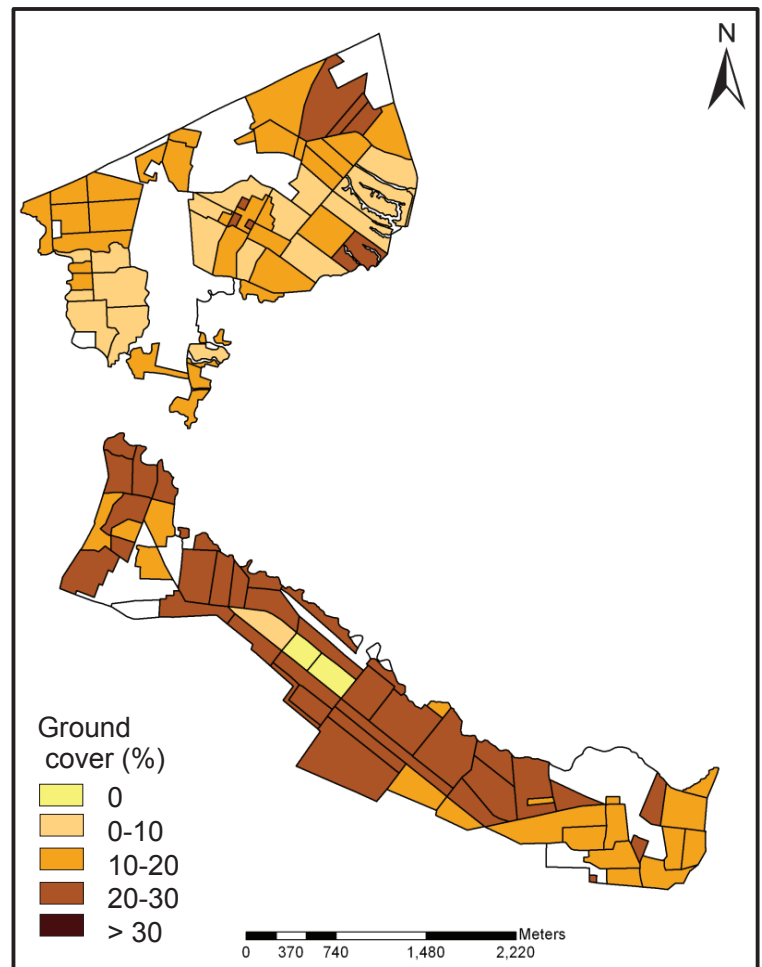
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate

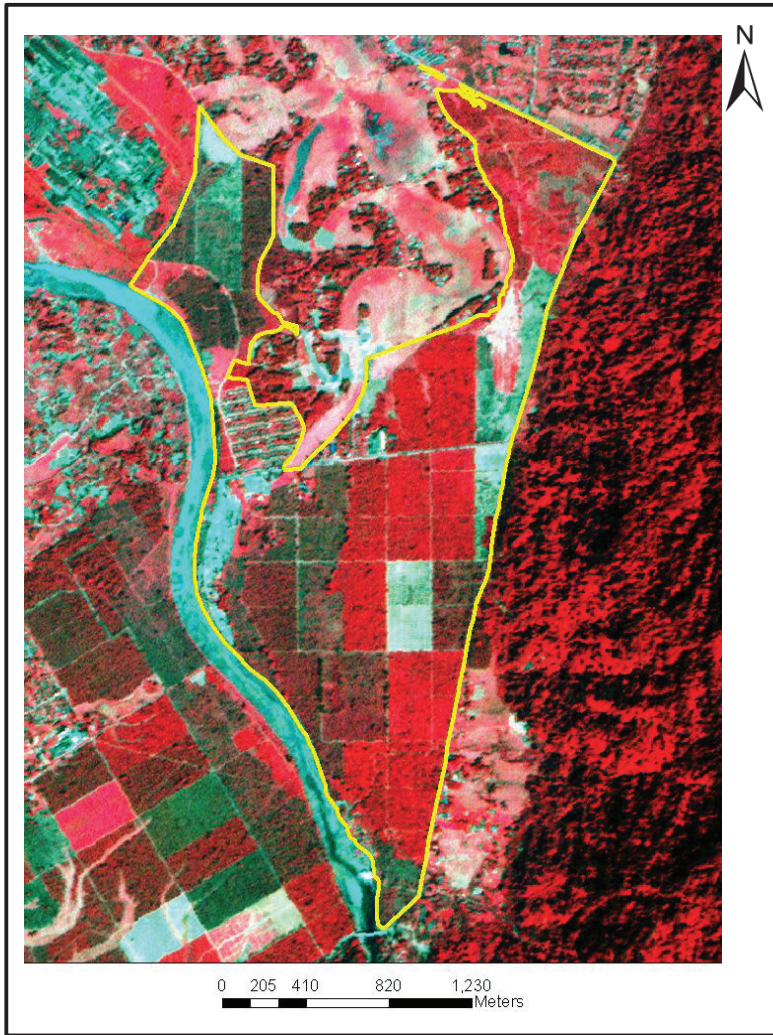


d. Shade Tree Density in Sections

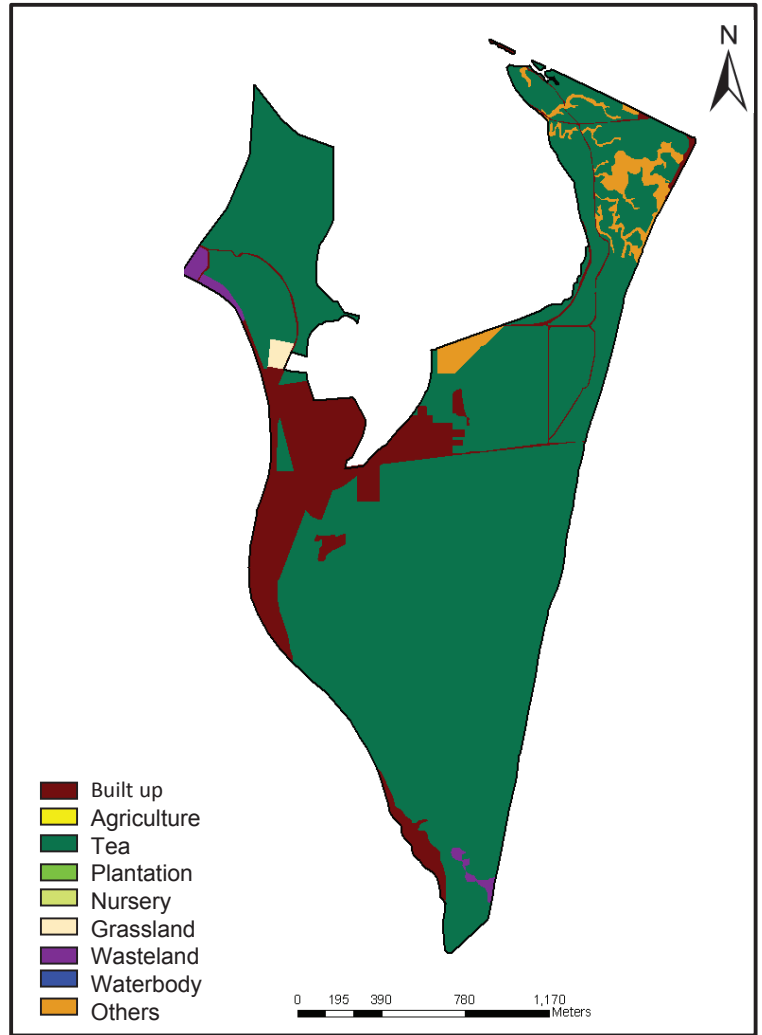




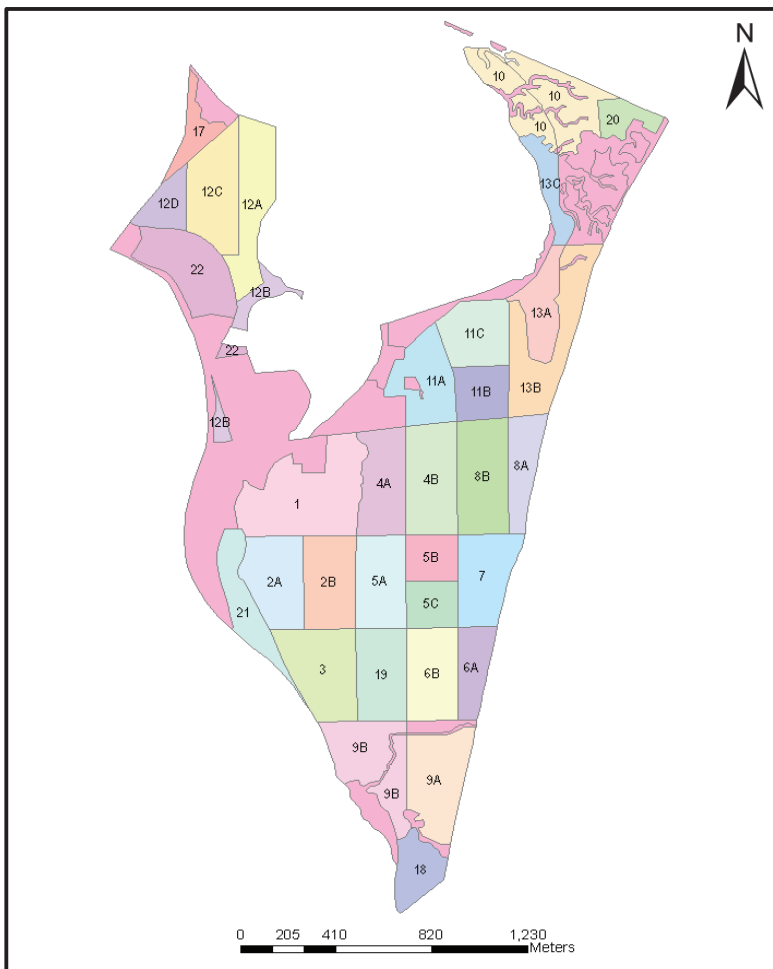
P17: DILLI TE



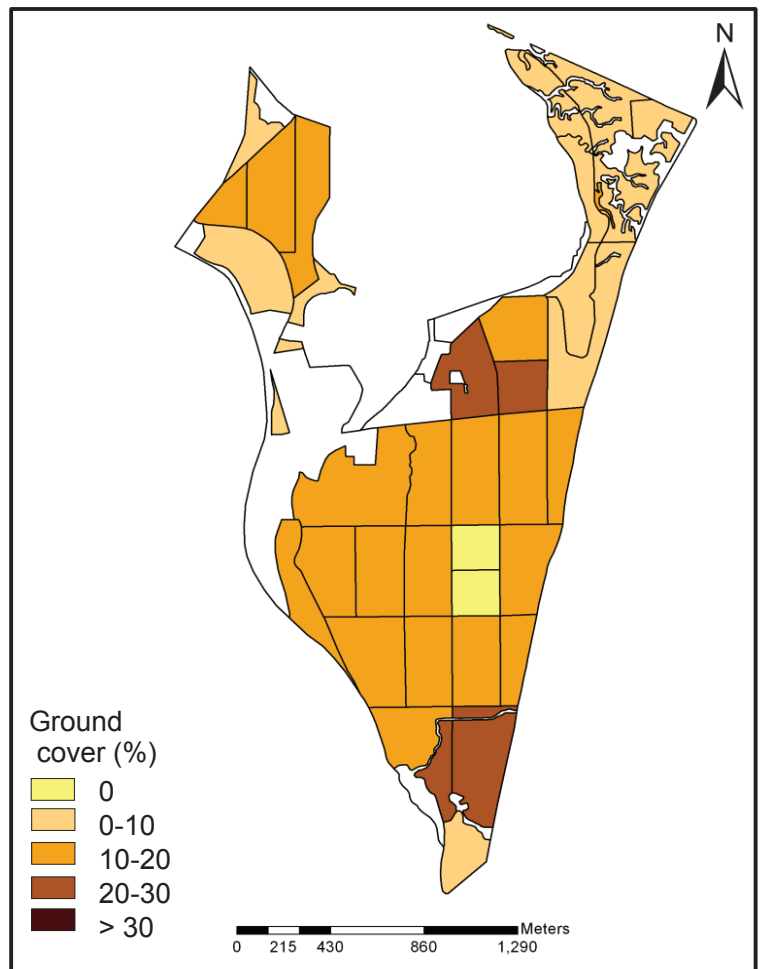
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections





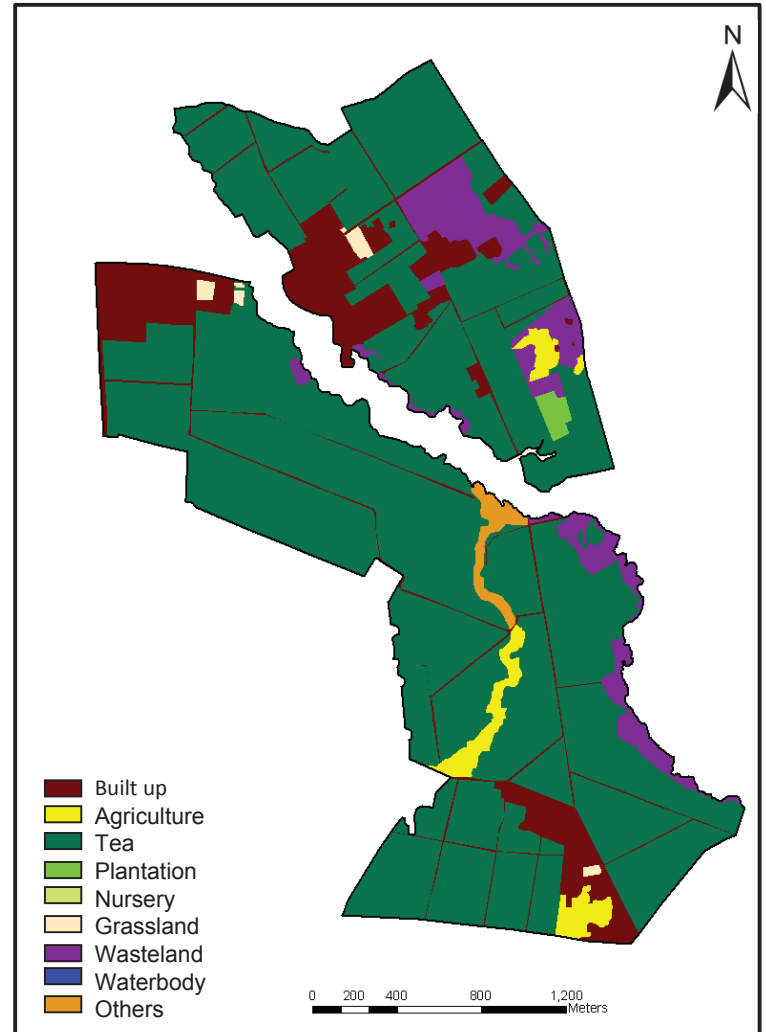
e. General Information

1. General		5. Natural resources constraints	
Contact address	PO: Parbatpur, Dist: Dibrugarh	Drainage congestion and water logging	--
Contact phone	0374-2160771	Scarcity of water during summer	Yes
Name of the company	--	River bank erosion	Yes
Name of the village where it falls	Namrup	Major diseases and duration	--
Leased area of the estate (ha)	391.27	Major pests and duration	RSM (4 months), <i>Helopeltis</i> (6 months)
Tea grown area of the estate (ha)	271.52	Damage due to wildlife	No
No. of divisions / sections	1 div / 36sec	6. Yield / production	
Year of establishment	--	Peak plucking periods	Jul - Aug
Type of tea produced	CTC	Annual green leaf yield	2400 kg/ha
2. Infrastructure		Annual production of processed tea	620872 kg
Availability of processing factory	Yes	7. Pruning	
Availability of workers colony	Yes	Time of pruning	Dec - Jan
Availability of internet facility / e-mail id	Yes	Pruning cycle	4 yrs
Meteorological observations taken	Tmax, Tmin	Types of pruning	--
3. Amenities		8. Fertilizer use	
Availability of health care / dispensary	Yes	Types of N, P, K fertilizers used	--
Availability of school	Yes	Dose of Nitrogen (kg/ha)	140
4. Shade trees		Dose of Phosphorous (kg/ha)	110
Shade tree density (garden level)	Medium	Dose of Potash (kg/ha)	80
Plant to plant spacing (m)	13.33 X 13.33	Whether lime is applied, if yes dose	Yes
Row to row spacing (m)	14 X 14		

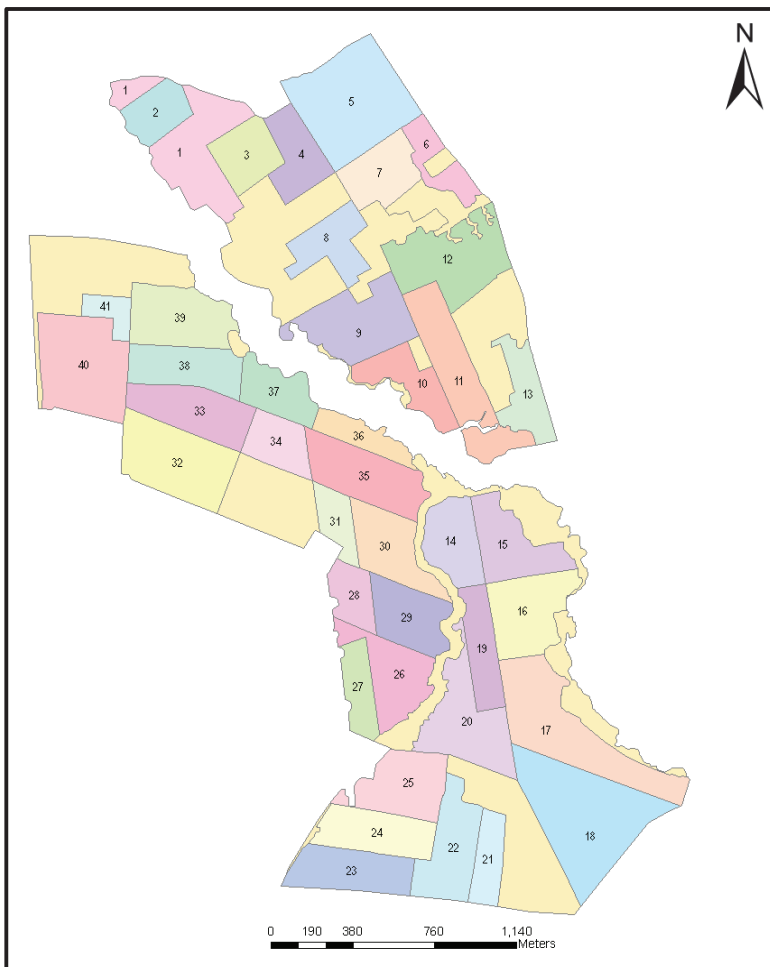




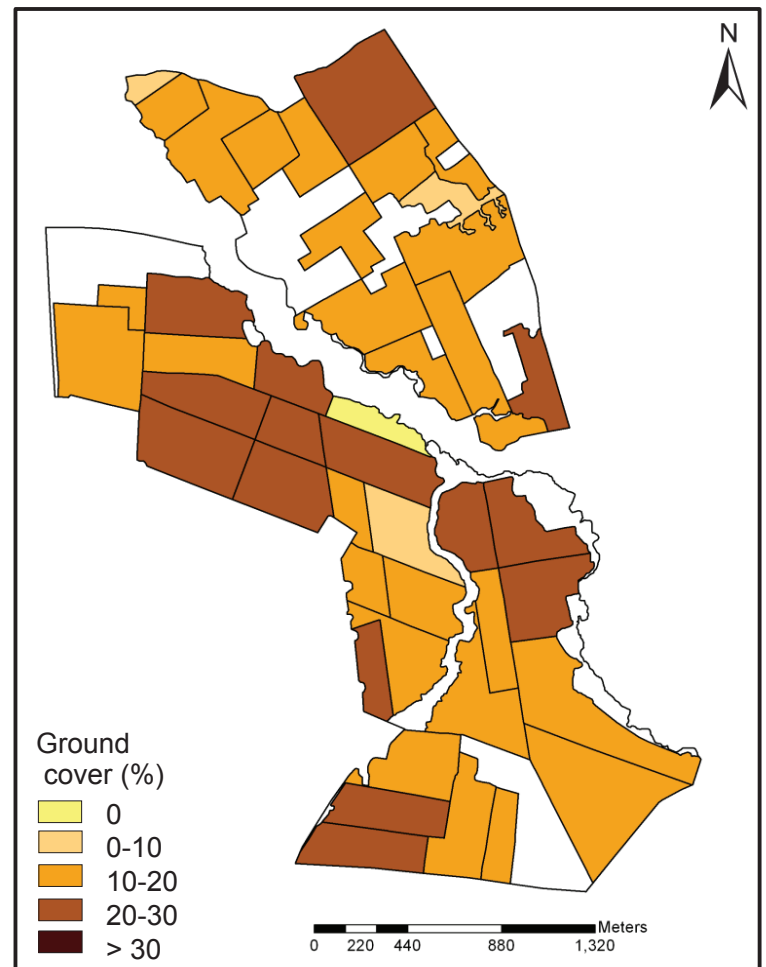
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse

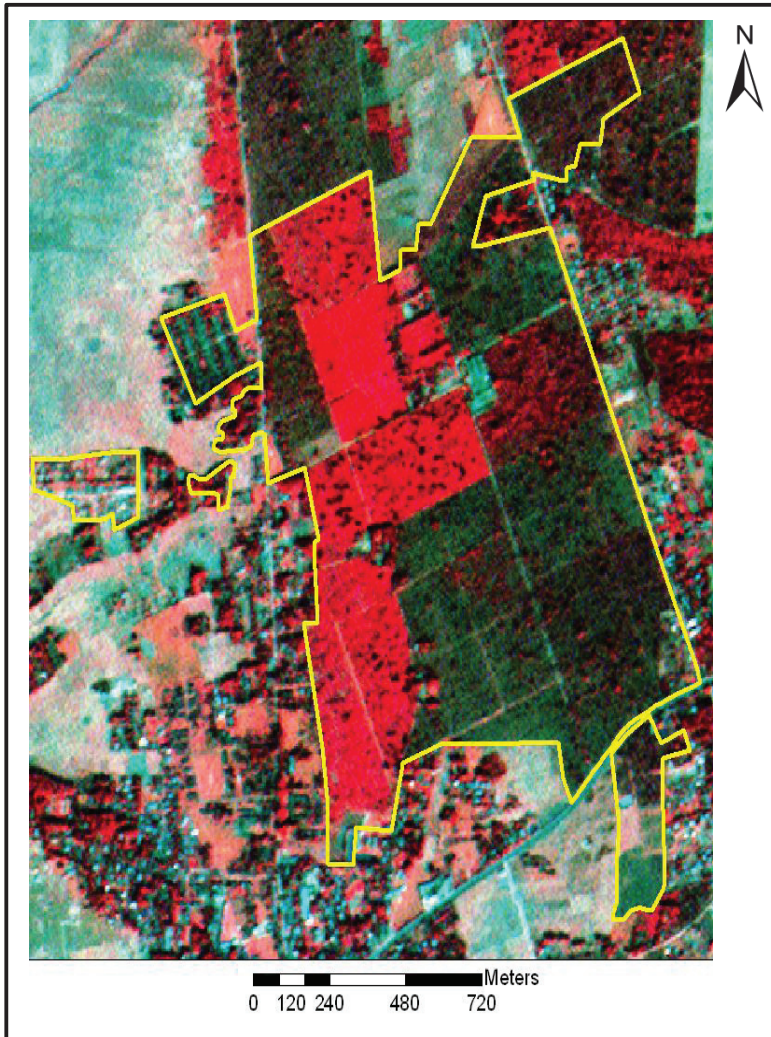


c. Section Boundaries of the Estate

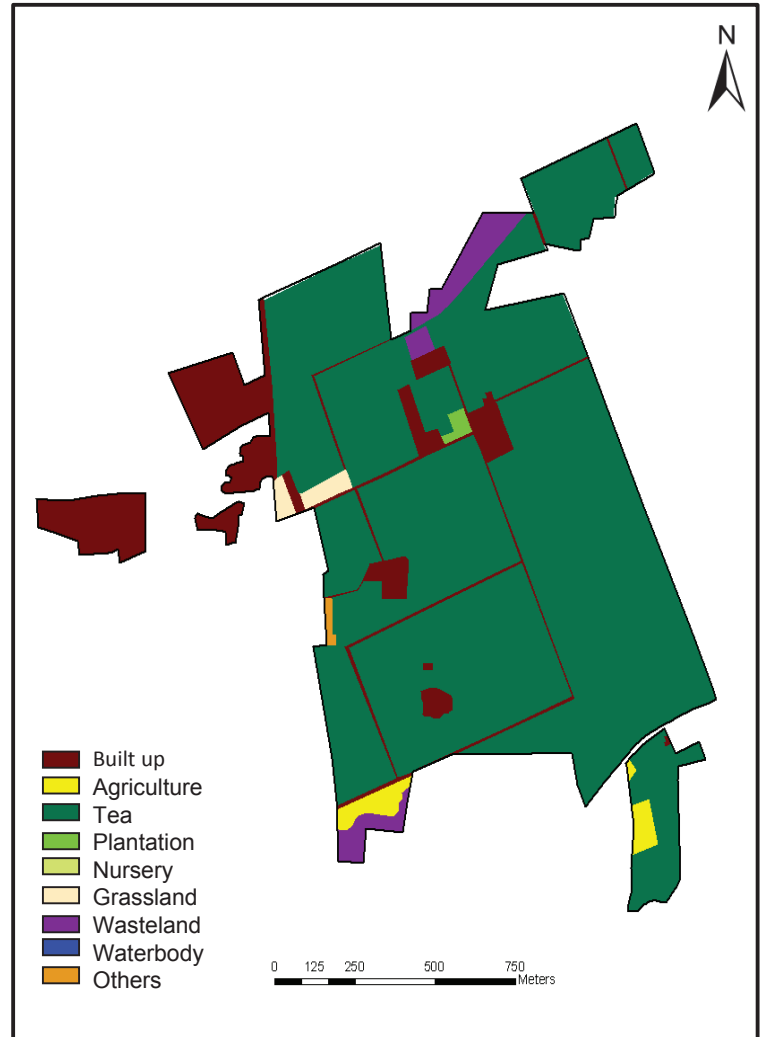


d. Shade Tree Density in Sections

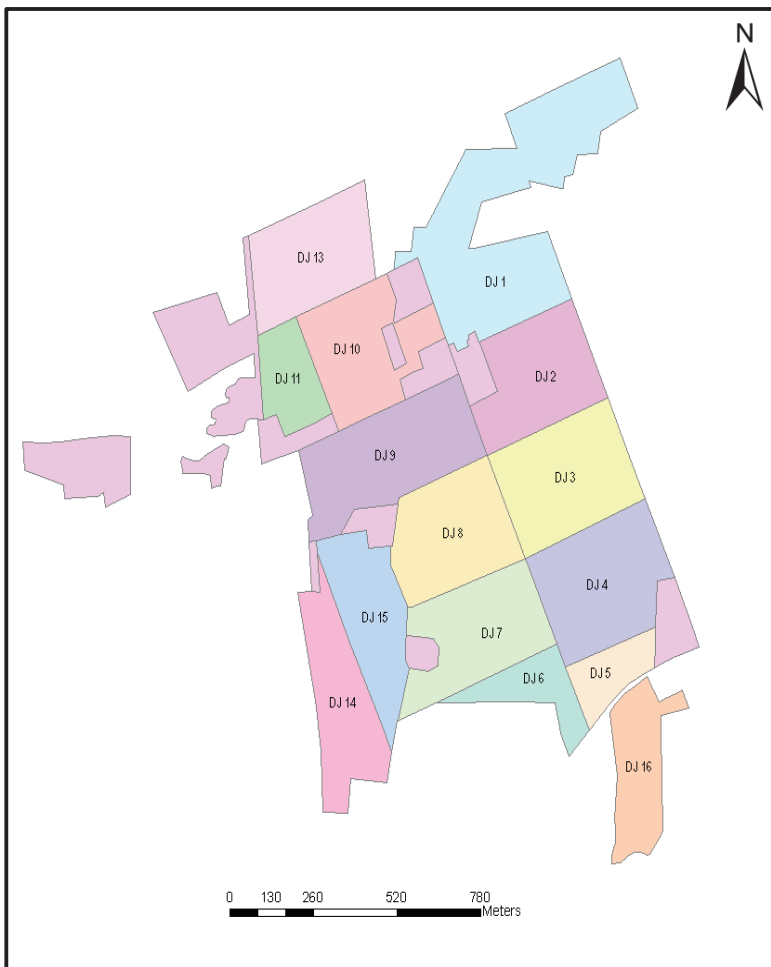




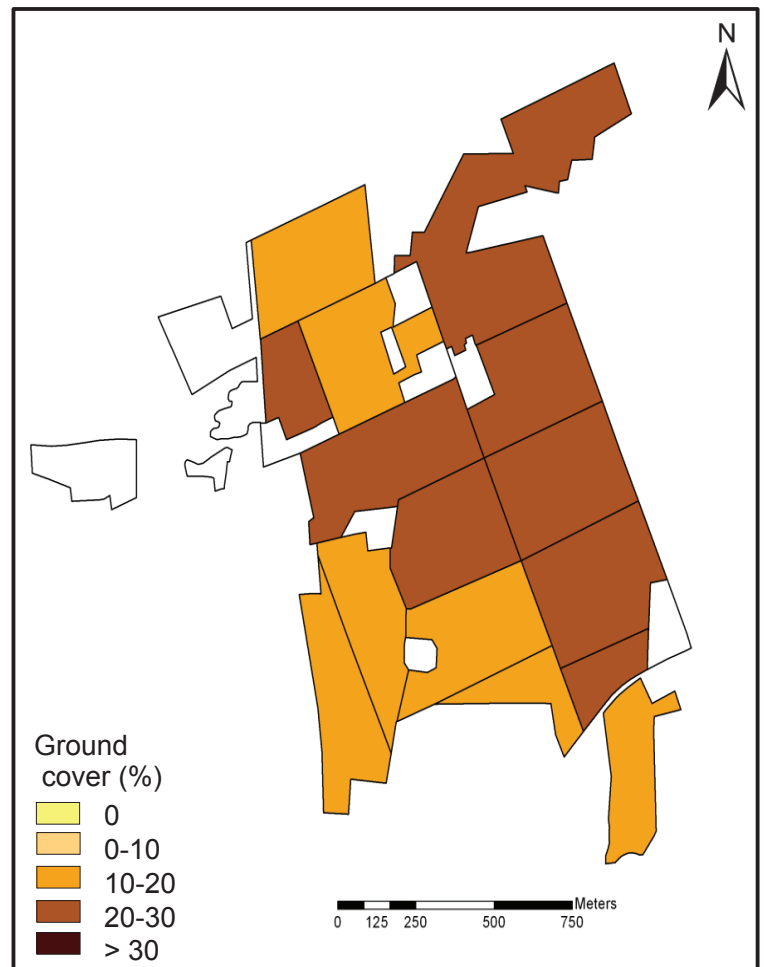
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse

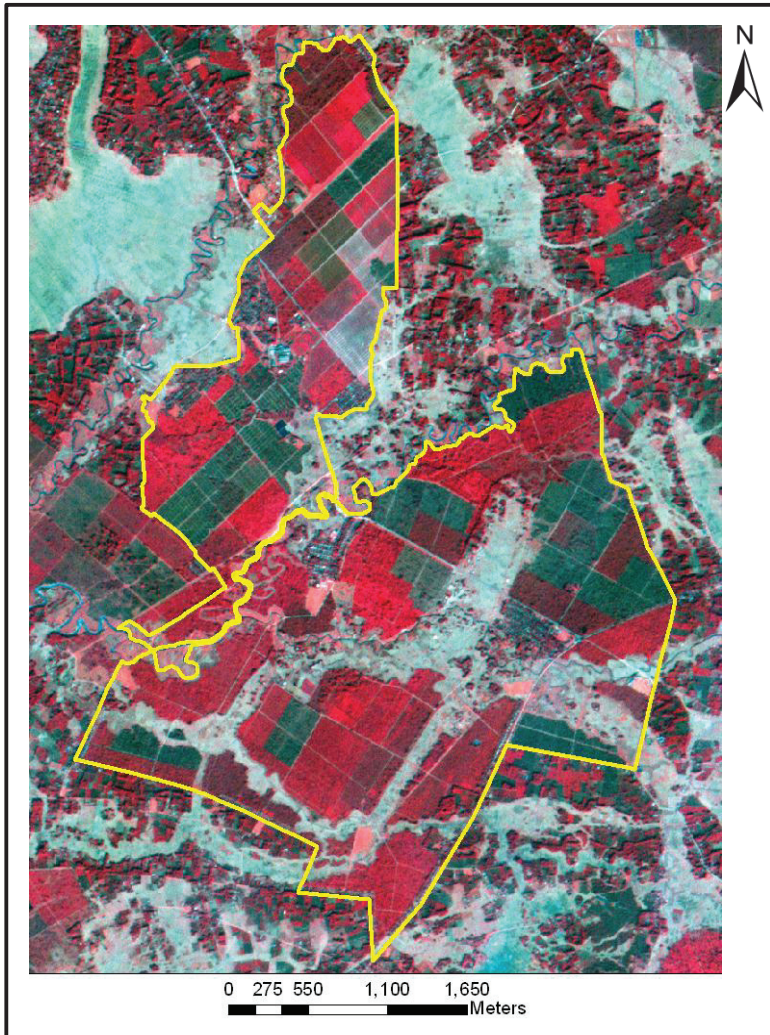


c. Section Boundaries of the Estate

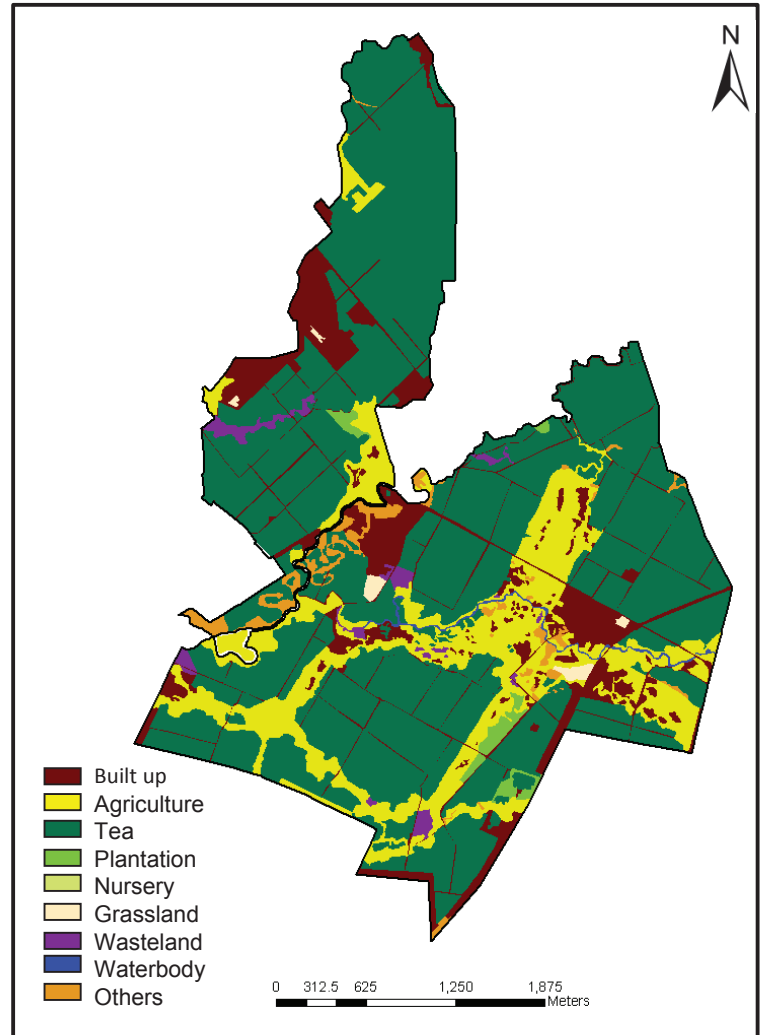


d. Shade Tree Density in Sections

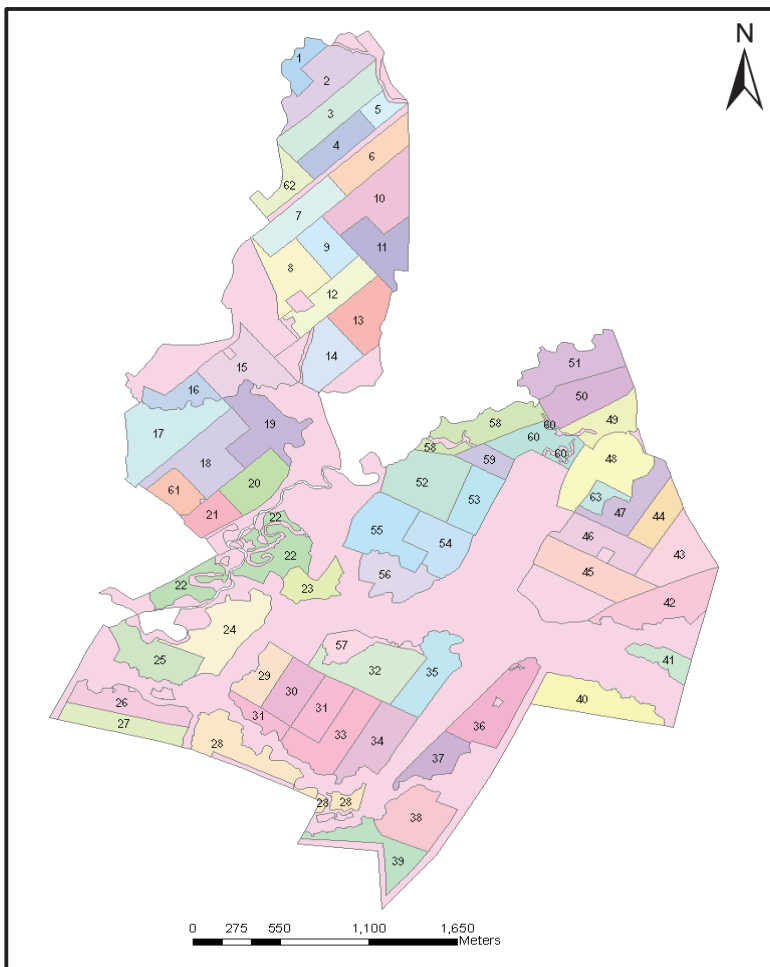




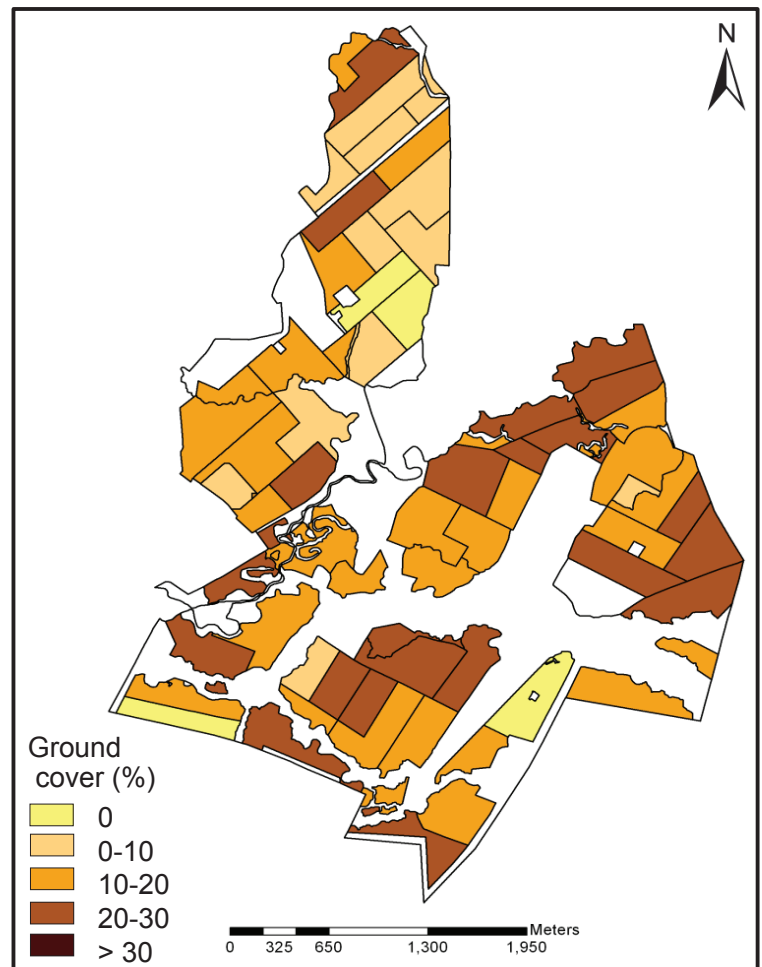
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

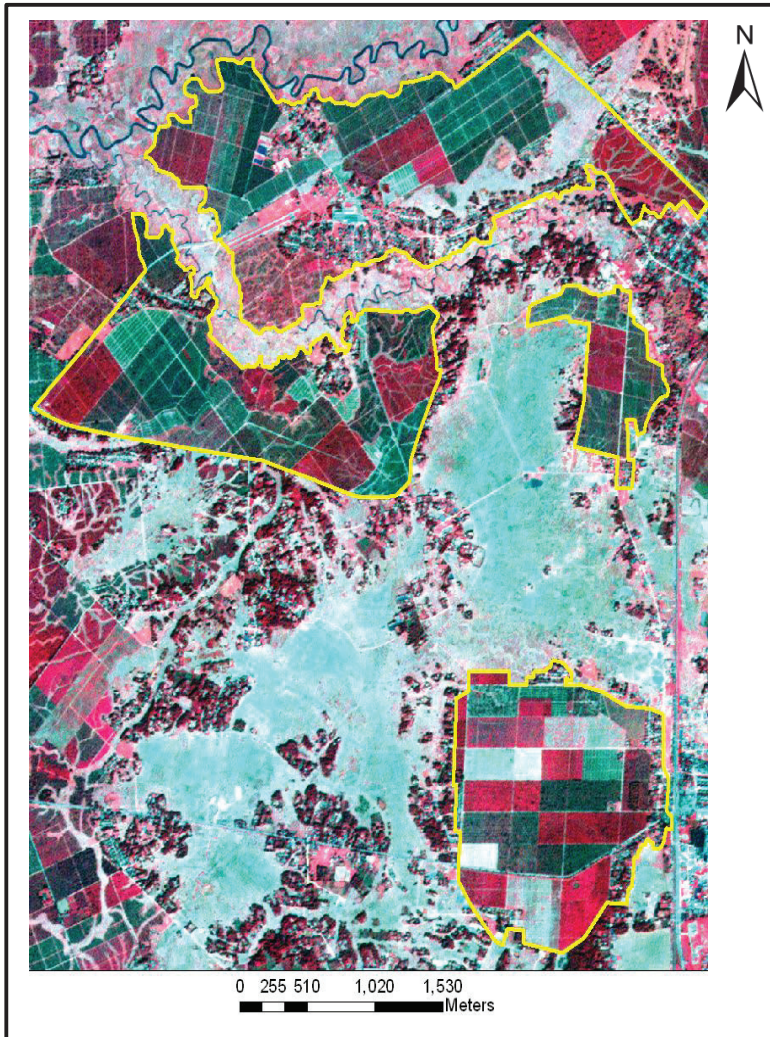




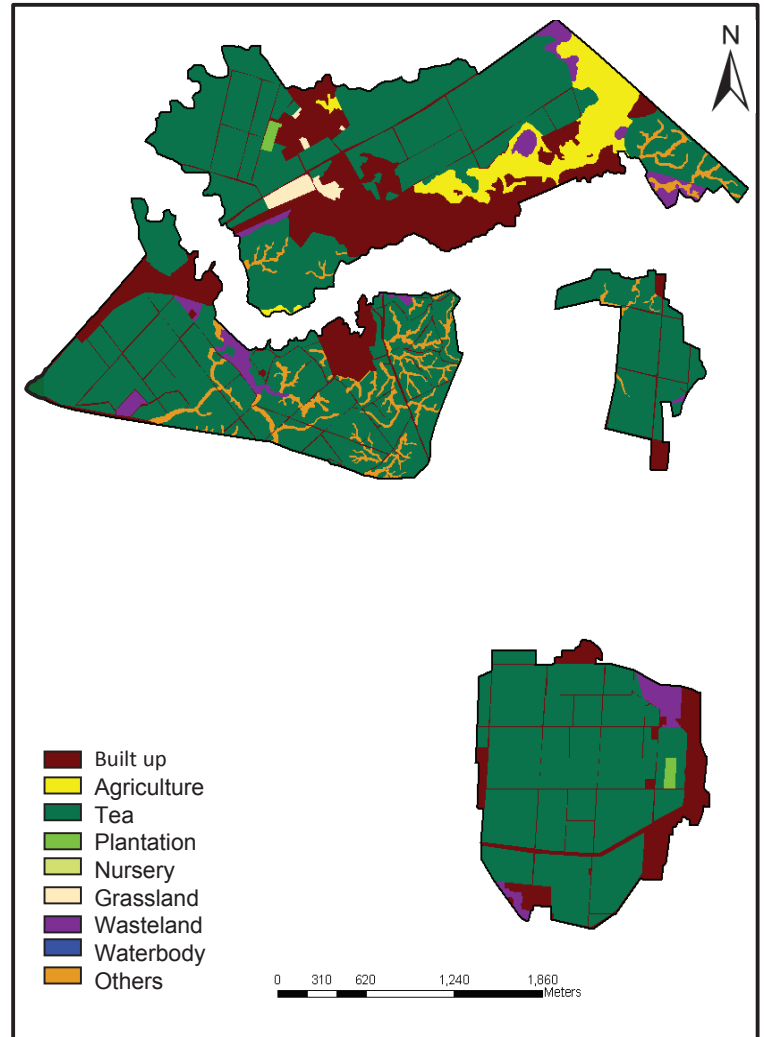
e. General Information

1. General		5. Natural resources constraints	
Contact address	P.O: Moran, Dist: Dibrugarh, PIN: 785669	Drainage congestion and water logging	Yes
Contact phone	03754-291866	Scarcity of water during summer	No
Name of the company	McLeod Russel India Ltd.	River bank erosion	Yes
Name of the village where it falls	Dirai TE	Major diseases and duration	Red Rust (4 months)
Leased area of the estate (ha)	1138.33	Major pests and duration	<i>Helopeltis</i> (5 months)
Tea grown area of the estate (ha)	707.74	Damage due to wildlife	No
No. of divisions / sections	3 div / 63 sec	6. Yield / production	
Year of establishment	1925	Peak plucking periods	Jun - Oct
Type of tea produced	CTC, Orthodox	Annual green leaf yield	2126 kg/ha
2. Infrastructure		Annual production of processed tea	14 45028 kg
Availability of processing factory	Yes	7. Pruning	
Availability of workers colony	Yes	Time of pruning	--
Availability of internet facility / e-mail id	Yes	Pruning cycle	--
Meteorological observations taken	Tmax, Rainfall	Types of pruning	TP, LOS, DS
3. Amenities		8. Fertilizer use	
Availability of health care / dispensary	Yes	Types of N, P, K fertilizers used	Urea, MOP, RP
Availability of school	Yes	Dose of Nitrogen (kg/ha)	120
4. Shade trees		Dose of Phosphorous (kg/ha)	36
Shade tree density (garden level)	Medium	Dose of Potash (kg/ha)	80
Plant to plant spacing (m)	1 X 0.75	Whether lime is applied, if yes dose	--
Row to row spacing (m)	100 cm		

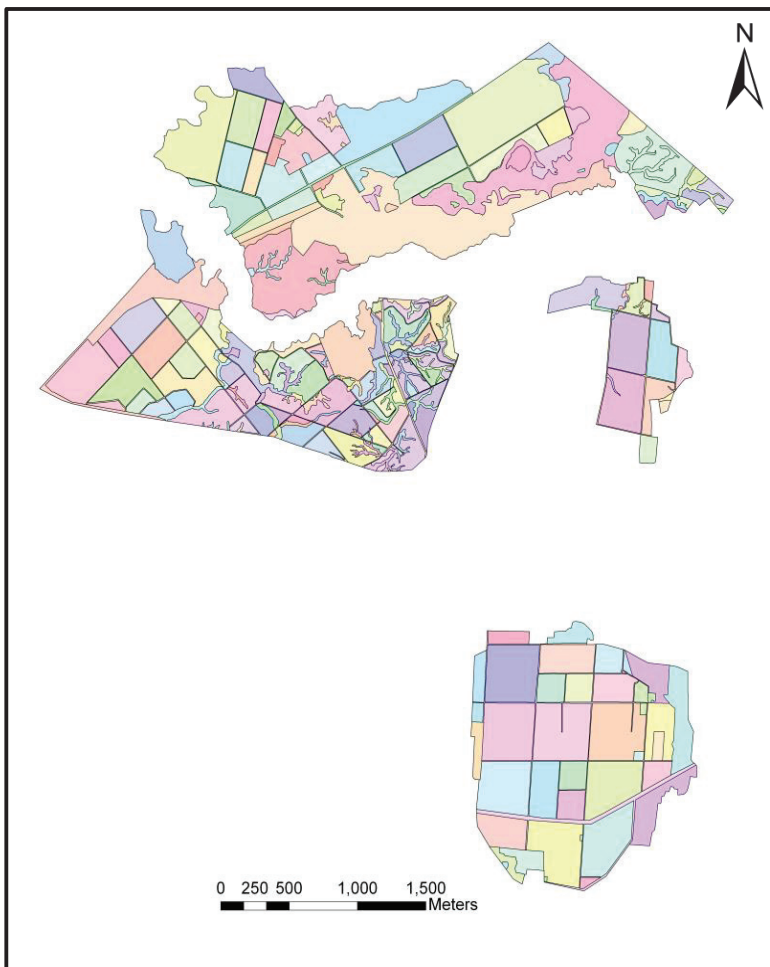




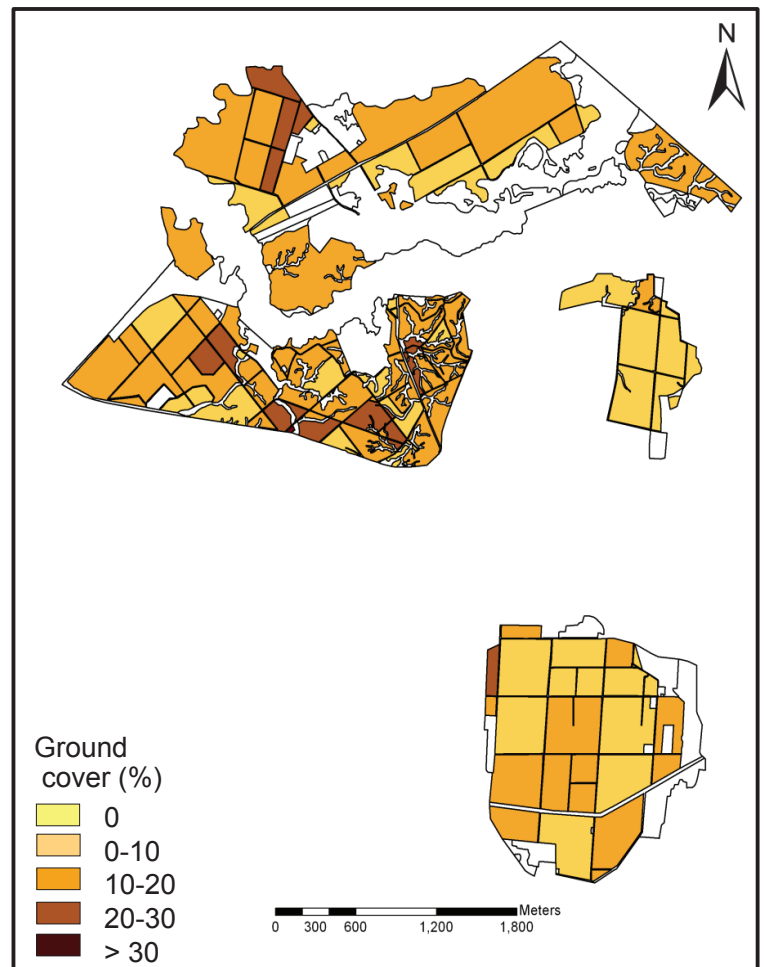
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

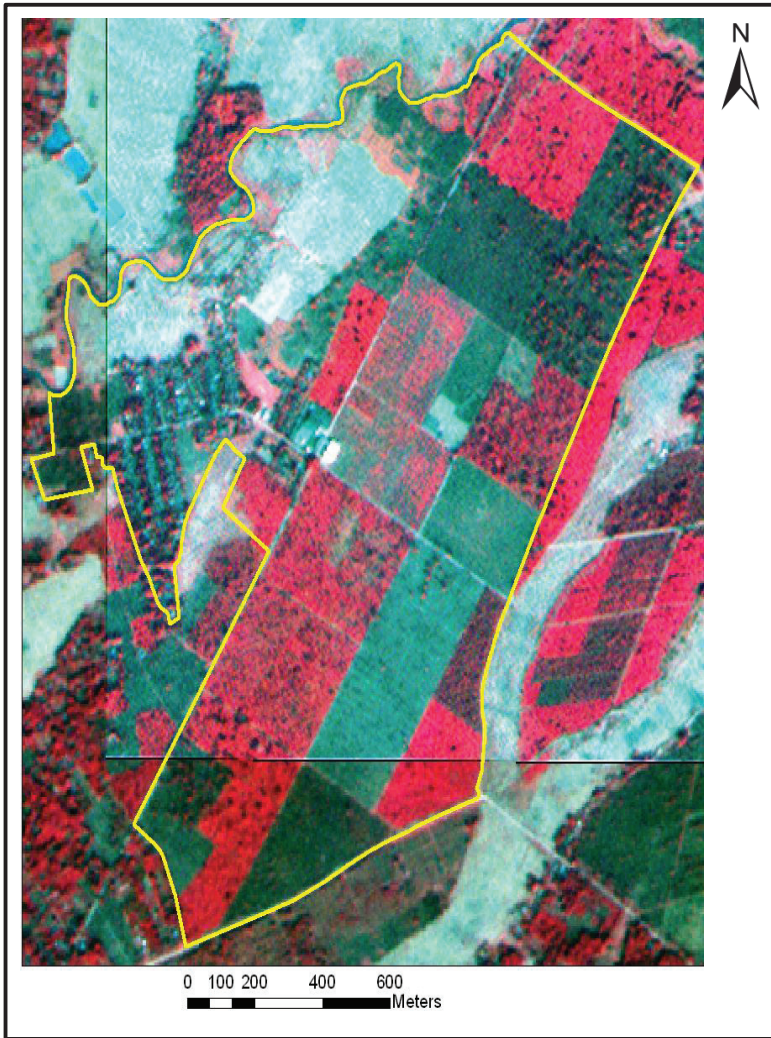




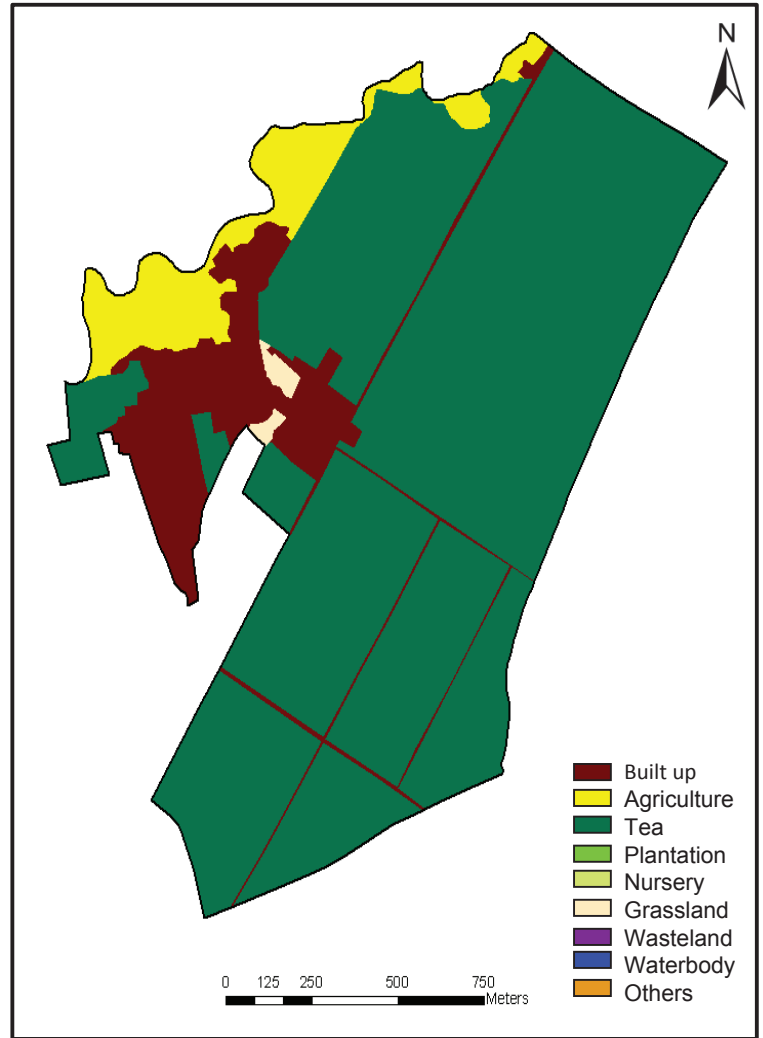
e. General Information

1. General		5. Natural resources constraints	
Contact address	PO: Hoogrijan, Dist: Dibrugarh PIN: 786 601	Drainage congestion and water logging	Yes
Contact phone	0374 – 2911387 (O)	Scarcity of water during summer	No
Name of the company	--	River bank erosion	No
Name of the village where it falls	--	Major diseases and duration	Black Rot (Jul - Oct)
Leased area of the estate (ha)	894.35	Major pests and duration	Red Spider, <i>Helopeltis</i> , Red Slug, Looper, Thrips, Scale Insects
Tea grown area of the estate (ha)	599.47	Damage due to wildlife	Leopard
No. of divisions / sections	1 div / 57 sec	6. Yield / production	
Year of establishment	1870	Peak plucking periods	Jul - Oct
Type of tea produced	CTC, Orthodox	Annual green leaf yield	2343 kg/ha
2. Infrastructure		Annual production of processed tea	1333820 kg
Availability of processing factory	Yes	7. Pruning	
Availability of workers colony	Yes	Time of pruning	Nov - Jan
Availability of internet facility / e-mail id	Yes	Pruning cycle	--
Meteorological observations taken	Tmax, Tmin, Rainfall	Types of pruning	TP-LOS-DS
3. Amenities		8. Fertilizer use	
Availability of health care / dispensary	Yes	Types of N, P, K fertilizers used	Urea, MOP, RP
Availability of school	Yes	Dose of Nitrogen (kg/ha)	137
4. Shade trees		Dose of Phosphorous (kg/ha)	165
Shade tree density (garden level)	Medium	Dose of Potash (kg/ha)	76
Plant to plant spacing (m)	12 X 12	Whether lime is applied, if yes dose	No
Row to row spacing (m)	12 X 12		

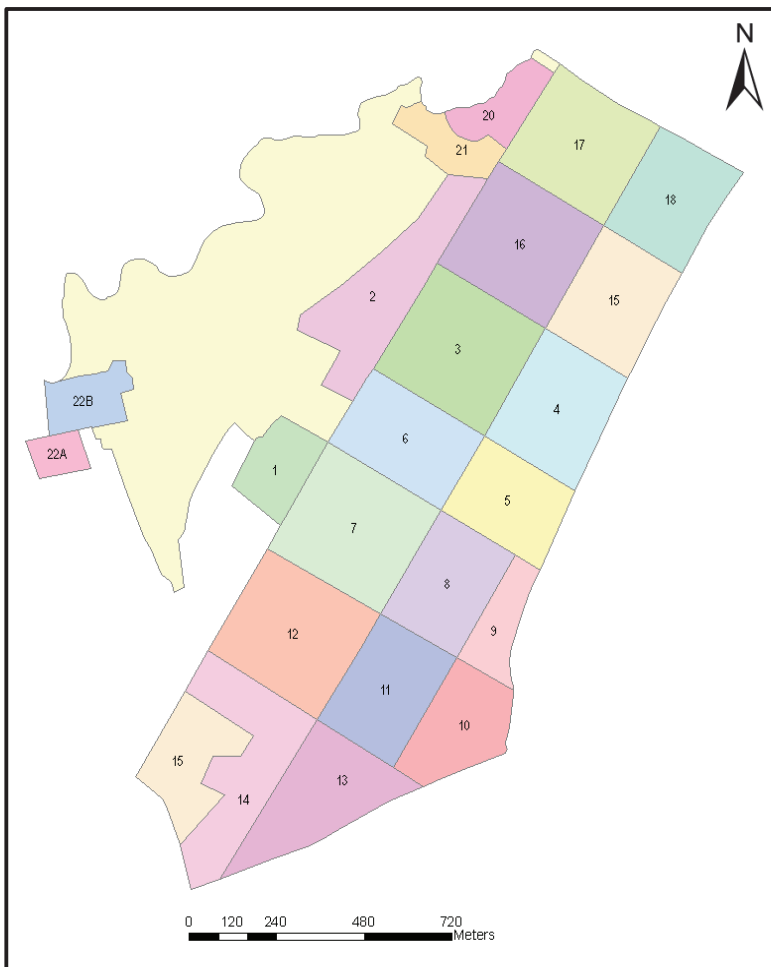




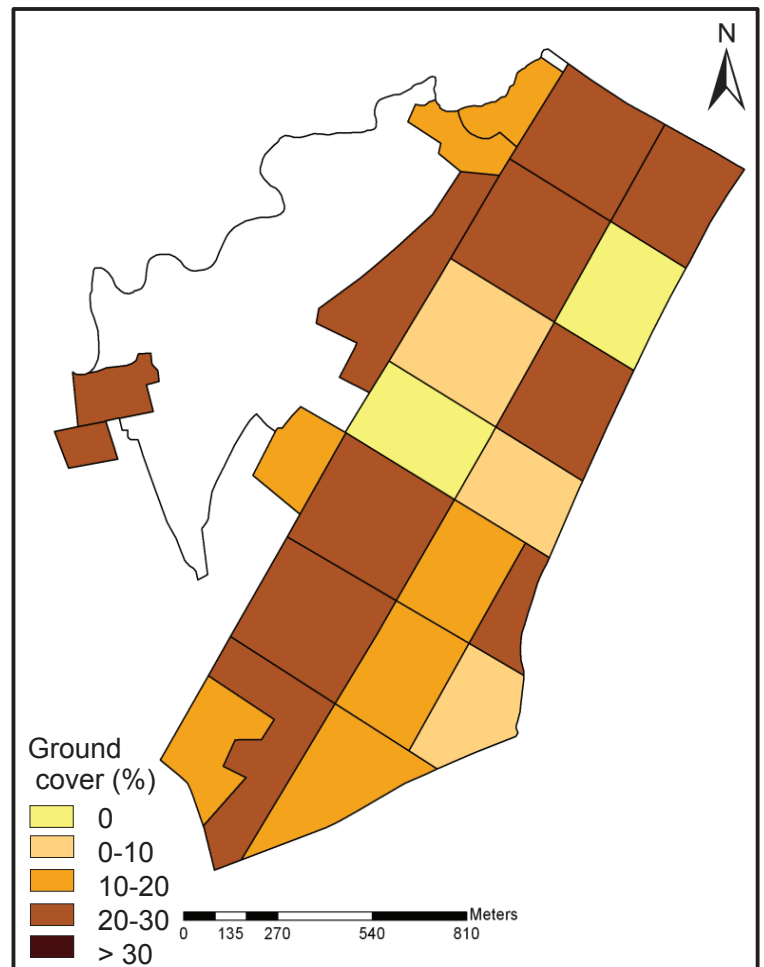
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse

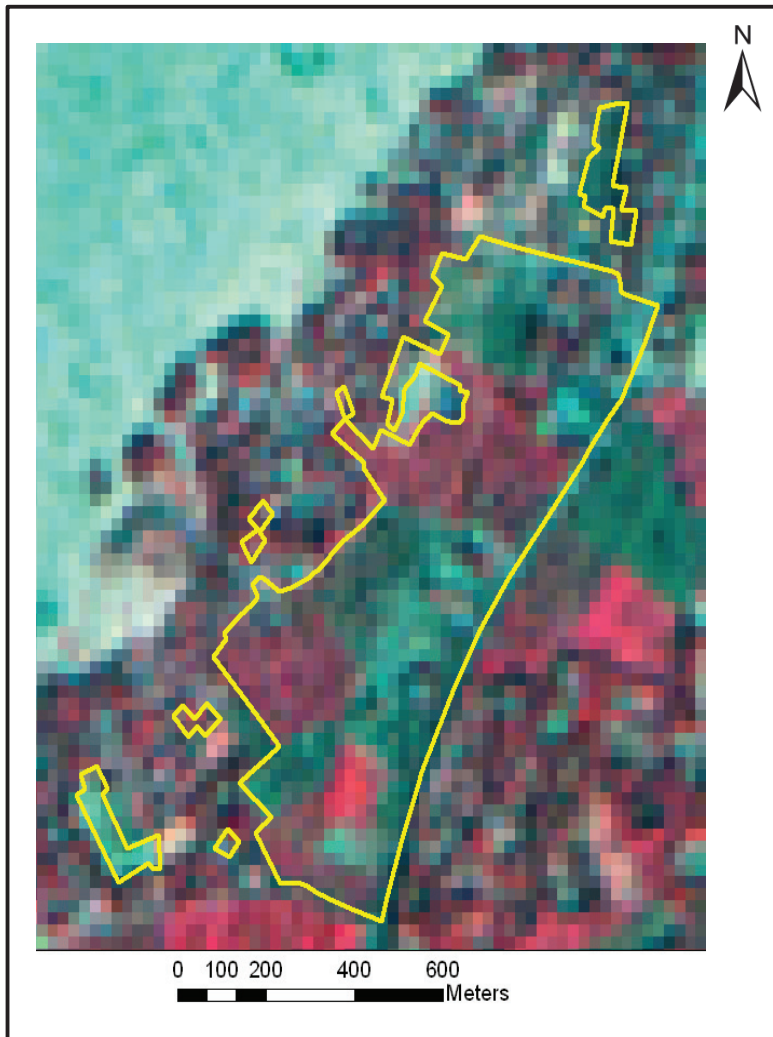


c. Section Boundaries of the Estate

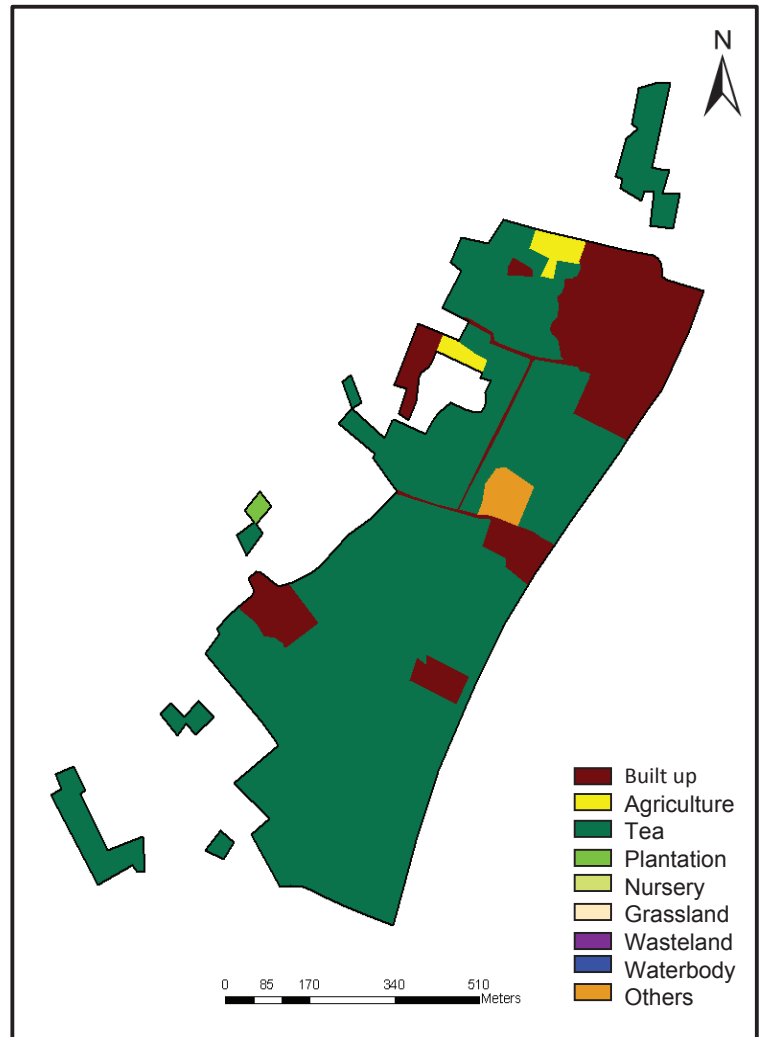


d. Shade Tree Density in Sections

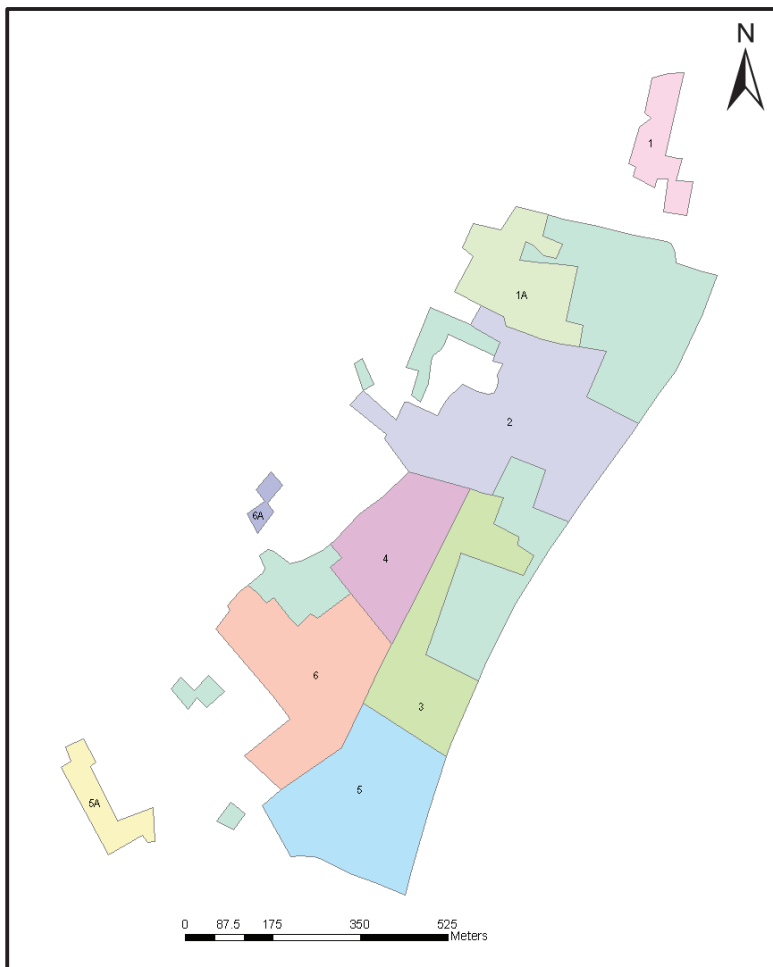




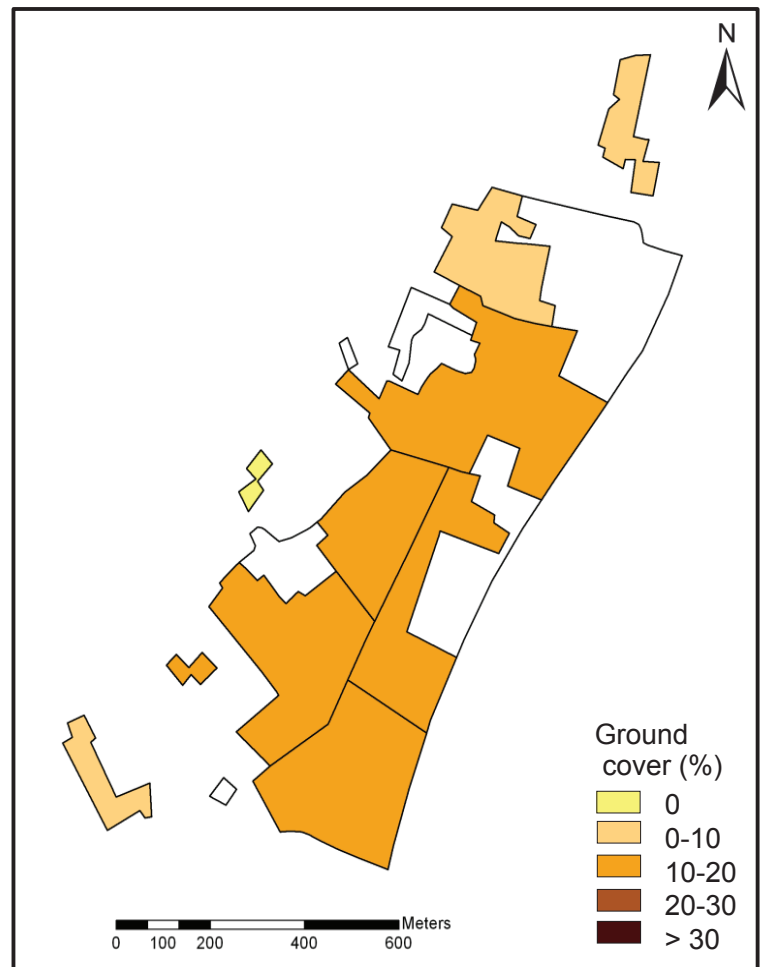
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections





