Government of India
Ministry of Commerce and Industry

TEA GARDEN ATLAS

Jalpaiguri District, West Bengal

(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

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चाय बगान मानचित्रावली

जलपाईगुड़ी जिला, पश्चिम बंगाल

(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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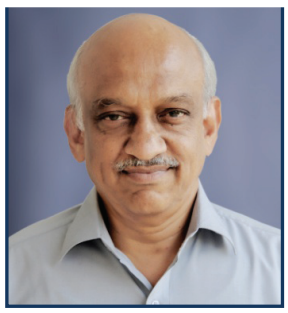

GOVERNMENT OF INDIA
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FOREWORD

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 has 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.

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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 maual 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 Senisng 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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Chairman, Tea Board of India, Ministry of Commerce and Industry, Kolkata

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डॉ. विनय कुमार डढ़वाल
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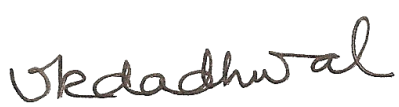
PREFACE

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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Government of India
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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 West Bengal viz. Jalpaiguri 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 atrribute 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.

Dibyendu

डॉ. दिव्येंदु दत्ता

Dr. Dibyendu Dutta

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 हैं । उद्यान भू-उपयोग, नदी के तट के कटाव क्षेत्र, खाली क्षेत्रों, चाय झाडियों आदि के स्वास्थ्य को दूर से पहचान तथा उखाड़ क्षेत्र और पुनःरोपण की निगरानी तन्त्र नहीं हैं । अब तक यह विशुद्ध रूप से मानव सर्वेक्षण हैं 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 हैं । उपग्रह सुदूर संवेदन के माध्यम से प्राप्त जानकारी भू-डाटाबेस, जो पुनः प्राप्त किया जा सकता हैं, संग्लग्न अध्ययन और आवश्यकता पर आधारित मोडेलिंग के रूप में संगृहीत किया जा सकता हैं । 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 हैं । यह प्रयोग करने की क्रिया में डाटा प्रबंधन का अभिन्न अंग हैं ।

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 estates 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 estates. 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 estates 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 an 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 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

Jalpaiguri is one of the northern districts of West Bengal (Fig. 1), shares international borders with Bhutan (north) and Bangladesh (south). Kokrajhar district of Assam lies in the eastern part and Darjeeling hills in the west and northwest. The district extends from 26°16'N to 27°00"N latitude and 88°04'E to 89°53'E longitude. It was established in 1869 with headquarter at Jalpaiguri town, which is also the divisional headquarter of North Bengal and has its special importance in respect of tourism, forest, hills, tea estates, scenic beauty and a wide variety of tribes. Area of the district is 6245 sq km, elongated in the east-west direction. The name Jalpaiguri came from the word "Jalpai" means "olive" which grew in the town and were seen even in 1900. The suffix "guri" means a place. The name as well be associated with Jalpesh, the presiding deity (Shiva) of the entire region. The district is the gateway to the entire North-Eastern States and Bhutan. The area is dotted by several national parks and wildlife sanctuaries which attract lot of tourist from all over India and abroad making an important contributor to the economy and also employs large number of people in the service sector. Famous wildlife sanctuaries and national park viz. Jaldapara Wildlife Sanctuary, Buxa National Park, Gorumara National Park, Chapramari Wildlife Reserve, and the Mahananda Wildlife Sanctuary are worth mentioning.

Altogether 128 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 is presented in Table 1.

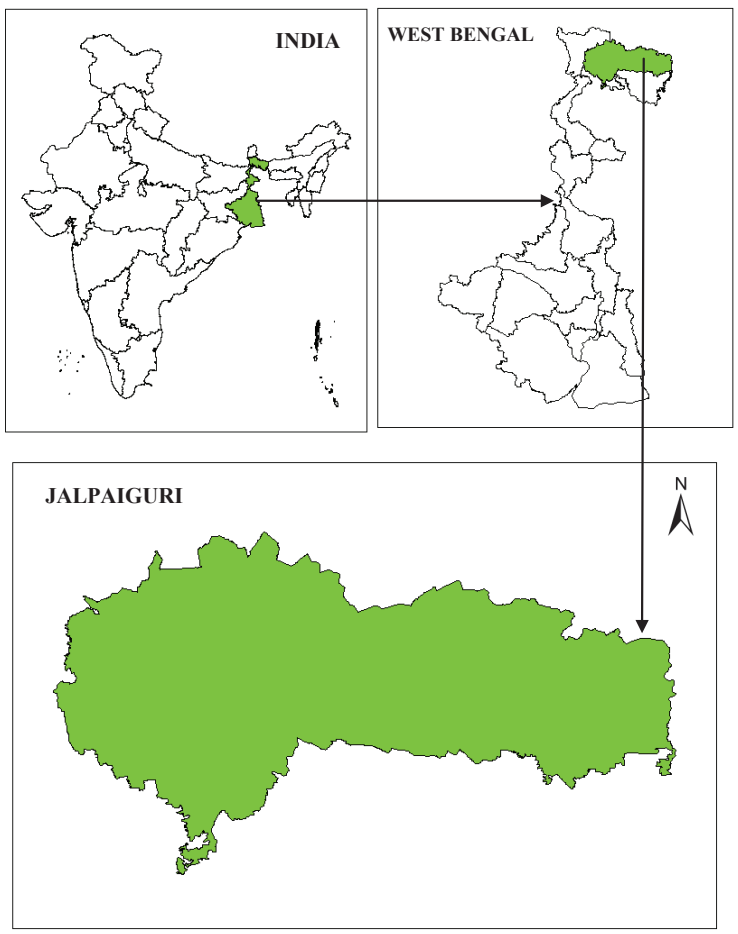


Fig. 1: Location of the Study Area

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

Sl no.	Estate name	Latitude		Longitude		SOI Topomap reference	Area (ha)
		From (dd mm ss)	To (dd mm ss)	From (dd mm ss)	To (dd mm ss)		
1	Aibheel	26 50 53	26 55 09	88 46 02	88 48 11	78B13	1390.40
2	Amarpur	26 25 36	26 27 03	88 40 49	88 41 28	78B11	88.43
3	Ambari	26 51 04	26 53 36	89 02 24	89 03 49	78F01	721.04
4	Anandapur	26 44 15	26 46 24	88 39 39	88 41 16	78B09, 78B10	553.09
5	Bagrakote	26 51 50	26 53 28	88 34 13	88 36 12	78B09	595.50
6	Baintgoorie	26 47 48	26 50 50	88 40 51	88 43 27	78B09	1004.79
7	Bamandanga Tondoo	26 43 57	26 49 01	88 52 21	88 54 21	78B13, 78B14	688.71
8	Banarhat	26 46 50	26 48 40	89 01 22	89 03 42	78F01	819.69
9	Baradighi	26 47 03	26 48 59	88 45 34	88 48 49	78B13	888.81
10	Batabari	26 48 56	26 52 14	88 46 59	88 48 46	78B13	428.53
11	Beech	26 43 53	26 47 03	89 19 39	89 21 43	78F05, 78F06	960.81
12	Bhandiguri	26 37 19	26 38 35	88 36 13	88 38 29	78B10	408.31
13	Bharnobari	26 44 02	26 46 12	89 20 59	89 23 26	78F05, 78F06	873.92
14	Bhatkowa	26 38 58	26 40 24	89 26 03	89 29 31	78F06	783.36
15	Bhatpara	26 42 40	26 45 47	89 27 01	89 29 09	78F05, 78F06	1289.51
16	Bhogotpore	26 52 44	26 55 01	88 54 20	88 56 20	78B13	829.63
17	Binaguri	26 44 55	26 46 54	88 02 14	89 04 07	78F01	730.27
18	Birpara	26 39 27	26 43 08	89 06 13	89 09 44	78F02	1490.60
19	Carron	26 52 53	26 56 13	88 58 44	89 00 48	78B13, 78F01	518.18
20	Central Dooars	26 47 17	26 49 59	89 24 49	89 28 08	78B13	1189.45
21	Chalouni	26 57 11	26 58 43	88 46 06	88 48 08	78F05	760.48
22	Chinchula	26 40 06	26 42 46	89 28 28	89 30 14	78F06, 78F10	876.02
23	Choonabhuti	26 50 58	26 52 19	89 03 36	89 05 29	78F01	557.50
24	Chuapara	26 43 18	26 45 47	89 25 34	89 27 58	78F05, 78F06	948.72
25	Chuniajhora	26 38 53	26 40 42	89 39 53	89 41 47	78F10	440.96
26	Dalgaon	26 39 25	26 41 22	89 08 21	89 10 03	78F02	679.68
27	Damdim	26 48 24	26 51 09	88 39 02	88 41 53	78B09	1176.53
28	Debipur	26 45 04	26 45 51	88 40 53	88 41 42	78B09	92.66
29	Debpara	26 49 25	26 50 43	88 58 59	89 02 19	78B13, 78F01	748.92
30	Demdima	26 40 30	26 43 04	89 05 57	89 07 49	78F02	1144.08
31	Denguajhar	26 32 57	26 35 51	88 39 01	88 42 12	78B10	1033.54
32	Dharanipur	26 51 56	26 53 30	88 59 02	89 01 42	78B13, 78F01	365.71
33	Dhowlajhora	26 32 46	26 35 12	89 41 52	89 43 18	78F06	575.94
34	Dima	26 39 51	26 41 31	89 25 28	89 29 17	78F01, 78F02	1003.66
36	Ellenbarie	26 51 03	26 52 31	89 30 40	88 32 27	78B09	352.23
37	Engo	26 57 15	26 58 08	88 45 26	88 46 09	78B13	151.36
38	Ethelbarie	26 38 10	26 40 57	89 04 33	89 05 35	78F02	377.61
39	Gairkhata	26 39 40	26 43 32	89 00 23	89 01 52	78F02	1068.87
40	Gandrapara	26 46 54	26 48 46	88 58 54	89 01 34	78B13, 78F01	1009.59
41	Garganda	26 46 01	26 47 18	89 12 35	89 15 29	78F01, 78F05	724.17
42	Goodhope	26 51 05	26 52 12	88 40 12	88 42 26	78B09	646.61
43	Gopalpur	26 41 39	26 43 46	89 09 50	89 12 12	78F02	880.11
44	Gopimohan	26 50 30	26 51 18	89 22 37	89 23 24	78F05	52.29
45	Gurjangjhora	26 53 17	26 54 49	88 42 52	88 44 15	78B09	325.76

Sl no.	Estate name	Latitude		Longitude		SOI Topomap reference	Area (ha)
		From (dd mm ss)	To (dd mm ss)	From (dd mm ss)	To (dd mm ss)		
46	Haldibari	26 43 24	26 46 05	89 00 28	89 02 05	78F01, 78F02	1147.82
47	Hantapara	26 43 55	26 46 06	89 14 29	89 16 35	78F05, 78F06	967.60
48	Hope	26 57 05	26 57 56	88 53 21	88 57 09	78B13	573.58
49	Indong	26 54 31	26 56 01	88 48 04	88 50 29	78B13	804.34
50	Jadabpur	26 42 53	26 44 36	88 50 18	88 51 26	78B14	313.17
51	Jainti	26 40 37	26 42 18	89 41 09	89 43 26	78B14	819.14
52	Jaldacca altadanga	26 42 18	26 44 01	88 53 10	88 54 30	78F10	378.95
53	Jalpara	26 47 53	26 49 08	88 57 50	88 58 57	78B13	196.74
54	Jiti	26 57 24	26 59 33	88 54 01	88 57 15	78B13	935.19
55	Jogesh Chandra	26 41 41	26 44 09	88 39 03	88 41 43	78B10	479.57
56	Joybirpara	26 44 16	26 45 56	89 05 53	89 07 01	78F01, 78F02	320.36
57	Kailashpur	26 44 25	26 45 56	88 38 23	88 39 42	78B09, 78B10	412.08
58	Kalabari	26 46 03	26 47 40	88 55 42	88 57 14	78B13	418.03
59	Karala valley	26 32 05	26 33 37	88 39 51	88 41 33	78B10	314.94
60	Karballa	26 46 44	26 48 29	89 02 52	89 05 38	78F01	1048.65
61	Kartick	26 37 39	26 39 36	89 42 51	89 45 14	78F10, 78F14	555.51
62	Kathaldhura	26 51 32	26 52 06	88 56 21	88 57 22	78F14	92.38
63	Killcott	26 53 16	26 54 40	88 47 44	88 49 45	78B13	648.97
64	Kohinoor	26 32 15	26 35 27	89 41 00	89 43 13	78F10	690.75
65	Kumargram	26 38 26	26 40 49	89 48 54	89 50 32	78F14	898.42
66	Kumlai	26 49 46	26 51 12	88 39 59	88 42 30	78B09	627.40
67	Kurti	26 54 06	26 57 11	88 55 17	88 57 07	78B13	754.61
68	Lakhikanta	26 40 22	26 42 18	88 55 30	88 56 59	78B14	424.05
69	Lakhipara	26 48 04	26 50 06	88 58 36	89 02 09	78B14, 78F01	948.16
70	Lankapara	26 46 50	26 48 59	89 12 29	89 15 14	78F01, 78F05	1183.47
71	Lessriver	26 49 43	26 52 14	88 33 50	88 35 52	78B09	856.58
72	Looksun	26 52 43	26 55 19	88 56 49	88 59 03	78B13	920.26
73	Madhu	26 41 48	26 44 00	89 22 30	89 23 45	78F06	427.18
74	Majherdabri	26 31 22	26 33 26	89 30 38	89 33 53	78F10	447.57
75	Malnuddy	26 54 05	26 54 48	88 43 21	88 44 29	78B09	126.66
76	Manabarie	26 52 06	26 54 16	88 36 37	88 38 34	78B09	454.70
77	Matelli	26 56 22	26 57 50	88 48 00	88 51 24	78B13	1062.30
78	Mathura	26 29 34	26 32 36	89 22 57	89 25 12	78F06, 78F07	977.26
79	Mechapara	26 42 41	26 44 40	89 25 08	89 27 35	78F06	683.47
80	Meenglass	26 54 45	26 55 39	88 40 10	88 44 35	78B09	938.94
81	Mogalkata	26 45 15	26 47 57	88 57 11	88 58 33	78B13	610.52
82	Moraghat	26 45 58	26 46 58	89 00 19	89 02 41	78F01, 78F02	603.17
83	Mujnai	26 42 40	26 44 22	89 13 17	89 15 59	78F02, 78F06	678.82
84	Nagrakata	26 52 54	26 56 27	88 53 08	88 55 12	78B13	895.06
85	Nangdala	26 42 58	26 45 16	89 06 06	89 07 45	78F01, 78F02	577.60
86	Nedam	26 52 24	26 54 33	88 42 39	88 44 18	78B09	316.02
87	Nepuchapur	26 46 30	26 48 13	88 43 08	88 44 53	78B09	417.81
88	New Dooars	26 49 19	26 51 11	89 02 11	89 04 49	78F01	997.18
89	New lands	26 38 48	26 40 51	89 47 34	89 49 18	78F14	816.34
90	Newglenceco	26 50 05	26 52 10	88 42 06	88 44 22	78B09	521.70
91	Nimtijhora	26 33 35	26 35 42	89 25 26	89 26 50	78F06	489.82

Sl no.	Estate name	Latitude		Longitude		SOI Topomap reference	Area (ha)
		From (dd mm ss)	To (dd mm ss)	From (dd mm ss)	To (dd mm ss)		
92	Nowera nuddy	26 42 42	26 44 33	88 43 53	88 45 33	78B10, 78B14	552.52
93	Oodlabari	26 48 49	26 50 57	88 35 55	88 38 11	78B09	701.83
94	Palashbari	26 48 26	26 49 27	89 02 06	89 03 53	78F01	431.69
95	Patkapara	26 31 26	26 33 53	89 25 34	89 27 41	78F06	556.87
96	Phaskowa	26 40 37	26 41 42	89 39 37	89 41 05	78F10	265.70
97	Putharjhora	26 55 35	26 57 57	88 38 13	88 39 49	78B09	558.23
98	Radharani	26 45 37	26 46 17	89 26 26	89 28 49	78F05	218.97
99	Raghuutkarsh	26 44 59	26 46 16	88 40 32	88 41 34	78B09	83.21
100	Rahimabad	26 39 43	26 40 44	89 40 46	89 43 42	78F10	737.99
101	Rahimpur	26 42 36	26 44 36	89 04 40	89 06 03	78F02	326.86
102	Raipur	26 35 30	26 36 47	88 39 36	88 40 57	78F02	284.71
103	Raja	26 50 13	26 52 56	88 42 59	88 45 01	78B09, 78B13	648.00
104	Rheabari	26 48 16	26 49 23	89 03 24	89 05 30	78F01	468.41
105	Rydak	26 35 11	26 38 26	89 43 31	89 46 29	78F10, 78F14	1282.79
106	Samsing	26 57 45	26 59 35	88 47 09	88 50 11	78B13	709.30
107	Sankos	26 38 20	26 40 46	89 50 25	89 52 17	78F14	864.45
108	Saraswatipur	26 43 40	26 45 40	88 32 13	88 33 51	78B09, 78B10	365.51
109	Sarugaon	26 34 27	26 37 24	89 04 52	89 07 04	78F02	553.92
110	Satali	26 42 42	26 44 51	89 19 42	89 23 28	78F06	1115.87
111	Shikarpur	26 36 18	26 38 28	88 32 55	88 36 27	78B10	823.83
112	Singhania	26 42 52	26 44 40	89 08 53	89 10 26	78F02	339.02
113	Sonali	26 48 51	26 50 53	88 33 46	88 35 17	78B09	292.32
114	Soongachi	26 51 37	26 55 34	88 44 29	88 46 06	78B09,78B13	933.77
115	Srinathpur	26 31 57	26 33 37	89 36 58	89 38 29	78F10	320.24
116	Subhasini	26 41 08	26 43 48	89 19 46	89 20 47	78F06	475.87
117	Sylee	26 50 56	26 51 48	88 38 33	88 40 20	78B09	280.95
118	Tasati	26 38 00	26 39 32	89 07 43	89 09 39	78F02	598.10
119	Telepara	26 42 22	26 45 08	89 01 53	89 03 45	78F01, 78F02	1154.41
120	Toonbarie	26 52 22	26 54 08	88 43 52	88 45 01	78B09	254.24
121	Torsa	26 48 19	26 50 16	89 20 56	89 23 21	78F05	634.80
122	Totapara	26 46 08	26 48 47	88 57 45	88 59 39	78B13	519.24
123	Tulsipara	26 46 11	26 48 14	89 10 33	89 12 39	78F01	684.73
124	Turturi	26 38 19	26 40 14	89 44 11	89 45 55	78F10, 78F14	462.31
125	Uttarsalbari	26 46 02	26 46 42	88 56 54	88 57 36	78B13	74.96
126	Washabarie	26 49 58	26 52 57	88 32 04	88 33 38	78B09	721.62
127	Yongtong	26 57 45	26 58 52	88 48 45	88 50 54	78B13	474.80
128	Zurantee	26 54 44	26 57 19	88 45 30	88 47 17	78B13	724.08

2.2 Climate

The district falls in super humid mountain slope and Terai region and experiences three seasons, namely Summers, Monsoon and Winter. Summers are mild and constitute a very short period of the year. Monsoon which generally starts from the middle of May and continues till the end of September is very severe with high amount of rainfall, sometimes stalling all life and activities. Winters are quite severe and chilly with foggy mornings and nights and cold Himalayan winds blow from north. The normal minimum temperature

during January is 12°C but there are large variations across the years as is seen in Table 2. Mean monthly maximum temperature reaches around 37°C during summer (April to September). The average annual rainfall is 3653 mm and the average relative humidity is about 82%. Month-wise rainfall distribution during 1999 to 2010 along with normal values is given in Table 3. Highest rainfall occurs in the month of July. In the Table 3 the highest rainfall year was 2010 (4146.2 mm) and minimum rainfall occurred in the year of 2002 i.e. 2932 mm. Mean monthly maximum and minimum temperature and rainfall is given in Fig. 2.

Table 2: Month-wise Maximum and Minimum Temperature (°C) in Different Years

Month	Normal		2001		2002		2003		2004		2005		2006		2007		2008	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
January	**24**	**12**	27	1	27	10	28	5	27	9	27	11	28	9	28	8	27	9
February	**27**	**15**	31	11	31	10	29	11	31	9	32	12	30	12	28	10	28	9
March	**30**	**18**	33	2	35	15	33	11	37	16	34	16	35	15	35	13	33	15
April	**32**	**21**	37	17	33	15	35	13	35	19	34	17	37	17	36	18	35	17
May	**31**	**23**	36	20	36	22	36	21	37	20	35	20	37	20	37	20	36	20
June	**33**	**24**	36	21	33	22	36	22	37	23	37	21	36	23	28	22	36	23
July	**32**	**25**	35	25	36	23	38	23	35	23	37	23	36	23	36	23	36	23
August	**32**	**25**	36	24	35	23	36	25	37	24	36	23	37	23	38	23	37	23
September	**34**	**25**	34	23	36	22	38	24	35	23	37	23	36	21	36	23	36	22
October	**30**	**21**	33	19	35	18	34	20	35	18	34	17	35	17	35	20	35	18
November	**30**	**16**	31	13	33	16	32	14	33	14	33	14	33	13	32	14	33	13
December	**28**	**13**	27	10	32	11	30	10	31	8	29	10	29	11	29	10	31	12

Source: India Meteorological Department and http://wbagrimarketingboard.gov.in

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

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1999	2	0	8	167	394	590	1060	948	250	313	4	0	3736.0
2000	3	17	15	152	400	1021	818	694	414	141	58	0	3733.0
2001	2	0	42	112	385	529	473	626	523	473	35	5	3205.0
2002	26	0	94	244	167	471	1319	145	343	116	2	5	2932.0
Year	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**
2003	8	61	103	202	260	630	1234	432	550	314	24	24	3842.0
2006	0	15.4	16	99	386.1	663.5	741.2	299.8	672.5	199.9	21.7	5.6	3120.7
2007	0	68	24.7	209.4	260	583.6	919.3	676.2	689.7	73.5	2.8	0.6	3507.8
2008	13.6	5.5	64.6	134.9	226.8	672	959.2	1045.8	321.5	98.8	12.9	3.7	3559.3
2009	0	0	33.5	153.9	258.2	656.2	698.5	746.3	263.8	322.5	2.5	2.4	3137.8
2010	0	3.1	43	225.8	420.8	873.1	1164.7	783.7	552.7	73.7	5.6	0	4146.2
Normal	**14**	**16**	**50**	**137**	**350**	**699**	**968**	**640**	**453**	**195**	**24**	**17**	**3653.0**

Source: India Meteorological Department

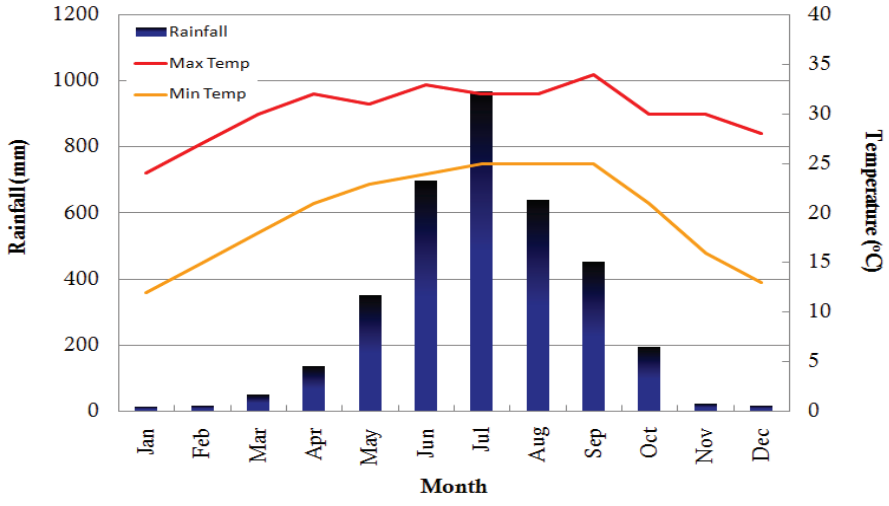


Fig. 2: Normal Monthly Mean Maximum, Minimum Temperature and Rainfall

2.3 Physiography, Slope and Aspect

2.3.1 Physiography

Jalpaiguri district is bounded in the North by the hill ranges of the Himalayan and the South by the piedmont plains, which gradually grade into the alluvial plains further south. This district exhibits a diversity of sediment and soil colour. As evidenced by the huge size of the boulders they display later fluvial activity in the terraces and later deposits besides a plethora of distributaries. Rill and gully erosion over a long period of time has produced an undulating surface of ancient deposits. In the north they consist mainly of pebble to quartzite overlain by finer water lain deposit. Later fluvial deposits ranging mainly from cobble to clay size material overlaid the area.

The geological milieu in the district represents the sub-Himalayas or the foothill zone consist almost entirely of the Siwaliks and typical formation of Quaternary and recent sediments. The upper part of the district mainly consists of Siwalik and older Quaternary formation, which are dominated by thick boulder and conglomerated horizons. The lower portion occurs as a fluvial terrace deposit. The recent sediments mainly represent thick piles of fluvial, unconsolidated sediments. The various faulting occur in this region. The time of faulting ranges from Pliocene to Recent with some of the structures assumed to be seismically active. The tectonic activity has played the pivotal role in creating the elevations and depression has had both a direct and indirect effect on the erosion and depositional aspect and drainage networks in the region, which persist even today. The Digital Elevation Model (DEM) of the district is given in Fig. 3. Horizontally half of the district is monotonously flat and northern margin of the upper half is quite steep. As a result the rivers descending from Bhutan enters the district with enormous speed with large volume of sediment load is left behind causing periodic flooding and uplifting of the river bed which leads to changes in the rivers course over the years.

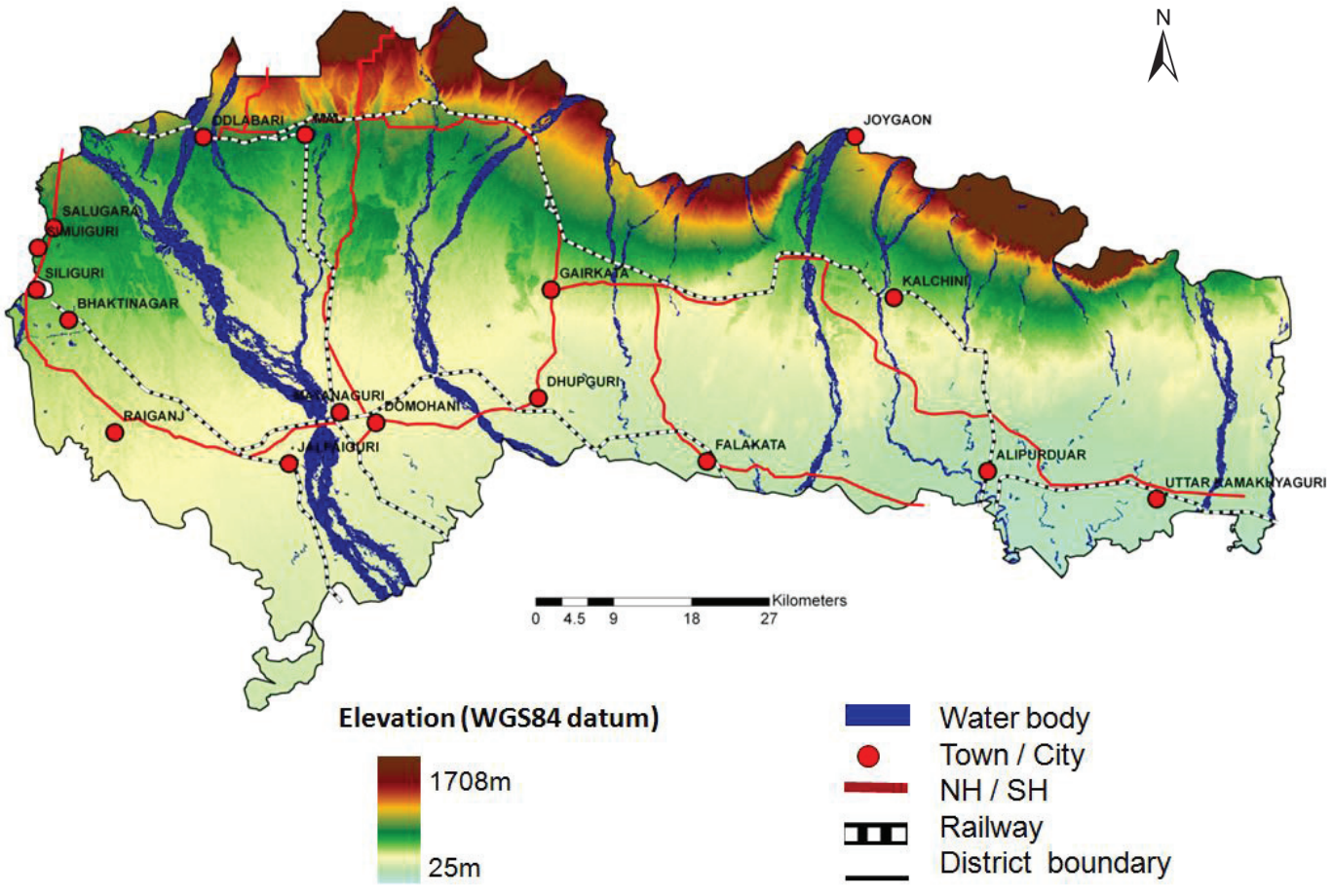


Fig. 3: Digital Elevation Model

2.3.2 Slope and Aspect

Most of the area (66.20% area) of the district is plain i.e. slope varies between 0-1%. In the north-eastern part steeper slopes are prevalent where the slope is as high >35%. Steep to very steep slope accounts for 2.18% are of the district. Maximum elevation is 1895 m and minimum is 25 m with average value of 125 m as per WGS 84 datum. The aspect direction is mostly intermixed, however in the north of the district have predominantly east and south-east facing slopes. Area under different slope and aspect classes is given in Table 4 and their spatial distribution is given in Fig.4 and Fig. 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	4131.83	66.16	1	N	440.90	7.06
2	1-3	1162.58	18.62	2	NNE	637.27	10.20
3	3-5	222.88	3.57	3	E	788.02	12.62
4	5-10	119.53	1.91	4	ESE	1059.75	16.97
5	10-15	29.45	0.47	5	S	1019.27	16.32
6	15-35	63.09	1.01	6	SSW	895.50	14.34
7	> 35	69.27	1.11	7	W	583.87	9.35
Waterbody	-	446.37	7.15	8	NNW	374.04	5.99
					Waterbody	446.37	7.15

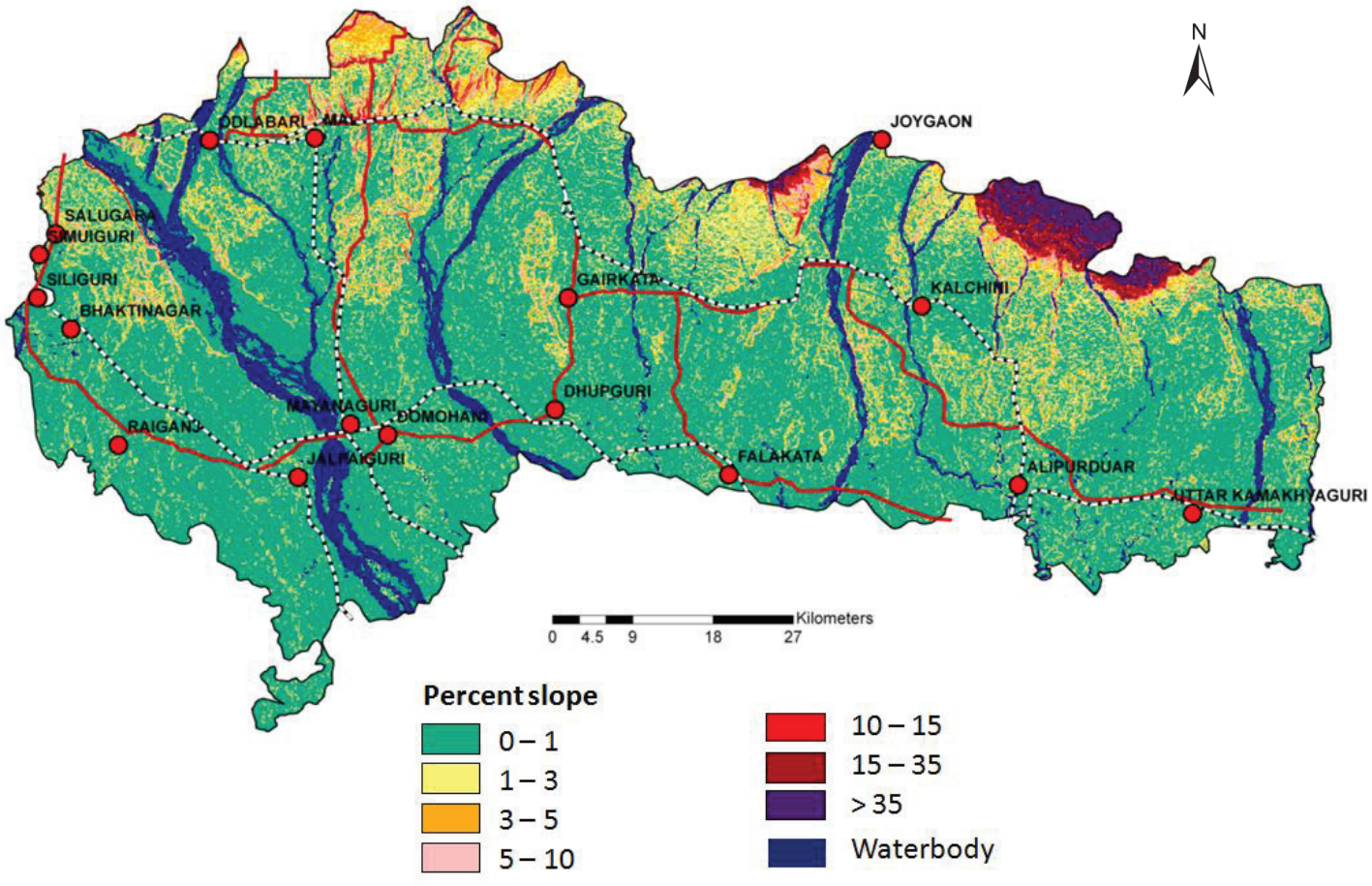


Fig. 4: Slope Classes in Percentage

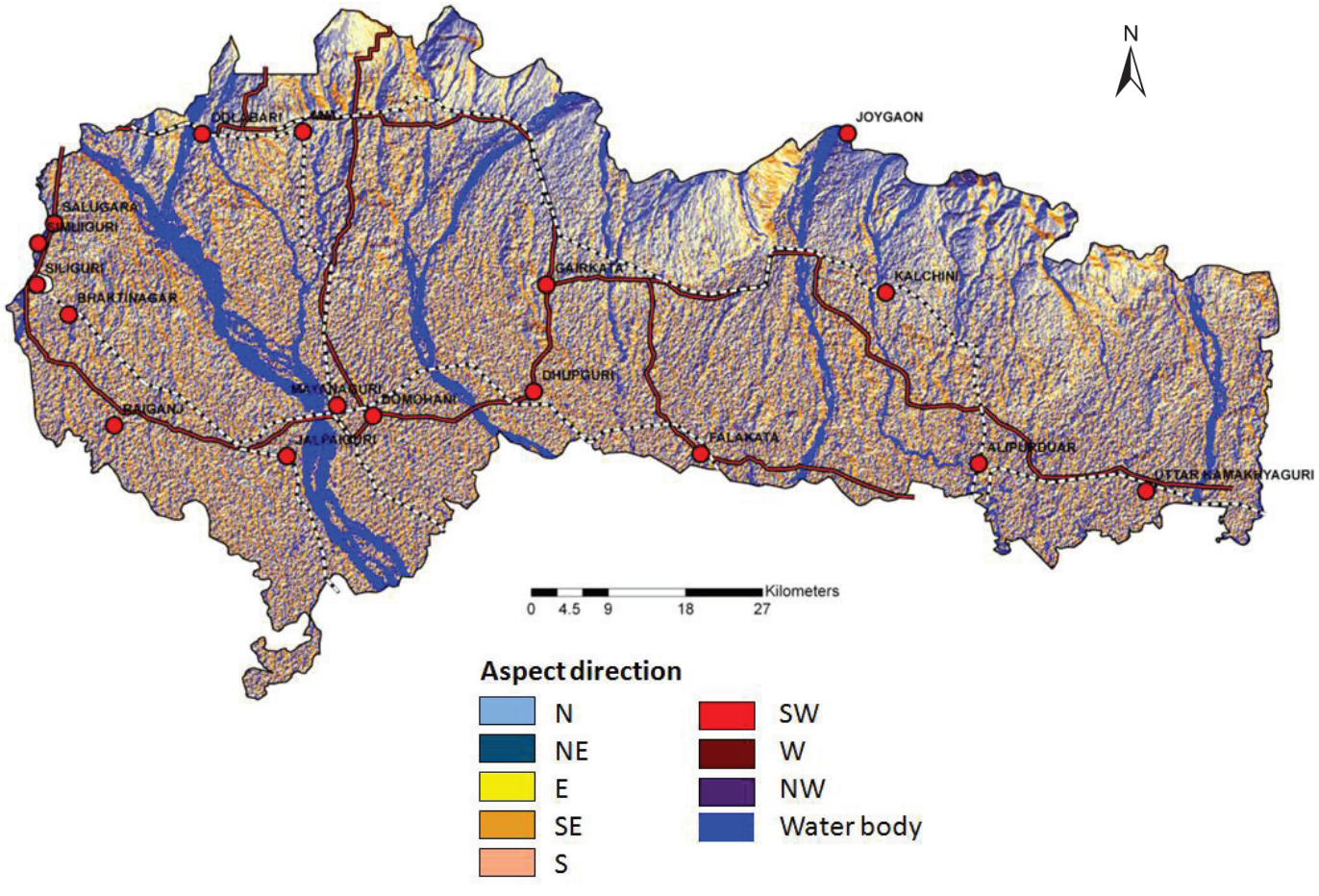


Fig. 5: Aspect Direction

Tea estate-wise maximum and minimum elevation with mean values is given in Table 5.

Table 5: Estate-wise Maximum, Minimum and Mean Elevation (WGS 84 datum)

Sl no.	Estate name	Max (m)	Min (m)	Mean (m)	Sl no.	Estate name	Max (m)	Min (m)	Mean (m)
1	Aibheel	267	133	172.94	65	Kumargram	127	83	99.04
2	Amarpur	81	71	76.33	66	Kumlai	159	129	142.94
3	Ambari	288	211	245.10	67	Kurti	434	213	307.03
4	Anandapur	119	104	111.27	68	Lakhikanta	103	90	97.02
5	Bagrakote	212	154	175.90	69	Lakhipara	188	152	171.33
6	Baintgoorie	139	113	125.54	70	Lankapara	416	252	331.29
7	Bamandanga Tondoo	134	101	112.66	71	Lessriver	177	133	158.55
8	Banarhat	188	150	161.28	72	Looksun	329	183	231.80
9	Baradighi	147	110	126.80	73	Madhu	136	109	119.31
10	Batabari	164	121	145.04	74	Majherdabri	60	44	54.95
11	Beech	151	118	135.97	75	Malnuddy	246	190	232.06
12	Bhandiguri	103	90	98.07	76	Manabarie	200	156	174.73
13	Bharnobari	160	129	140.11	77	Matelli	392	258	312.43
14	Bhatkowa	108	86	98.17	78	Mathura	66	51	59.14
15	Bhatpara	211	135	163.15	79	Mechapara	155	120	142.36
16	Bhogotpore	302	172	233.02	80	Meenglass	272	202	229.68
17	Binaguri	167	130	146.51	81	Mogalkata	144	112	128.07

Sl no.	Estate name	Max (m)	Min (m)	Mean (m)	Sl no.	Estate name	Max (m)	Min (m)	Mean (m)
18	Birpara	121	81	97.08	82	Moraghat	160	130	147.38
19	Carron	416	195	284.57	83	Mujnai	156	95	114.42
20	Central Dooars	346	187	252.80	84	Nagrakata	353	169	280.77
21	Chalouni	463	341	393.03	85	Nangdala	155	116	126.69
22	Chinchula	141	102	120.26	86	Nedam	245	153	216.24
23	Choonabhuti	269	227	247.46	87	Nepuchapur	122	105	111.45
24	Chuapara	211	137	158.84	88	New Dooars	240	186	211.89
25	Chuniajhora	142	89	118.57	89	New lands	121	88	101.36
26	Dalgaon	99	78	90.13	90	Newglenceco	157	125	144.16
27	Damdim	160	121	137.35	91	Nimtijhora	78	63	69.11
28	Debipur	115	108	111.10	92	Nowera nuddy	109	94	102.21
29	Debpara	199	164	181.40	93	Oodlabari	154	127	146.20
30	Demdima	123	90	105.53	94	Palashbari	196	173	185.94
31	Denguajhar	96	82	89.22	95	Patkapara	70	52	61.82
32	Dharanipur	258	186	209.95	96	Phaskowa	209	124	148.28
33	Dhowlajhora	73	59	67.48	97	Putharjhora	381	213	255.24
34	Dima	123	93	110.81	98	Radharani	223	176	202.42
35	Dumchipara	228	146	181.55	99	Raghuutkarsh	116	107	111.49
36	Ellenbarie	175	127	148.54	100	Rahimabad	131	95	108.31
37	Engo	411	290	338.10	101	Rahimpur	138	110	123.28
38	Ethelbarie	100	76	90.26	102	Raipur	99	89	92.95
39	Gairkhata	115	77	96.98	103	Raja	191	127	153.70
40	Gandrapara	170	139	154.28	104	Rheabari	206	183	195.31
41	Garganda	275	211	239.76	105	Rydak	103	68	78.04
42	Goodhope	173	136	156.24	106	Samsing	560	351	456.75
43	Gopalpur	140	91	108.45	107	Sankos	114	80	93.64
44	Gopimohan	330	192	215.81	108	Saraswatipur	147	117	125.46
45	Gurjangjhora	248	200	235.25	109	Sarugaon	80	64	70.45
46	Haldibari	145	105	125.08	110	Satali	139	112	122.63
47	Hantapara	222	113	174.07	111	Shikarpur	107	91	99.26
48	Hope	470	253	372.31	112	Singhania	163	114	133.13
49	Indong	268	201	239.79	113	Sonali	157	121	144.86
50	Jadabpur	111	97	101.20	114	Soongachi	238	142	203.91
51	Jainti	210	107	125.23	115	Srinathpur	58	49	53.39
52	Jaldacca altadanga	111	95	102.95	116	Subhasini	125	98	111.76
53	Jalpara	156	135	147.24	117	Sylee	165	146	154.53
54	Jiti	504	273	356.31	118	Tasati	90	73	81.07
55	Jogesh Chandra	115	94	107.79	119	Telepara	138	102	129.53
56	Joybirpara	163	132	149.82	120	Toonbarie	236	157	180.20
57	Kailashpur	128	107	110.79	121	Torsa	218	159	182.63
58	Kalabari	136	112	123.70	122	Totapara	155	123	140.42
59	Karala valley	91	79	86.01	123	Tulsipara	306	220	272.07
60	Karballa	195	156	176.63	124	Turturi	111	88	98.18
61	Kartick	109	83	92.44	125	Uttarsalbari	125	116	120.25

62	Kathaldhura	173	154	163.81	126	Washabarie	197	124	152.95
63	Killcott	263	175	226.85	127	Yongtong	438	291	358.13
64	Kohinoor	73	55	63.32	128	Zurantee	361	210	282.09

The elevations are based on SRTM data of WGS 84 datum

2.4 Soils

The soils of Jalpaiguri district falls in two Agro-ecological regions viz. warm to hot perhumid Terai soils of the Himalayan foot hills with warm summer, cool winter and high rainfall. Soils are partly developed, mainly formed of young alluvium on alluvial fans of the foothills, shallow to moderately deep and at places deep with medium to find texture, faces severe flood hazards and runoff problem associated with low water holding capacity of the soils resulting in low pH due to percolation of the alkaline salts and consequent low decomposition of organic matter. The soils contains high amount of un-decomposed organic matter, low in available nitrogen and phosphorus and potassium is normally high. Geographically this type of soil is found in the northern fringe of the district. The second region falls in hot perhumid alluvial plains of Teesta, Torsa and Mahananda rivers where summer is warmer, mild winter associated with high rainfall and length of growing period is in between 270-300 days. Here the soils are moderately deep to deep, coarse to fine loamy in texture, formed by recent alluvial deposits, have low water holding capacity resulting in low pH, nitrogen and CEC. These areas face problems of water logging and severe flood hazard. These soils are prevalent in the southern part of the district.

From geological point of view soils are mainly the products of weathering of fluvial clastics. Pedagogically the deposits can be grouped into five units based on soil formation, colour of topsoil, composition and quaternary terrace deposits. The first one has no soil cover which is the present day flood plain, the second unit consists of enormous well developed coarse to fine sand size particles southward away from the foot hills, to silt and clay. The third and fourth unit ranges form boulder to sand size fraction, which has developed highly porous and permeable soils. The last unit mainly made up of boulder of various sizes, with little or no matrix. In general nitrogen content in soil of Dooars ranges between 0.3-2.3%, organic carbon 0.3 to 2.9%, available P_2O_5 is 185 ppm and available K_2O varies from 10 to 60 ppm. As per the soil taxonomic classification of NBSS and LUP the soils are classified as association and grouped under 11 soil mapping units. The description of different mapping units is given below:

Soil mapping unit 2 (*Coarse loamy, Typic Udorthents and Loamy-skeletal, Typic Dystrochrepts*): Moderately shallow, excessively drained, coarse loamy soils occurring on steep side slopes with gravelly loam surface, severe erosion and strong rockiness associated with moderately shallow, well drained, gravelly loamy soils with loamy surface and moderate erosion.

Soil mapping unit 6 *(Coarse loamy, Umbric Dystrochrepts and Fine loamy Fluventic Dystrochrepts):* Very deep, imperfectly drained, coarse loamy soils occurring on very gently sloping upper piedmont plains with loamy surface and moderate erosion associated with very deep, imperfectly drained, fine loamy soils.

Soil mapping unit 7 *(Fine loamy, Fluventic Eutrochrepts and Coarse loamy Aquic Udifluvents):* Very deep, imperfectly drained fine loamy soils occurring on very gently sloping lower piedmont plain with loamy surface and moderate erosion associated with very deep imperfectly drained coarse loamy soils.

Soil mapping unit 8 *(Coarse loamy Typic Haplaquents and Coarse loamy Typic Fluvaquents):* Very deep, poorly drained, coarse loamy soils occurring on level to nearly level lower piedmont plain with loamy surface associated with very deep poorly drained coarse loamy soils.

Soil mapping unit 9 *(Coarse loamy, Aquic Udifluvents and Fine loamy, Fluventic Eutrochrepts):* Very deep, imperfectly drained, coarse loamy soils occurring on nearly level lower piedmont plain with loamy surface associated with very deep, imperfectly drained, fine loamy soils.

Soil mapping unit 10 *(Coarse lomay, Aquic Ustifluvents and Fine loamy, Typic Fluvaquents):* Very deep, moderately well drained, coarse loamy soils occurring on level to nearly level active alluvial plain with loamy surface and moderate flooding associated with very deep poorly drained, fine loamy soils.

Soil mapping unit 13 *(Fine loamy, Typic Haplaquents and Fine loamy, Typic Haplaquepts):* Very deep, poorly drained, fine loamy soils occurring on level to nearly level active alluvial plain with loamy surface associated with very deep, poorly drained, fine loamy soils.

Soil mapping unit 18 *(Coarse loamy, Typic Fluvaquents and Coarse lomay, Aquic Ustifluvents):* Very deep, poorly drained, coarse loamy soils occurring on level to nearly level recent alluvial plain with loamy surface associated with very deep, imperfectly drained, coarse loamy soils.

Soil mapping unit 22 *(Coarse loamy, Aquic Ustifluvents):* Very deep, moderately well drained, coarse loamy soils occurring on level to nearly level recent alluvial plain with loamy surface and moderate flooding.

Soil mapping unit 25 *(Coarse loamy, Aquic Ustifluvents and Fine Aeric Haplaquepts):* Very deep, imperfectly drained, coarse loamy soils occurring on level to nearly level recent alluvial plain with loamy surface and moderate flooding associated with very deep, imperfectly drained, fine soils.

Soil mapping unit 26 *(Fine loamy, Aeric Haplaquepts and Coarse loamy, Typic Ustorthents):* Very deep, poorly drained, fine loamy soils on level to nearly level recent alluvial plain with loamy surface associated with very deep, moderately well drained, coarse loamy soils.

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
2	Coarse loamy, Typic Udorthents associated with Loamy-skeletal, Typic Dystrochrepts	32.22	0.52
6	Coarse loamy, Umbric Dystrochrepts associated with Fine loamy Fluventic Dystrochrepts	532.88	8.53
7	Fine loamy, Fluventic Eutrochrepts associated with Coarse loamy Aquic Udifluvents	1464.96	23.46
8	Coarse loamy Typic Haplaquents associated with Coarse loamy Typic Fluvaquents	2309.58	36.98
9	Coarse loamy, Aquic Udifluvents associated with Fine loamy, Fluventic Eutrochrepts	30.95	0.50
10	Coarse lomay, Aquic Ustifluvents associated with Fine loamy, Typic Fluvaquents	132.51	2.12
13	Fine loamy, Typic Haplaquents associated with Fine loamy, Typic Haplaquepts	156.49	2.51
18	Coarse loamy, Typic Fluvaquents associated with Coarse lomay, Aquic Ustifluvents	651.81	10.44
22	Coarse loamy, Aquic Ustifluvents	46.52	0.74

SMU	Soil Taxonomy	Area (sq km)	% of total area
25	Coarse loamy, Aquic Ustifluvents associated with Fine Aeric Haplaquepts	53.27	0.85
26	Fine loamy, Aeric Haplaquepts associated with Coarse loamy, Typic Ustorthents	387.39	6.20
200	Water body	446.37	7.15

SMU = soil mapping unit

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

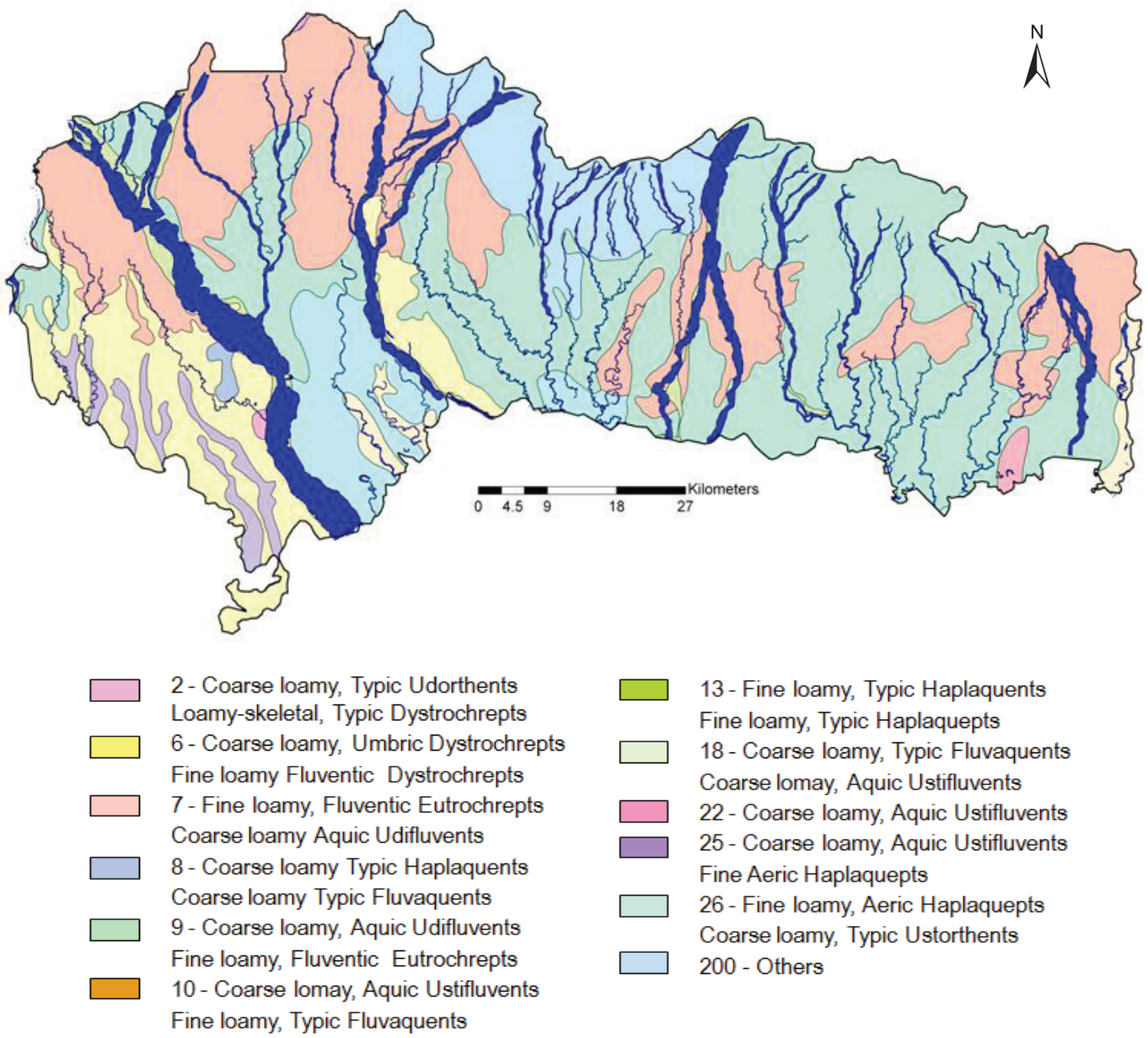


Fig. 6: Soil Taxonomic Map

2.5 Landuse Pattern

The dramatic transformation of land use pattern of Jalpaiguri district has taken place during the second half of the last century. Huge migration vis-à-vis influx of population compelled the people to settle in the former water bodies, marshy lands, hilly forest, decayed water bodies and interior area of the district. So the land use pattern has also been changing from natural land to man-made or artificial structure. The northern part of the district is covered by hills and tea estates. Forest cover area is scattered in whole district. The region is the interfluves of numerous rivers and rivulets. Because of foothills situation, rivers are coming from hills suddenly reaches the plain. Due to this sudden flattening of slope rivers are not capable to carry the debris which flow through from hills and deposit the detritus in different regions as per their specific gravity, like boulders, pebbles, singles, bozri, course sand, fine sand, silt and finer silt particles resulting in the formation of alluvial fan. Due to continuous rising of river beds and siltation in downstream there is frequent shifting

of river courses. Satellite data reveals that the river Teesta and Jaldhaka shifted from west to east by 2.9 km and 2.1 km respectively. Since the flood of 1954, river Jaldhaka was shifting towards east near Tandu Tea estate in Nagrakata block. River Torsha including Sil and Char Torsha shifts frequently. The only exception is shifting of Diana River from east to west. Large deforestation and unscientific dolomite mining in Bhutan and surrounding hills has aggravated the land degradation problem. During the flood of 1968, river Teesta opened a new course through Upalchand Forest near Kathalbari in Mal block causing devastation of large forest area. A big chunk of Upalchand Forest was washed out in this case. During 1956, river Diana avulsed through a rivulet viz. Jhumur and Rangati, south of Kalabari Tea Estate, devastating about a 100 sq km (approximately) area. Due to this original course of river Jhumur was abandoned and it is now a tributary of river Rangati. By constructing embankment at Kalabari, the course of Diana was thrown back to its own. But this river has a tendency to avulse to river Rangati. Based on Advanced Wide Field Sensor (AWiFS) onboard Resourcesat-1 satellite multi-date data the landuse / landcover has been mapped and the integrated landuse statistics is presented in Table 7 and spatially represented in Fig. 7. The table shows that 12.42% area is under kharif crop and only 1.66% is under rabi crop due to poor water availability. Double cropped area accounts 25% of district area. The area under different types of forests together accounts for 23.45% of district area out of which 21.44% is deciduous. Tea being a most remunerative crop in this region accounts 14.21% area where the contribution from small tea growers has increased disproportionately during last decade wherein large number of crop lands have been converted to tea. The area under wasteland is only 0.87% including all the categories.

Table 7: Landuse Statistics

Sl no.	Landuse / landcover	Area (sq km)	% of district	Sl no.	Landuse / landcover	Area (sq km)	% of district
1	Built up land	28.81	0.46	9	Evergreen forest	13.04	0.21
2	Kharif crop only	775.42	12.42	10	Deciduous forest	1339.20	21.44
3	Rabi crop only	103.89	1.66	11	Scrub / Degraded forest	112.37	1.80
4	Summer crop only	39.98	0.64	12	Littoral swamp	2.78	0.04
5	Double / Tripple crop	1560.97	25.00	13	Grassland	56.95	0.91
6	Current fallow	127.39	2.04	14	Other wasteland	46.18	0.74
7	Plantation other than tea	367.16	5.88	15	Scrub land	5.32	0.09
8	Tea growing area	887.41	14.21	16	Waterbodies	778.14	12.46

Source: Natural Resources Census, NRSC, 2009

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

Table 8: Area, Production and Yield of Tea during 1951 to 1999

	1951	1961	1971	1981	1993	1995	1996	1997	1998	1999
Area (ha)	54609	54756	59485	63418	67510	69175	69748	69630	70479	70996
Production ('000 kg)	63944	66898	80840	100251	125906	121420	125253	129760	147133	133803
Yield (kg/ha)	1711	1222	1359	1581	1865	1755	1796	1864	2088	1885

Source: Official website of Jalpaiguri

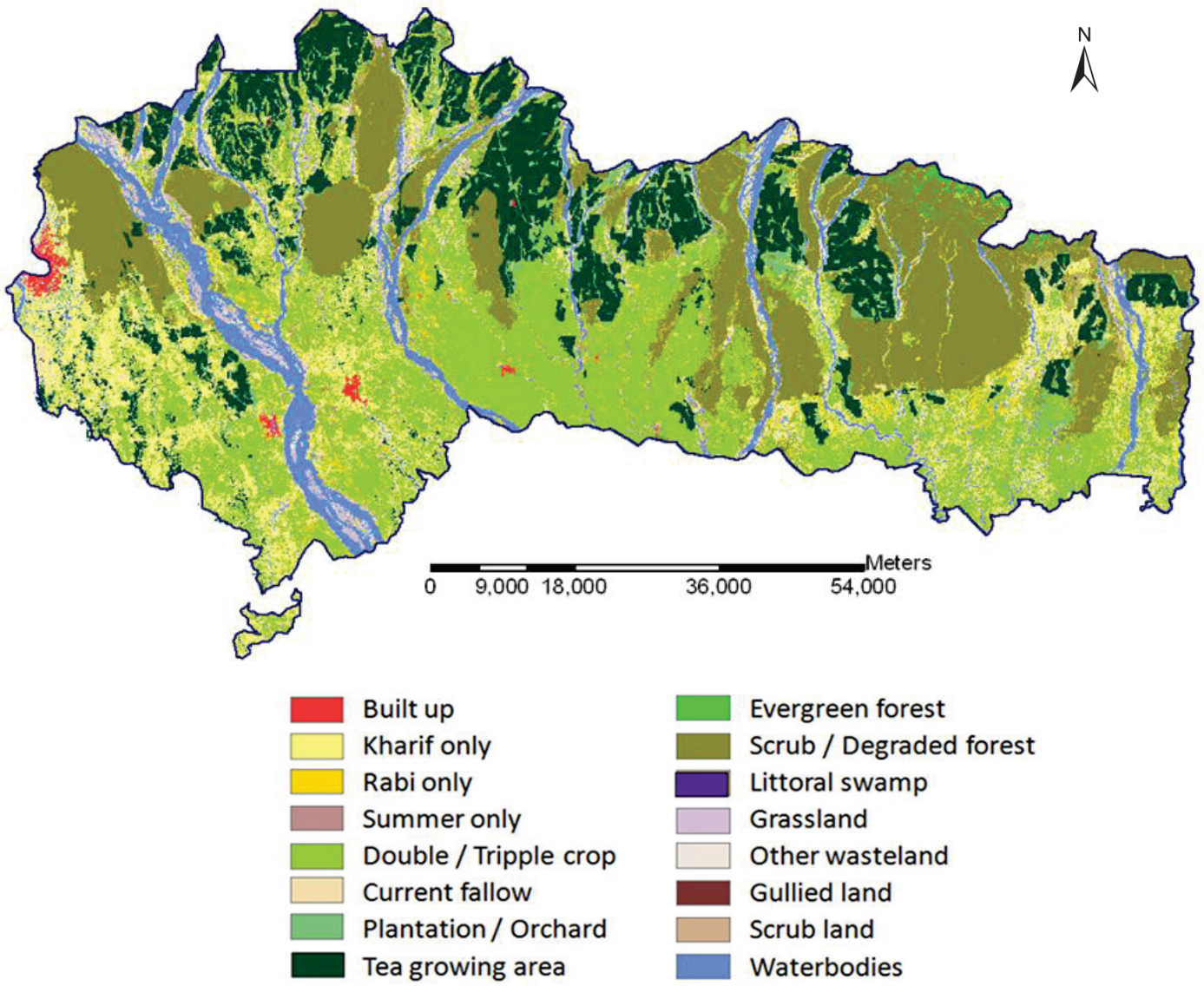


Fig. 7: Landuse / Landcover Distribution

2.6 Watershed and Drainage

As per AIS and LUS Watershed Atlas of India, the watersheds of Jalpaiguri district mostly (98%) fall under Water Resources Region (WRR) of 3 which consists of Brahmaputra and rivers of north-eastern states and also in WRR 2 consists of river Ganges. The WRR 3 consists of 1 basin (3A-right bank of Brahmaputra upto confluence of Lohit river), 1 catchment (3A1-Teesta to Manas confluence) and 4 sub-catchments (3A1A-Teesta lower, 3A1C-Jaldhaka, 3A1D-Raidak and 3A1E-Raidak to confluence of Manas). All together there are 18 watersheds falling in the district under WRR 3 viz. 3A1A1 (Teesta left bank), 3A1A3 (Chel, Neora), 3A1A5 (Remam, right bank of Tangit), 3A1C2 (Khutamara), 3A1C3 (Jaldhaka main), 3A1C4 (Jaldhaka main), 3A1C5 (Duduya, Khanabati), 3A1C6 (Dolong, Buri Torsa, Mujnari), 3A1D2 (Phulkumar), 3A1D3 (Tersa, Bura), 3A1D4 (Kaljani, Kalkut, Dima Laikuri), 3A1D5 (Jangti), 3A1D6 (Ratdak), 3A1E2 (Sankosh) and 3A1E9 (Bhur). The WRR 2 consists of 1 basin (2A-lower Ganges upto Ghagra on left bank and Yamuna on right bank), 1 catchment (2A1-left bank of Ganges and Bhagirathi from delta upto confluence with Ghugri), 1 sub-catchment (2A1E-entry point of Ganges into Bangladesh from Jalpaiguri) and 1 watershed (2A1E9-Chani, Panga). The watershed hierarchy is given in Fig. 8. The area of district falling under different watersheds is given in Table 9 and their spatial distribution is given in Fig. 9.

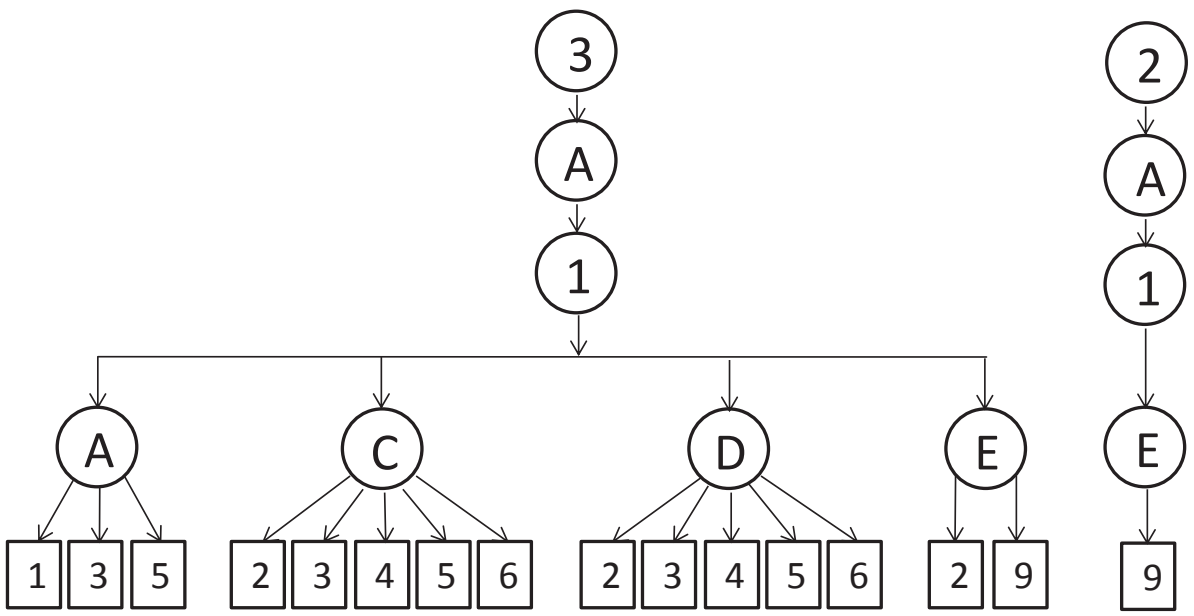


Fig. 8: Watershed Hierarchy

Table 9: The Area under Different Watersheds

Watershed	Area (sq km)	% of the District	Watershed	Area (sq km)	% of the District
3A1C4	464.79	7.44	3A1C3	293.71	4.70
3A1A1	366.65	5.87	3A1D5	216.12	3.46
3A1A3	446.71	7.15	3A1C2	303.53	4.86
3A1C5	642.77	10.29	3A1D6	451.67	7.23
3A1A5	126.57	2.03	3A1E2	164.45	2.63
2A1F6	50.47	0.81	3A1D2	52.99	0.85
3A1D3	430.90	6.90			
2A1E9	733.73	11.75			
3A1D4	861.85	13.80			
3A1C6	440.20	7.05			

The district is veined by mighty rivers like the Teesta, Torsa, Jaldhaka, Dyna, Neora, Sankosh etc. The rivers cross the district mostly in north-south direction as the water is mostly flown from Upper hills of Bhutan. While coming down to plain the rivers carry huge sediment load and deposit it in the plain. The Jalpaiguri town lies on the banks of the Teesta river, possibly the second largest river in West Bengal after the Ganges. Other than Teesta, there are three other rivers passing by the town viz. Karala, Dharala and Panga. The tiny River Karala flows through the middle of the town bisecting the town into two halves. Karala meets the Teesta some five kilometres south of the town. All the rivers are perennial in nature as they are fed by Himalayan glaciers. The rivers and drainage network are presented in Fig.10.

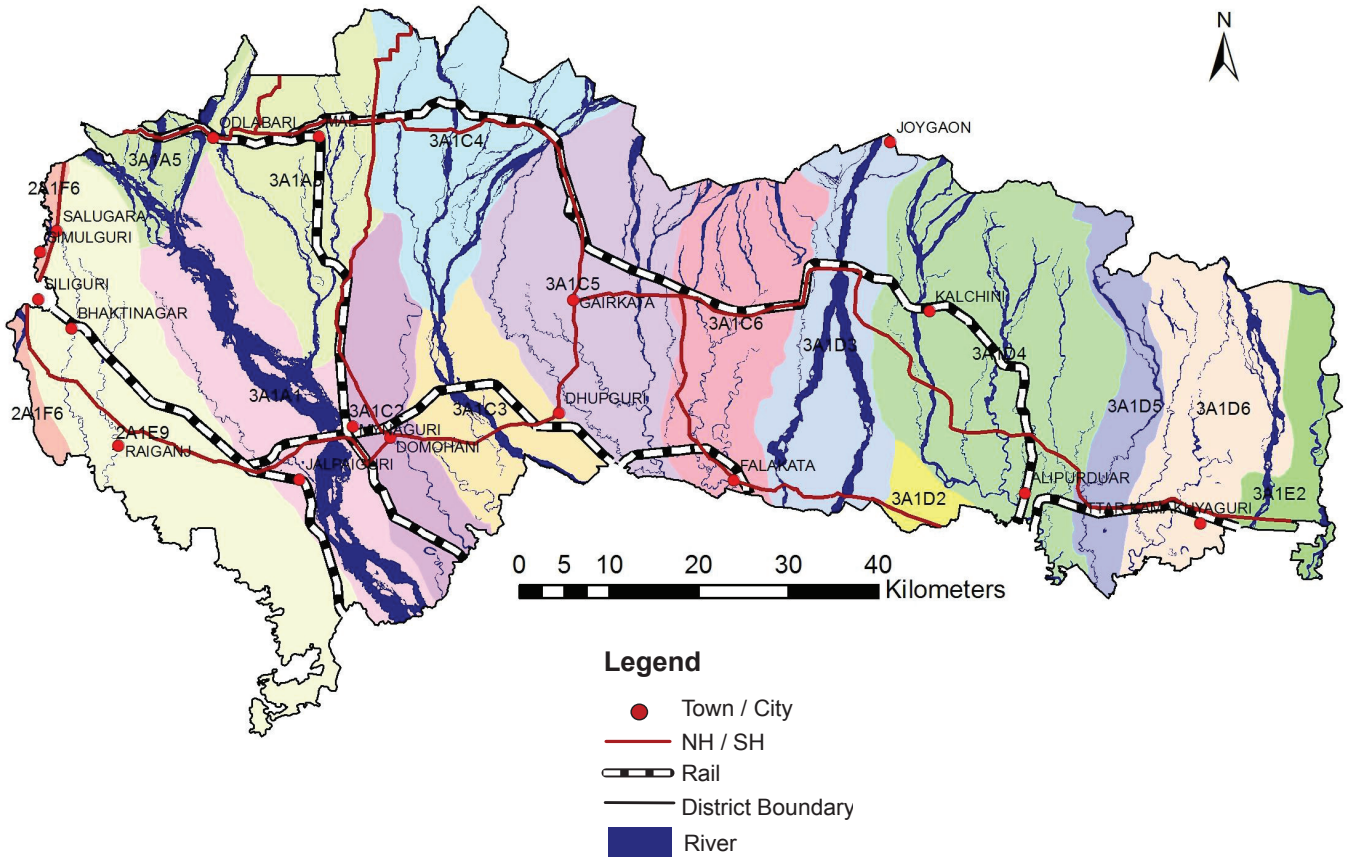


Fig. 9: Watersheds Falling in the District (as per AIS and LUS)

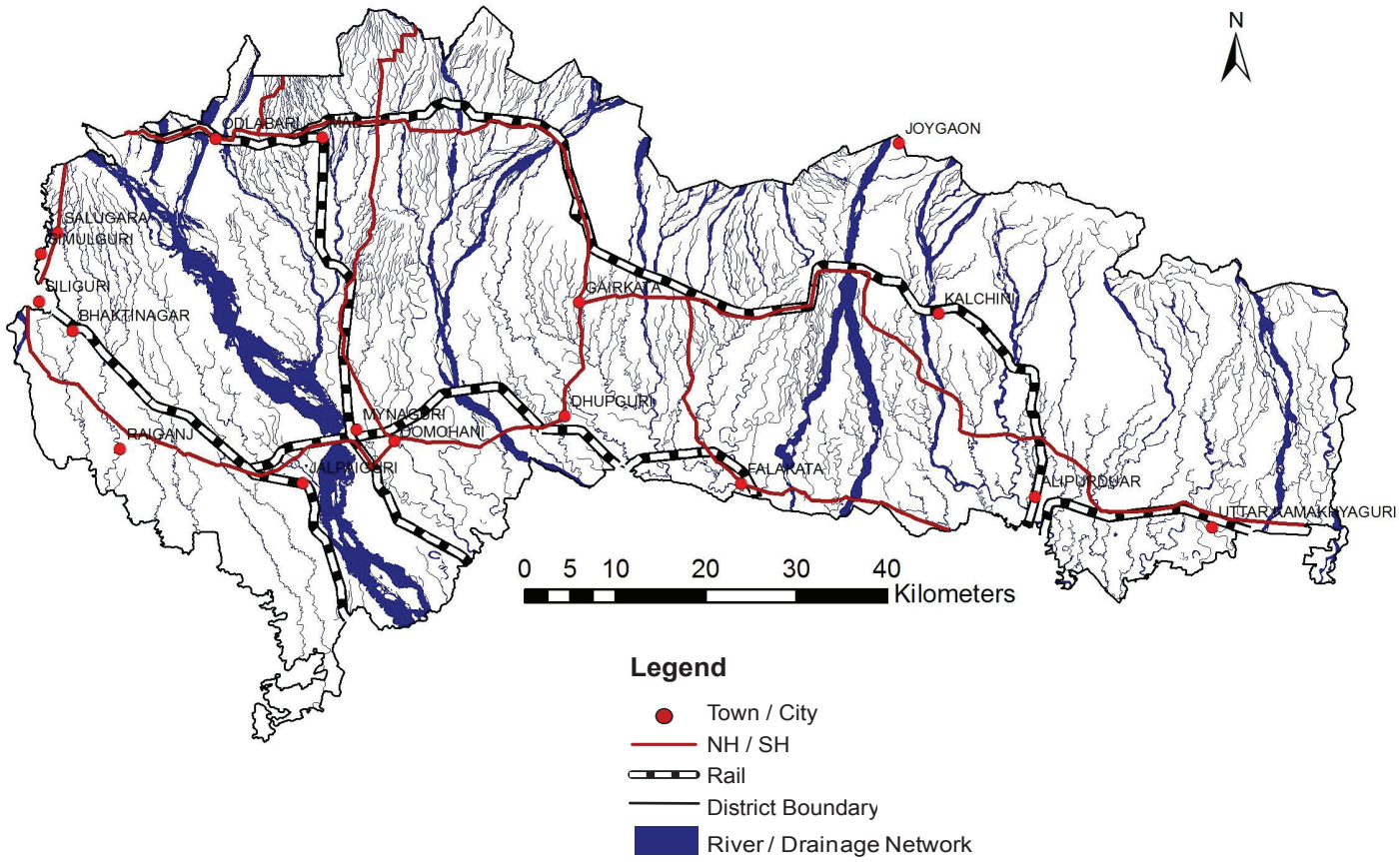


Fig. 10: Drainage Network

2.7 Flora and Fauna

Jalpaiguri district has two National Park viz. Buxa National Park (established in 1992) and Gorumara National Park (established in 1994). Apart from the national parks, the district contains three wildlife sanctuaries, namely, Buxa (located adjacent to national park), Chapramari, and Jaldapara. The forests of this district are predominantely semi-moist-deciduous type with pockets of various other types viz. evergreen forest, savannahs, riverine forest and swamps are abundant.The sal forests can be primarily

classified as a) mature sal, b) scattered sal, c) wet mixed and d) dry sal. Savannahs are found where a good quality of sand is present in the soil and are characterised by the presence of kumbhi, amla, sidha, tanki etc. Riverine forest is a deciduous forest and its main two species are khair and sissoo. At some places odal and sidha are found in good proportion. In many places lands surrounding the streams are swampy and bear a special type of vegetation viz. tree *Syzygium formosum*, *Carallia integerrima*, *Elaeocarpus* species and *Myristica* species. Apart from these high rise forests, there are flood plains of rivers like Murti, Jaldhaka, Torsa etc. covered with grasslands which nourish a wide spectrum of wildlife. The forests of Jalpaiguri mainly extend from plains to Terai regions of Himalayas and are located in the flood plains of different main hill rivers and other medium and small rivers and rivulets which have created a pocket of grassland. Apart from national parks and sanctuaries a significant area of this district is covered by forest.

The forests of Jalpaiguri are home to many rare and endangered species of mammals and birds. The Indian one horned rhinocerous is found in both Gorumara National Park and Jaldapara Wildlife Sanctuary. Near extinct species like hispid hare and pygmy hog have been reported from the Gorumara National Park. Bengal florican, an endangered bird had been found in Jaldapara Wildlife Sanctuary. Apart from these species, tiger, leopard, Asian elephant, gaur, wild boar, sambar, cheetal, hog deer, barking deer are also found in the various forest tracts of Jalpaiguri.

2.8 Transport Network

The district is well connected by rail, road and air from any part of the country. New Jalpaiguri is the railway station which is connected with all parts of the country and gateway of north-east. There are 18 railway stations covering the district. Bagdogra is the nearest airport which is connected with Delhi and Kolkata. There is centralized NBSTC bus depot run by the government from where buses ply to Dooars region, Cooch Bihar, Alipurduar, Mathabhanga, Malbazar and different districts of Assam and Bihar. The district headquarter is 58 km away from Siliguri city. Total length of the roads accounts to 5492 km of which length of national highway is 321.70 km, state highway is 63.01 km, district road is 36.17 km, village and other roads constitutes 5071 km. Different road types are given in Fig. 11.

2.9 Economy

Though the economy of the district is mostly agriculture based, tea industry enjoys a prominent position. Besides jute pressing, saw-milling and match manufacturing are other supportive industries. Jalpaiguri is also the chief agricultural distribution center of West Bengal. The northern strip of the region is a hilly tract, which is congenial for tea cultivation. The ample production of tea in the region laid the foundation of the tea industry here. The auxiliary industries centred around tea, involves a large-scale employment, thereby supporting the local economy.

Also, the industries lend a dual support to the economy by fetching a large volume of labours locally at a low rate and exporting superior quality of tea to the neighboring region even in abroad. An oil refinery in Baranhat is the principal project adopted by the Government. In the adjacent areas of Jalpaiguri, medicine factory, cold storage for fruits and different other factories of electronic goods etc. have grown up, which augment the economic growth. The physical homogeneity of the central and the southern part of the district is formed of alluvium and the silt carried by the rivers like Teesta, Mahananda, Torsha etc. All the streams are originated from the northern glacier and hence are perennial; they provide continuous water to the region for the growth of agriculture. The conducive landscape with the continuous supply of water is favourable for the cultivation of rice which is the principal crop of the district, though the major part of its

production is meant to serve the domestic requirement. Wheat also shares a position in serving the local economy of Jalpaiguri. The cultivation of the horticulture is also promoted thereby serving the district's economy to a large extent. The superior quality of orchard fruits (mainly pineapple and banana) draws a large quantity of export income. Jute, tobacco and mustard are the principal products here, much of which is exported.

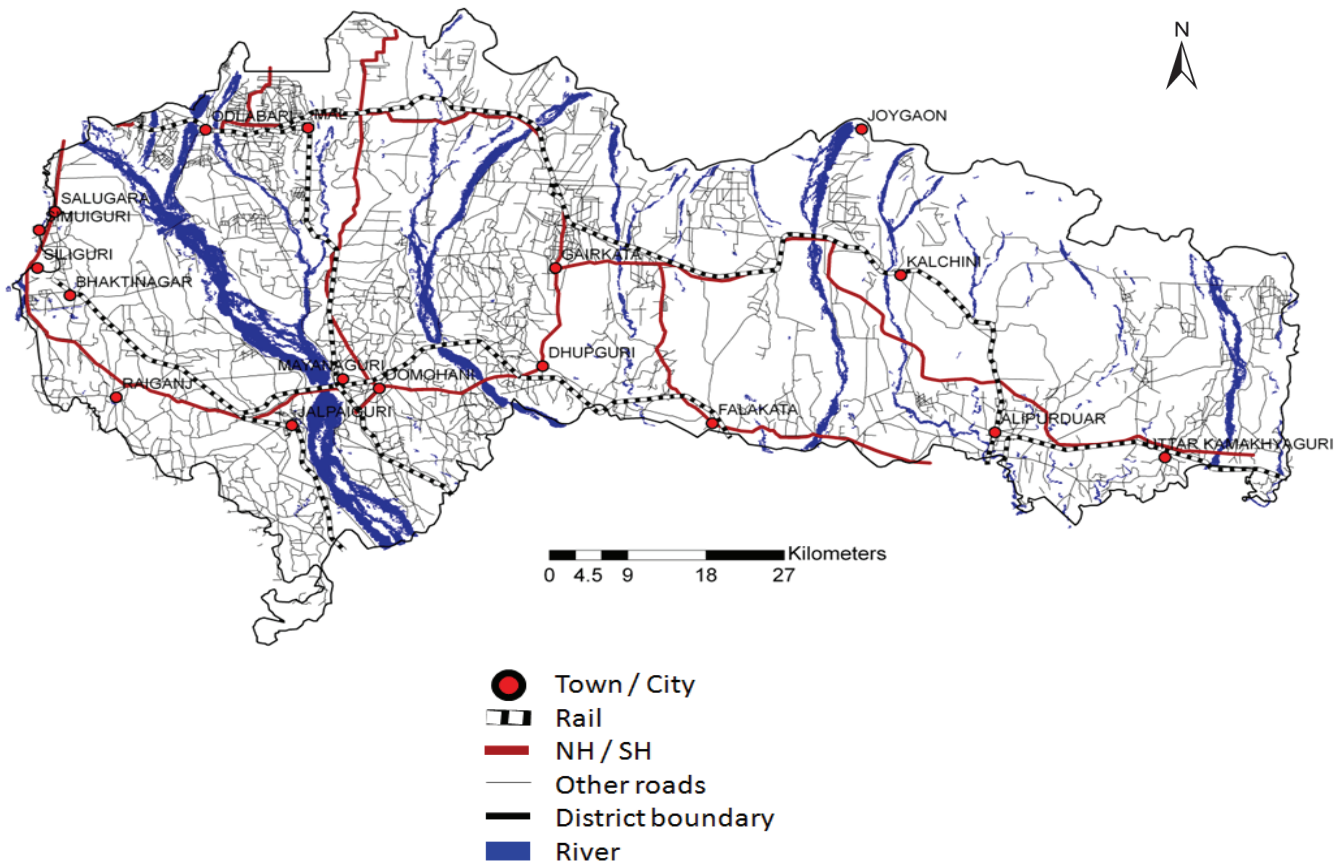


Fig. 11: Transport Network

2.10 Education

Average literacy rate of the district is 73.79%, higher than the national average of 59.5%. Male literacy is slightly better than female literacy. In the tea estates the literacy is 37.48%, which is very poor in comparison to tea estates. Density of literacy per square km is 296.

2.11 Demography

As of 2011 India census, Jalpaiguri had a population of 38,69,675. Males constitute 51.17% of the population and females 48.83%. Total male population is 19,80,068 and female population is 18,89,607. Population density per square km is 621. The district is primarily rural with more than 80% of rural population. It has also high percentage of SC/ST population. Relatively sizeable population resides in tea estates and forest villages which are isolated and mostly inaccessible. It has also high percentage of SC/ST population. As per 2001 census there are 13,05,668 persons who are main and marginal workers, of which most are rural workers. Number of rural and urban workers are 11,10,146 and 1,95,522 respectively. The number of household industries workers is 23,219. Among them 18,460 persons are rural workers and 4,759 are urban labourers. The economy of this region is based on three T's viz. Tea, Tourism and Timber. Thousands of people are engaged in the tea estates and factories as labours and other posts. Several people are also engaged in cultivation of Beetle nuts which also contribute to the economy. Cultivation of other crops is done mainly for local consumption.