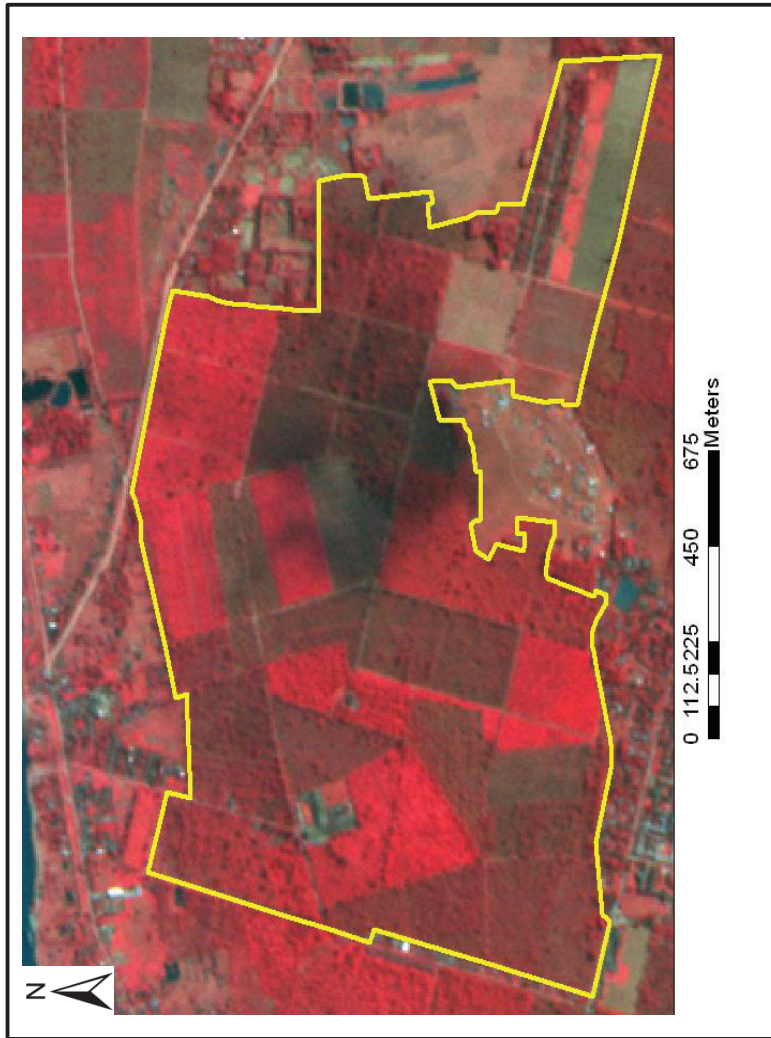
e. General Information

1. General		5. Natural resources constraints	
Contact address	PO: Barbaruah, Dist: Sibsagar PIN: 786007	Drainage congestion and water logging	Yes
Contact phone	09706043701	Scarcity of water during summer	No
Name of the company	--	River bank erosion	No
Name of the village where it falls	Burd Hozar gaon	Major diseases and duration	--
Leased area of the estate (ha)	--	Major pests and duration	<i>Helopeltis, RSM</i>
Tea grown area of the estate (ha)	42	Damage due to wildlife	No
No. of divisions / sections	--	6. Yield / production	
Year of establishment	--	Peak plucking periods	Aug - Oct
Type of tea produced	CTC	Annual green leaf yield	2400 kg/ha
2. Infrastructure		Annual production of processed tea	1000000 kg
Availability of processing factory	Yes	7. Pruning	
Availability of workers colony	Yes	Time of pruning	December
Availability of internet facility / e-mail id	Yes	Pruning cycle	4 yrs
Meteorological observations taken	Rainfall	Types of pruning	LP-UP-DS-UP
3. Amenities		8. Fertilizer use	
Availability of health care / dispensary	Yes	Types of N, P, K fertilizers used	Urea, MOP, RP
Availability of school	No	Dose of Nitrogen (kg/ha)	150
4. Shade trees		Dose of Phosphorous (kg/ha)	40
Shade tree density (garden level)	Low/ Medium	Dose of Potash (kg/ha)	100
Plant to plant spacing (m)	10 X 10, 13 x 13	Whether lime is applied, if yes dose	No
Row to row spacing (m)	1.2 x 1.2, 0.6 X 0.6, 0.76 X 0.76		

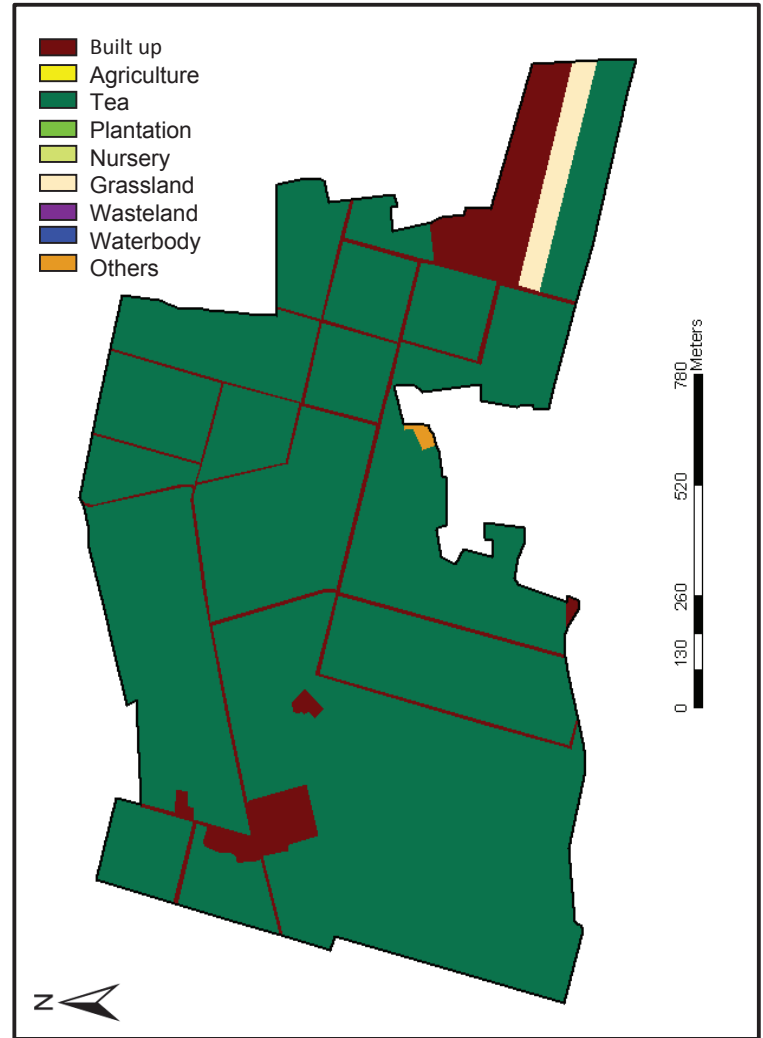




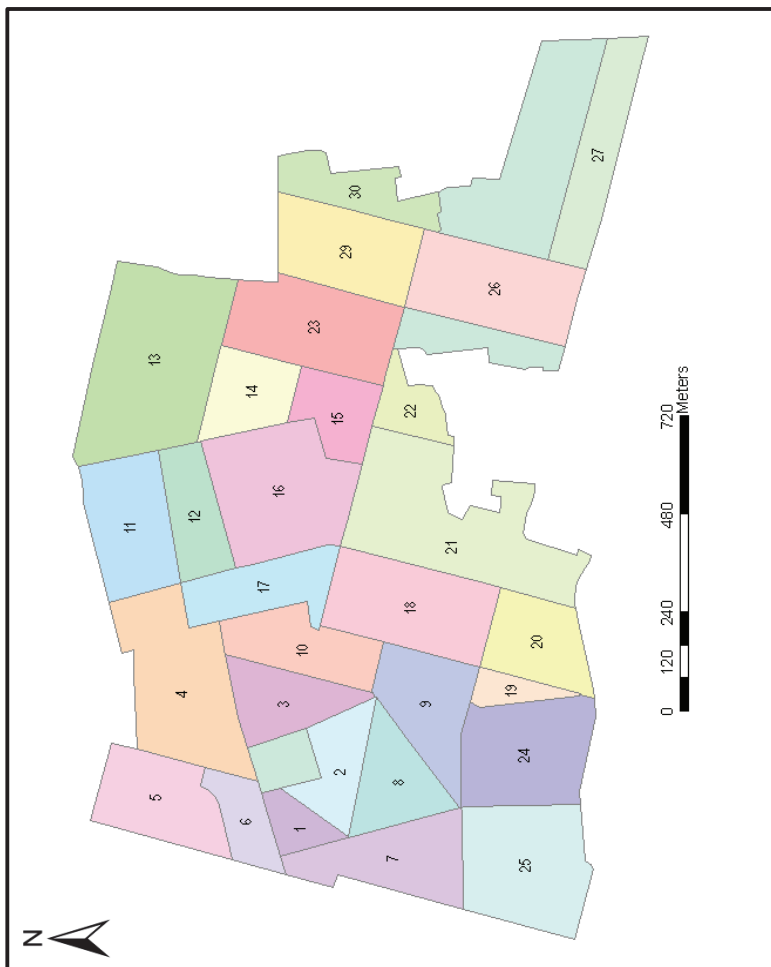
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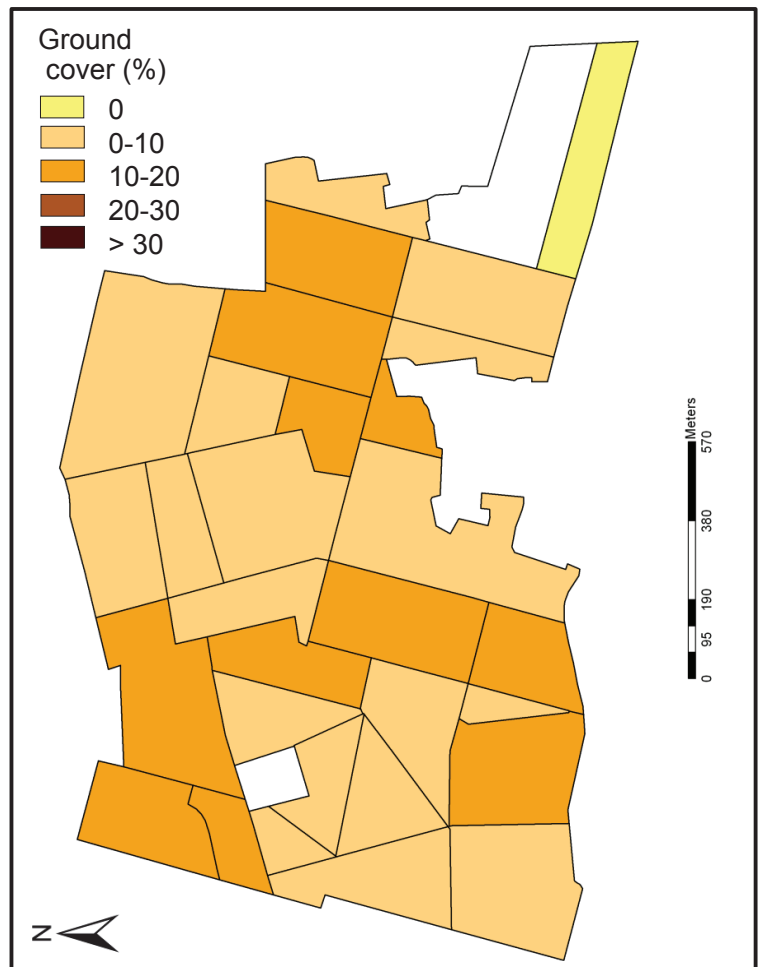
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate

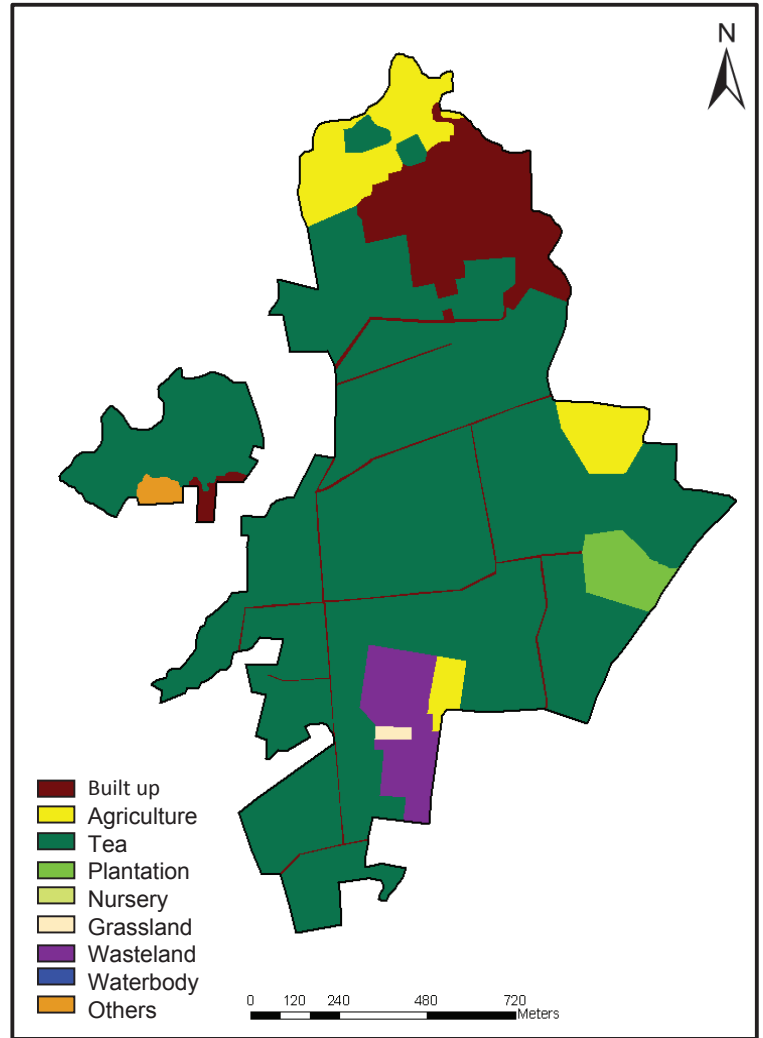


d. Shade Tree Density in Sections

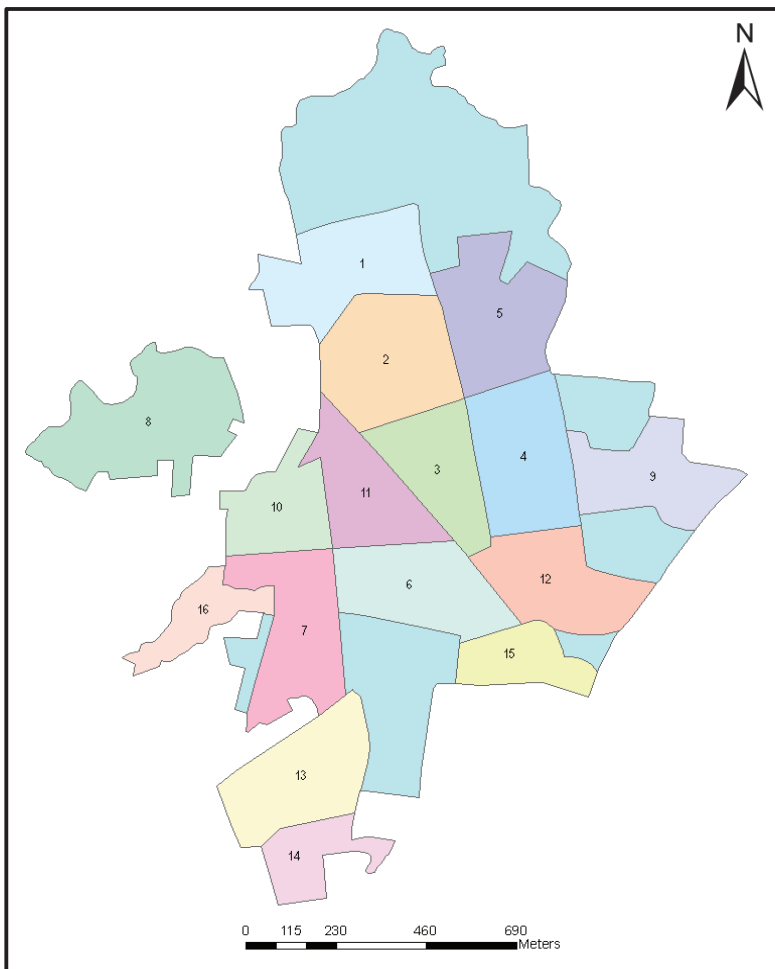




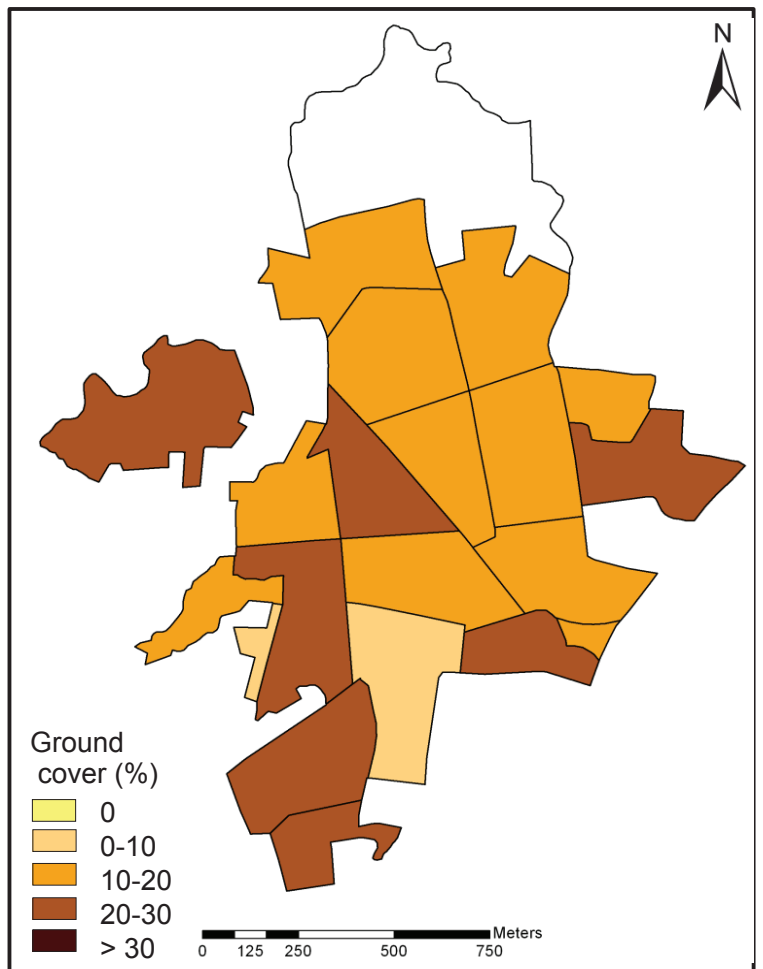
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse

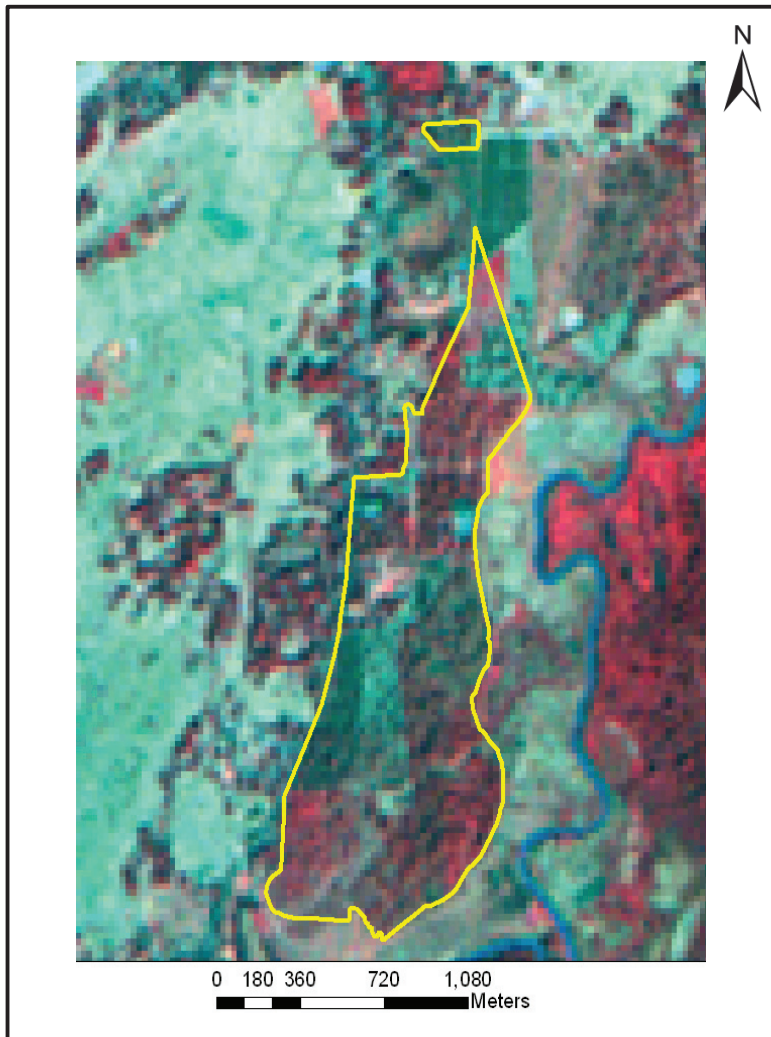


c. Section Boundaries of the Estate

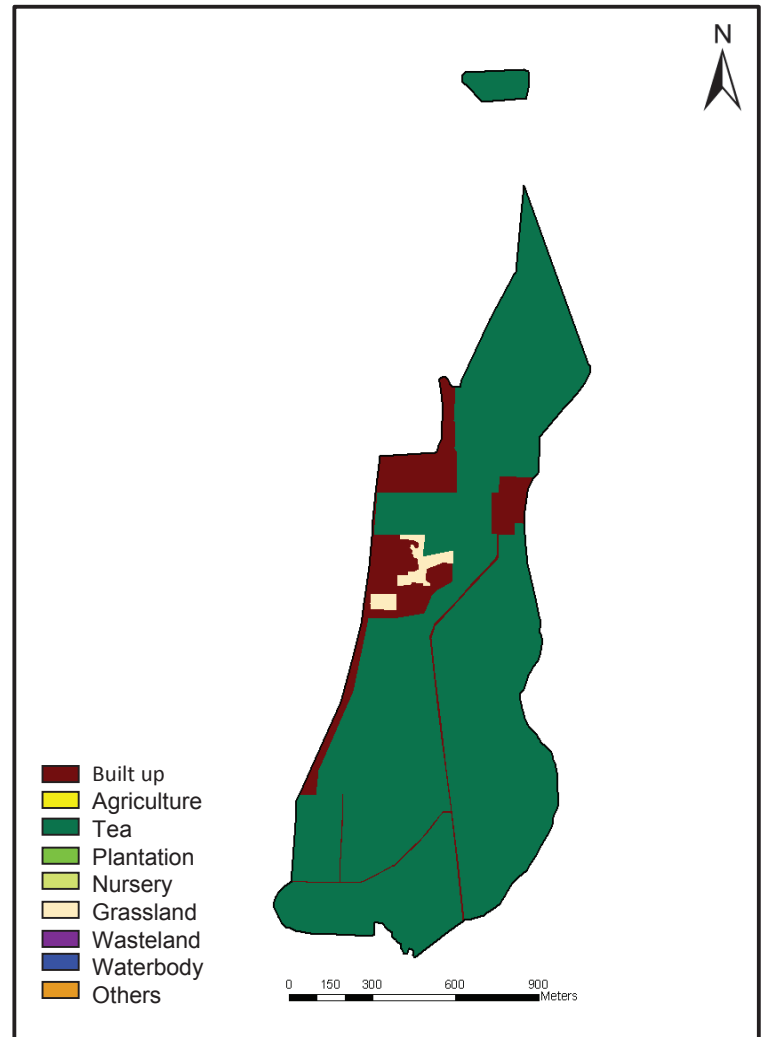


d. Shade Tree Density in Sections

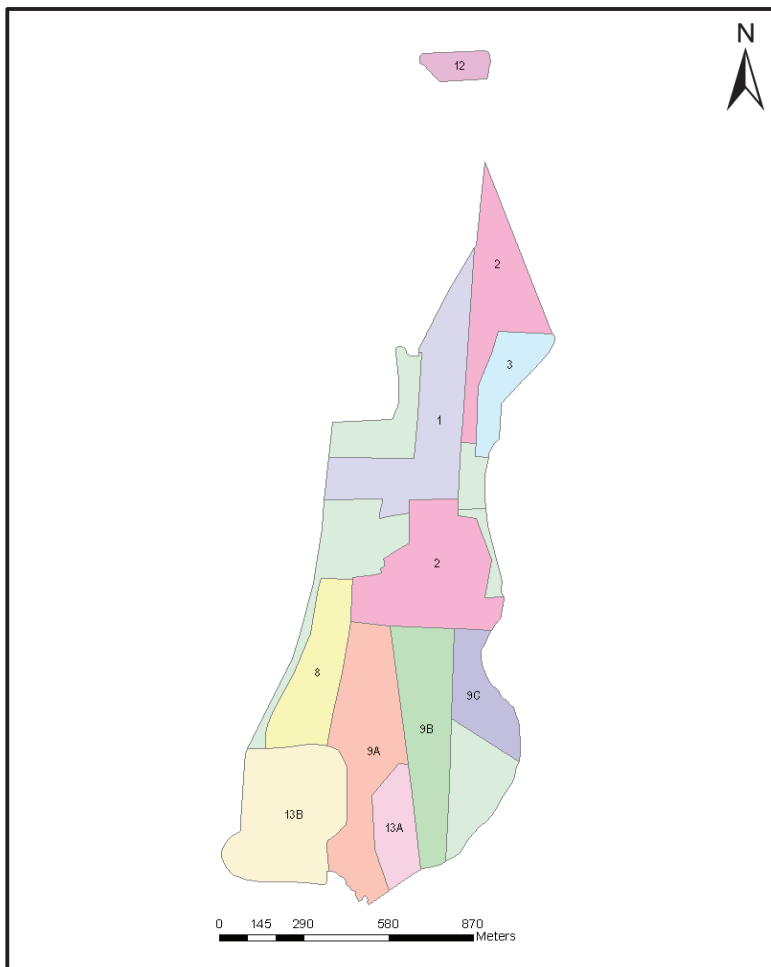




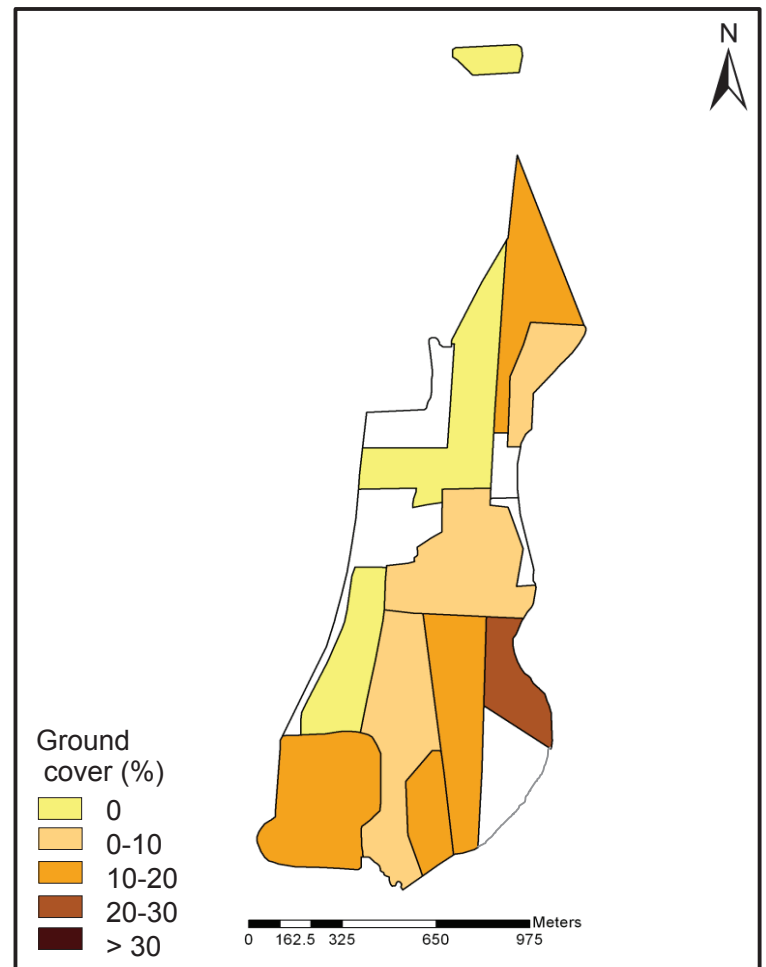
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate

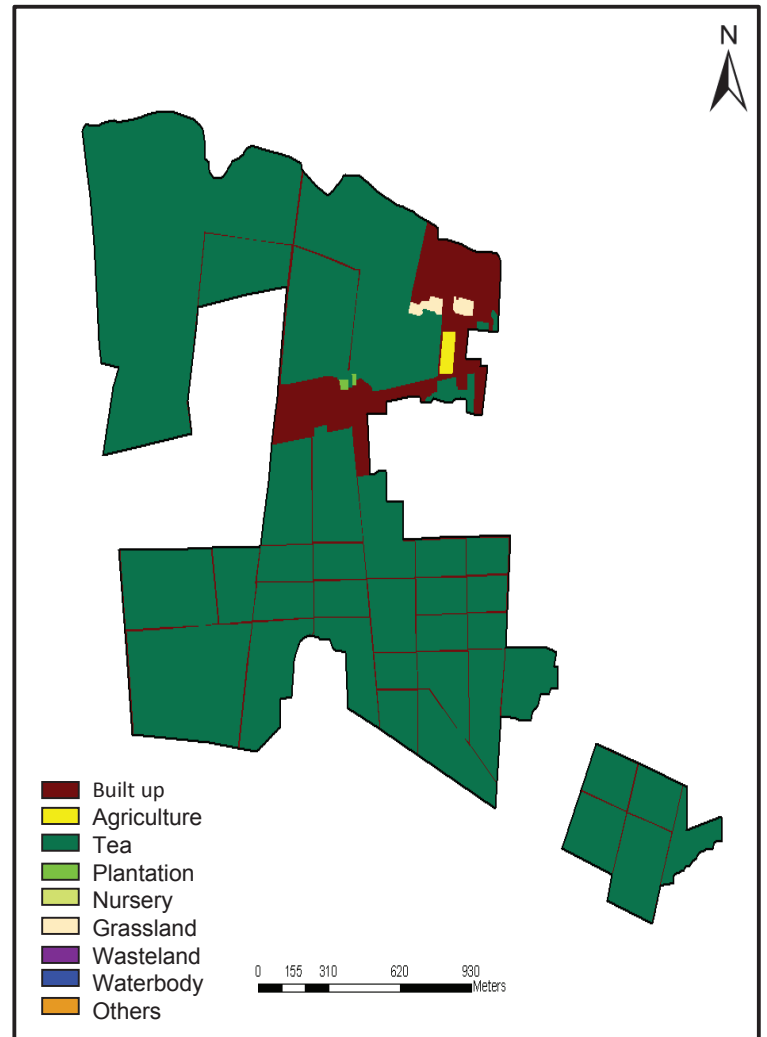


d. Shade Tree Density in Sections

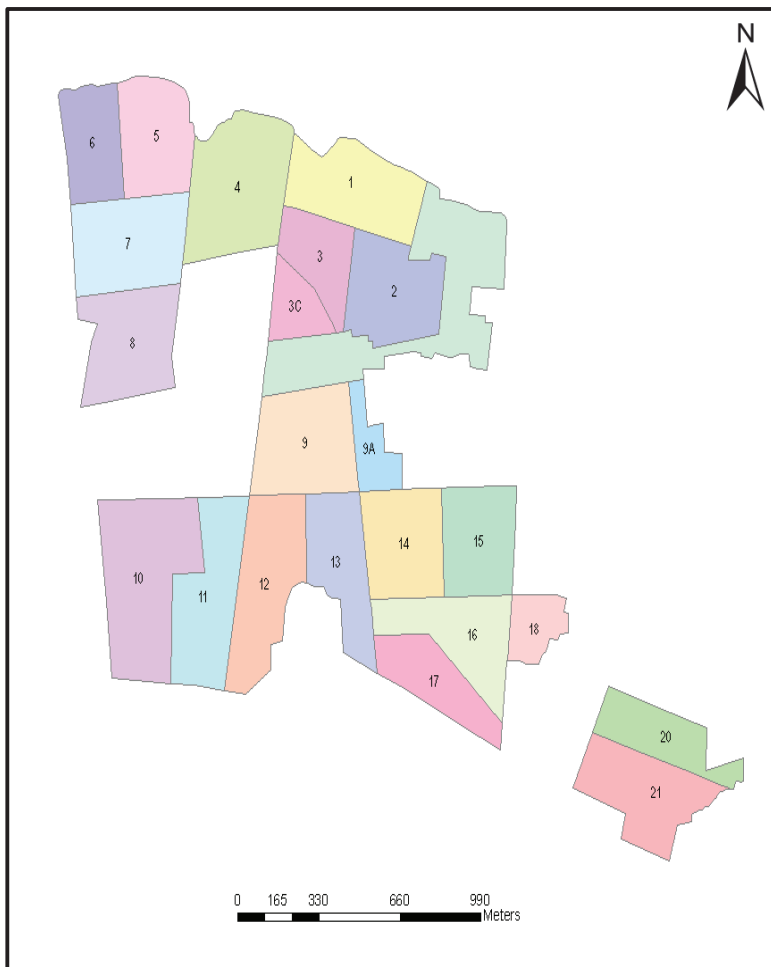




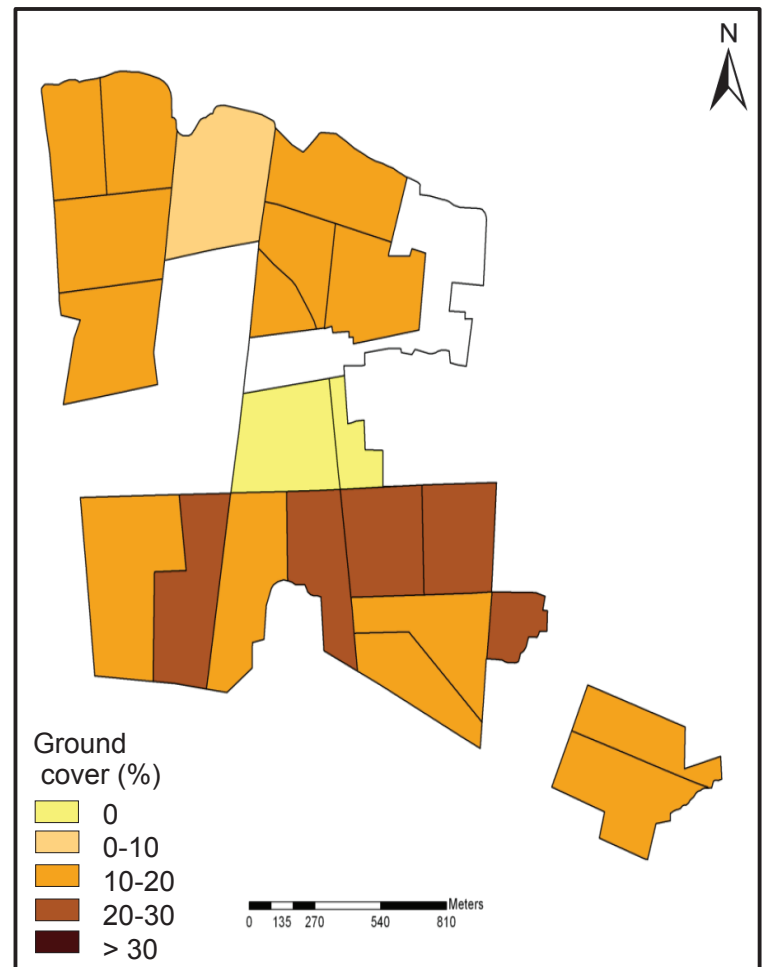
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

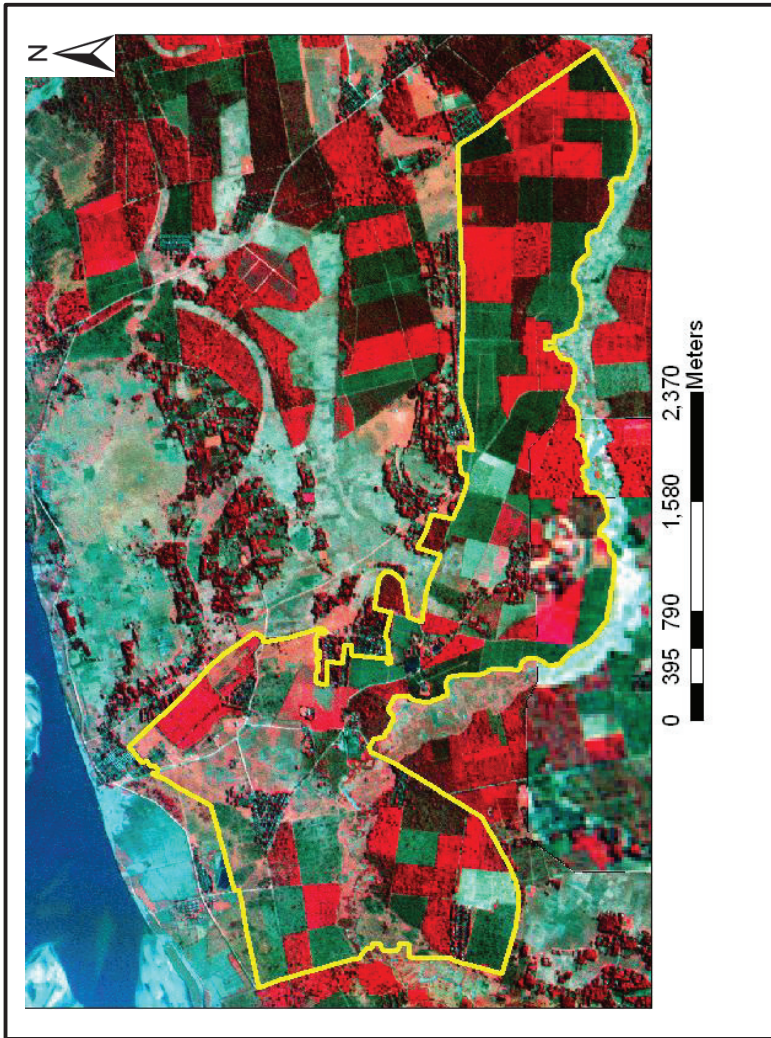




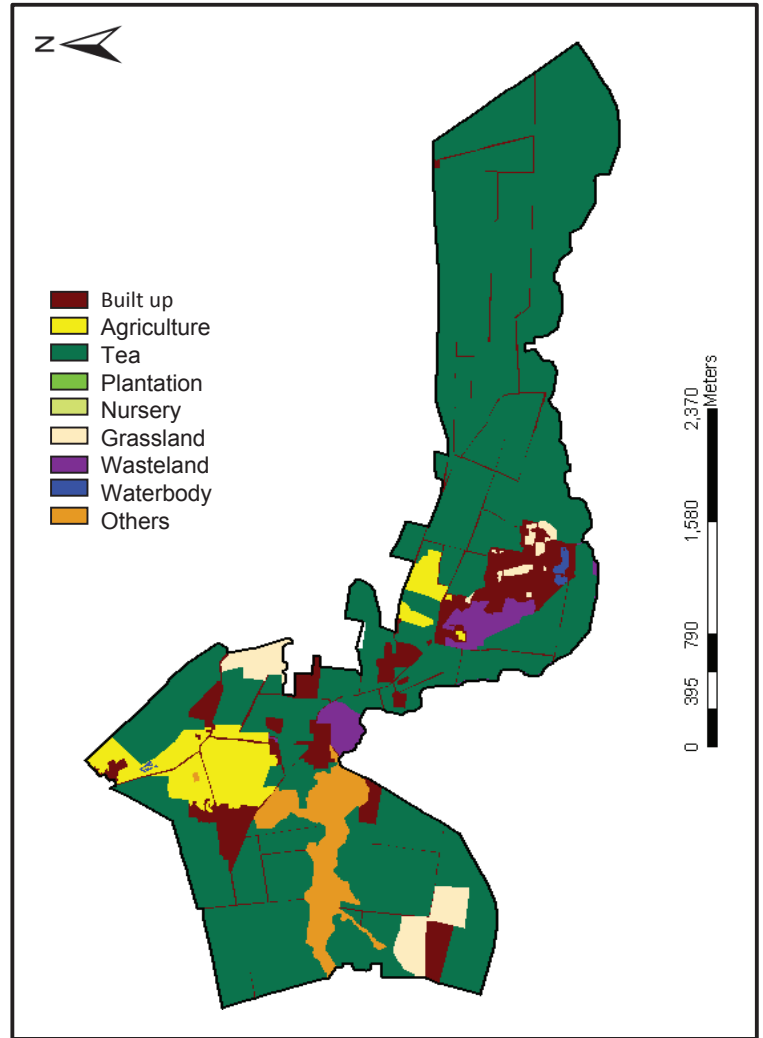
e. General Information

1. General		5. Natural resources constraints	
Contact address	P.O: Mohanbari, Dist: Dibrugarh, PIN: 786012	Drainage congestion and water logging	Yes
Contact phone	9957172140	Scarcity of water during summer	No
Name of the company	Mokalbari Kanoi Tea Estate Pvt. Ltd.	River bank erosion	No
Name of the village where it falls	--	Major diseases and duration	--
Leased area of the estate (ha)	--	Major pests and duration	<i>Helopeltis</i> (6 Months) RSM (6 Months)
Tea grown area of the estate (ha)	--	Damage due to wildlife	No
No. of divisions / sections	--	6. Yield / production	
Year of establishment	--	Peak plucking periods	Jun - Oct
Type of tea produced	CTC	Annual green leaf yield	6537 kg/ha
2. Infrastructure		Annual production of processed tea	--
Availability of processing factory	Yes	7. Pruning	
Availability of workers colony	Yes	Time of pruning	Last week of Nov - Mid of Jan
Availability of internet facility / e-mail id	Yes	Pruning cycle	4 yrs
Meteorological observations taken	Rainfall	Types of pruning	--
3. Amenities		8. Fertilizer use	
Availability of health care / dispensary	Yes	Types of N, P, K fertilizers used	Urea, MOP, RP
Availability of school	Yes	Dose of Nitrogen (kg/ha)	160 - 200
4. Shade trees		Dose of Phosphorous (kg/ha)	40
Shade tree density (garden level)	Medium	Dose of Potash (kg/ha)	80 -100
Plant to plant spacing (m)	0.6 X 1.3	Whether lime is applied, if yes dose	No
Row to row spacing (m)	1.16 X 1.3		

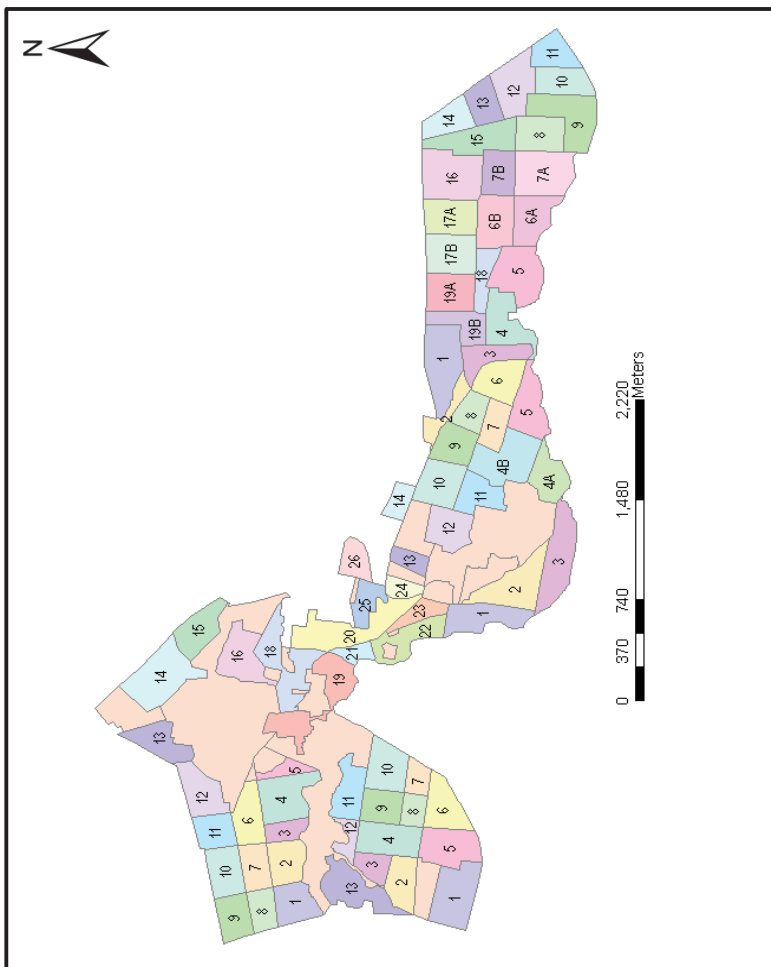




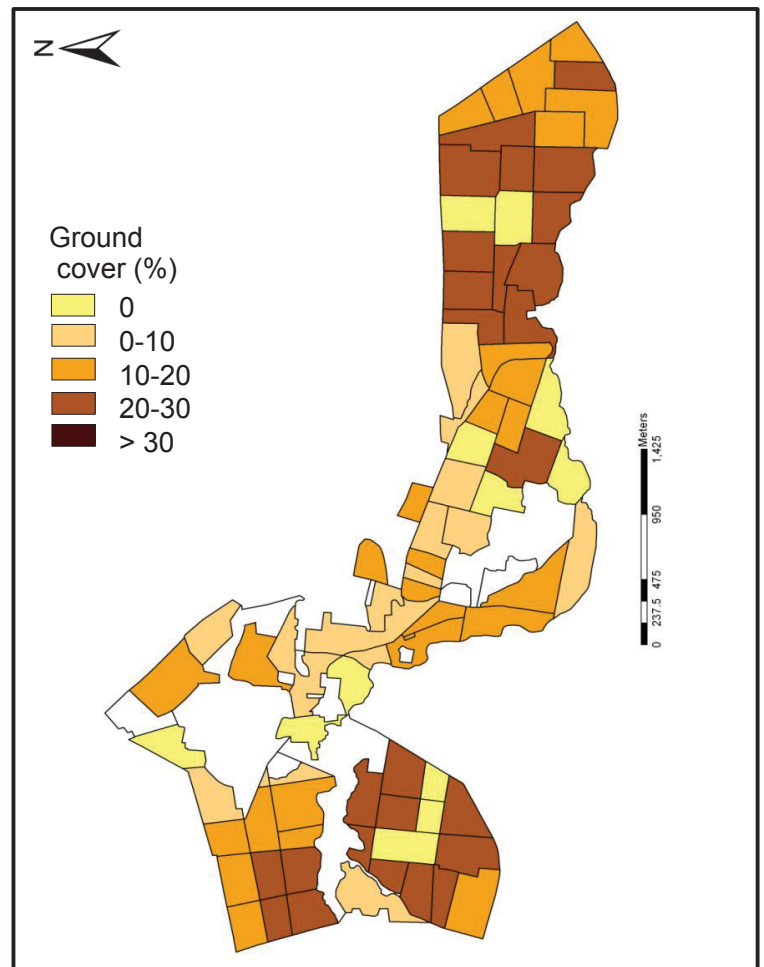
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of The Estate



d. Shade Tree Density in Sections

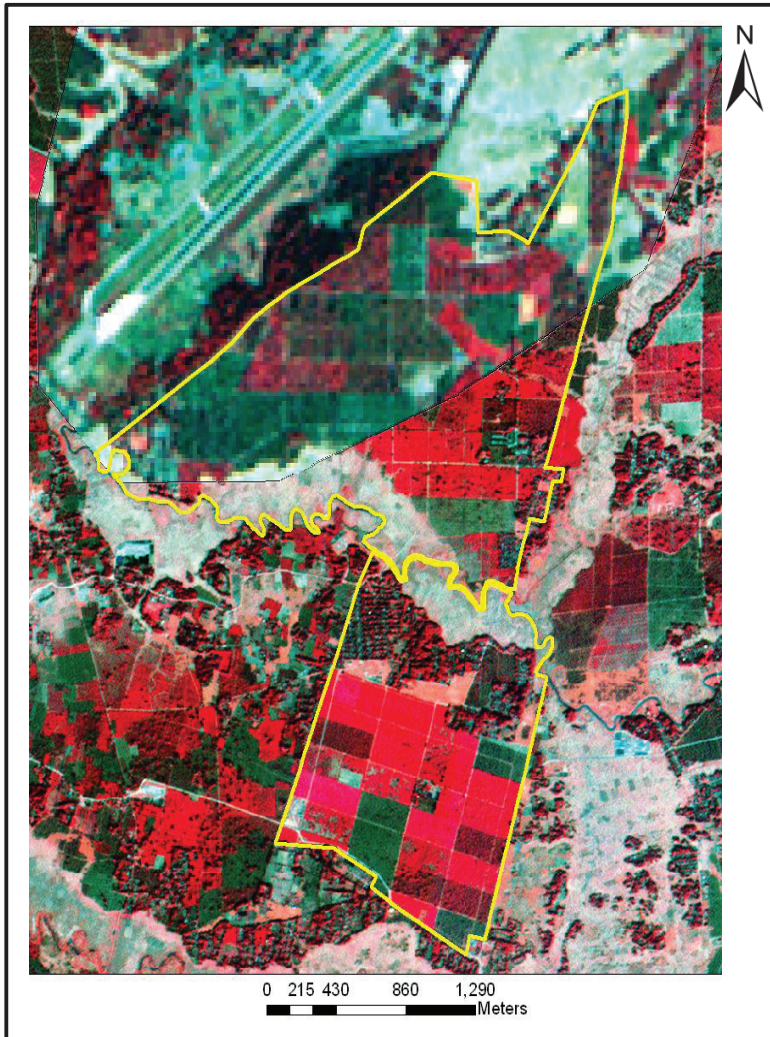




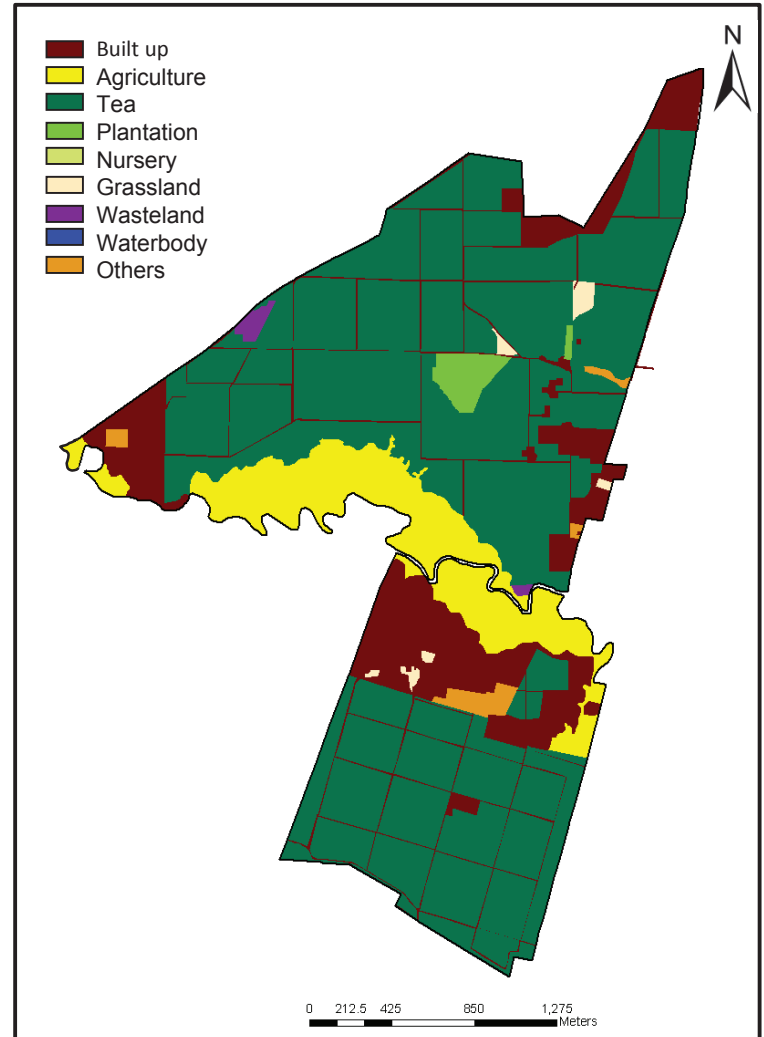
e. General Information

1. General		5. Natural resources constraints	
Contact address	PO: Dibrugarh, Dist: Dibrugarh, PIN:786001	Drainage congestion and water logging	Yes
Contact phone	0373-2100819	Scarcity of water during summer	No
Name of the company	Assam Company India Limited	River bank erosion	Yes
Name of the village where it falls	Kanai Garuchora Gaon	Major diseases and duration	Black Rot, Blister Blight
Leased area of the estate (ha)	969.93	Major pests and duration	<i>Helopeltis</i> , Looper, RSM
Tea grown area of the estate (ha)	548.39	Damage due to wildlife	No
No. of divisions / sections	5 div/87 sec	6. Yield / production	
Year of establishment	1839	Peak plucking periods	Jul - Oct
Type of tea produced	CTC, Orthodox	Annual green leaf yield	7917.7 kg/ha
2. Infrastructure		Annual production of processed tea	989412 kg
Availability of processing factory	Yes	7. Pruning	
Availability of workers colony	Yes	Time of pruning	Dec - 1 st week of Feb
Availability of internet facility / e-mail id	Yes	Pruning cycle	--
Meteorological observations taken	Tmax, Tmin, Rainfall	Types of pruning	LP-DS-UP, LP-UP-DS
3. Amenities		8. Fertilizer use	
Availability of health care / dispensary	Yes	Types of N, P, K fertilizers used	Urea, MOP, RP
Availability of school	Yes	Dose of Nitrogen (kg/ha)	263
4. Shade trees		Dose of Phosphorous (kg/ha)	153
Shade tree density (garden level)	Medium	Dose of Potash (kg/ha)	149
Plant to plant spacing (m)	13 X 13	Whether lime is applied, if yes dose	Yes (LP year), 1MT/ha
Row to row spacing (m)	13 X 13		

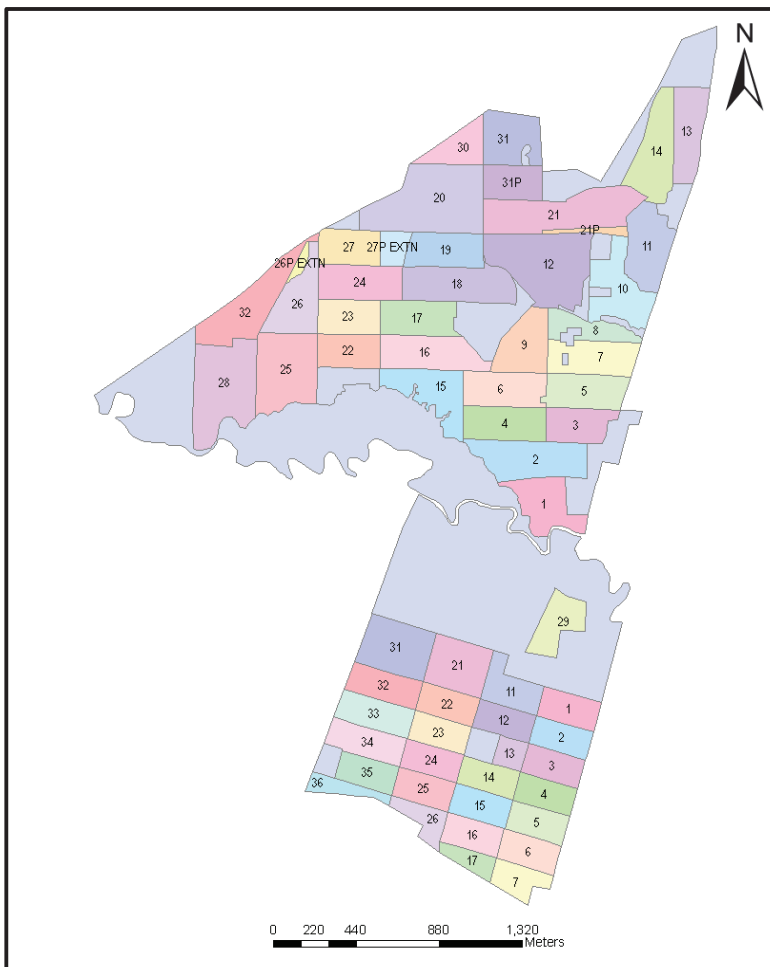




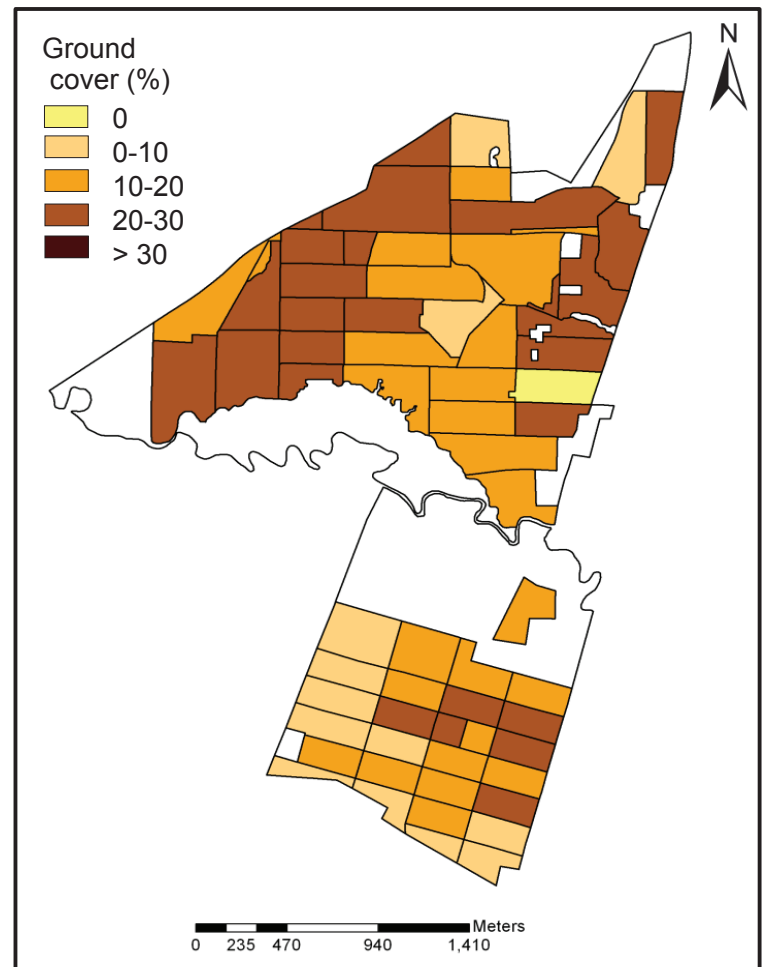
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

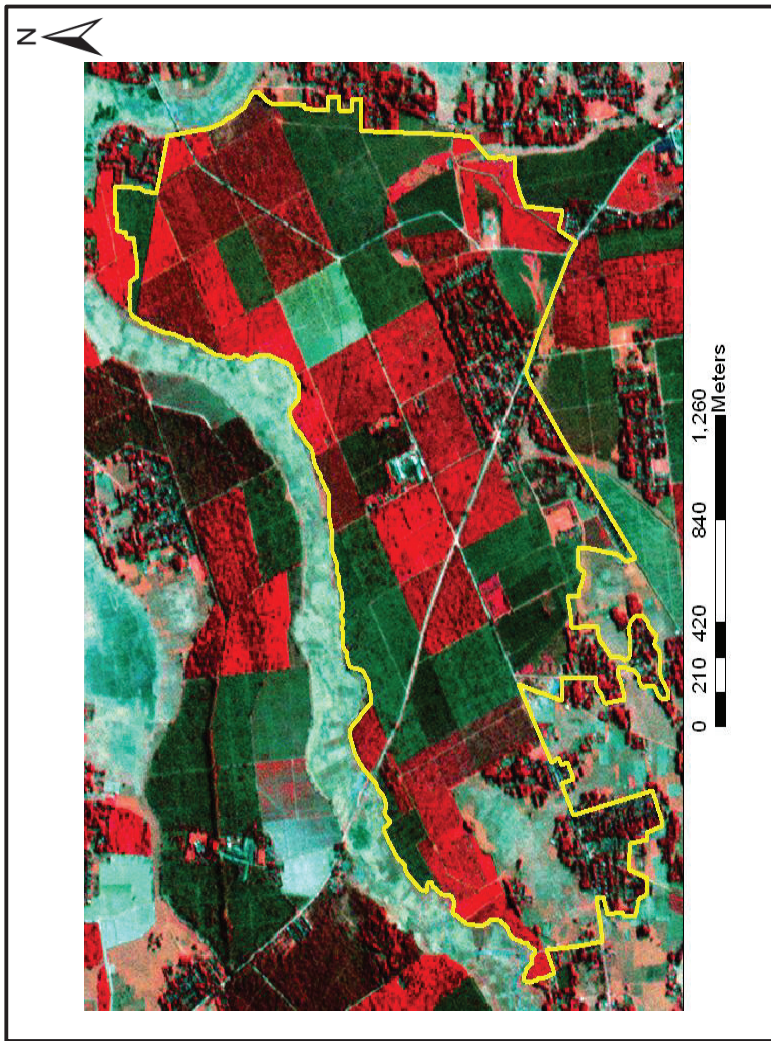




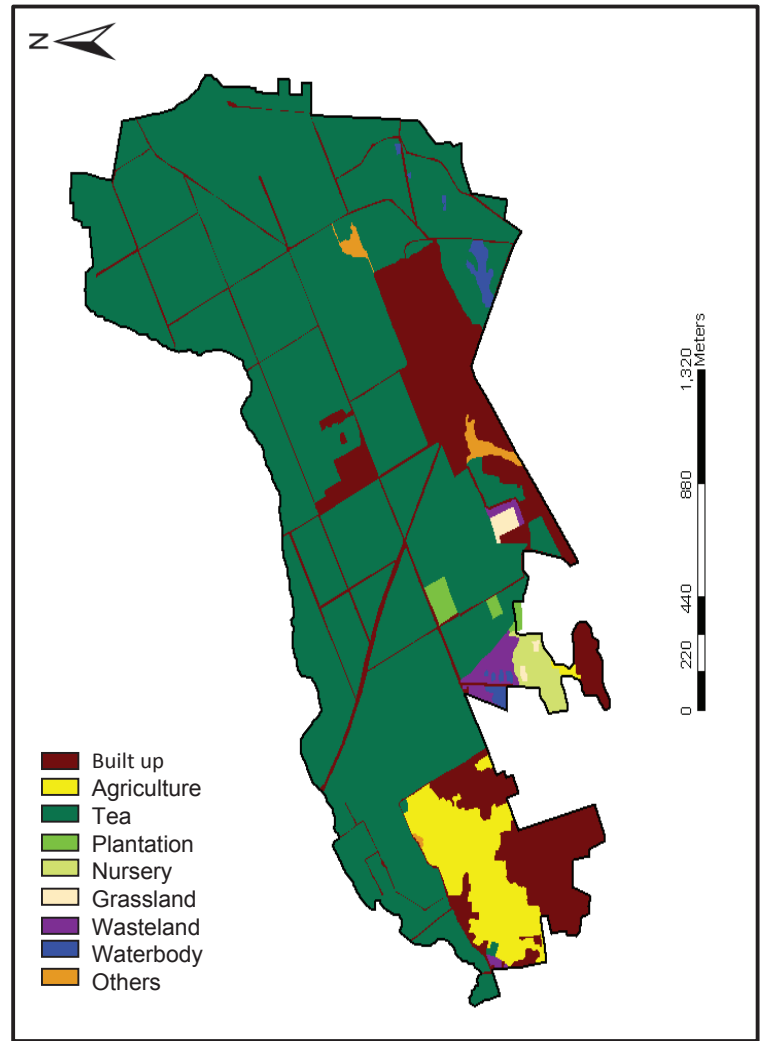
e. General Information

1. General		5. Natural resources constraints	
Contact address	PO: Chubwa, Dist: Dibrugarh, PIN:786184	Drainage congestion and water logging	No
Contact phone	0373-2910365	Scarcity of water during summer	No
Name of the company	M. K. Shah Exports Limited	River bank erosion	No
Name of the village where it falls	Hattialli	Major diseases and duration	<i>Fusarium</i> , Red rust
Leased area of the estate (ha)	692.72	Major pests and duration	<i>Helopeltis</i>
Tea grown area of the estate (ha)	410.68	Damage due to wildlife	No
No. of divisions / sections	2 div/ 65 sec	6. Yield / production	
Year of establishment	--	Peak plucking periods	Mar - Nov
Type of tea produced	Orthodox	Annual green leaf yield	8203.35 kg/ha
2. Infrastructure		Annual production of processed tea	748656 kg
Availability of processing factory	Yes	7. Pruning	
Availability of workers colony	Yes	Time of pruning	Mid Nov - Dec
Availability of internet facility / e-mail id	Yes	Pruning cycle	3 yrs
Meteorological observations taken	Tmax, Tmin, Rainfall	Types of pruning	--
3. Amenities		8. Fertilizer use	
Availability of health care / dispensary	Yes	Types of N, P, K fertilizers used	Urea, MOP, RP
Availability of school	Yes	Dose of Nitrogen (kg/ha)	180
4. Shade trees		Dose of Phosphorous (kg/ha)	36
Shade tree density (garden level)	Medium	Dose of Potash (kg/ha)	80
Plant to plant spacing (m)	13.66 x 6.67	Whether lime is applied, if yes dose	--
Row to row spacing (m)	6.67 x 6.67		

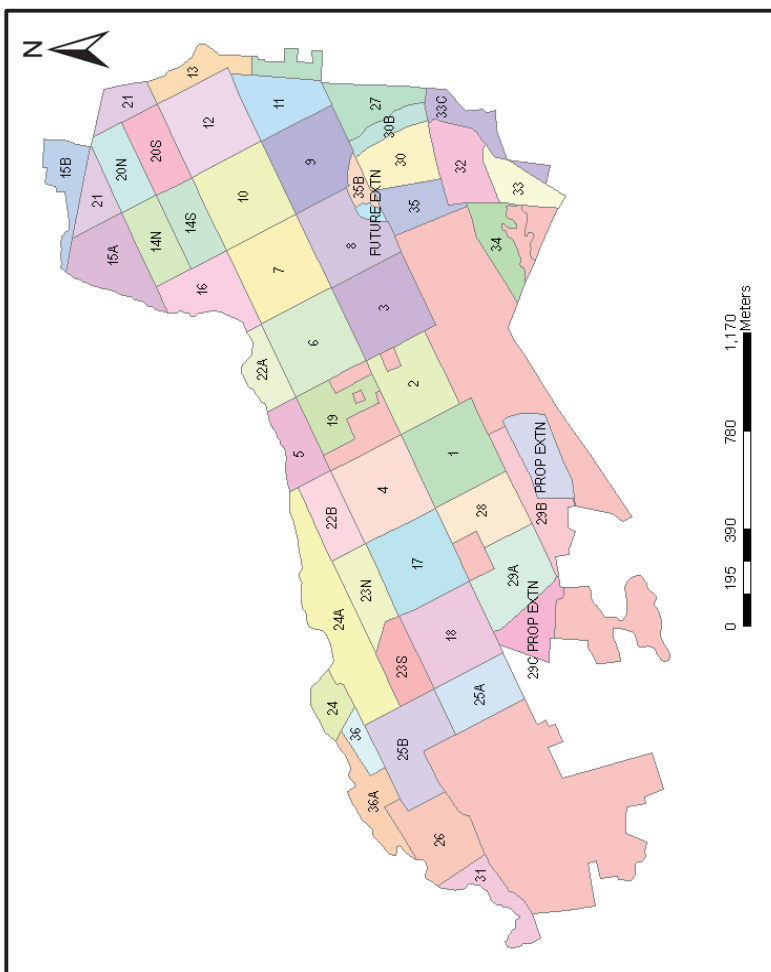




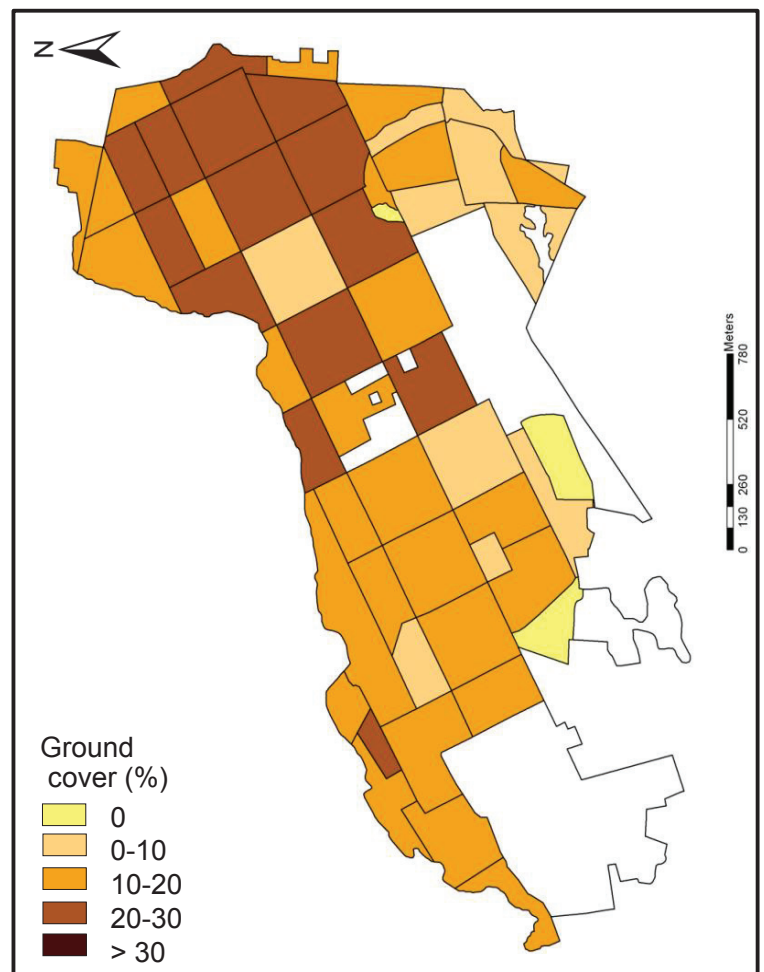
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

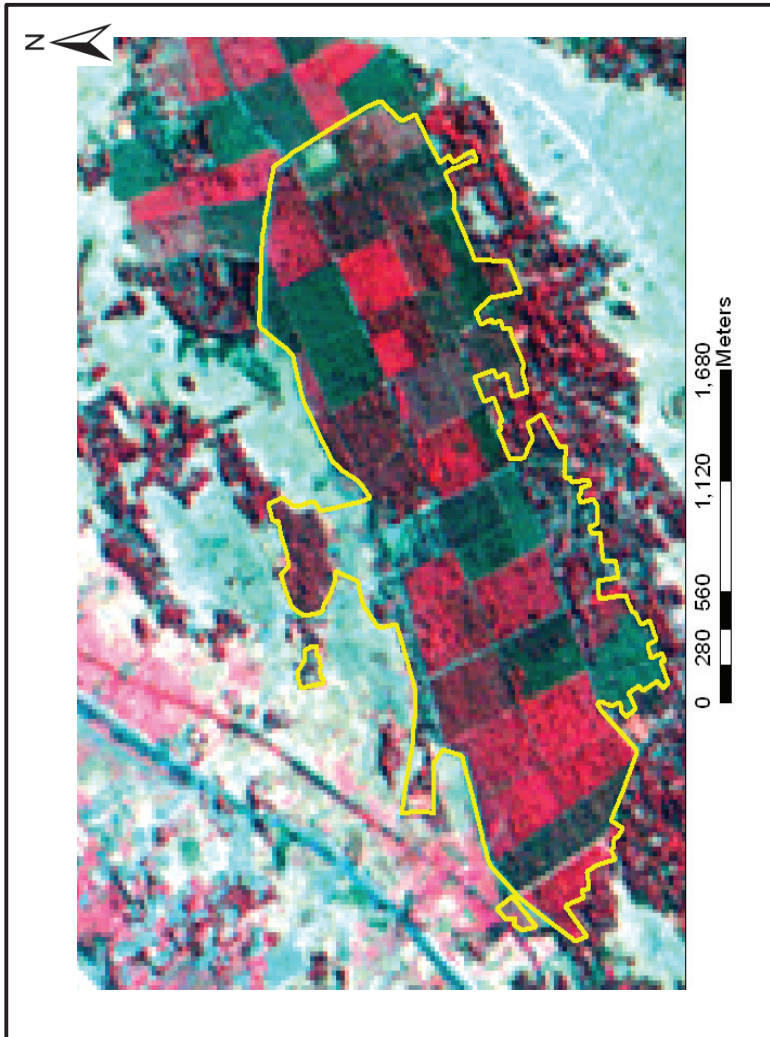




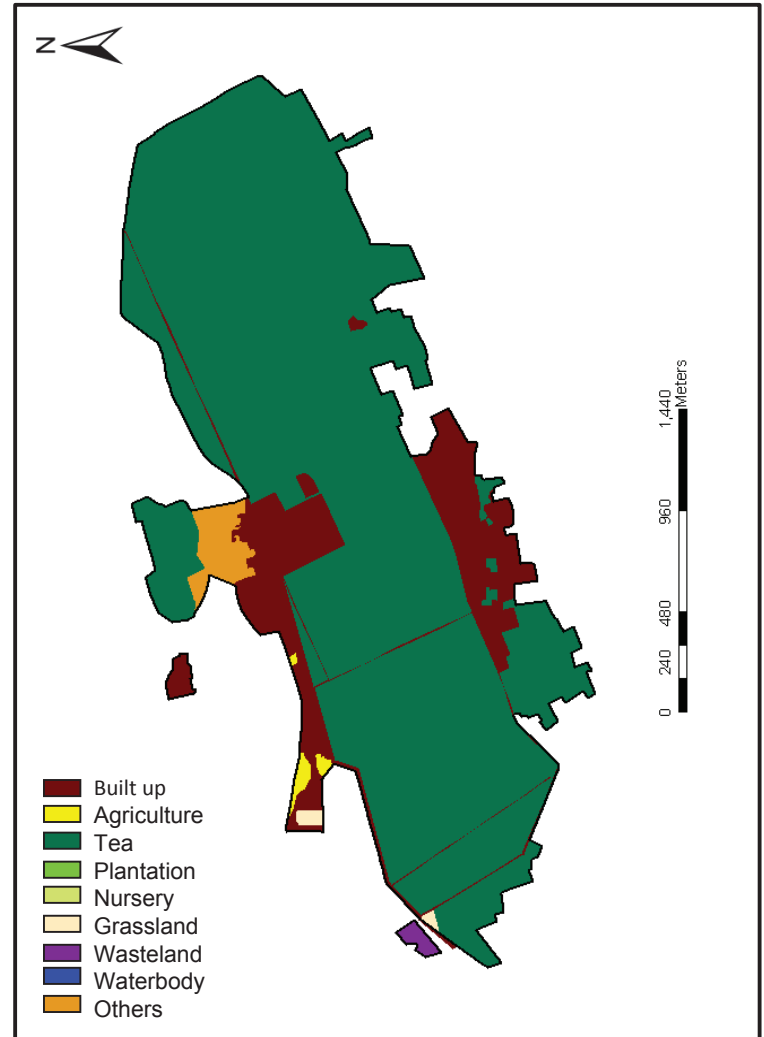
e. General Information

1. General		5. Natural resources constraints	
Contact address	PO: Dikom, Dist: Dibrugarh PIN: 786101	Drainage congestion and water logging	Yes
Contact phone	0373-2913376	Scarcity of water during summer	No
Name of the company	Assam Company India Ltd.	River bank erosion	No
Name of the village where it falls	Sonipotia	Major diseases and duration	Fungal (5 months)
Leased area of the estate (ha)	396.98	Major pests and duration	<i>Helopeltis</i> (5 months) Looper, Red slug (2 months) Mites (3 months)
Tea grown area of the estate (ha)	285.83	Damage due to wildlife	No
No. of divisions / sections	0 div / 48 sec	6. Yield / production	
Year of establishment	1839	Peak plucking periods	Jul - Oct
Type of tea produced	CTC, Orthodox	Annual green leaf yield	1954 kg/ha
2. Infrastructure		Annual production of processed tea	592228.4 kg
Availability of processing factory	Yes	7. Pruning	
Availability of workers colony	Yes	Time of pruning	1st week Dec - 1st week January
Availability of internet facility / e-mail id	Yes	Pruning cycle	4 yrs
Meteorological observations taken	Tmax, Tmin, Rainfall	Types of pruning	LP-UP-DS-LP
3. Amenities		8. Fertilizer use	
Availability of health care / dispensary	Yes	Types of N, P, K fertilizers used	Urea, RP, MOP, SSP
Availability of school	Yes	Dose of Nitrogen (kg/ha)	140
4. Shade trees		Dose of Phosphorous (kg/ha)	31
Shade tree density (garden level)	Medium	Dose of Potash (kg/ha)	100
Plant to plant spacing (m)	13 X 13	Whether lime is applied, if yes dose	--
Row to row spacing (m)	13 X 13		