3. ANALYSIS OF TEA ESTATES

3.1 Tea Area Inventory

Tea growing area 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 estates are characterized by rectangular / square / trapezoidal sections, coarse texture attributed to co-existence of shade trees, processing factory, and labour quarters. The dynamic estate management practices viz. pruning activities also gives distinct appearance on the image in comparison to unpruned areas of the same estate. 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 smallest tea growing areas have been picked up. The tea areas were classified into three categories in pre-field mapping viz. i) confirmed tea area where there was standing tea bush on the ground ii) tea areas undergone transformation viz. uprooted, soil rehabilitation using Guatemala grass, degraded tea area and land preparation ongoing for tea. Finally, in third category the doubtful areas were kept which need field validation as the signature on the satellite data mixes with scrub land. A random sampling approach was adopted to verify the confirmed tea areas, areas undergoing land transformation for cultivation of tea and doubtful areas. About 10% doubtful areas, as was evident on the satellite data, were verified in the field and corrected in the post-field map. Most of the unorganized estates with very small area and grown as kitchen garden creates confusion. The area inventory gives complete spatial information about the tea growing areas. The tea estate maps from most of the small growers were not available and only the maps from organised large and medium estates (as was available) were used in the present study. The organized estates are mostly located in the northern fringe of the district especially at the foothills of Terai region but over the years significant small to medium estates have emerged along the western boundary of the district. Many of the small estates are also strategically located nearer to the big estates or processing factories as cluster for ease of green leaf transport. Based upon the IRS LISS IV and Cartosat-1 data, total area under tea in the district accounts for 899.40 sq km i.e. 14.40% of the district. The spatial distribution of tea growing areas is given in Fig. 12 and the organized estate boundaries in Fig. 13 respectively.

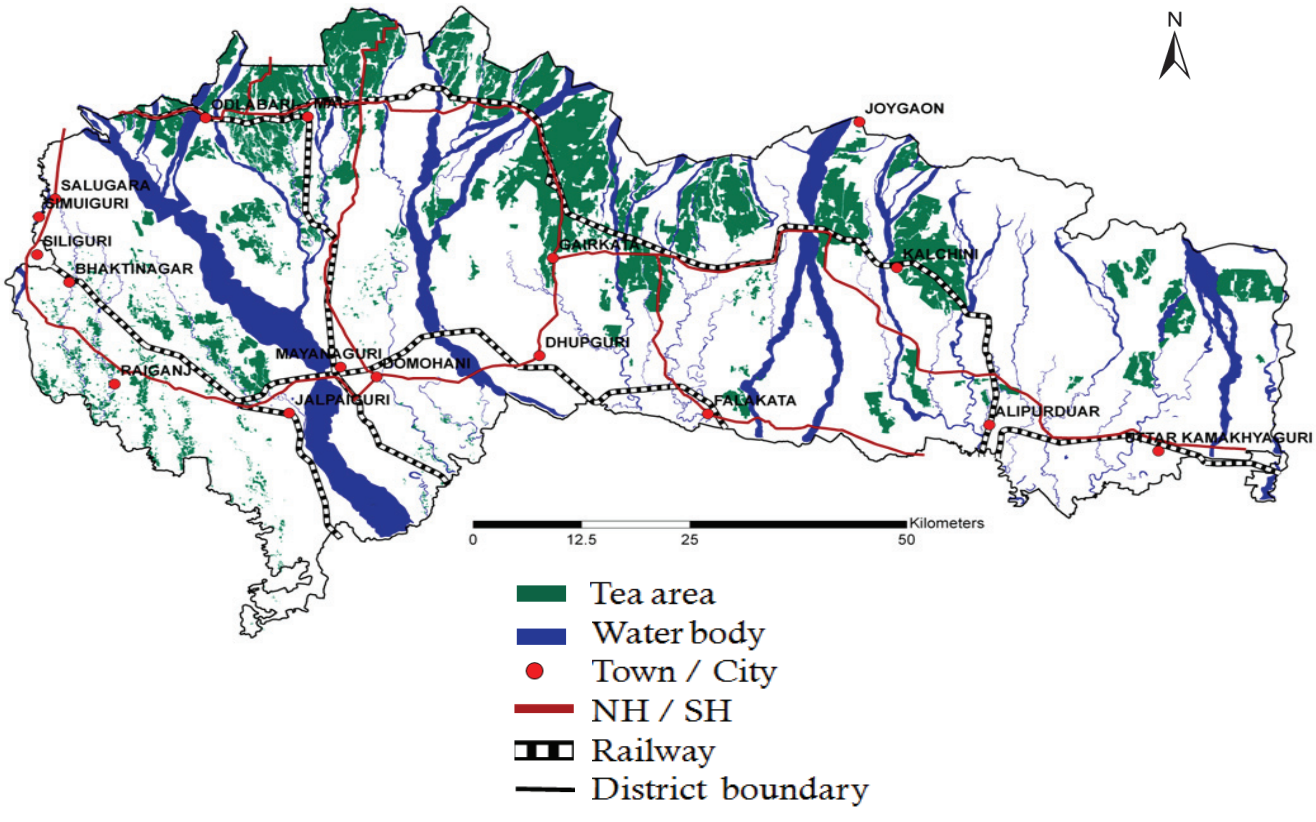


Fig. 12: Spatial Distribution of the Tea Growing Areas

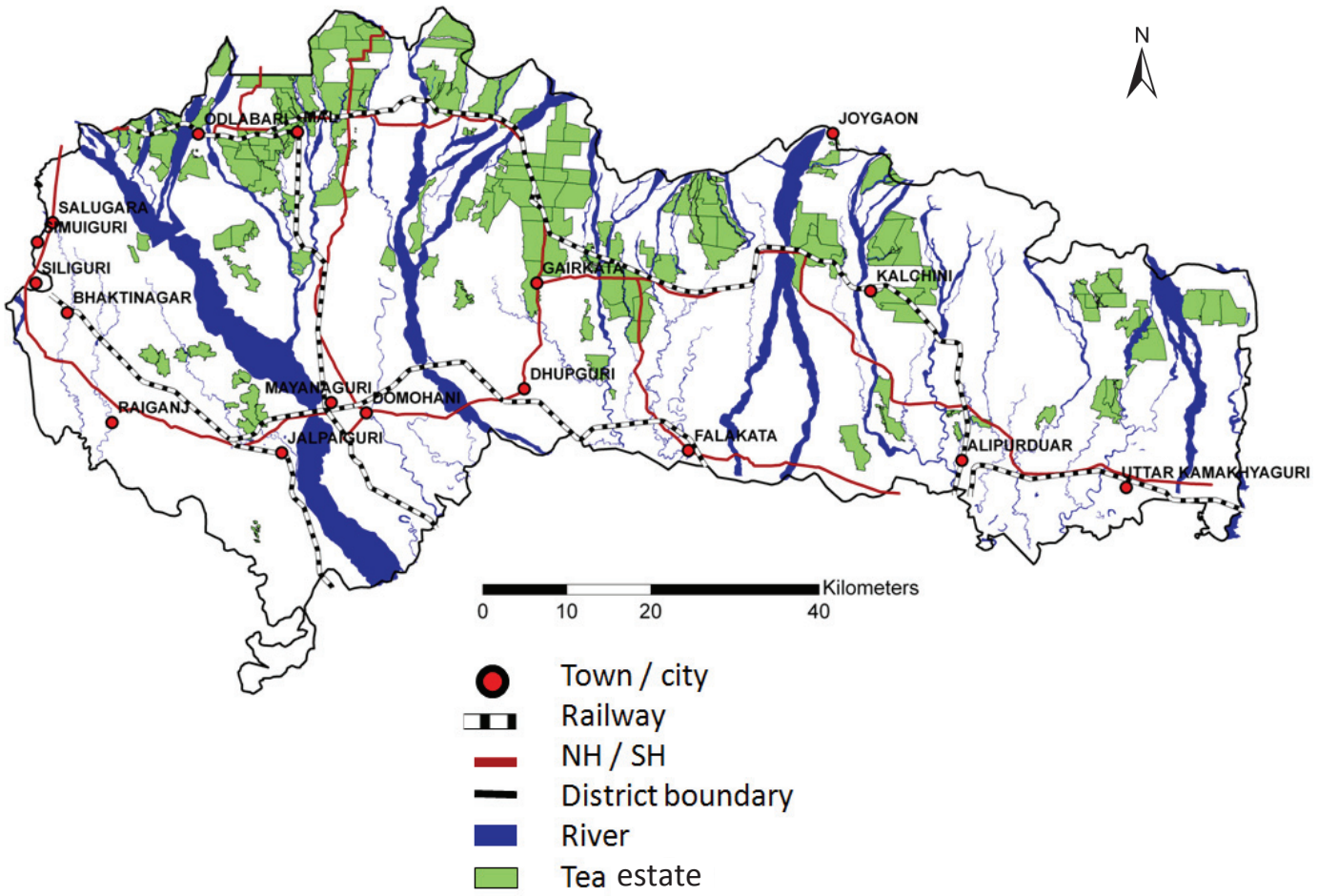


Fig. 13: Spatial Distribution of the Major Tea Estates

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 standards and categorized into nine 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	AL	BUL	GL	NUR	OTH	PLA	TEA	WB	WL
1	Aibheel	63.83 (4.59)	106.19 (7.64)	2.16 (0.16)	-	19.72 (1.42)	0.44 (0.03)	1016.93 (73.14)	5.18 (0.37)	175.93 (12.65)
2	Amarpur	0.28 (0.32)	0.73 (0.83)	-	0.12 (0.14)	0.74 (0.84)	-	83.19 (94.52)	-	2.95 (3.36)
3	Amabri	47.82 (6.63)	-	2.8 (0.39)	-	42.81 (5.94)	-	627.63 (87.04)	-	-
4	Anandpur	29.6 (5.35)	51.36 (9.29)	0.95 (0.17)	-	9.88 (1.79)	1.95 (0.35)	445.66 (80.57)	-	13.7 (2.48)
5	Bagracote	3.34 (0.56)	33.92 (5.7)	-	-	0.33 (0.06)	2.14 (0.36)	552.89 (92.85)	-	2.83 (0.48)

Sl no.	Estate name	AL	BUL	GL	NUR	OTH	PLA	TEA	WB	WL
6	Baintgoorie	101.94 (10.14)	127.46 (12.68)	1.04 (0.1)	-	32.54 (3.24)	-	726.97 (72.32)	1.06 (0.11)	14.25 (1.42)
7	Bamandanga Tondoo	52.57 (7.63)	69.48 (10.09)	2.45 (0.36)	-	36.16 (5.25)	-	513.79 (74.6)	-	14.27 (2.07)
8	Banarhat	-	105.14 (12.83)	-	-	2.35 (0.29)	2.54 (0.31)	706.06 (86.13)	-	3.7 (0.45)
9	Baradighi	70.16 (7.89)	127.76 (14.37)	-	6.57 (0.74)	1.59 (0.18)	2 (0.23)	599.27 (67.42)	-	81.46 (9.17)
10	Batabari	33.39 (7.79)	39.22 (9.15)	0.67 (0.16)	-	1 (0.23)	33.52 (7.82)	314.49 (73.38)	-	6.3 (1.47)
11	Beech	3.29 (0.34)	94.73 (9.86)	3.99 (0.42)	49.31 (5.13)	2.36 (0.25)	1.29 (0.13)	790.54 (82.28)	-	15.3 (0)
12	Bhandiguri	9.82 (2.4)	33.89 (8.29)	-	-	3.2 (0.78)	-	358.16 (87.6)	0.5 (0.12)	3.3 (0.81)
13	Bharnobari	0.3 (0.03)	93.28 (10.52)	2.03 (0.23)	23.68 (2.67)	0.5 (0.06)	4.29 (0.48)	754.63 (85.11)	-	7.9 (0.89)
14	Bhatkawa	8.71 (1.11)	66.55 (8.49)	-	5.56 (0.71)	14.99 (1.91)	6.62 (0.84)	662.47 (84.48)	-	19.3 (2.46)
15	Bhatpara	294.8 (22.86)	167.15 (12.96)	9.55 (0.74)	42.15 (3.27)	3.31 (0.26)	-	730.63 (56.66)	3.7 (0.29)	38.1 (2.95)
16	Bhogotpore	8.35 (1.01)	136.51 (16.46)	14.4 (1.74)	-	-	-	650.11 (78.37)	3.16 (0.38)	17.05 (2.06)
17	Binaguri	41.36 (5.66)	-	-	-	11.6 (1.59)	-	666.84 (91.32)	-	10.45 (1.43)
18	Birpara	3.25 (0.22)	247.09 (16.58)	2.87 (0.19)	-	20.99 (1.41)	-	1131.91 (75.94)	-	84.51 (5.67)
19	Carron	63.62 (12.28)	58.77 (11.34)	-	-	3.53 (0.68)	-	313.15 (60.44)	-	79.09 (15.26)
20	Central Dooars	92.6 (7.78)	128.23 (10.78)	1.63 (0.14)	2.17 (0.18)	33.04 (2.78)	0.7 (0.06)	877.14 (73.74)	2.72 (0.23)	51.31 (4.31)
21	Chalouni	-	50.89 (6.69)	-	9.48 (1.25)	28.79 (3.79)	1.59 (0.21)	651.95 (85.73)	-	17.77 (2.34)
22	Chinchula	40.31 (4.6)	104.97 (11.99)	-	-	1.52 (0.17)	1.76 (0.2)	664.57 (75.88)	-	62.66 (7.15)
23	Chunabhutti	-	73.79 (13.24)	-	-	4.57 (0.82)	-	410.53 (73.66)	3.83 (0.69)	64.64 (11.6)
24	Chuapara	2.02 (0.21)	122.03 (12.86)	-	35.82 (3.78)	3.61 (0.38)	3.38 (0.36)	763.87 (80.52)	-	17.94 (1.89)
25	Chuniajhora	-	42.13 (9.55)	-	82.77 (18.76)	11.83 (2.68)	-	278.63 (63.15)	-	25.87 (5.86)
26	Dalgaon	3.55 (0.52)	66.29 (9.75)	-	-	62.3 (9.17)	32.37 (4.76)	493.54 (72.62)	-	21.6 (3.18)

Sl no.	Estate name	AL	BUL	GL	NUR	OTH	PLA	TEA	WB	WL
27	Damdim	41.99 (3.57)	207.88 (17.67)	2.51 (0.21)	2.79 (0.24)	136.37 (11.59)	2.52 (0.21)	766.9 (65.19)	-	15.44 (1.31)
28	Debipur	3.94 (4.24)	17.37 (18.7)	0.06 (0.06)	-	0.3 (0.32)	1.21 (1.3)	70.04 (75.37)	-	-
29	Debpara	75.68 (10.1)	80.76 (10.78)	-	-	13.19 (1.76)	3.99 (0.53)	575.5 (76.82)	-	-
30	Demdima	90.91 (7.95)	130.43 (11.4)	4.58 (0.4)	9.45 (0.83)	-	-	808.42 (70.66)	-	100.3 (8.77)
31	Denguajhar	82.56 (7.99)	143.47 (13.88)	0.49 (0.05)	-	8.74 (0.85)	3.23 (0.31)	748.9 (72.46)	0.35 (0.03)	45.86 (4.44)
32	Dharanipur	-	42.68 (11.67)	-	-	51.92 (14.2)	-	271.1 (74.13)	-	-
33	Dhowlajhora	-	55.06 (9.43)	-	-	31.69 (5.43)	-	490.25 (83.95)	-	6.99 (1.2)
34	Dima	3.69 (0.37)	166.4 (16.58)	4.23 (0.42)	-	7.08 (0.71)	2.09 (0.21)	807.12 (80.41)	-	13.16 (1.31)
35	Dumchipara	-	139.27 (13.95)	-	-	4.88 (0.49)	3.37 (0.34)	803.25 (80.43)	7.29 (0.73)	40.58 (4.06)
36	Ellenbarie	-	33.67 (9.56)	11.22 (3.19)	-	13.76 (3.91)	-	263.03 (74.69)	-	30.47 (8.65)
37	Engo	-	7.74 (5.12)	-	-	25.47 (16.82)	-	118.16 (78.06)	-	-
38	Ethelbarie	29.74 (7.88)	34.84 (9.23)	-	-	-	-	269.01 (71.25)	-	44 (11.65)
39	Gairkata	-	135.92 (12.72)	0.48 (0.05)	-	112.41 (10.52)	1.32 (0.12)	721.1 (67.46)	-	97.62 (9.13)
40	Gandrapara	-	99.43 (9.85)	-	5.48 (0.54)	6.33 (0.63)	6.06 (0.6)	888.57 (88.02)	-	3.62 (0.36)
41	Garganda	3.22 (0.44)	84.64 (11.69)	-	-	4.56 (0.63)	-	620.79 (85.71)	-	11.09 (1.53)
42	Goodhope	101.54 (15.72)	70.56 (10.92)	-	0.89 (0.14)	1.94 (0.3)	2.44 (0.38)	461.39 (71.42)	0.93 (0.14)	6.35 (0.98)
43	Gopalpur	105.77 (12.02)	145.58 (16.54)	-	-	21.76 (2.47)	-	540.52 (61.42)	10.5 (1.19)	55.97 (6.36)
44	Gopimohan	-	5.72 (10.94)	-	-	0.32 (0.61)	-	41.97 (80.23)	-	4.3 (8.23)
45	Gurjangjhora	6.22 (1.91)	25.21 (7.75)	1.13 (0.35)	-	2.62 (0.81)	-	281.81 (86.62)	4.32 (1.33)	4.04 (1.24)
46	Haldibari	23.17 (2.02)	106.46 (9.27)	-	-	53.23 (4.64)	10.98 (0.96)	947.61 (82.55)	-	6.43 (0.56)
47	Hantapara	6.09 (0.63)	93.63 (9.68)	-	8.53 (0.88)	8.13 (0.84)	-	818.96 (84.68)	3.69 (0.38)	28.13 (2.91)

Sl no.	Estate name	AL	BUL	GL	NUR	OTH	PLA	TEA	WB	WL
48	Hope	-	68.53 (11.95)	-	0.59 (0.1)	0.92 (0.16)	2.25 (0.39)	489.04 (85.26)	-	12.25 (2.14)
49	Indong	68.2 (8.48)	81.32 (10.11)	-	-	82.91 (10.31)	3.65 (0.45)	519.37 (64.57)	18.7 (2.33)	30.15 (3.75)
50	Jadabpur	99.82 (31.87)	36.04 (11.51)	-	-	4.17 (1.33)	-	173.18 (55.29)	-	-
51	Jainti	16.5 (2.01)	133.36 (16.26)	-	-	24.52 (2.99)	3.23 (0.39)	515.22 (62.82)	13 (1.59)	114.36 (13.94)
52	Jaldacca Altadanga	128.45 (33.9)	31.36 (8.27)	-	-	-	-	194.51 (51.33)	-	24.63 (6.5)
53	Jalpara	133.96 (68.09)	29.66 (15.07)	-	-	-	-	12.63 (6.42)	-	20.5 (10.42)
54	Jiti	43.78 (4.68)	93.87 (10.04)	1.36 (0.15)	-	72.02 (7.7)	12.3 (1.31)	620.27 (66.33)	-	91.6 (9.79)
55	Jogesh Chandra	4.31 (0.9)	39.92 (8.32)	-	-	4.46 (0.93)	-	428.06 (89.26)	-	2.8 (0.58)
56	Joybirpara	3.06 (0.95)	34.88 (10.86)	-	-	1.15 (0.36)	-	264.95 (82.49)	-	17.17 (5.35)
57	Kailashpur	10.68 (2.59)	42.96 (10.43)	-	-	14.7 (3.57)	0.52 (0.13)	327.87 (79.57)	-	15.34 (3.72)
58	Kalabari	10.55 (2.52)	55.68 (13.32)	-	-	0.56 (0.13)	-	348.98 (83.5)	-	2.16 (0.52)
59	Karala valley	10.78 (3.42)	35.15 (11.16)	-	-	0.46 (0.15)	9.12 (2.9)	242.95 (77.15)	0.05 (0.02)	16.38 (5.2)
60	Karballa	-	175.7 (16.75)	-	-	14.61 (1.39)	4.86 (0.46)	802.41 (76.52)	-	51.08 (4.87)
61	Kartick	20.48 (3.68)	94.22 (16.93)	-	-	3.28 (0.59)	-	401.15 (72.1)	-	37.28 (6.7)
62	Kathaldhura	-	8.37 (9.06)	0.78 (0.84)	-	-	1.29 (1.4)	73.32 (79.37)	-	8.61 (9.32)
63	Killcott	56.3 (8.68)	37.44 (5.77)	1.08 (0.17)	6.8 (1.05)	-	1.37 (0.21)	501.04 (77.21)	-	44.94 (6.92)
64	Kohinoor	54.73 (7.92)	118.54 (17.16)	118.54 (17.16)	-	23.22 (3.36)	1.87 (0.27)	490.42 (70.99)	-	2.03 (0.29)
65	Kumargram	-	83.52 (9.29)	6.90 (0.77)	-	21.79 (2.42)	-	757.63 (84.26)	-	29.33 (3.26)
66	Kumlai	115.17 (18.36)	53.66 (8.56)	-	-	21.06 (3.36)	-	416.91 (66.47)	-	20.44 (3.26)
67	Kurti	21.59 (2.86)	65.34 (8.66)	-	-	12.32 (1.63)	2.61 (0.35)	528.17 (69.99)	-	124.6 (16.51)
68	Lakhikanta	99.56 (23.48)	150.14 (35.41)	-	7.79 (1.84)	30.73 (7.25)	-	131.83 (31.09)	0.17 (0.04)	3.81 (0.9)

Sl no.	Estate name	AL	BUL	GL	NUR	OTH	PLA	TEA	WB	WL
69	Lakhipara	69.56 (7.33)	153.59 (16.2)	-	2.26 (0.24)	4.69 (0.49)	14.56 (1.54)	703.67 (74.2)	-	-
70	Lankapara	21.12 (1.78)	175.98 (14.87)	-	-	0.65 (0.05)	-	918.72 (77.63)	0.64 (0.05)	66.41 (5.61)
71	Leesriver	-	141.73 (16.55)	-	-	3.16 (0.37)	2.52 (0.29)	702.35 (82)	-	6.79 (0.79)
72	Looksun	206.68 (22.46)	184.8 (20.08)	1.17 (0.13)	45.73 (4.97)	3.3 (0.36)	1.24 (0.13)	471.41 (51.23)	-	5.93 (0.64)
73	Madhu	21.73 (5.1)	45.29 (10.62)	-	3.87 (0.91)	0.43 (0.1)	-	344.09 (80.68)	-	11.06 (2.59)
74	Majherdabri	0.32 (0.07)	43.84 (9.79)	0.86 (0.19)	-	0.65 (0.15)	-	377.03 (84.23)	-	24.9 (5.56)
75	Malnuddy	4.44 (3.51)	12.77 (10.09)	-	-	2.15 (1.7)	-	102.08 (80.69)	-	5.08 (4.01)
76	Manabarie	11.45 (2.52)	58.34 (12.83)	-	-	7.83 (1.72)	-	357 (78.48)	0.14 (0.03)	19.93 (4.38)
77	Matelli	51.05 (4.81)	91.26 (8.59)	2.25 (0.21)	-	-	-	816.79 (76.89)	2.2 (0.21)	98.73 (9.29)
78	Mathura	53.04 (5.43)	174.05 (17.81)	5.99 (0.61)	-	2.22 (0.23)	--	726.25 (74.32)	-	15.59 (1.6)
79	Mechapara	2.87 (0.42)	89.44 (13.08)	1.33 (0.19)	-	2.09 (0.31)	-	563.8 (82.45)	-	24.26 (3.55)
80	Meenglas	24.68 (2.63)	117.02 (12.46)	-	-	32.15 (3.42)	-	686.32 (73.09)	1.86 (0.2)	76.92 (8.19)
81	Mogalkata	79.67 (13.05)	66.18 (10.84)	-	-	6.4 (1.05)	-	409.28 (67.04)	-	49 (8.03)
82	Moraghat	-	69.6 (11.54)	-	-	3.56 (0.59)	1.71 (0.28)	528.27 (87.59)	-	-
83	Mujnai	71.21 (10.5)	59.1 (8.71)	-	-	62.59 (9.23)	-	423.09 (62.38)	-	62.22 (9.17)
84	Nagrakata	63.3 (7.07)	62.36 (6.97)	-	-	6.33 (0.71)	2.18 (0.24)	595.44 (66.53)	-	165.39 (18.48)
85	Nangdala	5.95 (1.03)	76.95 (13.32)	-	-	0.74 (0.13)	-	487.5 (84.4)	-	6.45 (1.12)
86	Nedam	7.75 (2.45)	29.27 (9.26)	-	-	4.39 (1.39)	-	254.28 (80.46)	-	20.34 (6.44)
87	Nepuchapur	18.94 (4.55)	37.54 (9.01)	5.27 (1.26)	-	16.8 (4.03)	2.36 (0.57)	322.63 (77.47)	1.57 (0.38)	11.35 (2.73)
88	New Dooars	-	137.67 (13.81)	2.99 (0.30)	1.55 (0.16)	25.17 (2.52)	5.31 (0.53)	824.55 (82.68)	-	-
89	New Glencoe	51.27 (9.83)	63.87 (12.24)	-	-	33.05 (6.34)	-	349.74 (67.05)	6.59 (1.26)	17.09 (3.28)

Sl no.	Estate name	AL	BUL	GL	NUR	OTH	PLA	TEA	WB	WL
90	New Lands	-	77.58 (9.5)	-	9.05 (1.11)	1.3 (0.16)	-	717.76 (87.92)	-	10.72 (1.31)
91	Nimtijhora	33.86 (6.81)	56.74 (11.42)	-	-	-	-	387.88 (78.05)	0.2 (0.04)	18.29 (3.68)
92	Nowera Nuddy	136.78 (24.76)	69 (12.49)	3.76 (0.68)	-	45.65 (8.26)	-	285.49 (51.67)	-	11.81 (2.14)
93	Oodlabari	36.09 (5.14)	100.15 (14.27)	-	-	6.16 (0.88)	13.6 (1.94)	535.71 (76.34)	-	10.07 (1.43)
94	Palashbari	-	49.18 (11.39)	-	-	-	-	382.58 (88.61)	-	-
95	Patkapara	10.41 (1.87)	58.8 (10.56)	-	-	-	-	469.2 (84.24)		18.55 (3.33)
96	Phaskowa	-	42.96 (16.31)	-	-	3.55 (1.35)	-	132.34 (50.24)	-	84.53 (32.09)
97	Putharjhora	36.85 (6.6)	53.08 (9.51)	13.33 (2.39)	-	36.17 (6.48)	-	410.25 (73.49)	-	8.53 (1.53)
98	Radharani	10.38 (4.74)	19 (8.68)	-	-	2.75 (1.26)	1 (0.45)	183.72 (83.91)	-	2.09 (0.96)
99	Raghu Utkarsh	4.68 (5.65)	5.94 (7.17)	0.80 (0.97)	-	-	-	70.55 (85.15)	0.23 (0.28)	0.64 (0.78)
100	Rahimabad	-	62.03 (8.41)	2.35 (0.32)	-	101.88 (13.82)	3.61 (0.49)	352.98 (47.88)	4.36 (0.59)	209.95 (28.48)
101	Rahimpur	66.94 (20.47)	54.48 (16.66)	0.49 (0.15)	-	4.04 (1.24)	-	200.64 (61.37)	-	0.33 (0.1)
102	Raipur	3.3 (1.16)	28.11 (9.87)	3.71 (1.30)	0.63 (0.22)	0.1 (0.03)	-	248.12 (87.07)	-	0.99 (0.35)
103	Raja	58.74 (9.07)	136.68 (21.09)	-	-	7.66 (1.18)	-	395.04 (60.97)	-	49.85 (7.69)
104	Rheabari	-	39.67 (8.47)	16.35 (3.49)	-	2.07 (0.44)	1.81 (0.39)	408.41 (87.21)	-	-
105	Rydak	106.72 (8.32)	151.49 (11.81)	-	27.42 (2.14)	45.48 (3.55)	2.48 (0.19)	813.45 (63.42)	-	135.65 (10.58)
106	Samsing	-	92.92 (13.1)	-	-	0.84 (0.12)	-	606.63 (85.53)	-	8.89 (1.25)
107	Sankos	-	69.7 (8.07)	-	15.97 (1.85)	3.11 (0.36)	-	774.88 (89.72)	-	-
108	Sarugaon	70.41 (12.88)	85.95 (15.72)	-	-	-	-	360.83 (66.01)	-	29.47 (5.39)
109	Satali	1.35 (0.12)	155.67 (13.93)	-	8.95 (0.8)	7.58 (0.68)	-	935.03 (83.7)	-	8.57 (0.77)
110	Shikharpur	22.62 (2.74)	99.27 (12.04)	15.53 (1.88)	21.06 (2.55)	6.89 (0.84)	596.76 (72.37)	0.84 (0.1)	61.67 (7.48)	-

Sl no.	Estate name	AL	BUL	GL	NUR	OTH	PLA	TEA	WB	WL
111	Singhania	-	25.25 (7.45)	-	-	0.47 (0.14)	-	295.47 (87.17)	-	17.77 (5.24)
112	Sonali	9.26 (3.17)	48.45 (16.58)	-	-	4.6 (1.58)	1.5 (0.51)	221.89 (75.94)	-	6.48 (2.22)
113	Soongachi	0.23 (0.02)	95.63 (10.24)	-	-	114.09 (12.22)	-	714.46 (76.51)	-	9.37 (1)
114	Srinathpur	132.08 (41.25)	40.86 (12.76)	-	-	6.76 (2.11)	-	117.82 (36.8)	-	22.67 (7.08)
115	Subhasini	6.36 (1.34)	34.93 (7.34)	-	-	3.96 (0.83)	2.52 (0.53)	425.04 (89.36)	-	2.86 (0.6)
116	Swaraswatipur	-	28.65 (7.9)	1.07 (0.30)	-	-	-	321.94 (88.76)	-	11.05 (3.05)
117	Sylee	71.1 (25.31)	25.68 (9.14)	-	-	4.11 (1.46)	-	170.06 (60.53)	-	10.01 (3.56)
118	Tasati	-	87.53 (14.63)	7.00 (1.17)	-	9.52 (1.59)	-	463.02 (77.41)	-	31.05 (5.19)
119	Telepara	-	181.17 (15.69)	-	3.19 (0.28)	65.42 (5.67)	3.48 (0.3)	754.29 (65.34)	0.97 (0.08)	145.87 (12.64)
120	Toonbarie	8.18 (3.21)	29.87 (11.72)	-	-	31.81 (12.48)	1.73 (0.68)	160.14 (62.85)	-	23.09 (9.06)
121	Toorsa	5.68 (0.89)	33.28 (5.24)	-	-	10.41 (1.64)	2.23 (0.35)	572.53 (90.21)	-	10.58 (1.67)
122	Totapara	1.61 (0.31)	33.59 (6.47)	-	-	44.7 (8.61)	4.57 (0.88)	420.41 (80.97)	-	14.36 (2.77)
123	Tulsipara	-	64 (9.35)	-	18.14 (2.65)	14.45 (2.11)	-	556.87 (81.32)	0.33 (0.05)	30.98 (4.52)
124	Turturi	-	34.52 (7.46)	-	1.65 (0.36)	40.04 (8.66)	-	368.09 (79.59)	-	18.16 (3.93)
125	Uttarsalbari	65.18 (86.94)	5.83 (7.77)	-	-	3.96 (5.28)	-	-	-	-
126	Washabarie	76.16 (10.55)	78.26 (10.84)	-	-	28.35 (3.93)	4.44 (0.62)	478.93 (66.37)	-	55.48 (7.69)
127	Yongtong	-	62.25 (13.11)	3.52 (0.74)	-	0.76 (0.16)	0.29 (0.06)	402.78 (84.83)	-	5.21 (1.1)
128	Zurantee	1.11 (0.15)	43.44 (6)	-	6.95 (0.96)	61.19 (8.45)	-	579.51 (80.03)	-	31.88 (4.4)

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

*Figure in the parenthesis indicates 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 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 32.49%. The number of the gardens that have less than 10% canopy cover accounts for 41 gardens, 71 gardens have density between 10% to 20% and only 16 gardens have shade tree density of more than 20%. Garden wise overall shade tree density within the tea growing areas is given in Table 11.

Table 11: Garden-wise Overall Shade Tree Density

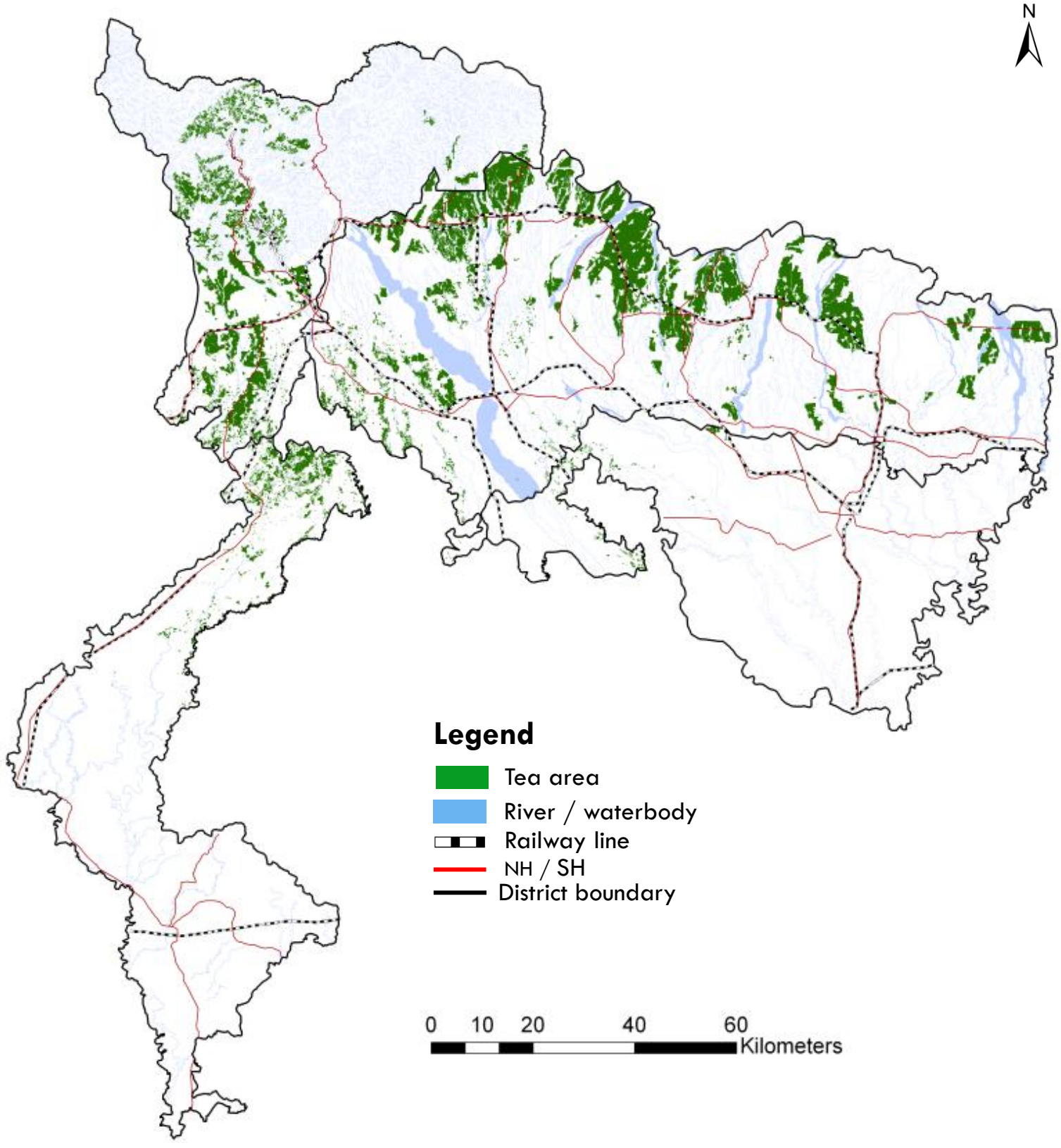
Sl no.	Garden name	% area under shade tree	Sl no.	Garden name	% area under shade tree
1	Aibheel	32.49	65	Kumargram	21.84
2	Amarpur	4.67	66	Kumlai	6.84
3	Ambari	15.99	67	Kurti	11.07
4	Anandapur	7.87	68	Lakhikanta	14.79
5	Bagrakote	5.87	69	Lakhipara	22.64
6	Baintgoorie	3.24	70	Lankapara	19.61
7	Bamandanga 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
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

Sl no.	Garden name	% area under shade tree	Sl no.	Garden name	% area under shade tree
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
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

Sl no.	Garden name	% area under shade tree	Sl no.	Garden name	% area under shade tree
59	Karala valley	2.98	123	Tulsipara	21.86
60	Karballa	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

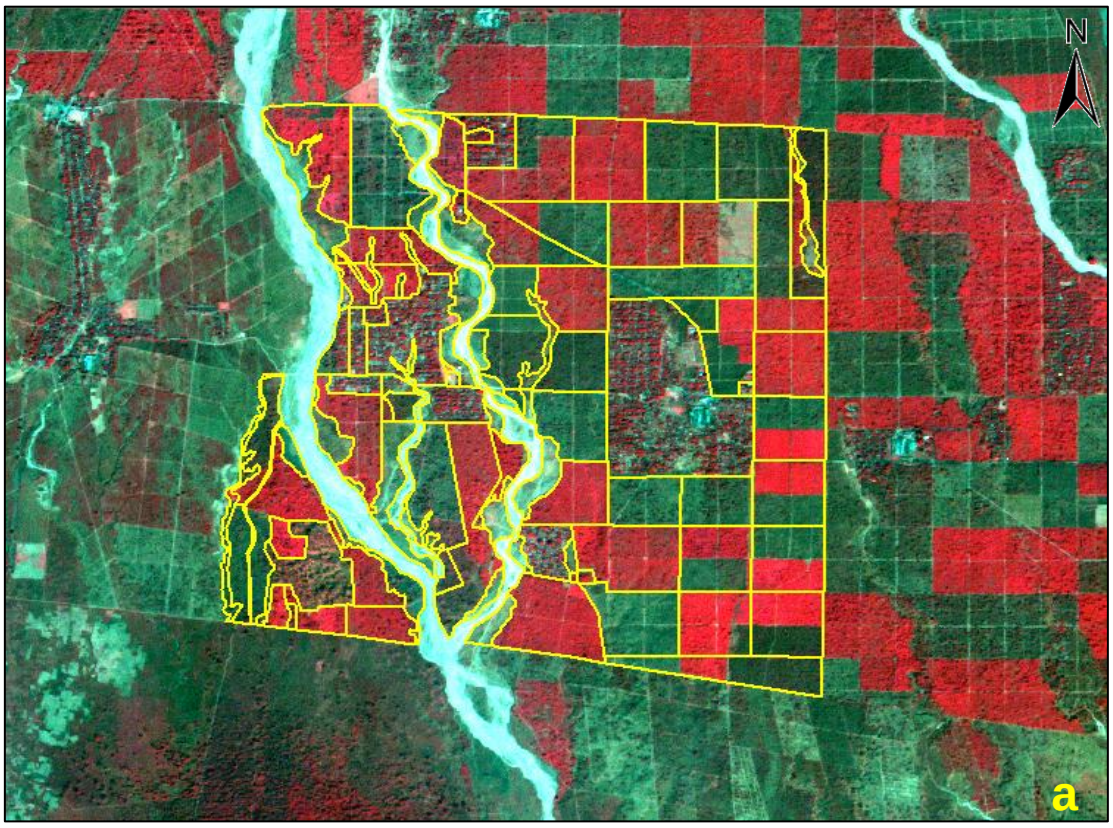
P1: Tea Growing Areas of West Bengal

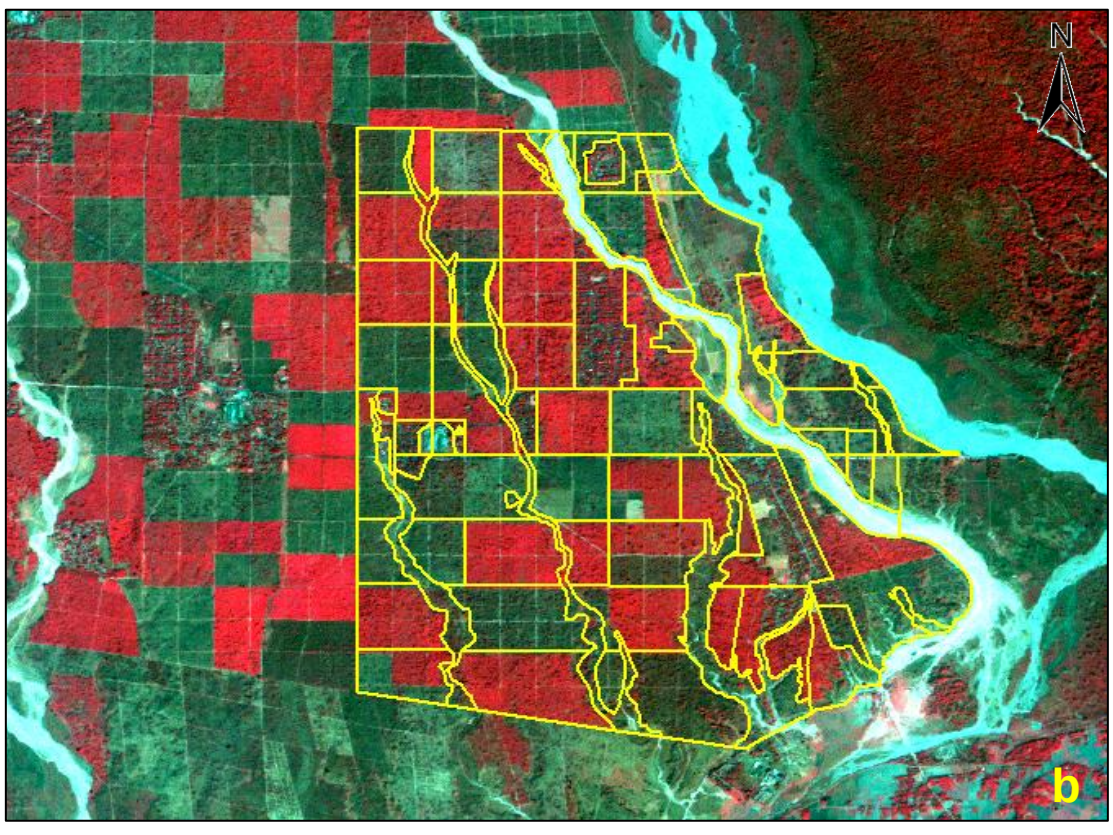
(Based on IRS LISS-IV and Cartosat-1 data)



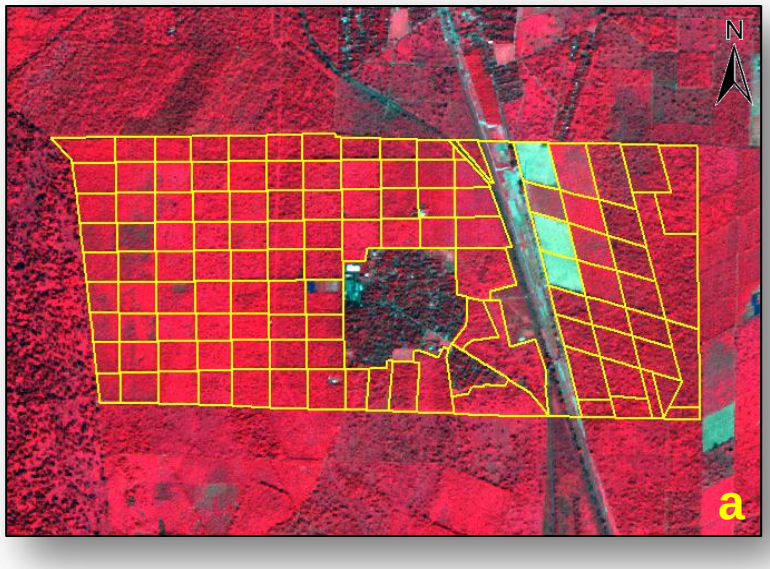
District	Tea area (sq km)	% of district
Cooch Bihar	9.68	0.29
Darjeeling	409.11	13.08
Jalpaiguri	925.10	14.85
North Dinajpur	88.53	2.83

P2: Tea Estates as Viewed by IRS LISS IV



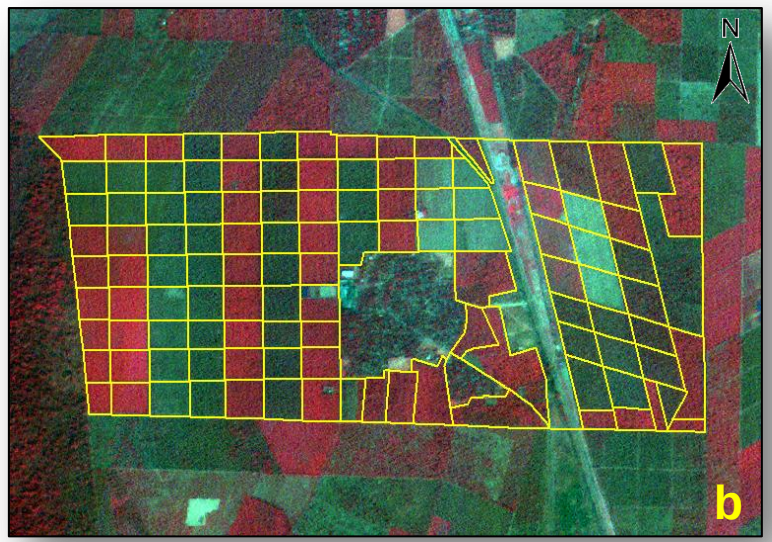


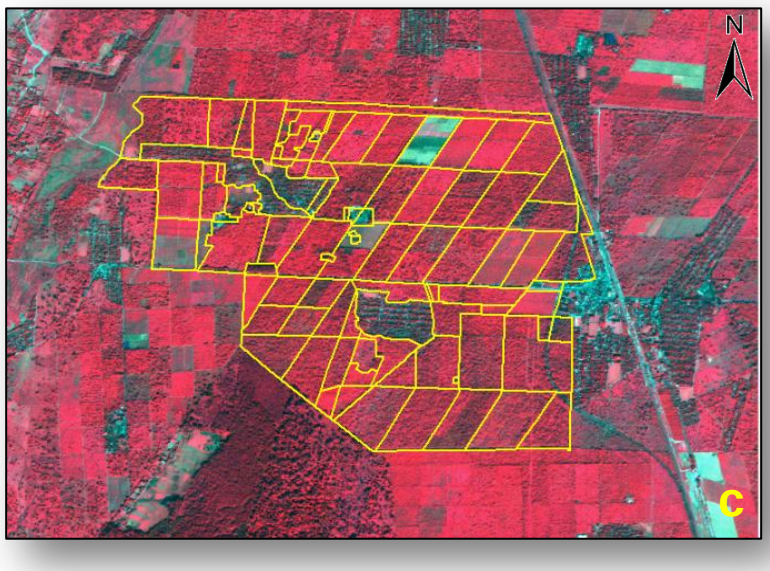
The above images are of a) Dumchipara TE and b) Hantapara TE of Jalpaiguri district, West Bengal, acquired on 24 February 2005 by IRS LISS IV sensor. The rivulets originating from the hills of Bhutan causes flash flood during monsoon and brings large amount sediment load. During winter generally pruning activities are undertaken to allow new tender flushes to come. The dark green areas represent pruned areas. Yellow colour depicts section boundaries of the tea estates.



a) IRS LISS IV image of Moraghat TE of Jalpaiguri district, acquired on 23 November 2009.

b) IRS LISS IV image of Moraghat TE of Jalpaiguri district, acquired on 14 February 2008.

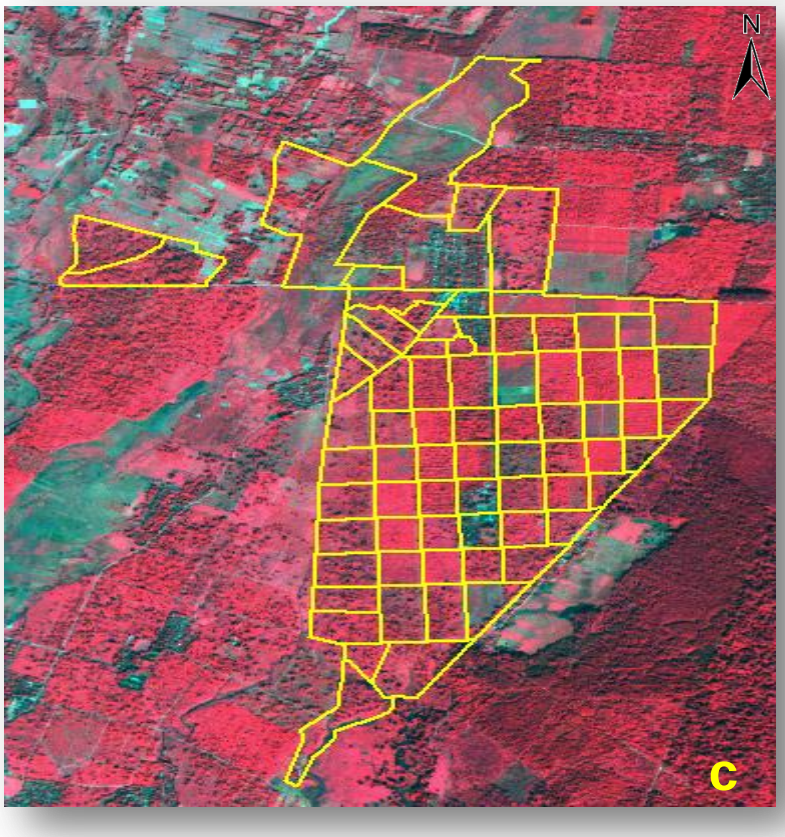


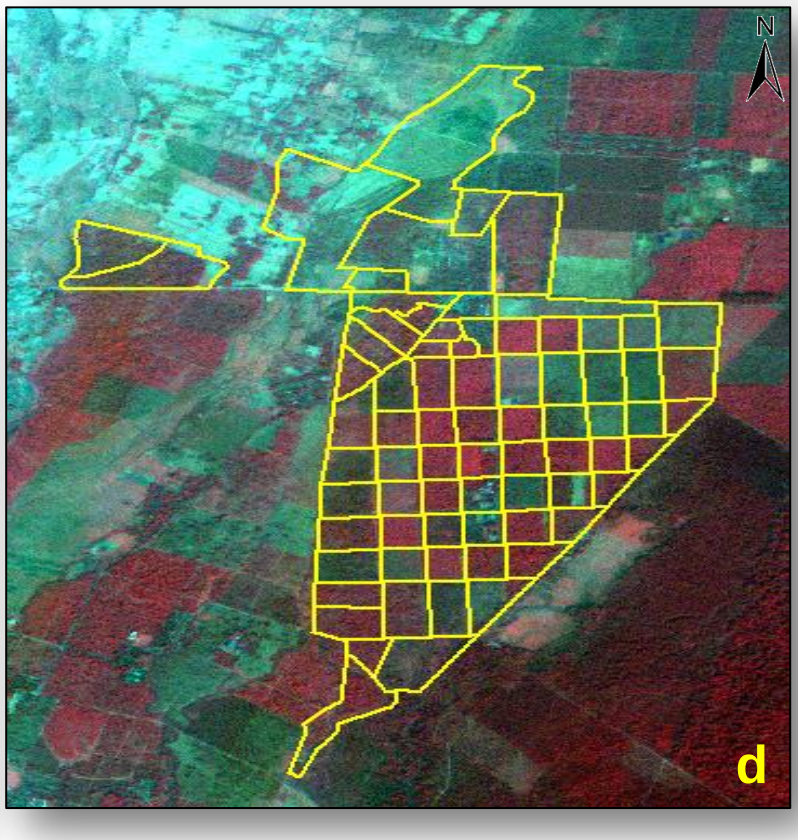


c) IRS LISS IV image of Gandrapara TE of Jalpaiguri district, acquired on 23 November 2009.

d) IRS LISS IV image of Gandrapara TE of Jalpaiguri district, acquired on 14 February 2008.

P4: Tea Estates as Viewed by IRS LISS IV

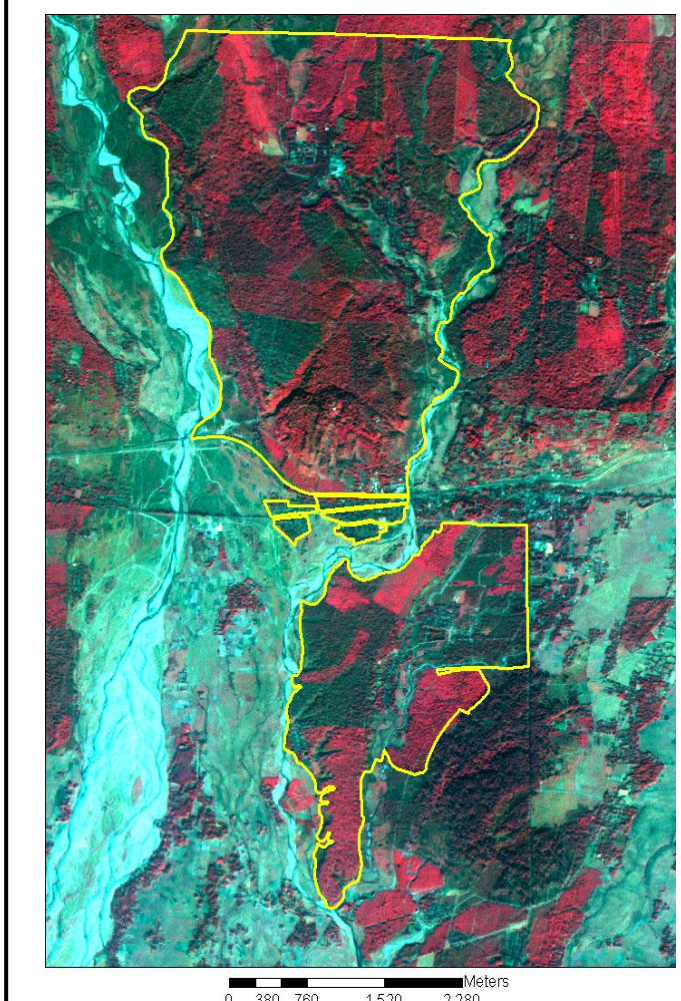




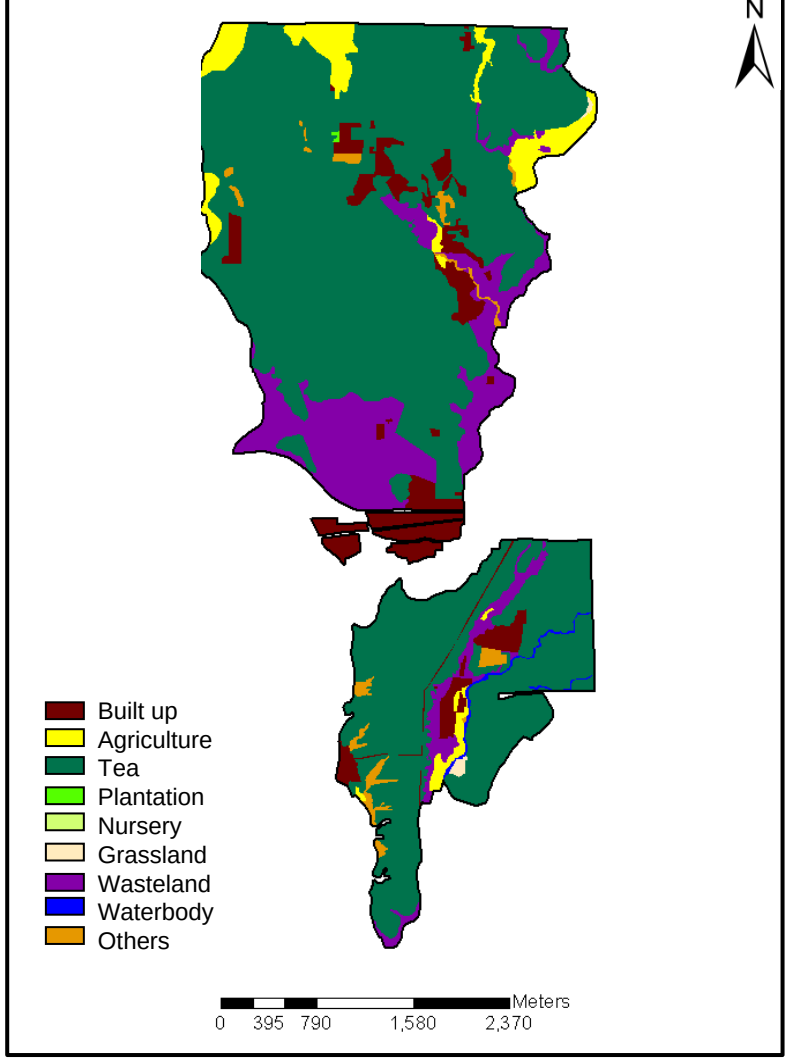
IRS LISS IV image of Lakhipara TE (a, b) and Totapara TE (c, d) of Jalpaiguri district, acquired on 23 November 2009 and 14 February 2008 respectively.

During November the tea estate sections mostly remained unpruned but in February pruning is clearly visible by dark green tone of the image.

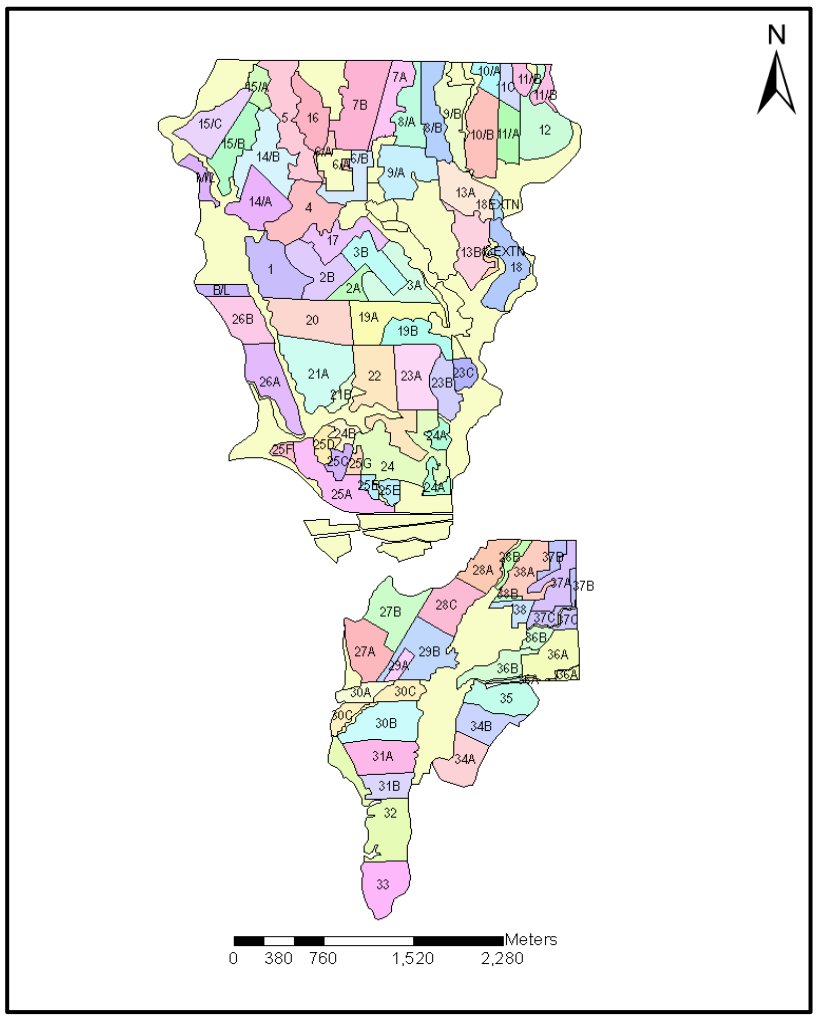
P5: AIBHEEL TE



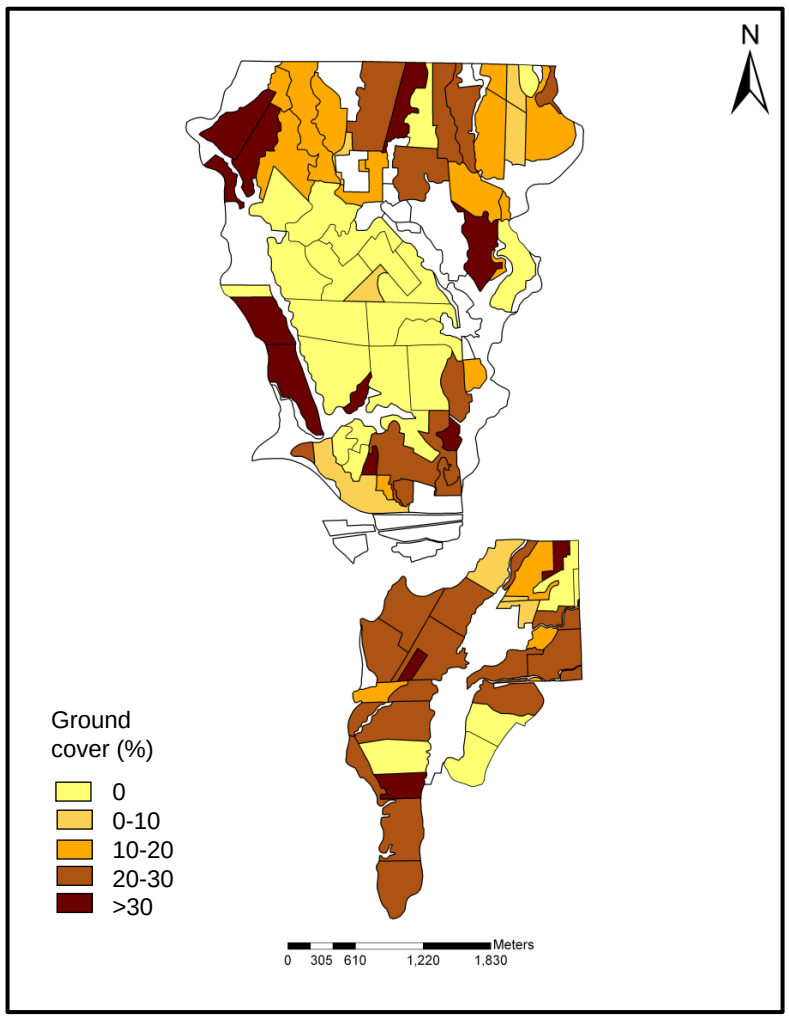
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

e. General Information

1. General	
Contact address	PO: Matelli, Dist: Jalpaiguri, PIN: 735223
Contact phone	03562-282956, 09647800560
Name of the company	Goodricke Group Ltd.
Name of the village where it falls	Aibheel
Leased area of the estate (ha)	1508.1
Tea grown area of the estate (ha)	842.64
No. of divisions / sections	4 div/84 sec
Year of establishment	1892
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

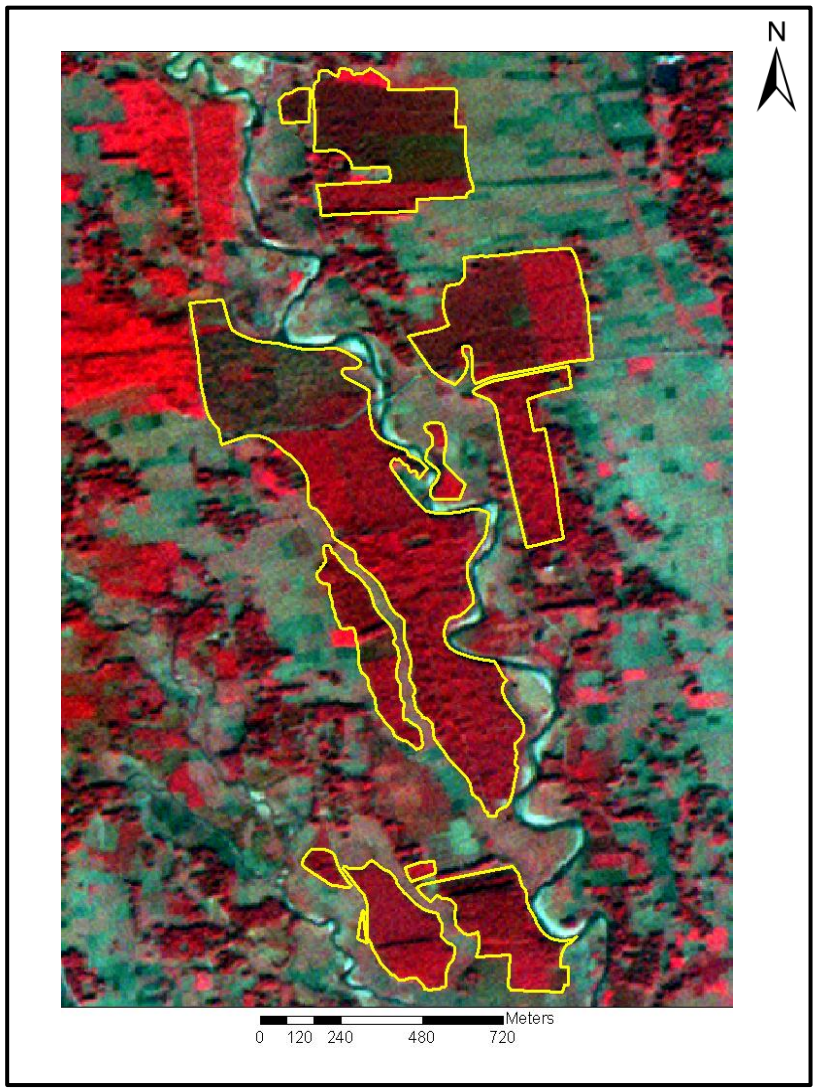
4. Shade trees	
Shade tree density (garden level)	Medium
Plant to plant spacing (m)	6.66 x 6.66
Row to row spacing (m)	6.66 x 6.66

5. Natural resources constraints	
Drainage congestion and water logging	No
Scarcity of water during summer	No
River bank erosion	Yes
Major diseases and duration	Black rot (Jun–Aug)
Major pests and duration	Looper (Feb-Jun), *Helopeltis* (Jul-Nov)
Damage due to wildlife	Yes

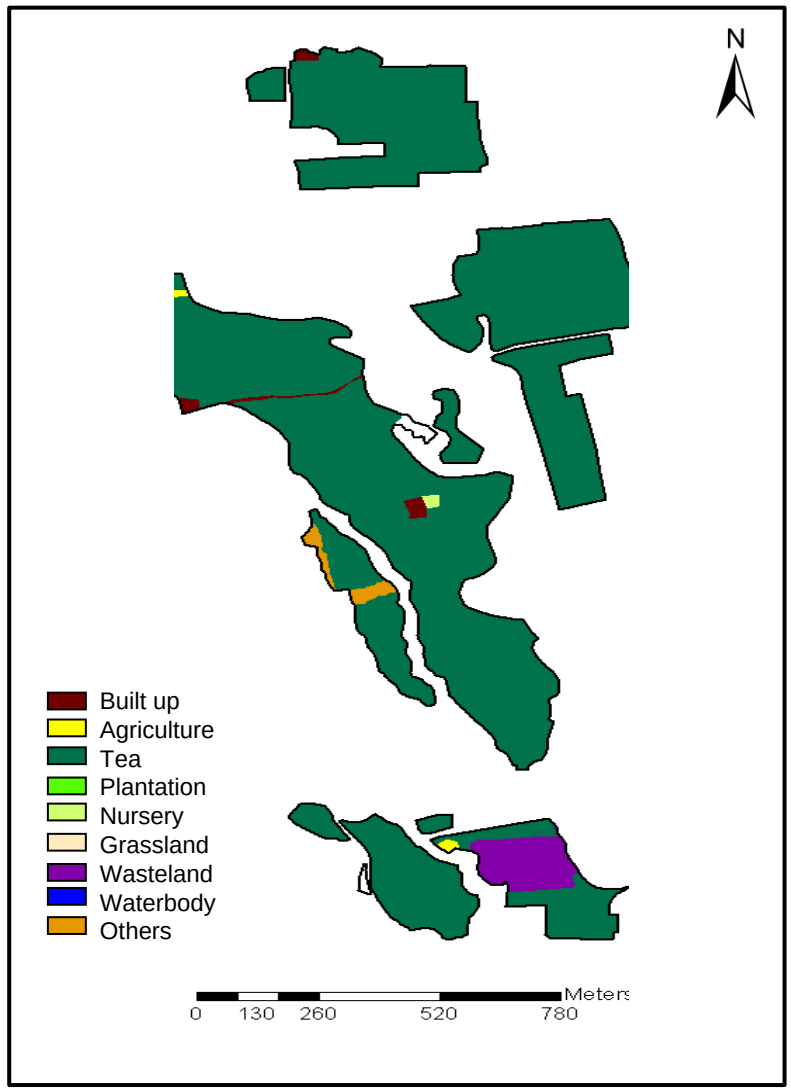
6. Yield / production	
Peak plucking periods	Jun-Oct
Annual green leaf yield	9143.85 kg/ha
Annual production of processed tea	1744676.8 kg

7. Pruning	
Time of pruning	4th week Nov-5th Jan
Pruning cycle	3 yr/2 yr
Types of pruning	LP-UP-DS/MS-UP

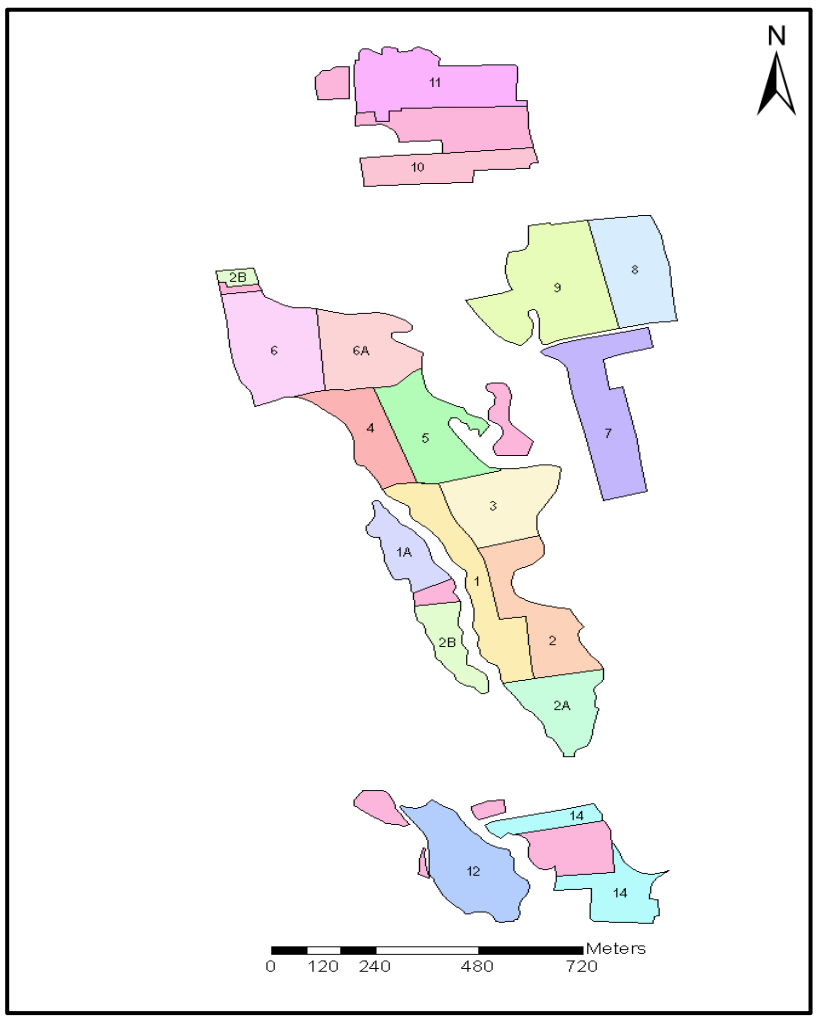
8. Fertilizer use	
Types of N, P, K fertilizers used	Urea, RP, MOP
Dose of Nitrogen (kg/ha)	150
Dose of Phosphorous (kg/ha)	35
Dose of Potash (kg/ha)	160
Whether lime is applied, if yes dose	Only in selective sections



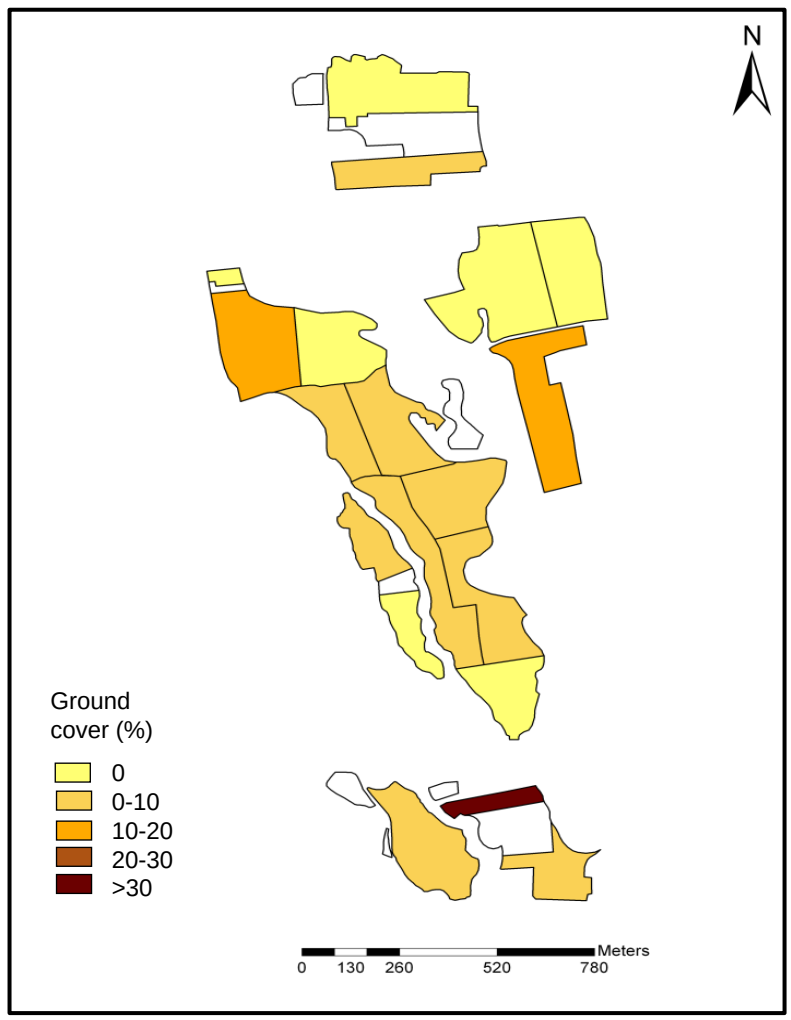
a. False Colour Composite of IRS LISS IV



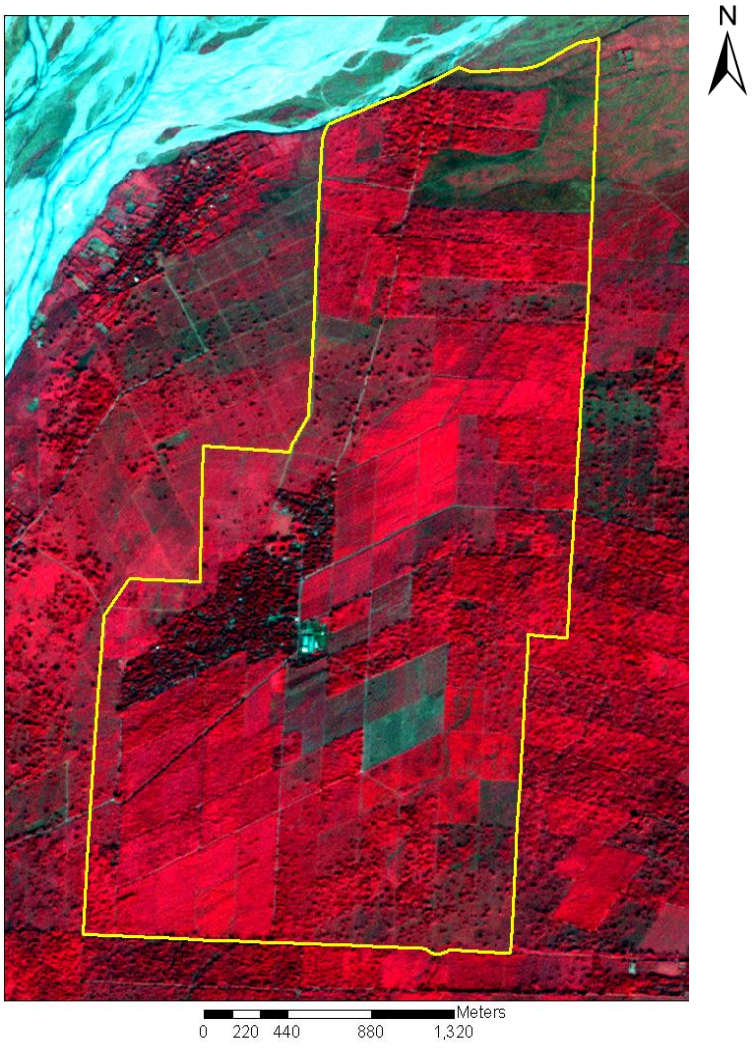
b. Tea Estate Landuse



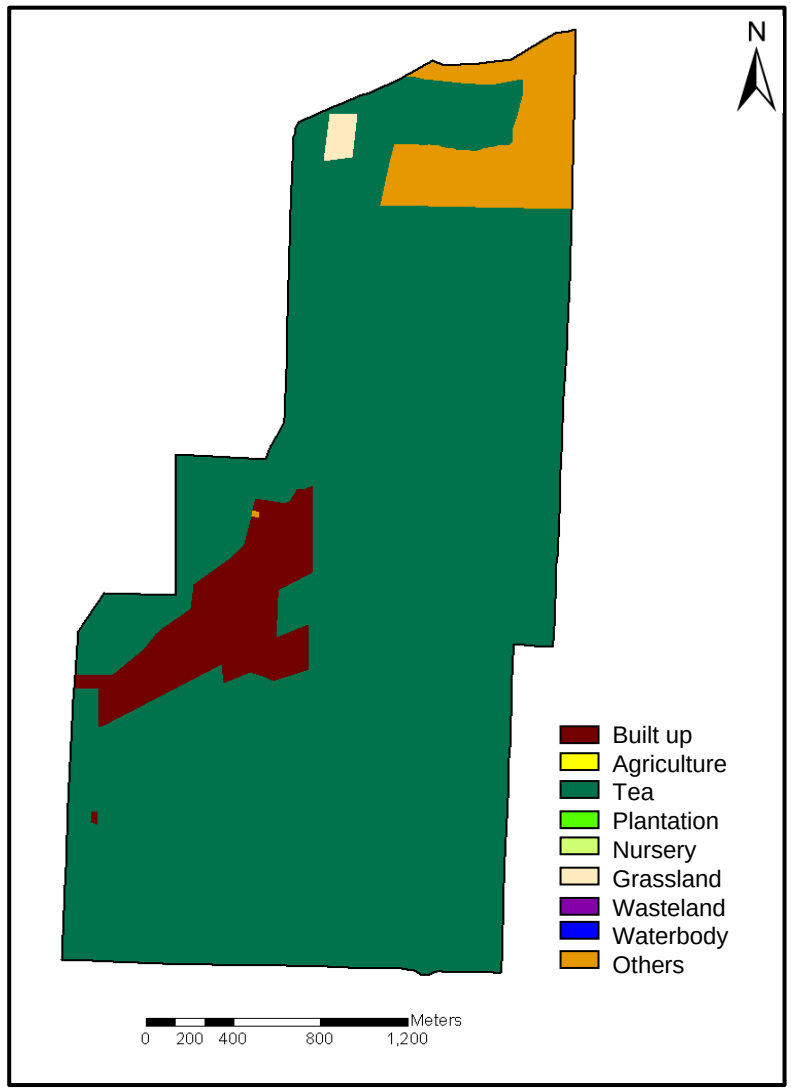
c. Section Boundaries of the Estate



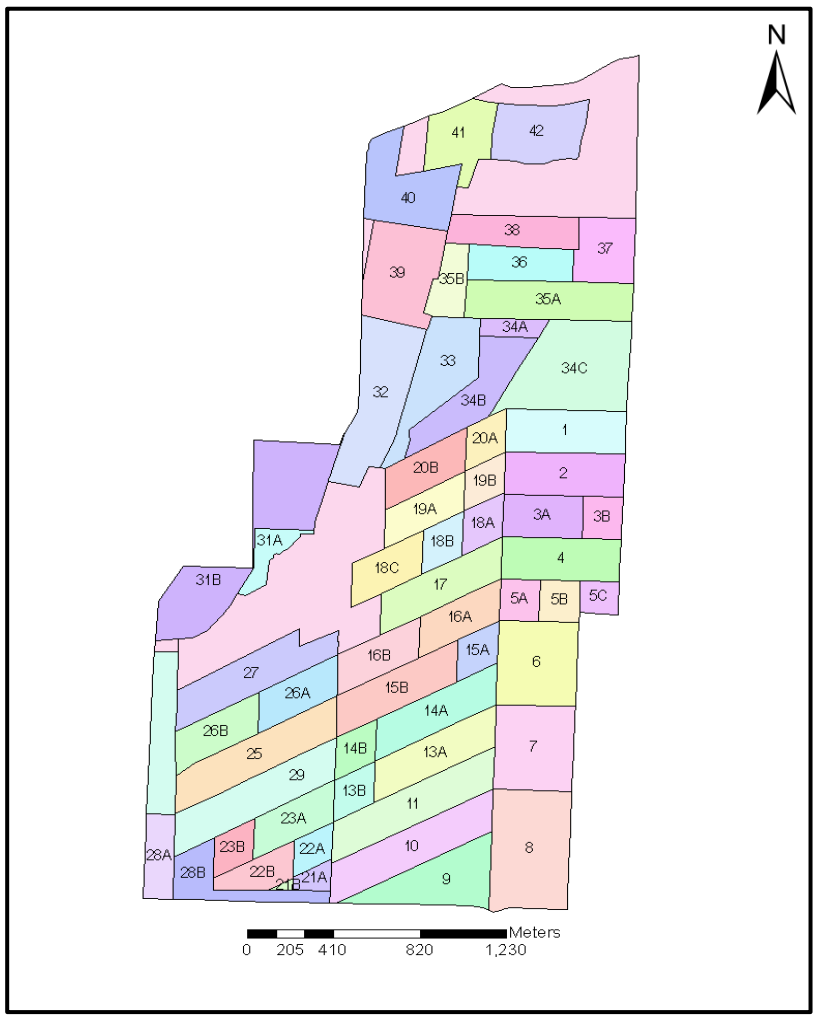
d. Shade Tree Density in Sections



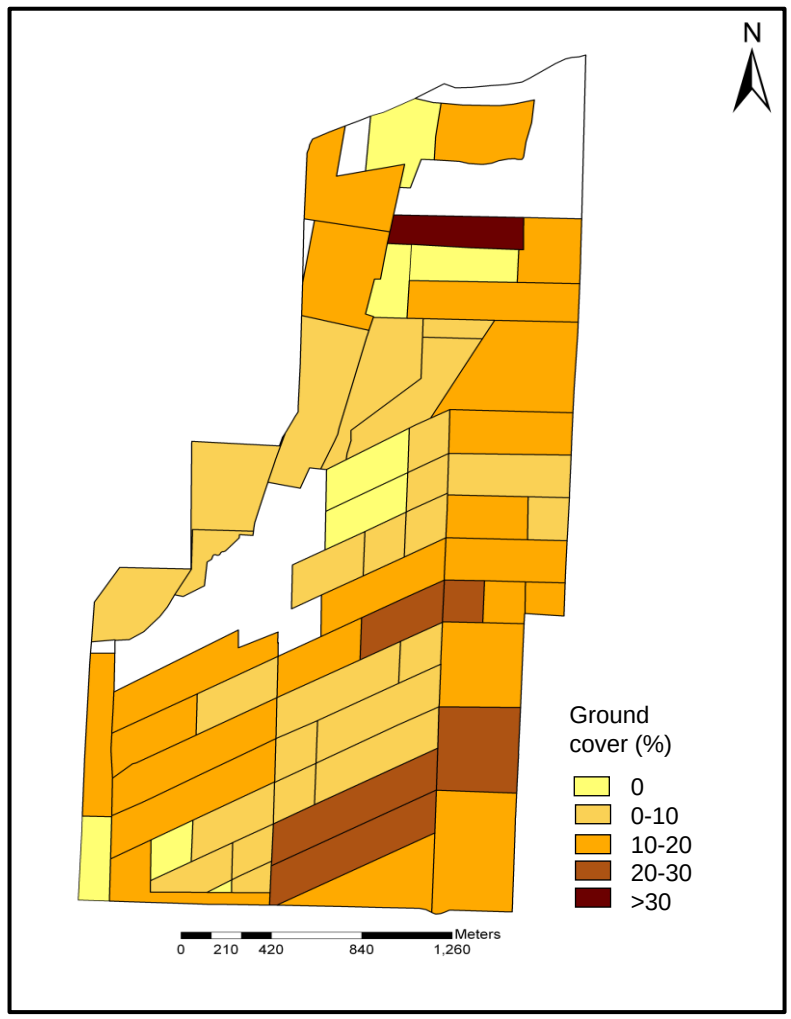
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

e. General Information

1. General	
Contact address	PO: Ambari bagan, Dist: Jalpaiguri PIN: 735201
Contact phone	09593932668, 03565-270726
Name of the company	--
Name of the village where it falls	--
Leased area of the estate (ha)	707.37
Tea grown area of the estate (ha)	587.10
No. of divisions / sections	0 div/129 sec
Year of establishment	1908
Type of tea produced	CTC