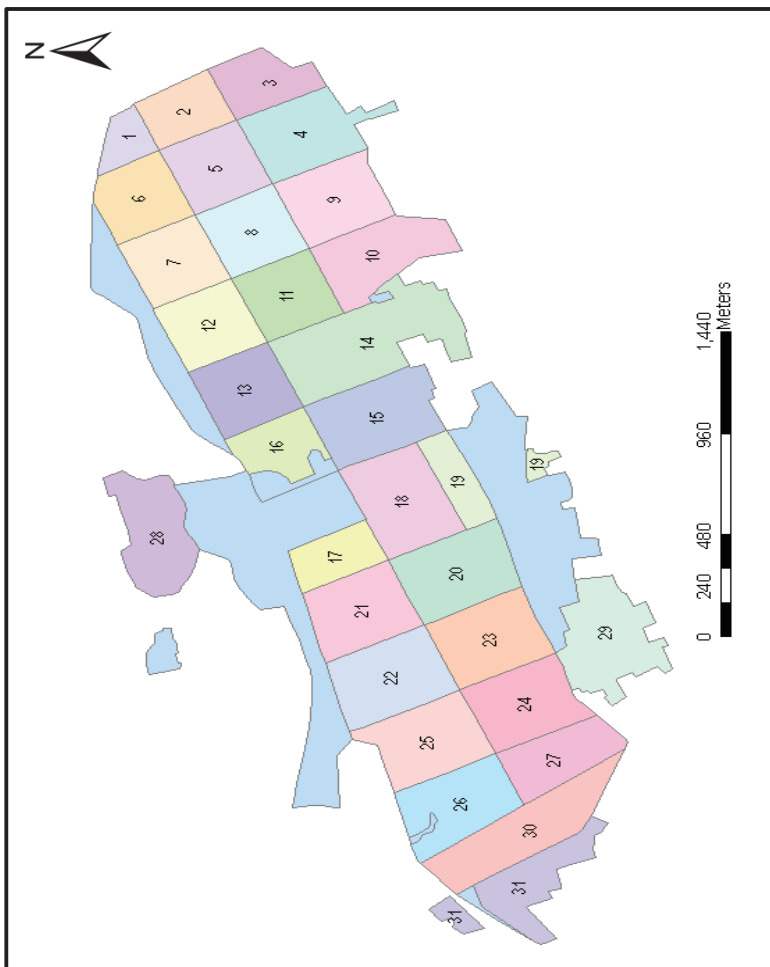




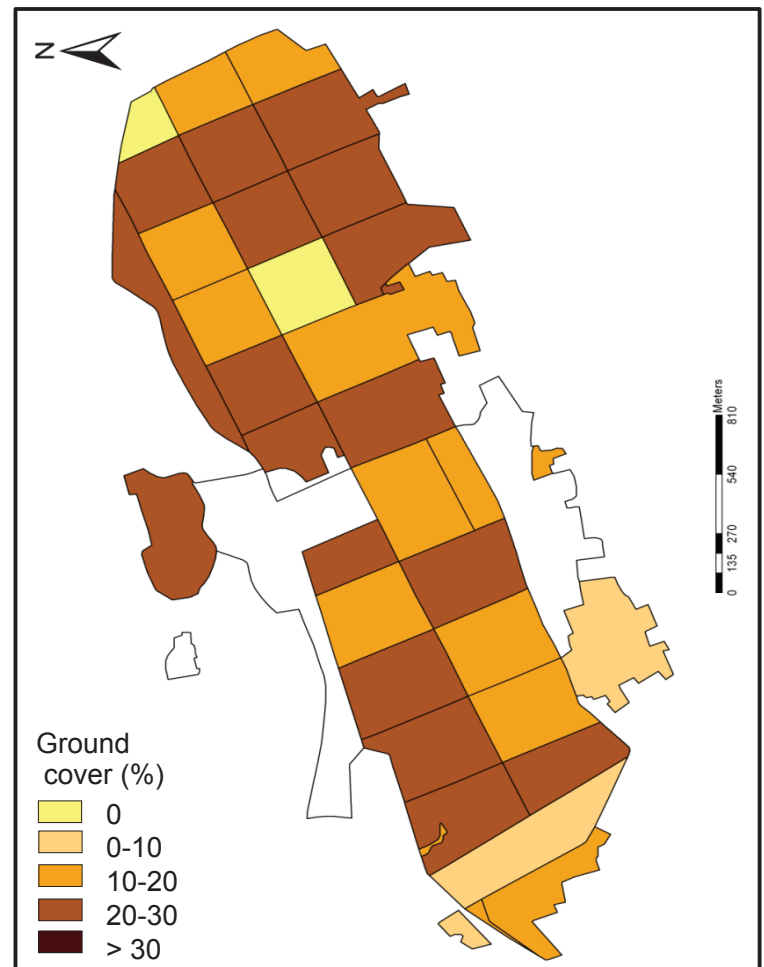
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

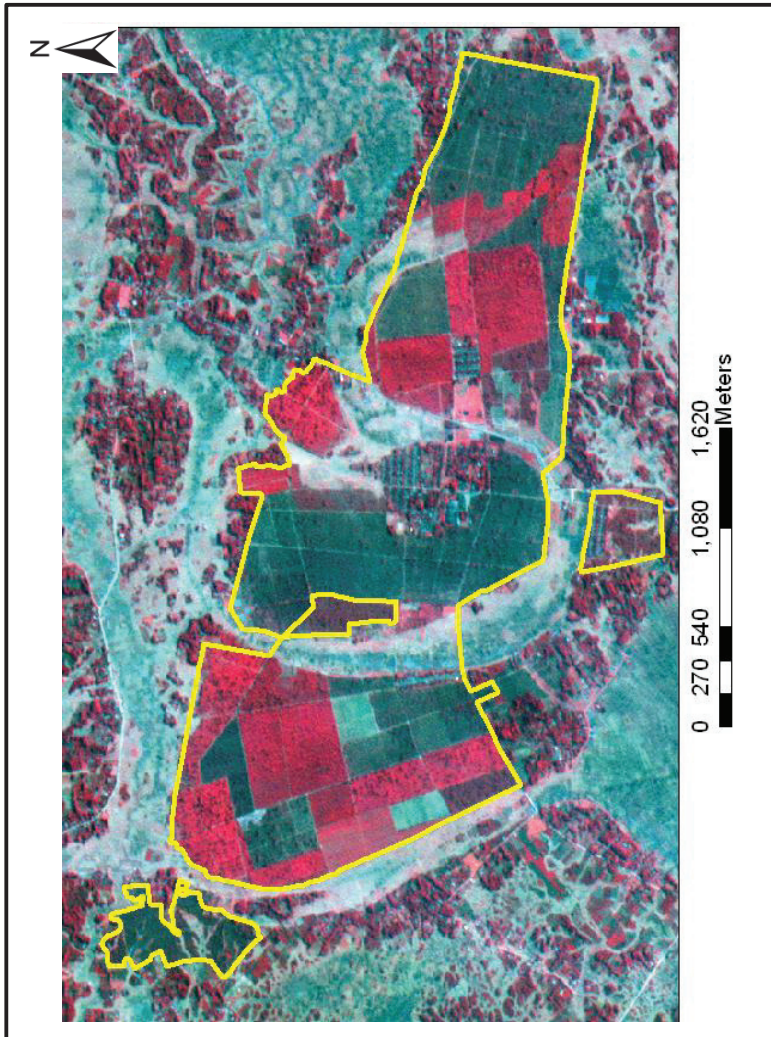




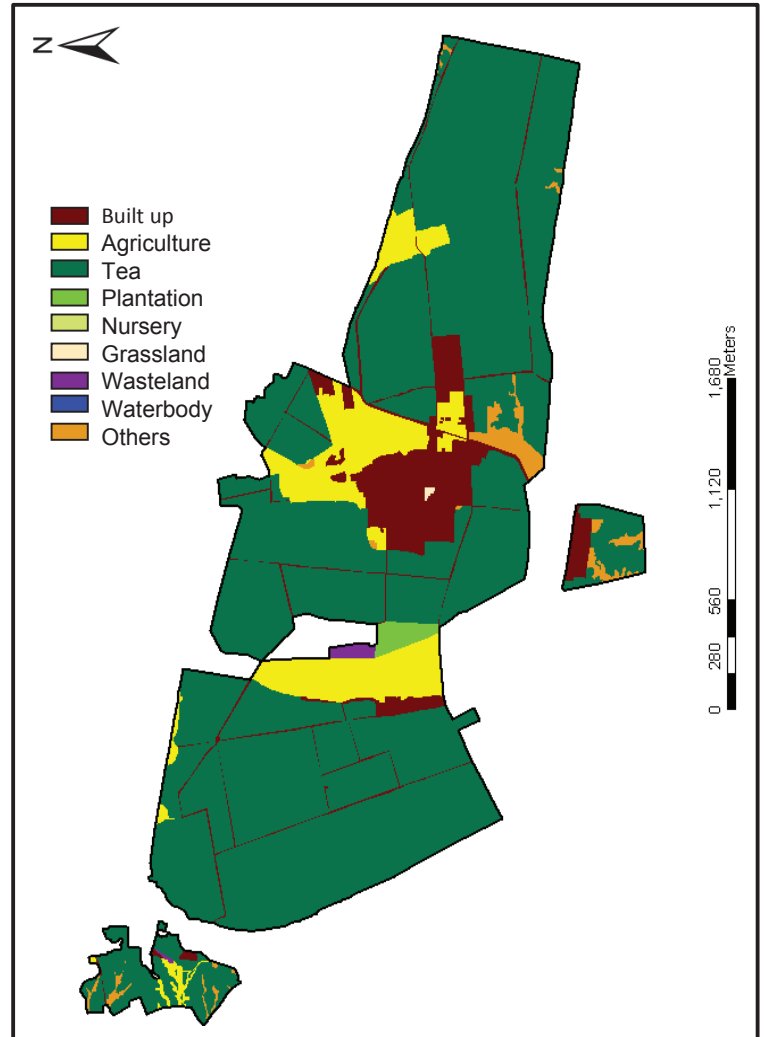
e. General Information

1. General		5. Natural resources constraints	
Contact address	PO: Dibrugarh, Dist: Dibrugarh PIN: 786001	Drainage congestion and water logging	Yes
Contact phone	0373- 25201065/106/10 7	Scarcity of water during summer	No
Name of the company	Jamirah Tea Company Ltd.	River bank erosion	No
Name of the village where it falls	--	Major diseases and duration	Black rot, Blister blight, Red rust (seasonal)
Leased area of the estate (ha)	573.75	Major pests and duration	Tea mosquito bug, RSM, Looper caterpillar (seasonal)
Tea grown area of the estate (ha)	371.80	Damage due to wildlife	No
No. of divisions / sections	1 div / 32 sec	6. Yield / production	
Year of establishment	1956	Peak plucking periods	6 months
Type of tea produced	CTC	Annual green leaf yield	12000 kg/ha
2. Infrastructure		Annual production of processed tea	929500 kg
Availability of processing factory	Yes	7. Pruning	
Availability of workers colony	Yes	Time of pruning	Mid Dec - Feb
Availability of internet facility / e-mail id	No	Pruning cycle	4 yrs
Meteorological observations taken	Tmax, Tmin, RHmax, RHmin, Rainfall	Types of pruning	--
3. Amenities		8. Fertilizer use	
Availability of health care / dispensary	Yes	Types of N, P, K fertilizers used	Urea, RP, SSP, MOP
Availability of school	Yes	Dose of Nitrogen (kg/ha)	180 -200
4. Shade trees		Dose of Phosphorous (kg/ha)	30 - 50
Shade tree density (garden level)	Medium	Dose of Potash (kg/ha)	140 - 50
Plant to plant spacing (m)	12 x 12	Whether lime is applied, if yes dose	--
Row to row spacing (m)	12 x 12		

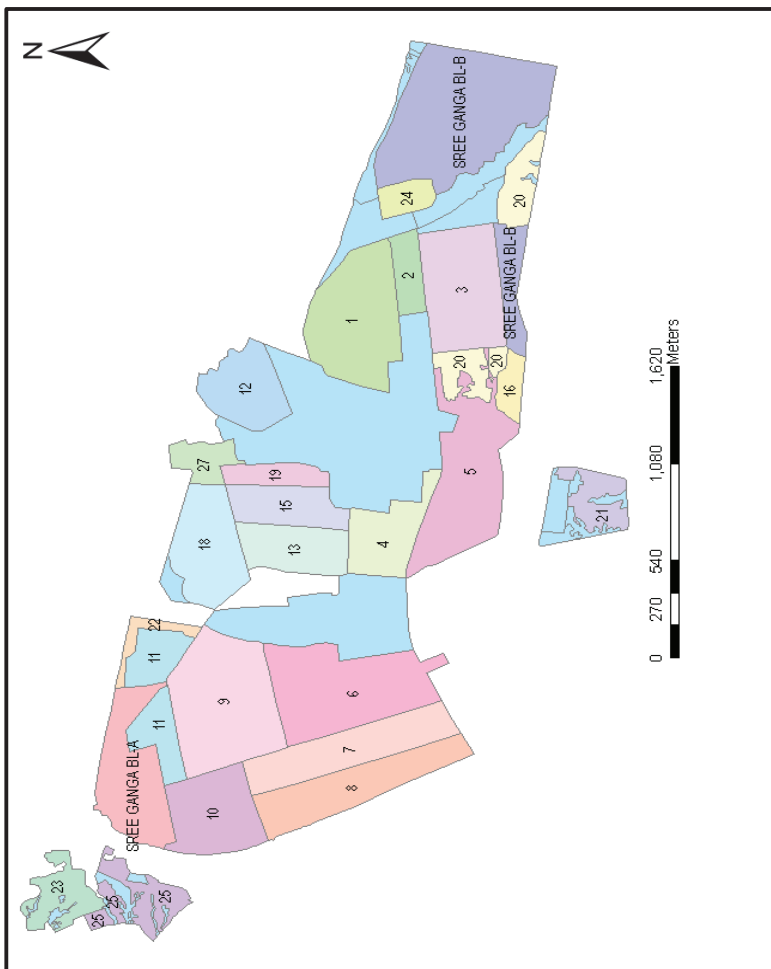




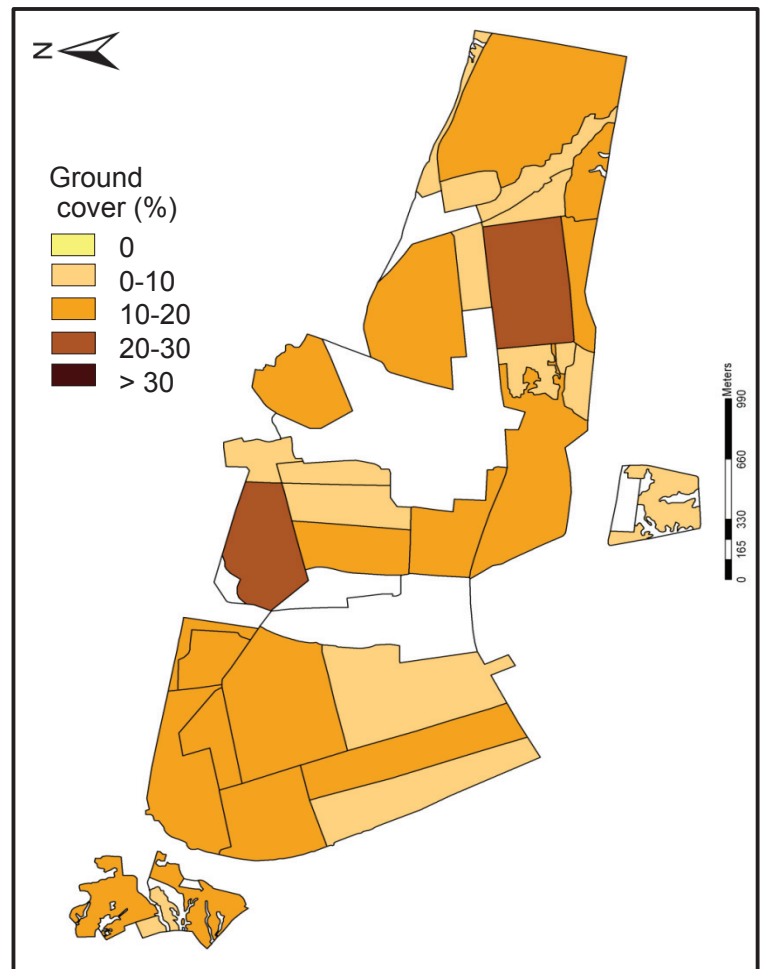
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections





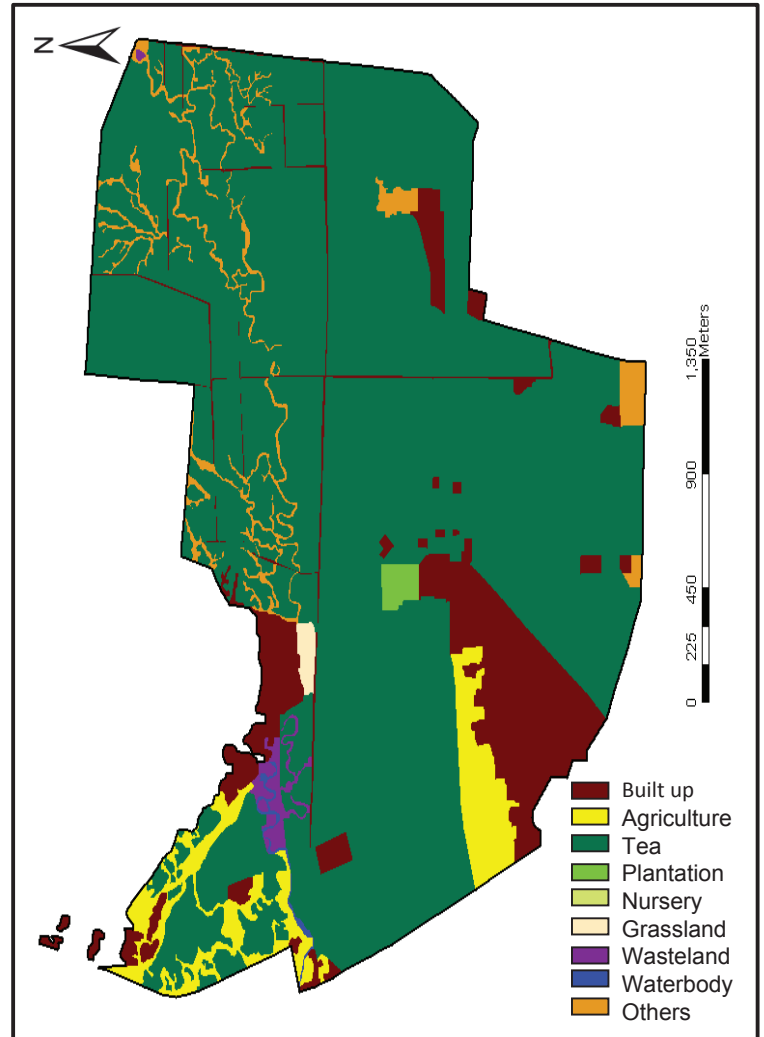
e. General Information

1. General		5. Natural resources constraints	
Contact address	PO: Barbam, Dist: Dibrugarh, PIN: 786624	Drainage congestion and water logging	Yes
Contact phone	03754-276707	Scarcity of water during summer	No
Name of the company	Joonktollee Tea & Industries Ltd.	River bank erosion	No
Name of the village where it falls	Barbam	Major diseases and duration	Black rot (4 months)
Leased area of the estate (ha)	755.96	Major pests and duration	<i>Helopeltis</i> (4 months)
Tea grown area of the estate (ha)	484.65	Damage due to wildlife	No
No. of divisions / sections	1 div / 34 sec	6. Yield / production	
Year of establishment	--	Peak plucking periods	Mar - Nov
Type of tea produced	CTC	Annual green leaf yield	9749.16 kg/ha
2. Infrastructure		Annual production of processed tea	1068837 kg
Availability of processing factory	Yes	7. Pruning	
Availability of workers colony	Yes	Time of pruning	2 nd fortnight of Nov - 1 st fortnight of Feb
Availability of internet facility / e-mail id	No	Pruning cycle	4 yr
Meteorological observations taken	Tmax, Tmin, Rainfall	Types of pruning	LP-UP-DS-MS
3. Amenities		8. Fertilizer use	
Availability of health care / dispensary	Yes	Types of N, P, K fertilizers used	Urea, RP, SSP, MOP
Availability of school	Yes	Dose of Nitrogen (kg/ha)	180 - 200
4. Shade trees		Dose of Phosphorous (kg/ha)	30 - 50
Shade tree density (garden level)	Medium	Dose of Potash (kg/ha)	140 - 200
Plant to plant spacing (m)	20 x 20	Whether lime is applied, if yes dose	--
Row to row spacing (m)	20 x 20		

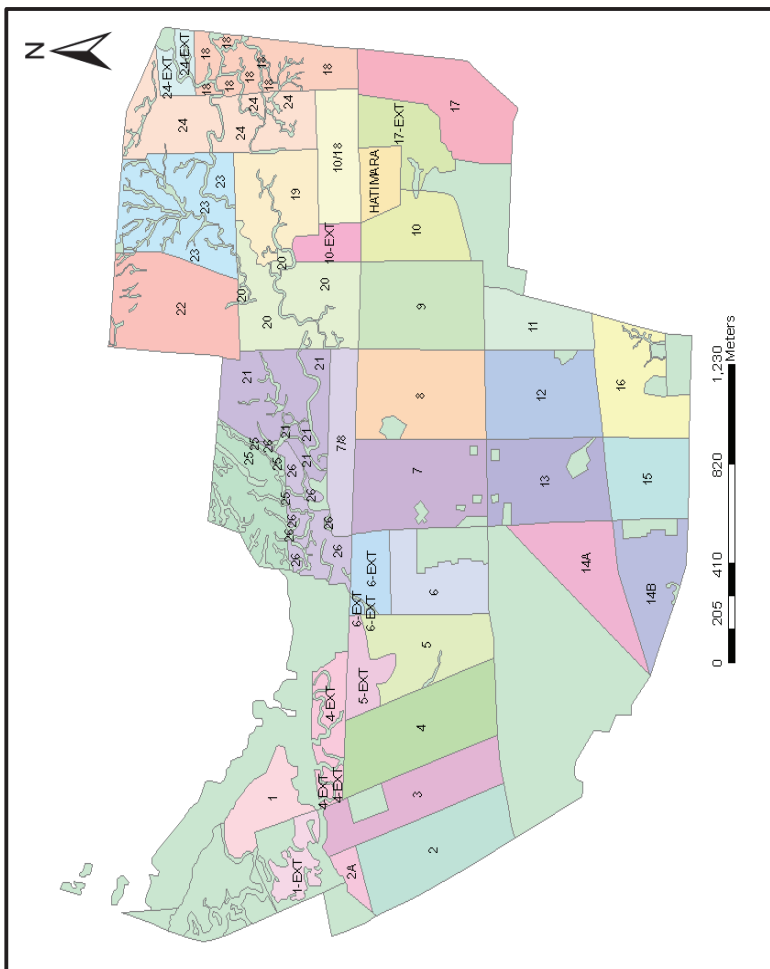




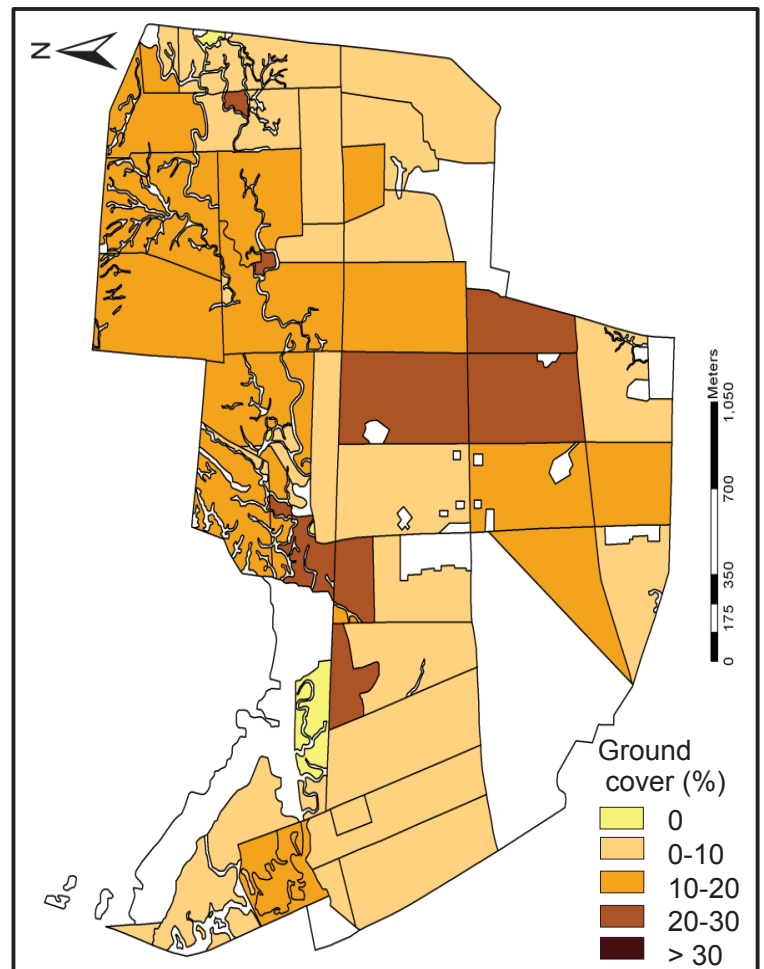
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections





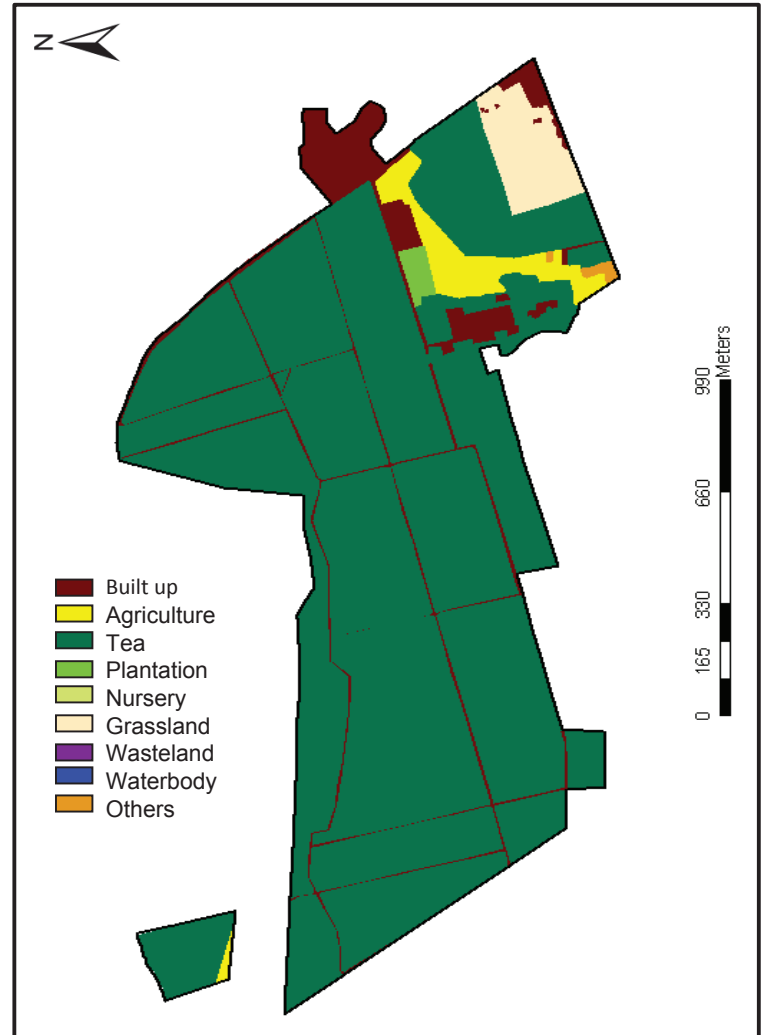
e. General Information

1. General		5. Natural resources constraints	
Contact address	PO: Hoogrijan, Dist: Dibrugarh PIN: 786601	Drainage congestion and water logging	Yes
Contact phone	0374-2367031	Scarcity of water during summer	Yes
Name of the company	Gillanders Arbuthnot & Co. Ltd.	River bank erosion	No
Name of the village where it falls	Naoholia	Major diseases and duration	Black rot, Red rust
Leased area of the estate (ha)	--	Major pests and duration	<i>Helopeltis</i> , Red slug, RSM, Looper
Tea grown area of the estate (ha)	524.49	Damage due to wildlife	--
No. of divisions / sections	0 div / 38 sec	6. Yield / production	
Year of establishment	1974	Peak plucking periods	Jun - Oct
Type of tea produced	CTC, Orthodox	Annual green leaf yield	1480 kg /ha
2. Infrastructure		Annual production of processed tea	1091261 kg
Availability of processing factory	Yes	7. Pruning	
Availability of workers colony	Yes	Time of pruning	Nov – Jan
Availability of internet facility / e-mail id	Yes	Pruning cycle	4 yrs
Meteorological observations taken	Tmax, Tmin, Rainfall	Types of pruning	LP-UP-DS-MS
3. Amenities		8. Fertilizer use	
Availability of health care / dispensary	Yes	Types of N, P, K fertilizers used	Urea, TSP, MOP
Availability of school	--	Dose of Nitrogen (kg/ha)	120
4. Shade trees		Dose of Phosphorous (kg/ha)	30
Shade tree density (garden level)	Medium	Dose of Potash (kg/ha)	80
Plant to plant spacing (m)	12 x 9	Whether lime is applied, if yes dose	Yes (Dolomite), 2MT/ha
Row to row spacing (m)	6 x 7		

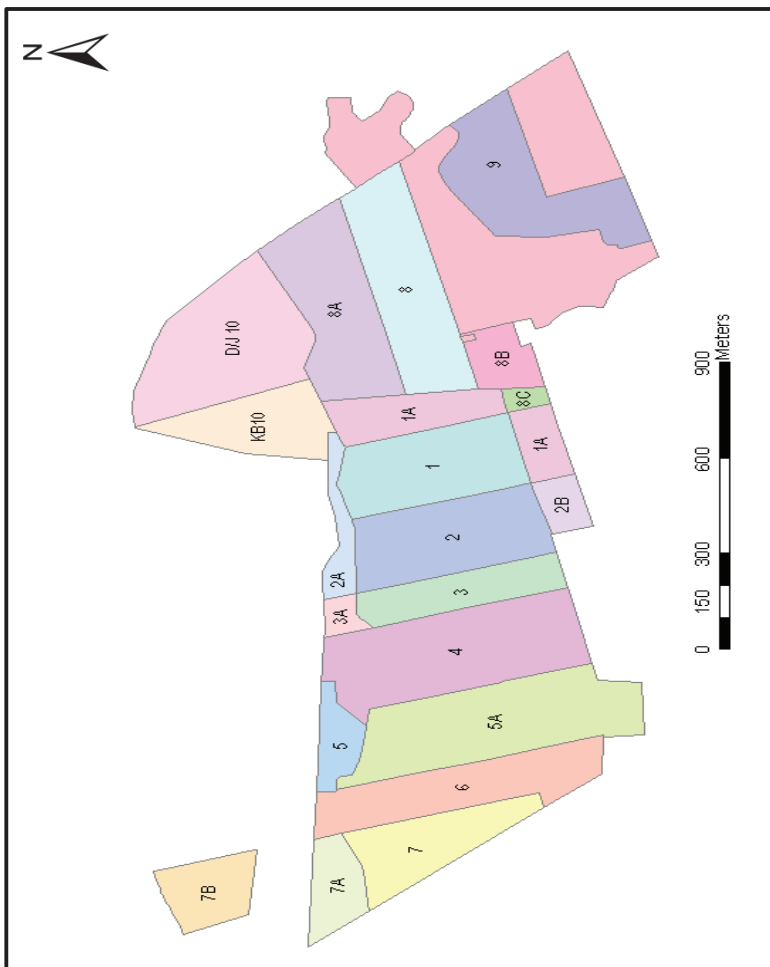




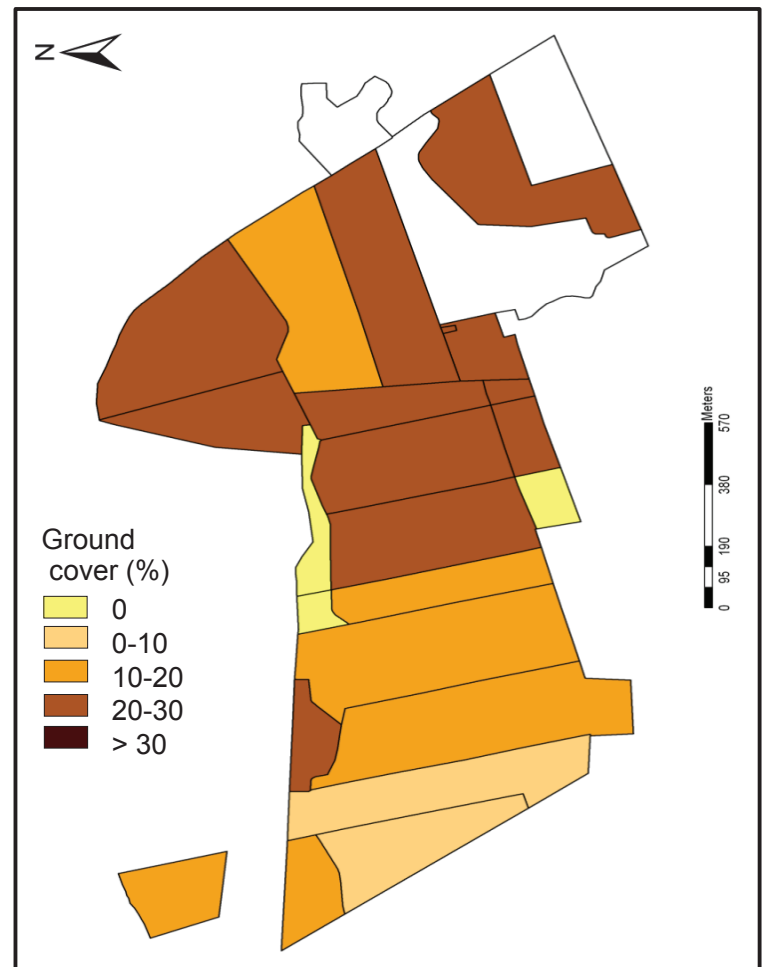
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections





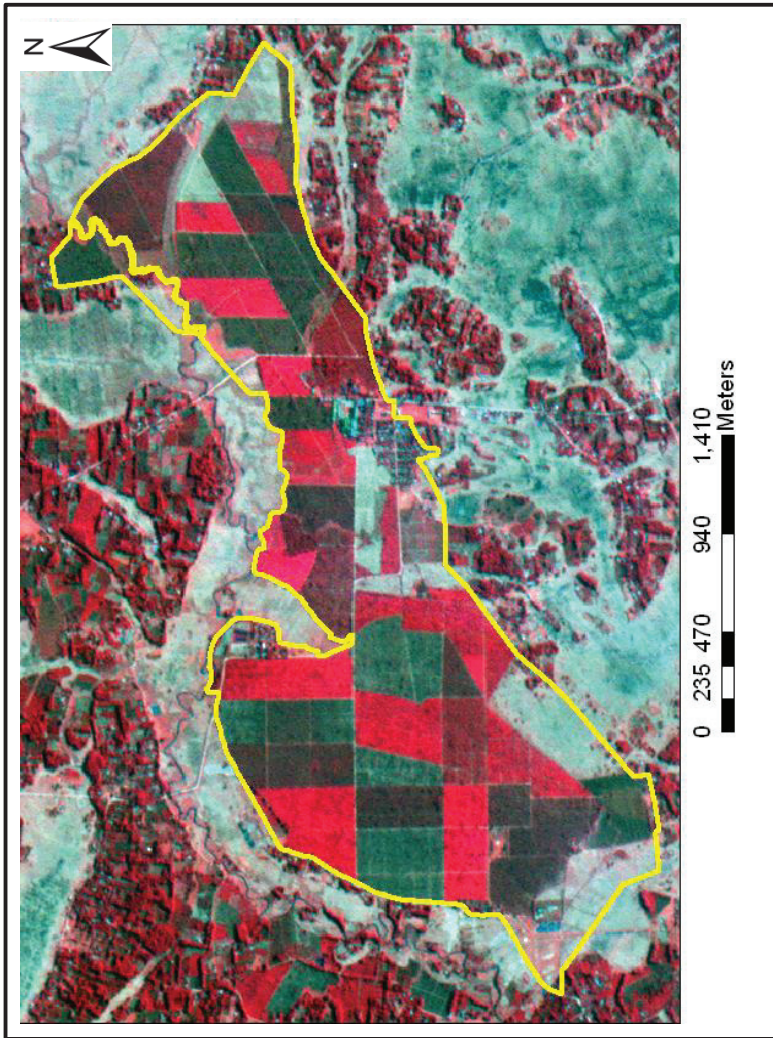
e. General Information

1. General		5. Natural resources constraints	
Contact address	P.O: Mohanbari A/f, Dist: Dibrugarh, PIN: 786012	Drainage congestion and water logging	Yes
Contact phone	0373-2910608	Scarcity of water during summer	No
Name of the company	Mokalbari Kanoi Tea Estate Pvt. Ltd.	River bank erosion	No
Name of the village where it falls	Kamakhyabari	Major diseases and duration	Red Rust (Jun-Aug)
Leased area of the estate (ha)	246.80	Major pests and duration	<i>Helopeltis</i> (Apr-Aug), RSM (Apr-May and Jul-Aug)
Tea grown area of the estate (ha)	135.31	Damage due to wildlife	No
No. of divisions / sections	0 div / 23 sec	6. Yield / production	
Year of establishment	--	Peak plucking periods	Jun - Oct
Type of tea produced	CTC	Annual green leaf yield	10641 kg/ha
2. Infrastructure		Annual production of processed tea	348639.7 kg
Availability of processing factory	Yes	7. Pruning	
Availability of workers colony	Yes	Time of pruning	End of Nov - First week of Jan
Availability of internet facility / e-mail id	Yes	Pruning cycle	4 yrs
Meteorological observations taken	Tmax, Tmin, RHmax, RHmin, Rainfall	Types of pruning	--
3. Amenities		8. Fertilizer use	
Availability of health care / dispensary	Yes	Types of N, P, K fertilizers used	Urea, MOP, RP
Availability of school	Yes	Dose of Nitrogen (kg/ha)	160-200
4. Shade trees		Dose of Phosphorous (kg/ha)	40
Shade tree density (garden level)	Medium	Dose of Potash (kg/ha)	80-100
Plant to plant spacing (m)	9 x 9	Whether lime is applied, if yes dose	--
Row to row spacing (m)	9 x 9		

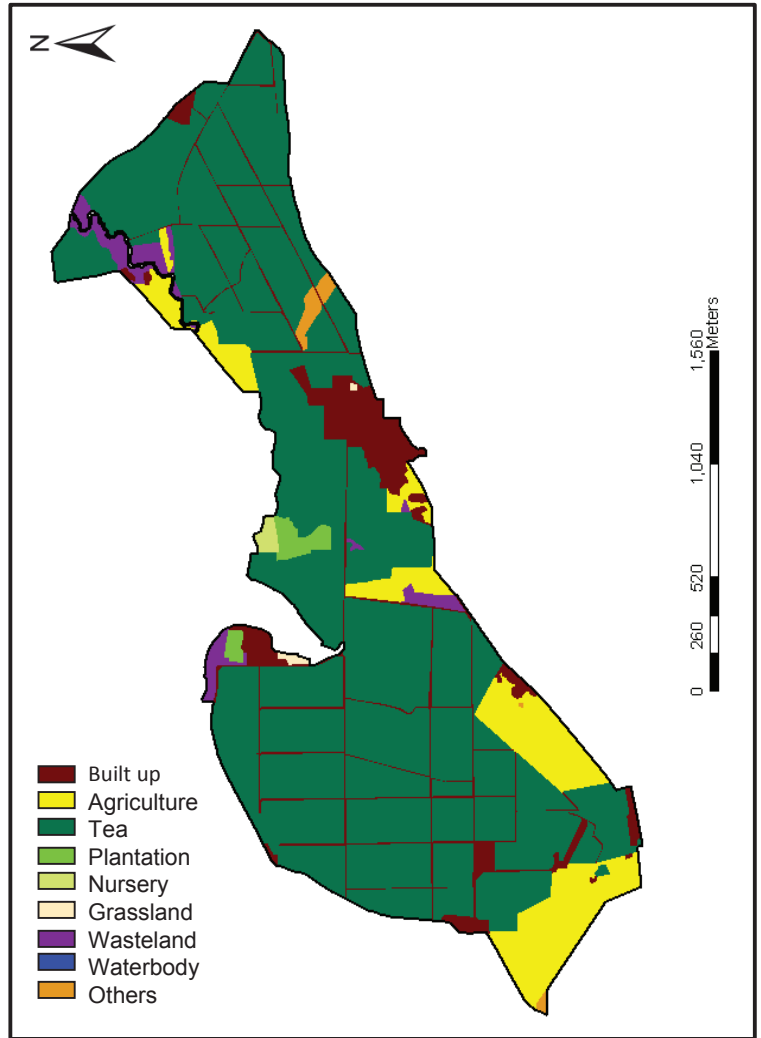




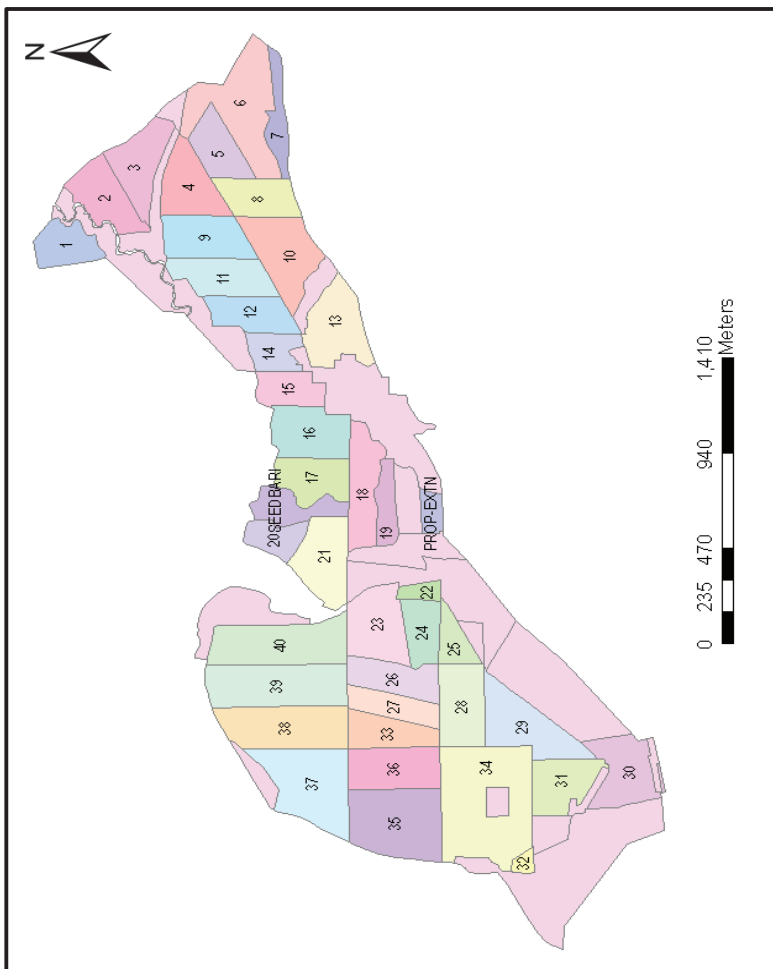
P35: KENDUGURI TE



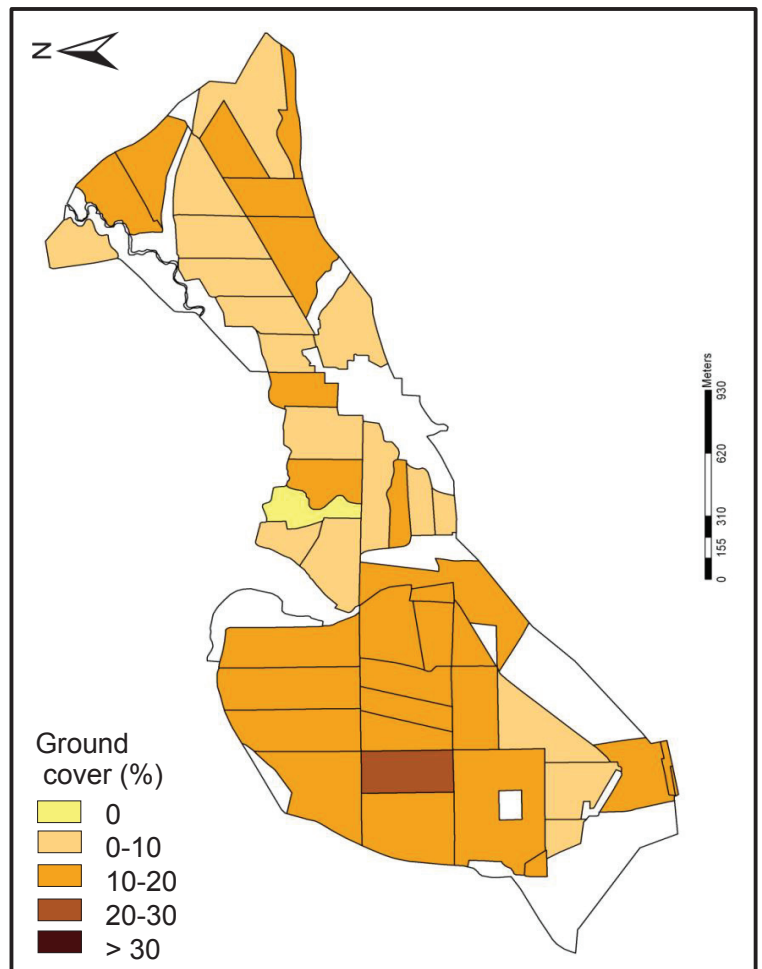
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse

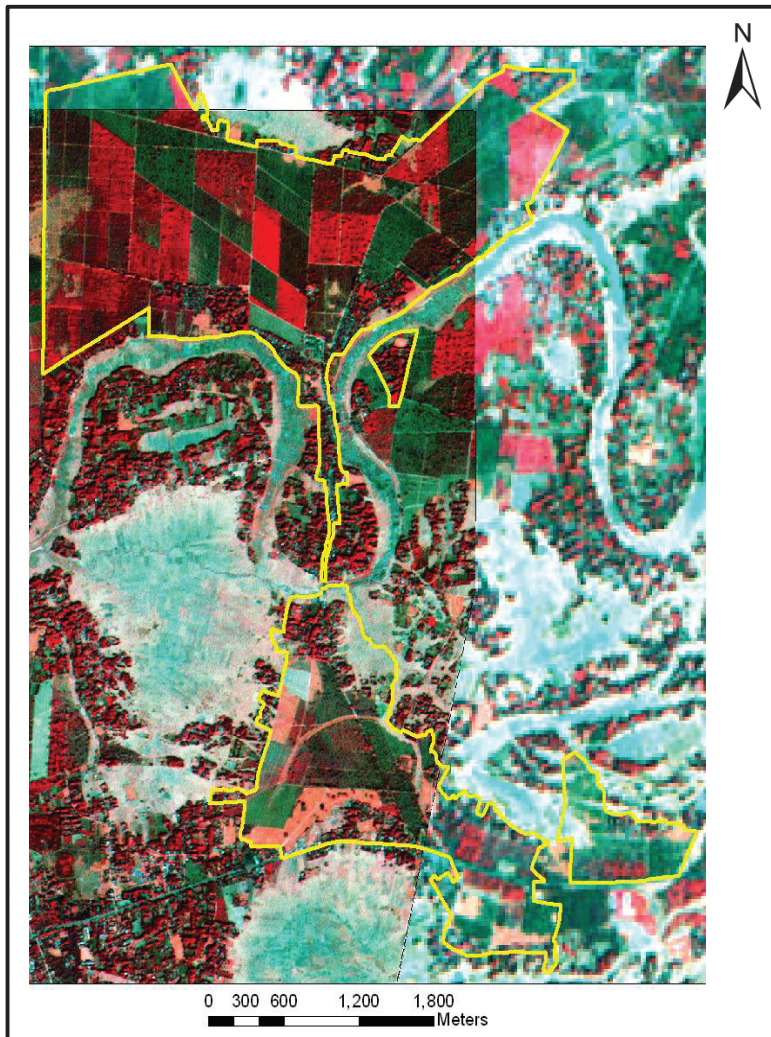


c. Section Boundaries of the Estate

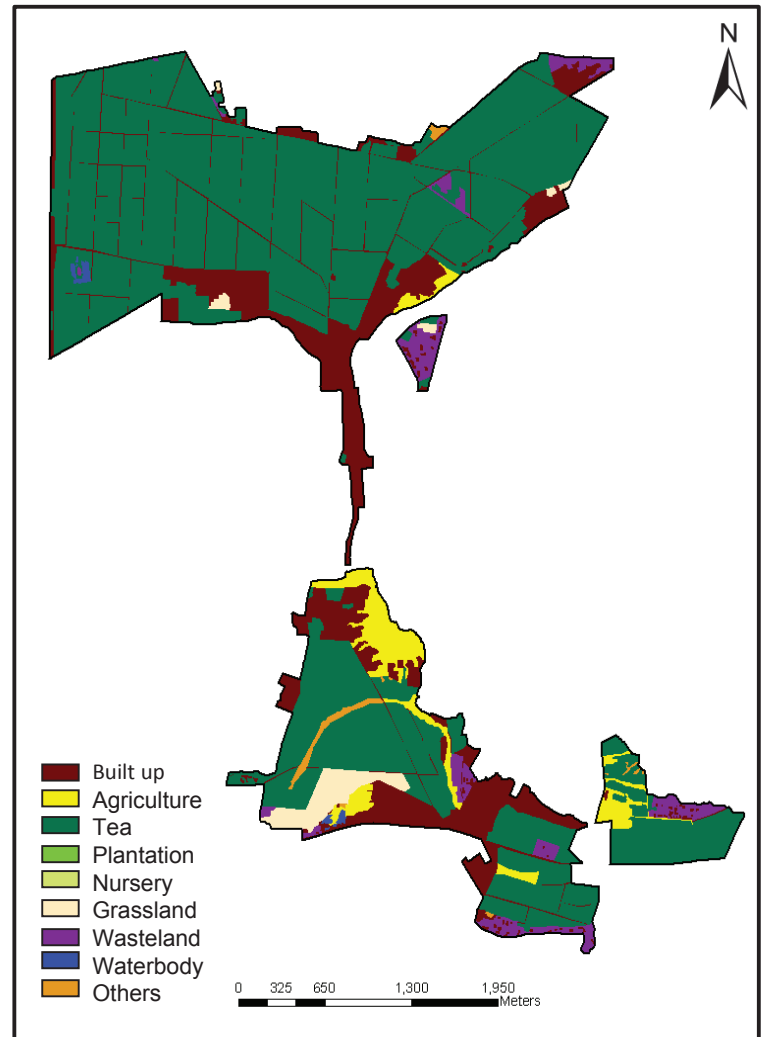


d. Shade Tree Density in Sections

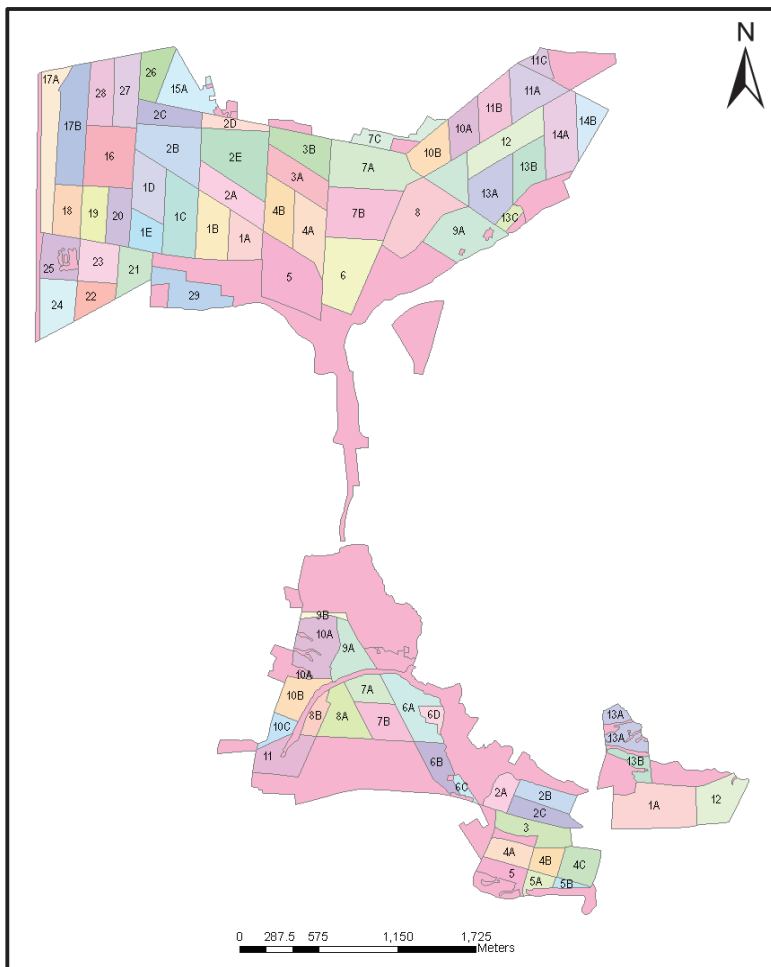




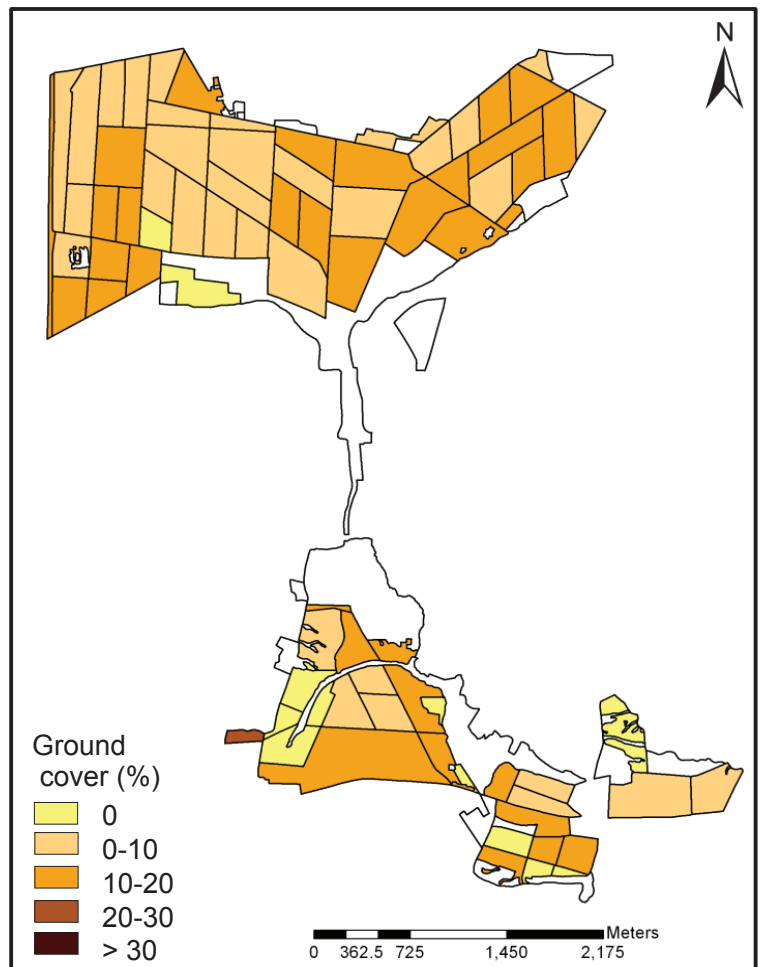
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

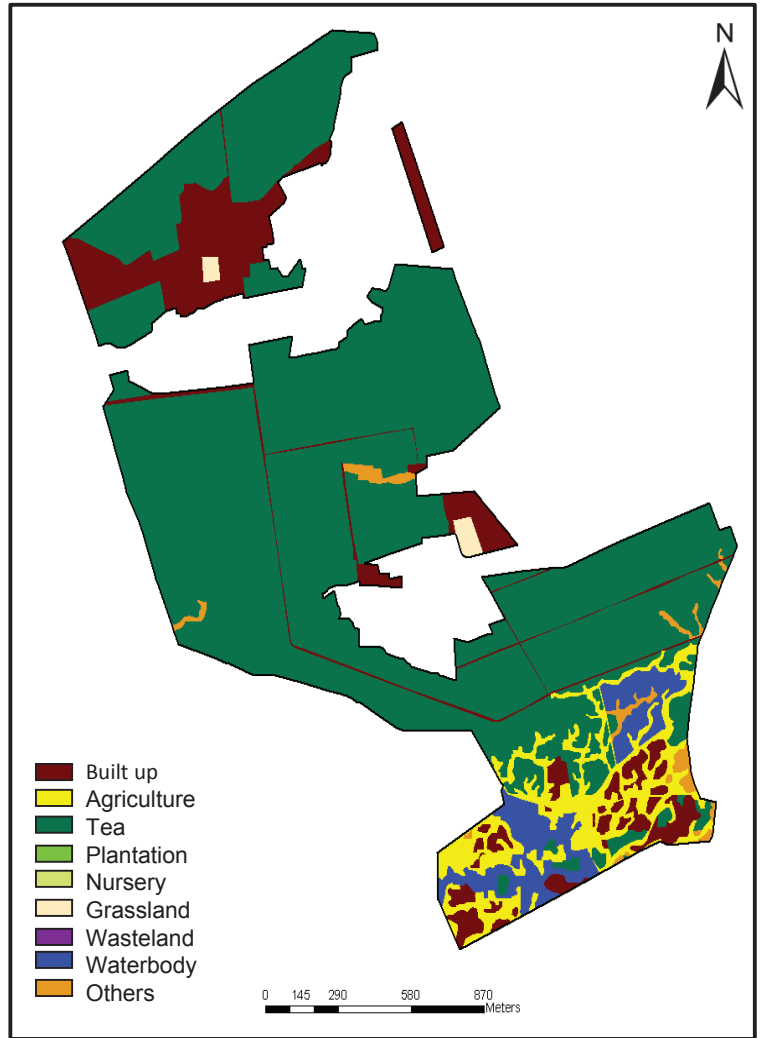




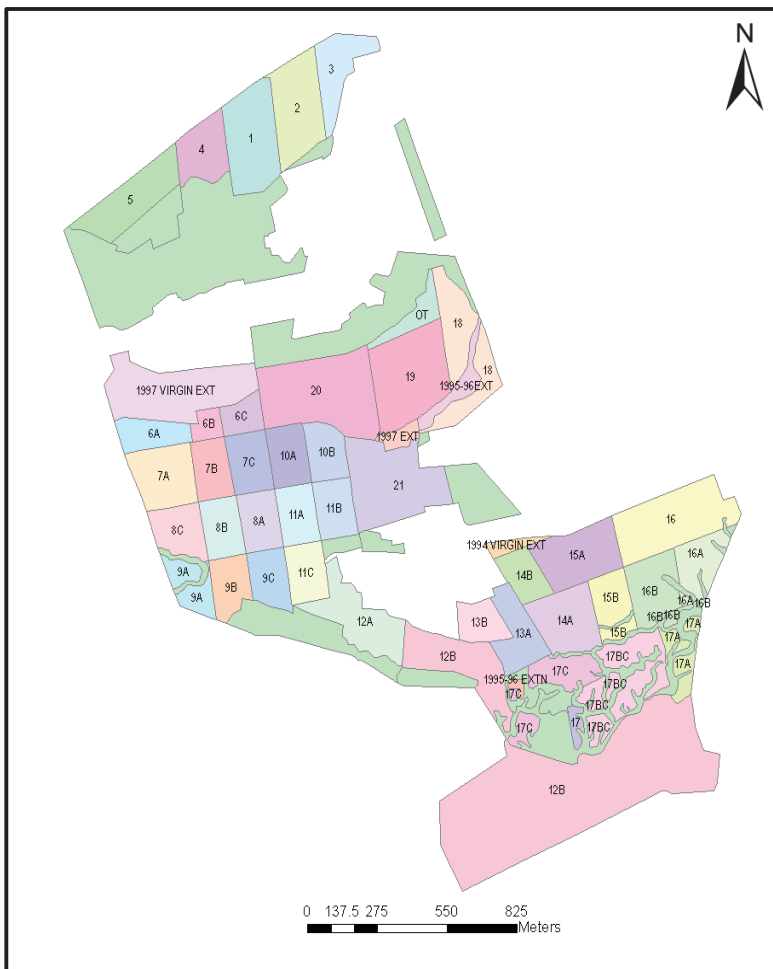
P37: KORAGANI TE



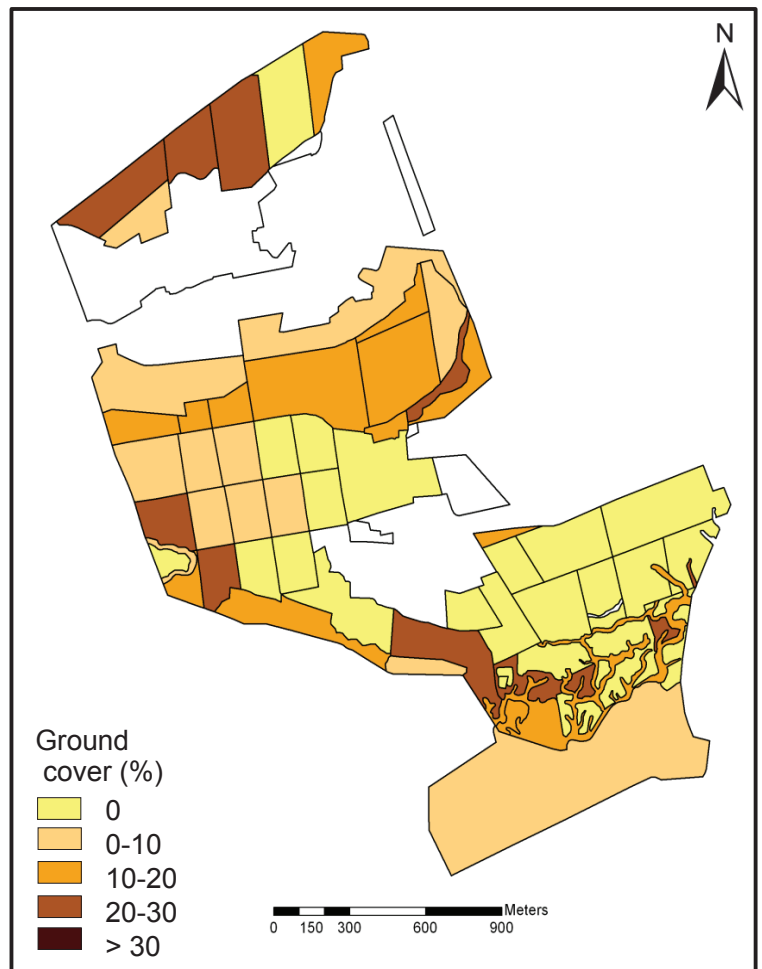
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse

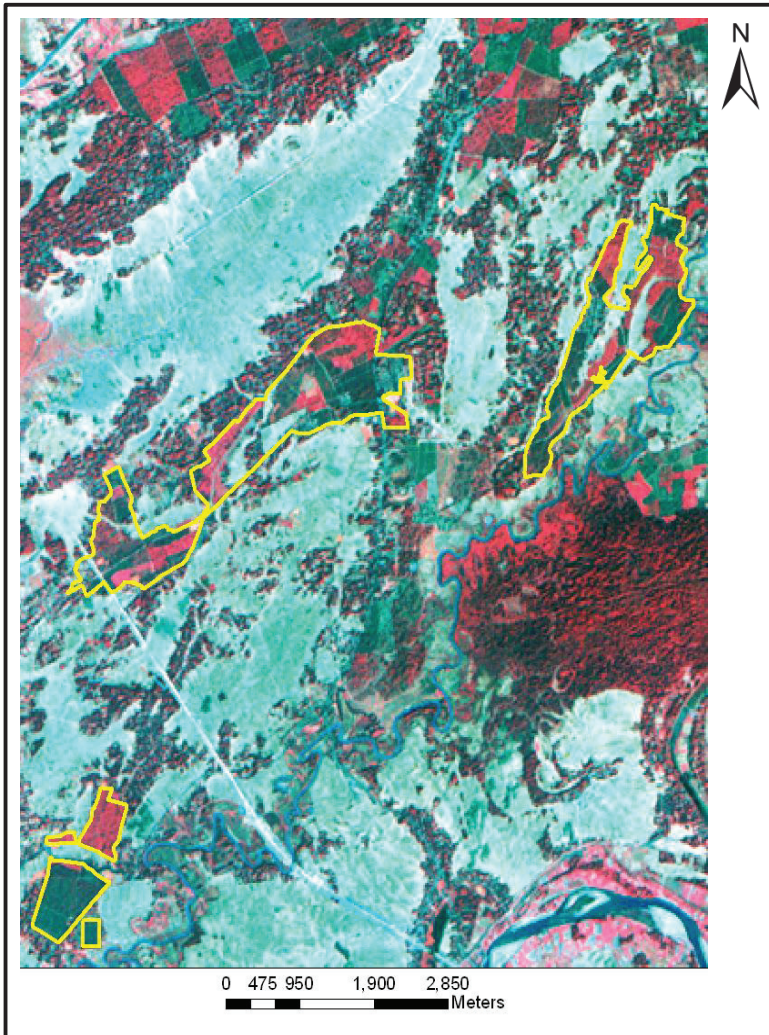


c. Section Boundaries of the Estate



d. Shade Tree Density in Sections





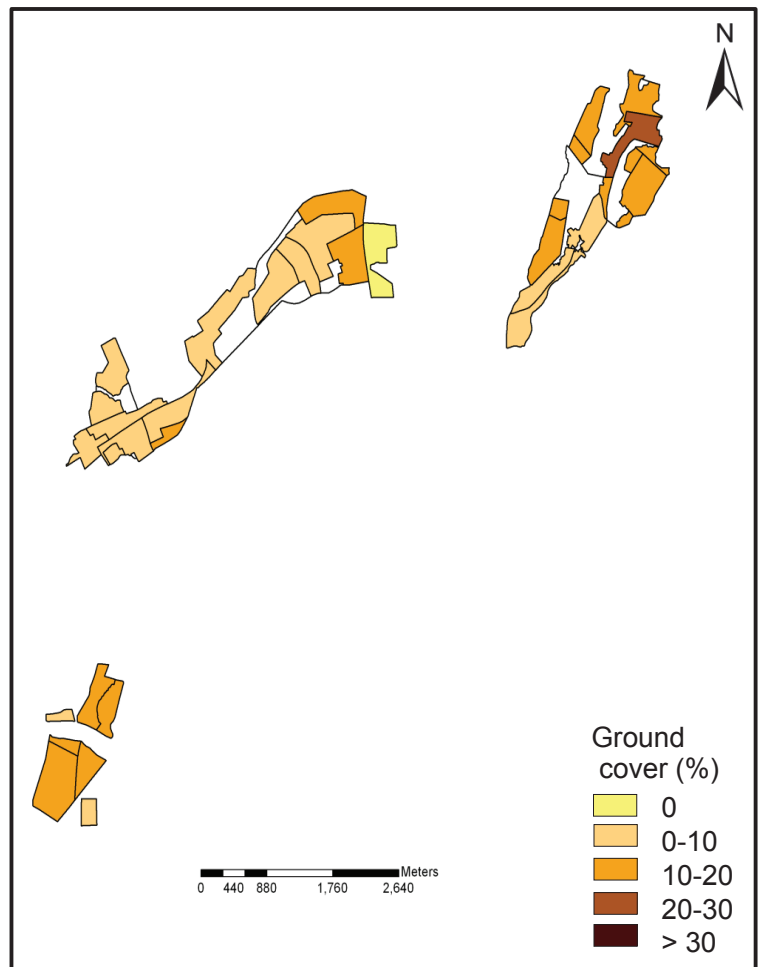
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections





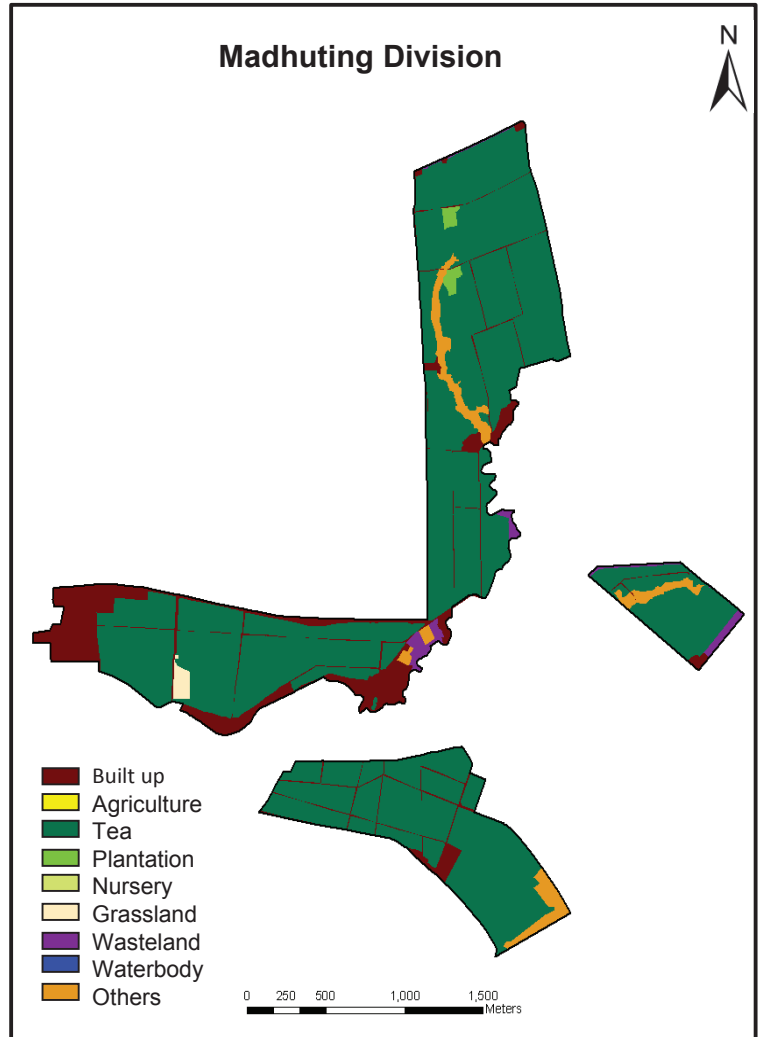
e. General Information

1. General		5. Natural resources constraints	
Contact address	PO: Barbaruah, Dist: Dibrugarh PIN: 768007	Drainage congestion and water logging	Yes
Contact phone	9957060774	Scarcity of water during summer	No
Name of the company	--	River bank erosion	No
Name of the village where it falls	Lepetkatta	Major diseases and duration	No
Leased area of the estate (ha)	1027.20	Major pests and duration	<i>Helopeltis (May-Oct)</i>
Tea grown area of the estate (ha)	454.53	Damage due to wildlife	No
No. of divisions / sections	4 div / 30 sec	6. Yield / production	
Year of establishment	1910 Approx.	Peak plucking periods	Jul - Oct
Type of tea produced	CTC, Orthodox	Annual green leaf yield	2036 kg/ha
2. Infrastructure		Annual production of processed tea	910407 kg
Availability of processing factory	Yes	7. Pruning	
Availability of workers colony	Yes	Time of pruning	Nov - Dec
Availability of internet facility / e-mail id	Yes	Pruning cycle	4 yrs
Meteorological observations taken	Tmax, Tmin, Rainfall	Types of pruning	--
3. Amenities		8. Fertilizer use	
Availability of health care / dispensary	Yes	Types of N, P, K fertilizers used	Urea, RP, MOP
Availability of school	Yes	Dose of Nitrogen (kg/ha)	120
4. Shade trees		Dose of Phosphorous (kg/ha)	36
Shade tree density (garden level)	High	Dose of Potash (kg/ha)	60
Plant to plant spacing (m)	12 x 12	Whether lime is applied, if yes dose	No
Row to row spacing (m)	12 x 12		