2. Infrastructure	
Availability of processing factory	Yes
Availability of workers colony	Yes
Availability of internet facility / e-mail id	No
Meteorological observations taken	Rainfall

3. Amenities	
Availability of health care / dispensary	Yes
Availability of school	Yes

4. Shade trees	
Shade tree density (garden level)	Medium
Plant to plant spacing	4' (old), 2' (new)
Row to row spacing	4' (old), 3' (new)

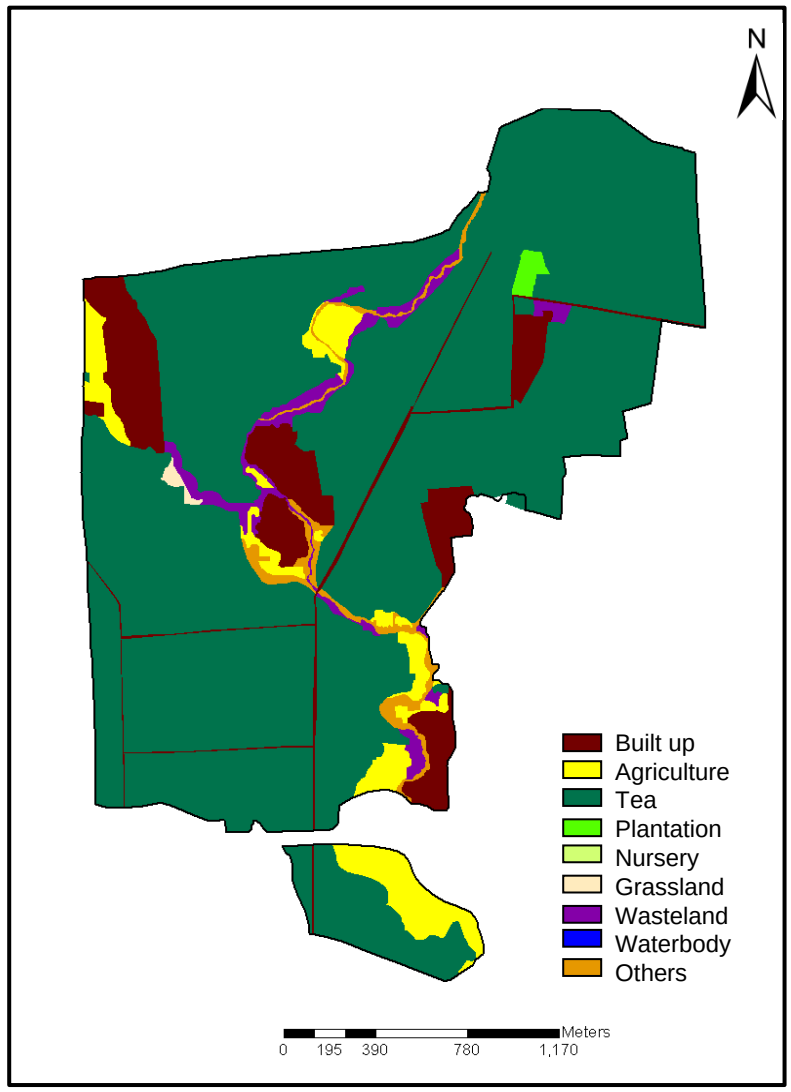
5. Natural resources constraints	
Drainage congestion and water logging	Yes
Scarcity of water during summer	Yes
River bank erosion	No
Major diseases and duration	Red rust, black rot, poria (May to Oct)
Major pests and duration	Looper, *Helopeltis*, RSM (whole year)
Damage due to wildlife	Yes

6. Yield / production	
Peak plucking periods	Mar-Nov
Annual green leaf yield	1600 kg/ha
Annual production of processed tea	900000 kg

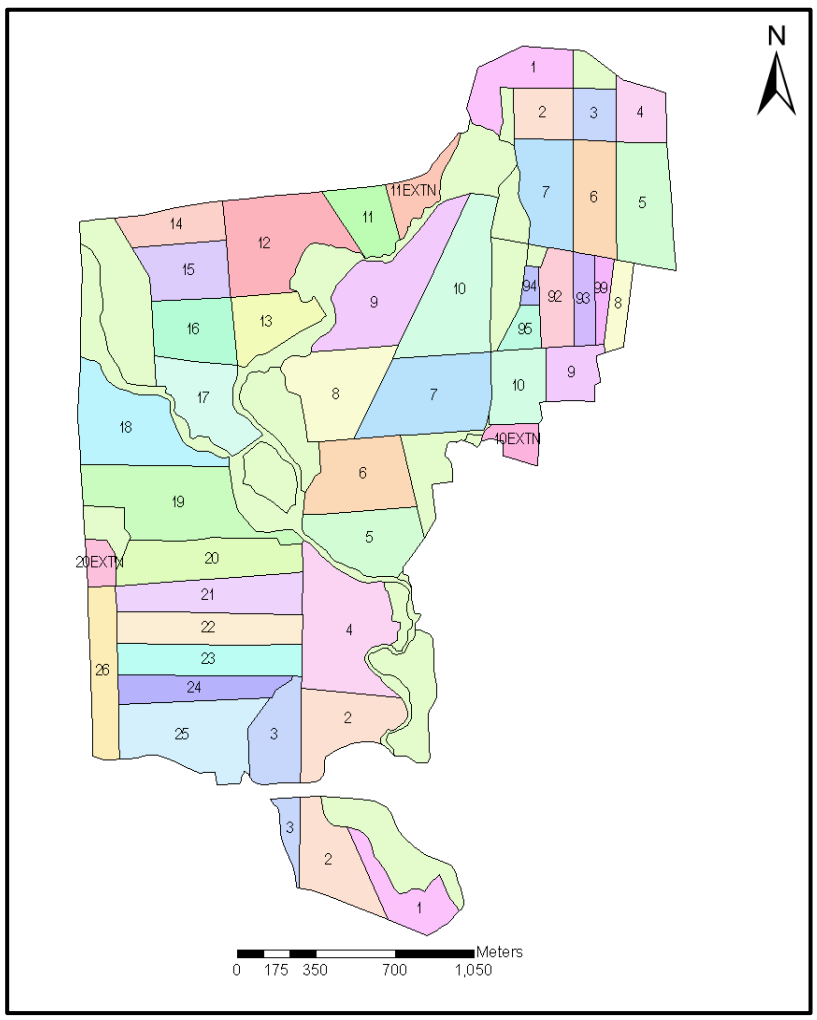
7. Pruning	
Time of pruning	Dec-Jan
Pruning cycle	3 yr/4 yr
Types of pruning	--

8. Fertilizer use	
Types of N, P, K fertilizers used	Urea, RP, MOP
Dose of Nitrogen (kg/ha)	130
Dose of Phosphorous (kg/ha)	30
Dose of Potash (kg/ha)	100
Whether lime is applied, if yes dose	No

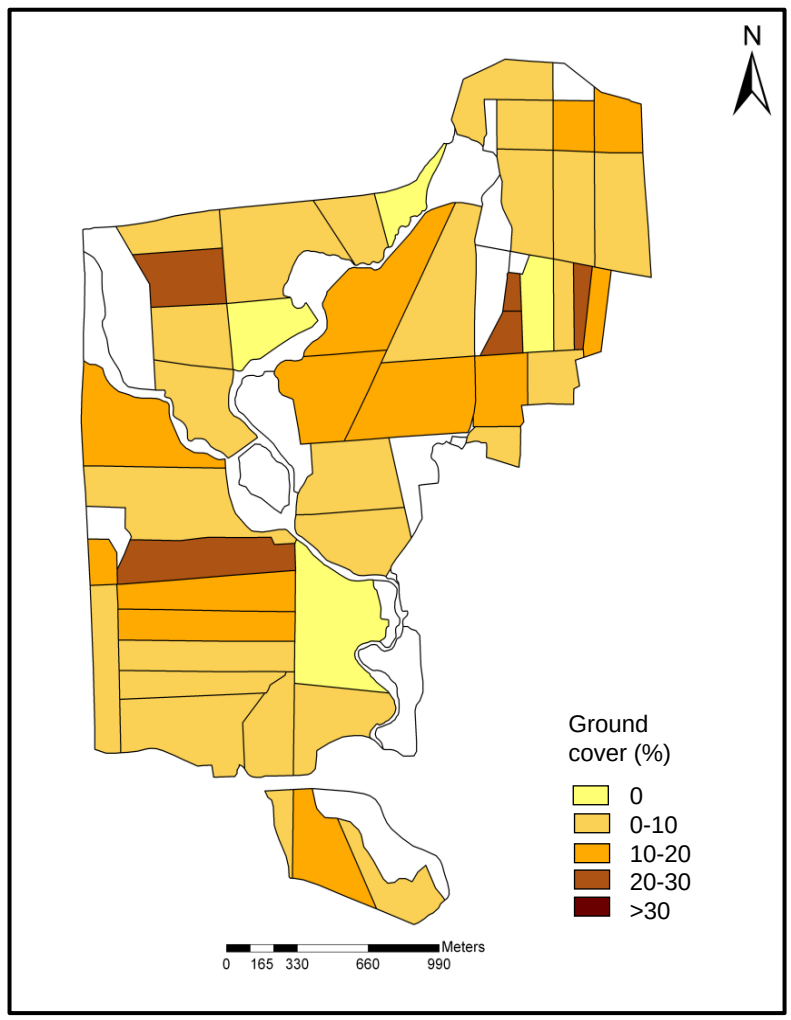
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

e. General Information

1. General	
Contact address	PO: Anandapur, Dist: Jalpaiguri PIN: 735218
Contact phone	03561-282162
Name of the company	Roopacherra Tea Co. Ltd.
Name of the village where it falls	Under Rajadanga Gram Panchayat
Leased area of the estate (ha)	631.71
Tea grown area of the estate (ha)	402.23
No. of divisions / sections	2 div/49 sec
Year of establishment	1929
Type of tea produced	CTC

2. Infrastructure	
Availability of processing factory	Yes
Availability of workers colony	Yes
Availability of internet facility / e-mail id	No
Meteorological observations taken	No

3. Amenities	
Availability of health care / dispensary	Yes
Availability of school	Yes

4. Shade trees	
Shade tree density (garden level)	Medium
Plant to plant spacing (m)	13.33 x 13.33
Row to row spacing (m)	13.33 x 13.33

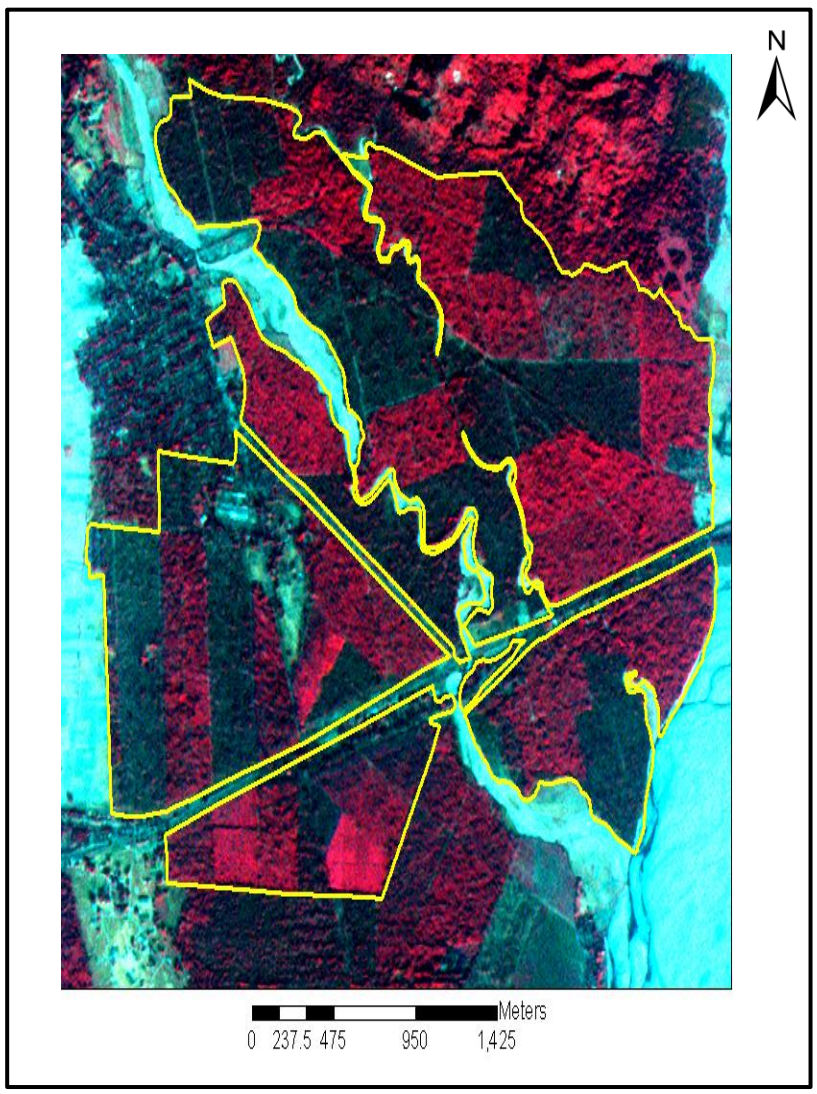
5. Natural resources constraints	
Drainage congestion and water logging	No
Scarcity of water during summer	Yes
River bank erosion	Yes
Major diseases and duration	--
Major pests and duration	Looper, *Helopeltis*, RSM (whole year)
Damage due to wildlife	Yes

6. Yield / production	
Peak plucking periods	Jun-Oct
Annual green leaf yield	10378 kg/ha
Annual production of processed tea	906413 kg

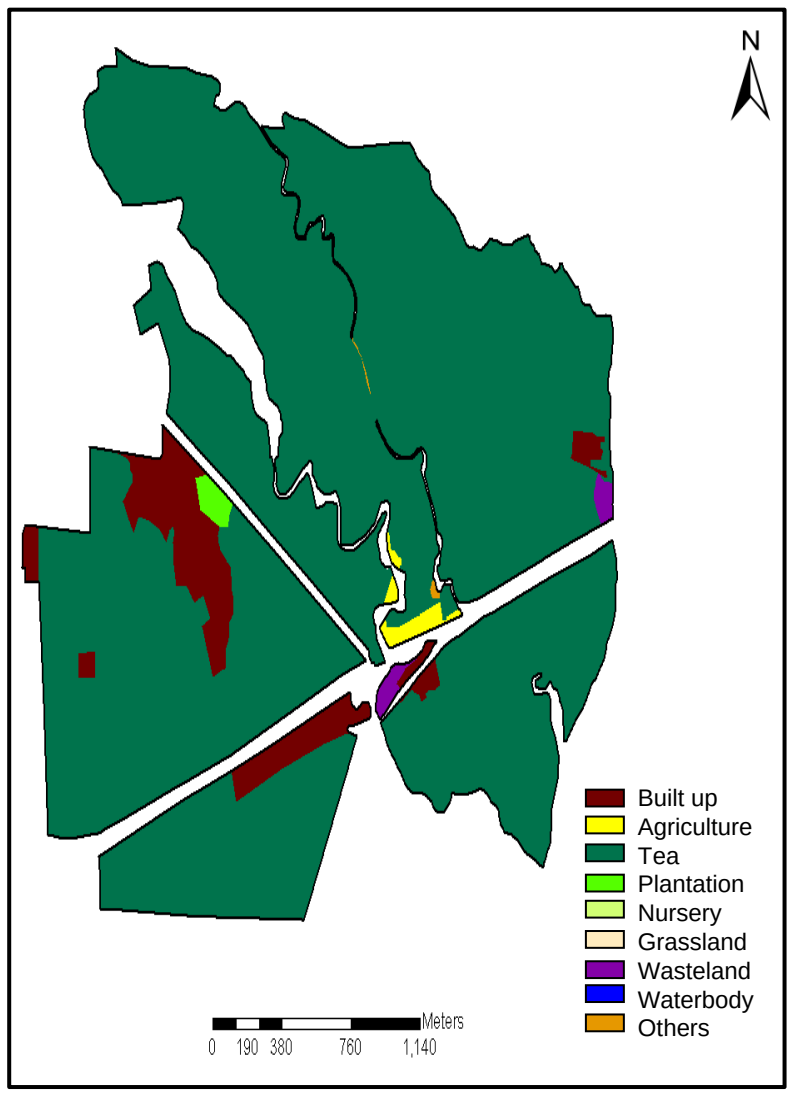
7. Pruning	
Time of pruning	Dec-Jan
Pruning cycle	4 yr
Types of pruning	LP-UP, MS/DS, UP

8. Fertilizer use	
Types of N, P, K fertilizers used	Urea, MOP, RP
Dose of Nitrogen (kg/ha)	140
Dose of Phosphorous (kg/ha)	20
Dose of Potash (kg/ha)	140
Whether lime is applied, if yes dose	No

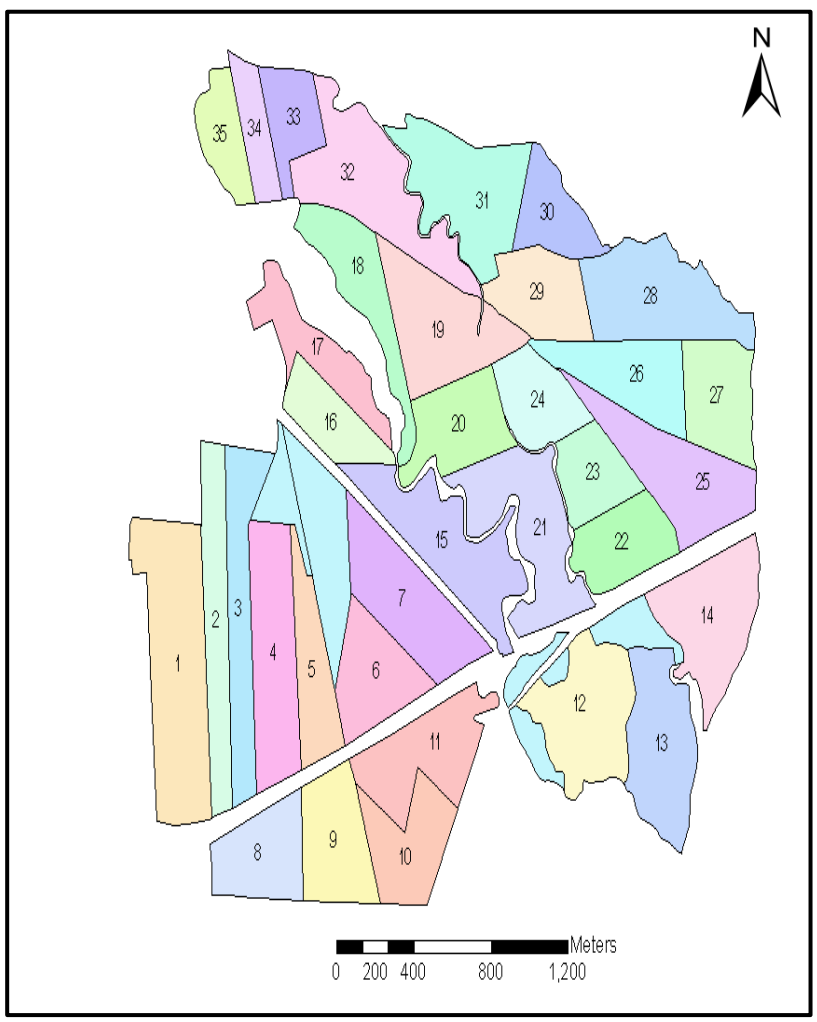
P9: BAGRACOTE TE



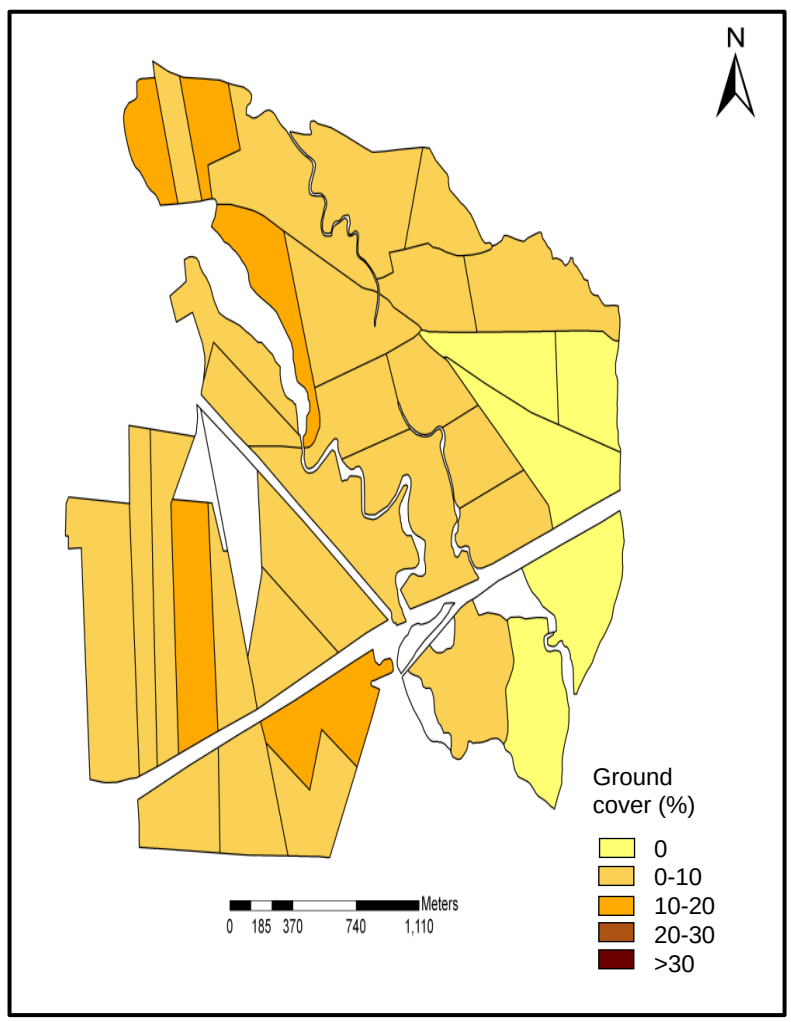
a. False Colour Composite of IRS LISS IV



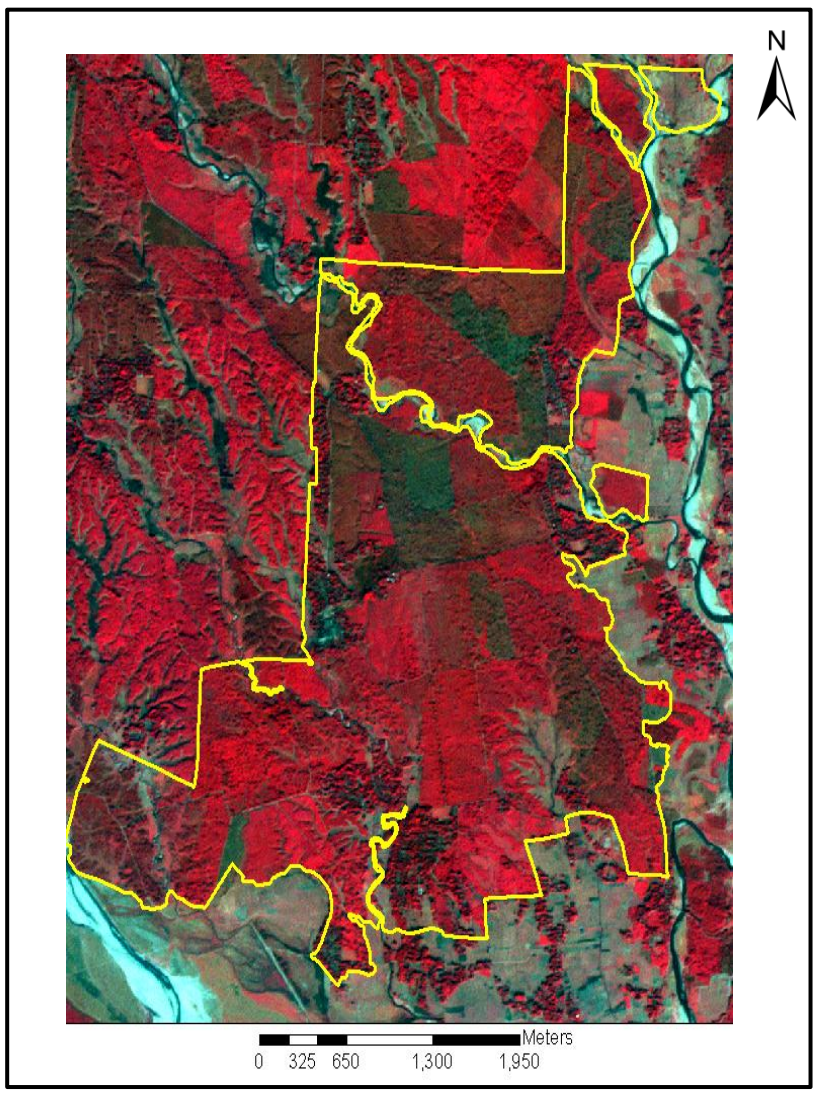
b. Tea Estate Landuse



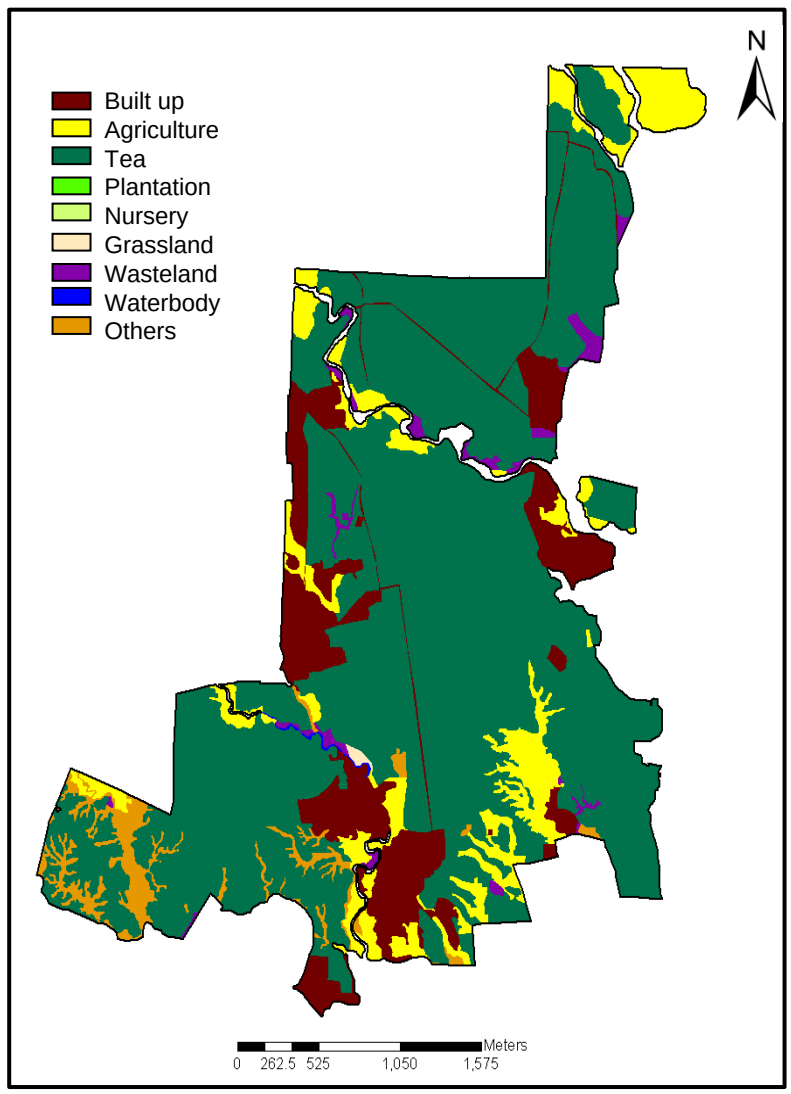
c. Section Boundaries of the Estate



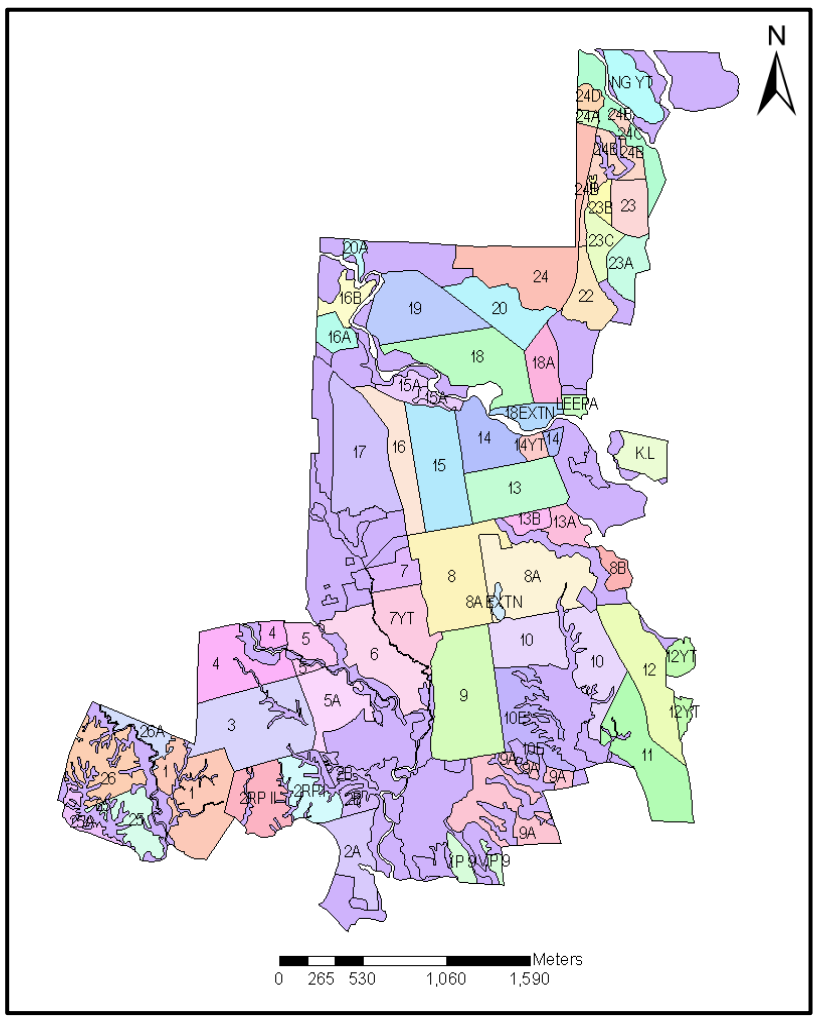
d. Shade Tree Density in Sections



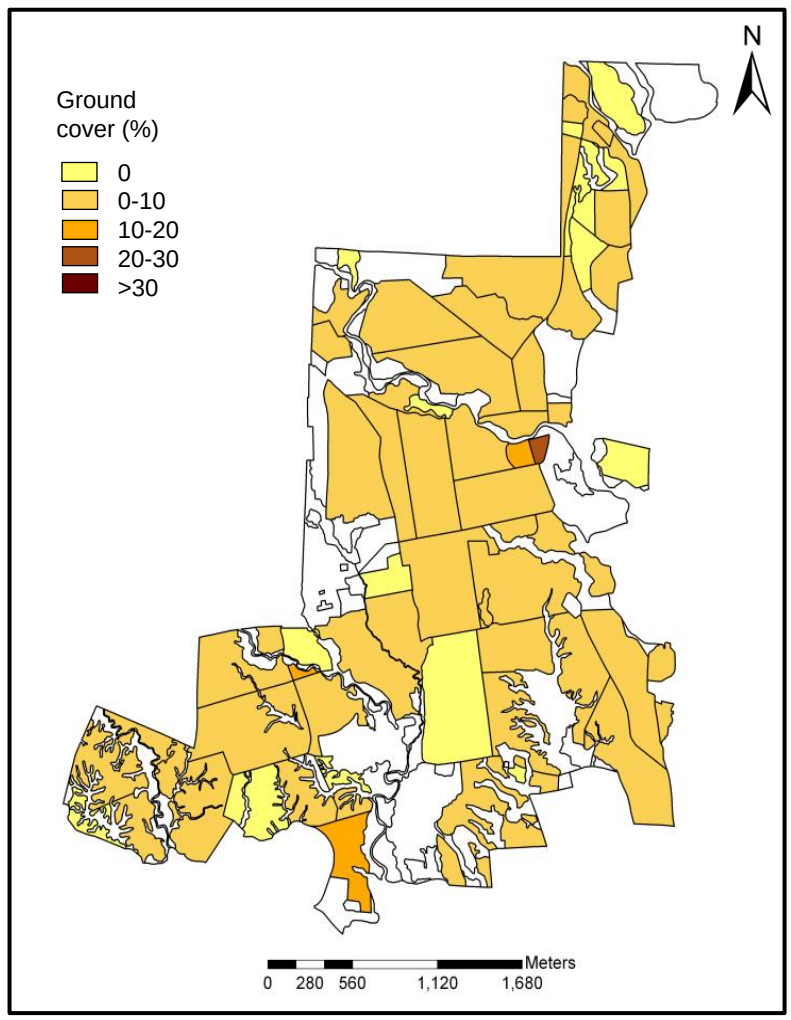
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse