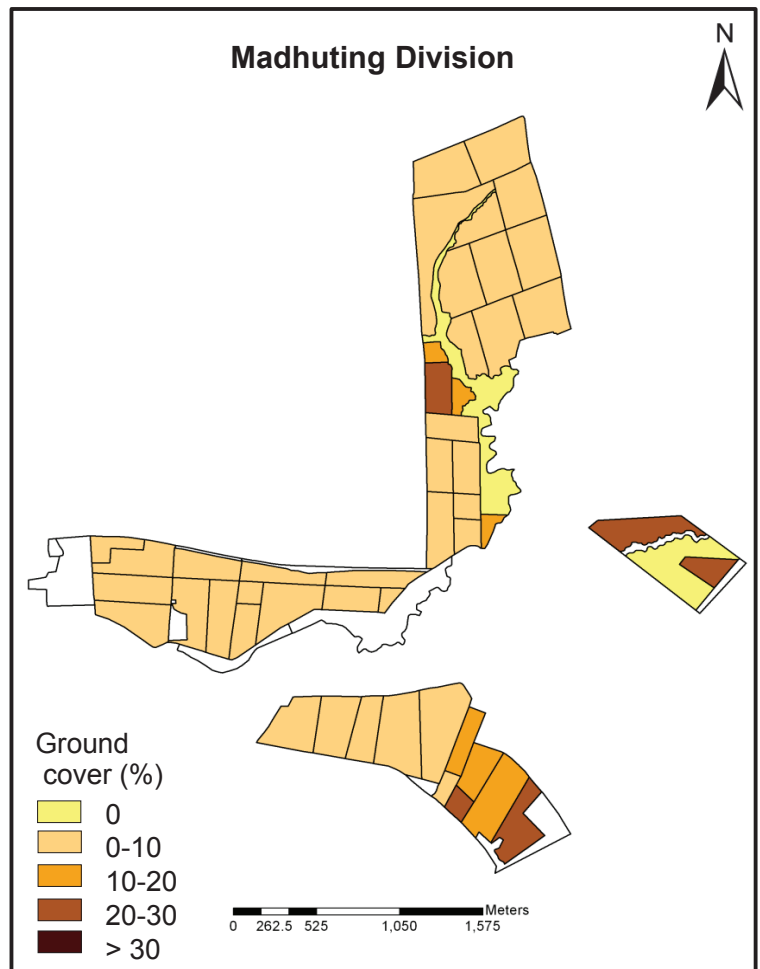
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate

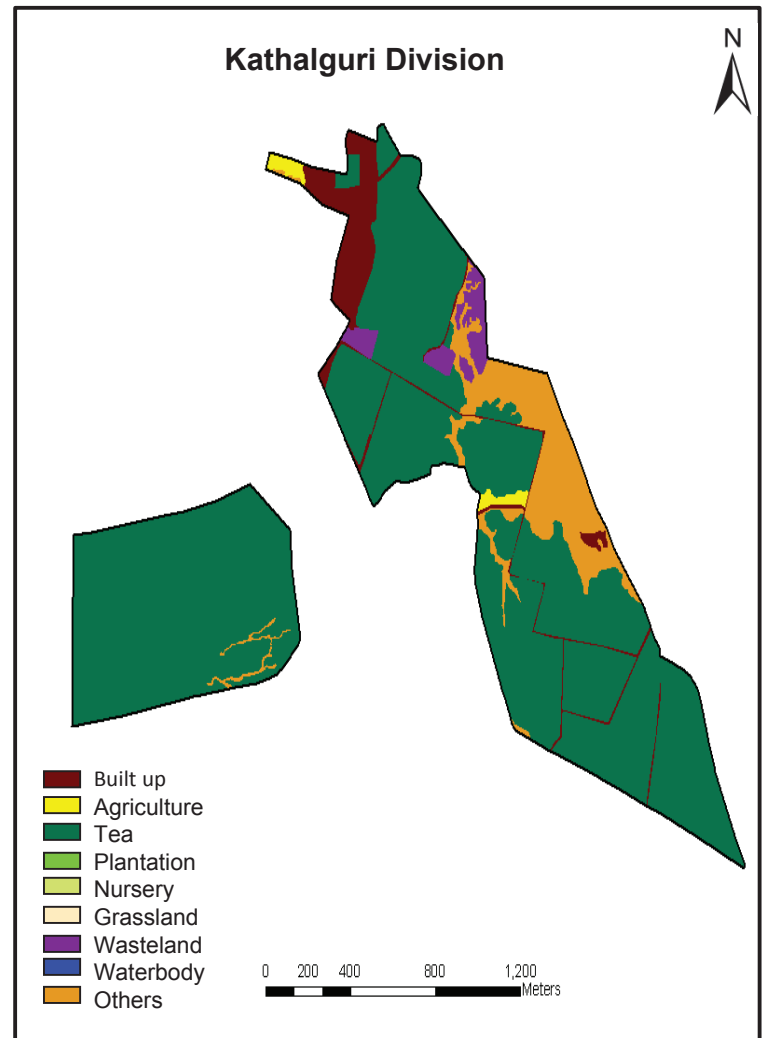


d. Shade Tree Density in Sections

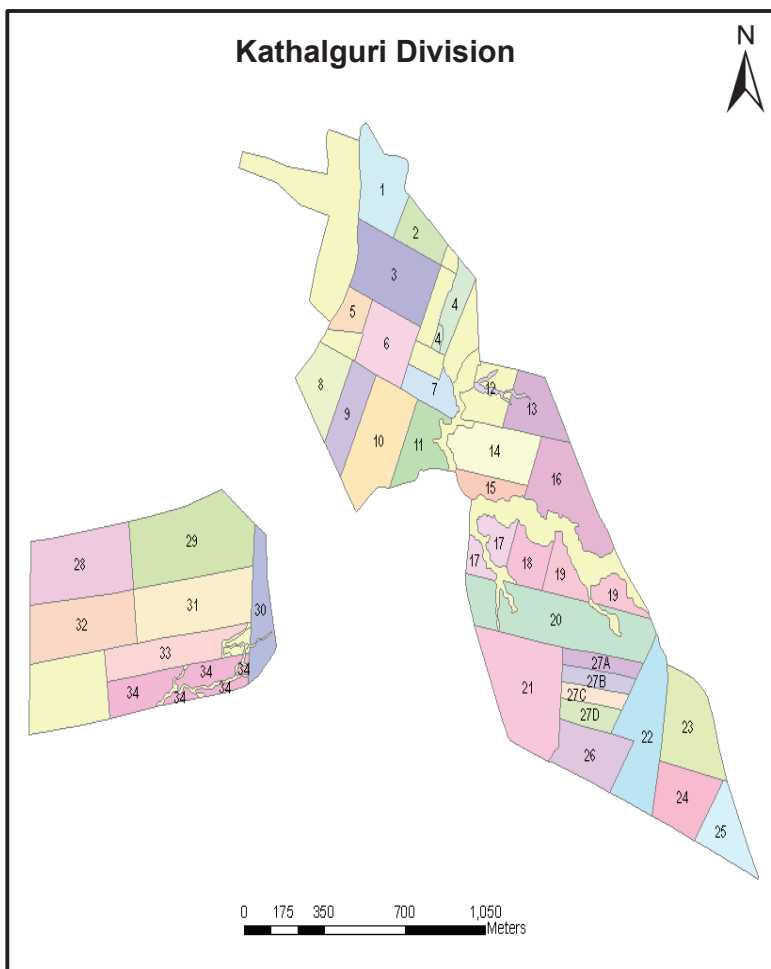




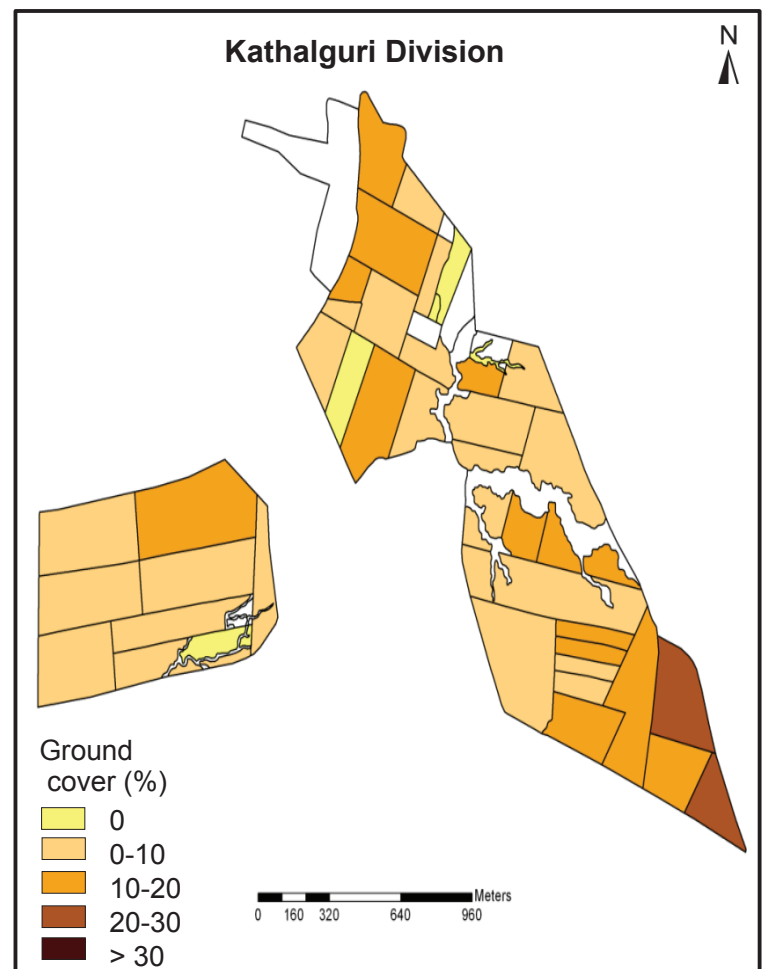
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

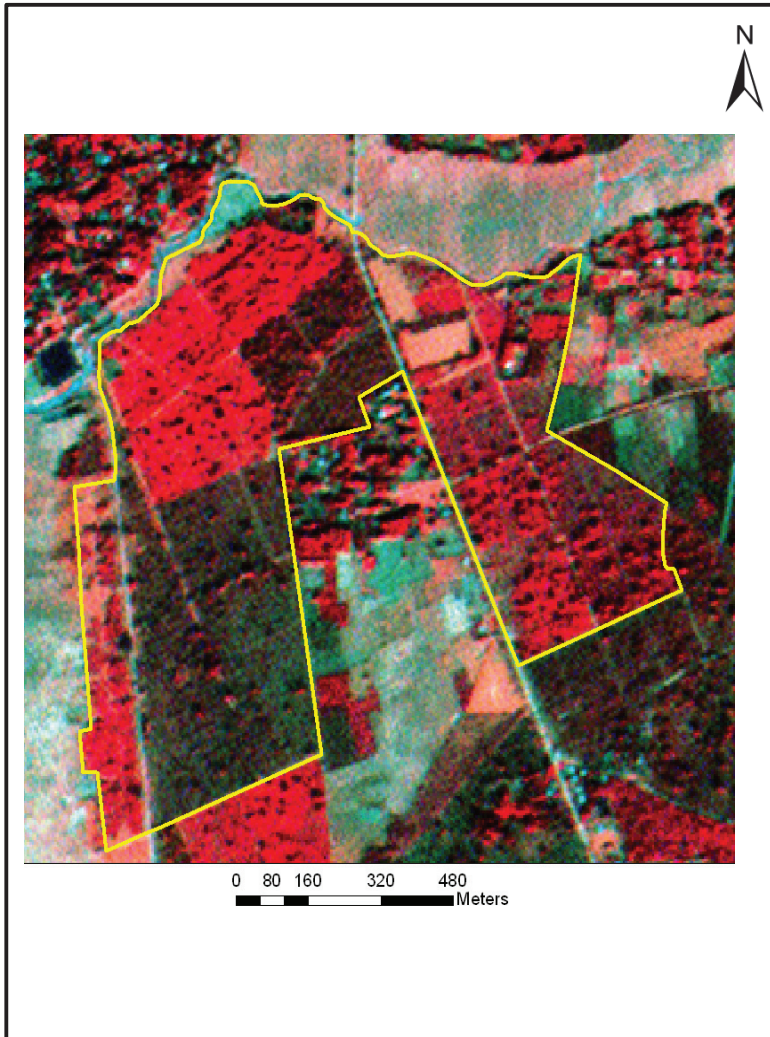




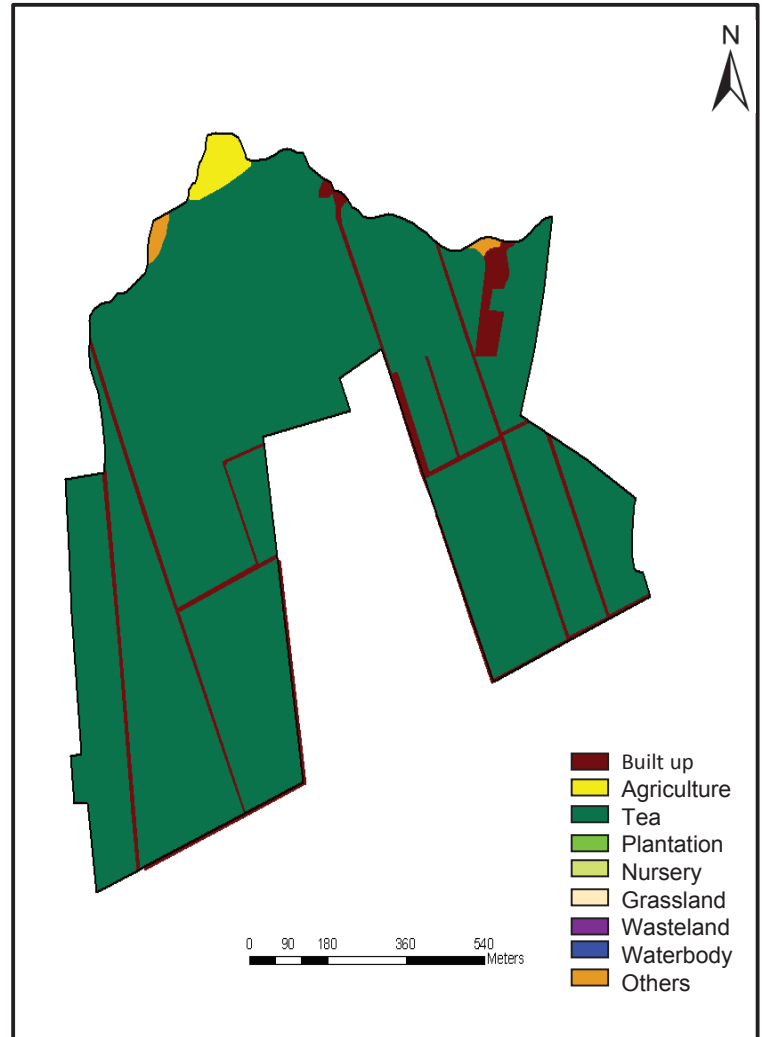
e. General Information

1. General		5. Natural resources constraints	
Contact address	P.O: Hoogrijan, Dist: Dibrugarh, PIN: 786601	Drainage congestion and water logging	Yes
Contact phone	0374-2911600	Scarcity of water during summer	No
Name of the company	Madhuting Tea Private Limited	River bank erosion	No
Name of the village where it falls	Madhuting	Major diseases and duration	No Major disease
Leased area of the estate (ha)	655.63	Major pests and duration	<i>Helopeltis</i> (May-Oct), RSM (Jan-May, Aug-Sep)
Tea grown area of the estate (ha)	502.30	Damage due to wildlife	No
No. of divisions / sections	3 div / 86 sec	6. Yield / production	
Year of establishment	1938	Peak plucking periods	Jul - Oct
Type of tea produced	Orthodox	Annual green leaf yield	7390 kg/ha
2. Infrastructure		Annual production of processed tea	974598 kg
Availability of processing factory	Yes	7. Pruning	
Availability of workers colony	Yes	Time of pruning	15 Nov - 15 Jan
Availability of internet facility / e-mail id	Yes	Pruning cycle	3, 4 yrs
Meteorological observations taken	Tmax, Tmin, Rainfall	Types of pruning	--
3. Amenities		8. Fertilizer use	
Availability of health care / dispensary	Yes	Types of N, P, K fertilizers used	Urea, MOP, RP, SSP
Availability of school	Yes	Dose of Nitrogen (kg/ha)	110
4. Shade trees		Dose of Phosphorous (kg/ha)	30
Shade tree density (garden level)	Medium	Dose of Potash (kg/ha)	70
Plant to plant spacing (m)	1.22 x 1.22 , 1.05 x 0.65	Whether lime is applied, if yes dose	Dolomite, 2 MT/ha
Row to row spacing (m)	1.22 x 1.05		

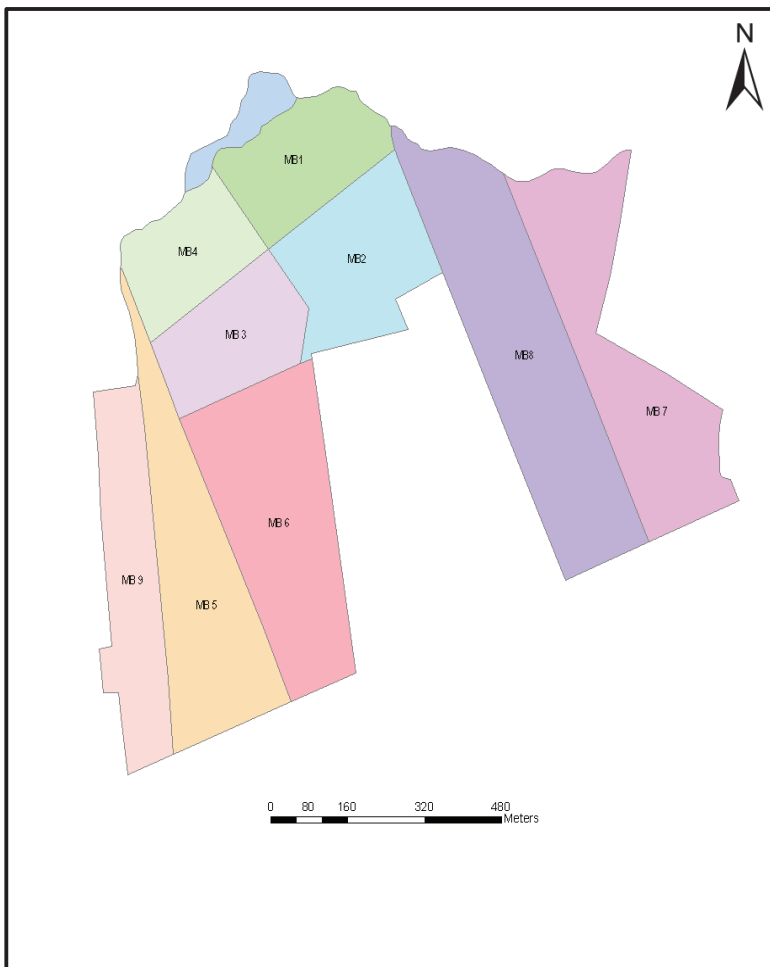




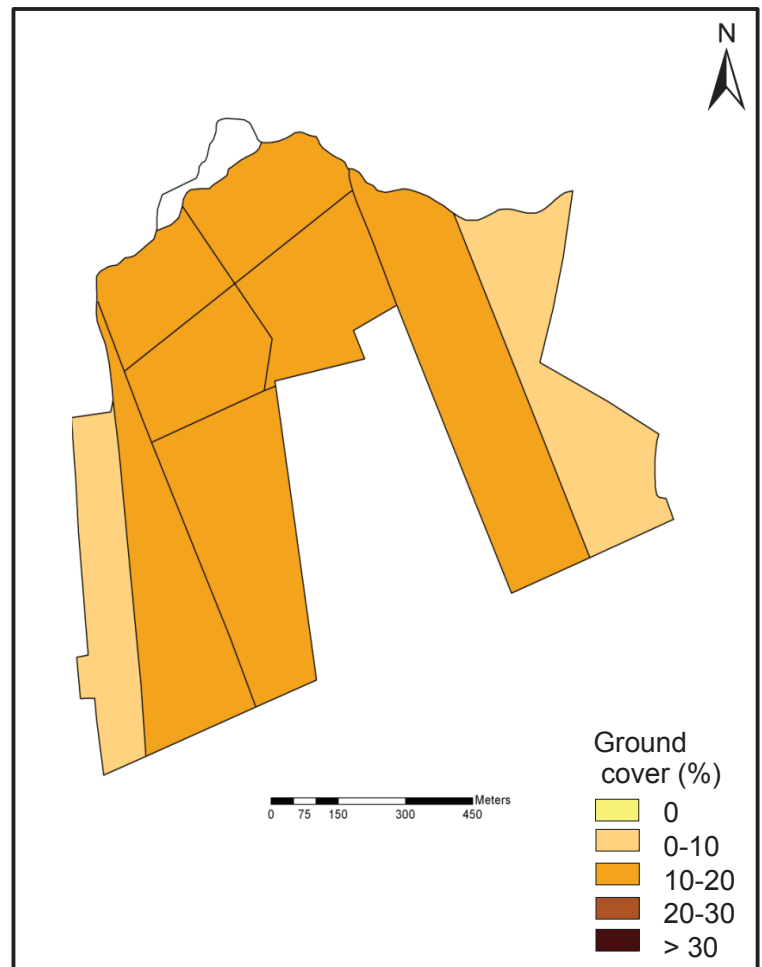
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate

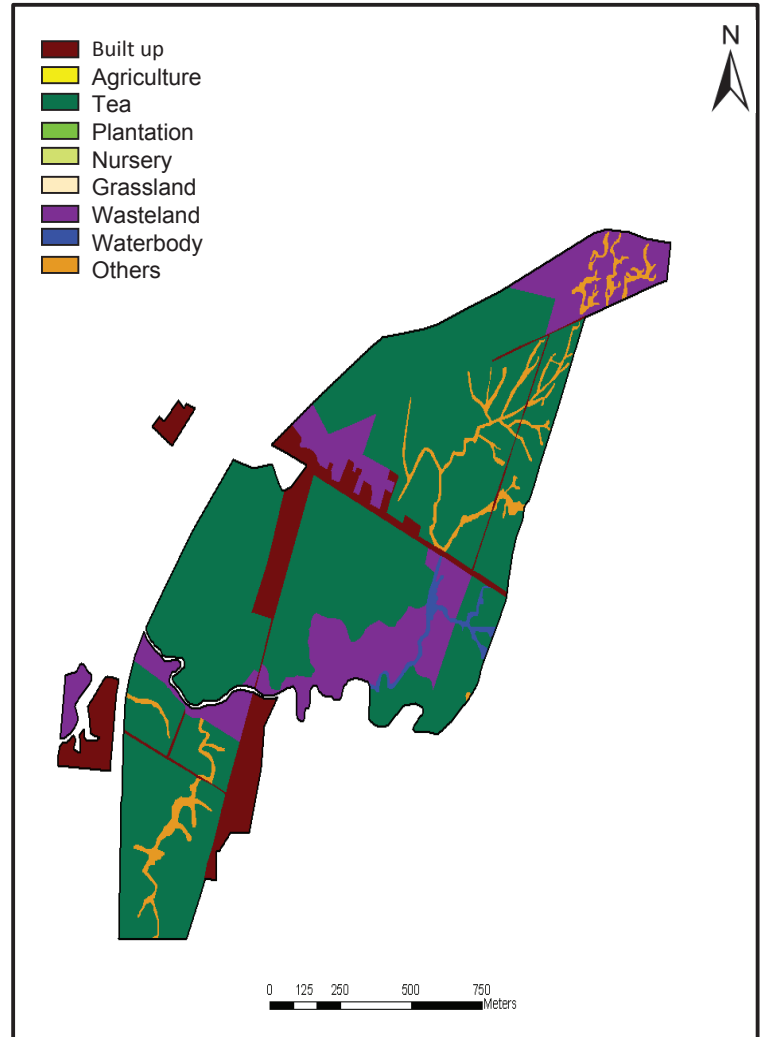


d. Shade Tree Density in Sections

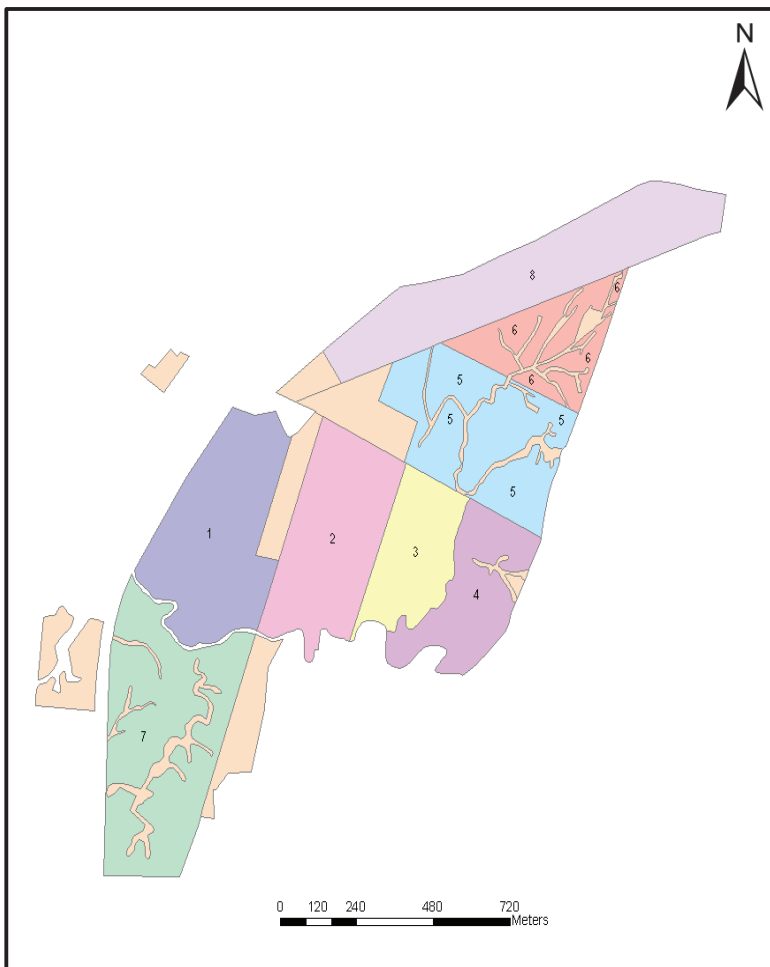




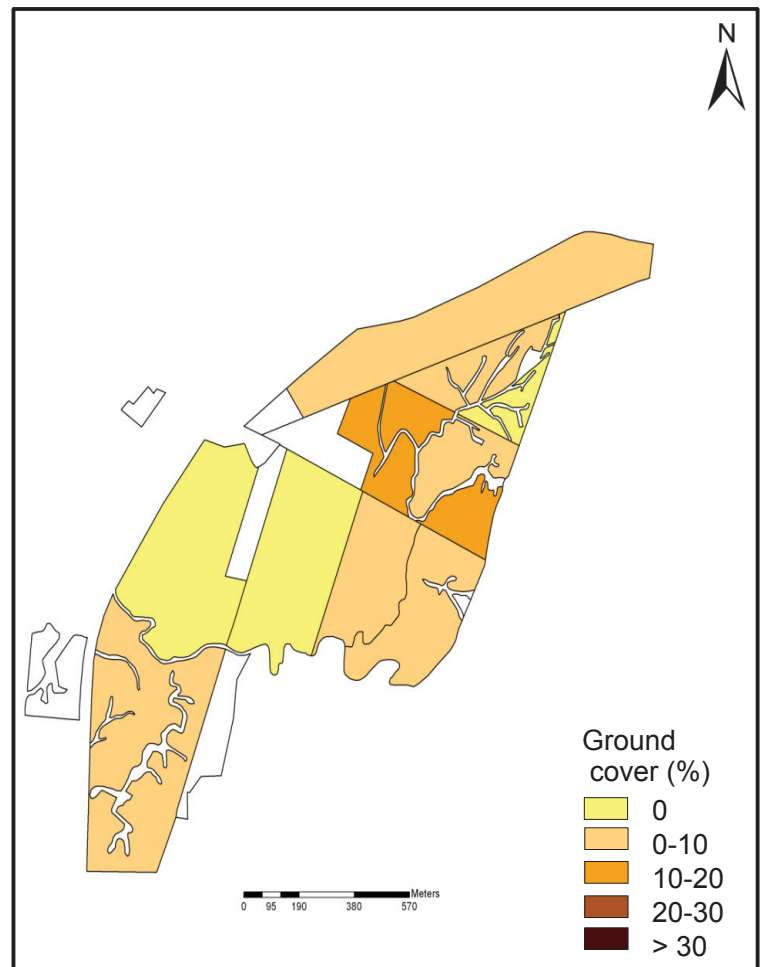
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

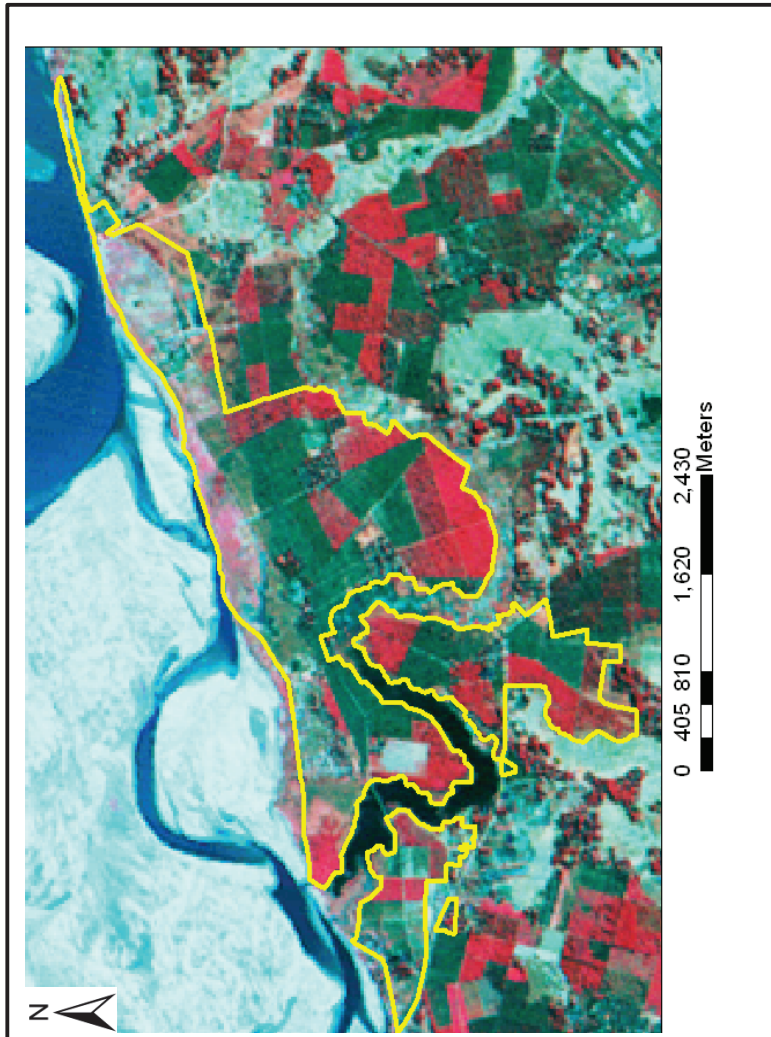




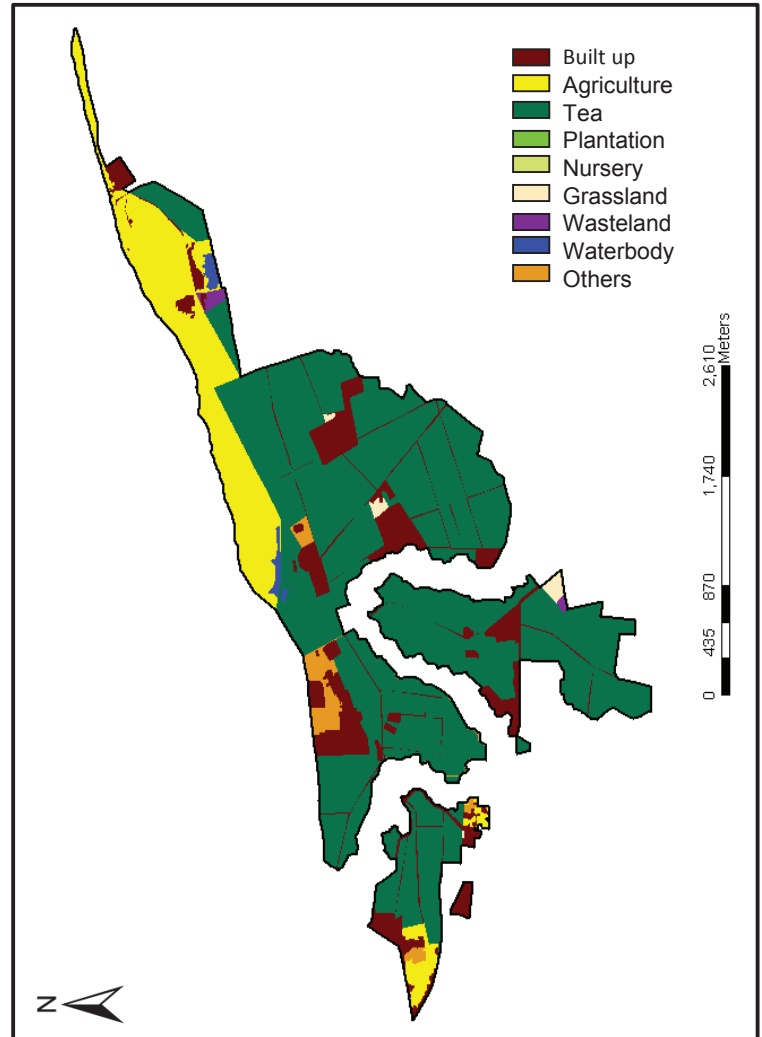
e. General Information

1. General		5. Natural resources constraints	
Contact address	PO: Hooglijan, Bordobi, Dist: Dibrugarh PIN: 786601	Drainage congestion and water logging	Yes
Contact phone	0374-2824306	Scarcity of water during summer	No
Name of the company	Mahadeobari Tea Co. Pvt. Ltd.	River bank erosion	Yes
Name of the village where it falls	Bordubi	Major diseases and duration	Red rust (Apr – Sep)
Leased area of the estate (ha)	148.25	Major pests and duration	<i>Helopeltis</i> , RSM (round the year)
Tea grown area of the estate (ha)	98.53	Damage due to wildlife	No
No. of divisions / sections	1 div / 8 sec	6. Yield / production	
Year of establishment	1935 Approx.	Peak plucking periods	Jul - Oct
Type of tea produced	CTC, Orthodox	Annual green leaf yield	7035.64 kg/ha
2. Infrastructure		Annual production of processed tea	157461 kg
Availability of processing factory	Yes	7. Pruning	
Availability of workers colony	Yes	Time of pruning	Dec – Jan
Availability of internet facility / e-mail id	Yes	Pruning cycle	3 yrs
Meteorological observations taken	Tmax, Tmin, Rainfall	Types of pruning	--
3. Amenities		8. Fertilizer use	
Availability of health care / dispensary	Yes	Types of N, P, K fertilizers used	Urea, MOP, TSP
Availability of school	Yes	Dose of Nitrogen (kg/ha)	125
4. Shade trees		Dose of Phosphorous (kg/ha)	20
Shade tree density (garden level)	Medium	Dose of Potash (kg/ha)	75
Plant to plant spacing (m)	1 x 0.75, 1 x 1	Whether lime is applied, if yes dose	--
Row to row spacing (m)	1 x 1.2		

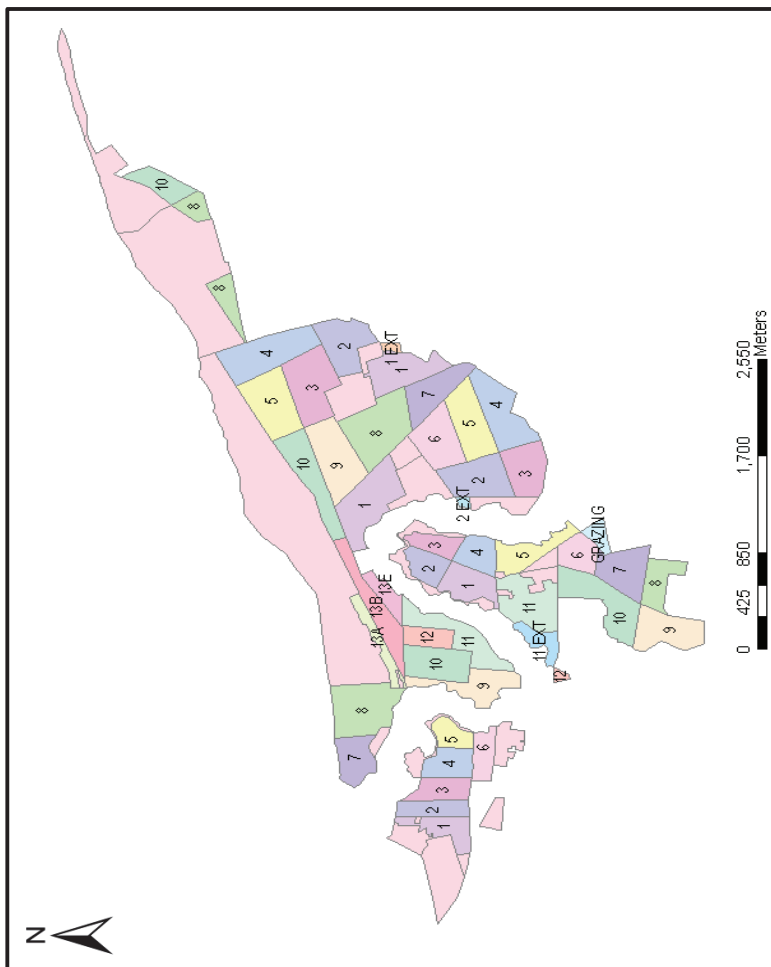




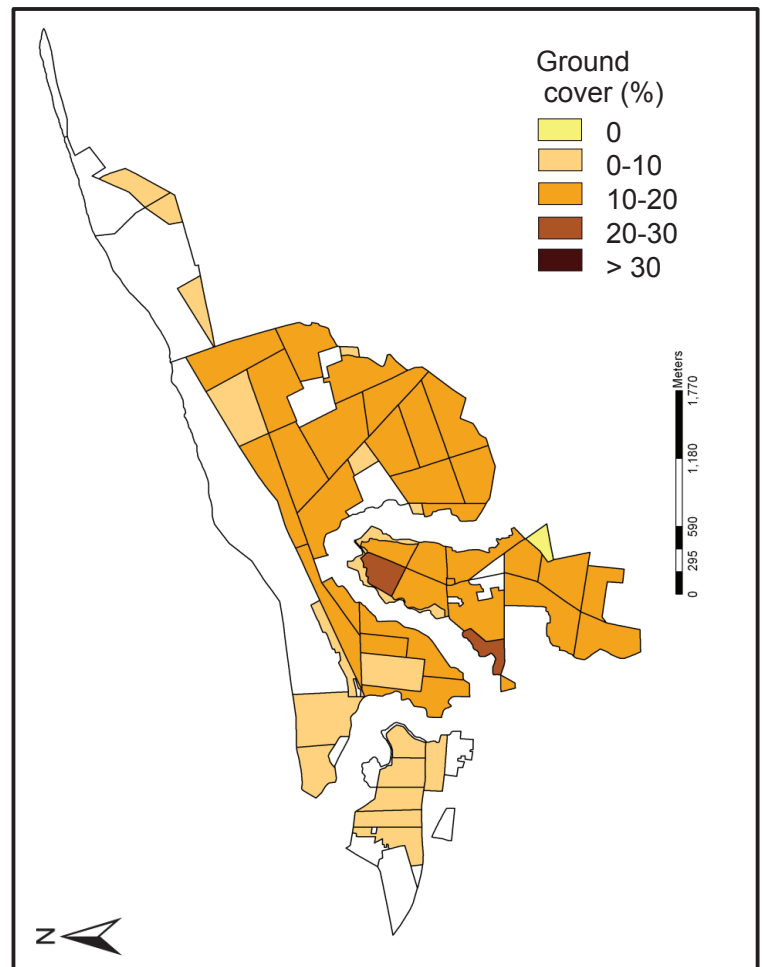
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections





e. General Information

1. General		5. Natural resources constraints	
Contact address	P. BOX 60, PO: Dibrugarh, Dist: Dibrugargh	Drainage congestion and water logging	Yes
Contact phone	0373-2300707	Scarcity of water during summer	No
Name of the company	--	River bank erosion	Yes
Name of the village where it falls	--	Major diseases and duration	Fungal
Leased area of the estate (ha)	--	Major pests and duration	<i>Helopeltis</i> (Apr-Sep) RSM (Nov-Mar)
Tea grown area of the estate (ha)	387.96	Damage due to wildlife	Yes, leopards and black panther prevalent
No. of divisions / sections	3 div / 13 sec	6. Yield / production	
Year of establishment	--	Peak plucking periods	Aug - Oct
Type of tea produced	CTC, Orthodox	Annual green leaf yield	6933 kg/ha
2. Infrastructure		Annual production of processed tea	730454 kg
Availability of processing factory	Yes	7. Pruning	
Availability of workers colony	Yes	Time of pruning	Dec - Jan
Availability of internet facility / e-mail id	Yes	Pruning cycle	4 yrs
Meteorological observations taken	Tmax, Tmin, Rainfall, SSH	Types of pruning	LP-UP-DS-UP
3. Amenities		8. Fertilizer use	
Availability of health care / dispensary	Yes	Types of N, P, K fertilizers used	Urea, MOP, RP
Availability of school	Yes	Dose of Nitrogen (kg/ha)	90 -200
4. Shade trees		Dose of Phosphorous (kg/ha)	15-50
Shade tree density (garden level)	Medium	Dose of Potash (kg/ha)	50-150
Plant to plant spacing (m)	13.33 x 13.33	Whether lime is applied, if yes dose	Yes, Quick Lime 4kg/ha and soda lime 12 kg/ha
Row to row spacing (m)	13.33 x 13.33		

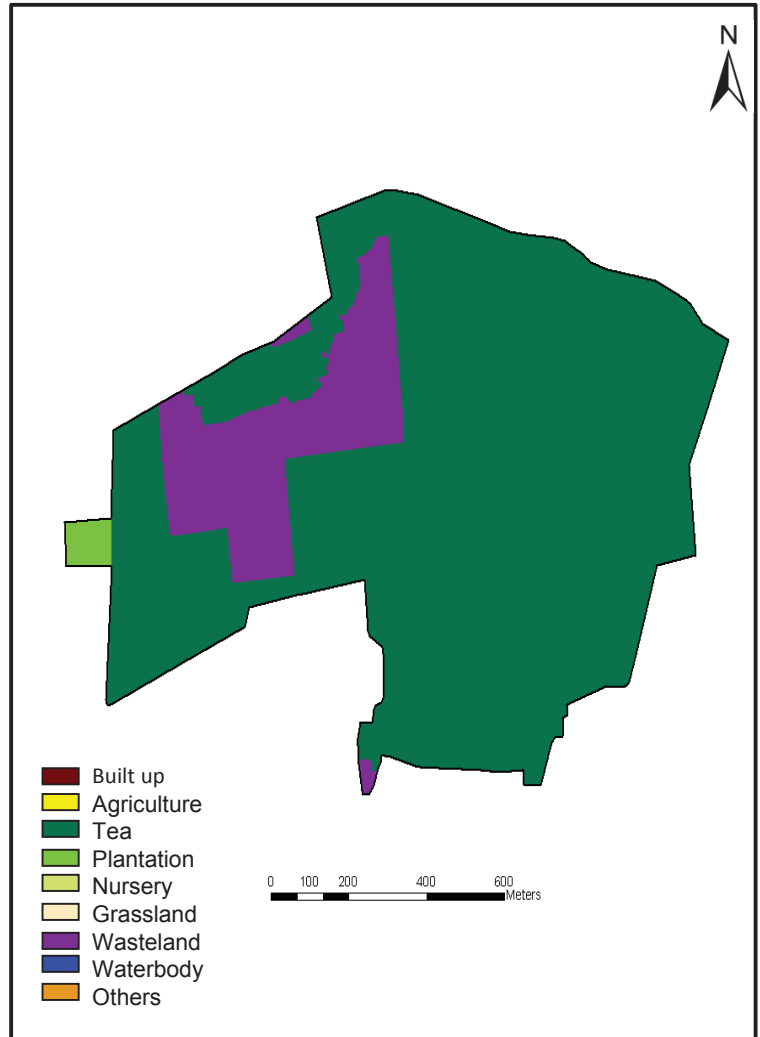




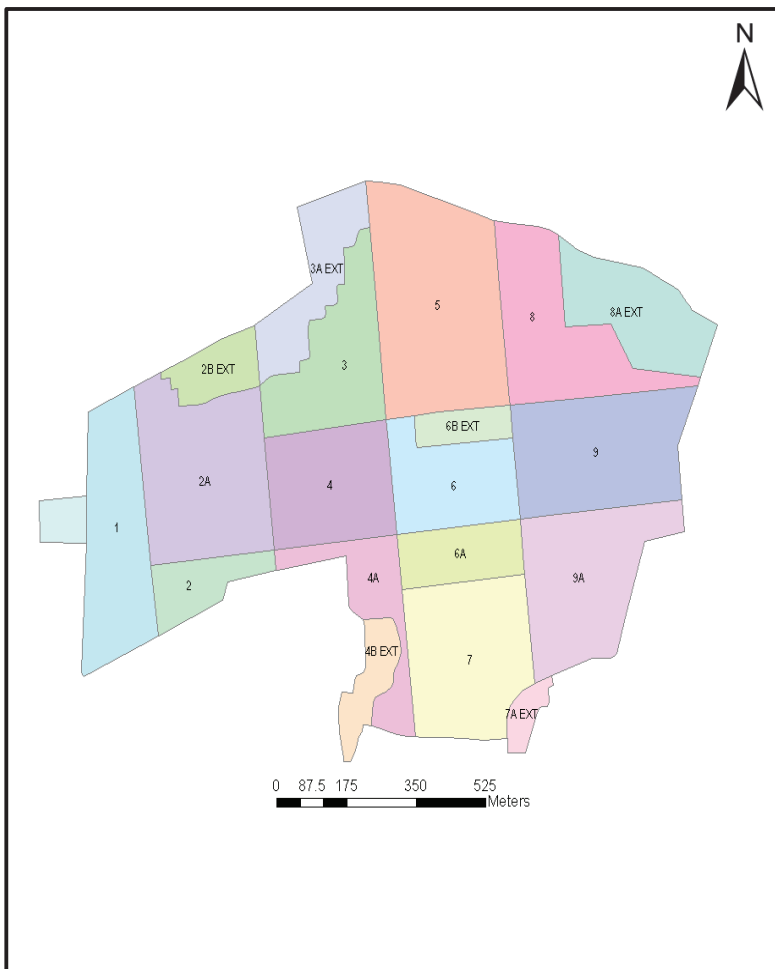
P44: MANABARIE TE



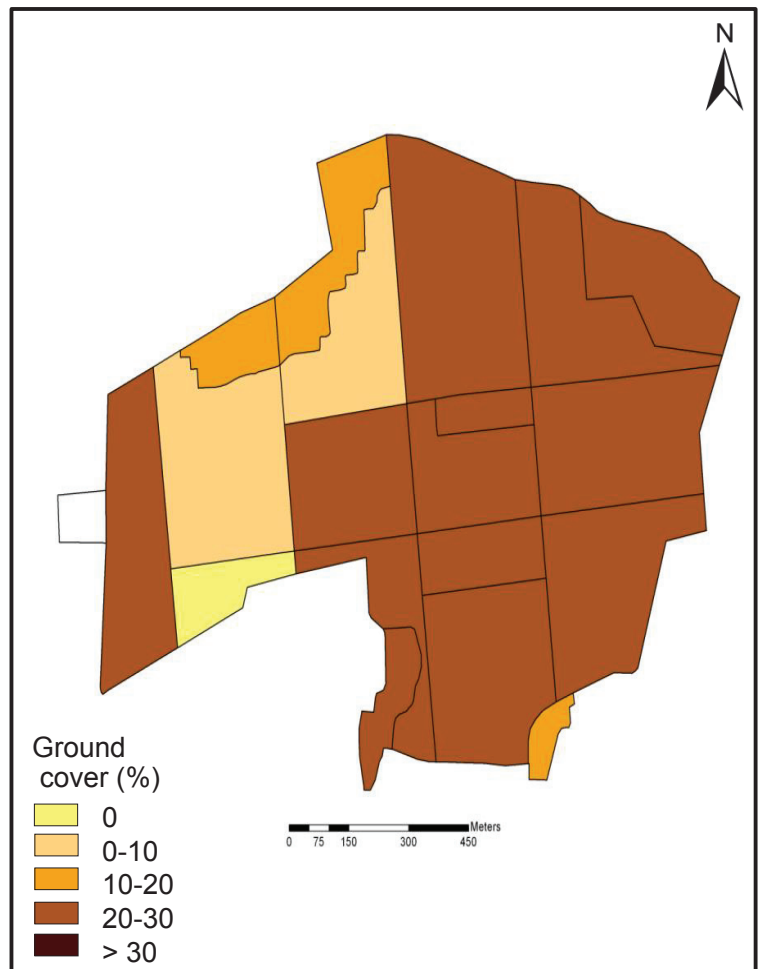
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections





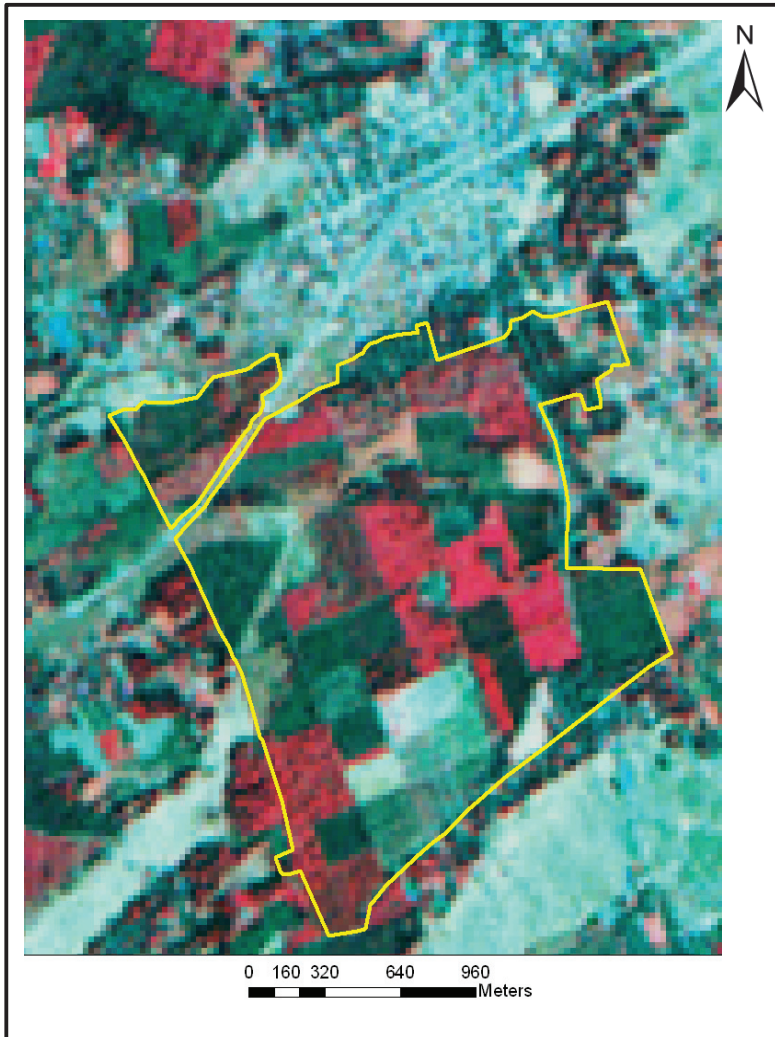
e. General Information

1. General		5. Natural resources constraints	
Contact address	P.O: Mohanbari A/f, Dist: Dibrugarh, PIN: 786012	Drainage congestion and water logging	Yes
Contact phone	0373-2913514	Scarcity of water during summer	No
Name of the company	Mokalbari Kanoi Tea Estate Pvt. Ltd.	River bank erosion	No
Name of the village where it falls	Manabarrie	Major diseases and duration	Red Rust (Jun-Aug)
Leased area of the estate (ha)	142.21	Major pests and duration	<i>Helopeltis</i> (Apr-Aug), RSM (Apr-May, Jul-Aug)
Tea grown area of the estate (ha)	117.29	Damage due to wildlife	No
No. of divisions / sections	0 div / 8 sec	6. Yield / production	
Year of establishment	1950 Approx.	Peak plucking periods	Jun - Oct
Type of tea produced	CTC, Orthodox	Annual green leaf yield	8999.2 kg/ha
2. Infrastructure		Annual production of processed tea	258647.9 kg
Availability of processing factory	No	7. Pruning	
Availability of workers colony	No	Time of pruning	End of Nov - First week of Jan
Availability of internet facility / e-mail id	No	Pruning cycle	4 yrs
Meteorological observations taken	Tmax, Tmin, RHmax, RHmin, Rainfall	Types of pruning	--
3. Amenities		8. Fertilizer use	
Availability of health care / dispensary	Yes	Types of N, P, K fertilizers used	Urea, MOP, RP
Availability of school	No	Dose of Nitrogen (kg/ha)	160 - 200
4. Shade trees		Dose of Phosphorous (kg/ha)	40
Shade tree density (garden level)	High	Dose of Potash (kg/ha)	80-100
Plant to plant spacing (m)	10 x 10	Whether lime is applied, if yes dose	No
Row to row spacing (m)	10 x 10		

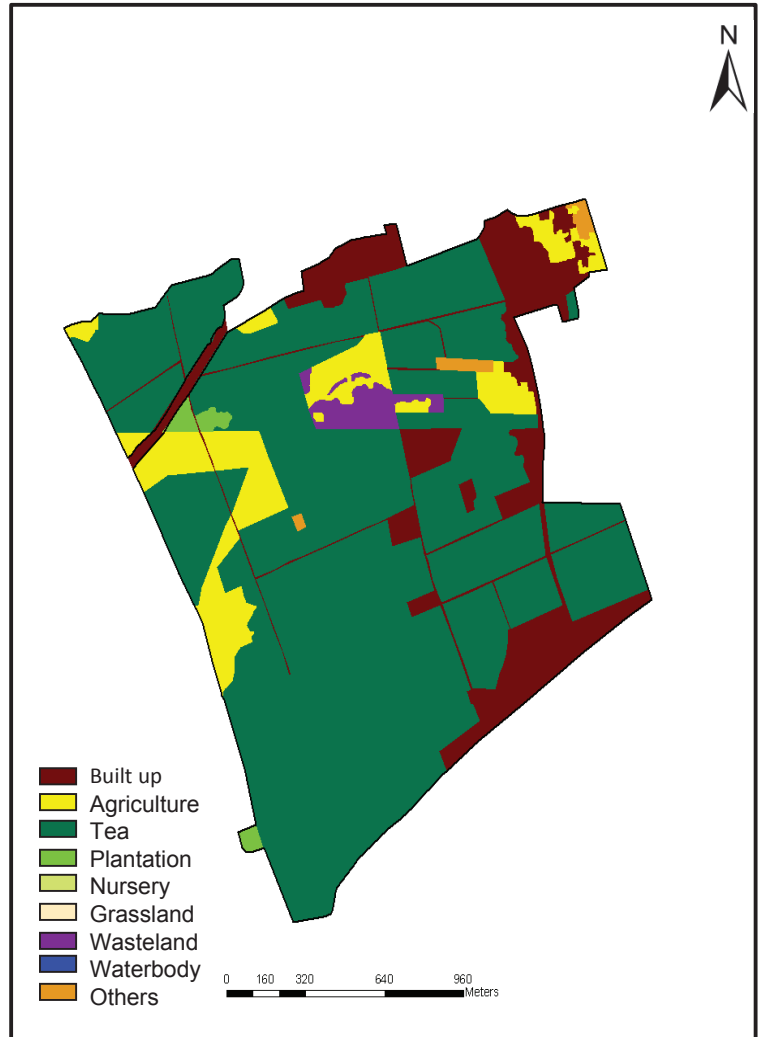




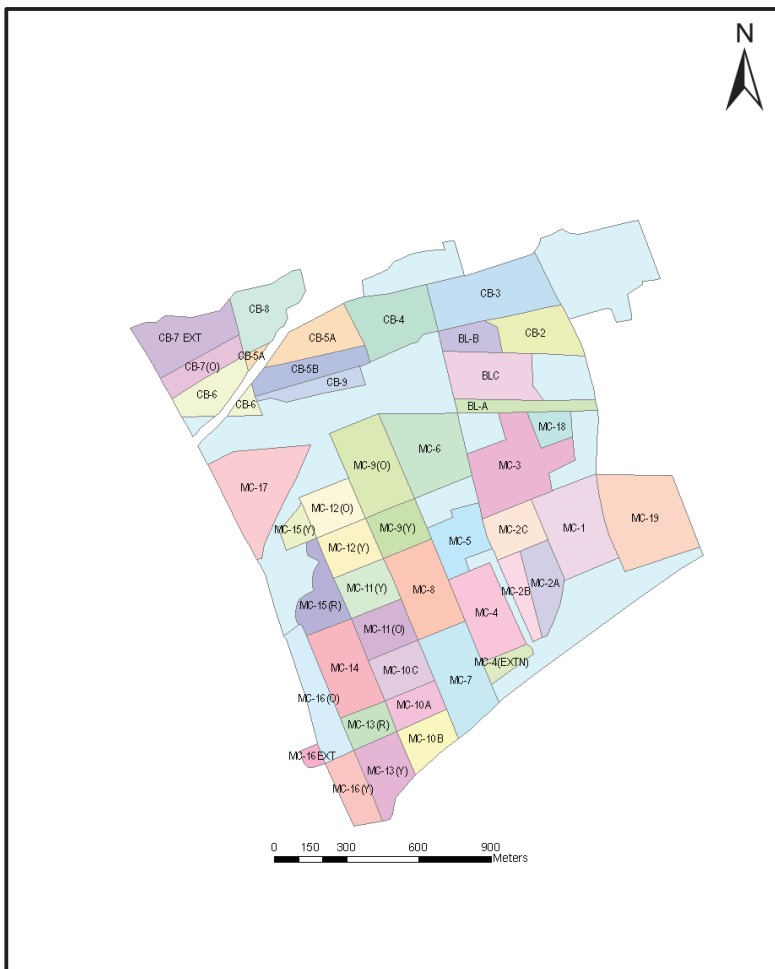
P45: MANCOTTA TE



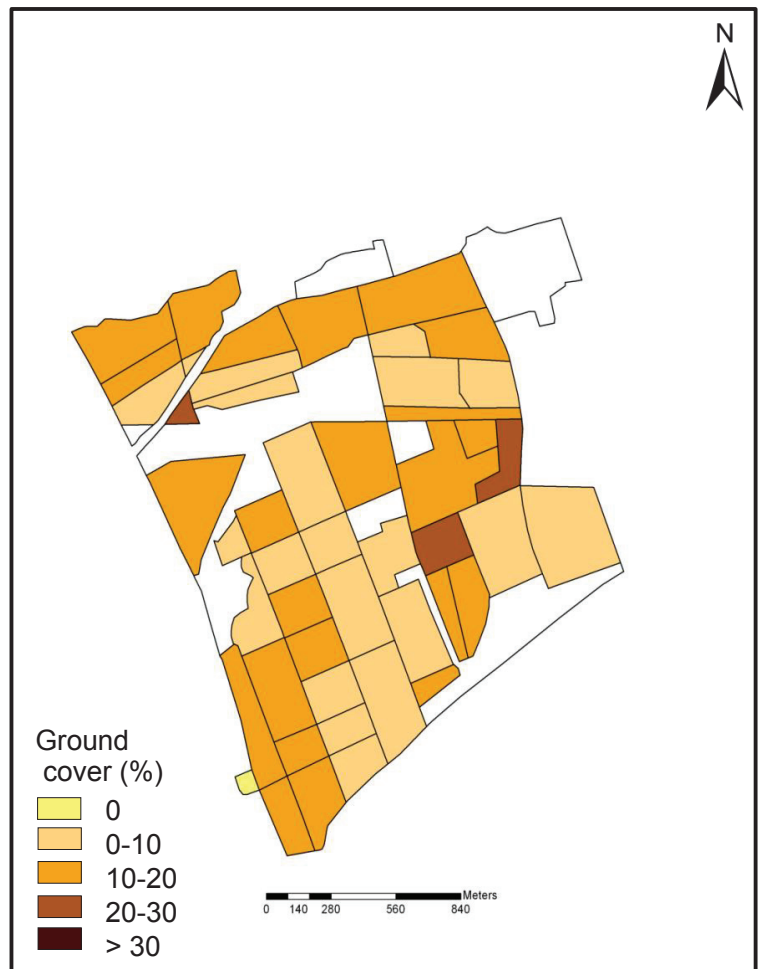
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

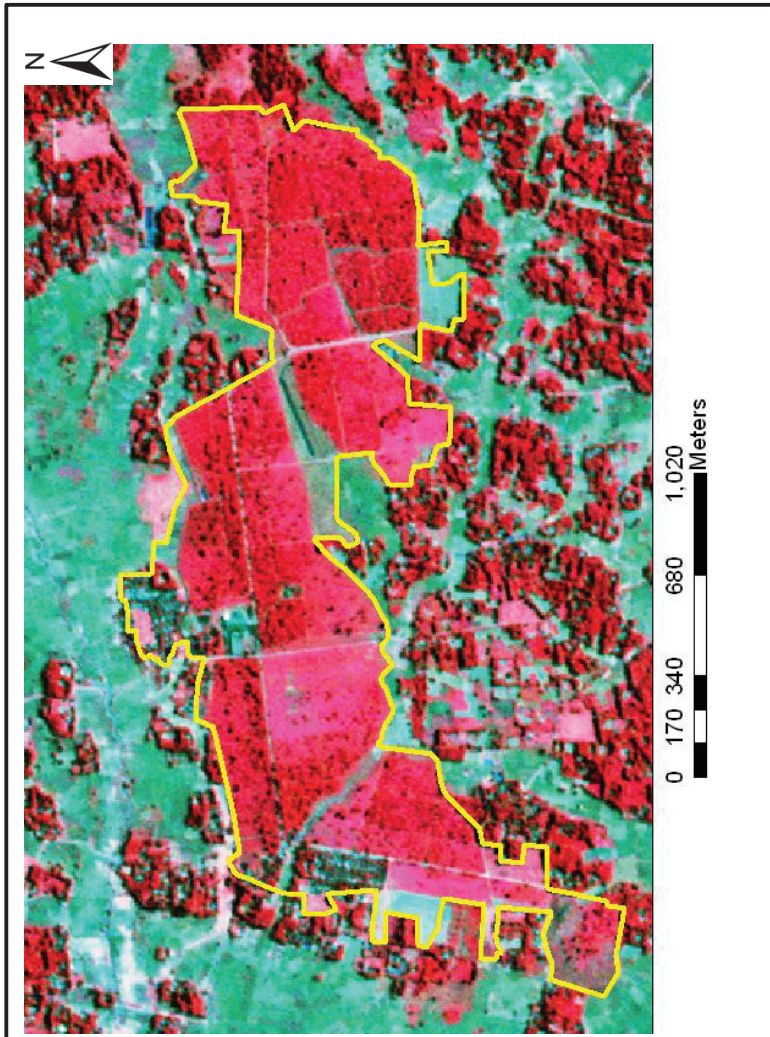




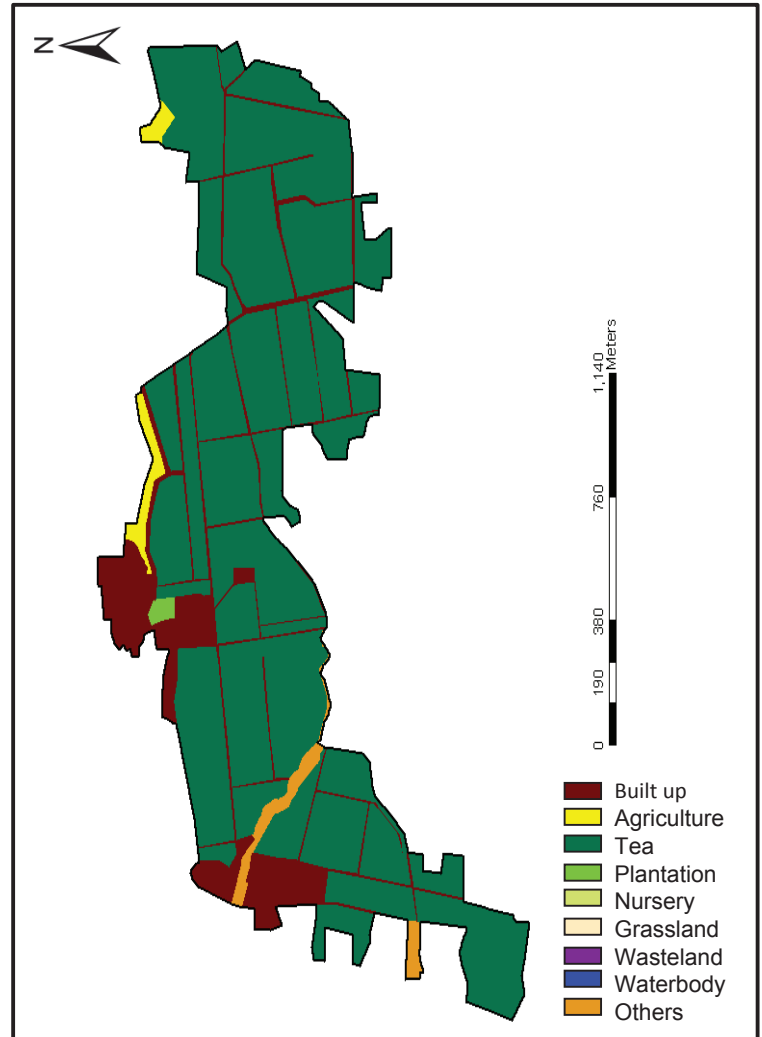
e. General Information

1. General		5. Natural resources constraints	
Contact address	PO: Dibrugarh DIST: Dibrugarh, PIN: 786001	Drainage congestion and water logging	Yes
Contact phone	0373-2376574	Scarcity of water during summer	No
Name of the company	Arunachal Tea & Industries (Pvt.) Ltd.	River bank erosion	No
Name of the village where it falls	Dibrugarh	Major diseases and duration	--
Leased area of the estate (ha)	410.10	Major pests and duration	<i>Helopeltis</i> (Apr - Aug) RSM (Mar - Sep)
Tea grown area of the estate (ha)	233.08	Damage due to wildlife	No
No. of divisions / sections	0 div / 42 sec	6. Yield / production	
Year of establishment	1908	Peak plucking periods	Jun - Oct
Type of tea produced	Orthodox	Annual green leaf yield	7280 kg/ha
2. Infrastructure		Annual production of processed tea	415601 kg
Availability of processing factory	Yes	7. Pruning	
Availability of workers colony	Yes	Time of pruning	1 st week of Dec - 2 nd week of Jan
Availability of internet facility / e-mail id	Yes	Pruning cycle	3 yrs
Meteorological observations taken	--	Types of pruning	--
3. Amenities		8. Fertilizer use	
Availability of health care / dispensary	Yes	Types of N, P, K fertilizers used	Urea, SOA, RP, SSP, MOP
Availability of school	Yes	Dose of Nitrogen (kg/ha)	90 -150
4. Shade trees		Dose of Phosphorous (kg/ha)	40
Shade tree density (garden level)	Optimum	Dose of Potash (kg/ha)	70 - 150
Plant to plant spacing (m)	6.67 x 6.67	Whether lime is applied, if yes dose	No
Row to row spacing (m)	7 x 7		

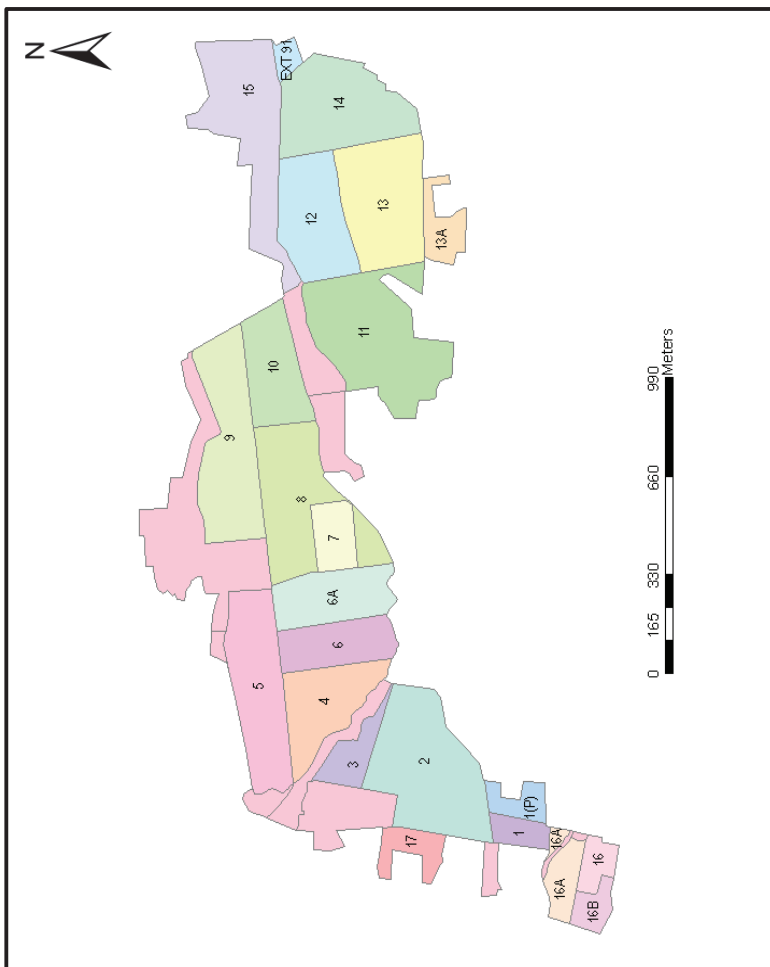




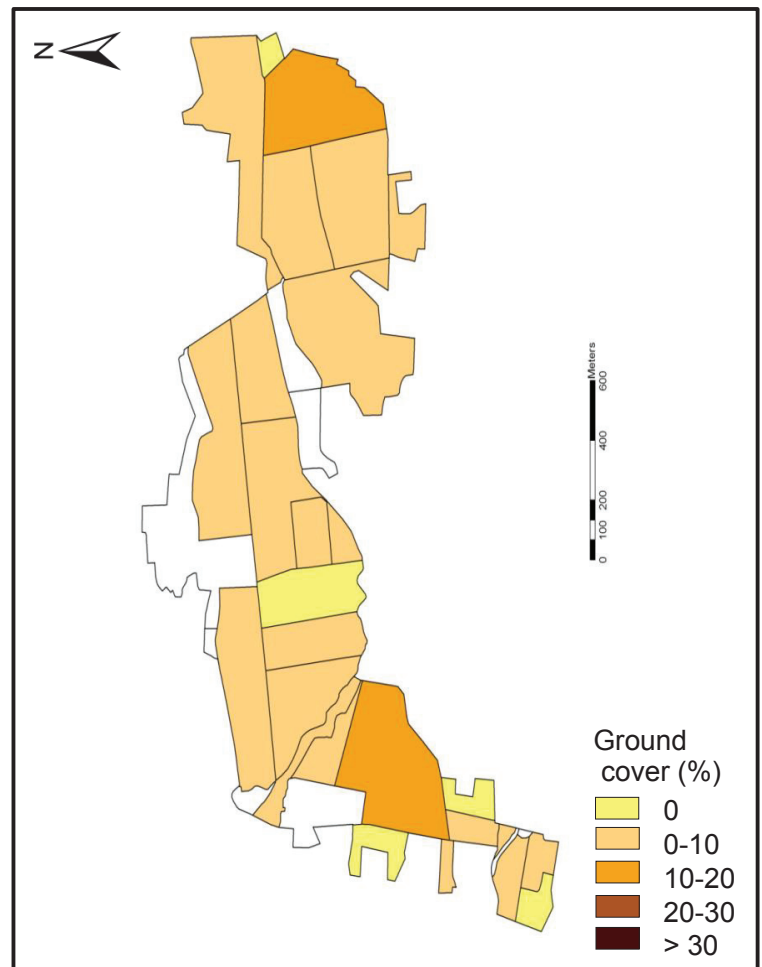
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections





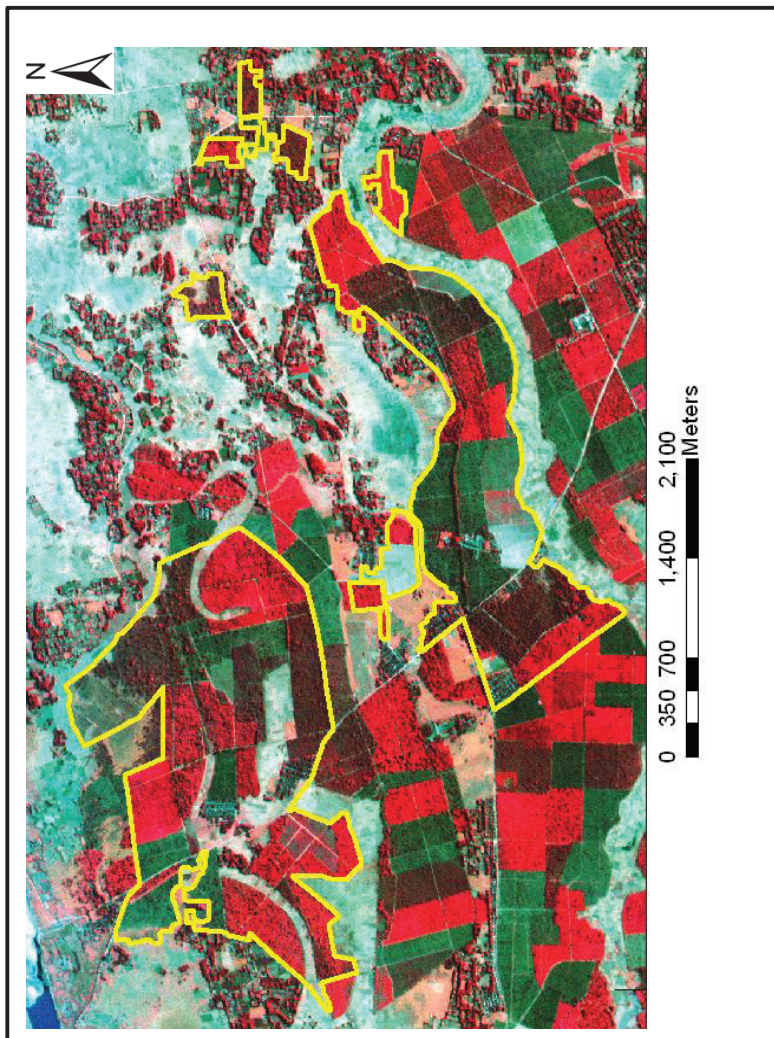
e. General Information

1. General		5. Natural resources constraints	
Contact address	PO: Chabua, Dist: Dibrugarh, PIN: 786184	Drainage congestion and water logging	Yes
Contact phone	0373-2100174, 9957186247	Scarcity of water during summer	No
Name of the company	Maud Tea & Seed Company Ltd.	River bank erosion	No
Name of the village where it falls	Chabua	Major diseases and duration	Black rot, Red rust
Leased area of the estate (ha)	--	Major pests and duration	<i>Helopeltis, RSM</i>
Tea grown area of the estate (ha)	154.58	Damage due to wildlife	No
No. of divisions / sections	0 div/ 23 sec	6. Yield / production	
Year of establishment	1933	Peak plucking periods	Jul - Oct
Type of tea produced	CTC, Orthodox	Annual green leaf yield	5984.01 kg/ha
2. Infrastructure		Annual production of processed tea	213738 kg
Availability of processing factory	Yes	7. Pruning	
Availability of workers colony	Yes	Time of pruning	End of Nov - mid Jan
Availability of internet facility / e-mail id	Yes	Pruning cycle	4 yrs
Meteorological observations taken	Rainfall	Types of pruning	--
3. Amenities		8. Fertilizer use	
Availability of health care / dispensary	Yes	Types of N, P, K fertilizers used	--
Availability of school	Yes	Dose of Nitrogen (kg/ha)	--
4. Shade trees		Dose of Phosphorous (kg/ha)	--
Shade tree density (garden level)	Medium	Dose of Potash (kg/ha)	--
Plant to plant spacing (m)	12 x 12	Whether lime is applied, if yes dose	No
Row to row spacing (m)	12 x 12		

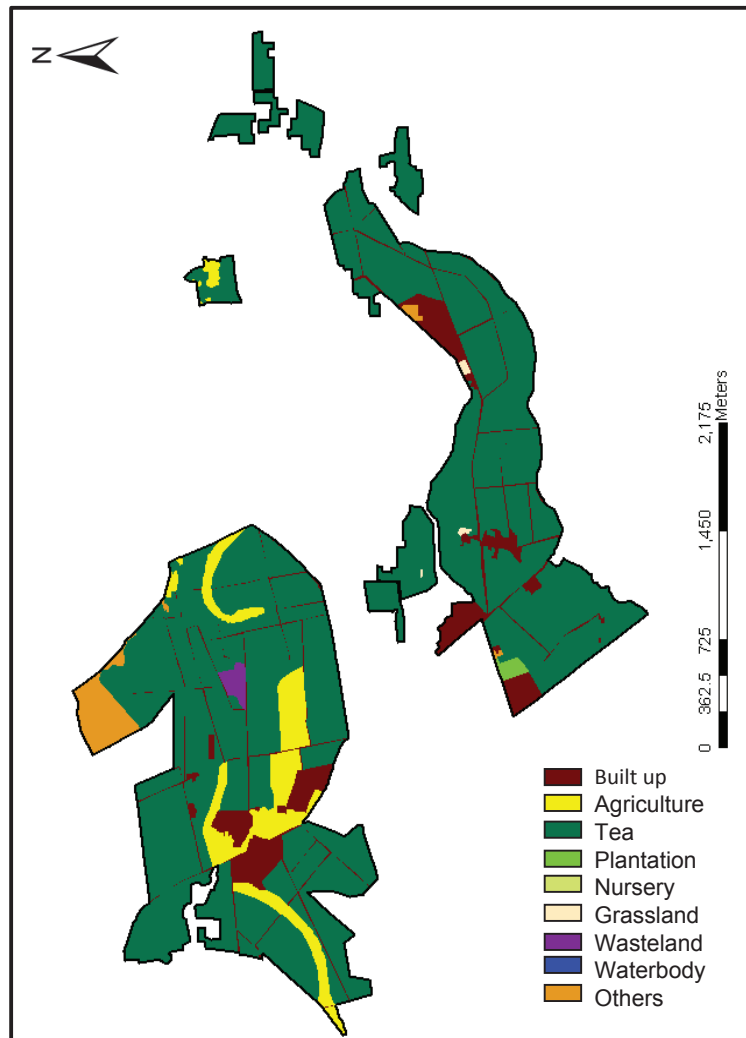




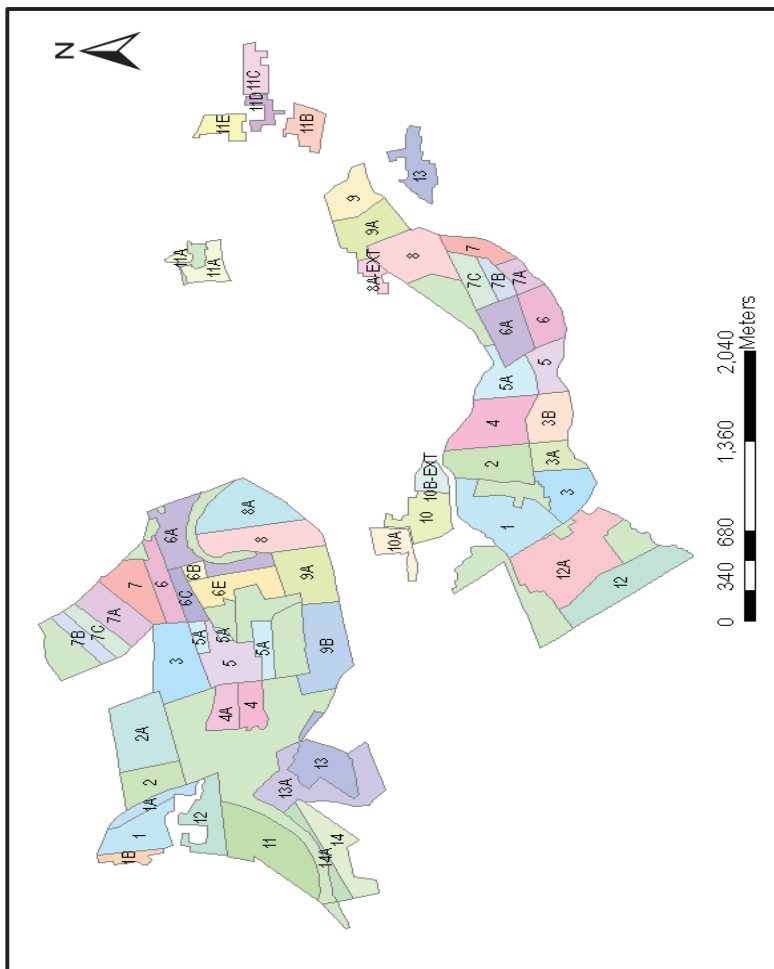
P47: MOKALBARI TE



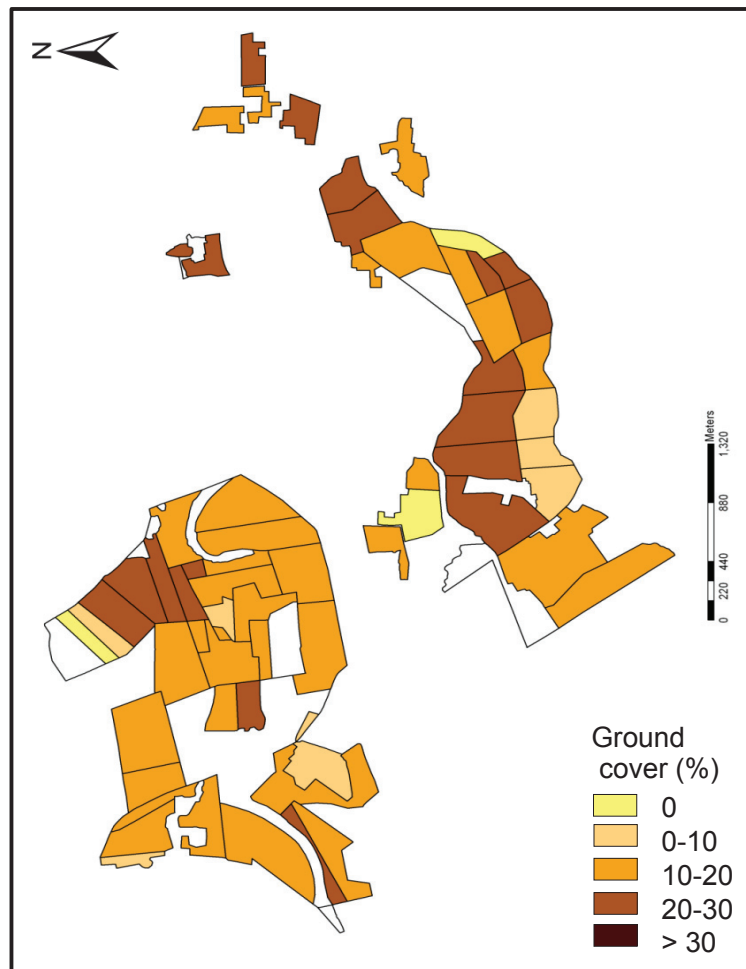
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

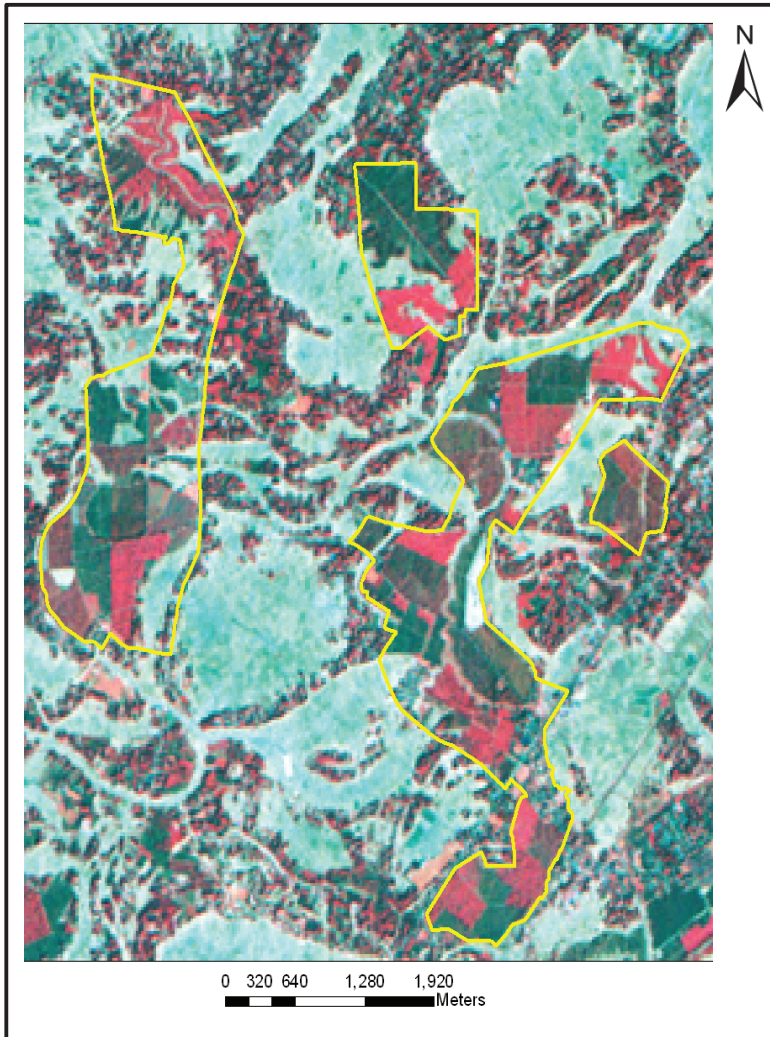




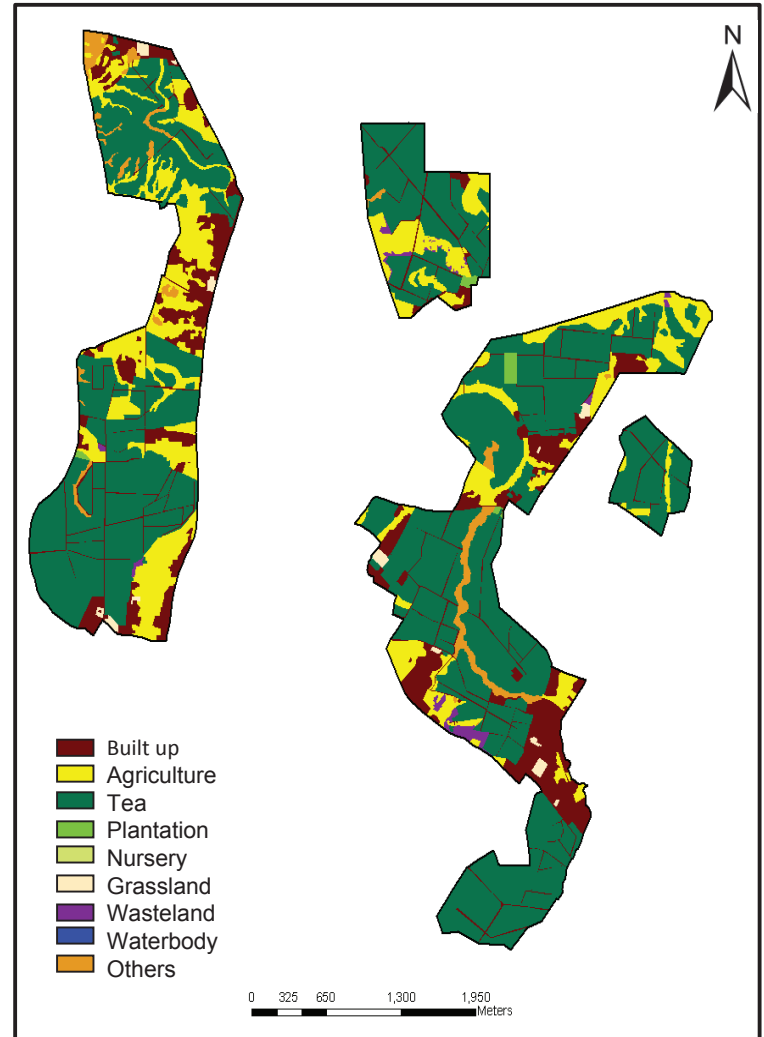
e. General Information

1. General		5. Natural resources constraints	
Contact address	PO: Mohanbari , Dist: Dibrugarh, PIN: 786012	Drainage congestion and water logging	Yes
Contact phone	0373-2913514	Scarcity of water during summer	No
Name of the company	Mokalbari Kanoi Tea Estate Pvt. Ltd.	River bank erosion	Yes
Name of the village where it falls	Mokalbari	Major diseases and duration	Red Rust (Jun-Aug)
Leased area of the estate (ha)	775.23	Major pests and duration	<i>Helopeltis</i> (Apr - Aug), RSM (Apr - May, Jul - Aug)
Tea grown area of the estate (ha)	558.66	Damage due to wildlife	No
No. of divisions / sections	3 div/ 60 sec	6. Yield / production	
Year of establishment	--	Peak plucking periods	Jun-Oct
Type of tea produced	CTC, Orthodox	Annual green leaf yield	9623 kg/ha
2. Infrastructure		Annual production of processed tea	1293410 kg
Availability of processing factory	Yes	7. Pruning	
Availability of workers colony	Yes	Time of pruning	End of Nov - 1st week of Jan
Availability of internet facility / e-mail id	Yes	Pruning cycle	4 yrs
Meteorological observations taken	Tmax, Tmin, RHmax, RHmin, Rainfall	Types of pruning	--
3. Amenities		8. Fertilizer use	
Availability of health care / dispensary	Yes	Types of N, P, K fertilizers used	Urea, MOP, RP
Availability of school	Yes	Dose of Nitrogen (kg/ha)	160 - 200
4. Shade trees		Dose of Phosphorous (kg/ha)	40
Shade tree density (garden level)	High	Dose of Potash (kg/ha)	80 - 100
Plant to plant spacing (m)	9 x 9	Whether lime is applied, if yes dose	No
Row to row spacing (m)	9 x 9		





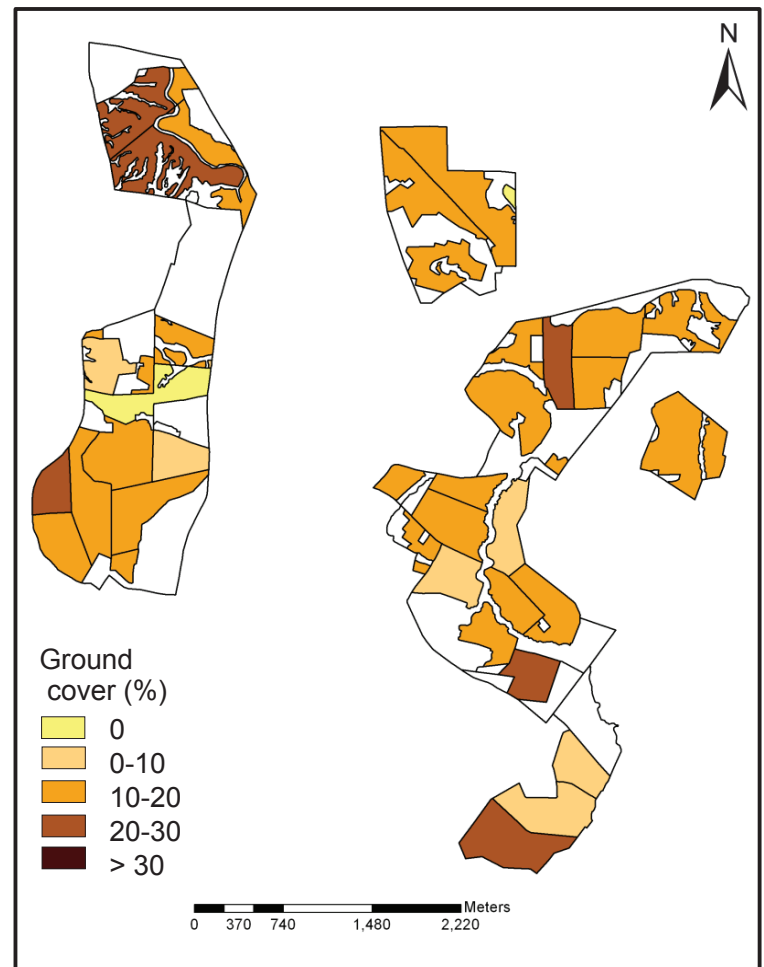
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections





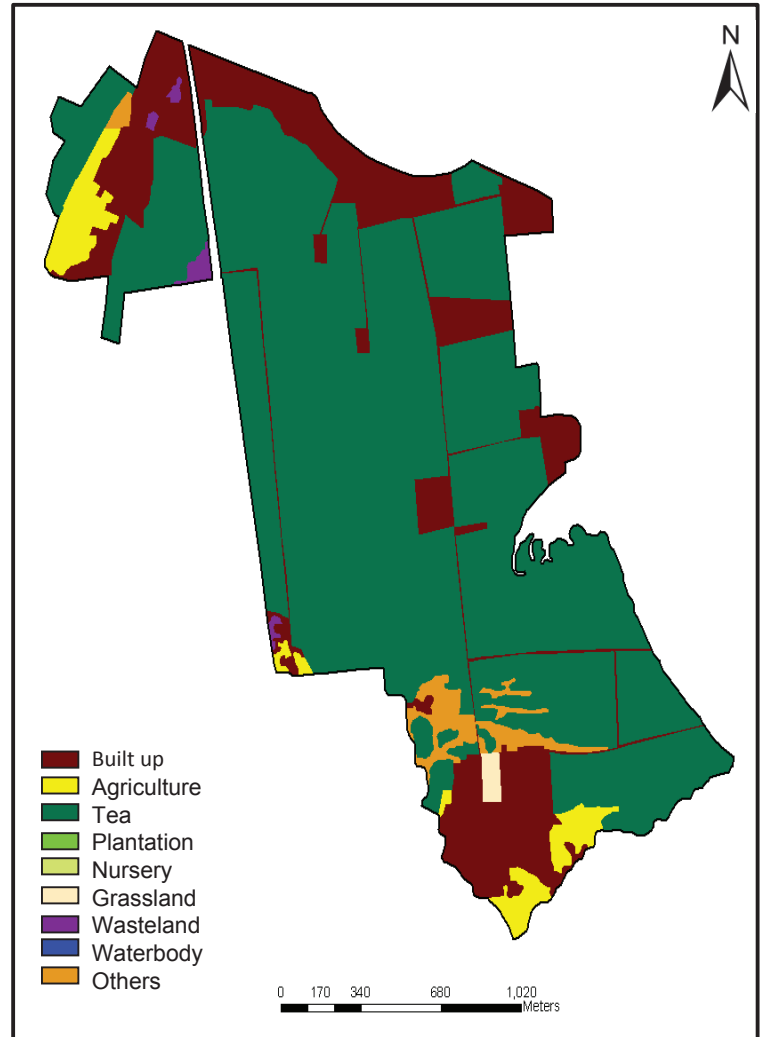
e. General Information

1. General		5. Natural resources constraints	
Contact address	PO: Moran, Dist: Dibrugarh, PIN: 785669	Drainage congestion and water logging	Yes
Contact phone	03754-212379	Scarcity of water during summer	No
Name of the company	McLeod Russel India Ltd.	River bank erosion	No
Name of the village where it falls	Moran	Major diseases and duration	Red Rust (Seasonal)
Leased area of the estate (ha)	1094.00	Major pests and duration	RSM (Seasonal)
Tea grown area of the estate (ha)	621.95	Damage due to wildlife	No
No. of divisions / sections	4 div / 32 sec	6. Yield / production	
Year of establishment	1886	Peak plucking periods	Mar - Dec
Type of tea produced	CTC, Orthodox	Annual green leaf yield	8695 kg/ha
2. Infrastructure		Annual production of processed tea	1177512 kg
Availability of processing factory	Yes	7. Pruning	
Availability of workers colony	Yes	Time of pruning	2 nd fortnight of Dec - 1 st fortnight of Feb
Availability of internet facility / e-mail id	Yes	Pruning cycle	--
Meteorological observations taken	Tmax, Tmin, Rainfall	Types of pruning	CA-LOS-DS
3. Amenities		8. Fertilizer use	
Availability of health care / dispensary	Yes	Types of N, P, K fertilizers used	Urea, MOP, RP, SP
Availability of school	Yes	Dose of Nitrogen (kg/ha)	123
4. Shade trees		Dose of Phosphorous (kg/ha)	49
Shade tree density (garden level)	Medium	Dose of Potash (kg/ha)	88
Plant to plant spacing (m)	0.75 X 0.75	Whether lime is applied, if yes dose	No
Row to row spacing (m)	1 X 1		

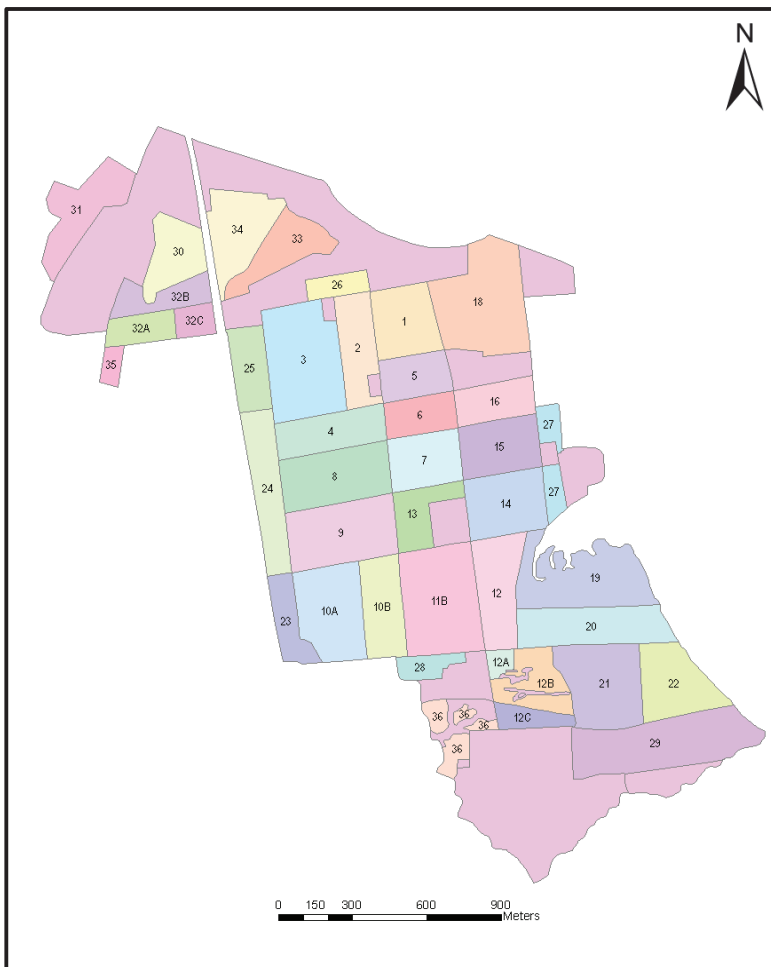




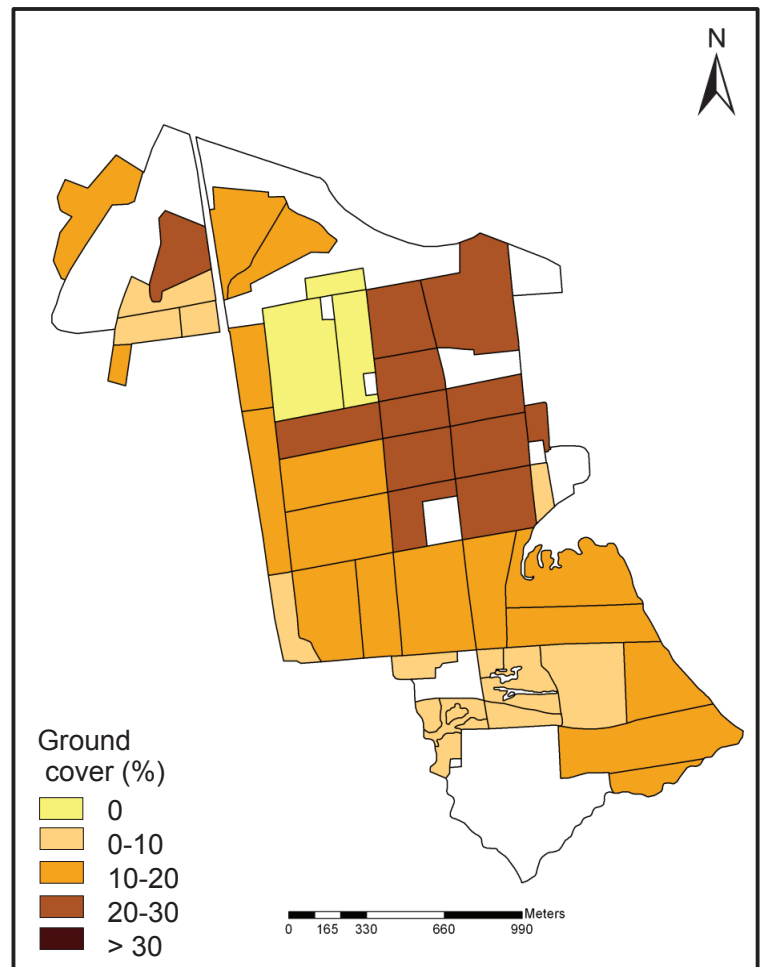
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections





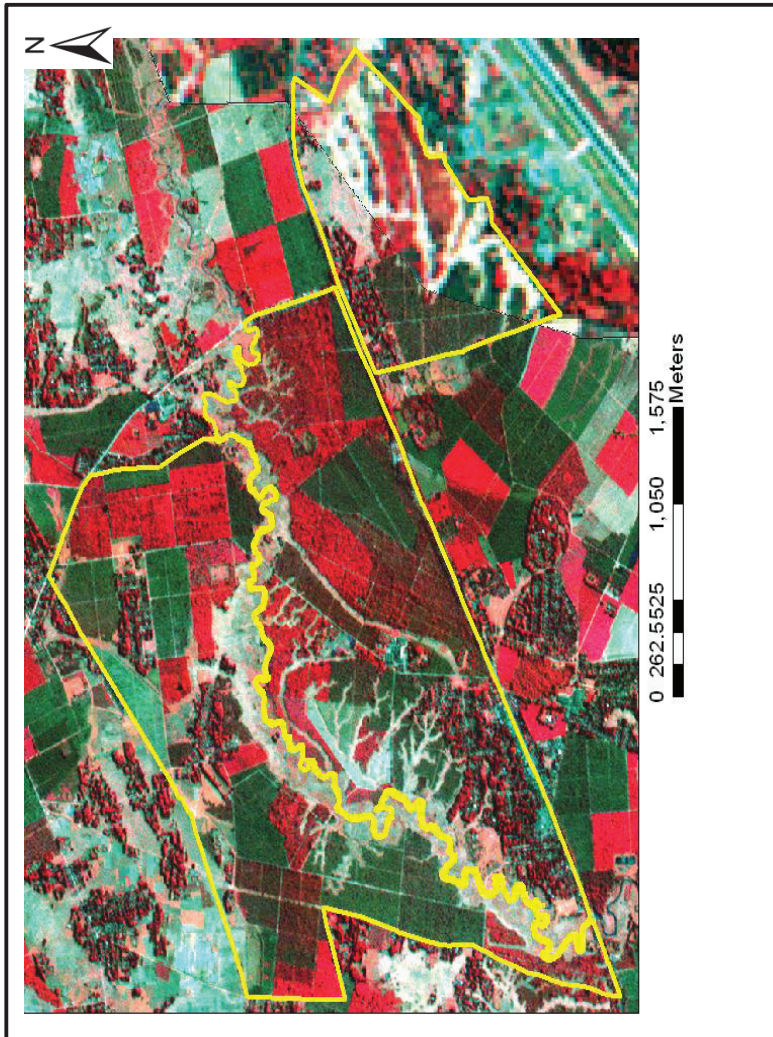
e. General Information

1. General		5. Natural resources constraints	
Contact address	PO: Naharkutia, Dist: Dibrugarh PIN: 786610	Drainage congestion and water logging	Yes
Contact phone	0374-2570029	Scarcity of water during summer	No
Name of the company	Amalgamated Plantations	River bank erosion	No
Name of the village where it falls	Naharkatia town, Ward no-2	Major diseases and duration	--
Leased area of the estate (ha)	380	Major pests and duration	<i>Helopeltis</i> , RSM (Apr-May, Sep-Oct)
Tea grown area of the estate (ha)	261.82	Damage due to wildlife	No
No. of divisions / sections	0 div / 44 sec	6. Yield / production	
Year of establishment	1901	Peak plucking periods	Jul - Nov
Type of tea produced	CTC	Annual green leaf yield	10285 kg/ha
2. Infrastructure		Annual production of processed tea	573660 kg
Availability of processing factory	Yes	7. Pruning	
Availability of workers colony	Yes	Time of pruning	Dec - Feb
Availability of internet facility / e-mail id	Yes	Pruning cycle	4 yrs
Meteorological observations taken	Tmax, Tmin, Rainfall	Types of pruning	--
3. Amenities		8. Fertilizer use	
Availability of health care / dispensary	Yes	Types of N, P, K fertilizers used	Urea, RP, MOP
Availability of school	Yes	Dose of Nitrogen (kg/ha)	350
4. Shade trees		Dose of Phosphorous (kg/ha)	250
Shade tree density (garden level)	Medium	Dose of Potash (kg/ha)	150
Plant to plant spacing (m)	6.5 x 6.5	Whether lime is applied, if yes dose	Yes, 1 ton/ha (When Required)
Row to row spacing (m)	12 x 12		

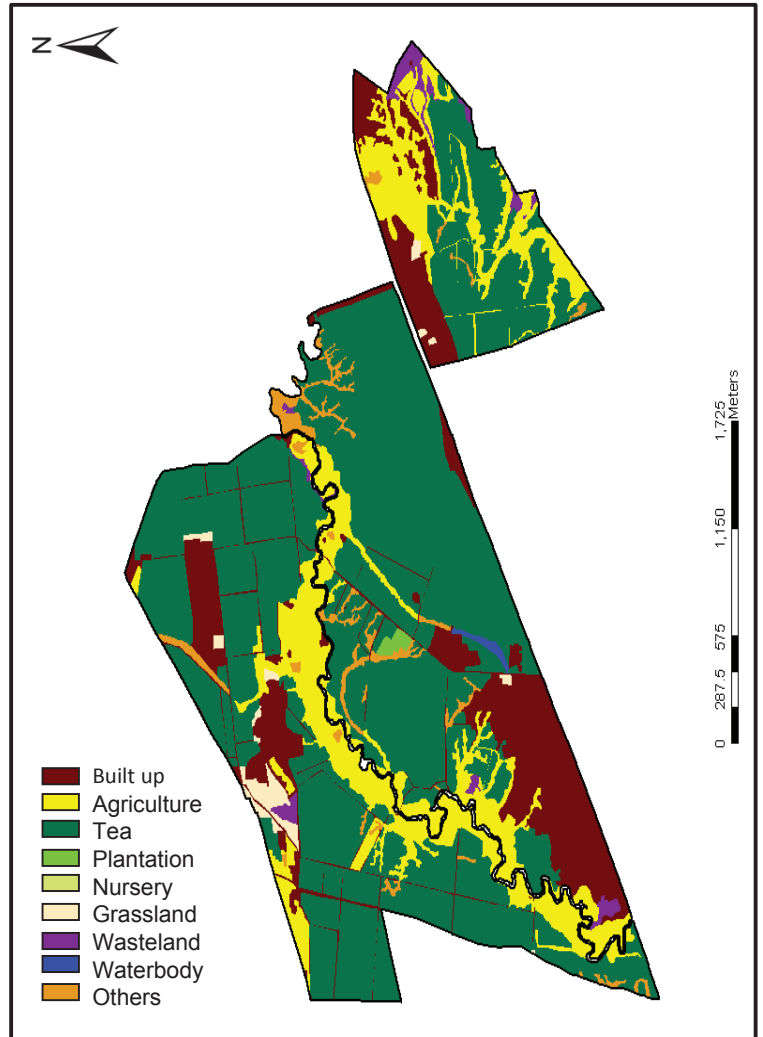




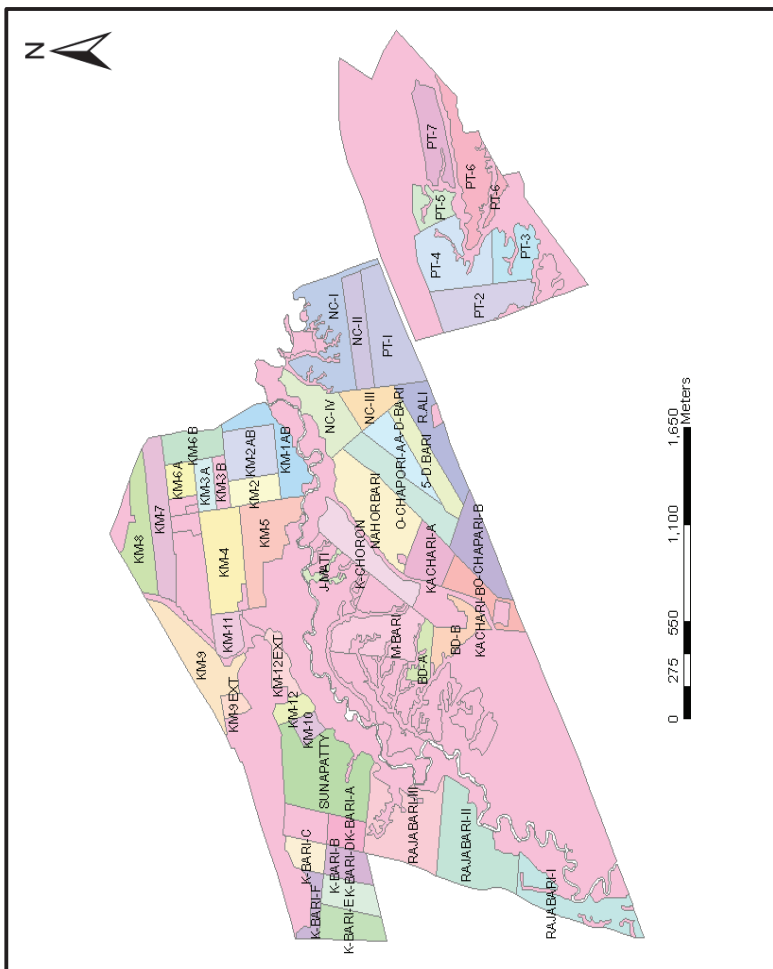
P50: NAHORTOLI TE



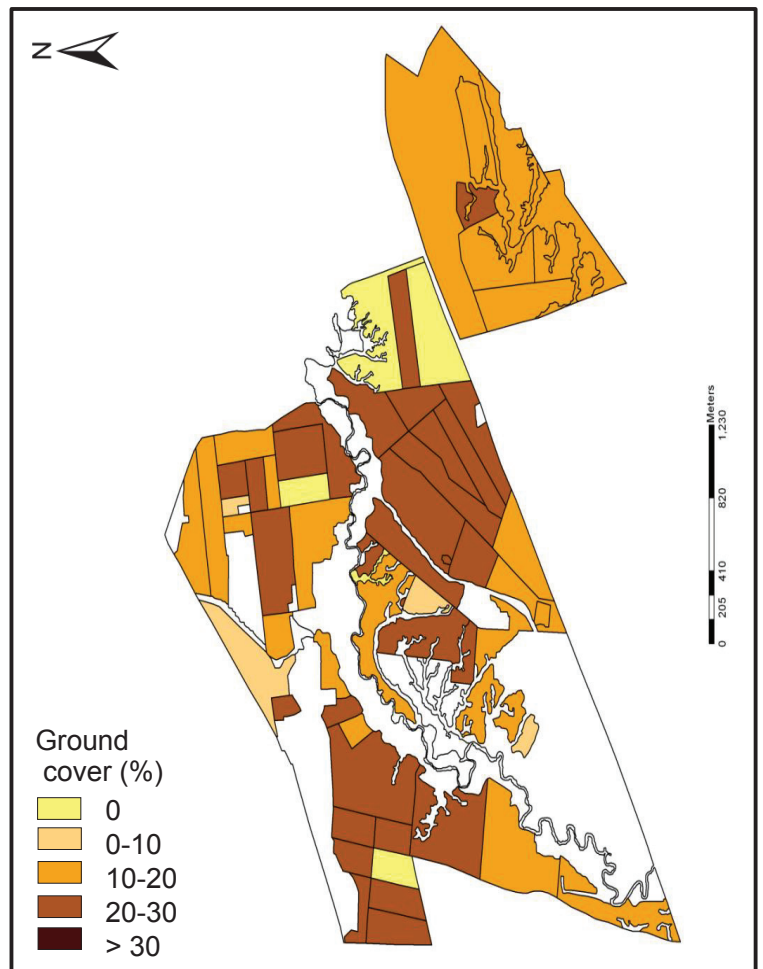
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse

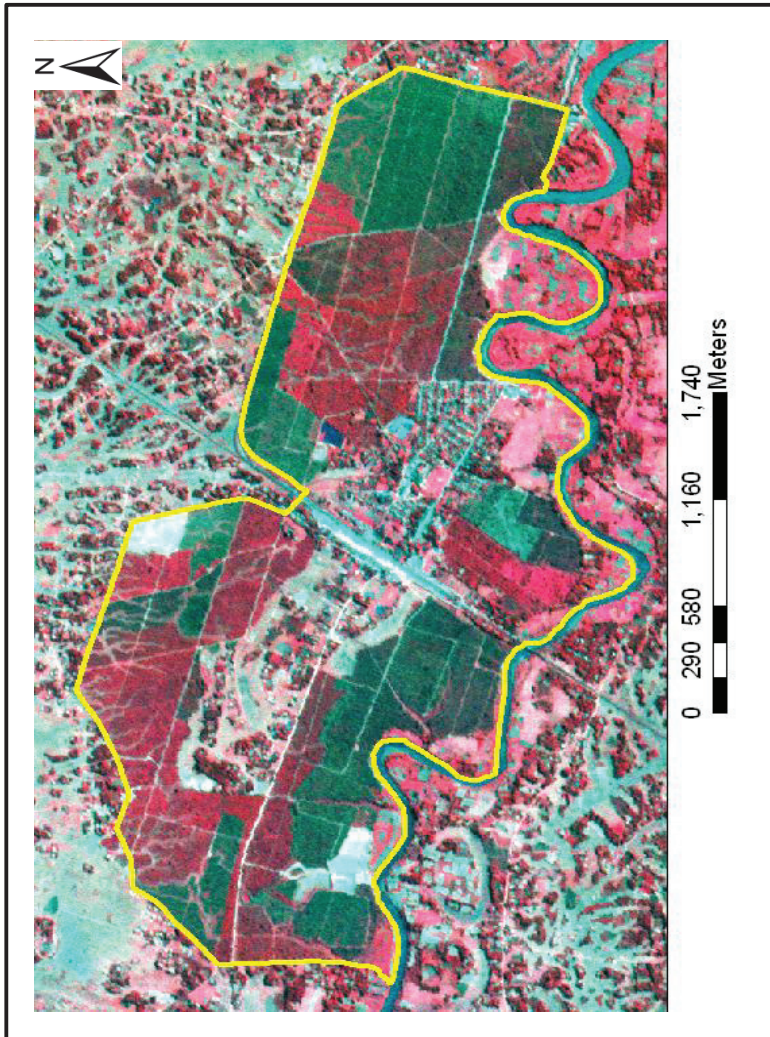


c. Section Boundaries of the Estate

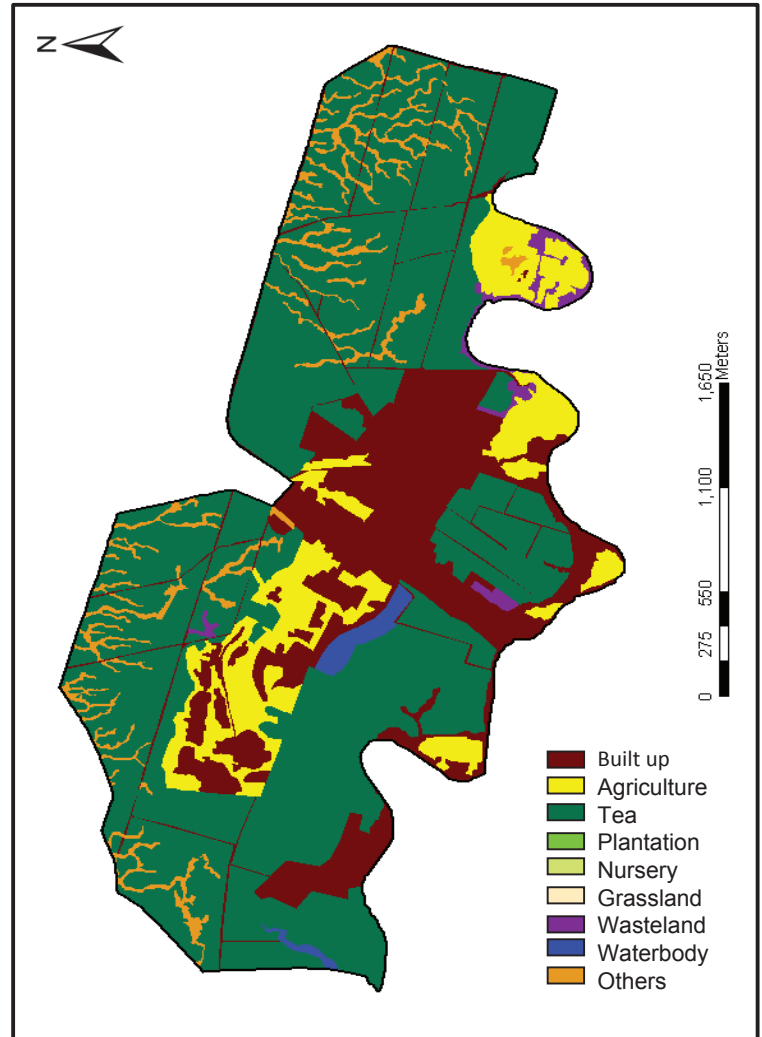


d. Shade Tree Density in Sections

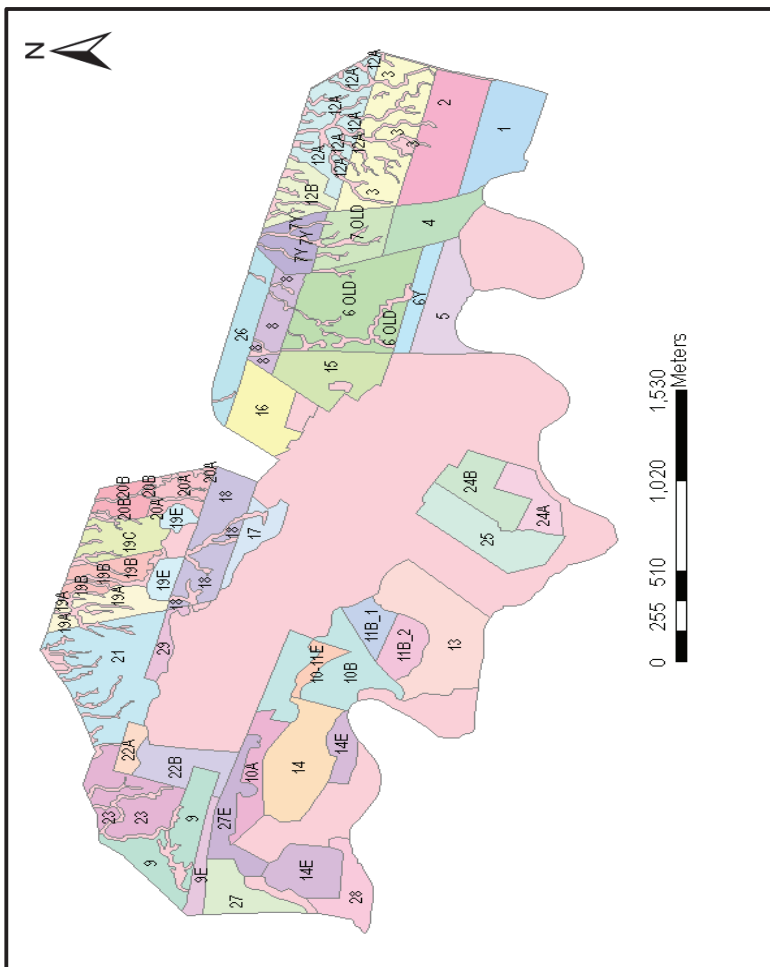




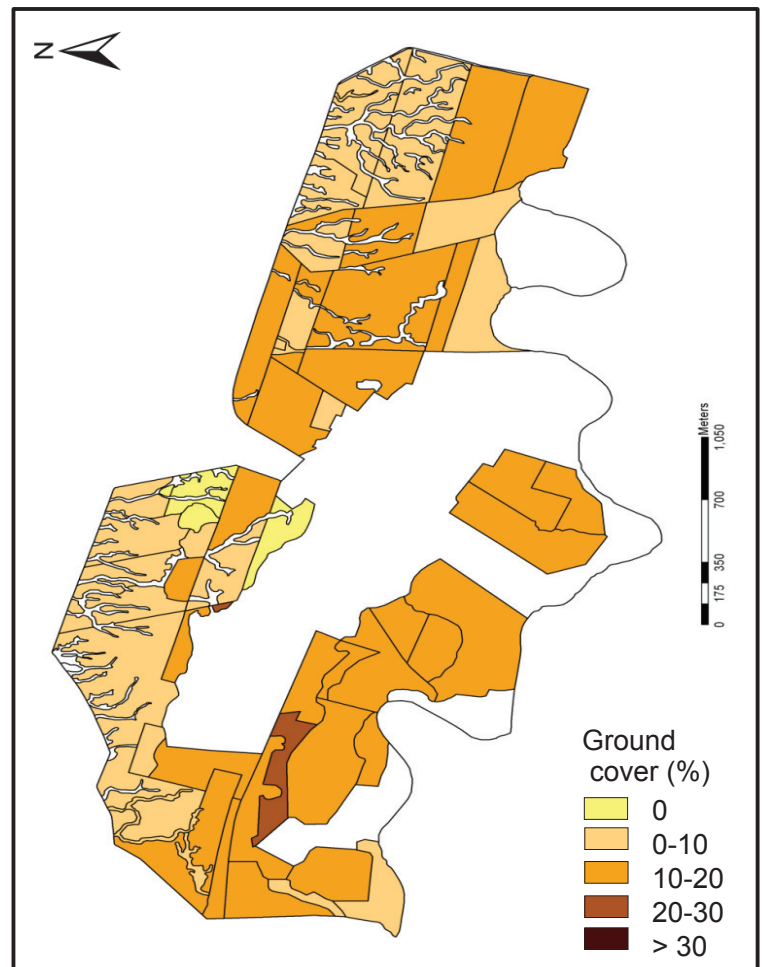
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections



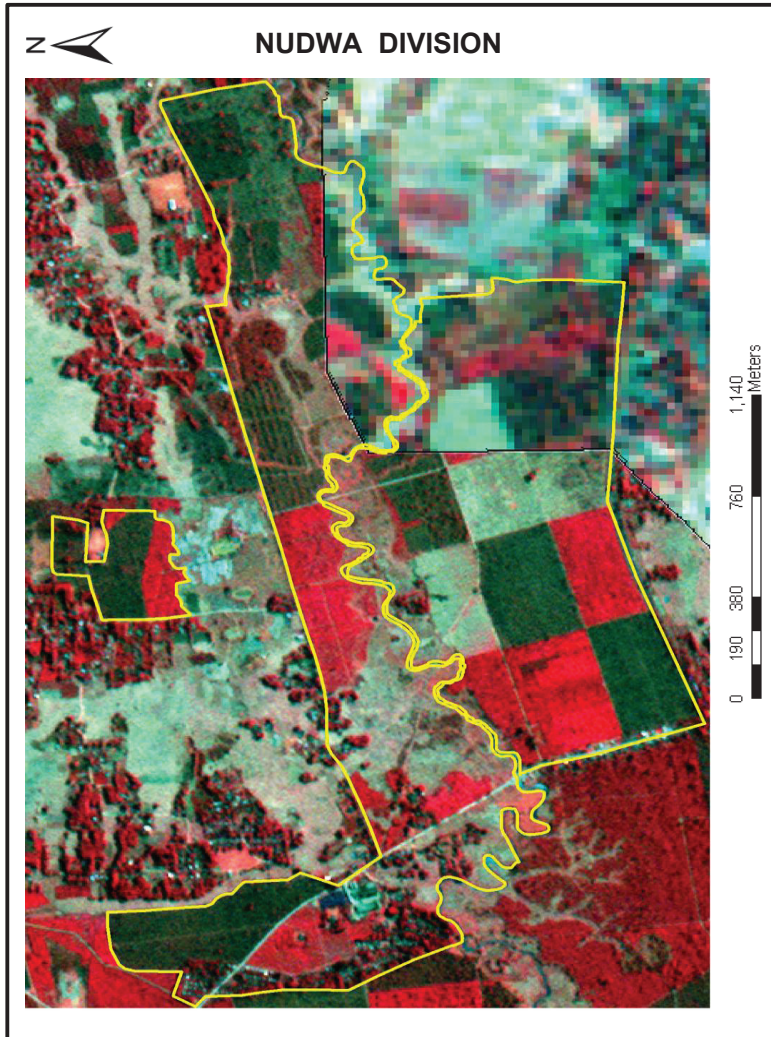


e. General Information

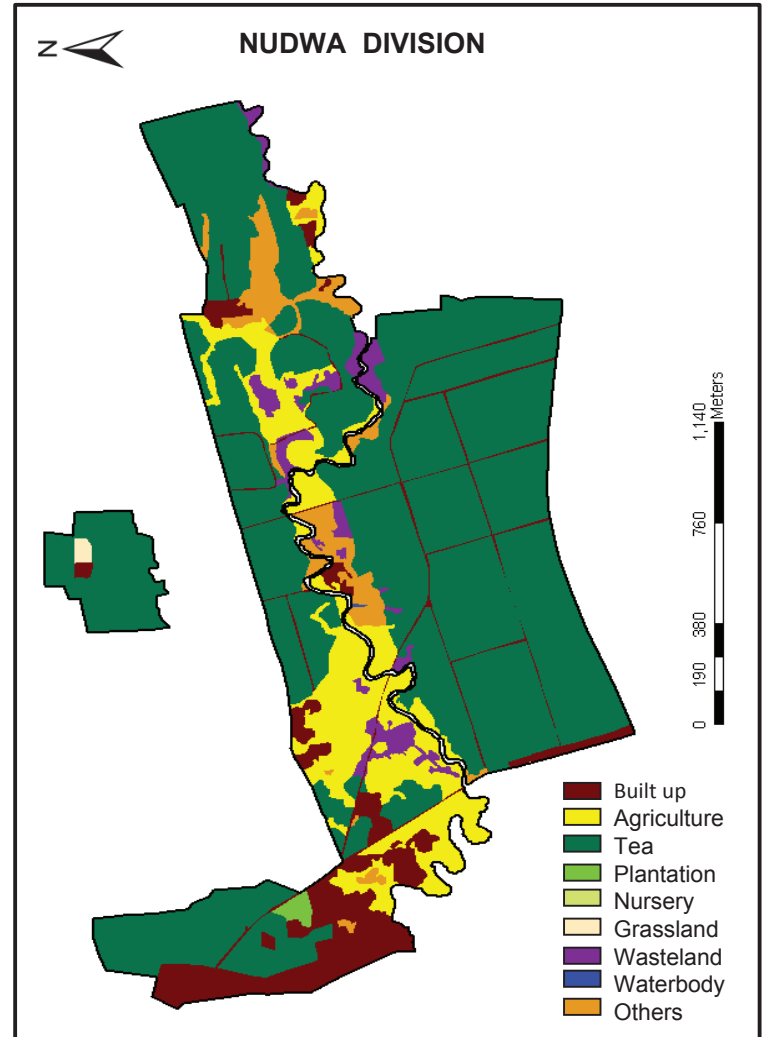
1. General	
Contact address	PO: Namroop, Dist: Dibrugarh PIN: 786621
Contact phone	0374-2500656, 2160020
Name of the company	Amalgamated Plantations
Name of the village where it falls	Namrup
Leased area of the estate (ha)	650.88
Tea grown area of the estate (ha)	399.94
No. of divisions / sections	1 div / 46 sec
Year of establishment	1910 Approx.
Type of tea produced	CTC
2. Infrastructure	
Availability of processing factory	Yes
Availability of workers colony	Yes
Availability of internet facility / e-mail id	Yes
Meteorological observations taken	Tmax, Tmin, Rainfall
3. Amenities	
Availability of health care / dispensary	Yes
Availability of school	Yes
4. Shade trees	
Shade tree density (garden level)	Optimum
Plant to plant spacing (m)	10.6 x 11
Row to row spacing (m)	10.6 x 11

5. Natural resources constraints	
Drainage congestion and water logging	Yes
Scarcity of water during summer	No
River bank erosion	Yes
Major diseases and duration	Black rot
Major pests and duration	<i>Helopeltis</i> , RSM (Mar – Oct)
Damage due to wildlife	No
6. Yield / production	
Peak plucking periods	Jul - Oct
Annual green leaf yield	10434 kg/ha
Annual production of processed tea	946575 kg
7. Pruning	
Time of pruning	2 nd fortnight of Nov – 1 st fortnight of Jan
Pruning cycle	4 yrs
Types of pruning	LP-UP-DS-UP, LP-UP-DS-MS
8. Fertilizer use	
Types of N, P, K fertilizers used	Urea, RP, MOP, SSP
Dose of Nitrogen (kg/ha)	124
Dose of Phosphorous (kg/ha)	35
Dose of Potash (kg/ha)	91
Whether lime is applied, if yes dose	--

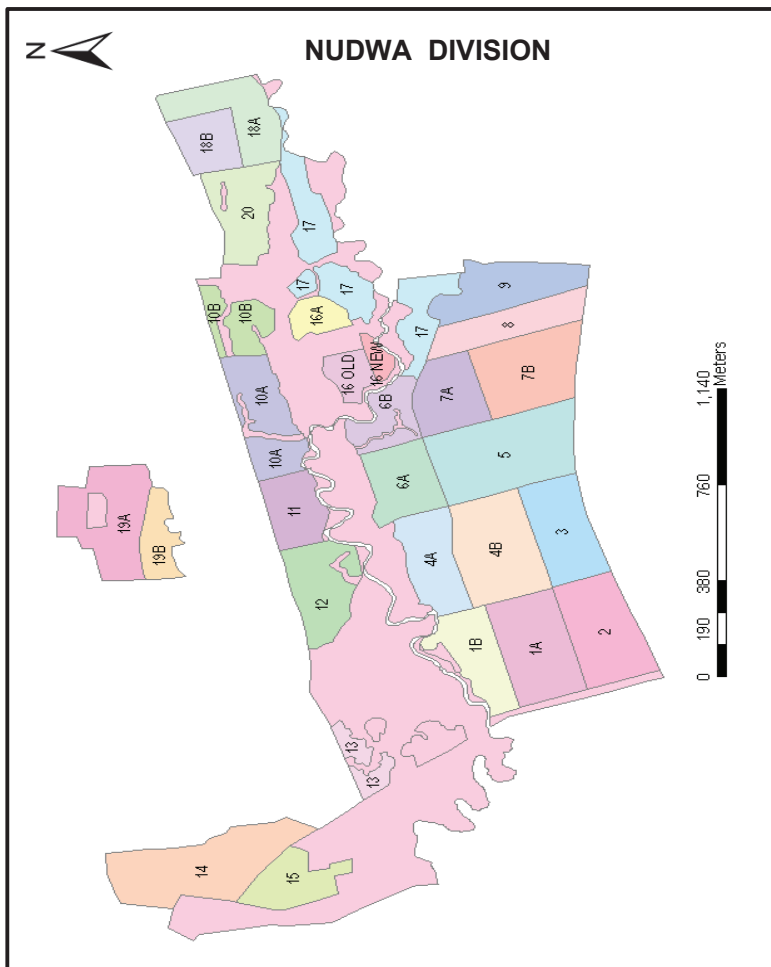




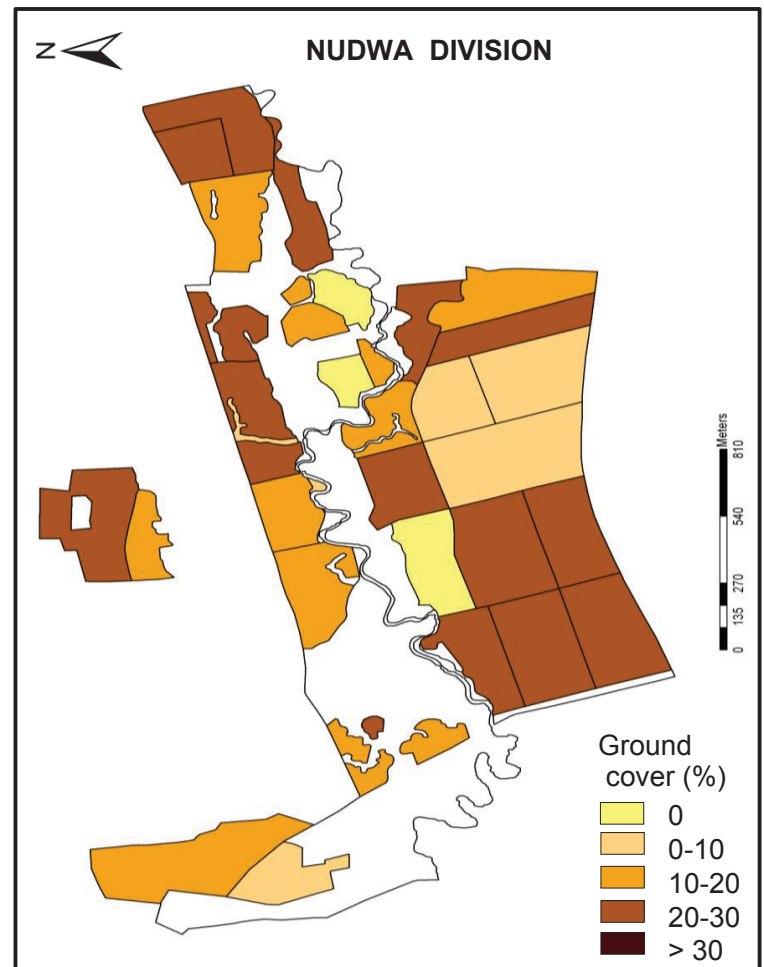
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse

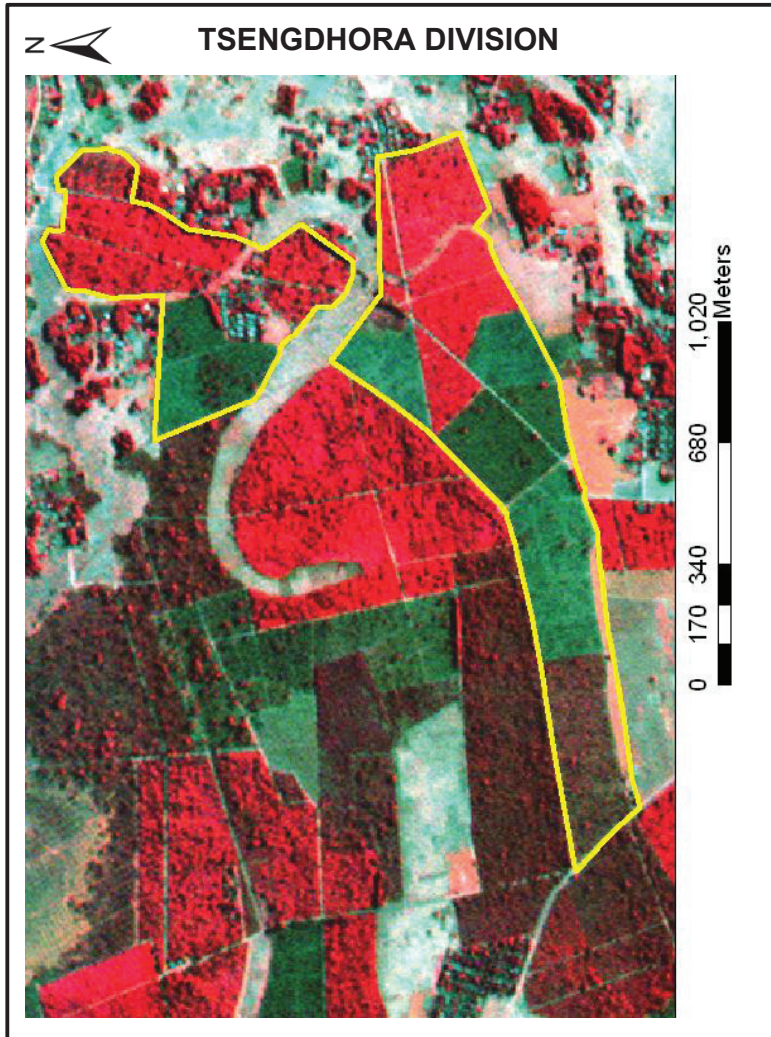


c. Section Boundaries of the Estate

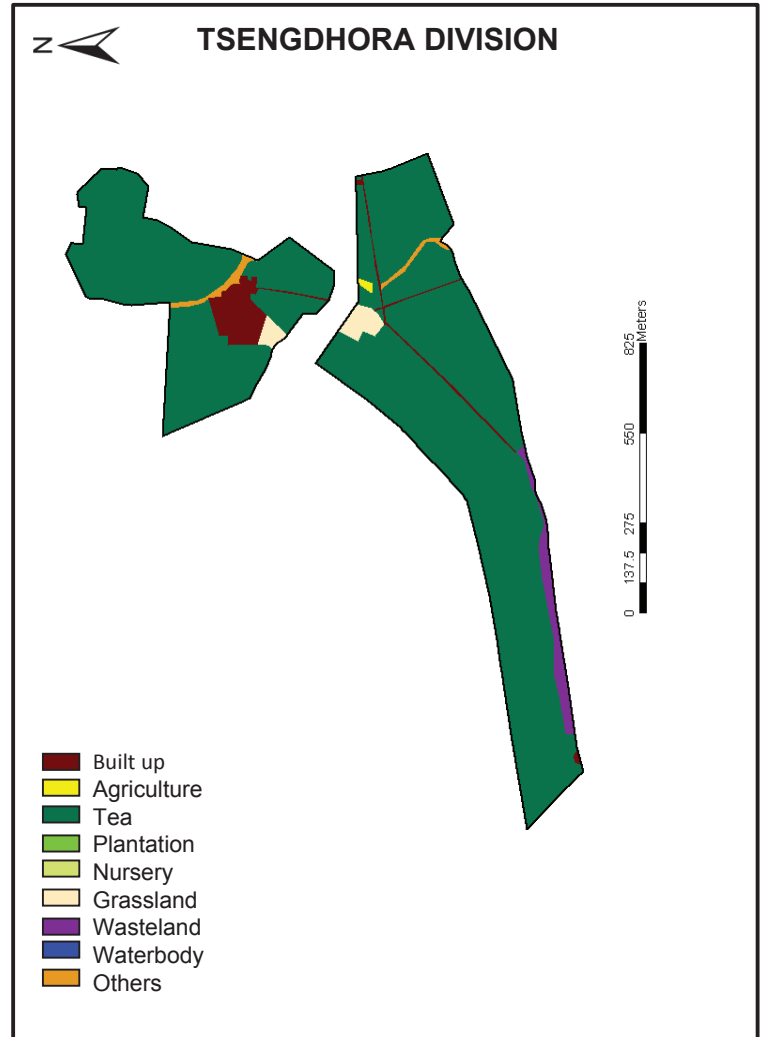


d. Shade Tree Density in Sections

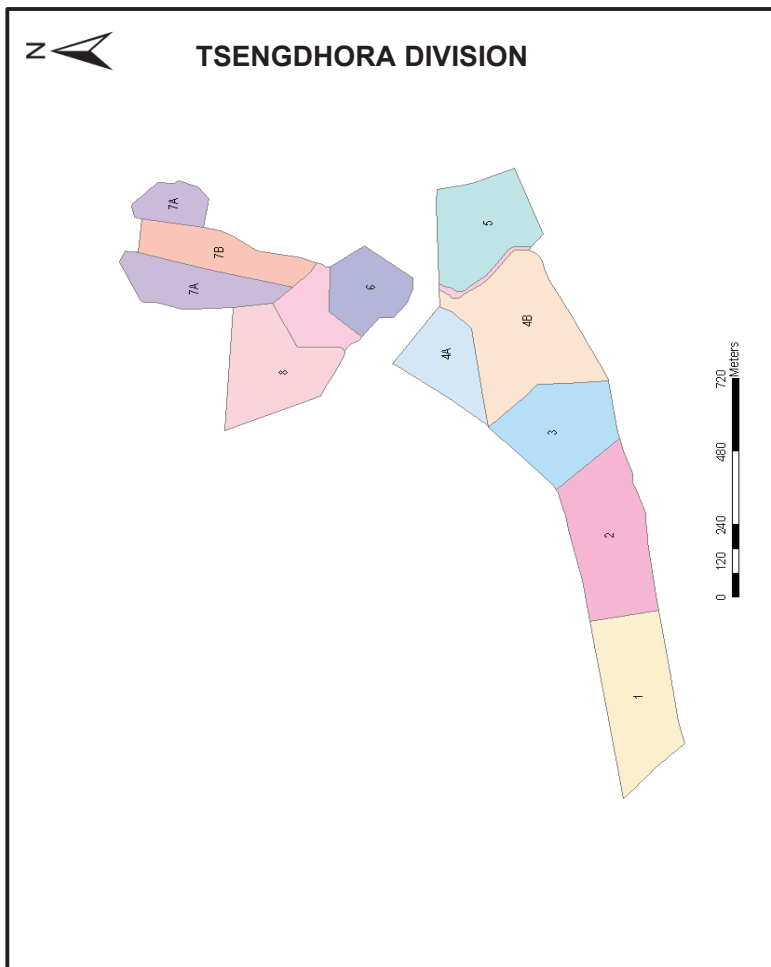




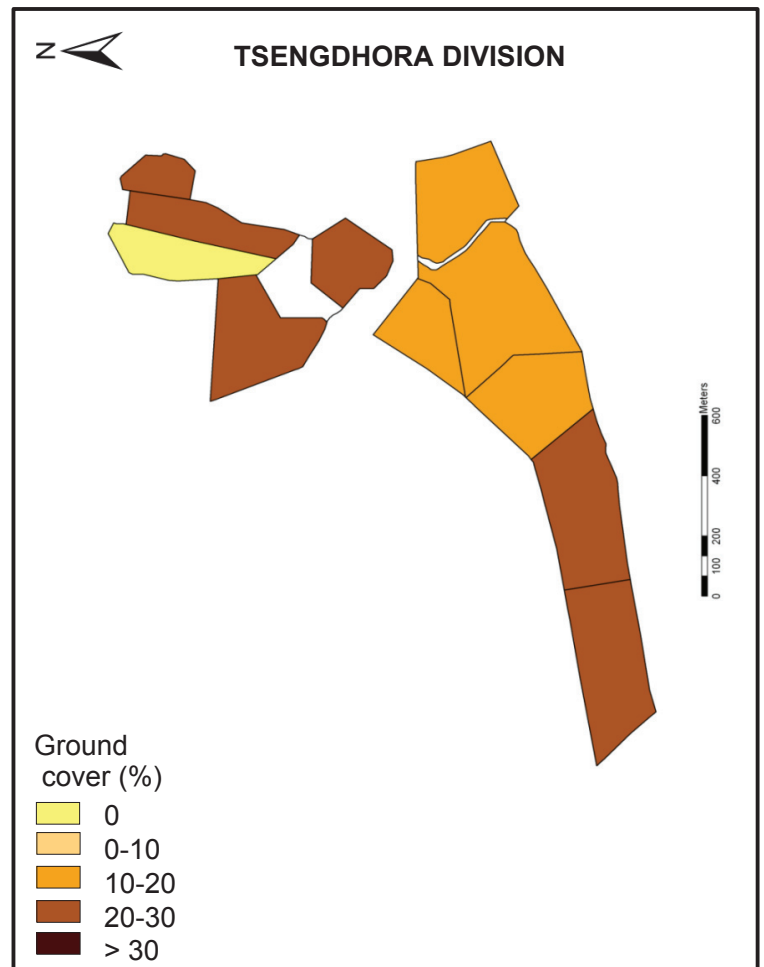
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse

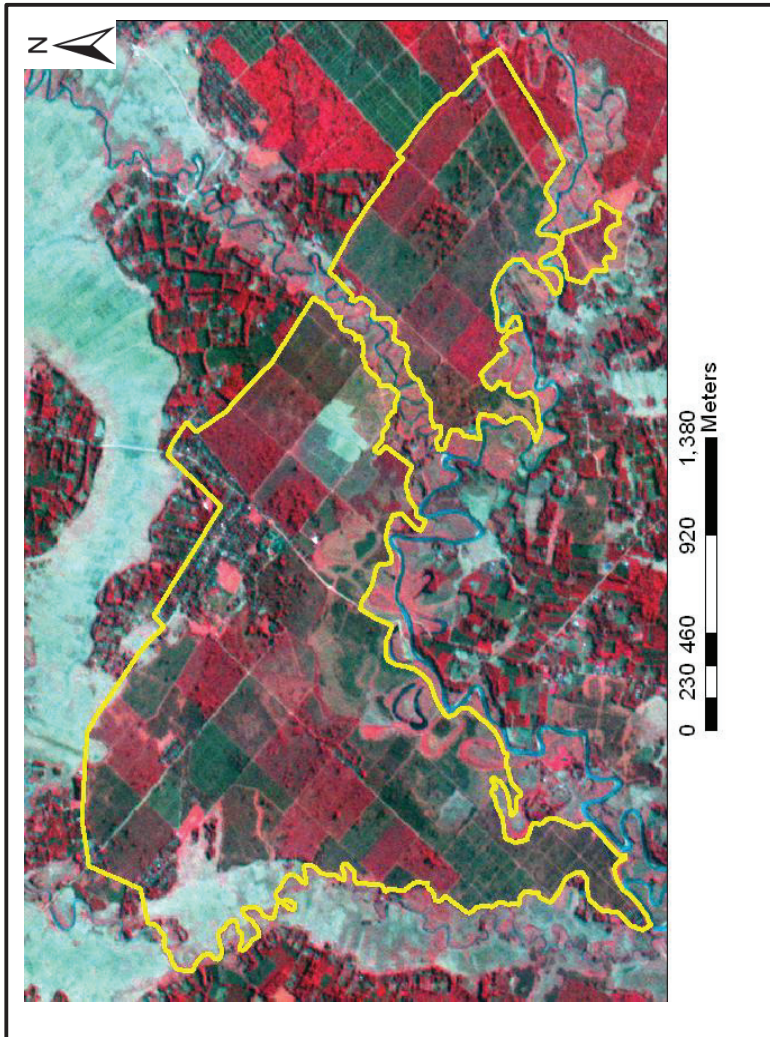


c. Section Boundaries of the Estate

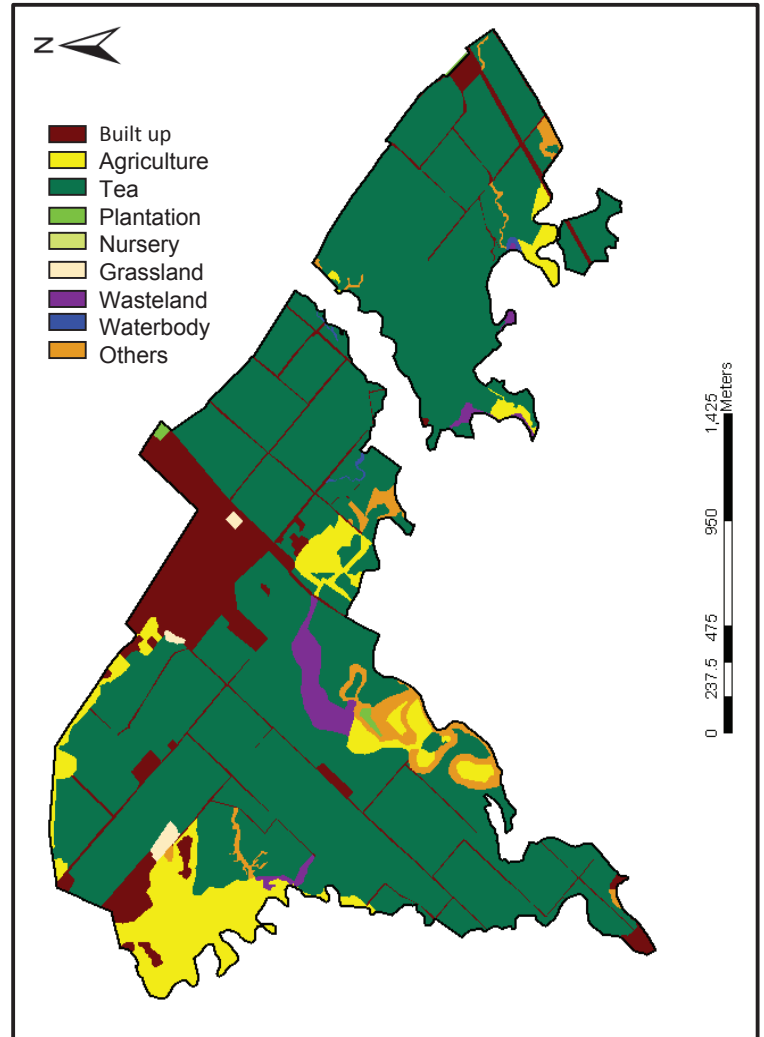


d. Shade Tree Density in Sections

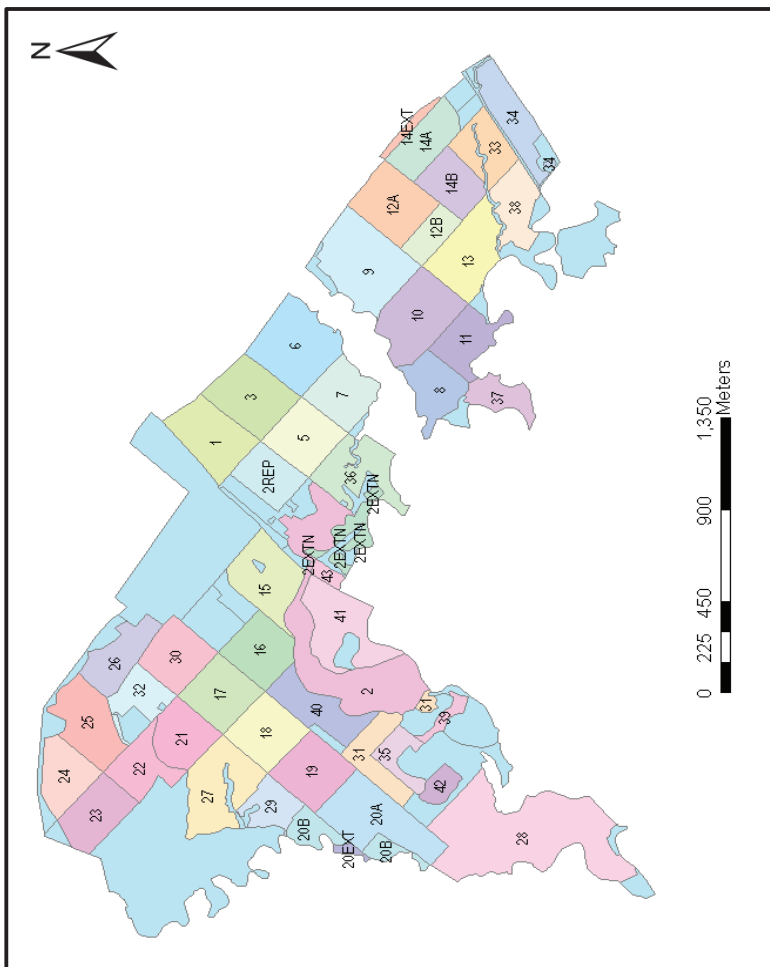




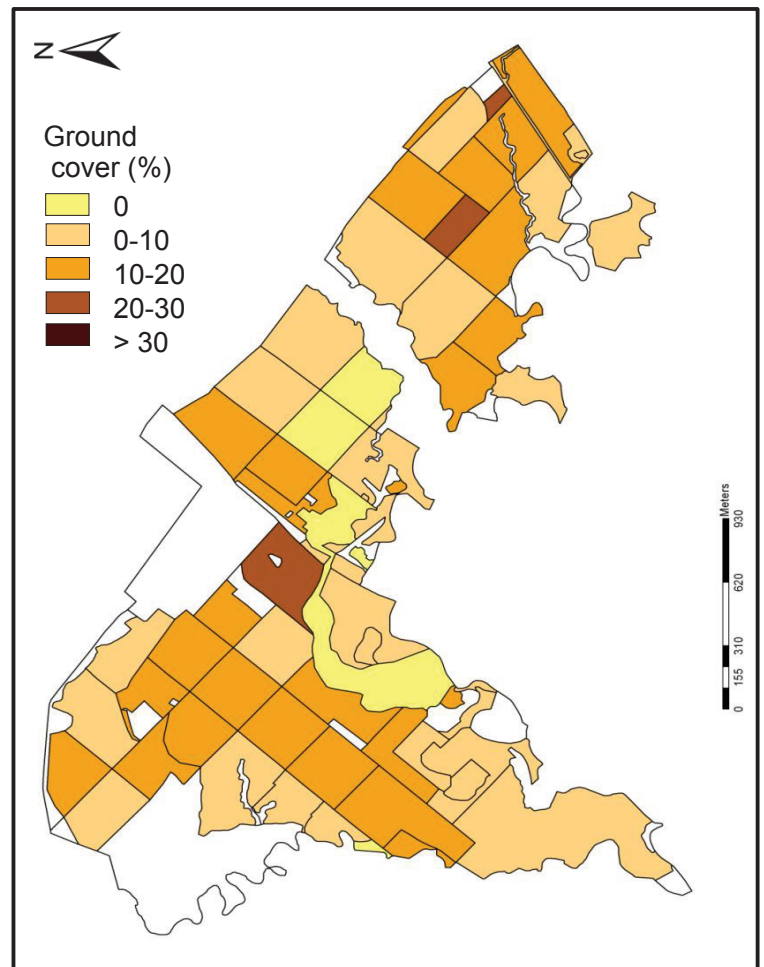
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse

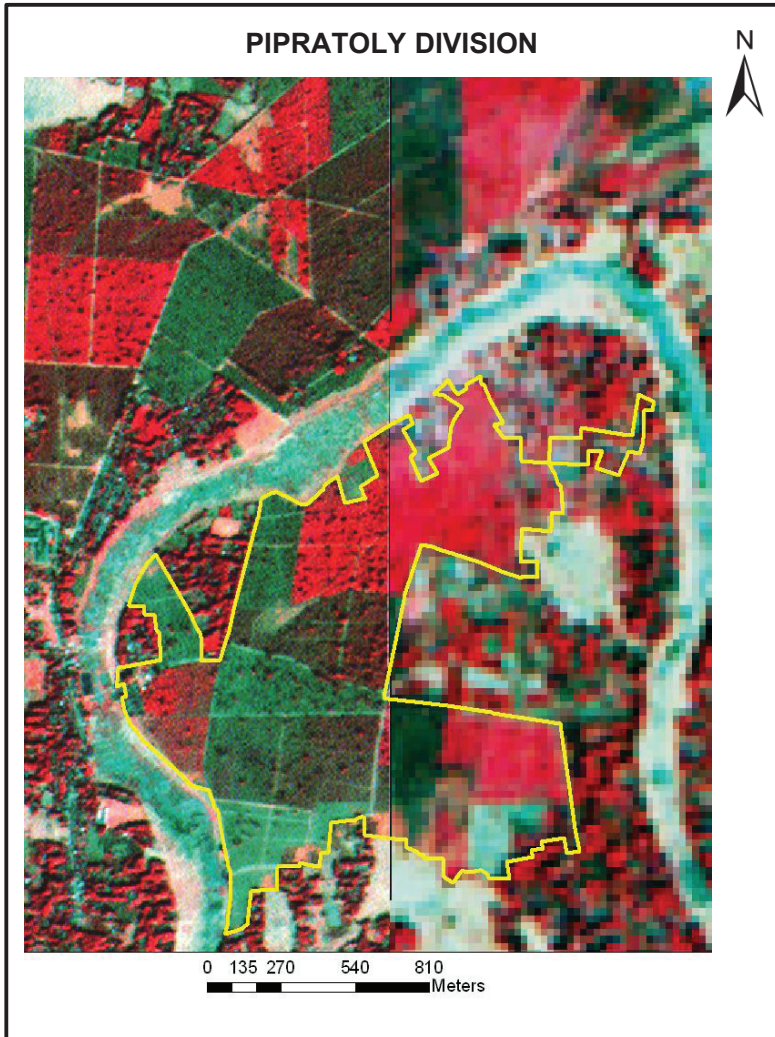


c. Section Boundaries of the Estate

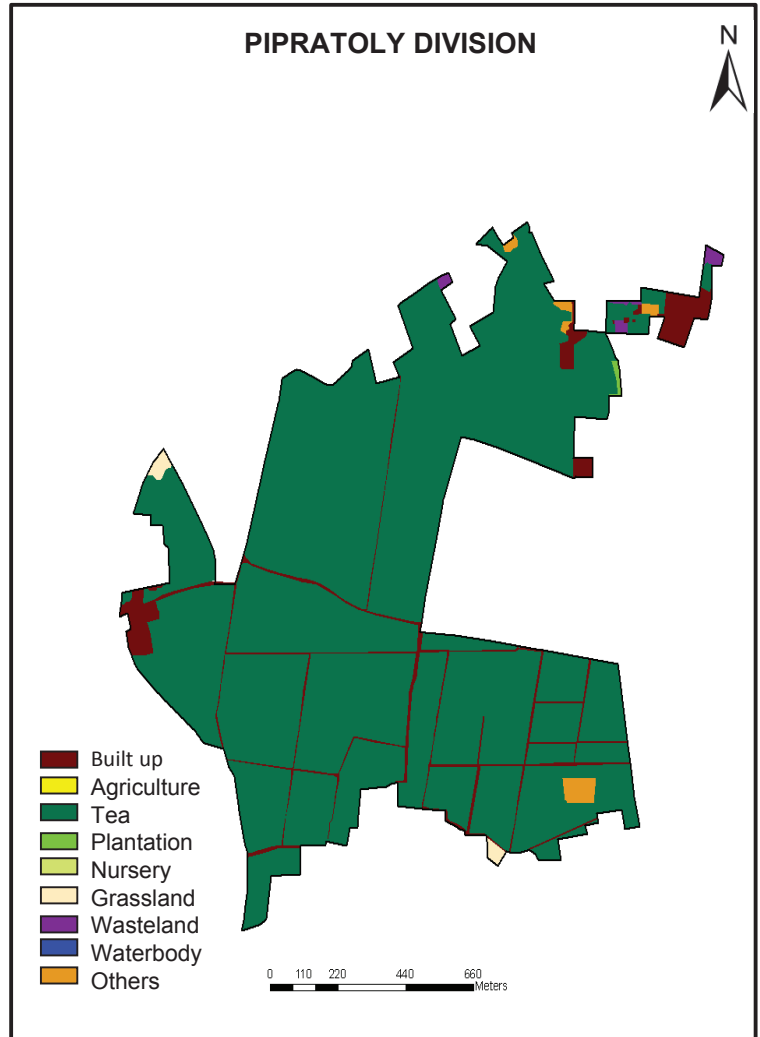


d. Shade Tree Density in Sections

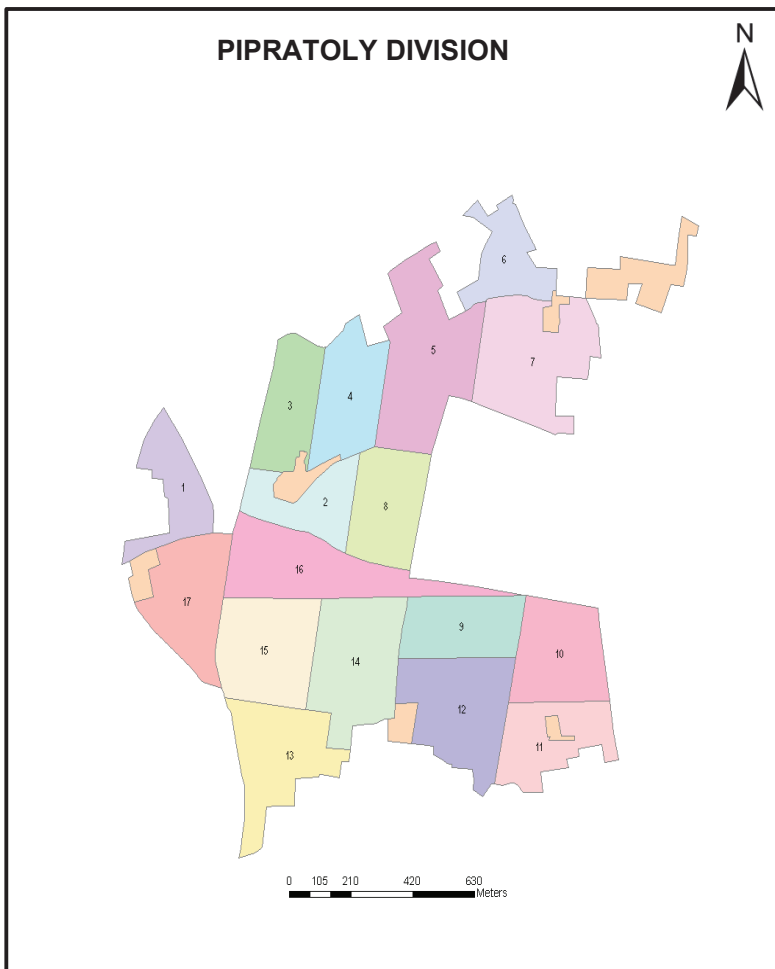




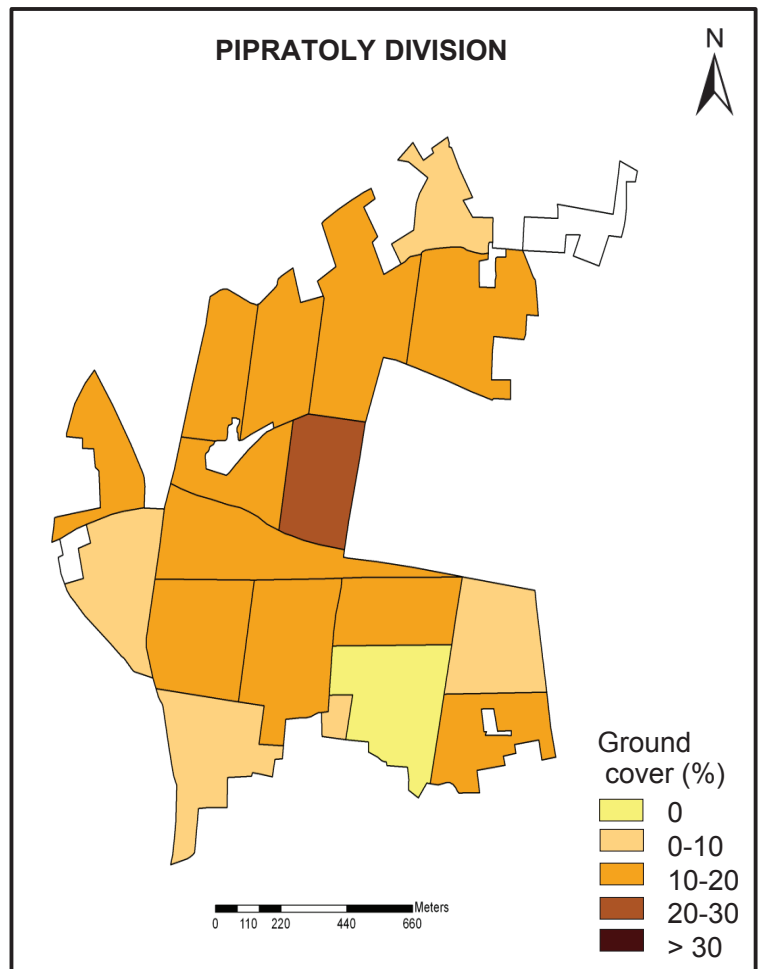
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse

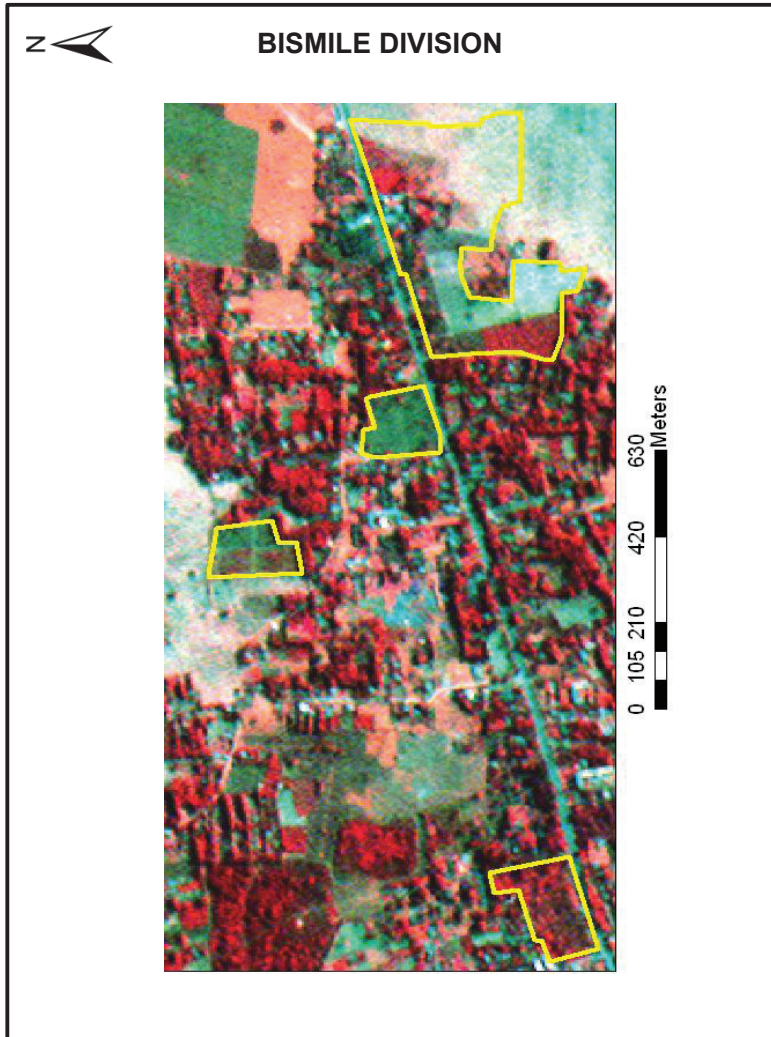


c. Section Boundaries of the Estate

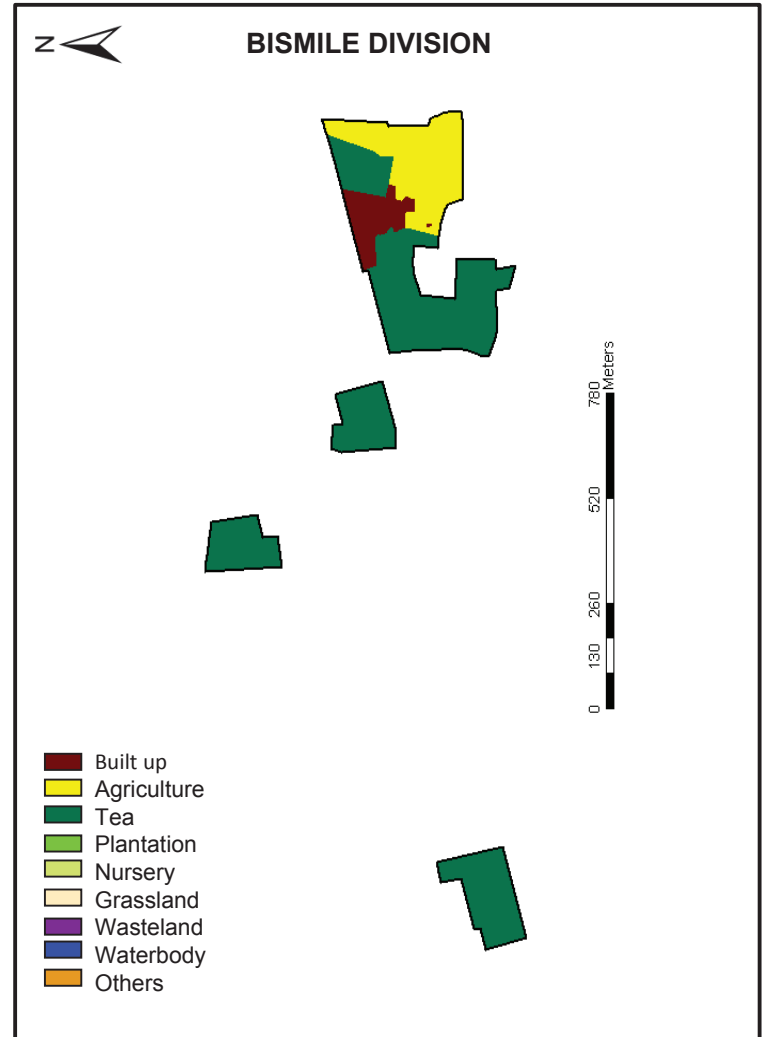


d. Shade Tree Density in Sections

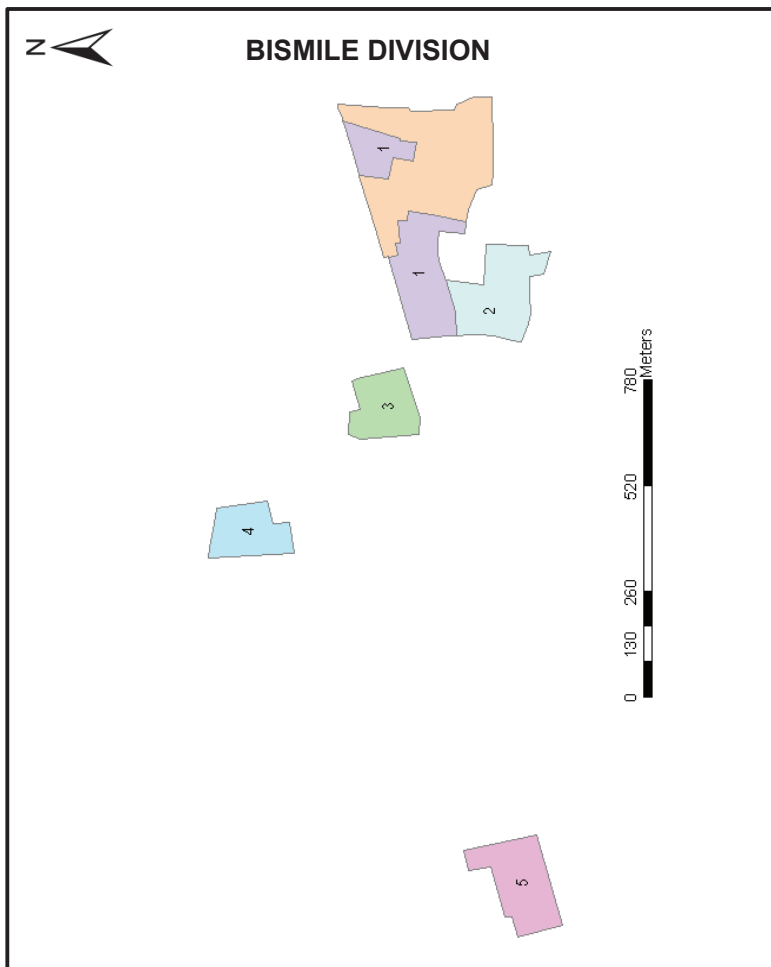




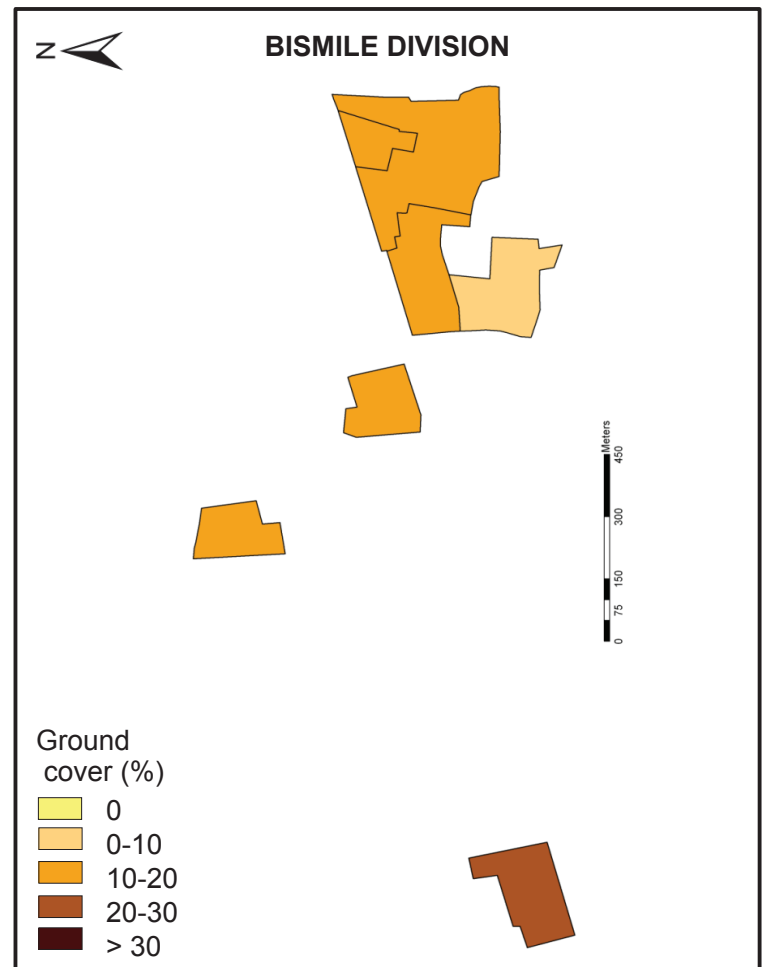
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse

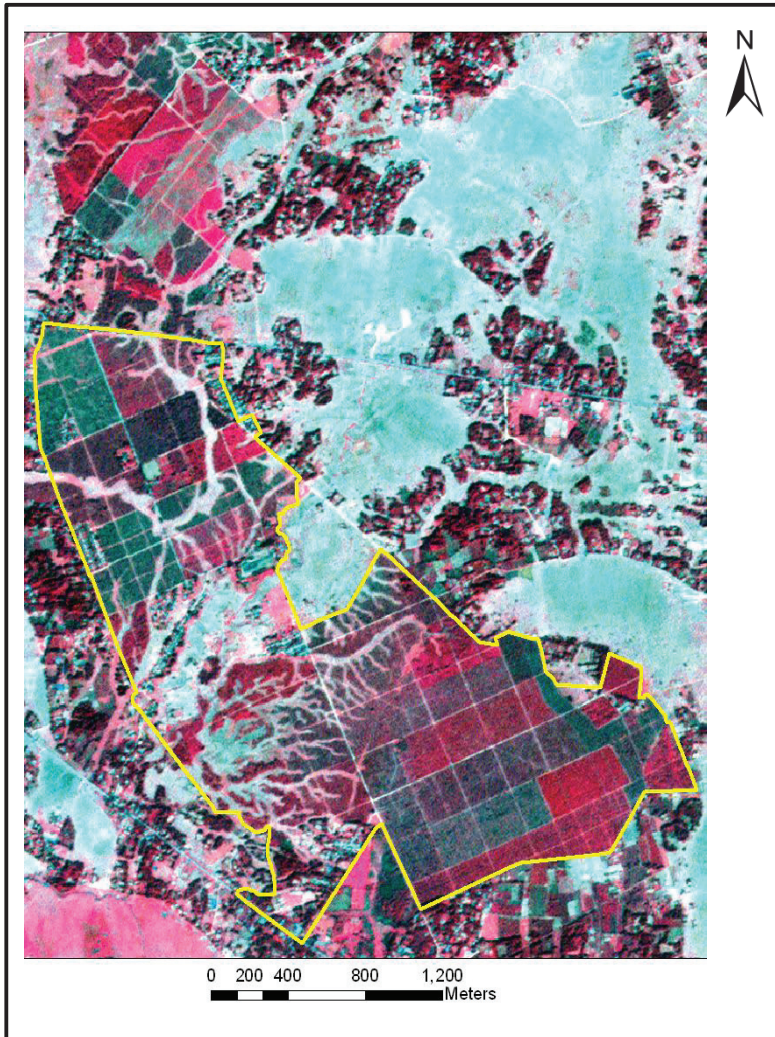


c. Section Boundaries of the Estate

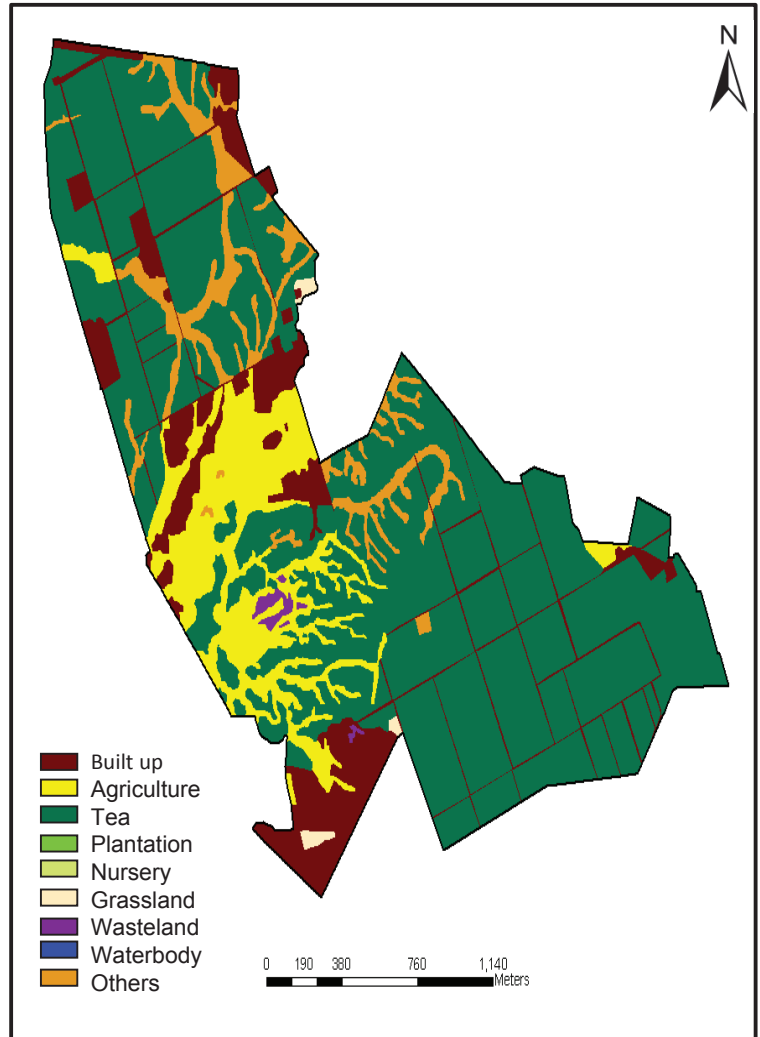


d. Shade Tree Density in Sections

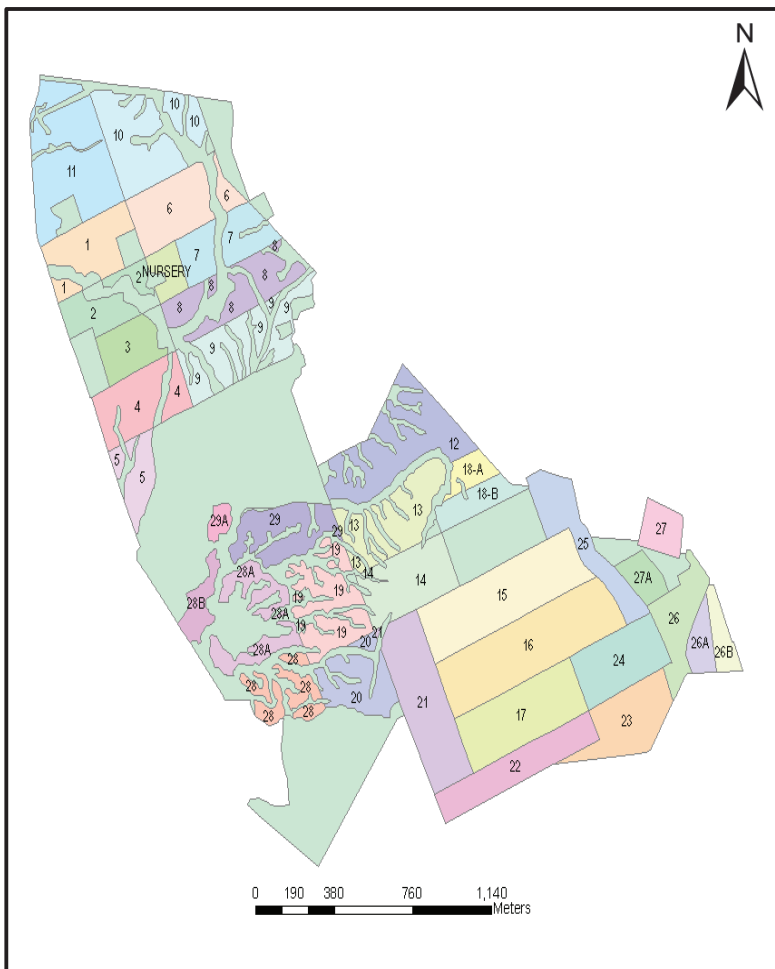




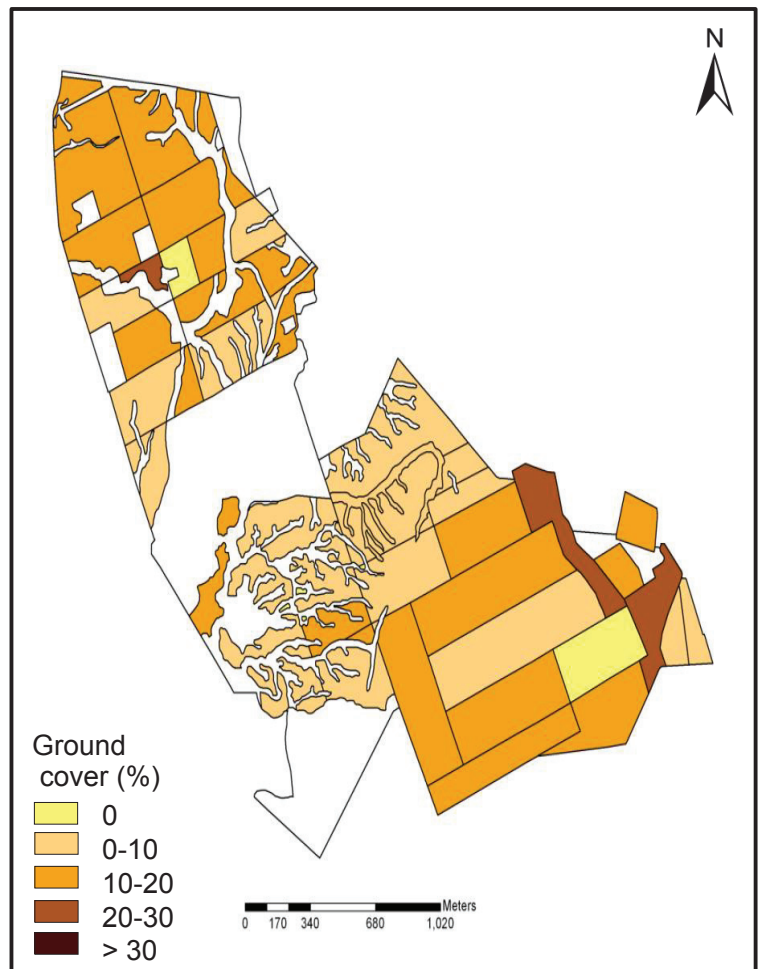
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse

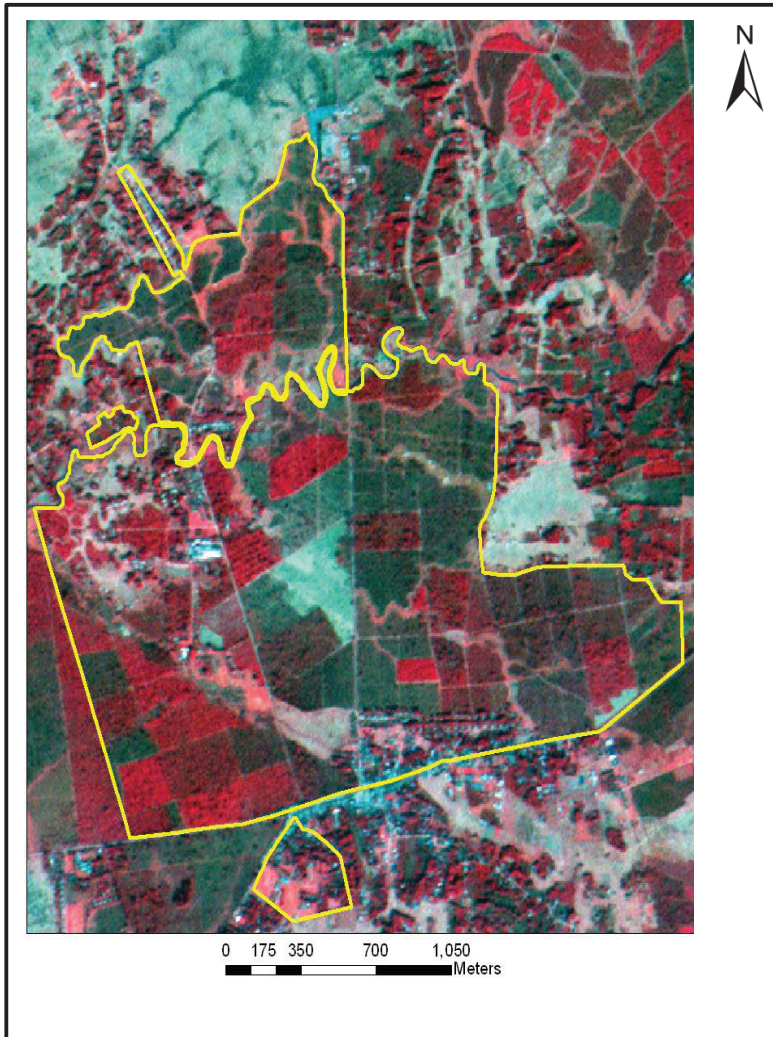


c. Section Boundaries of the Estate

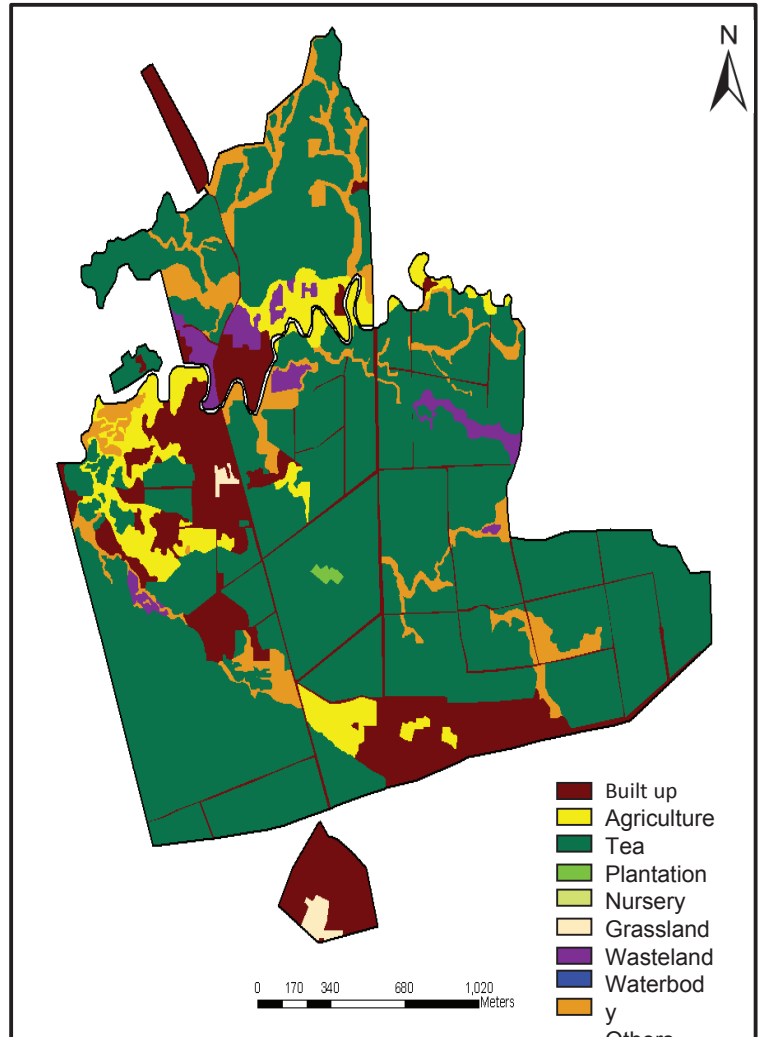


d. Shade Tree Density in Sections

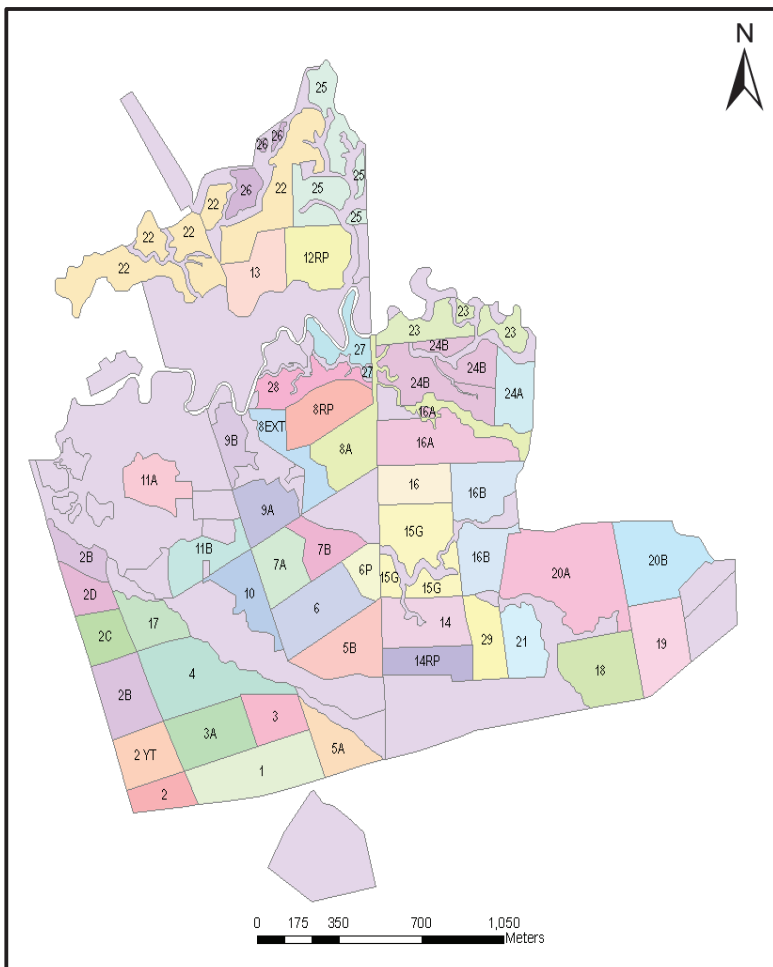




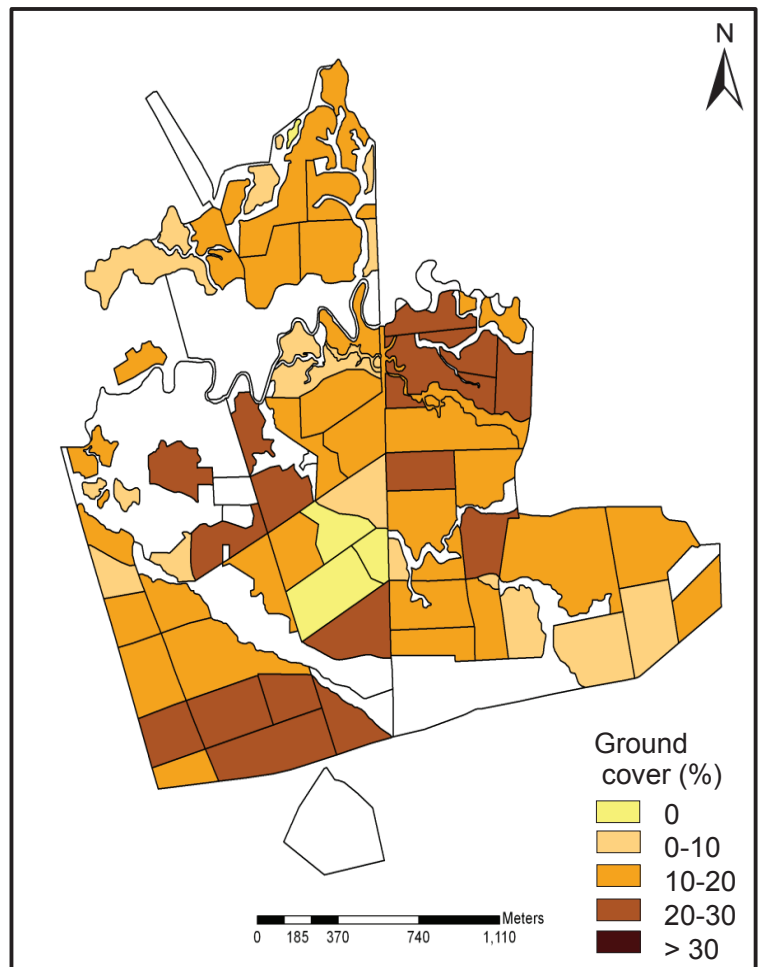
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

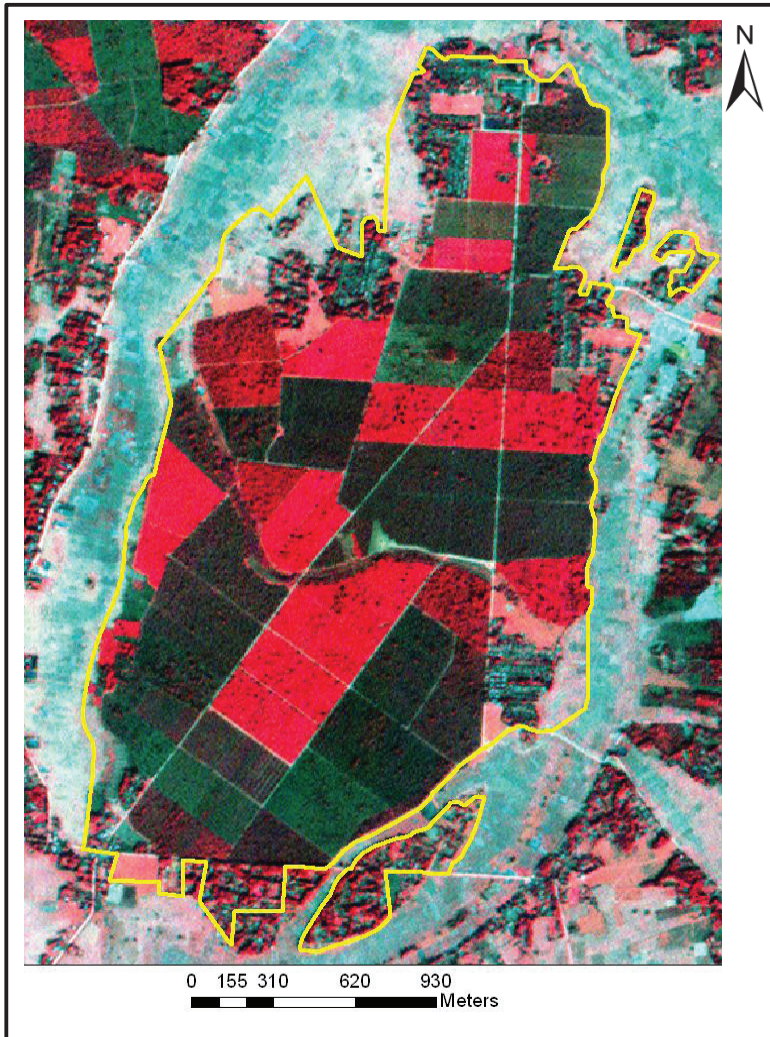




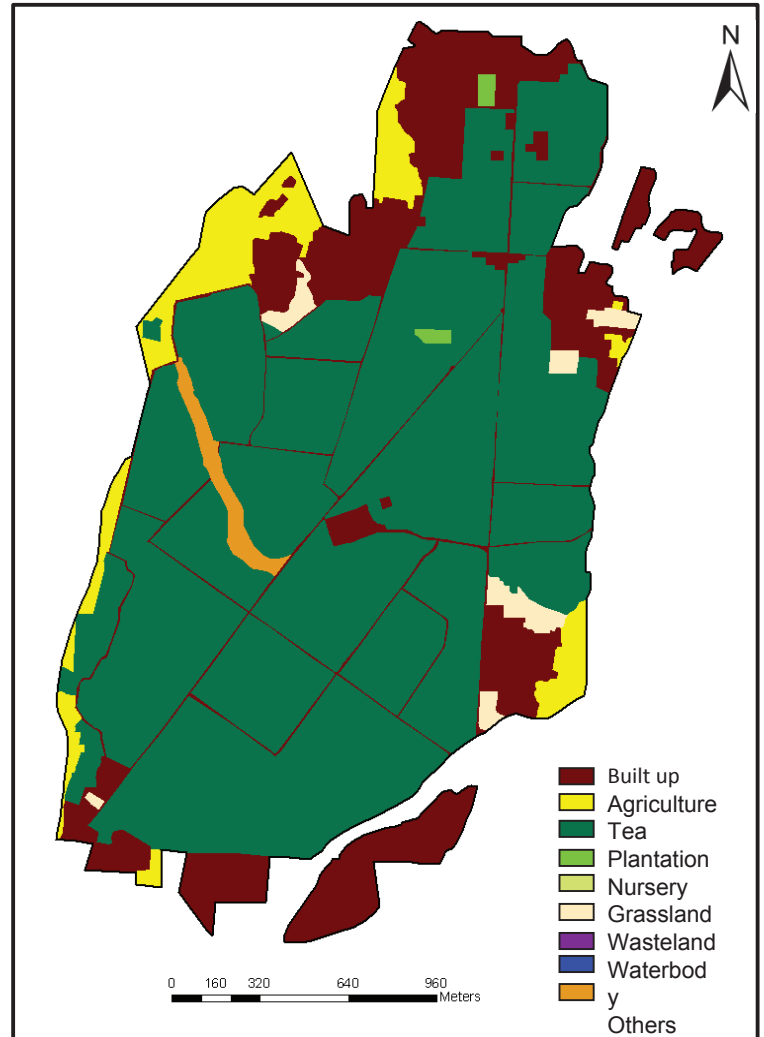
e. General Information

1. General		5. Natural resources constraints	
Contact address	PO: Rajgarh, Dist: Dibrugarh, PIN: 786611	Drainage congestion and water logging	No
Contact phone	03754-276626 03754-291011	Scarcity of water during summer	No
Name of the company	Andrew Yule And Company Limited	River bank erosion	No
Name of the village where it falls	Rajgarh	Major diseases and duration	Black Rot
Leased area of the estate (ha)	--	Major pests and duration	<i>Helopeltis</i> (3-months)
Tea grown area of the estate (ha)	262.52	Damage due to wildlife	No
No. of divisions / sections	0 div/ 58 sec	6. Yield / production	
Year of establishment	1918	Peak plucking periods	May - Oct
Type of tea produced	CTC, Orthodox	Annual green leaf yield	7940.51 kg/ha
2. Infrastructure		Annual production of processed tea	462562 kg
Availability of processing factory	Yes	7. Pruning	
Availability of workers colony	Yes	Time of pruning	Nov - Jan
Availability of internet facility / e-mail id	Yes	Pruning cycle	--
Meteorological observations taken	Tmax, Tmin, Rainfall	Types of pruning	LOS-MS-DS-LP
3. Amenities		8. Fertilizer use	
Availability of health care / dispensary	Yes	Types of N, P, K fertilizers used	Urea, RP, MOP
Availability of school	Yes	Dose of Nitrogen (kg/ha)	150
4. Shade trees		Dose of Phosphorous (kg/ha)	40
Shade tree density (garden level)	Low	Dose of Potash (kg/ha)	110
Plant to plant spacing (m)	12 x 12	Whether lime is applied, if yes dose	No
Row to row spacing (m)	12 x 12		

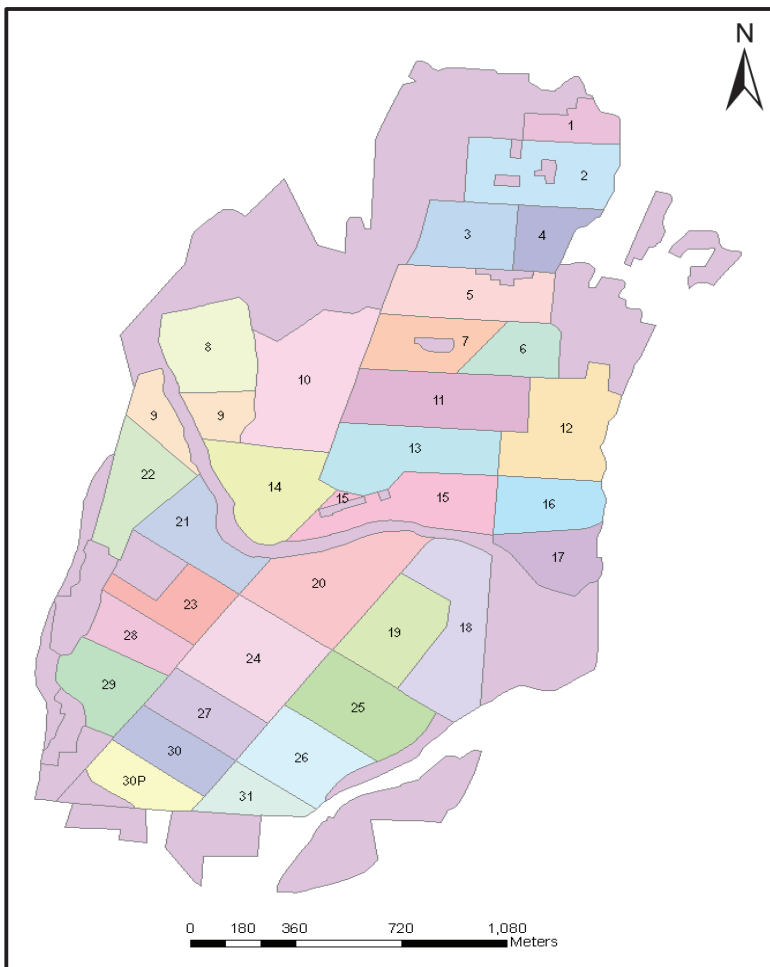




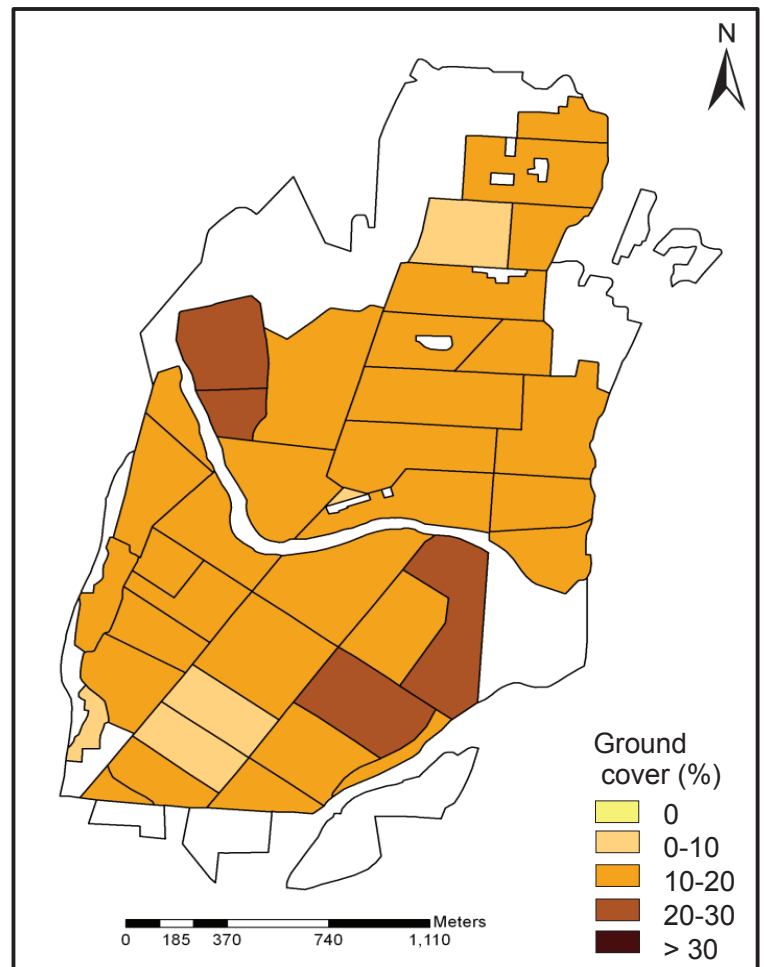
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

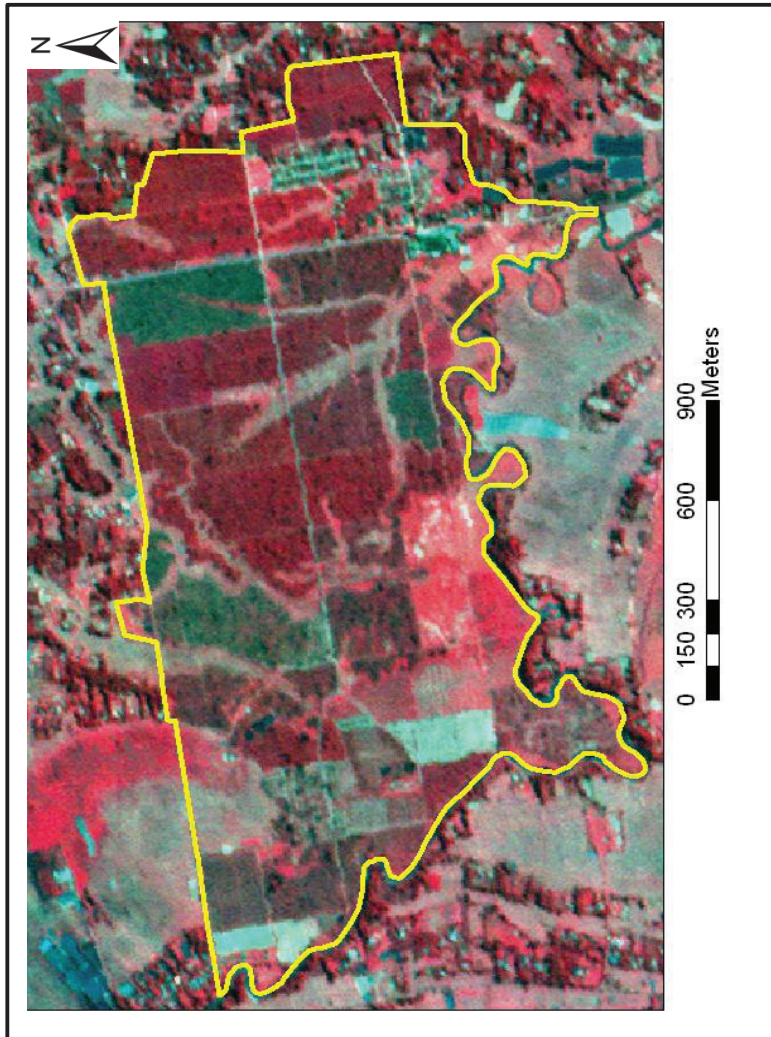




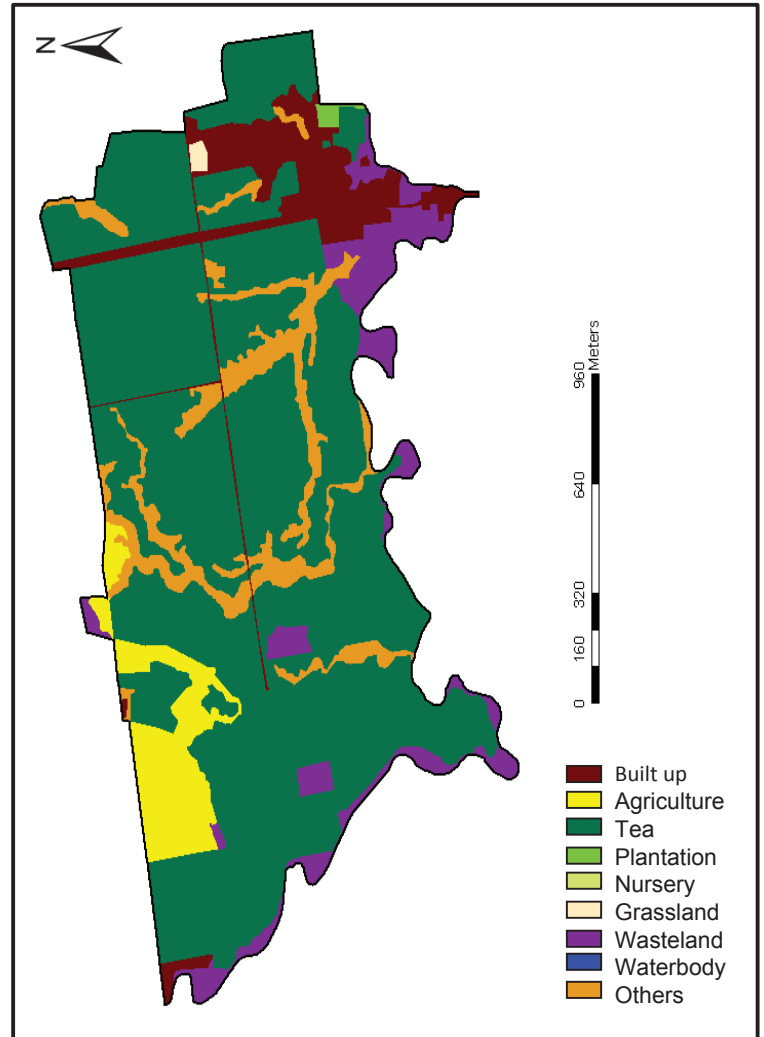
e. General Information

1. General		5. Natural resources constraints	
Contact address	PO: Lahoal, TO: Lahoal, Dist: Dibrugarh PIN: 786010	Drainage congestion and water logging	Yes
Contact phone	0373-2912881	Scarcity of water during summer	No
Name of the company	--	River bank erosion	Yes
Name of the village where it falls	Romai	Major diseases and duration	Nil
Leased area of the estate (ha)	465.05	Major pests and duration	<i>Helopeltis</i> , RSM (seasonal)
Tea grown area of the estate (ha)	311.91	Damage due to wildlife	No
No. of divisions / sections	0 div / 31 sec	6. Yield / production	
Year of establishment	1903	Peak plucking periods	Jun - Oct
Type of tea produced	CTC, Orthodox	Annual green leaf yield	2305 kg/ha
2. Infrastructure		Annual production of processed tea	707028 kg
Availability of processing factory	Yes	7. Pruning	
Availability of workers colony	Yes	Time of pruning	Dec - Jan
Availability of internet facility / e-mail id	Yes	Pruning cycle	3 yrs
Meteorological observations taken	Tmax, Tmin, RH, Rainfall	Types of pruning	CA-UP-DS-MS, CA-UP-DS-UP
3. Amenities		8. Fertilizer use	
Availability of health care / dispensary	Yes	Types of N, P, K fertilizers used	Urea, RP, MOP
Availability of school	Yes	Dose of Nitrogen (kg/ha)	140
4. Shade trees		Dose of Phosphorous (kg/ha)	25
Shade tree density (garden level)	Medium	Dose of Potash (kg/ha)	116
Plant to plant spacing (m)	12 x 12	Whether lime is applied, if yes dose	No
Row to row spacing (m)	12 x 12		

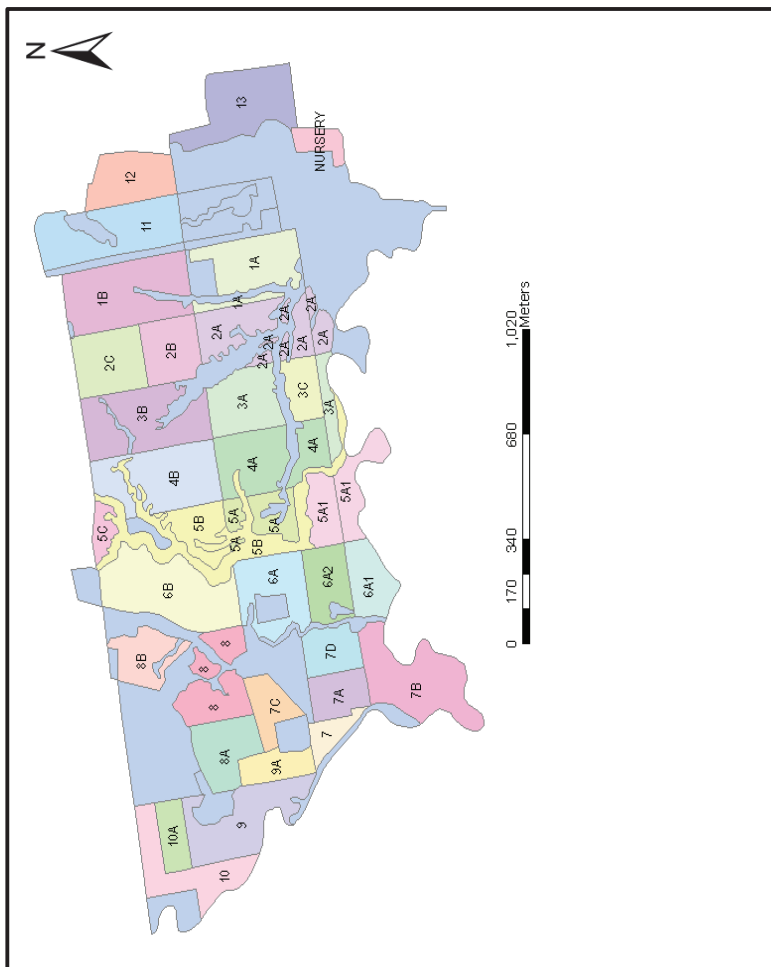




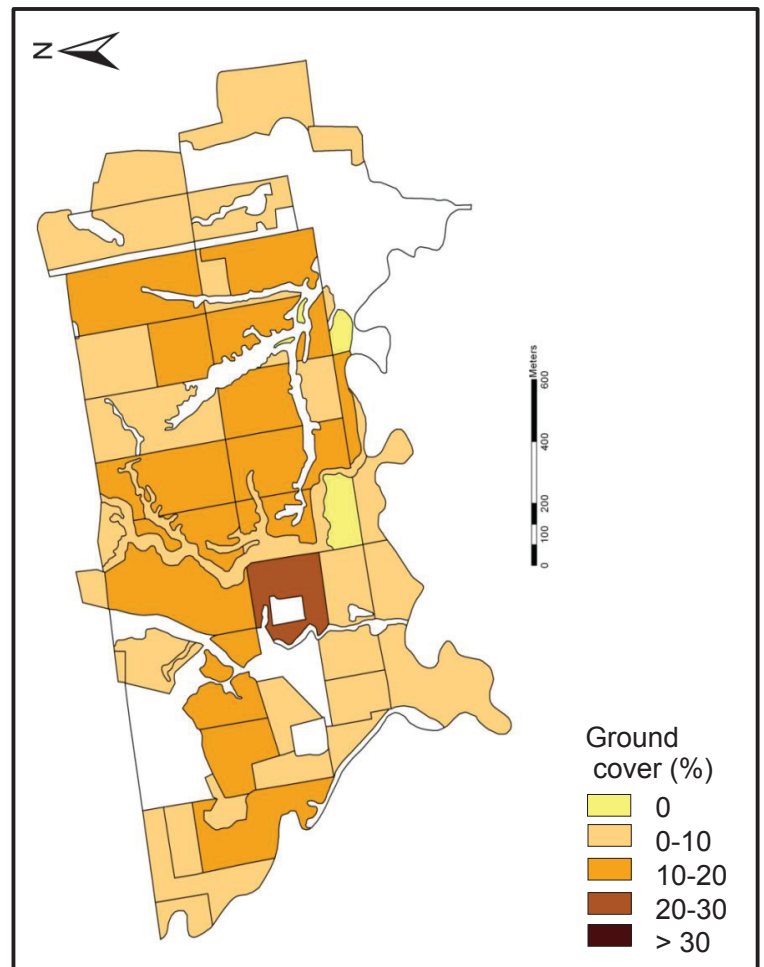
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

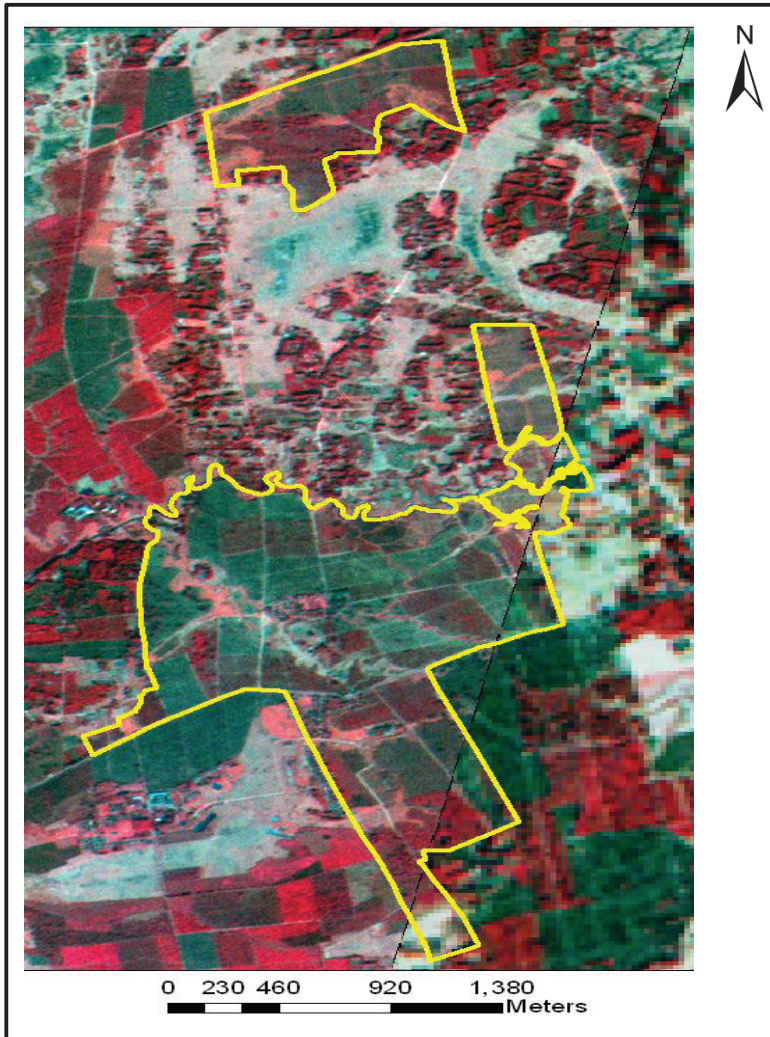




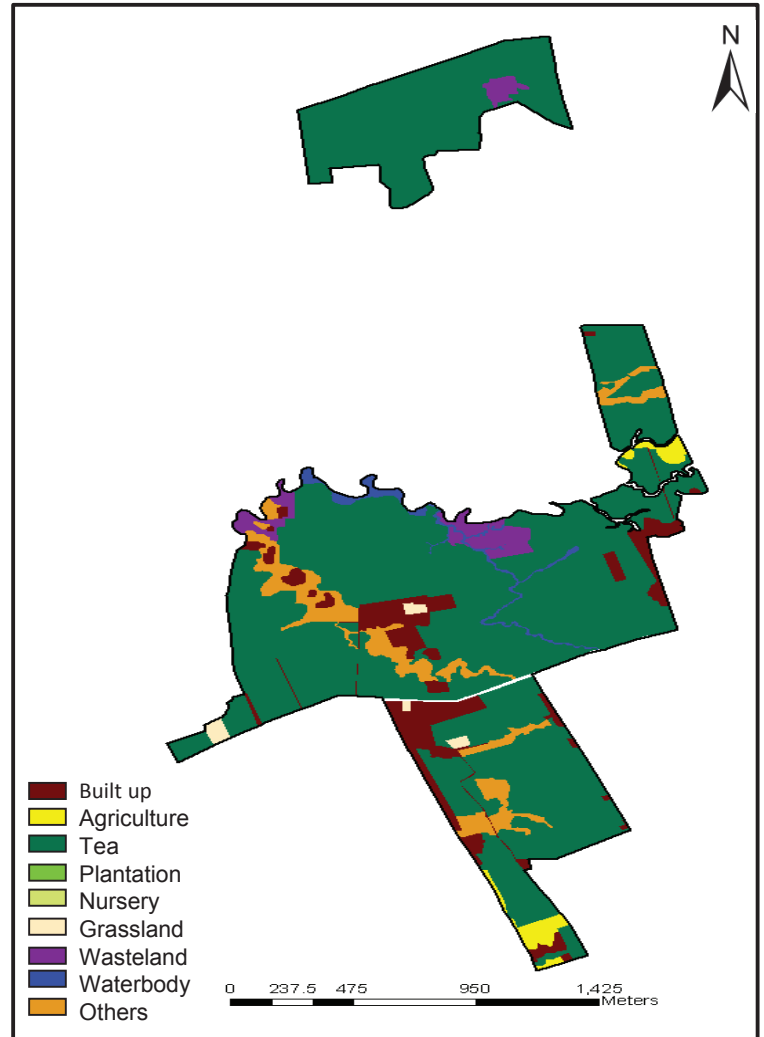
e. General Information

1. General		5. Natural resources constraints	
Contact address	PO: Hoogrijan, Dist: Dibrugarh PIN: 786601	Drainage congestion and water logging	No
Contact phone	0374-2913415	Scarcity of water during summer	No
Name of the company	Dhunseri Petrochem and Tea Ltd.	River bank erosion	Yes
Name of the village where it falls	Santi	Major diseases and duration	Red rust (Jun - Sep)
Leased area of the estate (ha)	--	Major pests and duration	<i>Helopeltis</i> , RSM (Apr-Jun)
Tea grown area of the estate (ha)	159.21	Damage due to wildlife	No
No. of divisions / sections	1 div / 35 sec	6. Yield / production	
Year of establishment	1950	Peak plucking periods	Sep - Jun
Type of tea produced	CTC	Annual green leaf yield	8659.84 kg/ha
2. Infrastructure		Annual production of processed tea	329953 kg
Availability of processing factory	Yes	7. Pruning	
Availability of workers colony	Yes	Time of pruning	20 th Nov
Availability of internet facility / e-mail id	Yes	Pruning cycle	4 yrs
Meteorological observations taken	Tmax, Tmin, Rainfall	Types of pruning	LP-UP-DSK-UP
3. Amenities		8. Fertilizer use	
Availability of health care / dispensary	Yes	Types of N, P, K fertilizers used	Urea, SP, RP
Availability of school	Yes	Dose of Nitrogen (kg/ha)	140
4. Shade trees		Dose of Phosphorous (kg/ha)	20
Shade tree density (garden level)	Low	Dose of Potash (kg/ha)	140
Plant to plant spacing (m)	12 x 12	Whether lime is applied, if yes dose	--
Row to row spacing (m)	12 x 12		