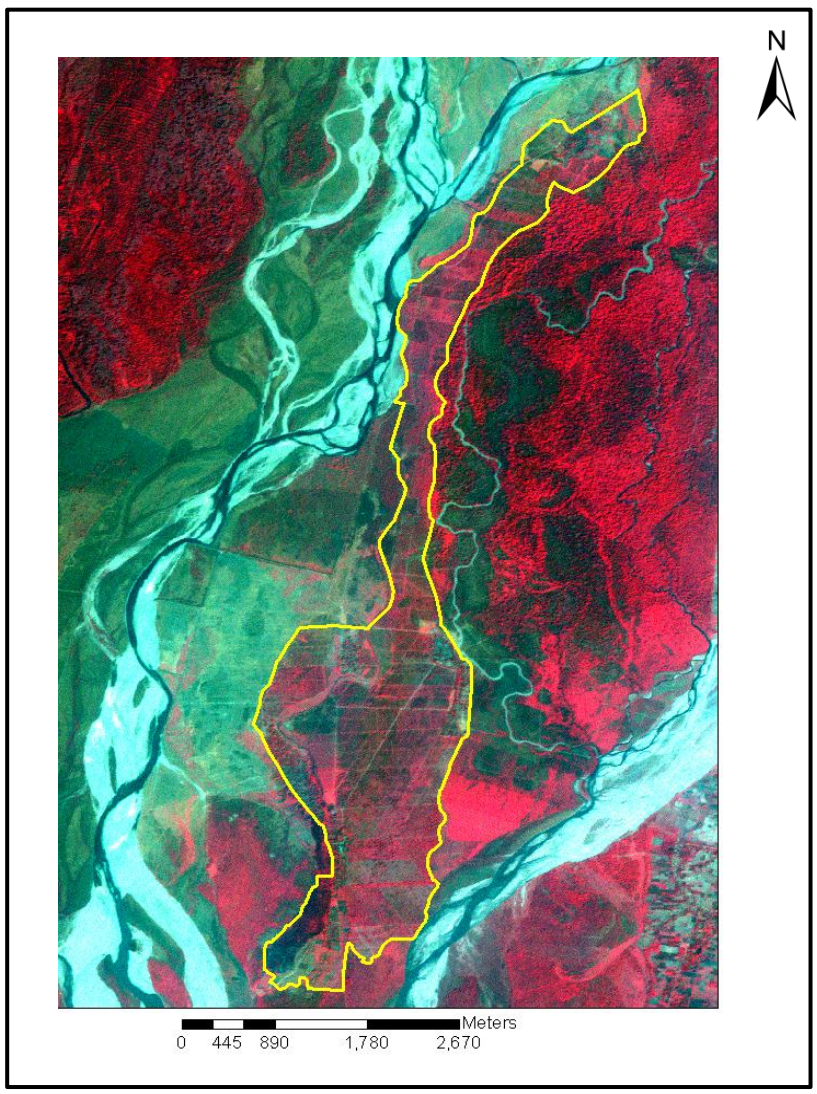


c. Section Boundaries of the Estate

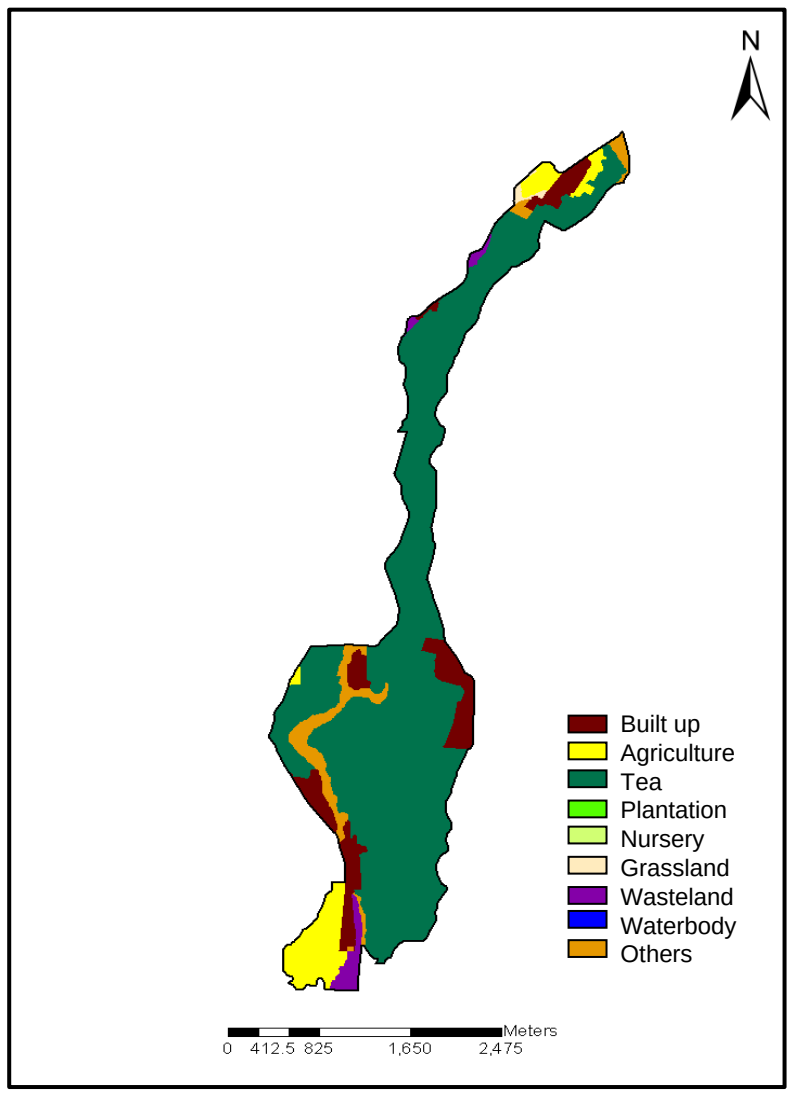


d. Shade Tree Density in Sections

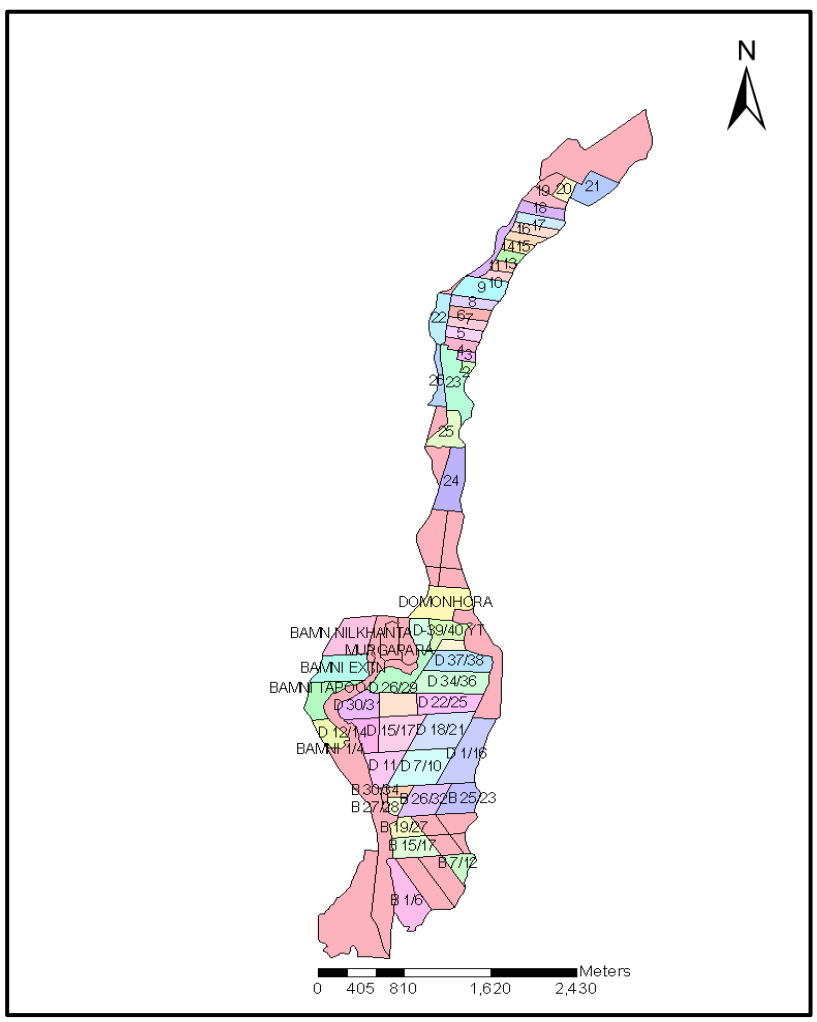
P11: BAMANDANGA TONDOO TE



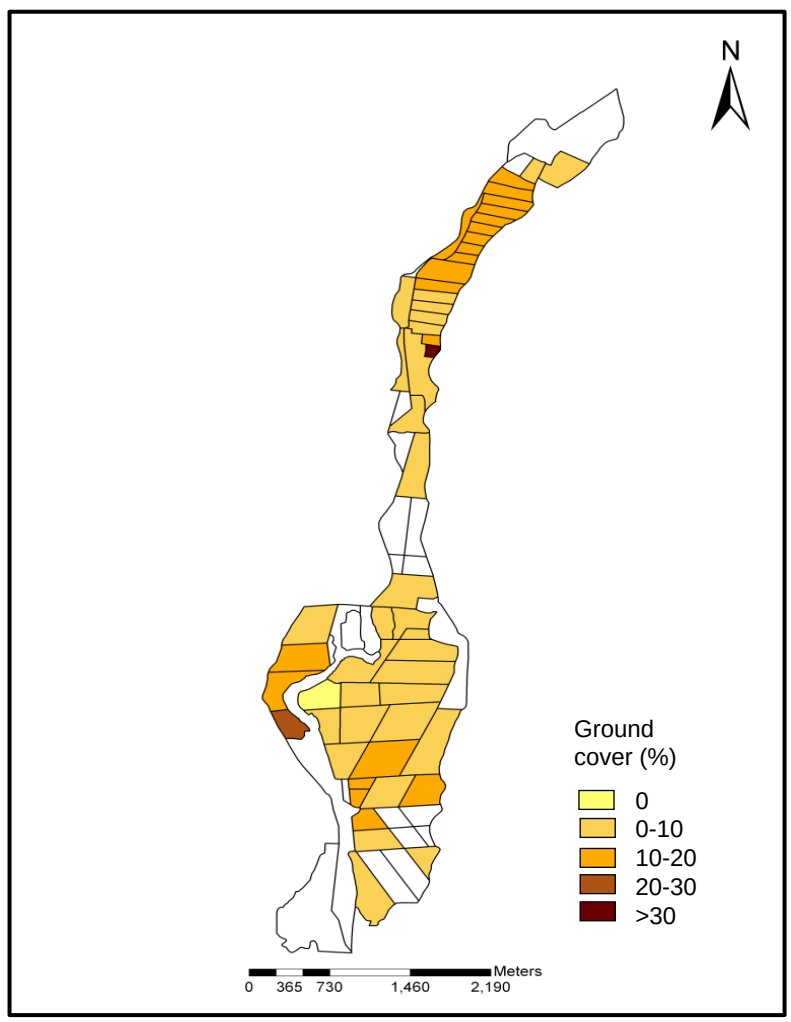
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

e. General Information

1. General	
Contact address	PO: Nagrakata, Dist: Jalpaiguri PIN: 735225
Contact phone	09007021339
Name of the company	--
Name of the village where it falls	Bamandanga
Leased area of the estate (ha)	734.25
Tea grown area of the estate (ha)	460.46
No. of divisions / sections	2 div/55 sec
Age	More than 70 years
Type of tea produced	Orthodox, 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 (primary)

4. Shade trees	
Shade tree density (garden level)	Low
Plant to plant spacing (m)	6 x 9
Row to row spacing (m)	6 x 9

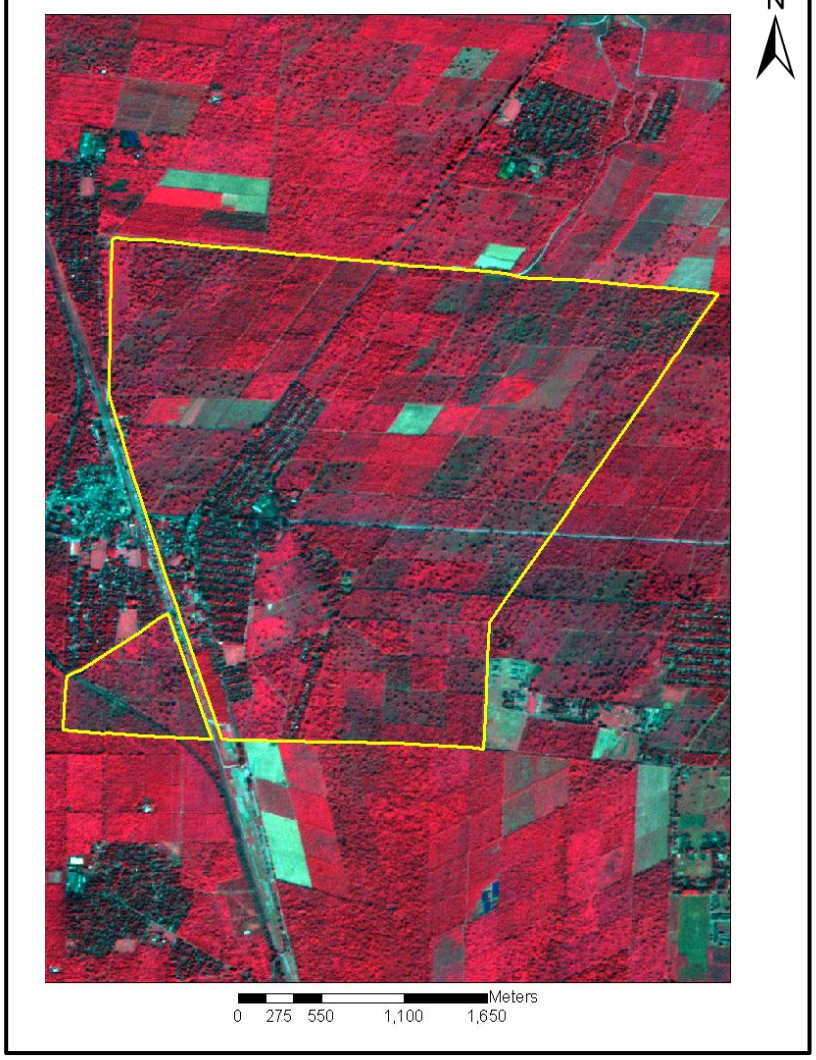
5. Natural resources constraints	
Drainage congestion and water logging	No
Scarcity of water during summer	No
River bank erosion	Yes
Major diseases and duration	Black rot, red rust, blister blight
Major pests and duration	RSM, *Helopeltis*, carterpillars, thrips
Damage due to wildlife	No

6. Yield / production	
Peak plucking periods	Mar-Nov
Annual green leaf yield	Opened on 16.03.10
Annual production of processed tea	Opened on 16.03.10

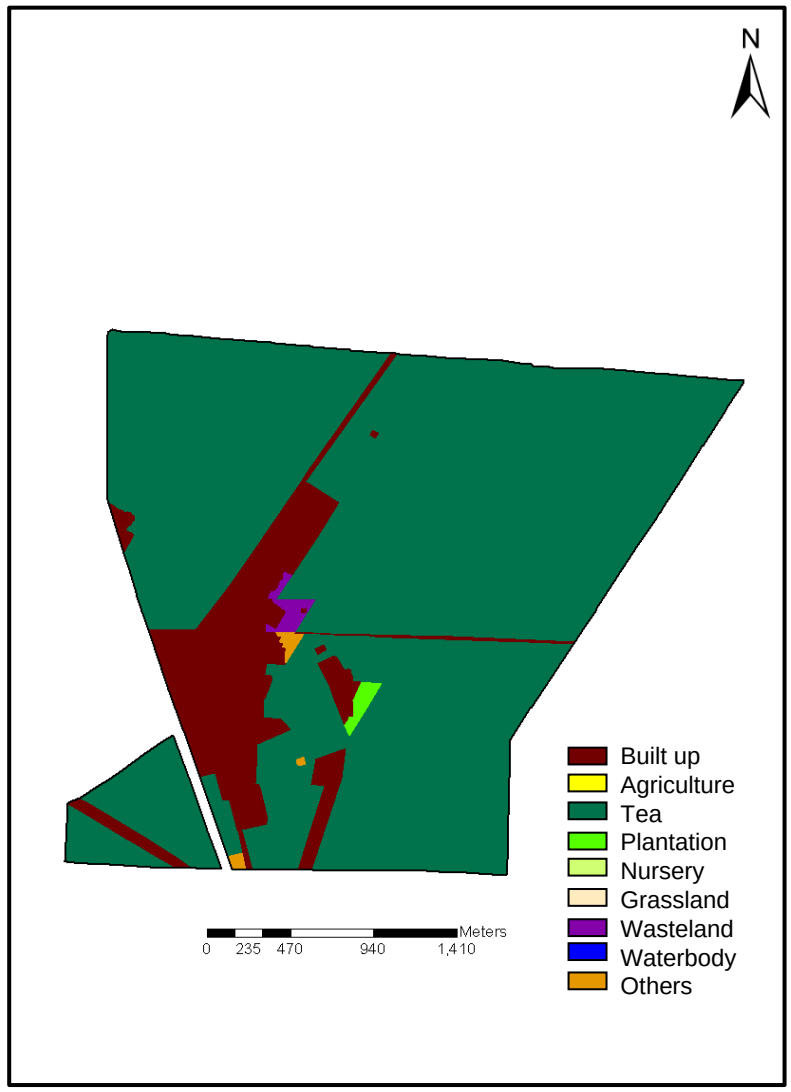
7. Pruning	
Time of pruning	Dec
Pruning cycle	4 yr
Types of pruning	LP-UP-DS-LP

8. Fertilizer use	
Types of N, P, K fertilizers used	--
Dose of Nitrogen (kg/ha)	--
Dose of Phosphorous (kg/ha)	--
Dose of Potash (kg/ha)	--
Whether lime is applied, if yes dose	--

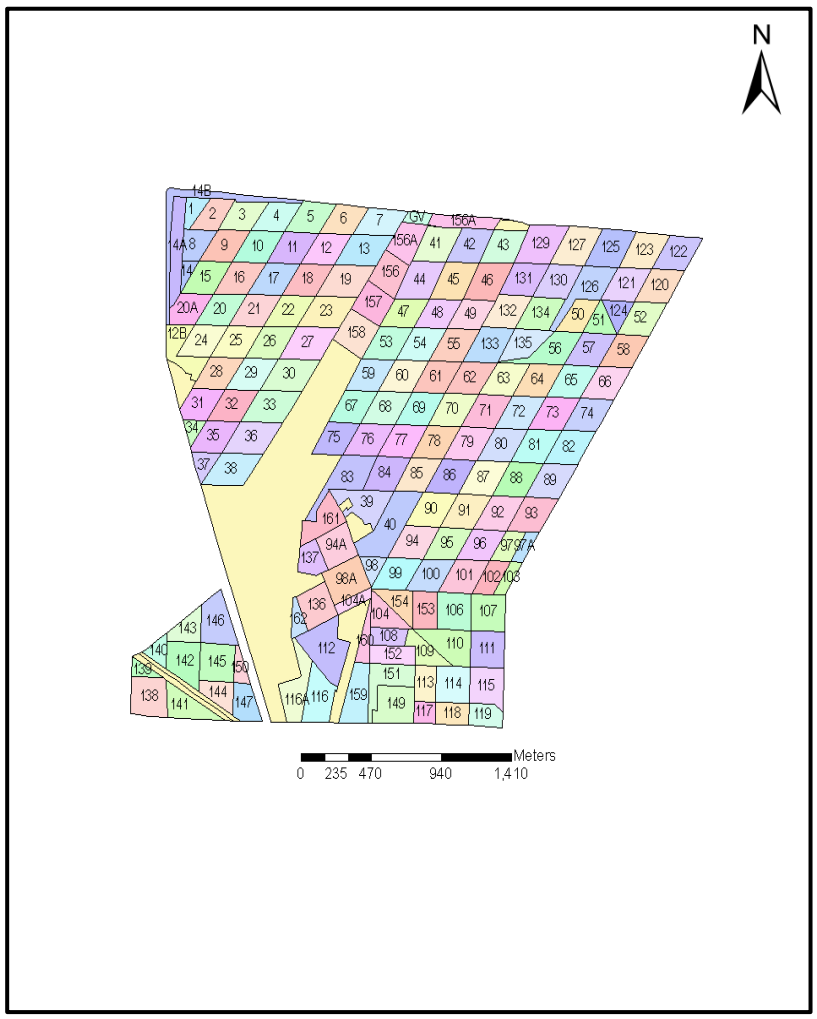
P12: BANARHAT TE



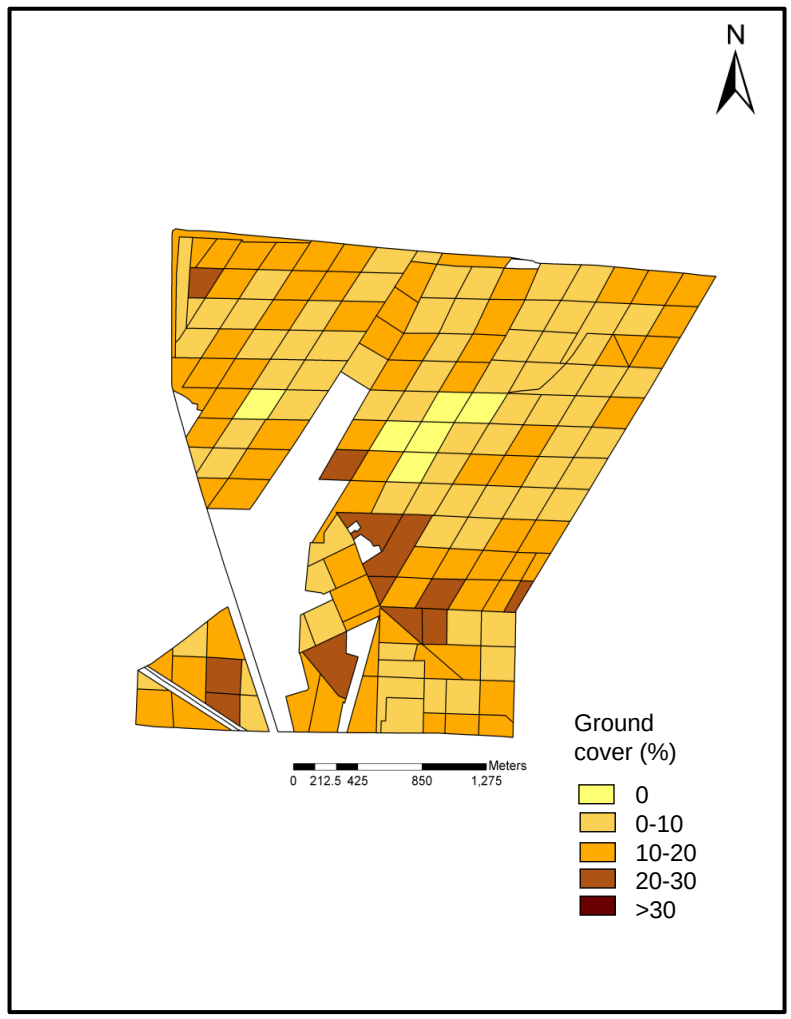
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse

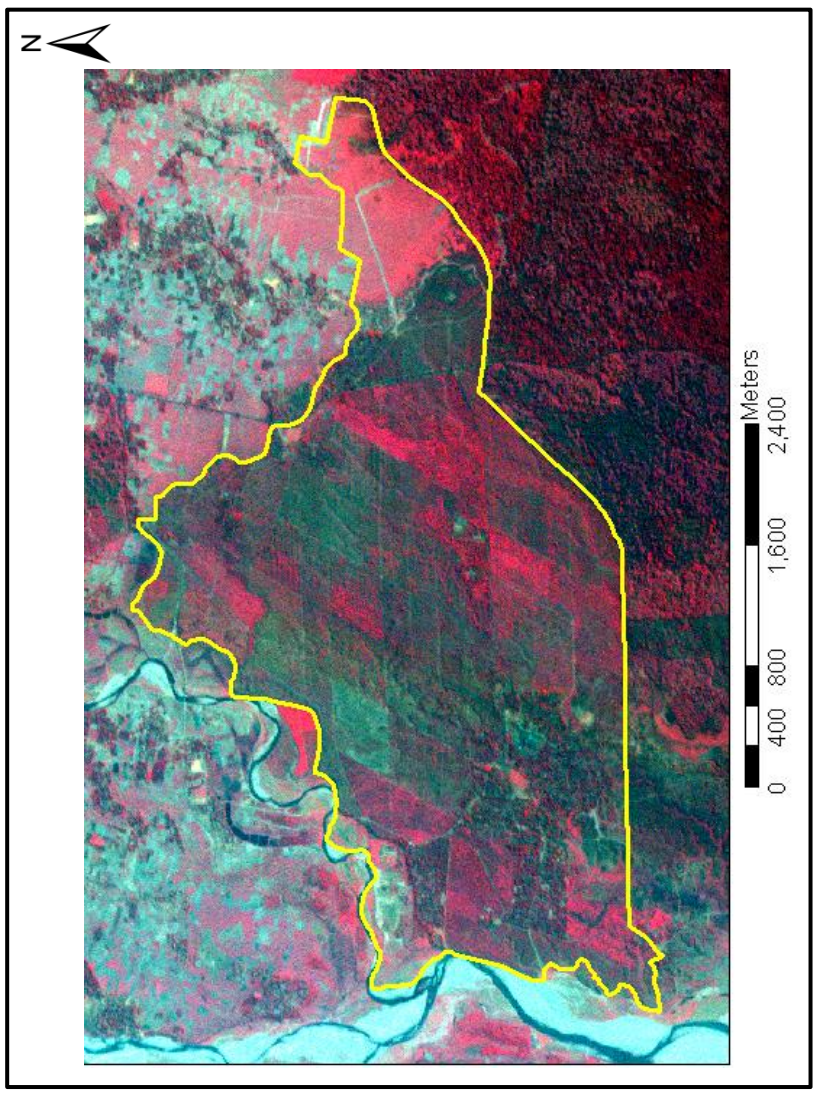


c. Section Boundaries of the Estate

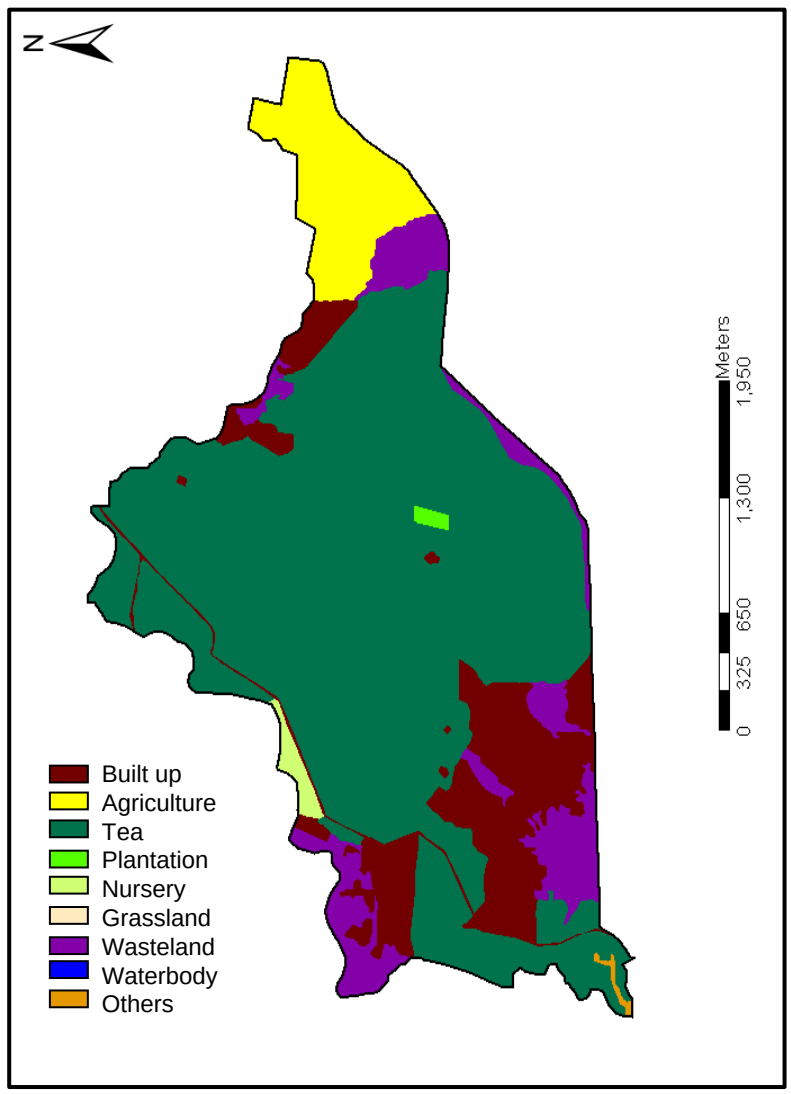


d. Shade Tree Density in Sections

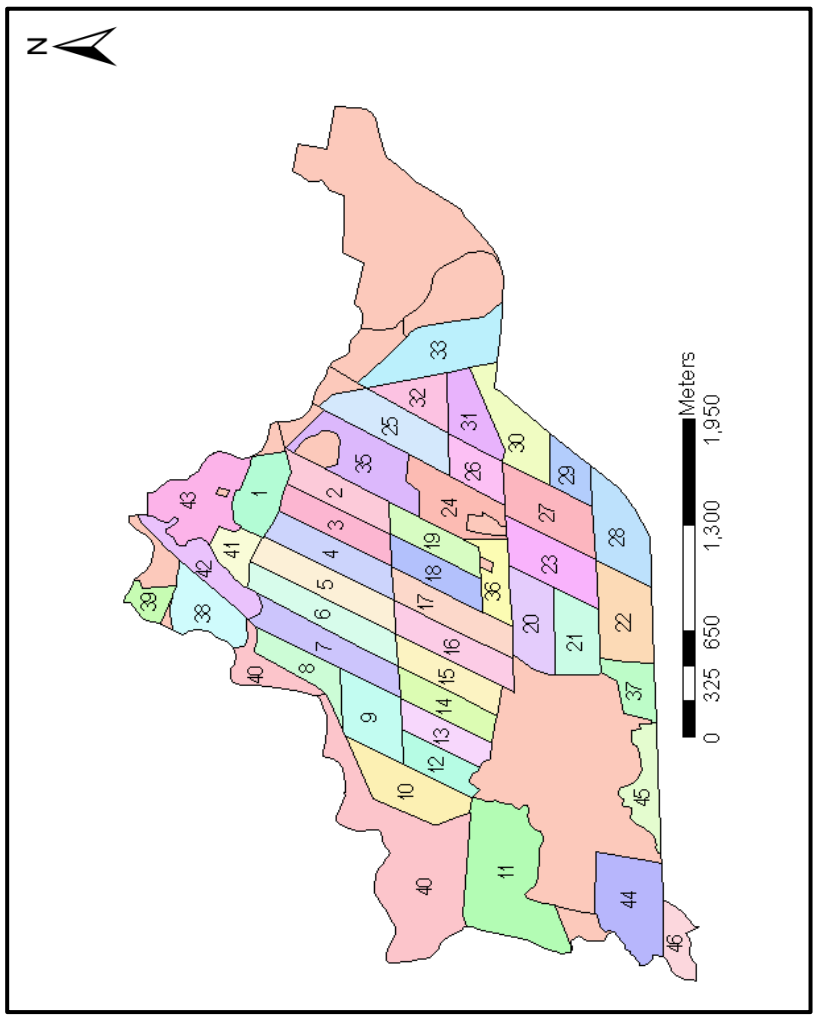
P13: BARADIGHI TE



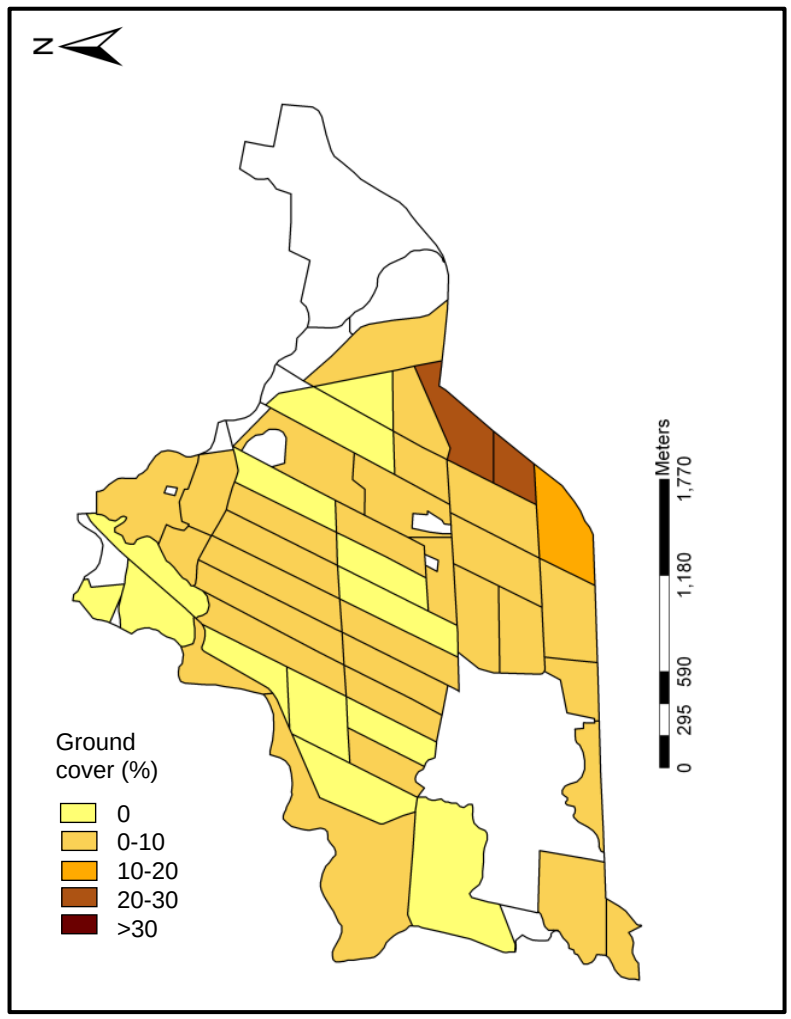
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

e. General Information

1. General	
Contact address	P.O: Baradighi, Dist: Jalpaiguri, PIN: 735230
Contact phone	03562-200081
Name of the company	Rydak Syndicate Ltd.
Name of the village where it falls	Baradighi
Leased area of the estate (ha)	861.47
Tea grown area of the estate (ha)	542
No. of divisions / sections	2 div/46 sec
Year of establishment	1893
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 / baradighitea@rediffmail.com
Meteorological observations taken	Nil

3. Amenities	
Availability of health care / dispensary	Yes
Availability of school	Yes

4. Shade trees	
Shade tree density (garden level)	Medium
Plant to plant spacing (m)	13.33 x 13.33
Row to row spacing (m)	13.33 x 13.33

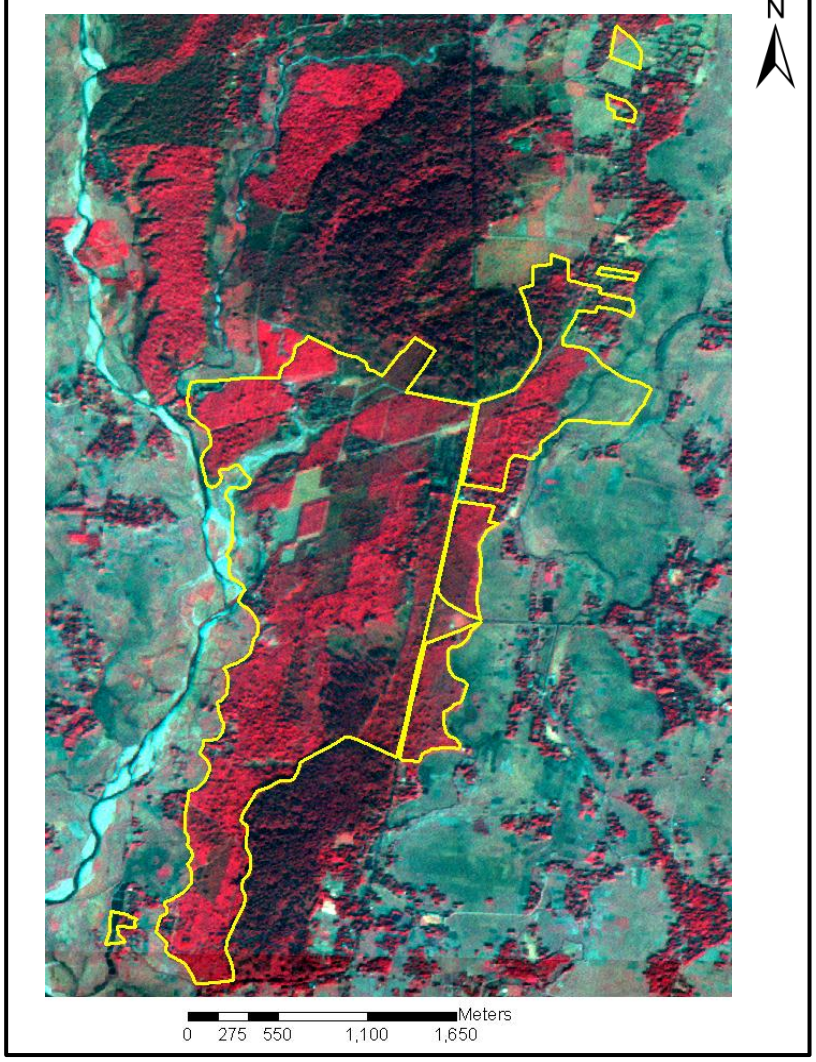
5. Natural resources constraints	
Drainage congestion and water logging	No
Scarcity of water during summer	No
River bank erosion	Yes
Major diseases and duration	Black rot (4 months)
Major pests and duration	Looper-6 months, *Helopeltis*-4 months
Damage due to wildlife	Yes (Elephant)

6. Yield / production	
Peak plucking periods	Aug-Oct
Annual green leaf yield	6756.42 kg/ha
Annual production of processed tea	816948 kg

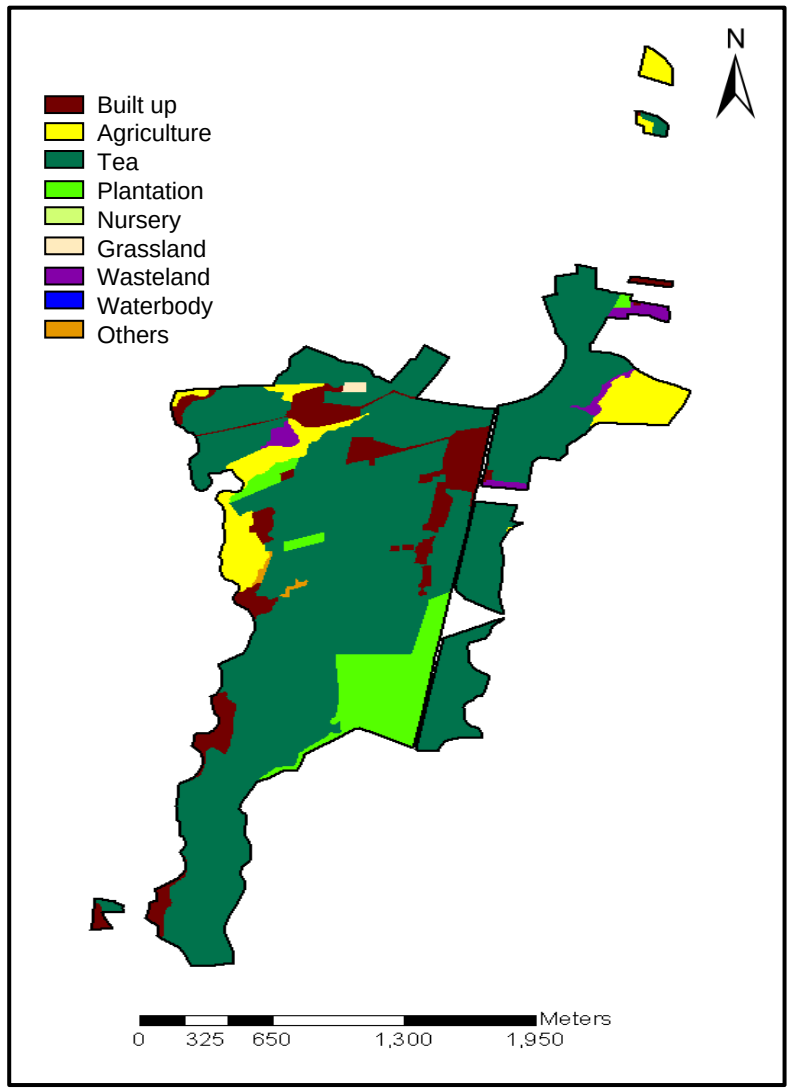
7. Pruning	
Time of pruning	Dec-Jan
Pruning cycle	4 yrs
Types of pruning	CA, DS, UP

8. Fertilizer use	
Types of N, P, K fertilizers used	Urea, MOP, RP
Dose of Nitrogen (kg/ha)	110
Dose of Phosphorous (kg/ha)	30
Dose of Potash (kg/ha)	110
Whether lime is applied, if yes dose	Yes, in pruned section, 4 kg/200 L of water

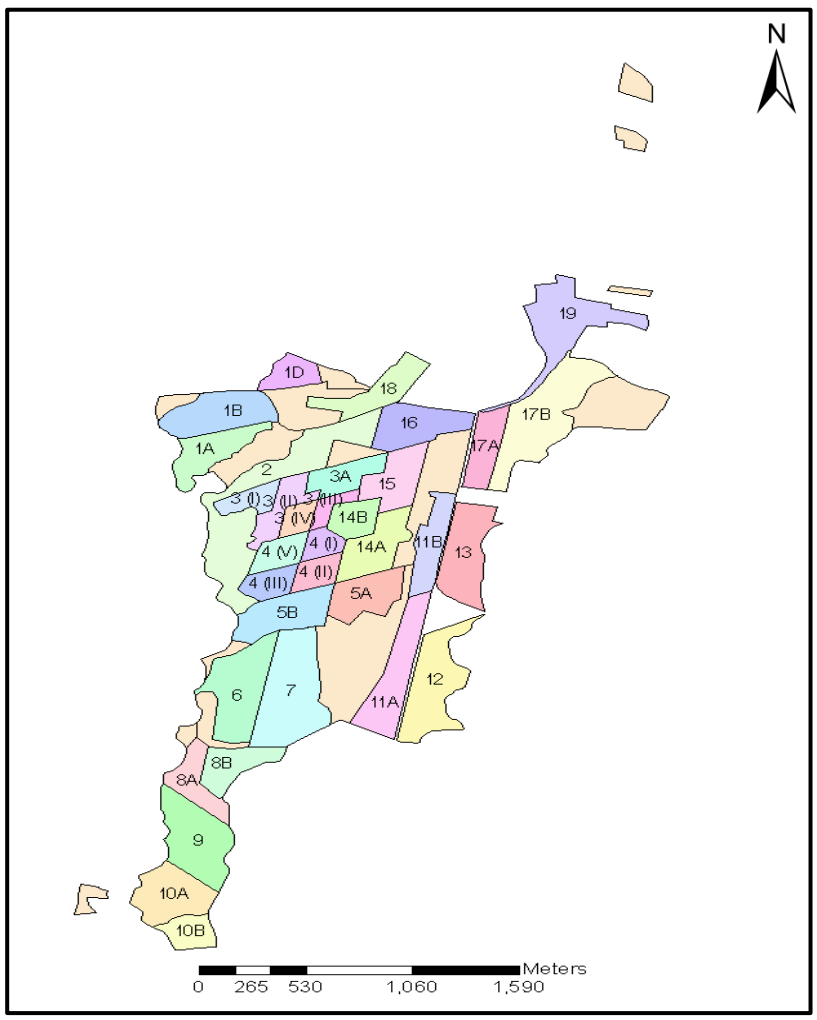
P14: BATABARI TE



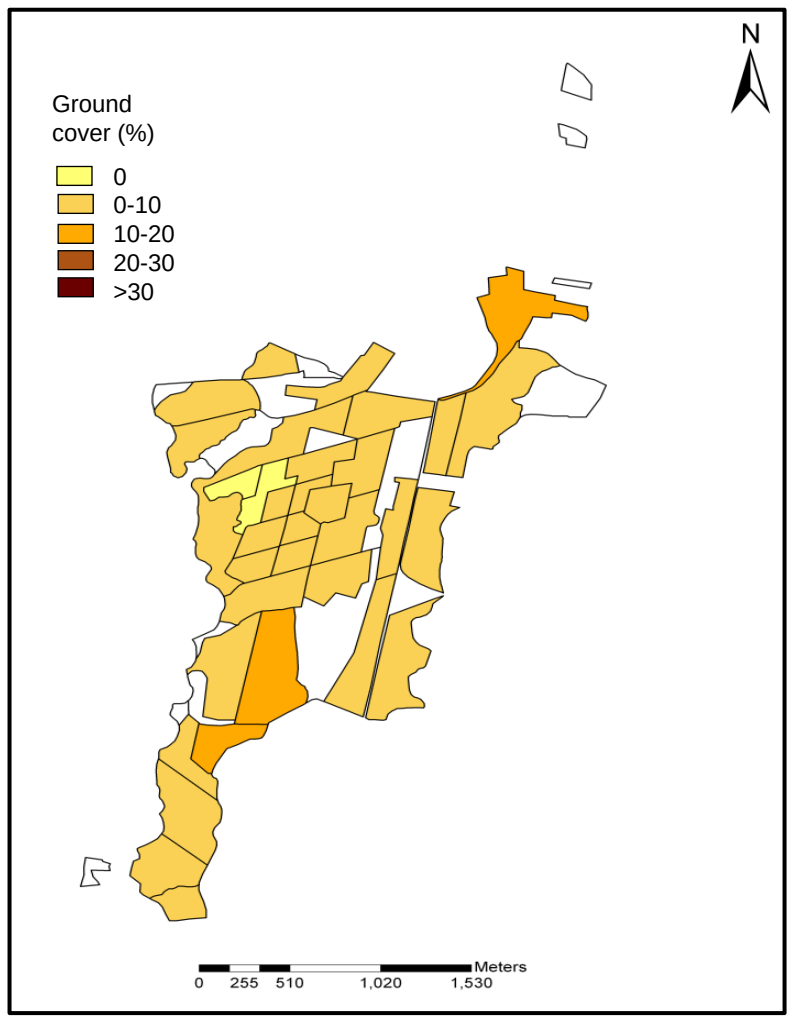
a. False Colour Composite of IRS LISS IV