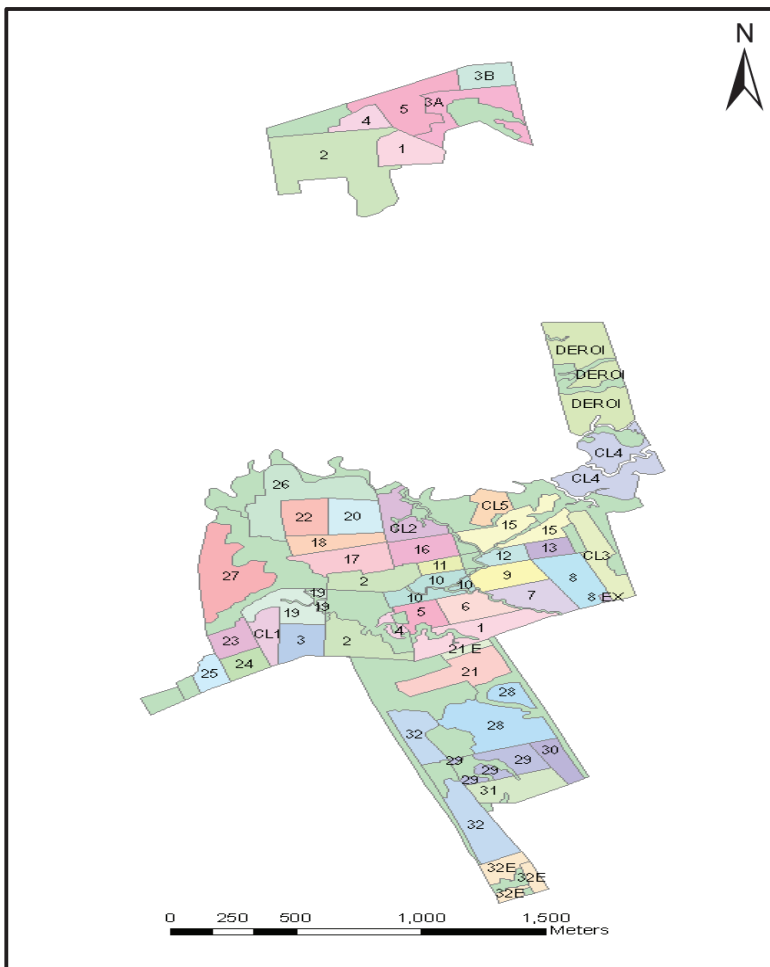




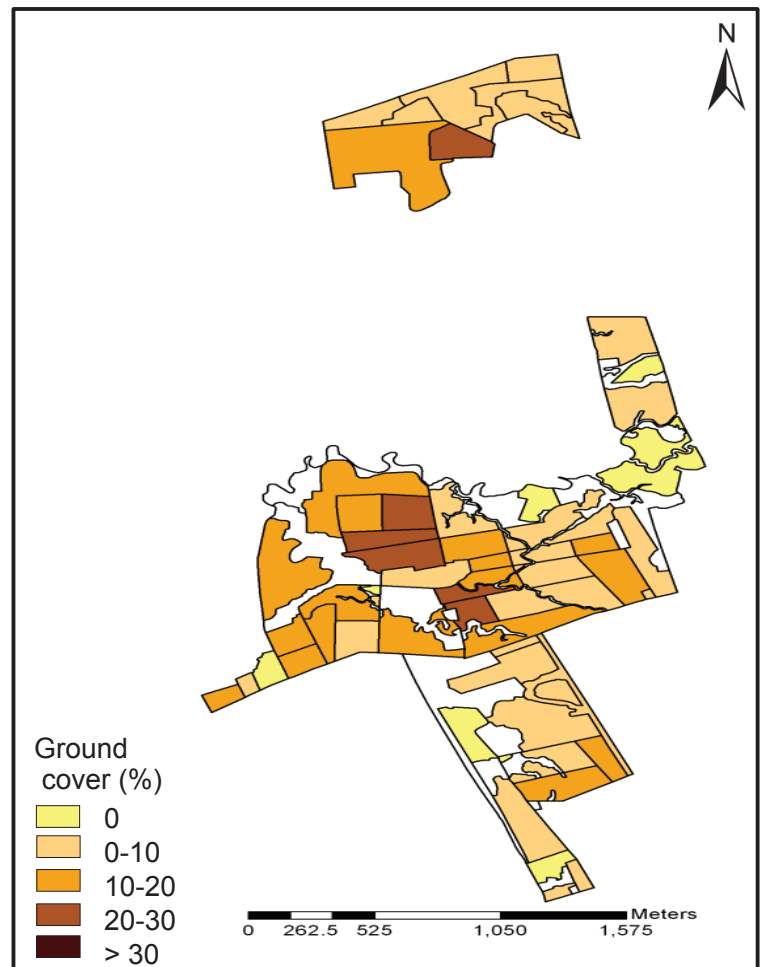
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse

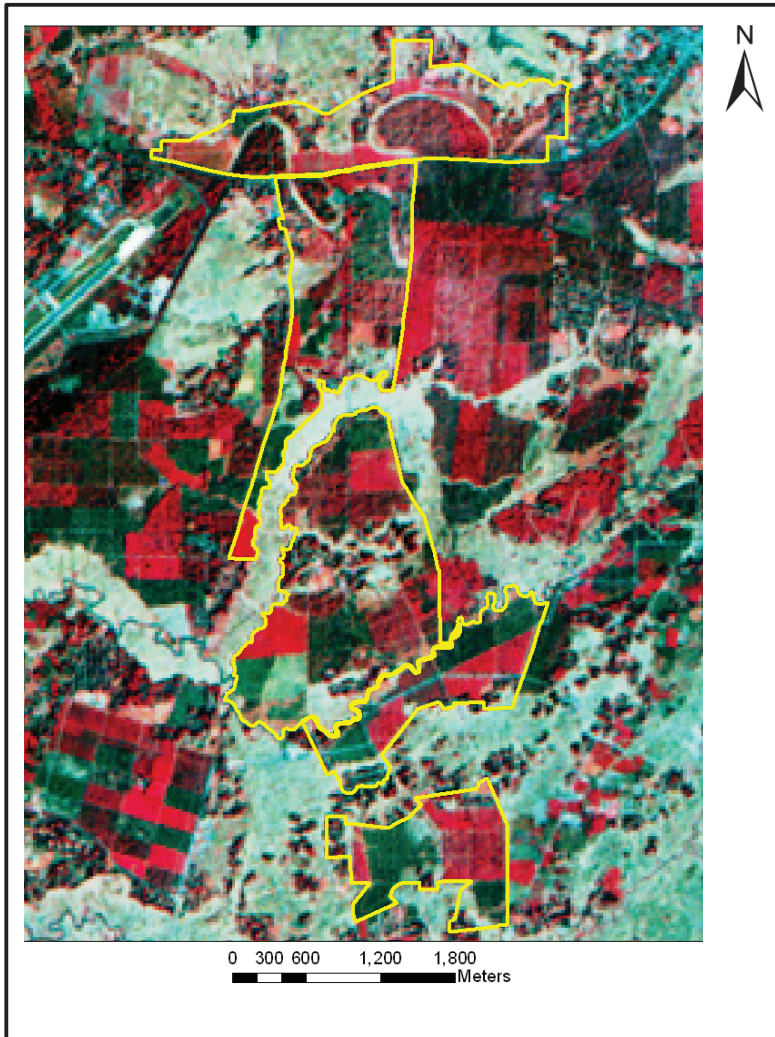


c. Section Boundaries of the Estate

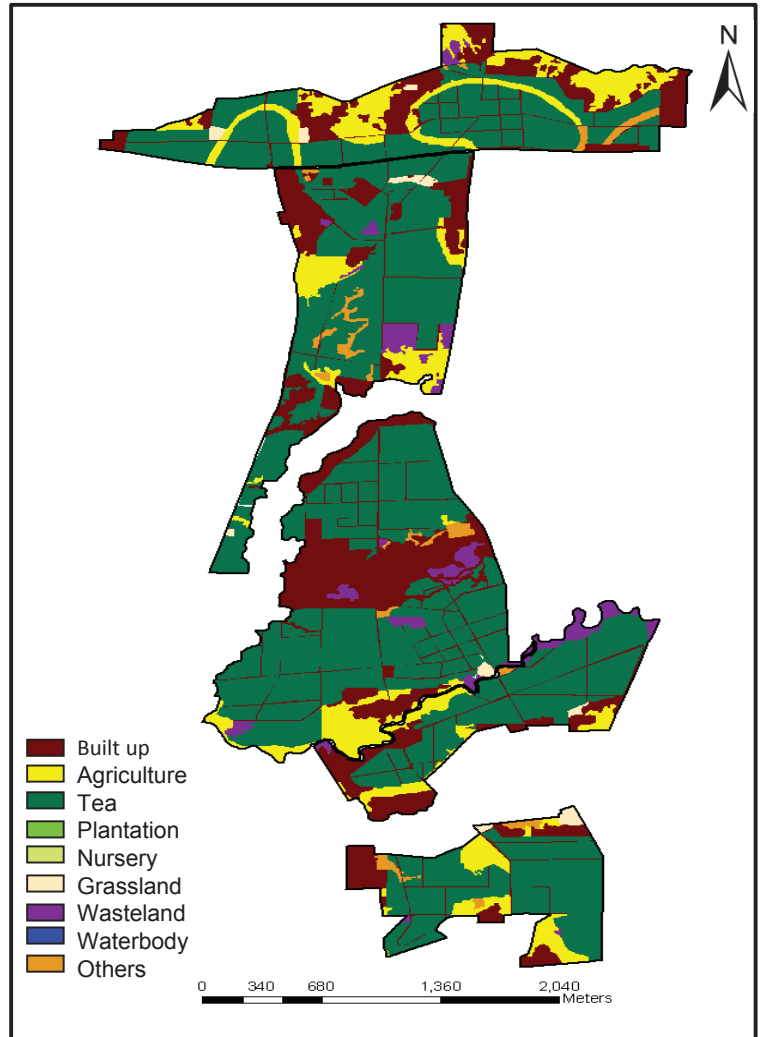


d. Shade Tree Density in Sections

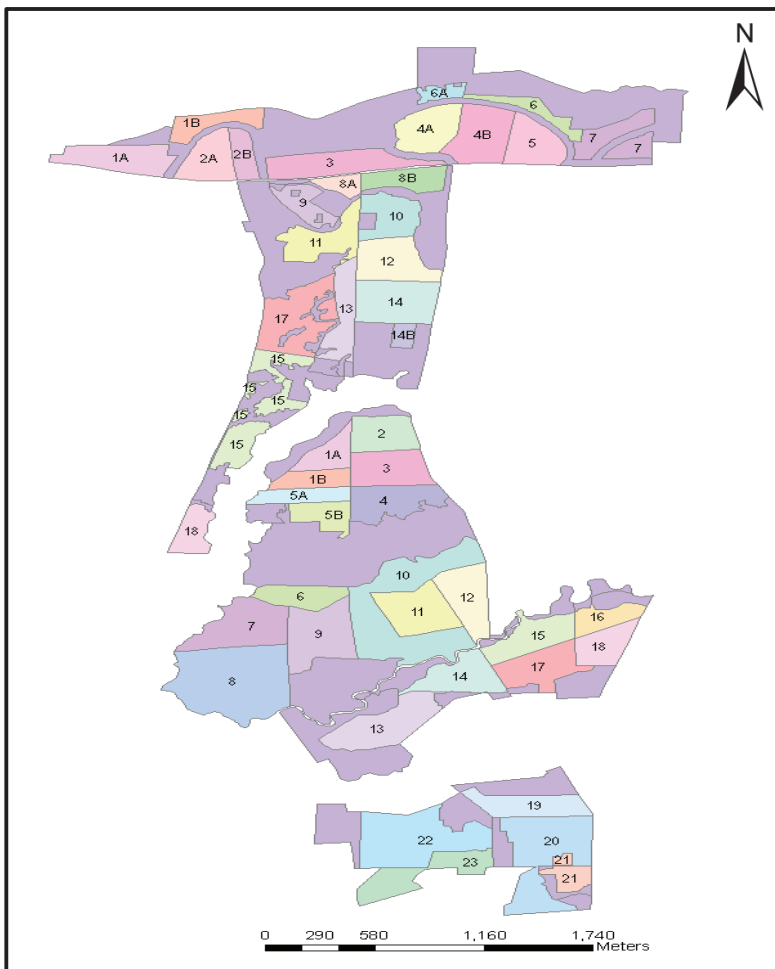




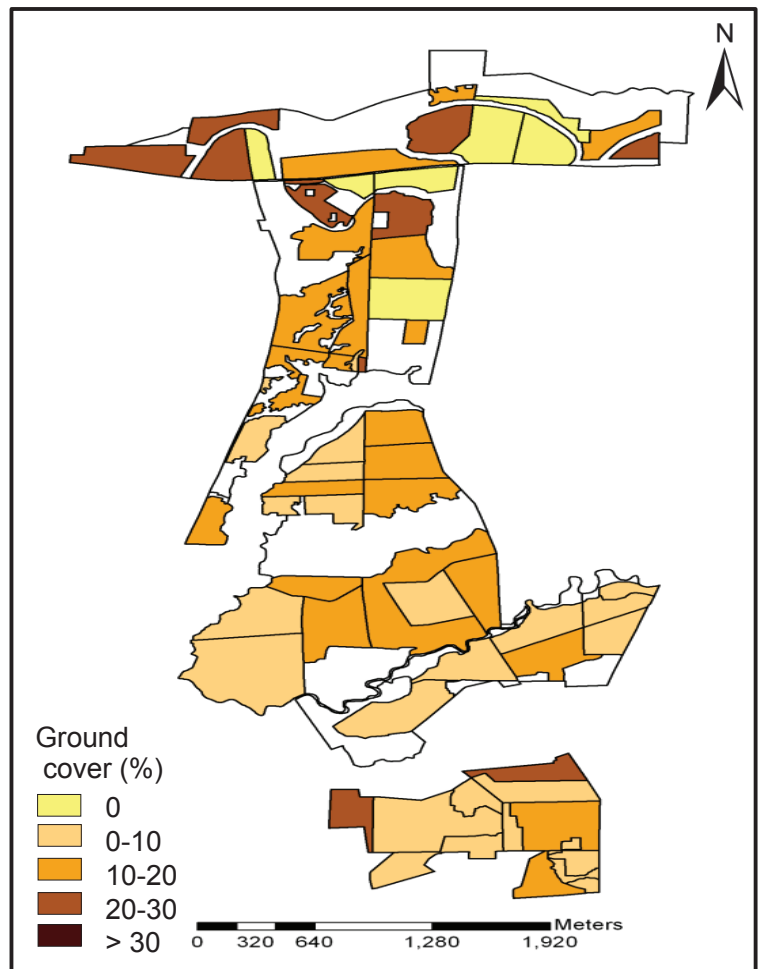
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse

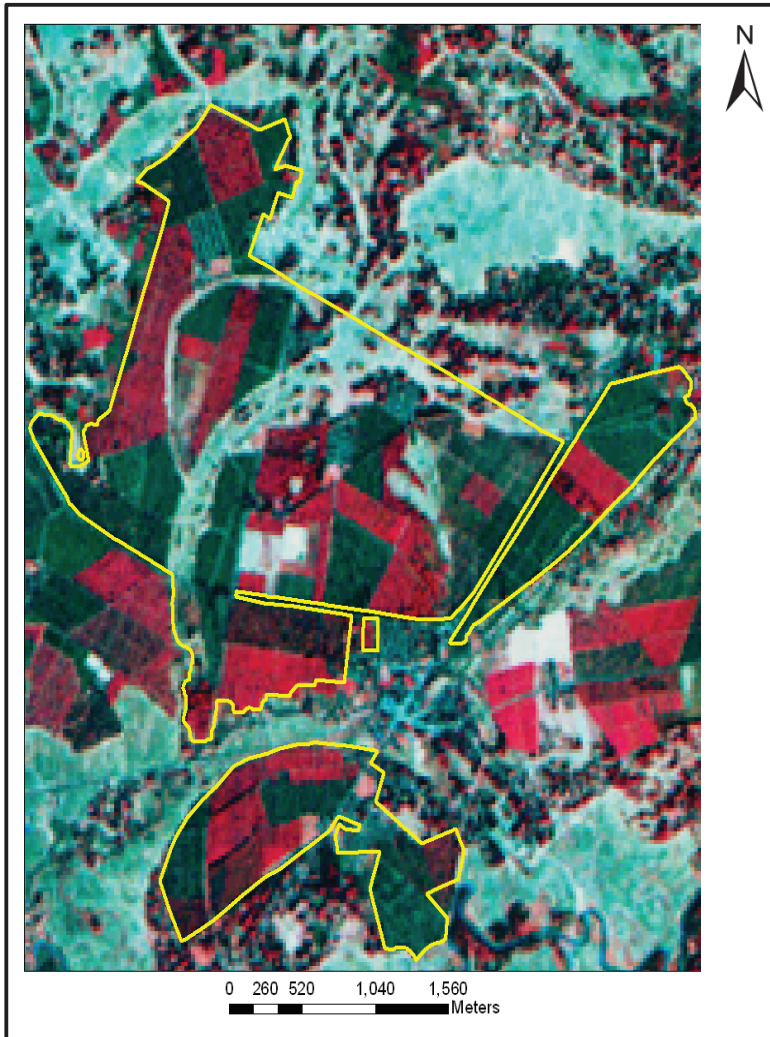


c. Section Boundaries of the Estate

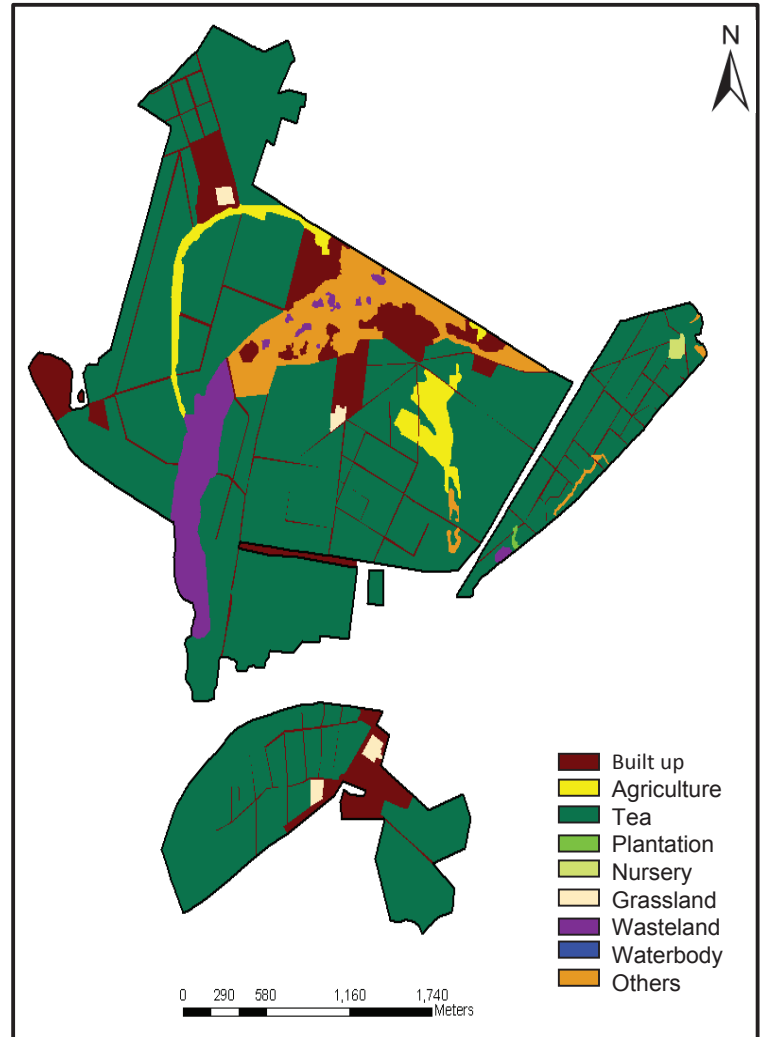


d. Shade Tree Density in Sections

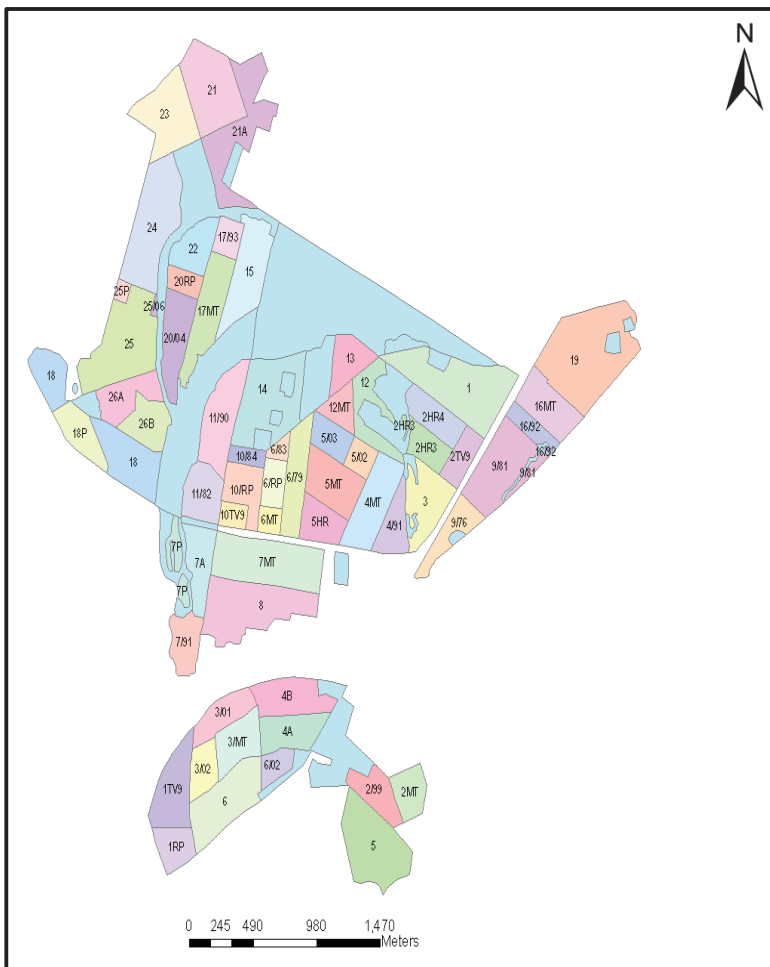




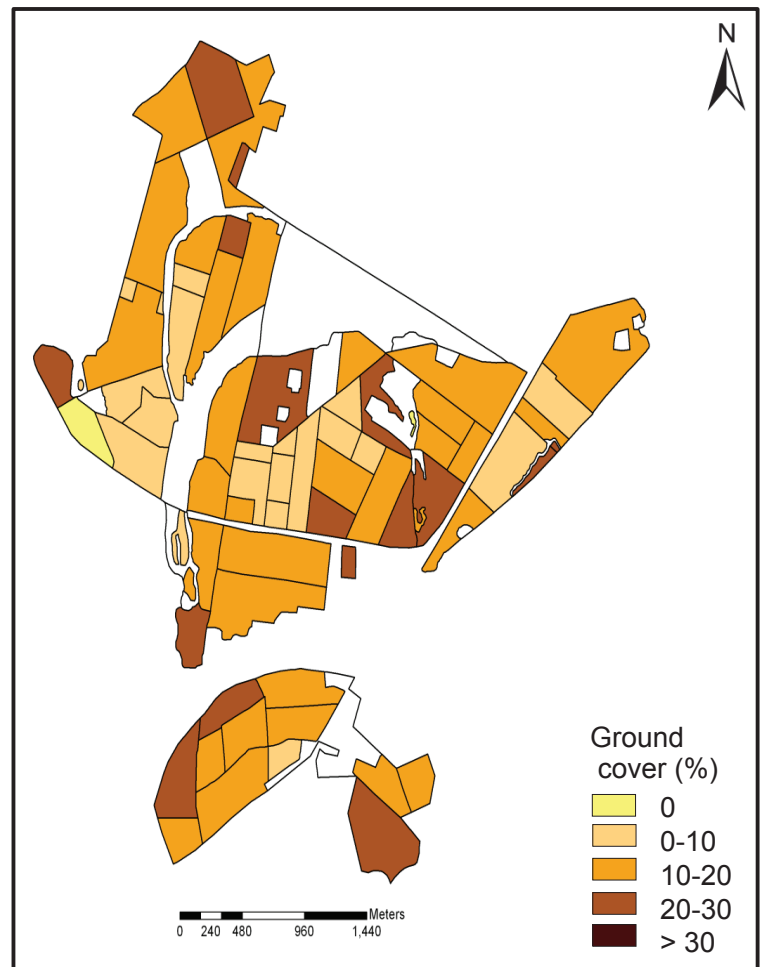
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

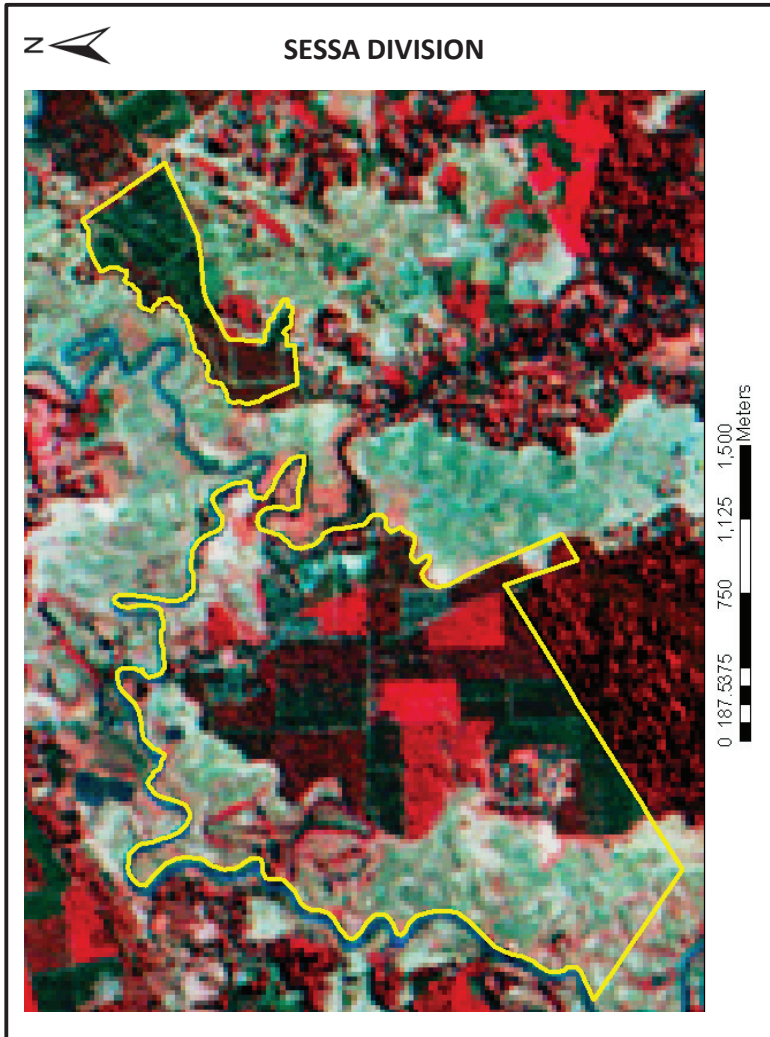




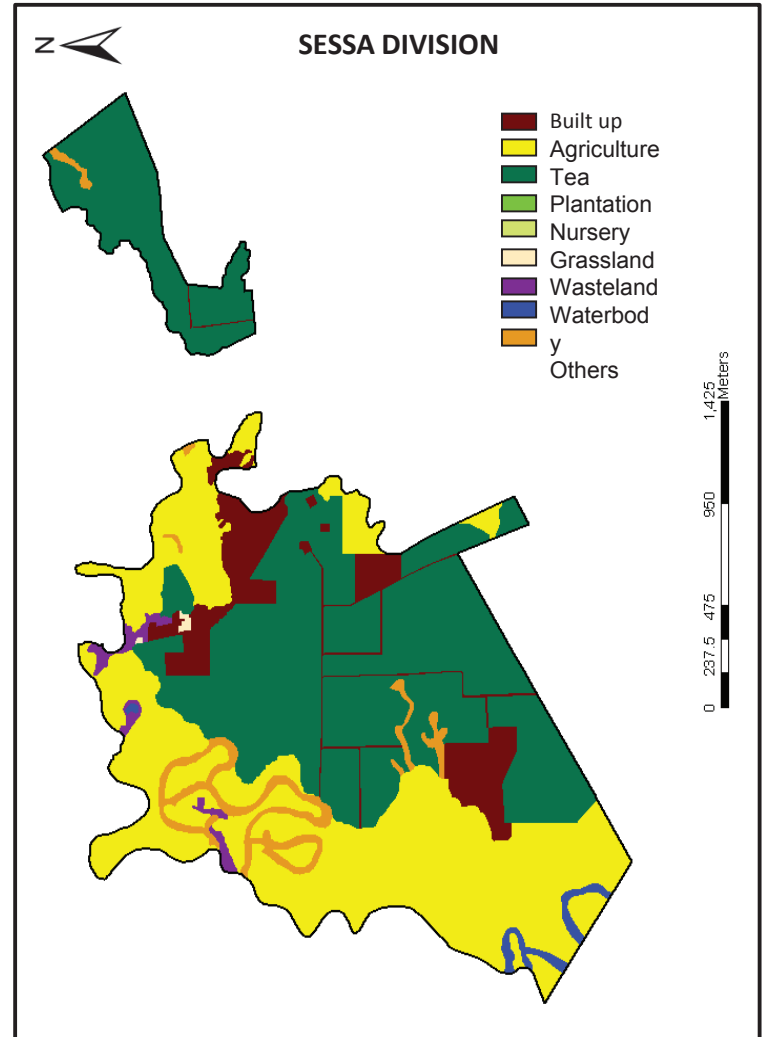
e. General Information

1. General		5. Natural resources constraints	
Contact address	PO: Sepon, Dist: Dibrugarh, PIN: 785669	Drainage congestion and water logging	Yes
Contact phone	03754-212687, 9435132380	Scarcity of water during summer	No
Name of the company	Mcleod Russel India Limited	River bank erosion	Yes
Name of the village where it falls	Sepon	Major diseases and duration	Black Rot (2 Months)
Leased area of the estate (ha)	930.71	Major pests and duration	<i>Helopeltis</i> , RSM, Greenfly Looper Caterpillar (6 months)
Tea grown area of the estate (ha)	622.26	Damage due to wildlife	No
No. of divisions / sections	4 div / 58 sec	6. Yield / production	
Year of establishment	--	Peak plucking periods	Jul - Sep
Type of tea produced	CTC, Orthodox	Annual green leaf yield	9246.33 kg/ha
2. Infrastructure		Annual production of processed tea	1395002 Kg
Availability of processing factory	Yes	7. Pruning	
Availability of workers colony	Yes	Time of pruning	2nd fortnight of Nov - 1st fortnight of Jan
Availability of internet facility / e-mail id	Yes	Pruning cycle	3 cycle
Meteorological observations taken	Tmax, Tmin, Rainfall	Types of pruning	--
3. Amenities		8. Fertilizer use	
Availability of health care / dispensary	Yes	Types of N, P, K fertilizers used	Urea, MOP, SOA, SP, RP
Availability of school	Yes	Dose of Nitrogen (kg/ha)	167
4. Shade trees		Dose of Phosphorous (kg/ha)	40
Shade tree density (garden level)	Medium	Dose of Potash (kg/ha)	102
Plant to plant spacing (m)	12 x 12	Whether lime is applied, if yes dose	No
Row to row spacing (m)	12 x 12		

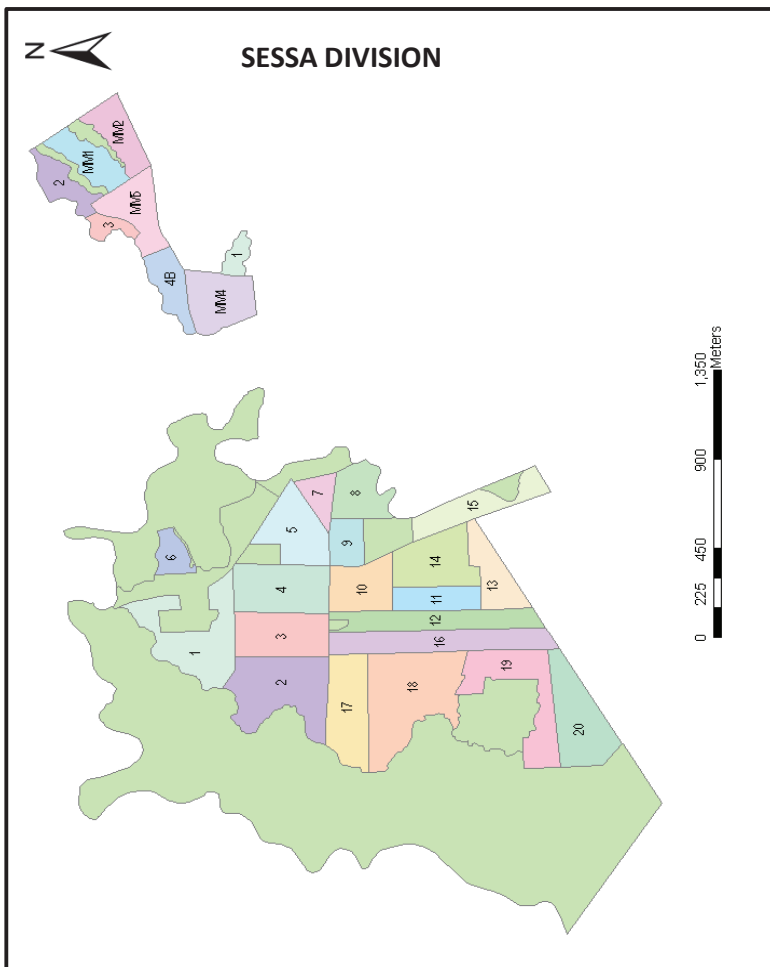




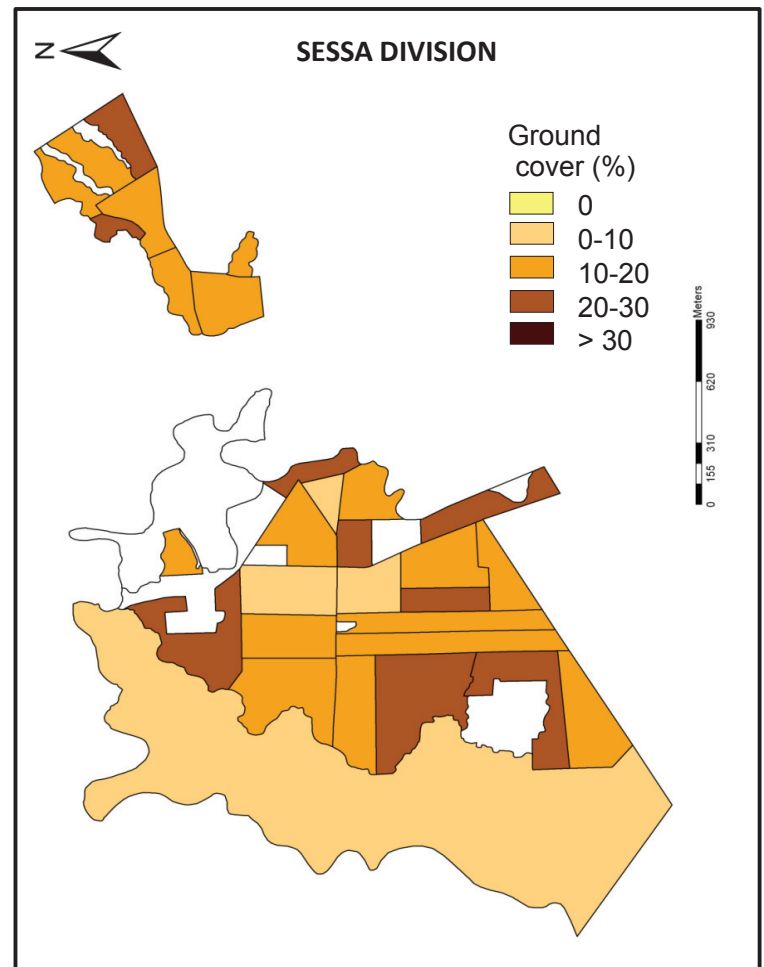
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate

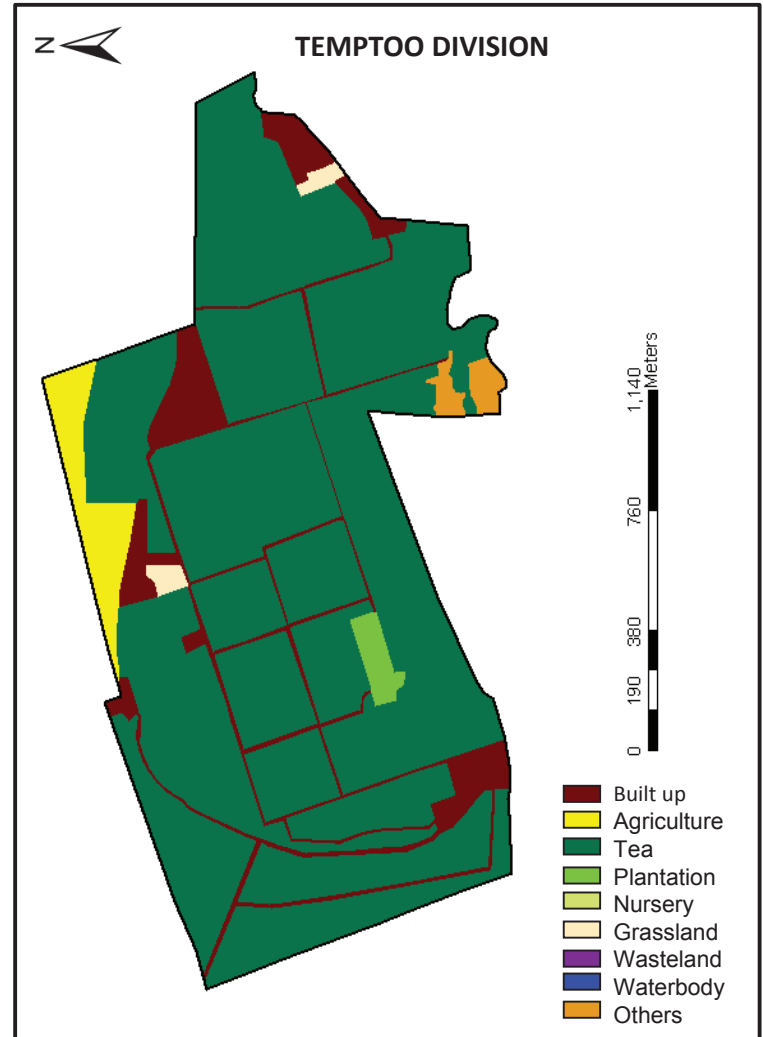


d. Shade Tree Density in Sections

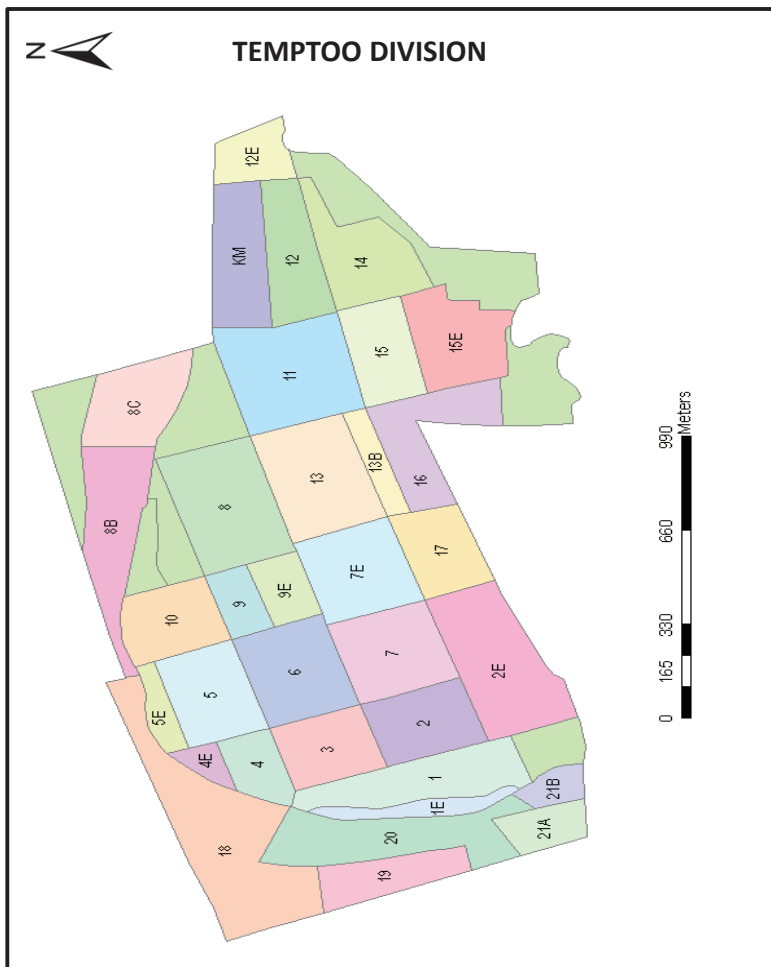




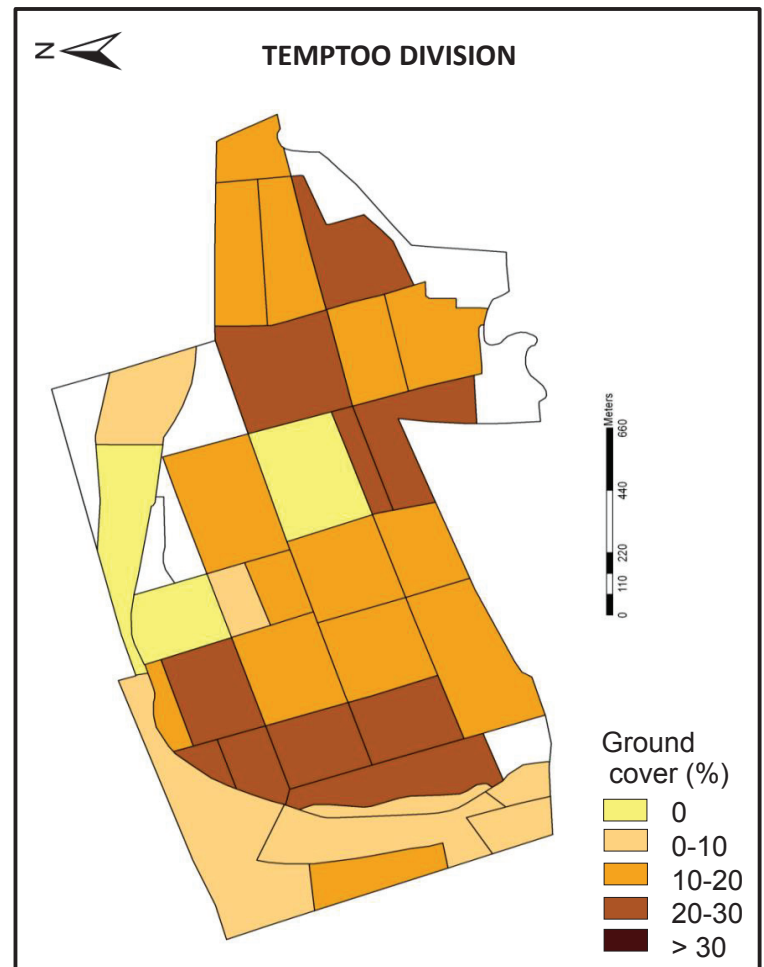
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate

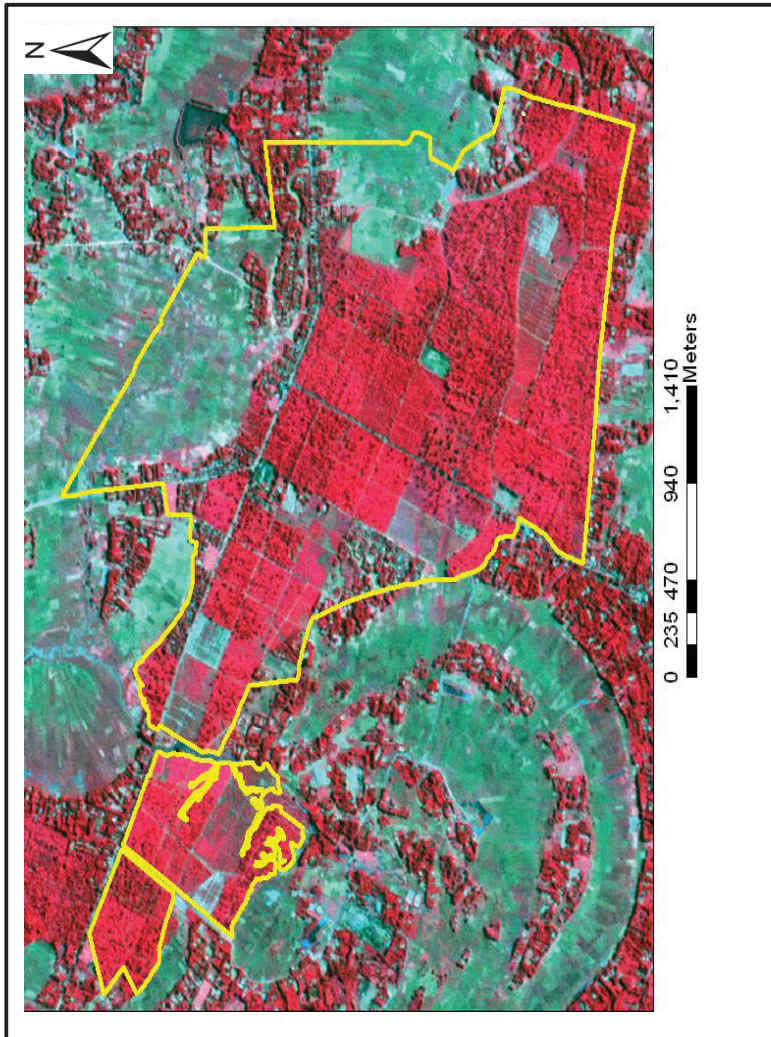


d. Shade Tree Density in Sections

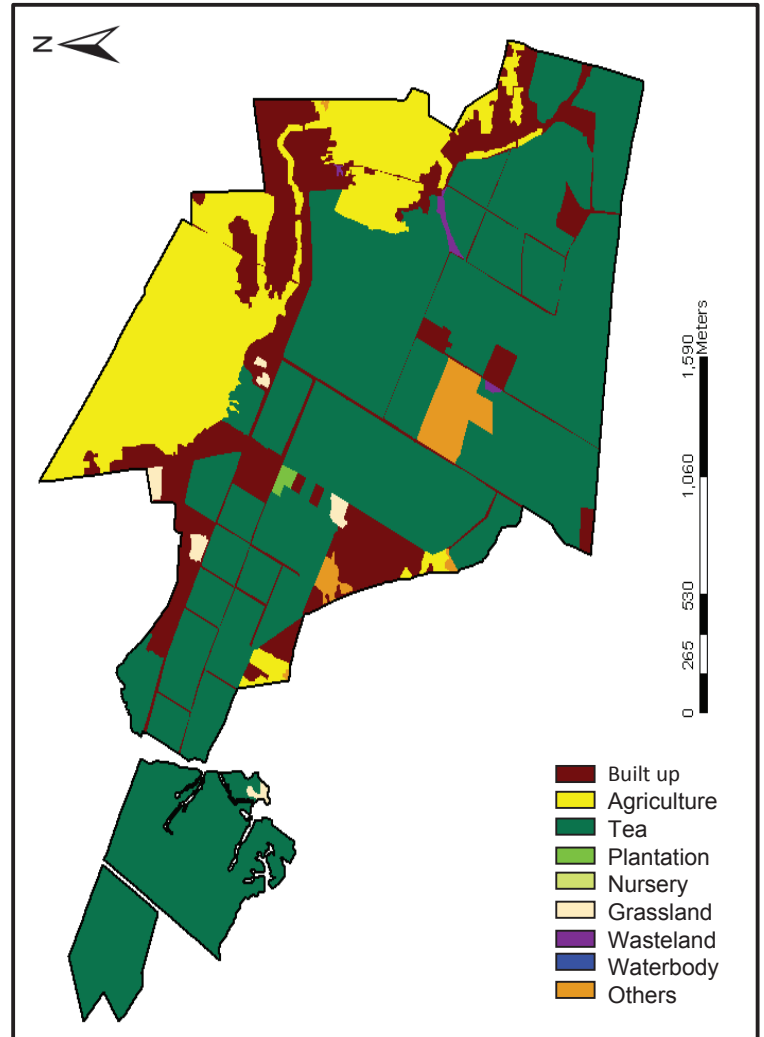




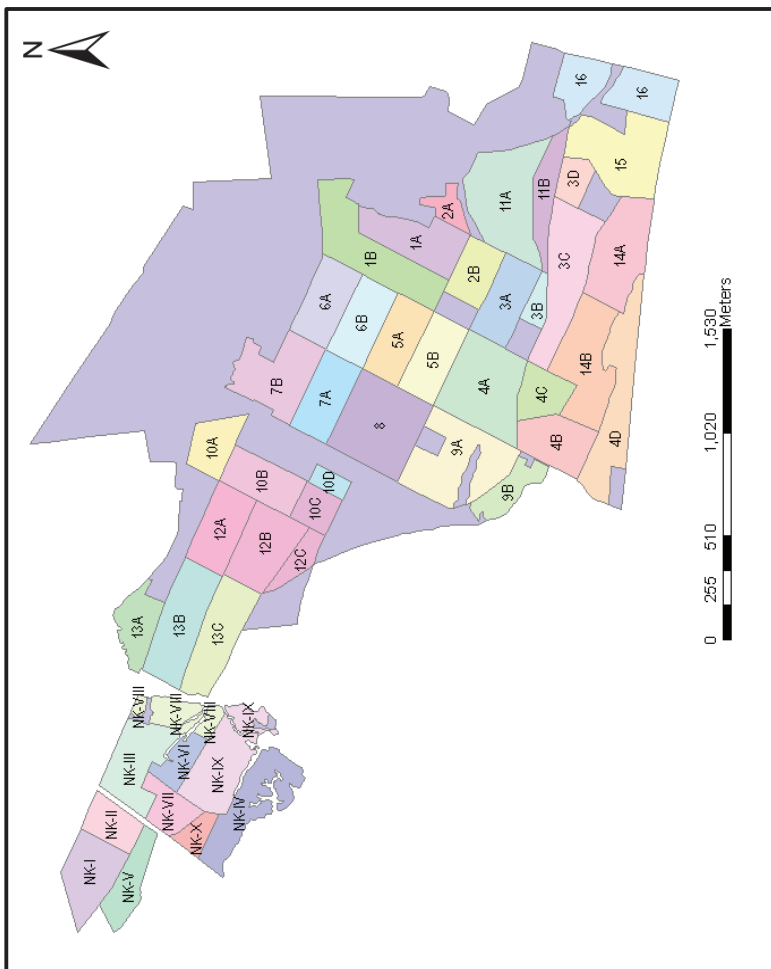
P66: TEENALI TE



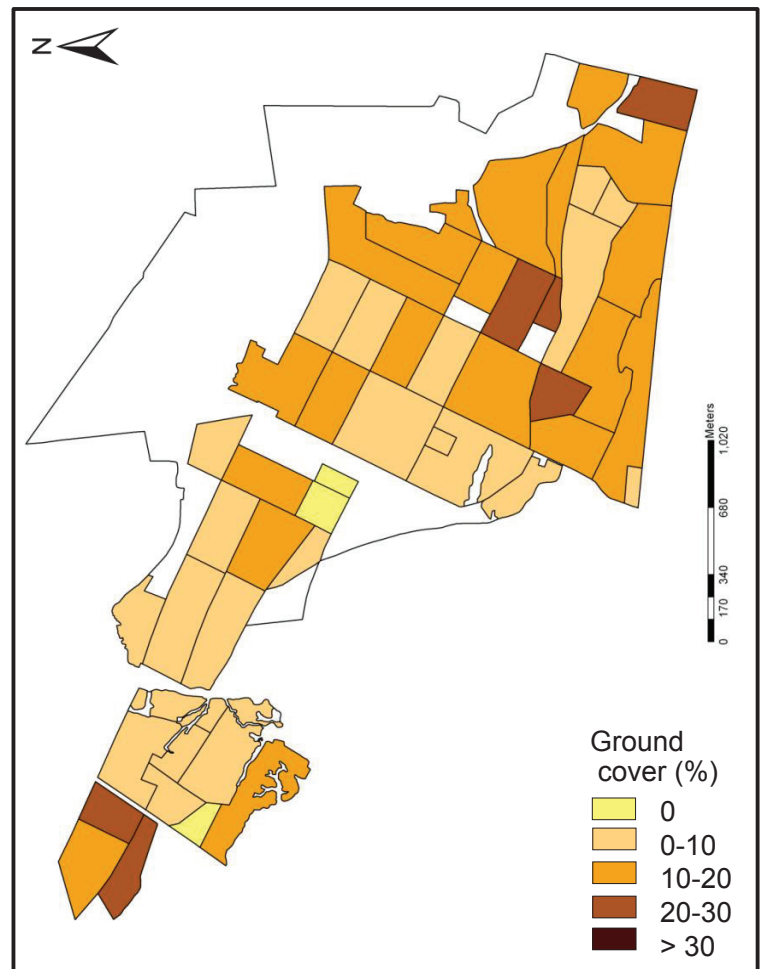
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

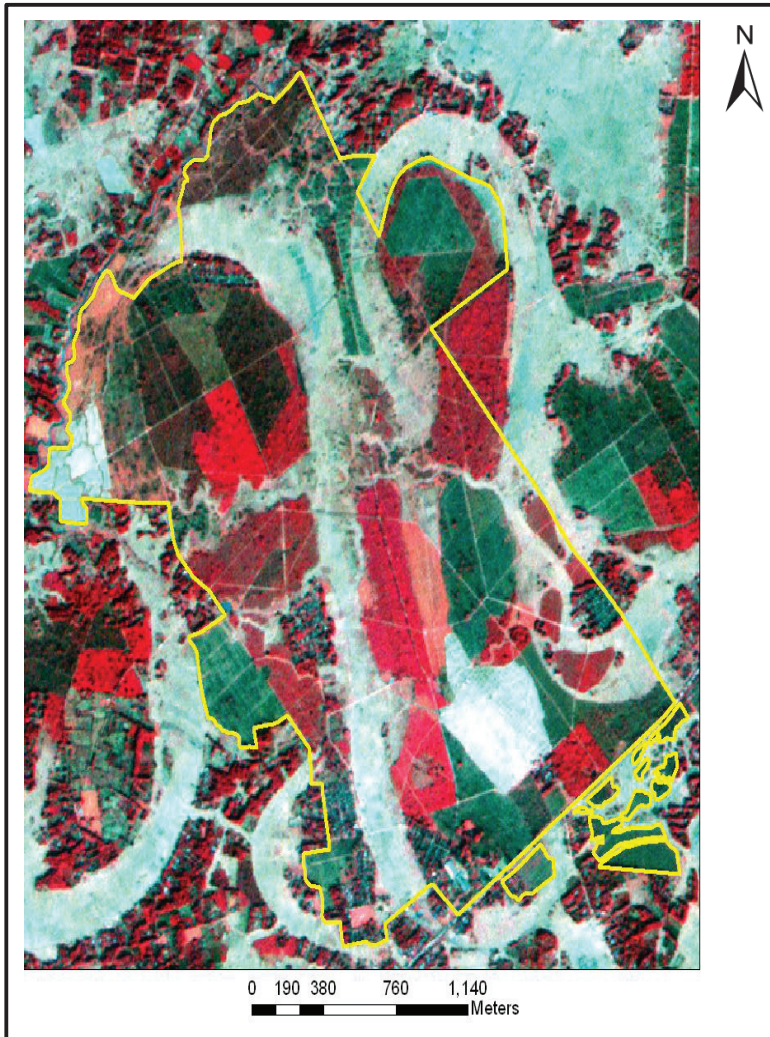




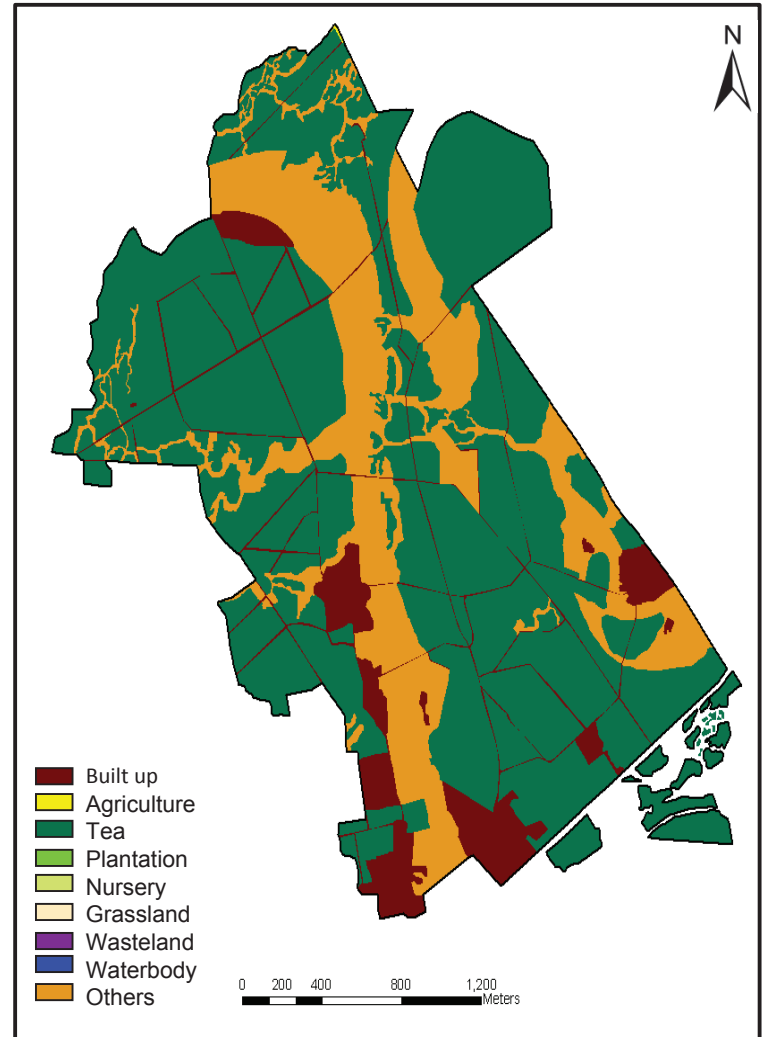
e. General Information

1. General		5. Natural resources constraints	
Contact address	PO: Nahorkotia, Dist: Dibrugarh, PIN: 786610	Drainage congestion and water logging	Yes
Contact phone	9954499218	Scarcity of water during summer	No
Name of the company	The Grob Tea Co. Ltd.	River bank erosion	No
Name of the village where it falls	Teenali	Major diseases and duration	Red Rust, Black Rot (6 months)
Leased area of the estate (ha)	690.34	Major pests and duration	RSM, <i>Helopeltis</i> (whole year)
Tea grown area of the estate (ha)	393.41	Damage due to wildlife	No
No. of divisions / sections	2 div/ 47 sec	6. Yield / production	
Year of establishment / age	--	Peak plucking periods	Jun - Oct
Type of tea produced	CTC	Annual green leaf yield	7223 kg/ha
2. Infrastructure		Annual production of processed tea	645526 kg
Availability of processing factory	Yes	7. Pruning	
Availability of workers colony	Yes	Time of pruning	1 st fortnight of Nov - 1 st fortnight of Jan
Availability of internet facility / e-mail id	Yes	Pruning cycle	4 yrs
Meteorological observations taken	Tmax, Tmin, Rainfall	Types of pruning	--
3. Amenities		8. Fertilizer use	
Availability of health care / dispensary	Yes	Types of N, P, K fertilizers used	Urea, MOP, RP
Availability of school	Yes	Dose of Nitrogen (kg/ha)	140
4. Shade trees		Dose of Phosphorous (kg/ha)	40
Shade tree density (garden level)	Medium	Dose of Potash (kg/ha)	80
Plant to plant spacing (m)	12 x 12	Whether lime is applied, if yes dose	No
Row to row spacing (m)	3 x 3		

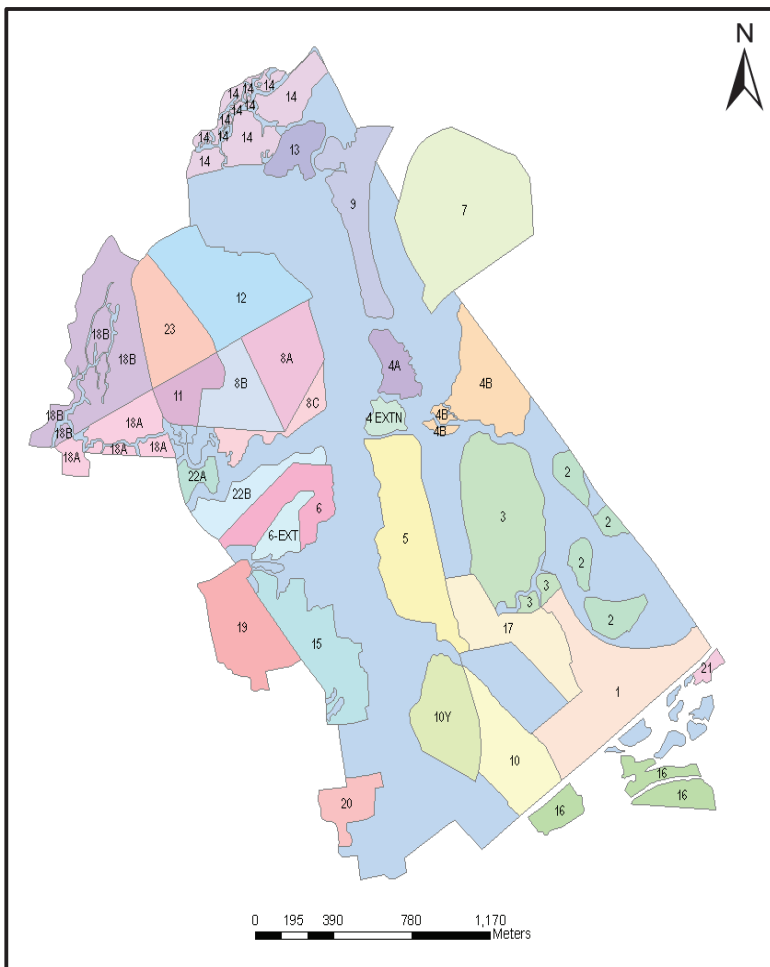




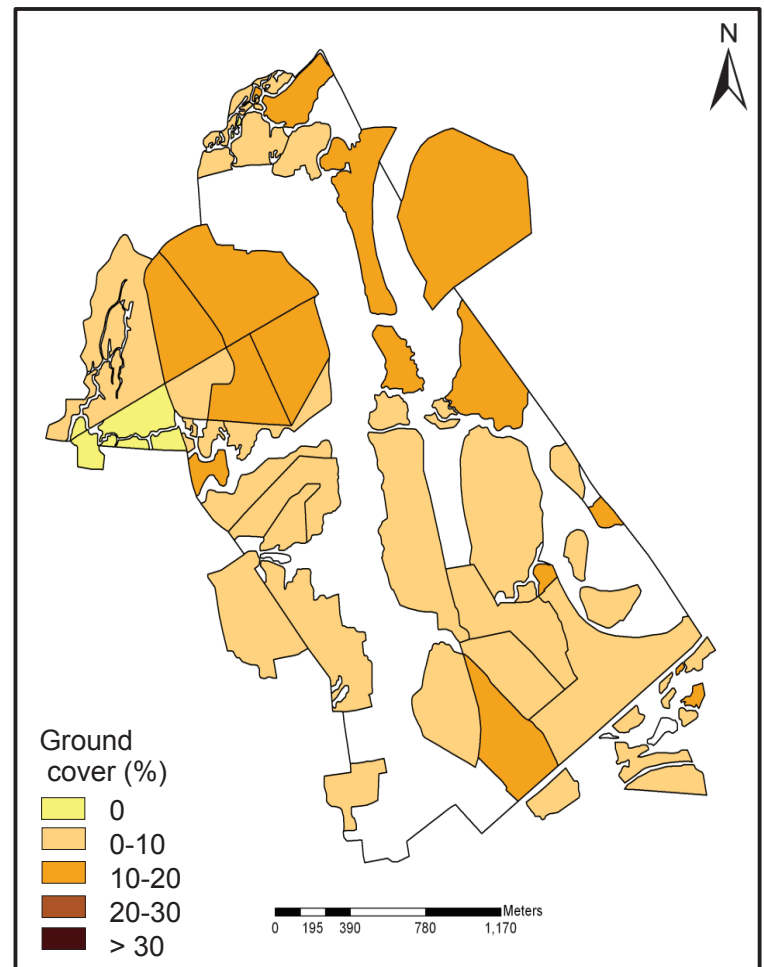
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse

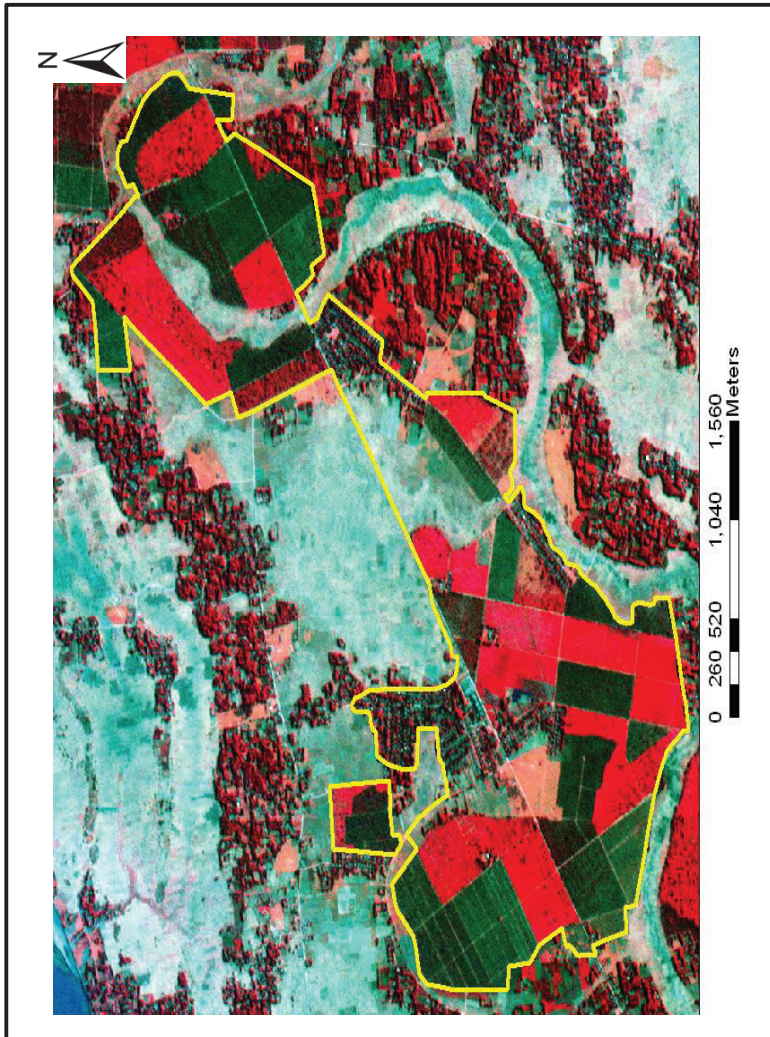


c. Section Boundaries of the Estate

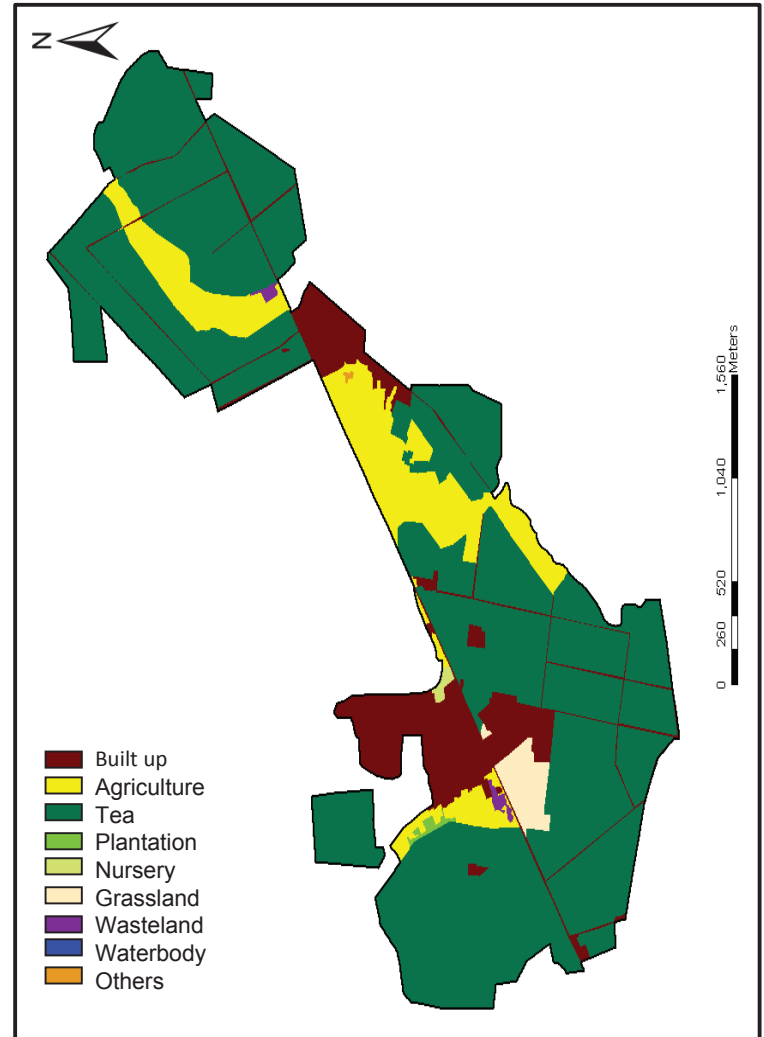


d. Shade Tree Density in Sections

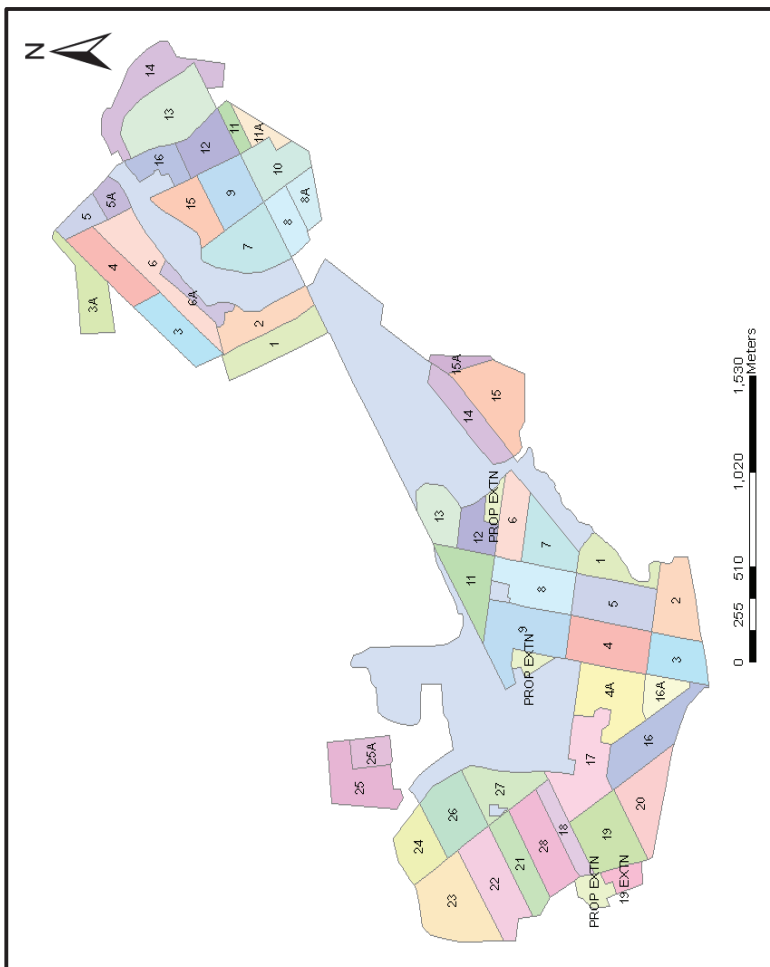




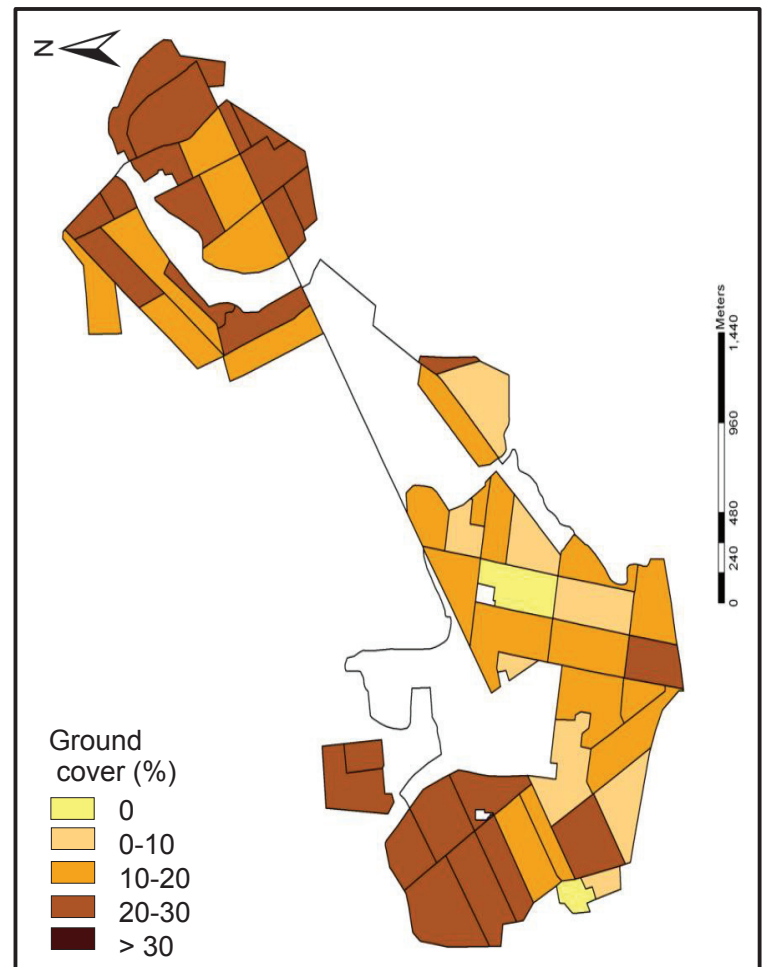
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