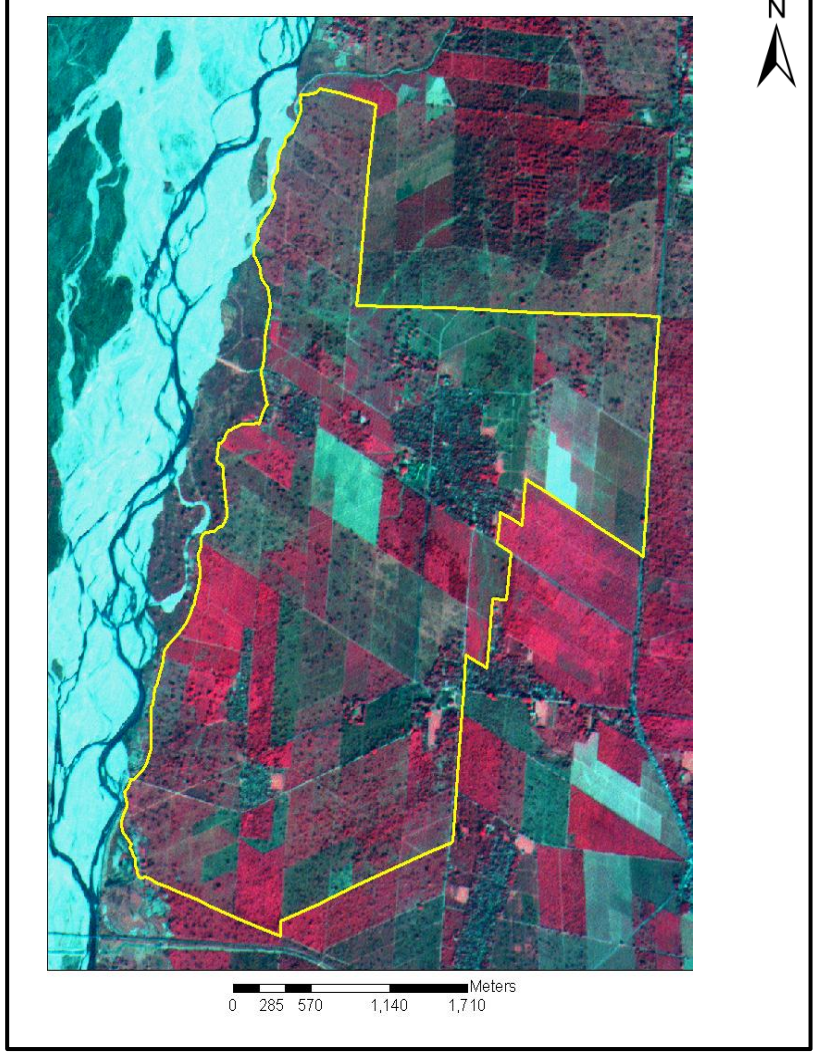
b. Tea Estate Landuse



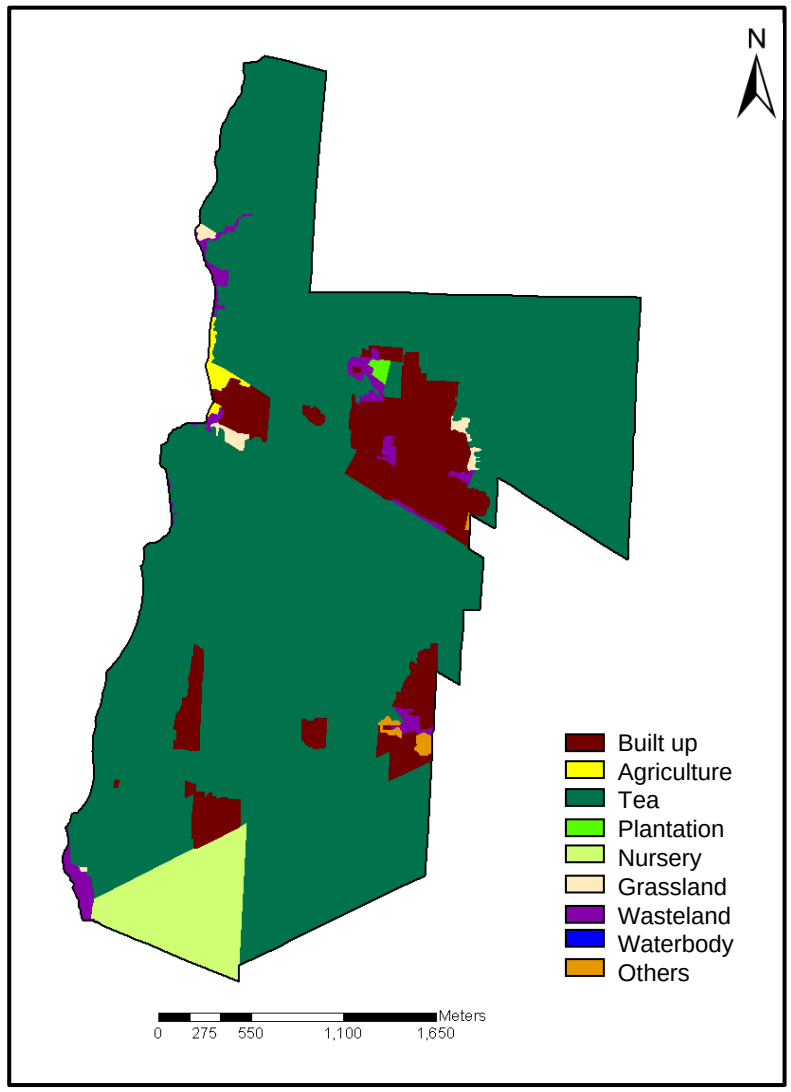
c. Section Boundaries of the Estate



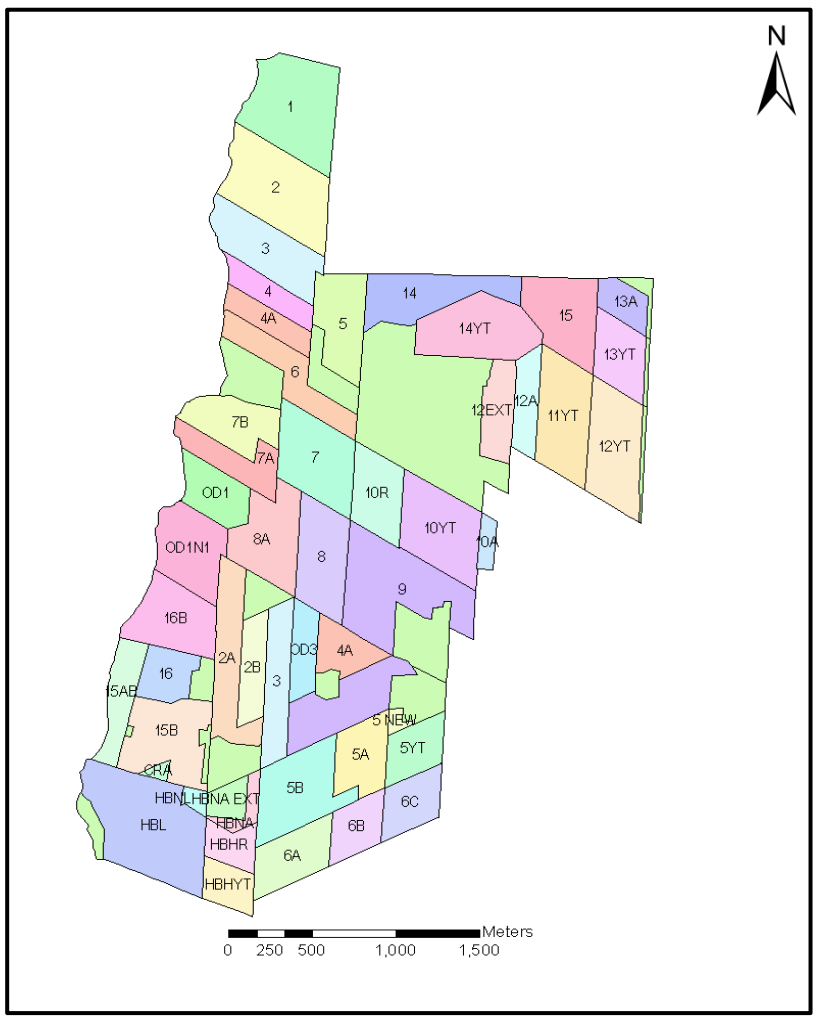
d. Shade Tree Density in Sections



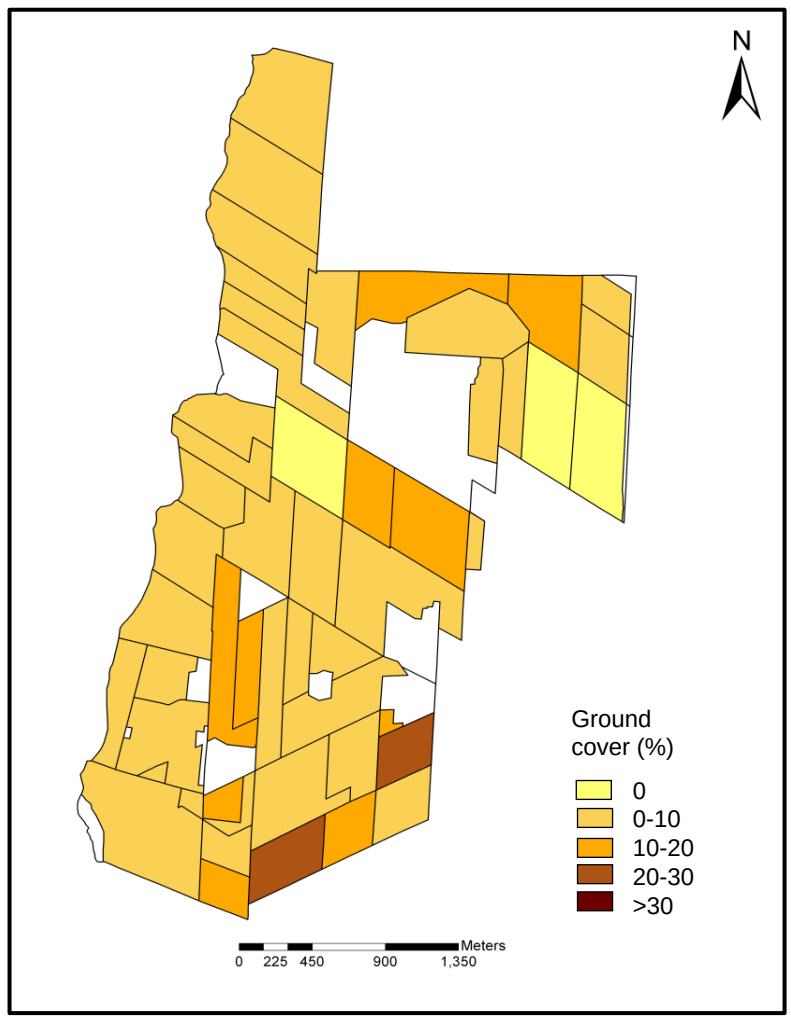
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate

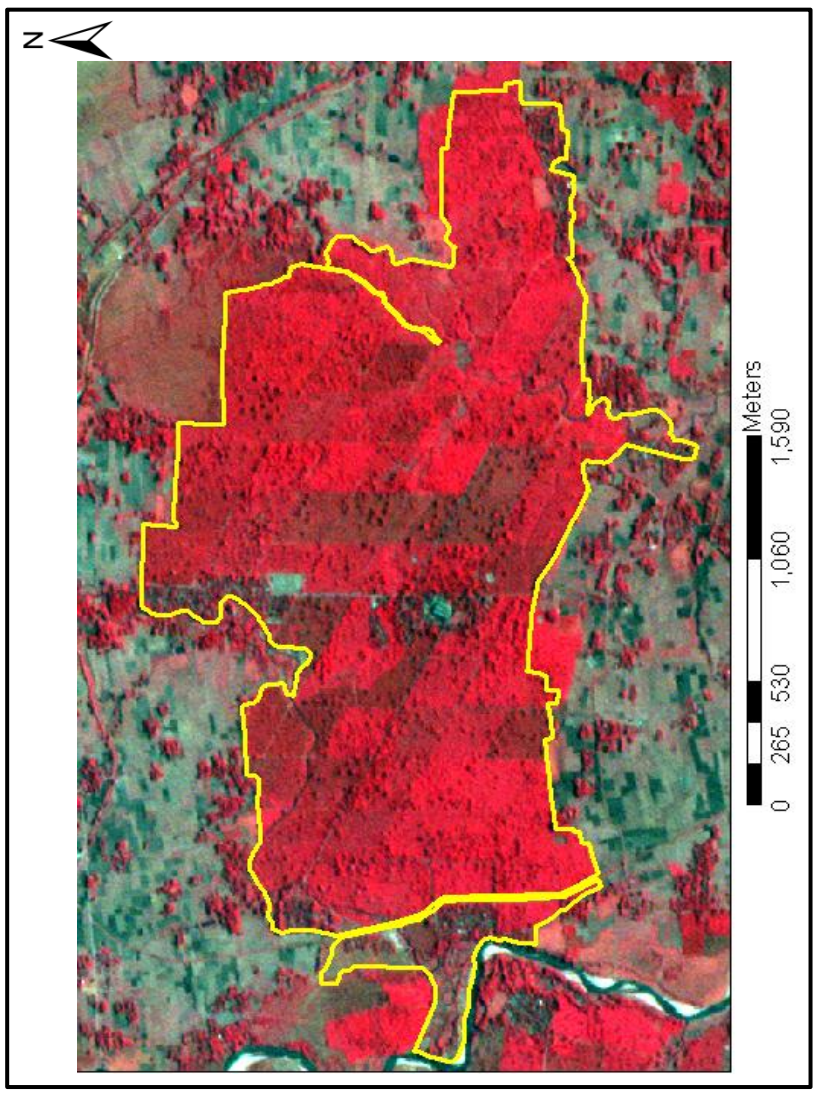


d. Shade Tree Density in Sections

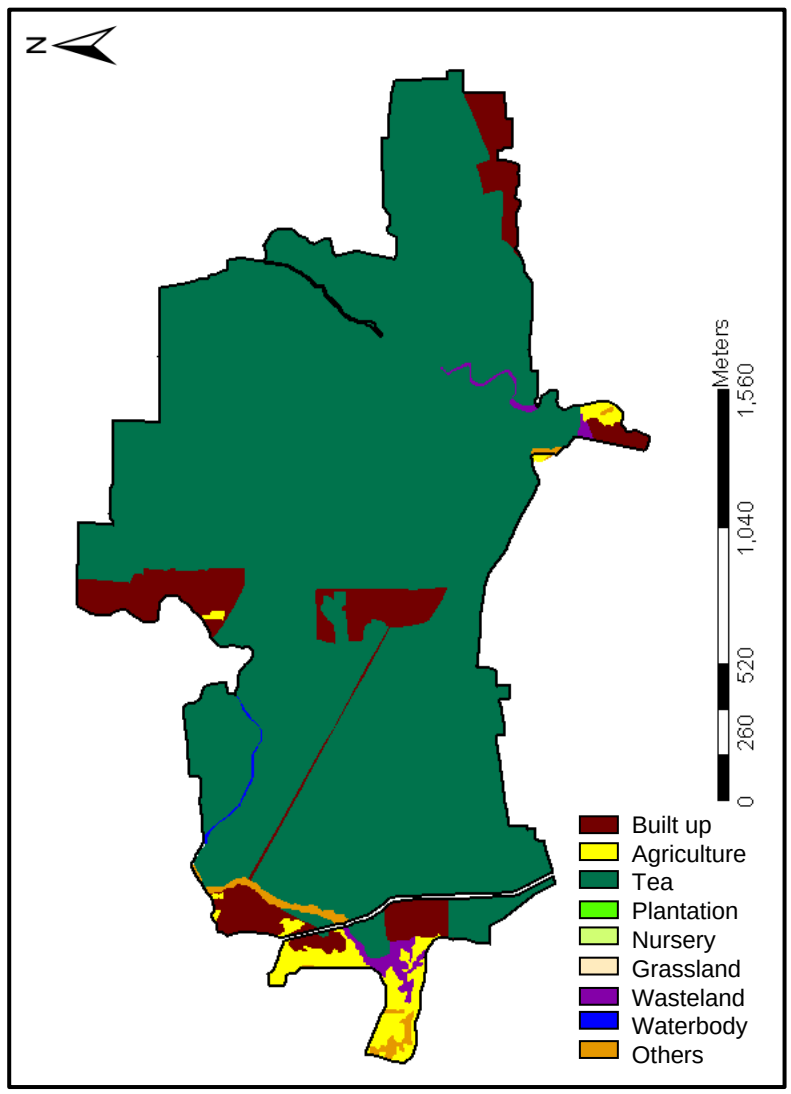
e. General Information

1. General	
Contact address	PO: Hasimara, Dist: Jalpaiguri PIN: 735215
Contact phone	9434603286/ 9733247640
Name of the company	The Dibrugarh Company Limited
Name of the village where it falls	Hasimara
Leased area of the estate (ha)	934.66
Tea grown area of the estate (ha)	785.63
No. of divisions / sections	2 div/48 sec
Age	117 yrs
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 RHmin, Wind direction, SSH
3. Amenities	
Availability of health care / dispensary	Yes
Availability of school	Yes
4. Shade trees	
Shade tree density (garden level)	Medium
Plant to plant spacing	2.5 ft
Row to row spacing	3.5 ft

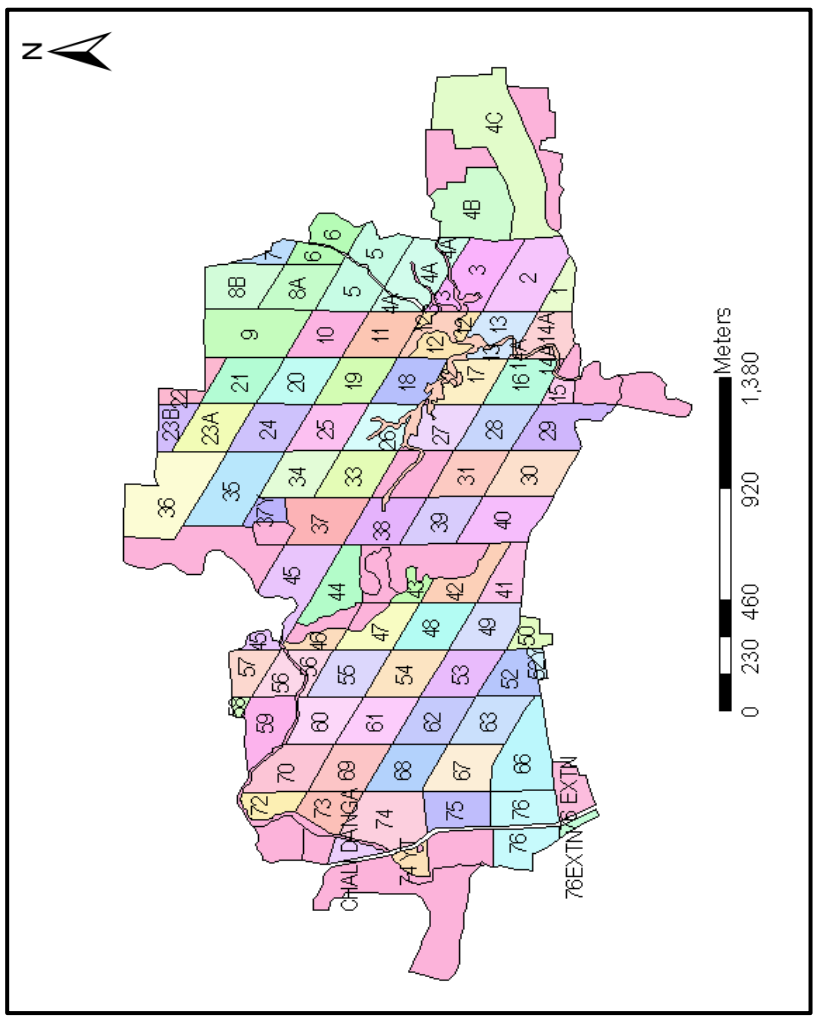
5. Natural resources constraints	
Drainage congestion and water logging	Yes
Scarcity of water during summer	Yes
River bank erosion	Yes
Major diseases and duration	Red rust (rainy season)
Major pests and duration	Looper (Feb-Nov), RSM (Mar-June), *Helopeltis* (Sep-Dec), thrips (Mar-May)
Damage due to wildlife	Yes
6. Yield / production	
Peak plucking periods	Jul-Oct
Annual green leaf yield	1265.2 kg/ha
Annual production of processed tea	943842.4 kg
7. Pruning	
Time of pruning	15th Nov-10th Jan
Pruning cycle	3 yrs, 4yrs
Types of pruning	YT, MT
8. Fertilizer use	
Types of N, P, K fertilizers used	Urea, RP, MOP
Dose of Nitrogen (kg/ha)	120-140
Dose of Phosphorous (kg/ha)	20-50
Dose of Potash (kg/ha)	90-120
Whether lime is applied, if yes dose	Yes, 2000 kg/ha



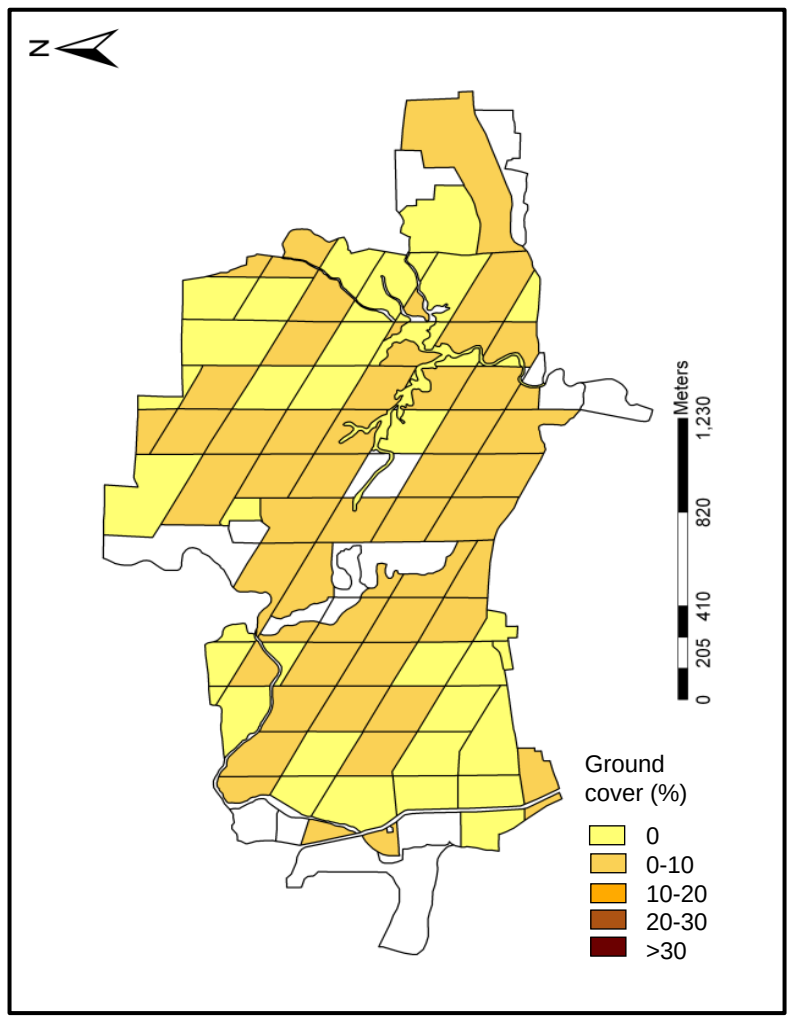
a. False Colour Composite of IRS LISS IV



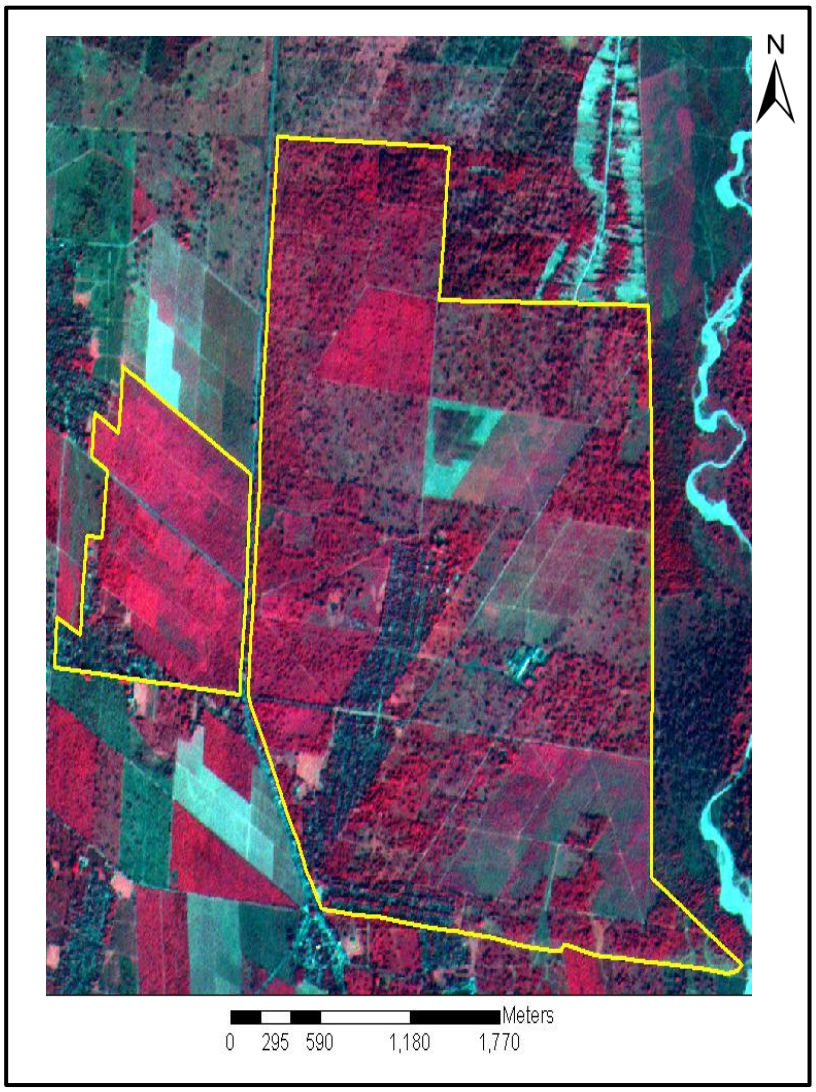
b. Tea Estate Landuse



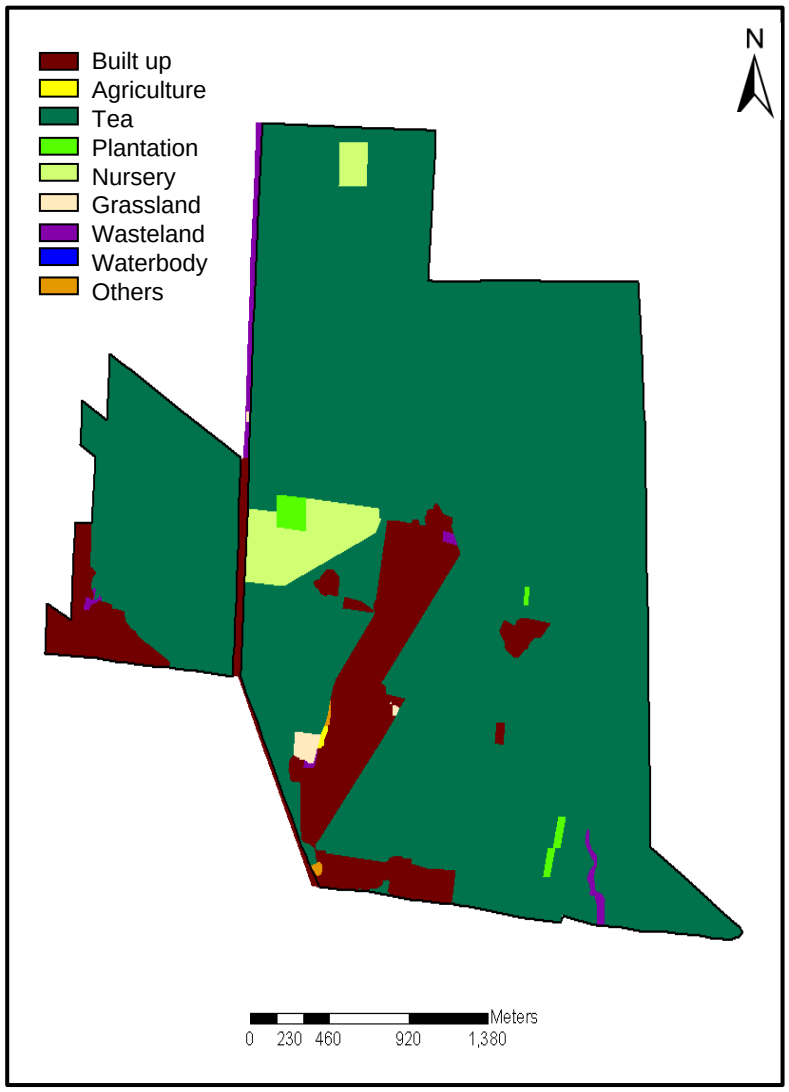
c. Section Boundaries of the Estate



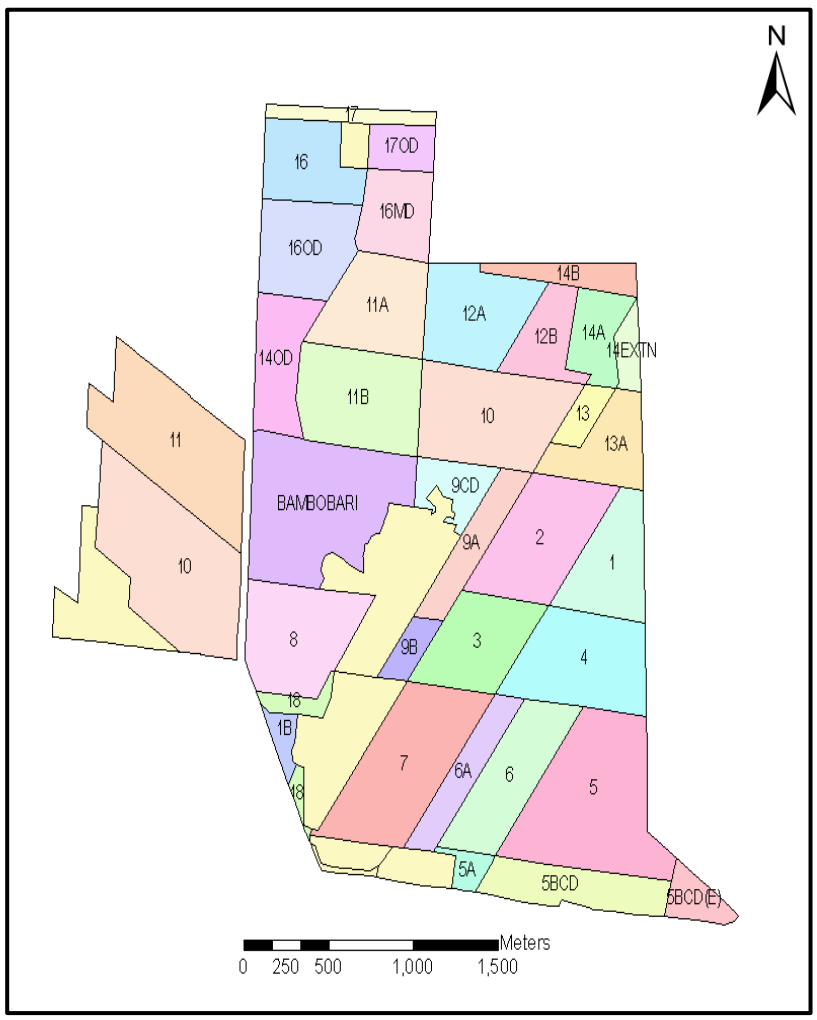
d. Shade Tree Density in Sections



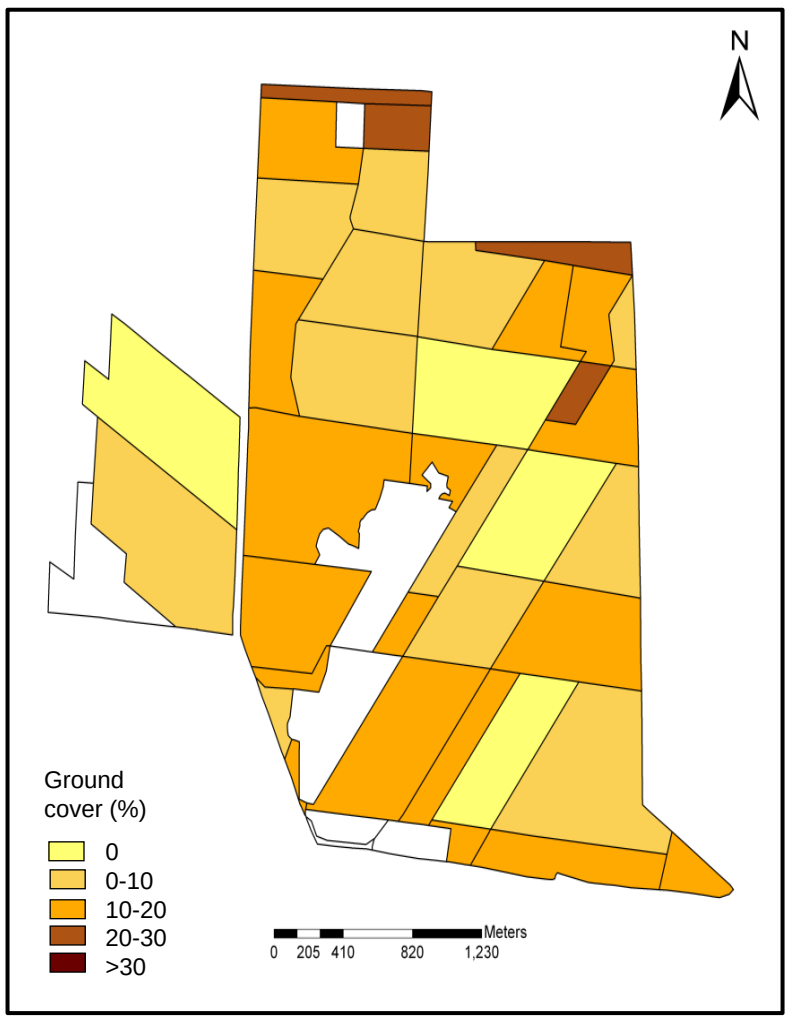
a. False Colour Composite of IRS LISS IV



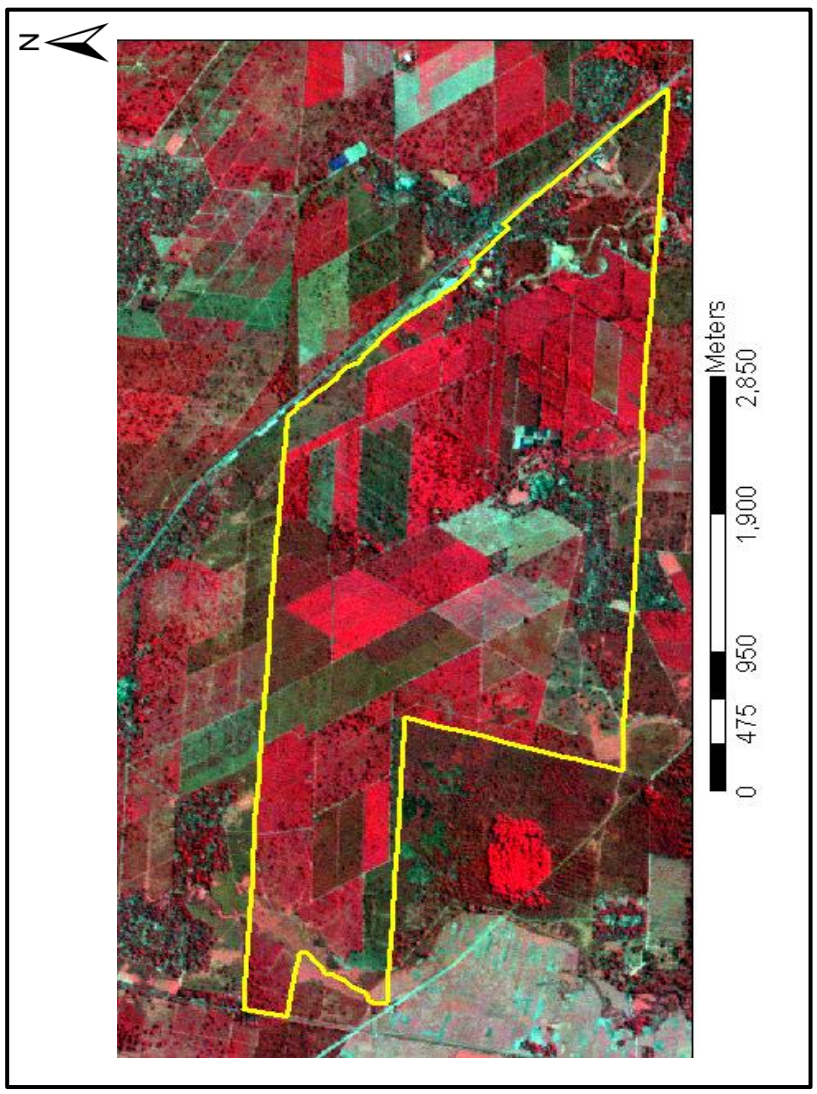
b. Tea Estate Landuse



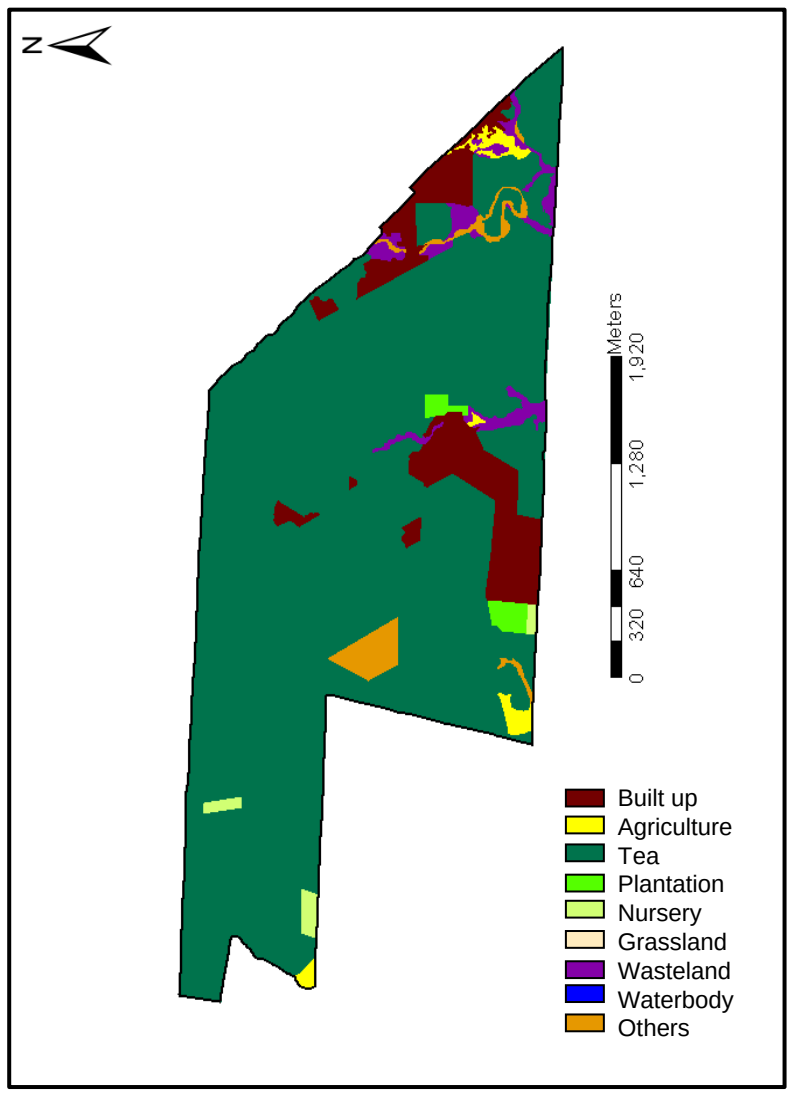
c. Section Boundaries of the Estate



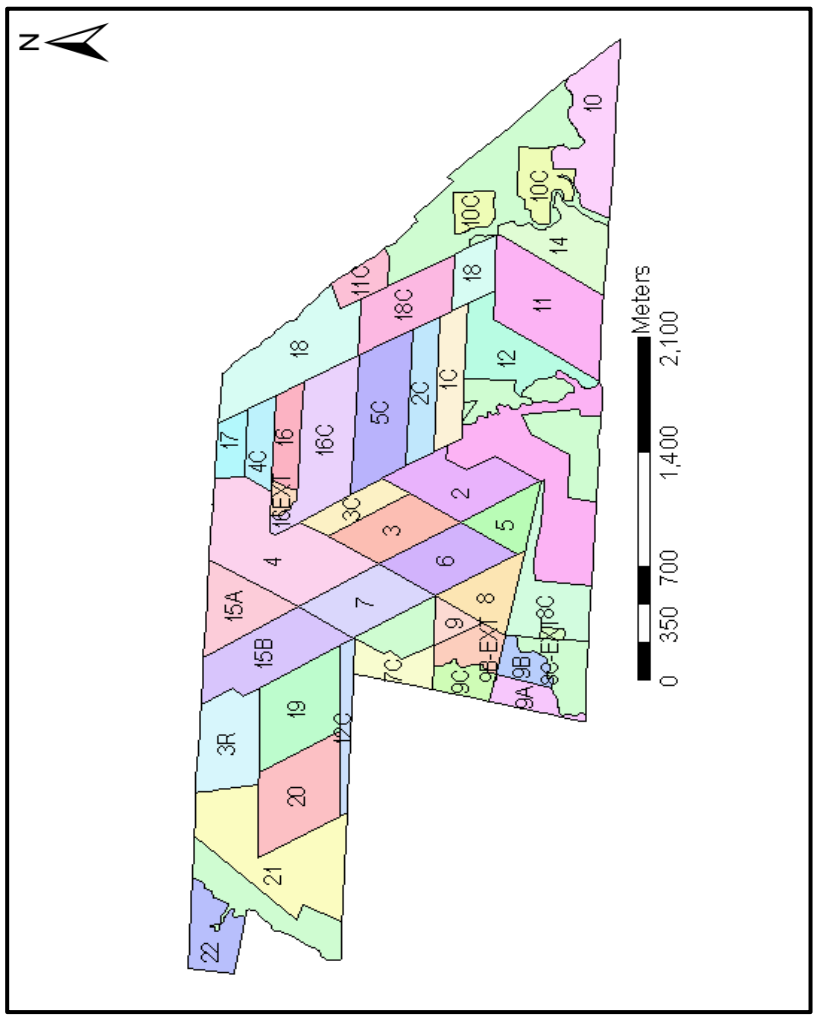
d. Shade Tree Density in Sections



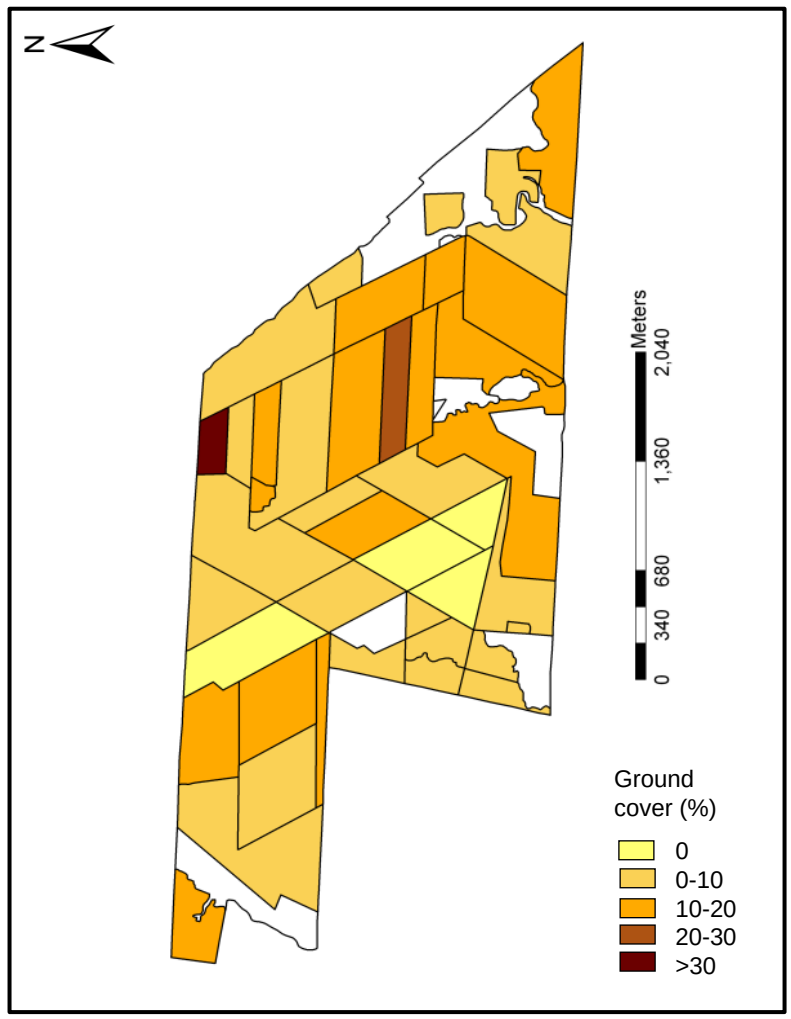
a. False Colour Composite of IRS LISS IV