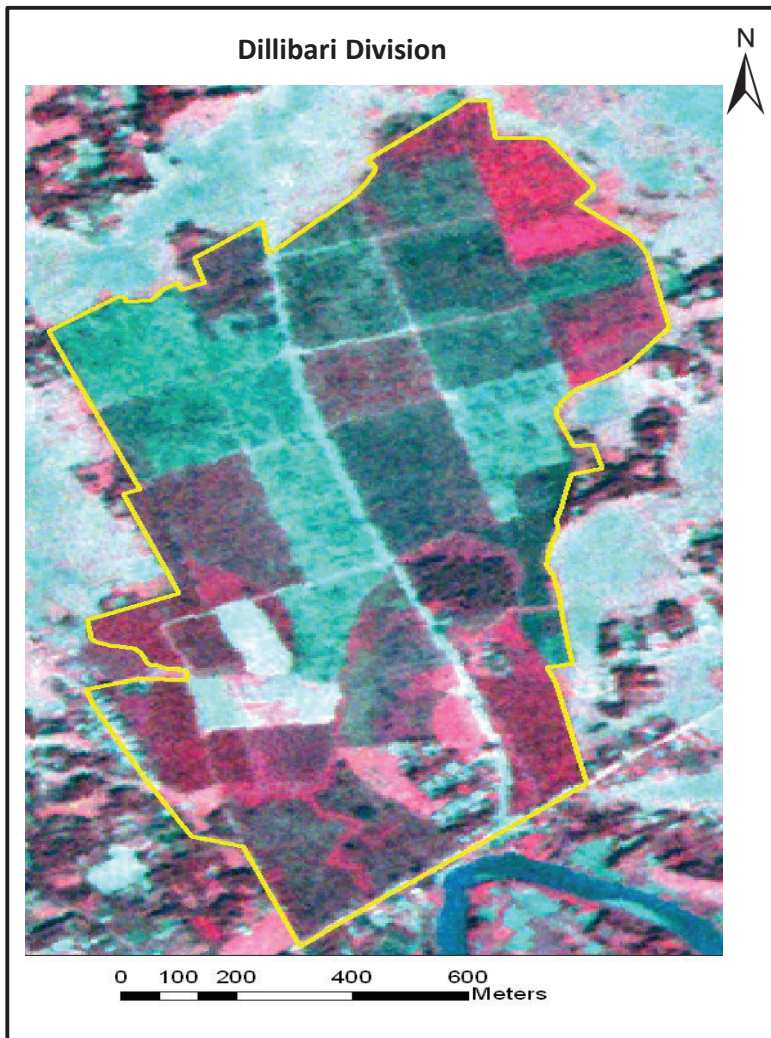




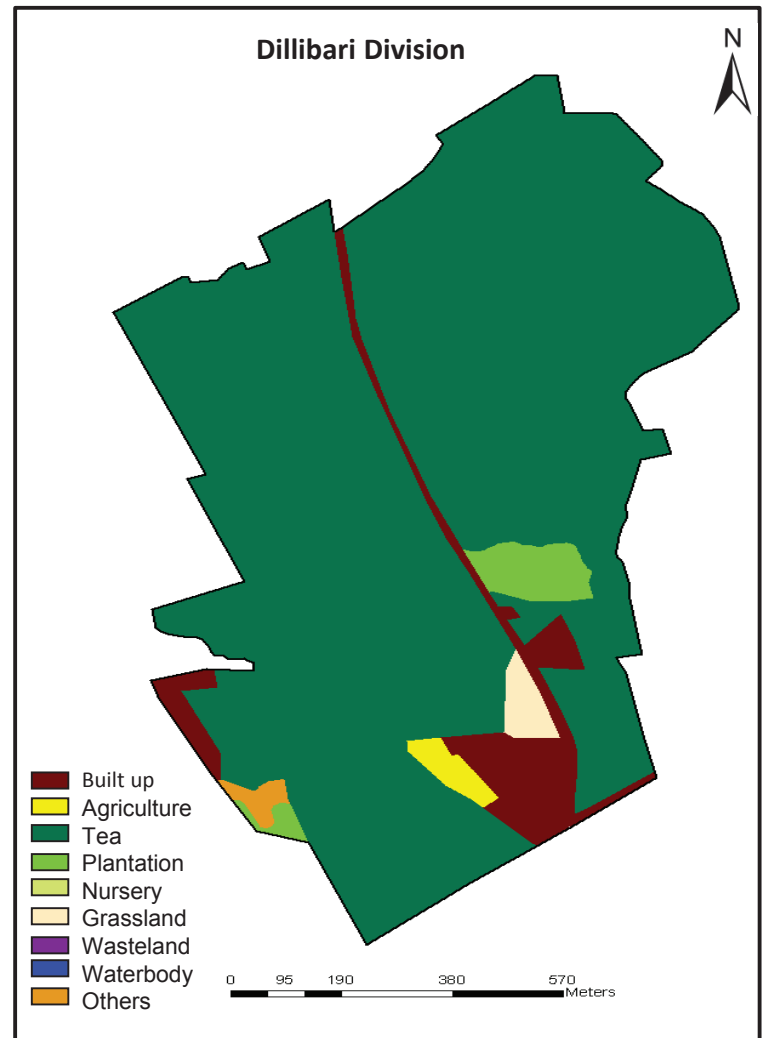
e. General Information

1. General		5. Natural resources constraints	
Contact address	PO: Thanai, Dist: Dibrugarh PIN: 786101	Drainage congestion and water logging	Yes
Contact phone	3732-100441	Scarcity of water during summer	Yes
Name of the company	Assam Company India Limited	River bank erosion	No
Name of the village where it falls	Rohmorja	Major diseases and duration	--
Leased area of the estate (ha)	854.46	Major pests and duration	--
Tea grown area of the estate (ha)	494.88	Damage due to wildlife	--
No. of divisions / sections	3 div / 55 sec	6. Yield / production	
Year of establishment	1839	Peak plucking periods	Apr - Oct
Type of tea produced	CTC, Orthodox	Annual green leaf yield	2230.8 kg/ha
2. Infrastructure		Annual production of processed tea	1043504 kg
Availability of processing factory	Yes	7. Pruning	
Availability of workers colony	Yes	Time of pruning	Dec – Jan
Availability of internet facility / e-mail id	Yes	Pruning cycle	3 yrs
Meteorological observations taken	Tmax, Tmin, Rainfall	Types of pruning	LP-DS-UP
3. Amenities		8. Fertilizer use	
Availability of health care / dispensary	Yes	Types of N, P, K fertilizers used	Urea, RP, MOP, DAP
Availability of school	Yes	Dose of Nitrogen (kg/ha)	110, 140, 175
4. Shade trees		Dose of Phosphorous (kg/ha)	77, 98, 122
Shade tree density (garden level)	Medium	Dose of Potash (kg/ha)	22, 28, 35
Plant to plant spacing (m)	13.33 x 13.33	Whether lime is applied, if yes dose	Yes
Row to row spacing (m)	13.33 x 13.33		

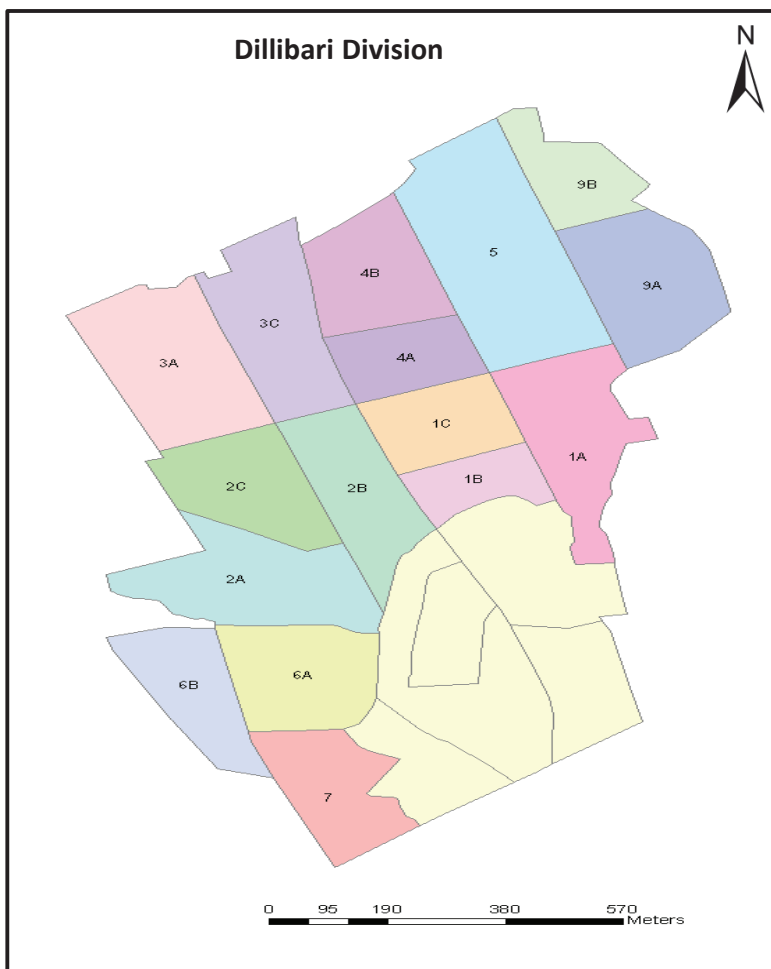




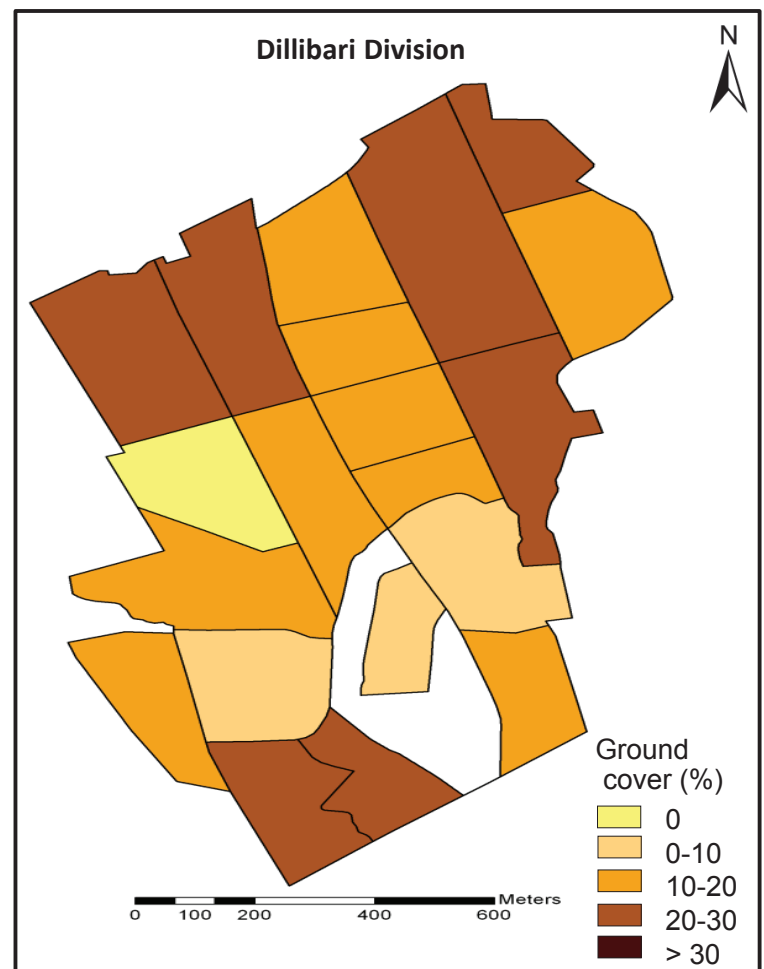
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate

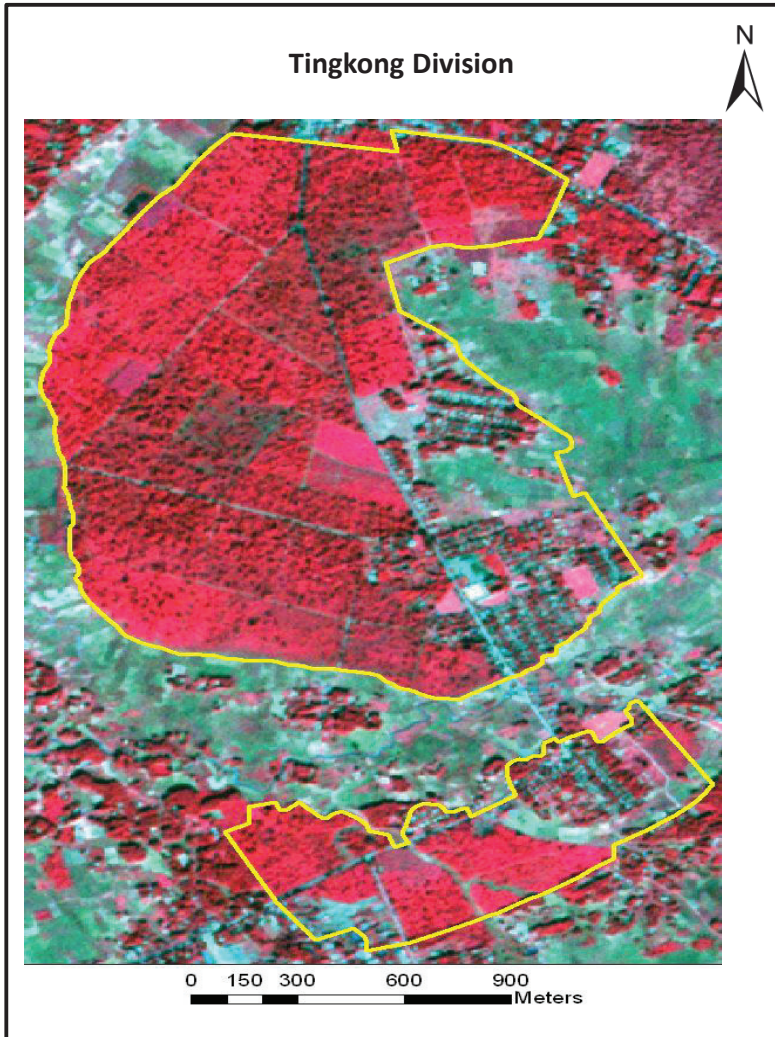


d. Shade Tree Density in Sections

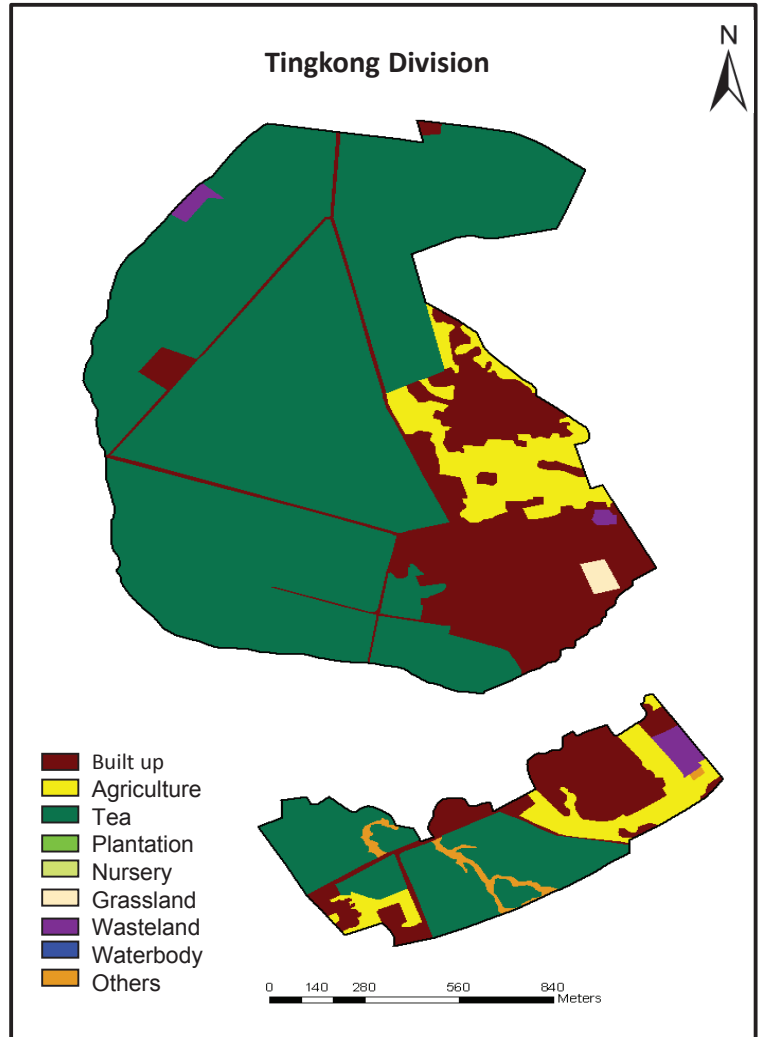




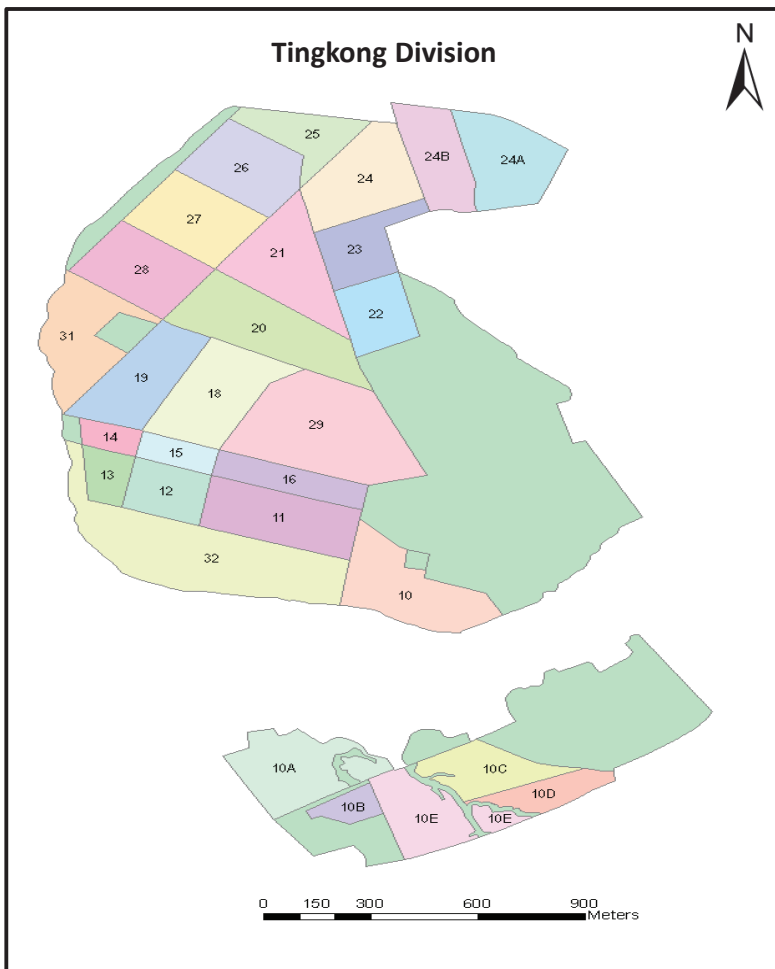
P70: TINGKONG TE



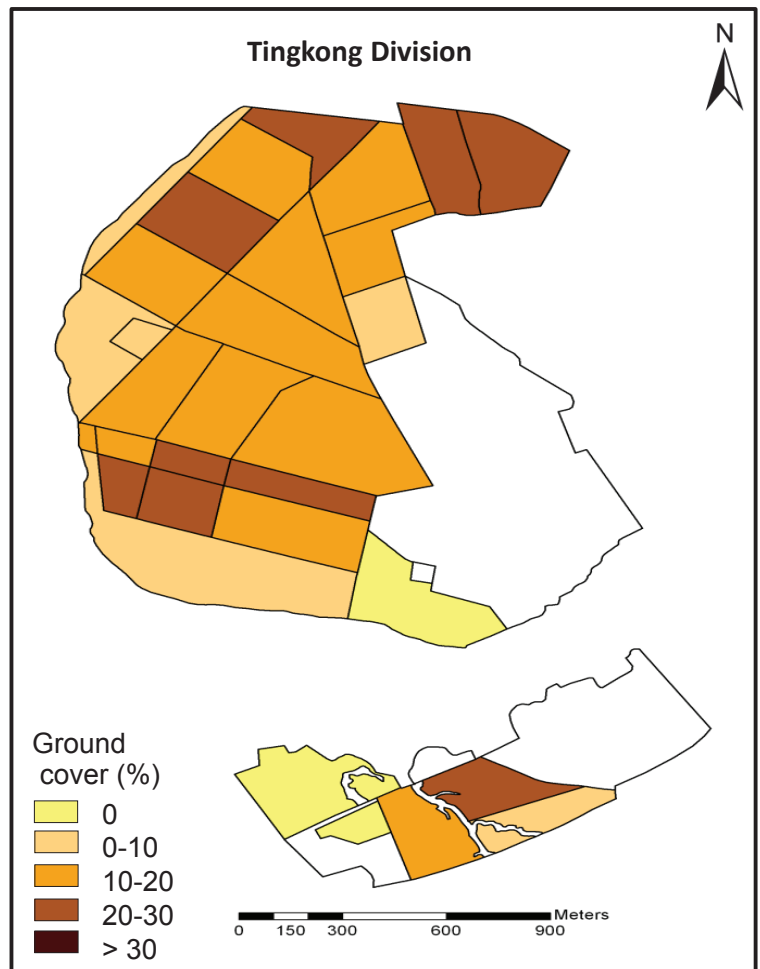
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse

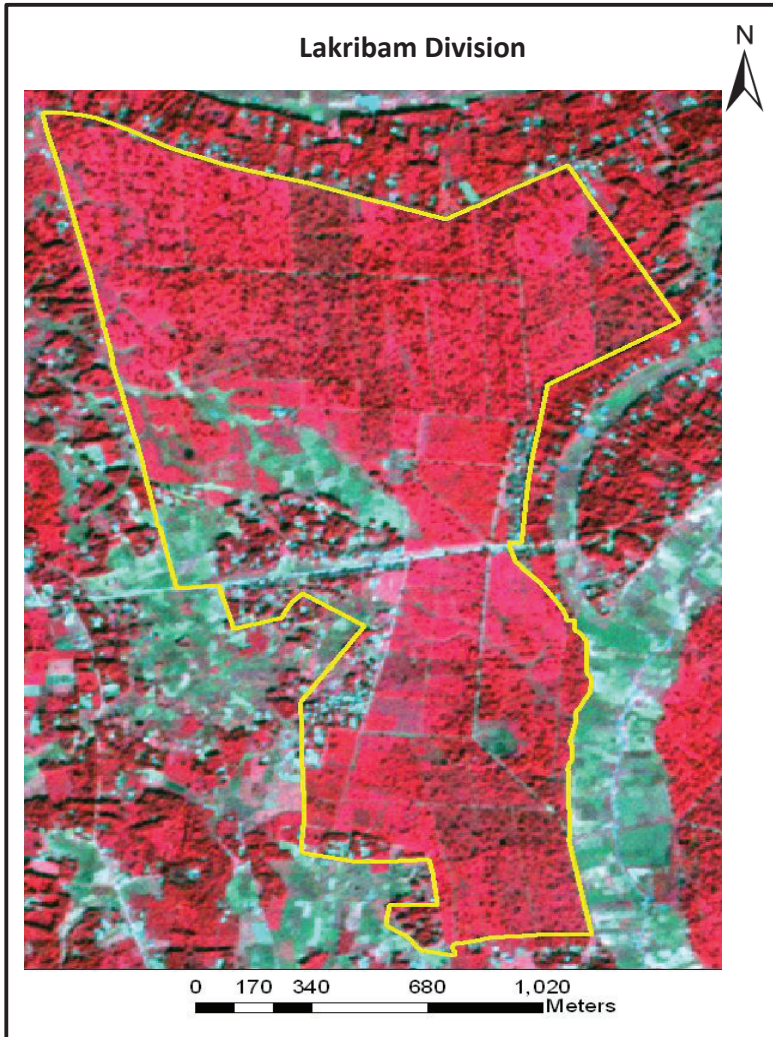


c. Section Boundaries of the Estate

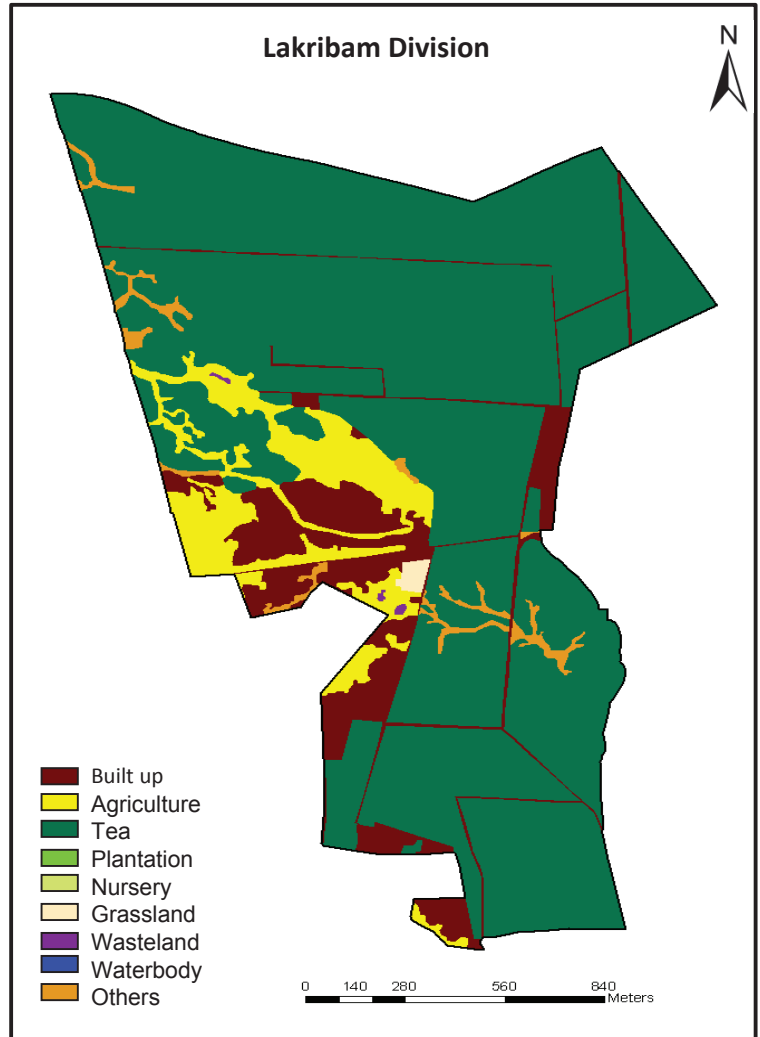


d. Shade Tree Density in Sections

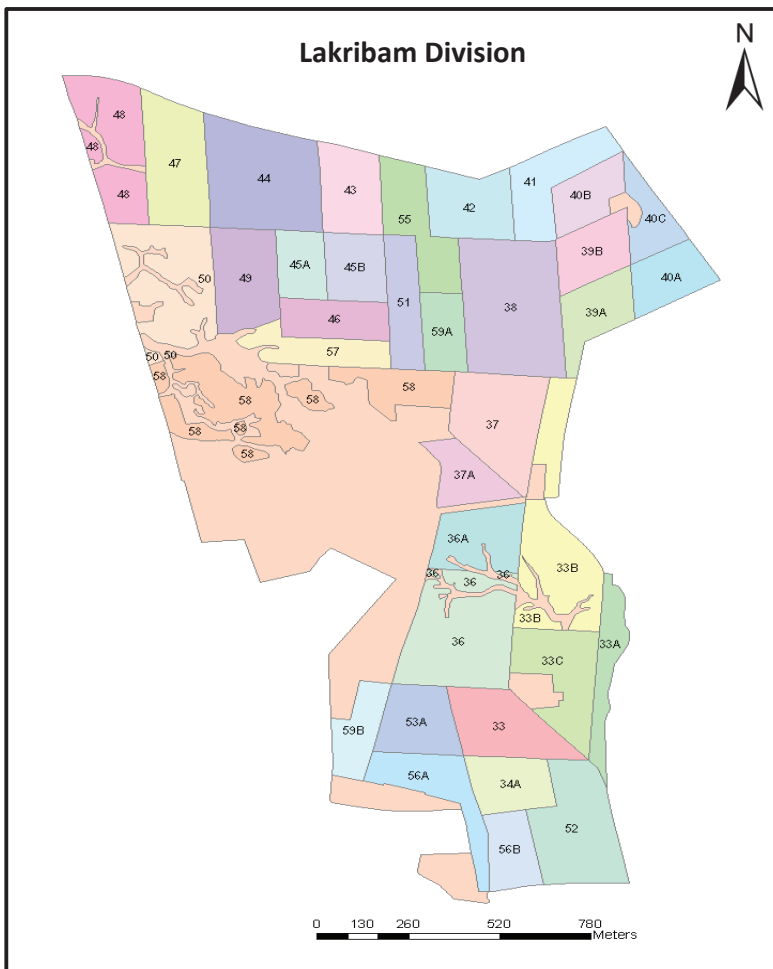




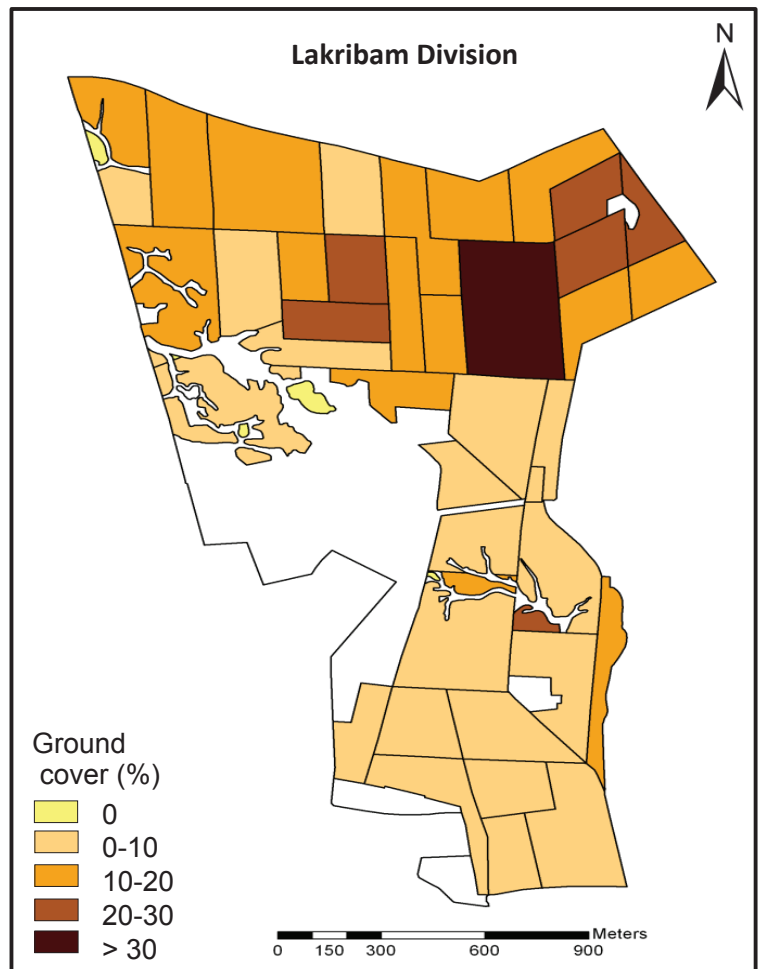
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections





e. General Information

1. General		5. Natural resources constraints	
Contact address	PO: Tinkong, Dist: Dibrugarh PIN: 786612	Drainage congestion and water logging	Yes
Contact phone	0374-2917564	Scarcity of water during summer	No
Name of the company	Andrew Yule and Co. Ltd.	River bank erosion	Yes
Name of the village where it falls	Tinkong	Major diseases and duration	Fungal and Bacterial diseases (2 months)
Leased area of the estate (ha)	706.06	Major pests and duration	<i>Helopeltis</i> , RSM, Looper (whole year)
Tea grown area of the estate (ha)	505.37	Damage due to wildlife	No
No. of divisions / sections	3 div / 94 sec	6. Yield / production	
Year of establishment	1910 Approx.	Peak plucking periods	Sep - Oct
Type of tea produced	CTC, Orthodox	Annual green leaf yield	7505 kg/ha
2. Infrastructure		Annual production of processed tea	838400 kg
Availability of processing factory	Yes	7. Pruning	
Availability of workers colony	Yes	Time of pruning	End of Nov
Availability of internet facility / e-mail id	Yes	Pruning cycle	3 yrs
Meteorological observations taken	Tmax, Tmin, Rainfall	Types of pruning	LP-UP-DS
3. Amenities		8. Fertilizer use	
Availability of health care / dispensary	Yes	Types of N, P, K fertilizers used	Urea, RP, MOP, SSP, Celrich
Availability of school	Yes	Dose of Nitrogen (kg/ha)	90 - 165
4. Shade trees		Dose of Phosphorous (kg/ha)	20 - 50
Shade tree density (garden level)	Medium	Dose of Potash (kg/ha)	90 - 165
Plant to plant spacing (m)	12 X 12	Whether lime is applied, if yes dose	Dolomite, 2000 g/ha
Row to row spacing (m)	12 X 12		

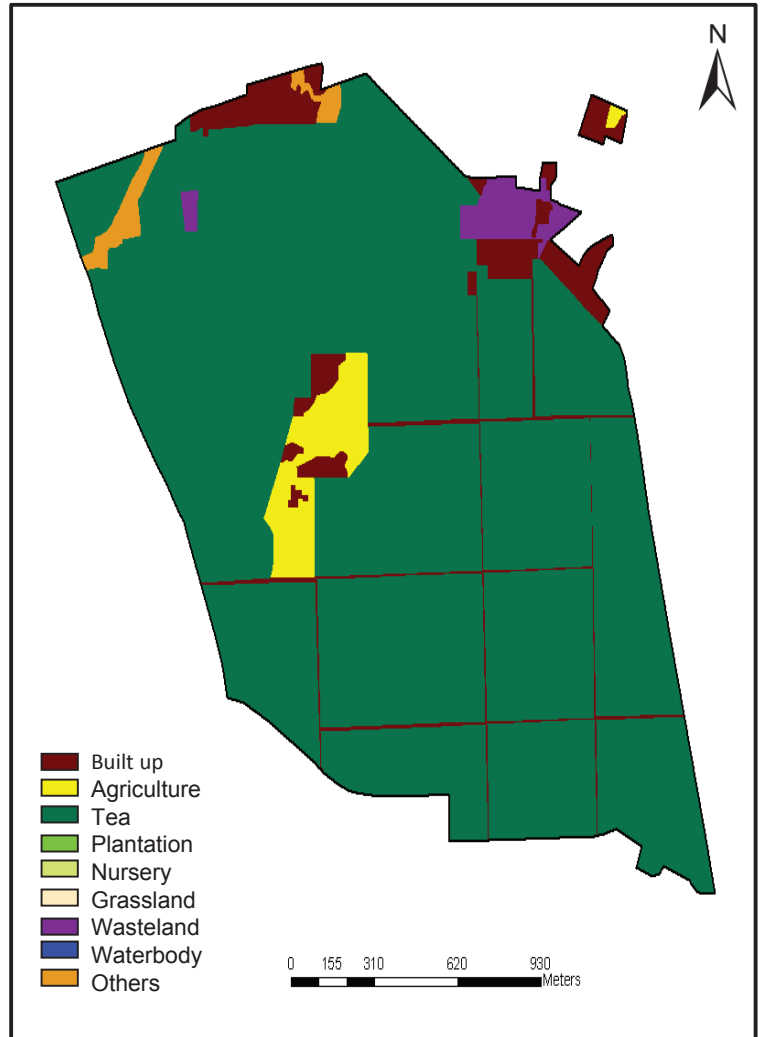




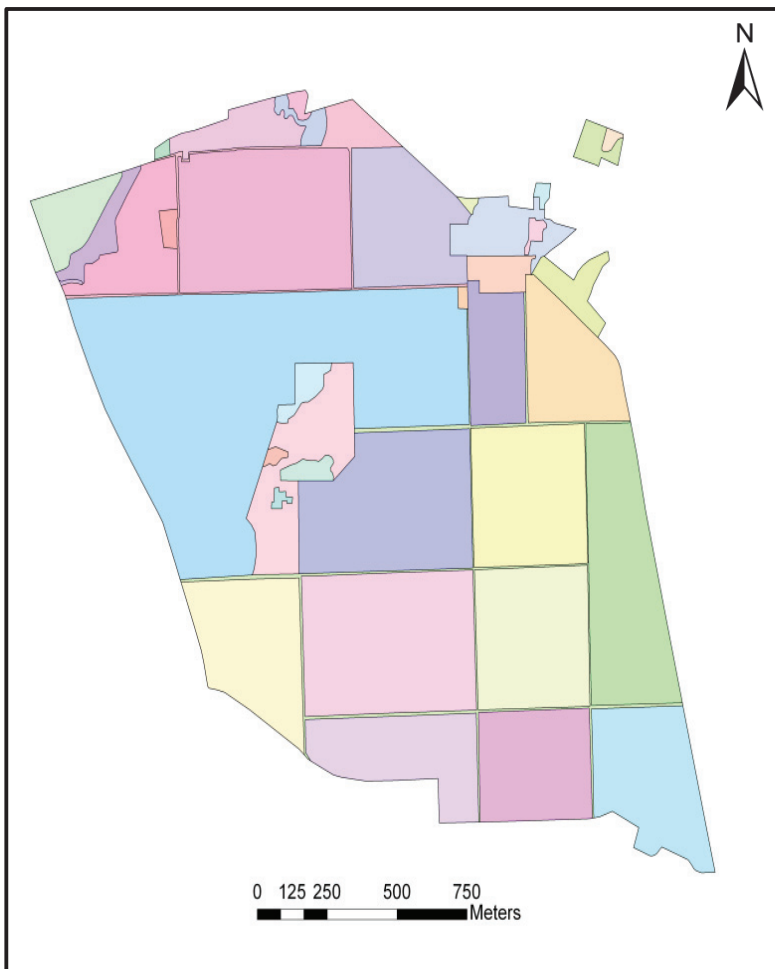
P72: UMATARA TE



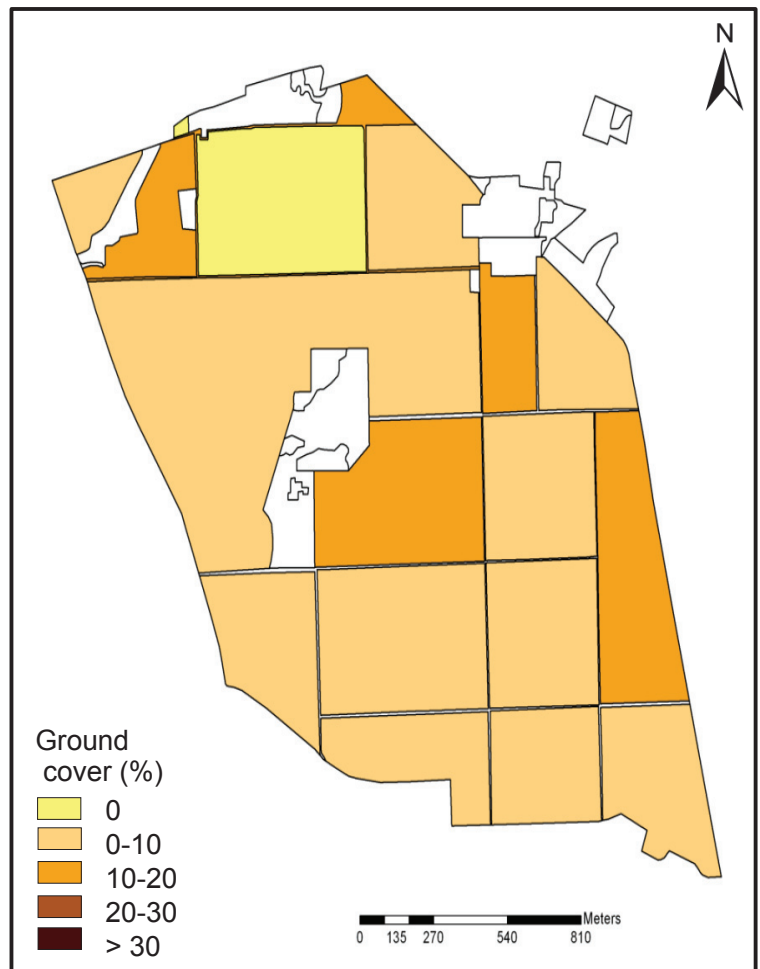
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

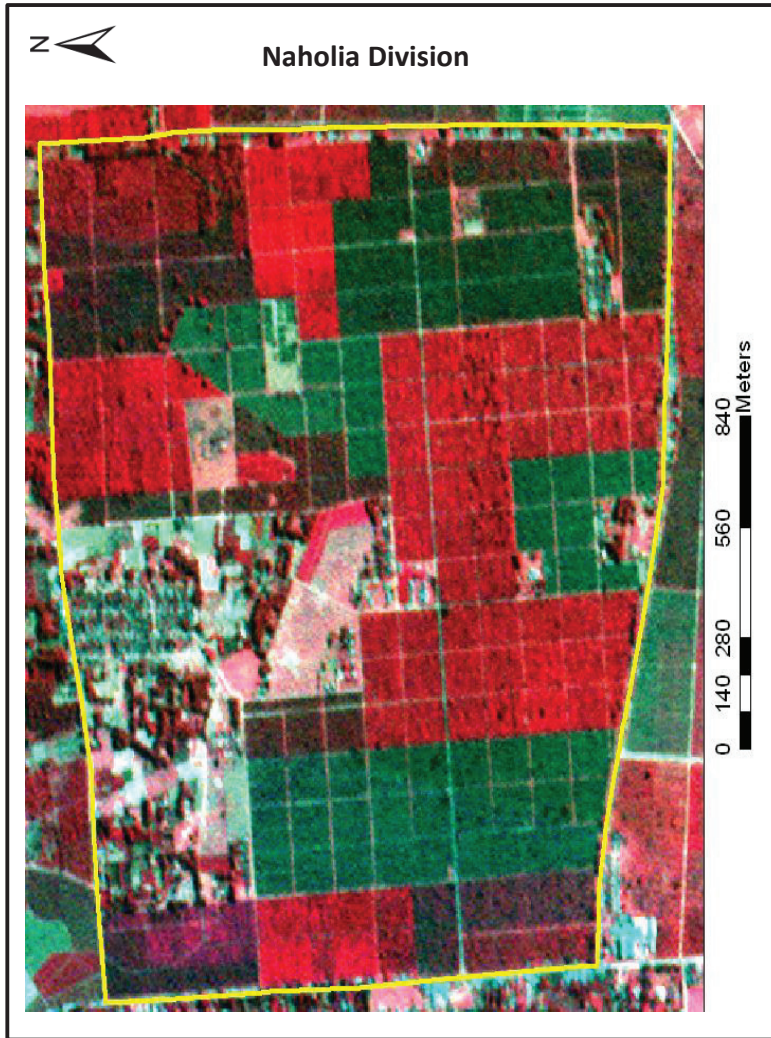




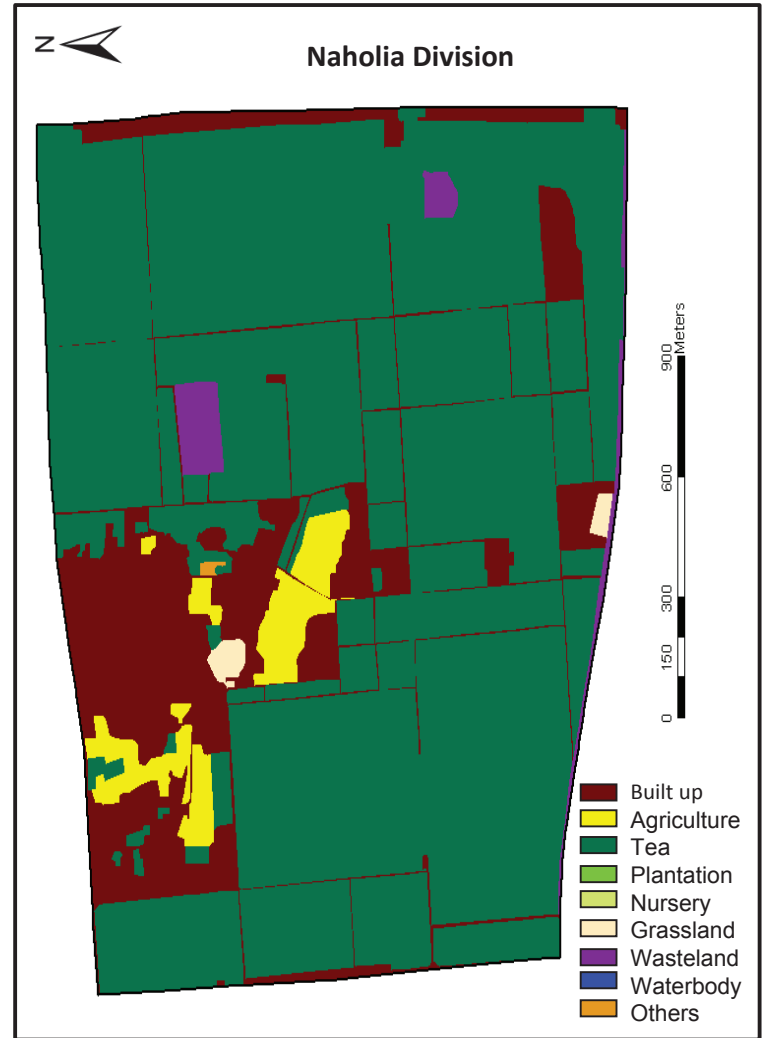
e. General Information

1. General		5. Natural resources constraints	
Contact address	PO: Naharkatia, Dist: Dibrugarh PIN: 786619	Drainage congestion and water logging	Yes
Contact phone	0374-2160378, 09435138111	Scarcity of water during summer	No
Name of the company	--	River bank erosion	No
Name of the village where it falls	Umatara, Rajgarh Rangoli/Samuguri	Major diseases and duration	Red rust
Leased area of the estate (ha)	330.64	Major pests and duration	--
Tea grown area of the estate (ha)	278.50	Damage due to wildlife	No
No. of divisions / sections	31 sec	6. Yield / production	
Year of establishment	1920	Peak plucking periods	Jul - Oct
Type of tea produced	CTC	Annual green leaf yield	8066.82
2. Infrastructure		Annual production of processed tea	657096.24
Availability of processing factory	Yes	7. Pruning	
Availability of workers colony	Yes	Time of pruning	Dec – Jan (4 th fortnight)
Availability of internet facility / e-mail id	Yes	Pruning cycle	4 yrs
Meteorological observations taken	--	Types of pruning	--
3. Amenities		8. Fertilizer use	
Availability of health care / dispensary	Yes	Types of N, P, K fertilizers used	Urea, RP, MOP
Availability of school	Yes	Dose of Nitrogen (kg/ha)	133.59
4. Shade trees		Dose of Phosphorous (kg/ha)	32.95
Shade tree density (garden level)	High	Dose of Potash (kg/ha)	133.19
Plant to plant spacing (m)	10 x 10	Whether lime is applied, if yes dose	No
Row to row spacing (m)	10 x 10		

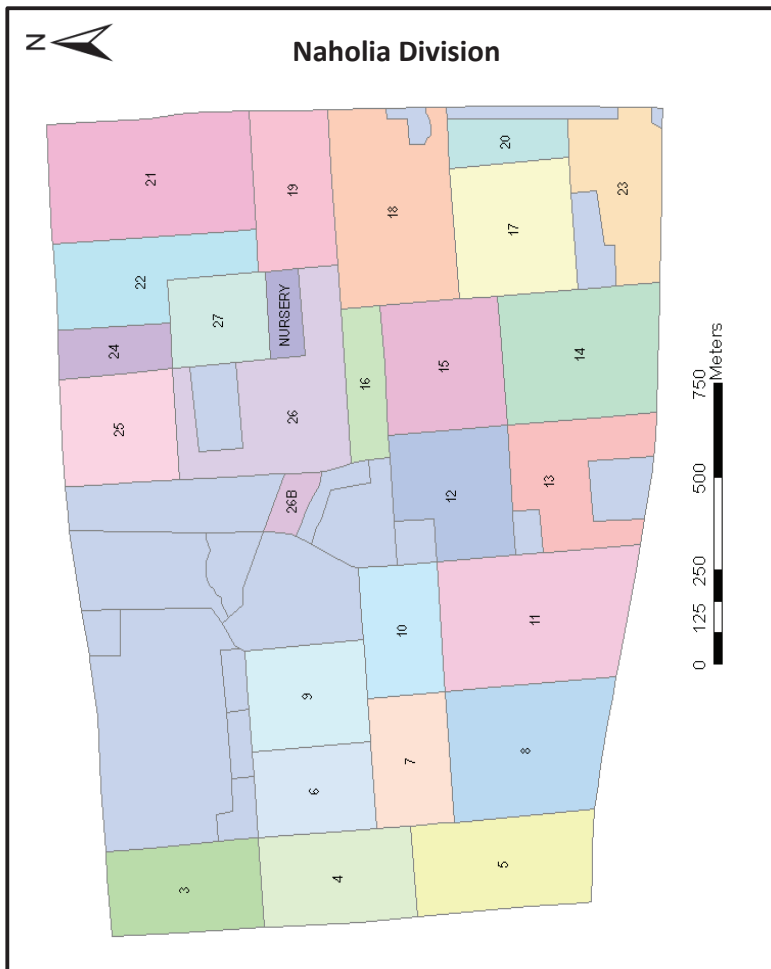




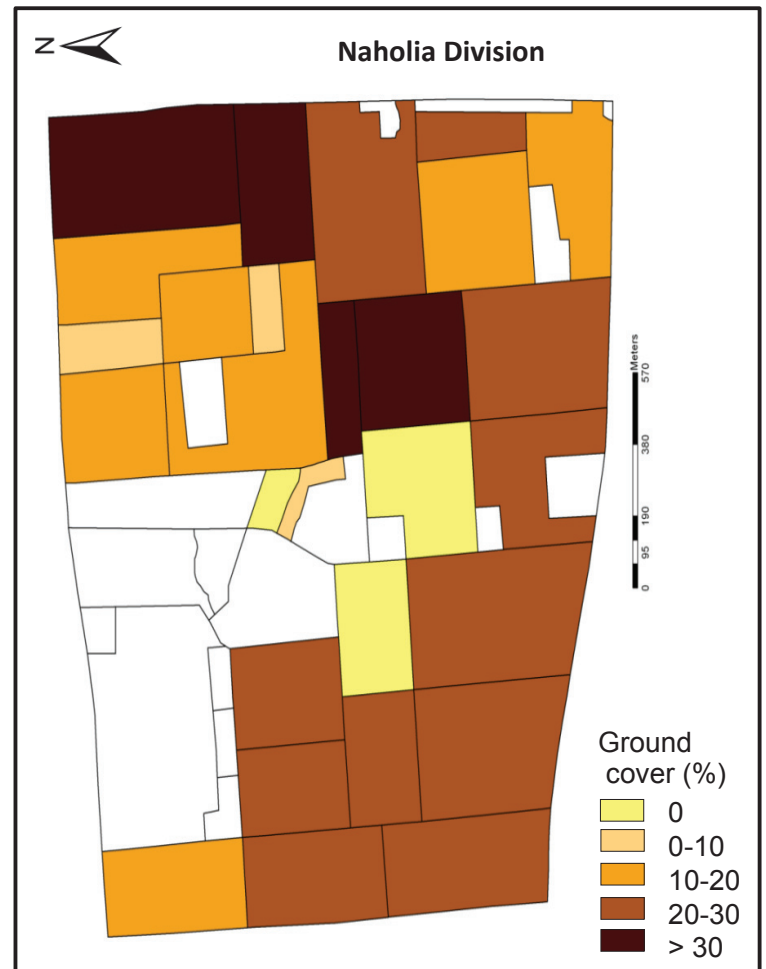
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse

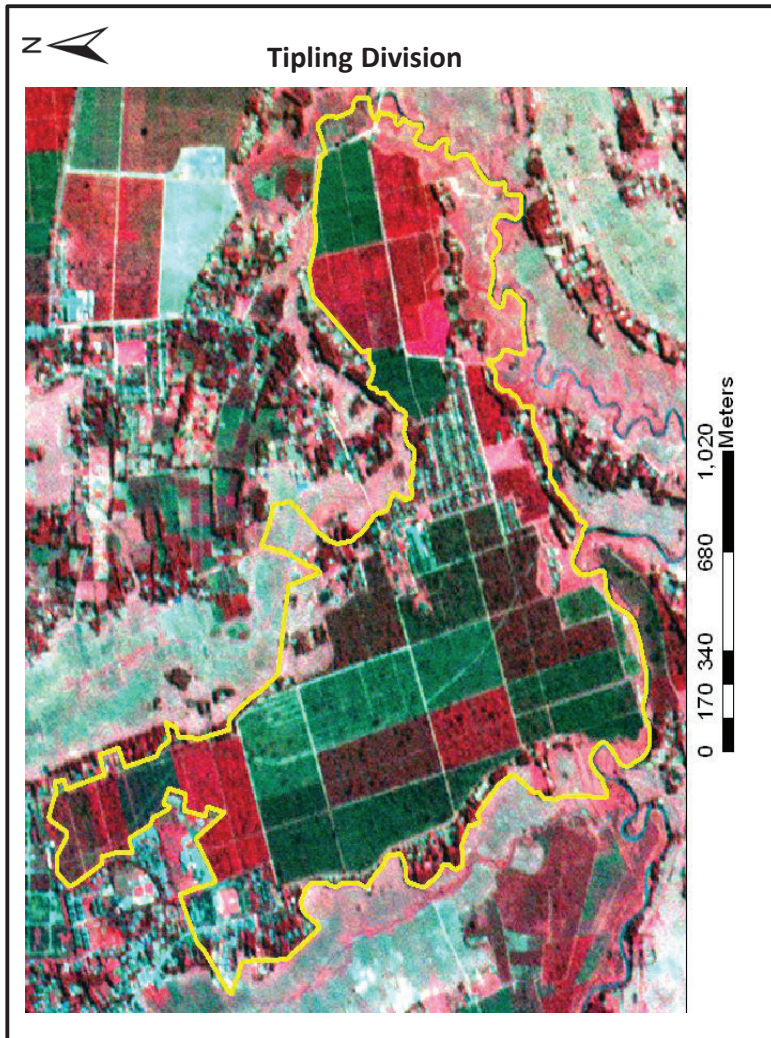


c. Section Boundaries of the Estate

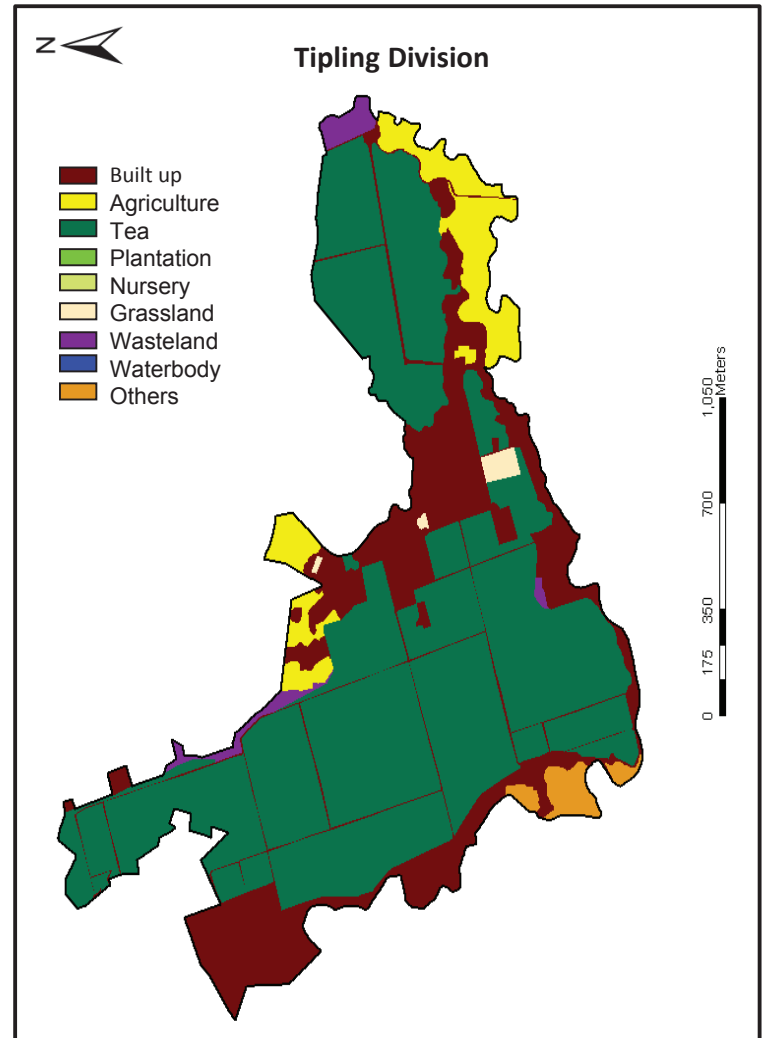


d. Shade Tree Density in Sections

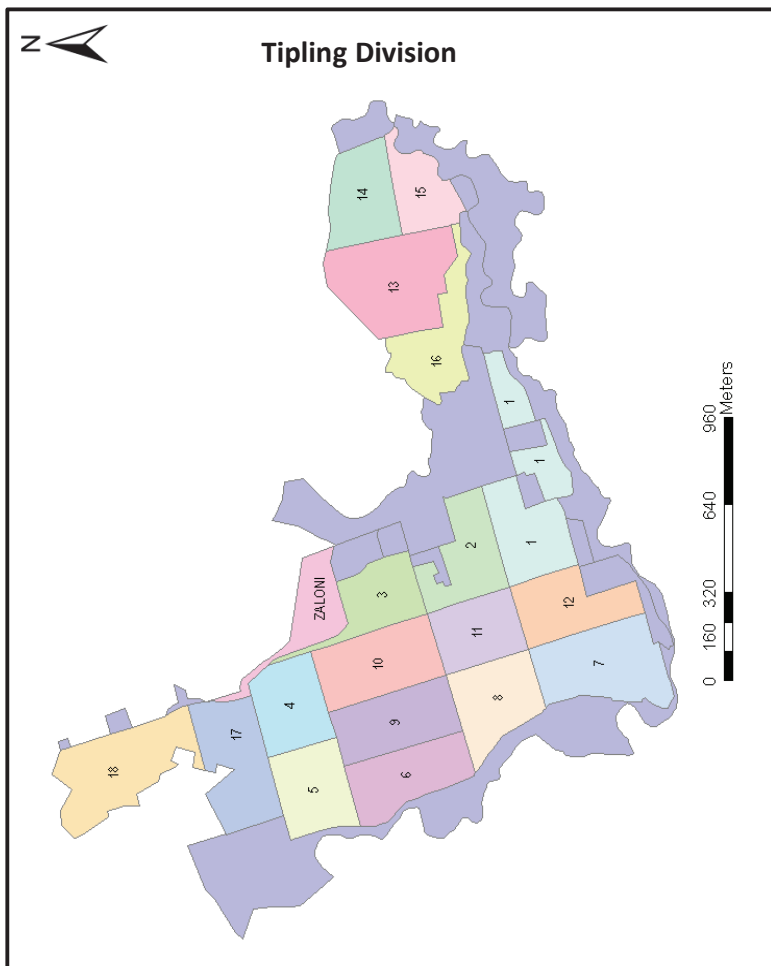




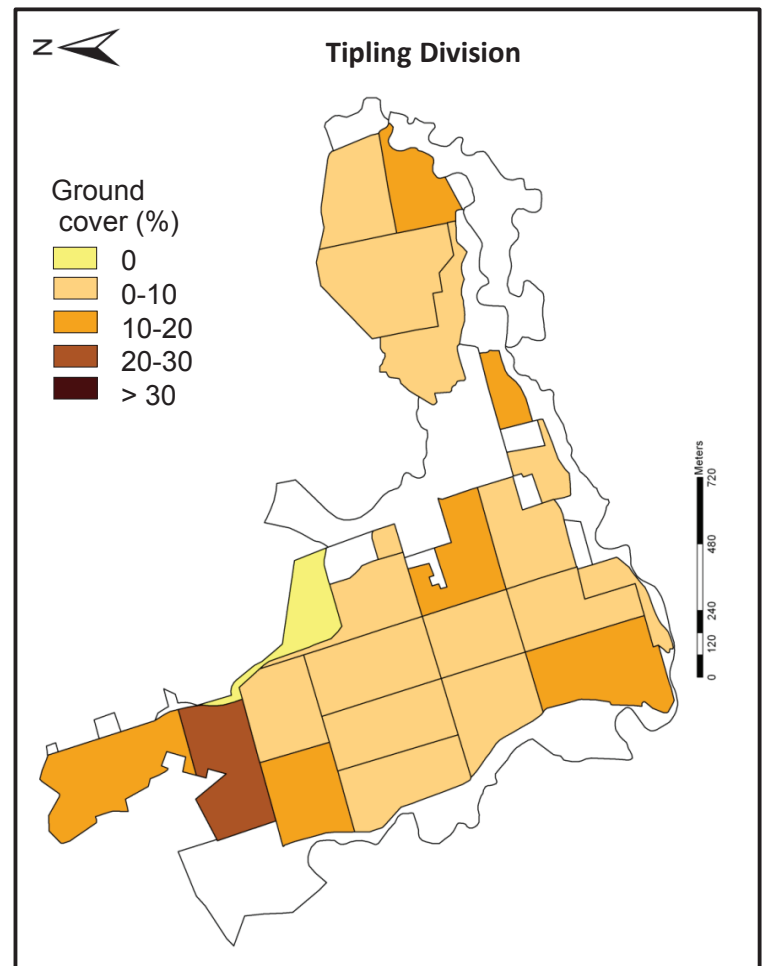
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections





Annexure 1: Dibrugarh District at a Glance

1. Administrative Set-up		4. Workers (2001)		8. Educational Institutes (as on 2007)	
District Headquarter	Dibrugarh	Main Workers	242708	Primary School	1184
No. of Sub Division	1	Marginal Workers	129711	Middle School	332
No. of Police Station (2008)	19	Non-Workers	712653	High School	156
No. of Block	7	5. Agriculture and Forest		Higher Secondary School	25
No. of Gram Panchayat	93	Crop Area (ha), 2008	220135	General College	14
No. of Post Office	219	Irrigated Area (ha), 2009	14838	University	1
No. of Villages	1348	Forest area (ha)	45275	Technical College	2
2. Area and Population (as on 2011)		6. Transport Network		9. Tea Industry (as on 2012)	
District Area (sq km)	1381	Total Road Length	4350 km	Area of Big growers (>10.12 ha) in ha	111217
Total Population	1,327,748	National Highways	72 km	Area of Small growers (<10.12 ha) in ha	20025
Male Population	680,114	State Highways	128 km	No of Big growers	263
Female Population	647,634	District Roads	535 km	No of Small growers	37700
SC Population	4%	Village Roads	3611 km	No of estate factories	158
ST Population	7%			No of bought leaf factories	145
Sex Ratio	952:1000			Production (m kg)	236
Population Density	351/sq km				
Decadal growth rate	12.04%				
Literacy rate	58.91%				
3. Climate		7. Major Rivers		10. Medical Facilities (as on 2003)	
Total rainfall (mm)	2618	Brahmaputra		Hospital	7
Mean Max Temperature (°C)	33	Lohit		Primary Health Centre	37
Mean Min Temperature (°C)	12	Dihang		Dispensary	11
		Disang		Civil Health Centre	5
		Tisa		Sub-centres	275
		Burhi Dihing			





Annexure 2: Satellite Data Used

Sl no.	Estate name	IRS LISS IV (Path-Row-date of overpass)	Cartosat-1 (Path-Row-date of overpass)
1	Achabam	101-48-08May06	620-272-16May06
2	Azizbag	101-48-16Nov06	620-272-16May06, 619-272-07Nov09
3	Balijan	101-47-08May06	620-271-16May06
4	Balijan north	101-47-16Nov06	619-270-23Jan07
5	Basmatia	101-48-16Nov06	620-272-16May06
6	Baughpara	NA	618-271-24Oct07
7	Belbari	101-46-15Feb08	620-271-16May06
8	Bijlibari	101-49-10Mar08	620-271-16May06
9	Borbari	101-46-15Feb06	620-271-16May06
10	Chubwa	101-46-15Feb08	620-271-16May06
11	Desam	101-50-10Mar08	620-272-16May06
12	Dikom	101-46-15Feb08	618-271-24Oct07
13	Dilli	101-48-08May06	620-272-16May06
14	Dinjan	NA	NA
15	Dinjoye	101-46-15Feb08	NA
16	Dirai	101-47-15Feb08	619-272-07Nov09
17	Dirial	101-49-10Mar08	620-271-16May06
18	Duliabam	101-47-15Feb08, 101-46-08Mar06	618-272-24Oct07
19	Durgapur	NA	618-271-24Oct07
20	Ghograjan	101-46-15Feb08	618-271-24Oct07
22	Ghooronia	101-46-15Feb08	618-271-24Oct07
23	Goneshbari	101-47-16Nov06	618-271-24Oct07
24	Greenwood	101-46-15Feb08	618-271-24Oct07
25	Hattiali	101-47-15Feb08	NA
26	Hazelbank	101-47-15Feb08	NA
27	Jamirah	101-46-15Feb06	618-271-24Oct07
28	Joonkatolee	101-43-24Sep07	619-272-07Nov09
29	Jutlibari	101-47-08May06	621-271-21Sep07
30	Kamakhyaabari	101-45-15Feb08, 101-46-15Feb08	618-271-24Oct07
31	Kenduguri	101-47-15Feb08, 101-48-16Nov06	619-272-07Nov09
32	Kharjan	101-45-15Feb08, 101-46-15Feb08, 101-47-16Nov06, 101-47-08May06	620-271-16May06
33	Korangani	101-48-16Nov06, 101-47-15Feb08	619-272-07Nov09
34	Lepetkatta	101-46-15Feb08	618-271-24Oct07
35	Madhuting	101-47-08May06, 101-49-10Mar08	621-271-21Sep07
36	Mahabirbari	101-47-16Nov06	620-271-16May06
37	Mahadeobari	101-47-08May06, 101-49-10Mar08	620-271-16May06
38	Maijan	101-47-20Feb07, 101-47-15Feb08	618-271-24Oct07
39	Manabarie	101-46-15Feb08	618-271-24Cct07
40	Mancotta	101-46-15Feb08	618-271-24Oct07
41	Maud	101-47-16Nov06	620-271-16May06
42	Mokalbari	101-45-15Feb08, 101-46-15Feb08	618-271-24Oct07





Sl no.	Estate name	IRS LISS IV (Path-Row-date of overpass)	Cartosat-1 (Path-Row-date of overpass)
43	Moran	NA	618-272-14Oct08
44	Nahorkutia	101-50-10Mar08	NA
45	Nahortoli	101-47-16Nov06, 101-46-15Feb08	618-271-24Oct07
46	Namroop	101-50-10Mar08	620-272-16May06
47	Nudwa	NA	NA
48	Ouphulia	101-48-16Nov06	619-272-07Nov09
49	Pipratoli	101-47-16Nov06, 101-46-15Feb08	620-271-16May06
50	Rajahalli	101-49-10Mar08	620-271-16May06
51	Rajgarh	101-47-15Feb08, 101-43-24Sep07	619-272-07Nov09
52	Romai	101-47-16Nov06	618-27124Oct07
53	Santi	101-50-10Mar08	NA
54	Sarojini	101-49-16Nov06	620-272-16May06
55	Sealkotee	101-47-16Nov06	620-271-16May06
56	Sepon	NA	NA
57	Sesa	101-46-15Feb08	618-271-24Oct07
58	Teenali	101-48-08May06	619-272-07Nov09, 620-272-16May06
59	Teloijan	101-43-24Sep07	618-272-24Oct07, 619-272-07Nov09
60	Thanai	101-46-15Feb08	NA
61	Tinkong	101-48-08May06	620-272-16May06
62	Umatara	101-50-10Mar08	620-272-16May06
63	Zaloni	101-49-10Mar08, 101-47-08May06	621-271-21Sep07, 620-271-16May06

*For Dinjan, Nudwa and Sepon IKONOS data of October, 2009 was used.





Annexure 3: Abbreviations

Sl no.	Abbreviation	Full Form
1	AIS and LUS	All India Soil and Landuse Survey
2	AWiFS	Advanced Wide Field Sensor
3	CA	Cut Across
4	CEC	Cation Exchange Capacity
5	CTC	Crush, Tear, Curl
6	DAP	Diammonium Phosphate
7	DEM	Digital Elevation Model
8	DS	Deep Skiff
9	GIS	Geographic Information System
10	GP	Gram Panchayat
11	IRS	Indian Remote Sensing Satellite
12	LISS IV	Linear Imaging Self-scanning Sensor
13	LOS	Level of Skiff
14	LP	Light Prune
15	LS	Light Skiff
16	MIS	Management Information System
17	MOP	Muriate of Potash
18	MS	Medium Skiff
19	MT	Mature Tea
20	NBSS & LUP	National Bureau of Soil Survey and Land Use Planning
21	NBSTC	North Bengal State Transport Corporation
22	NF	North-East Frontier
23	NESAC	North Eastern Space Applications Centre
24	NH	National Highway
25	NNRMS	National Natural Resources Management System
26	NRSC	National Remote Sensing Centre
27	RH	Relative Humidity
28	RP	Rock Phosphate
29	RSM	Red Spider Mite
30	SC	Scheduled Caste
31	SH	State Highway
32	SMU	Soil Mapping Unit
33	SOA	Sulphate of Ammonia
34	SOI	Survey of India
35	SP	Superphosphate
36	SRTM	Shuttle Radar Topography Mission
37	SSH	Sunshine Hours





Sl no.	Abbreviation	Full Form
38	SSP	Single Superphosphate
39	ST	Scheduled Tribe
40	TE	Tea Estate
41	TG	Tea Garden
42	TRA	Tea Research Association
43	TRI	Tea Research Institute
44	TSP	Triple Superphosphate
45	UP	Unpruned
46	UT	Untouched
47	W.soda	Washing Soda
48	WGS	World Geodetic System
49	WRR	Water Resources Region
50	YT	Young Tea
51	YTD	Young Tea Development Mixture





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