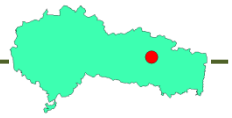
b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections



e. General Information

1. General

Contact address	P.O: Garopara, Dist: Jalpaiguri PIN:735217
Contact phone	03566-240241/240210
Name of the company	Bhatkawa Tea Industries Ltd.
Name of the village where it falls	Garopara
Leased area of the estate (ha)	783.46
Tea grown area of the estate (ha)	625.14
No. of divisions / sections	2 div/52 sec
Year of establishment	1902
Type of tea produced	CTC

2. Infrastructure

Availability of processing factory	Yes
Availability of workers colony	Yes
Availability of internet facility / e-mail id	No
Meteorological observations taken	No

3. Amenities

Availability of health care / dispensary	Yes
Availability of school	Yes

4. Shade trees

Shade tree density (garden level)	Medium
Plant to plant spacing (m)	10 x 10
Row to row spacing (m)	14 x 14

5. Natural resources constraints

Drainage congestion and water logging	Yes
Scarcity of water during summer	Yes
River bank erosion	Yes
Major diseases and duration	--
Major pests and duration	Red slug, RSM, looper *Helopeltis* (Seasonal)
Damage due to wildlife	Yes

6. Yield / production

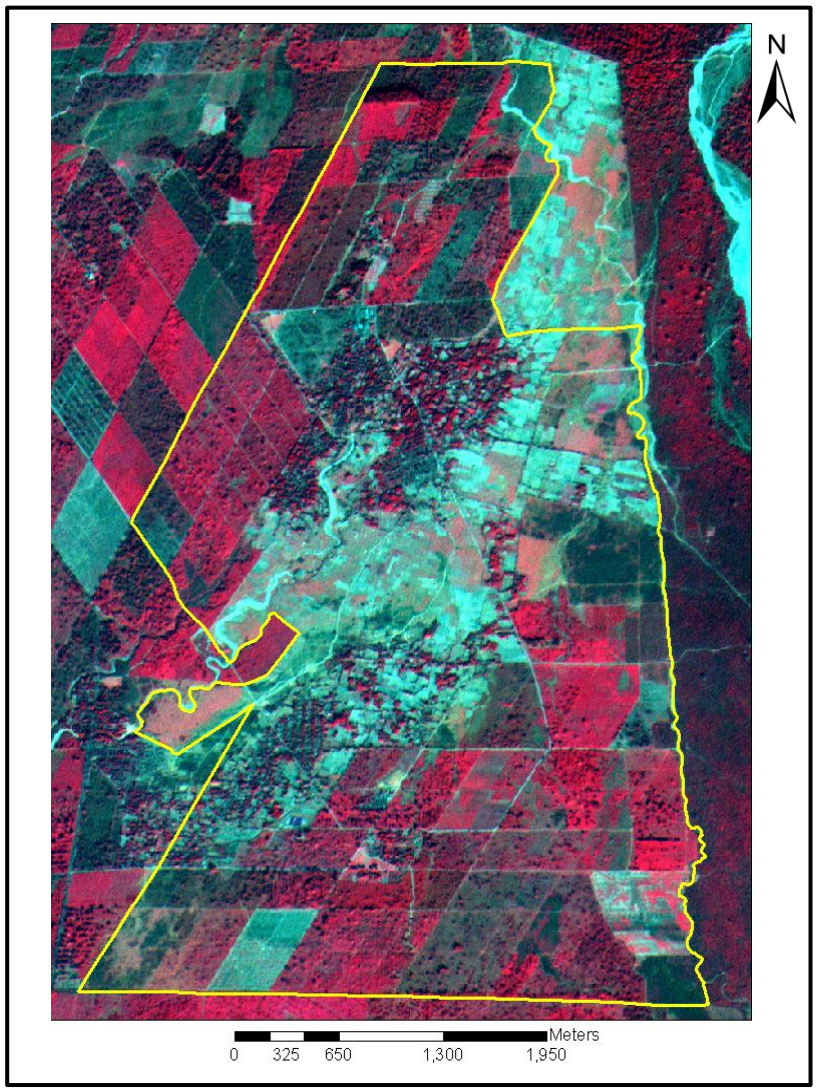
Peak plucking periods	Jun-Oct
Annual green leaf yield	2423 kg/ha
Annual production of processed tea	1510108 kg

7. Pruning

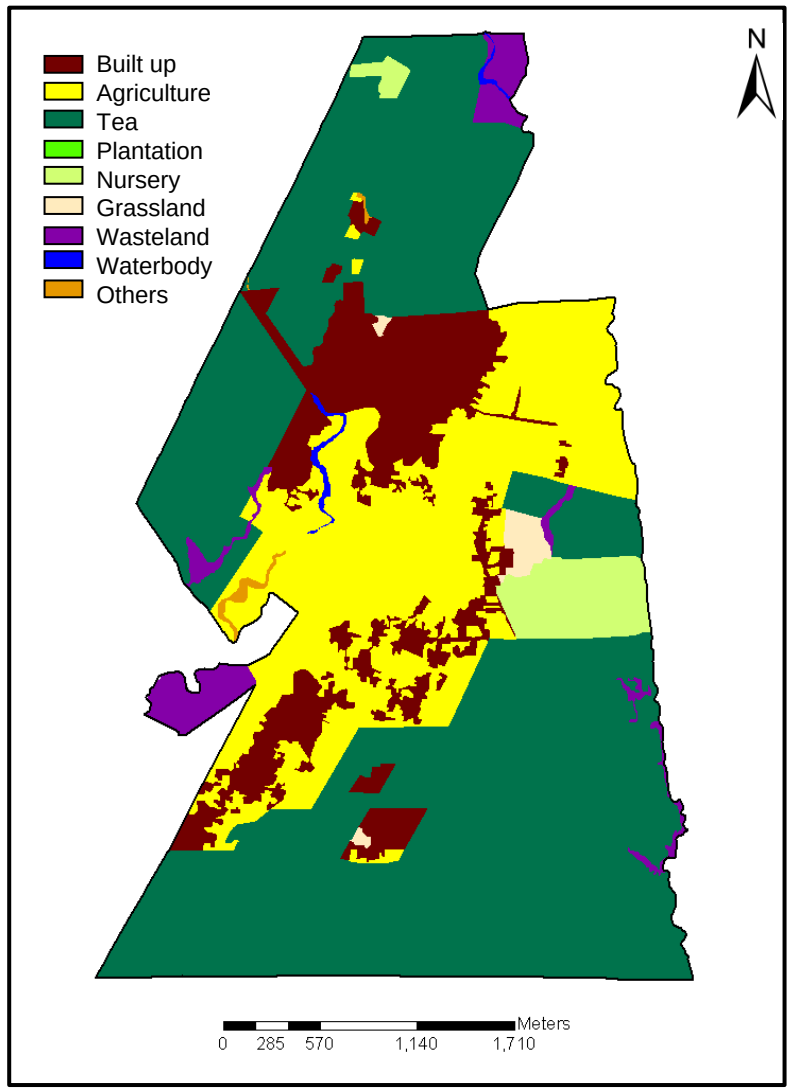
Time of pruning	1st Week of Dec
Pruning cycle	4 yrs
Types of pruning	LP-UP-MS-UP

8. Fertilizer use

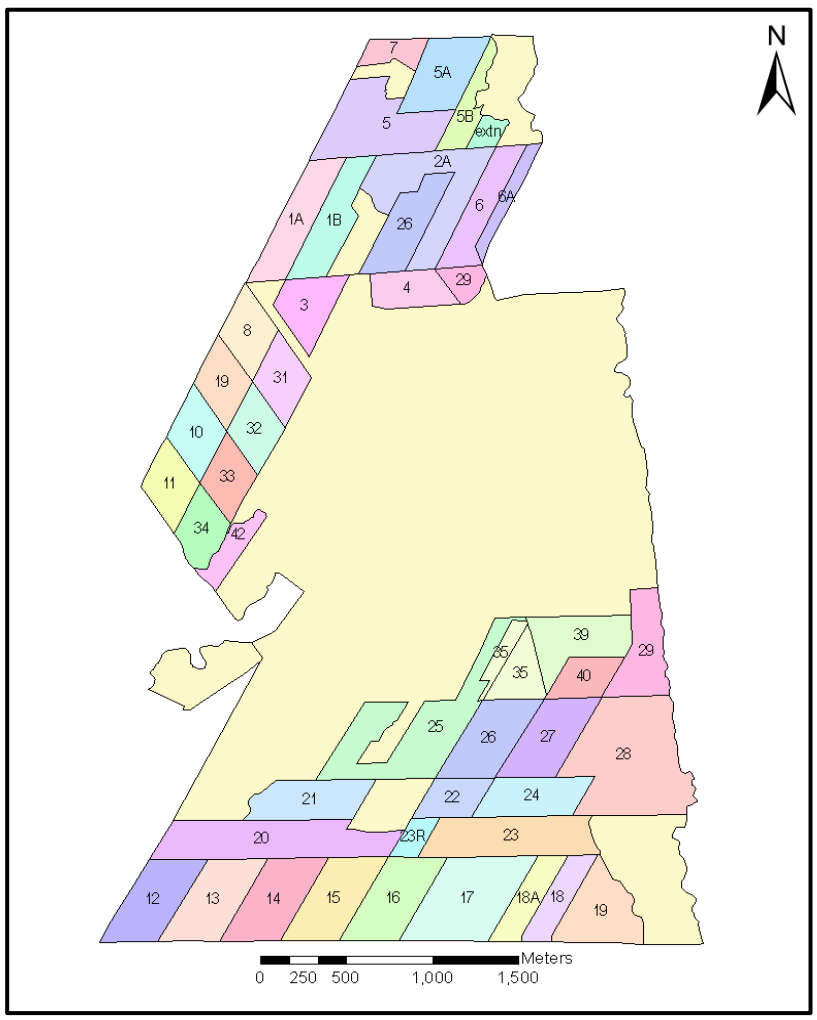
Types of N, P, K fertilizers used	Urea, MOP, RP
Dose of Nitrogen (kg/ha)	140
Dose of Phosphorous (kg/ha)	40
Dose of Potash (kg/ha)	125
Whether lime is applied, if yes dose	No



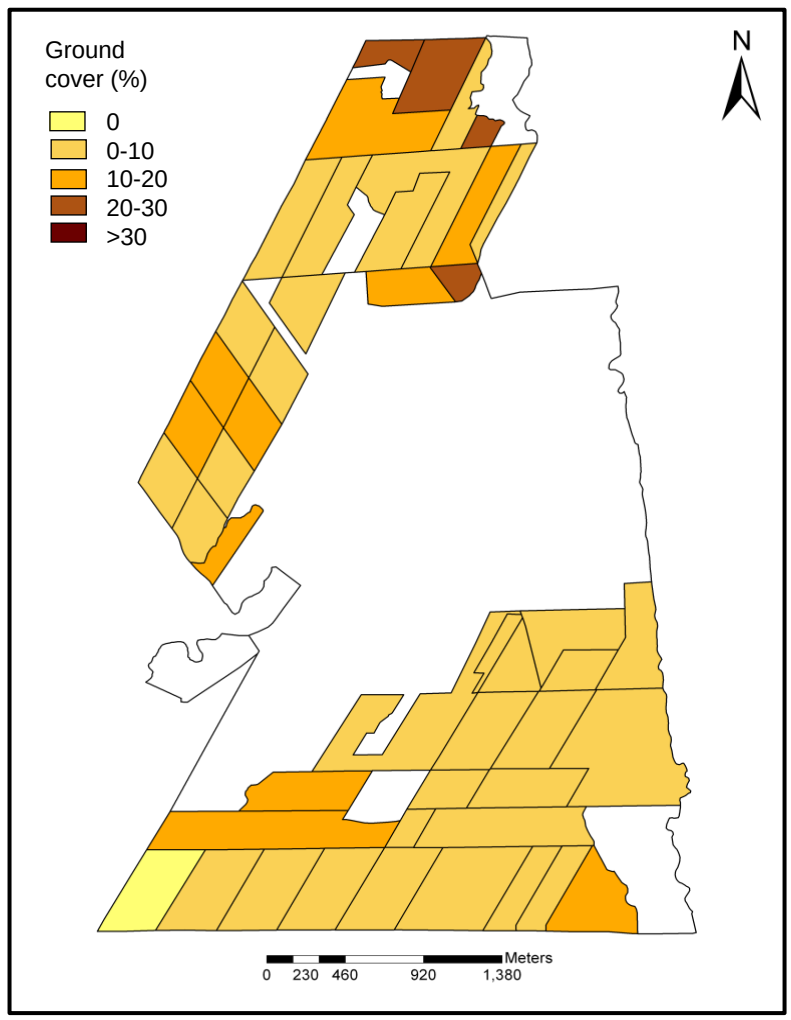
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse

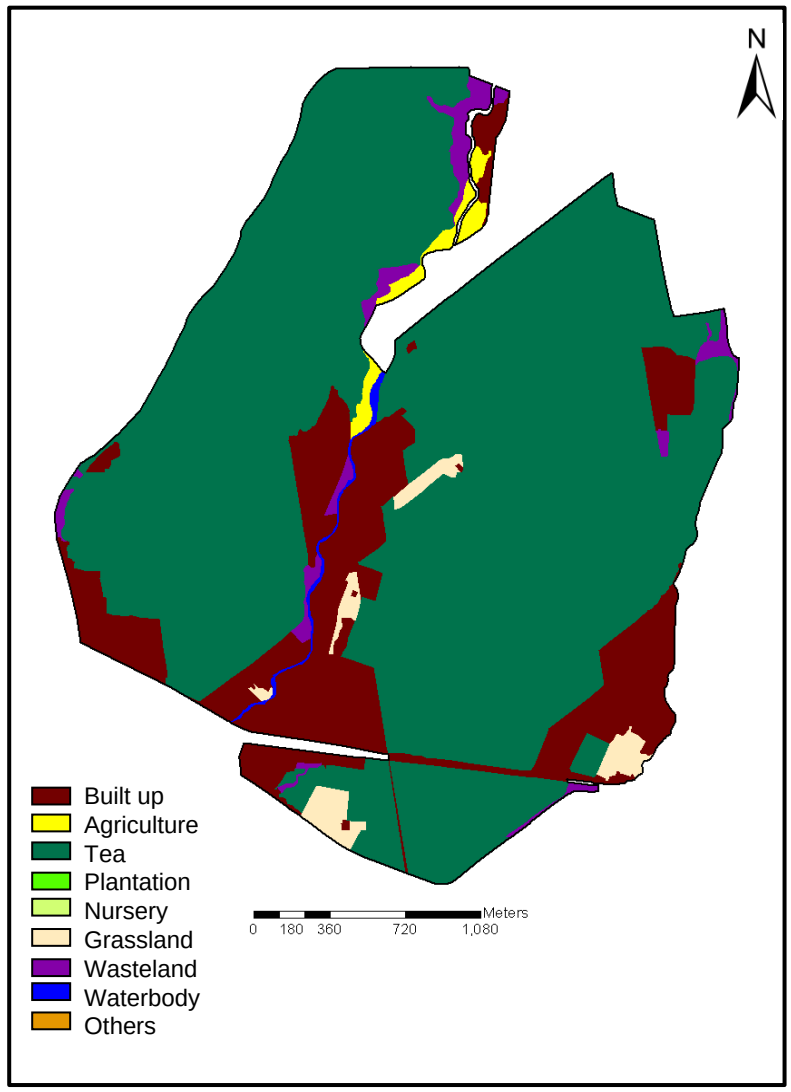


c. Section Boundaries of the Estate

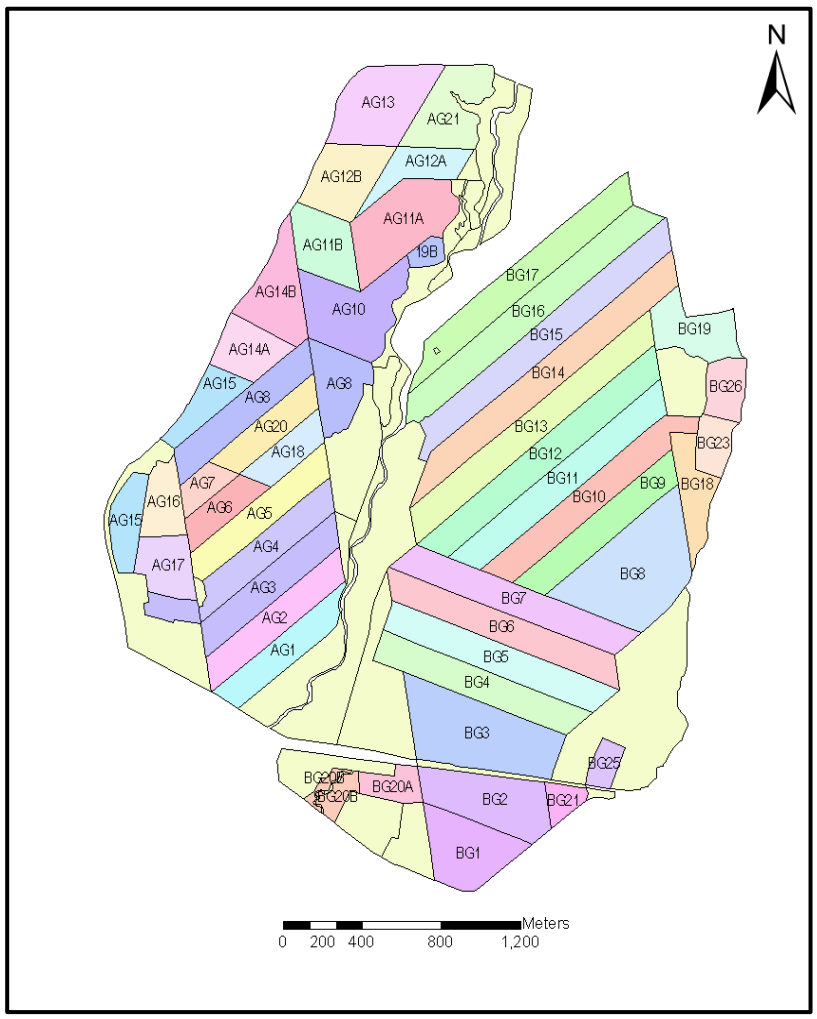


d. Shade Tree Density in Sections

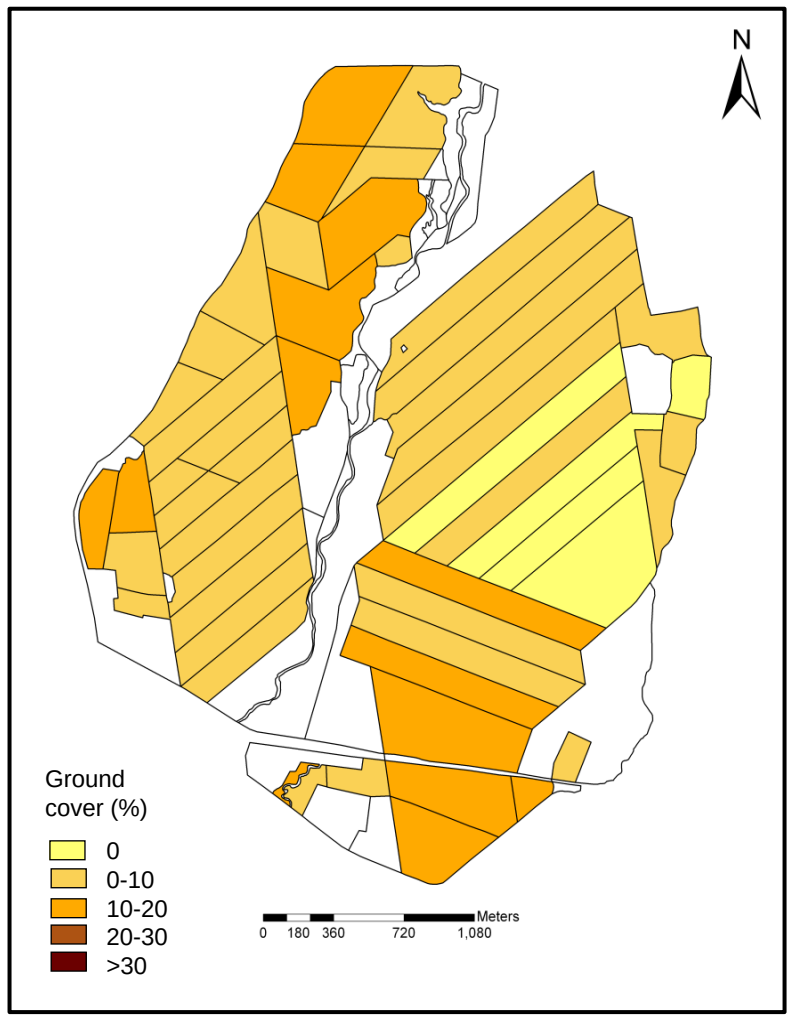
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse

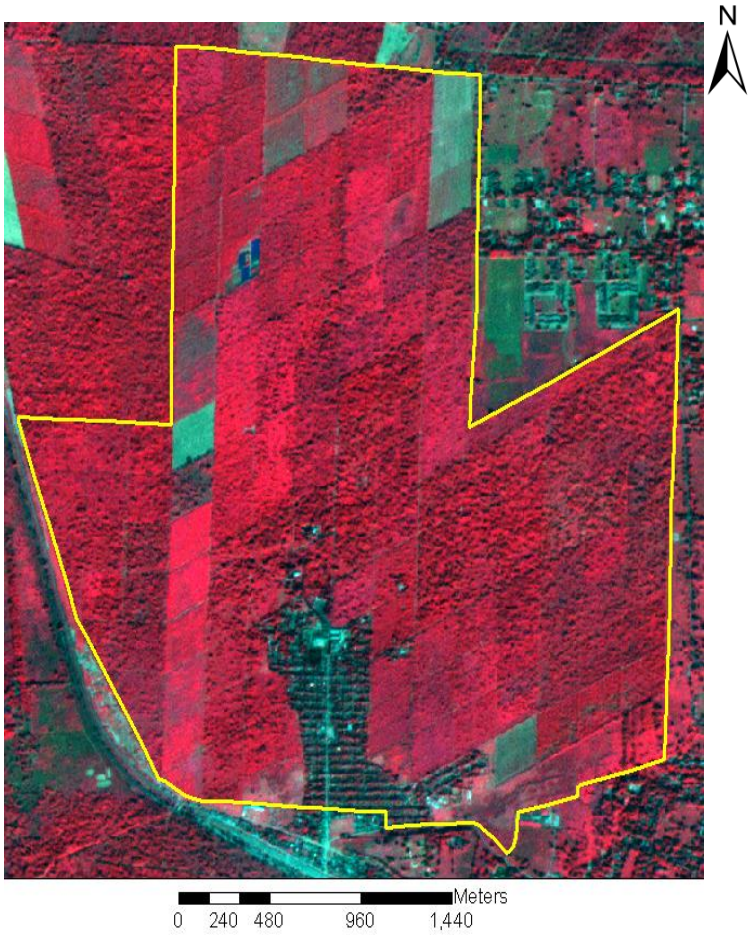


c. Section Boundaries of the Estate

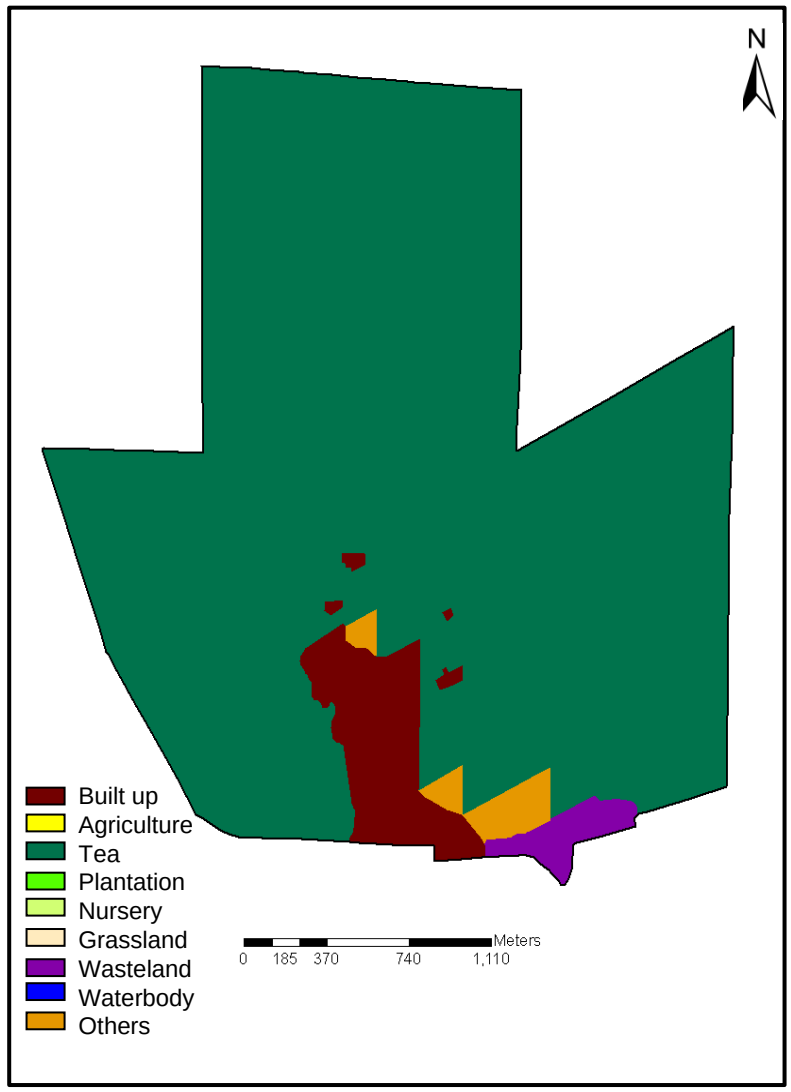


d. Shade Tree Density in Sections

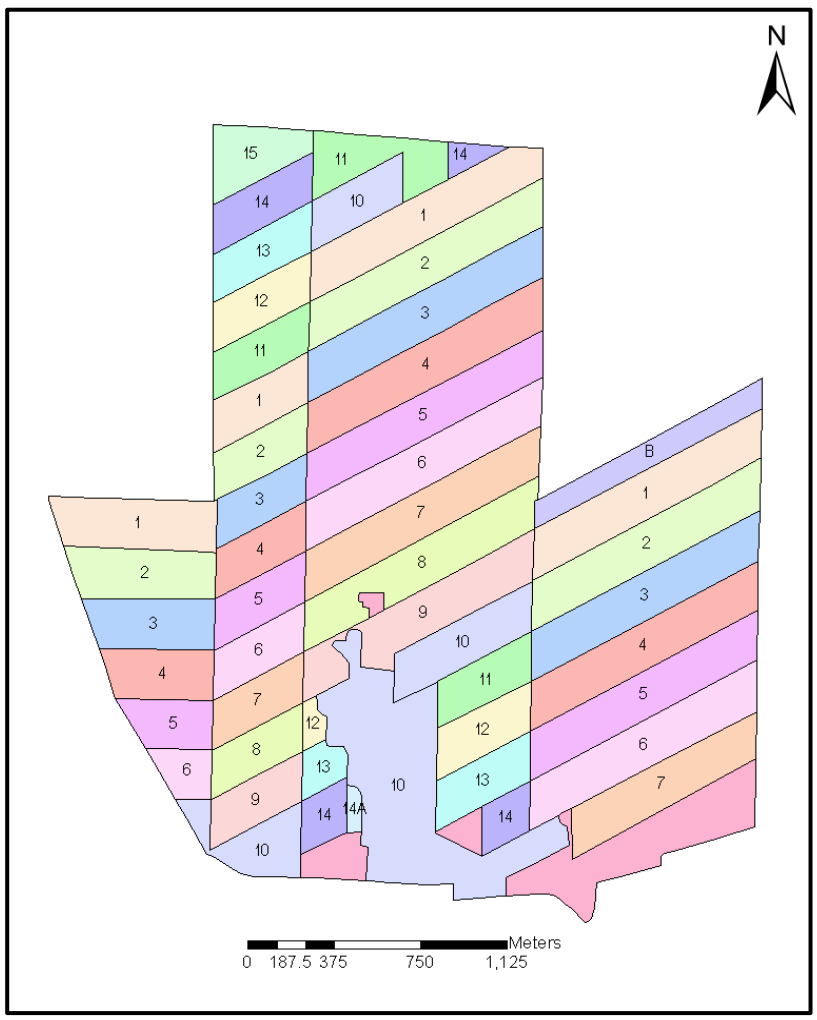
P21: BINAGURI TE



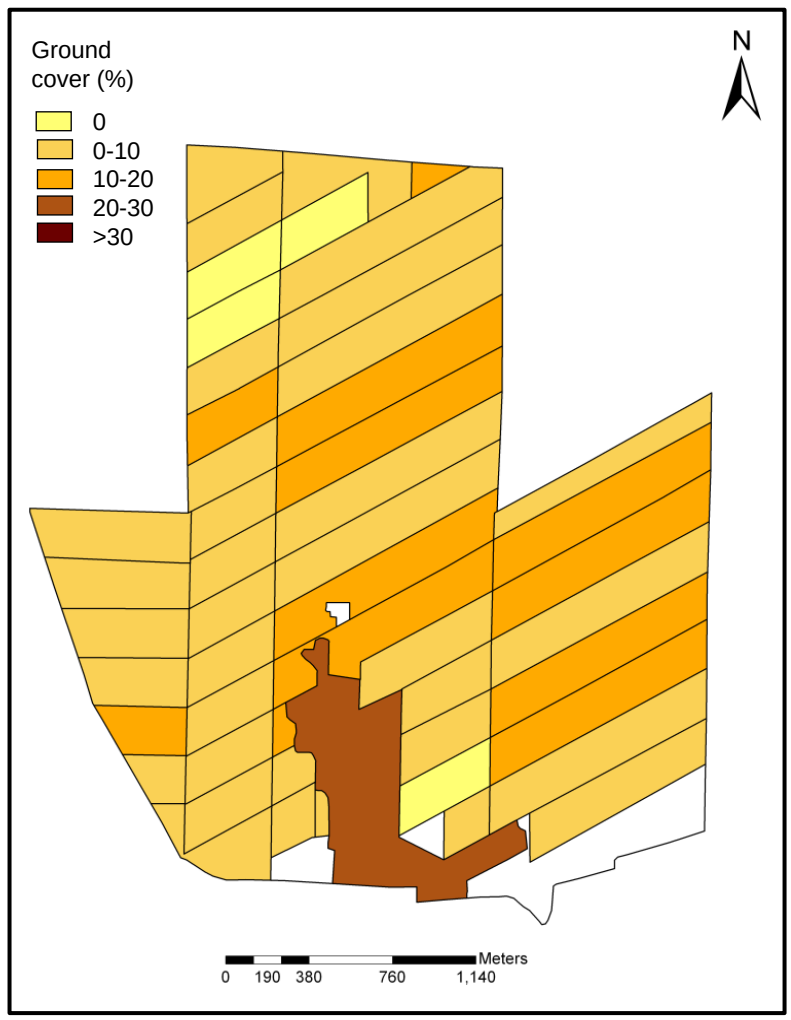
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



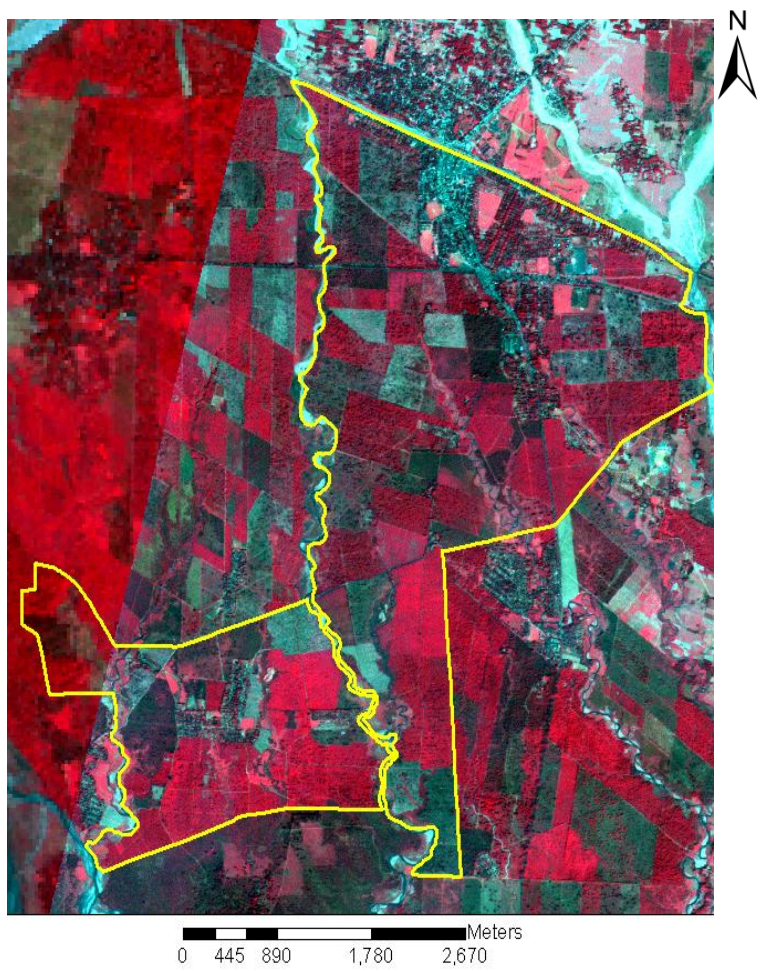
d. Shade Tree Density in Sections

e. General Information

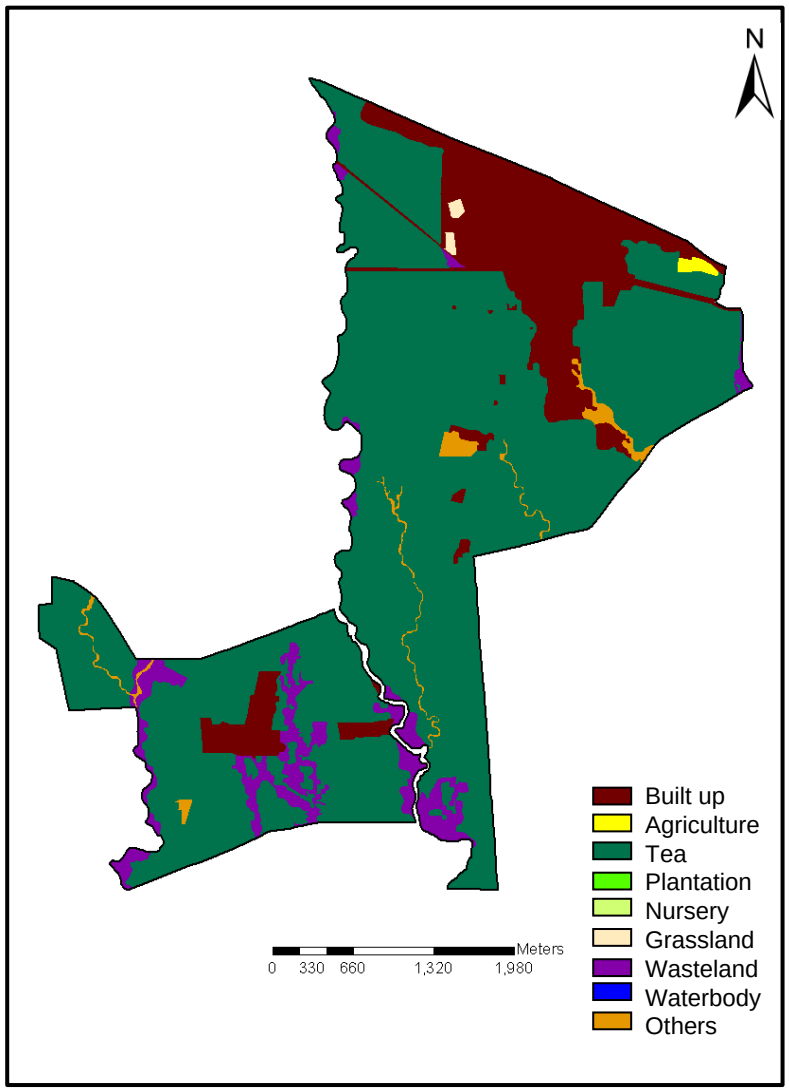
1. General	
Contact address	PO: Binaguri, PS: Banarhat Dist: Jalpaiguri, PIN: 735203
Contact phone	03563-259311
Name of the company	Binaguri Tea Co. Pvt. Ltd.
Name of the village where it falls	Binaguri
Leased area of the estate (ha)	725.09
Tea grown area of the estate (ha)	602.56
No. of divisions / sections	2 div/15 sec
Year of establishment	1898
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)	Low to Medium
Plant to plant spacing	2.5' x 2.5'
Row to row spacing	4' x 3'

5. Natural resources constraints	
Drainage congestion and water logging	No
Scarcity of water during summer	No
River bank erosion	No
Major diseases and duration	Red rust (Jun-Aug)
Major pests and duration	Looper (Mar-Nov), RSM (Jan, May/Jul-Sep)
Damage due to wildlife	Yes
6. Yield / production	
Peak plucking periods	Mar-Nov
Annual green leaf yield	9620.16 kg/ha
Annual production of processed tea	1358344 kg
7. Pruning	
Time of pruning	15th Nov-7th Jan
Pruning cycle	3 yr
Types of pruning	--
8. Fertilizer use	
Types of N, P, K fertilizers used	Urea/SOA, RP/ SSP, MOP
Dose of Nitrogen (kg/ha)	170
Dose of Phosphorous (kg/ha)	50
Dose of Potash (kg/ha)	170
Whether lime is applied, if yes dose	Nil

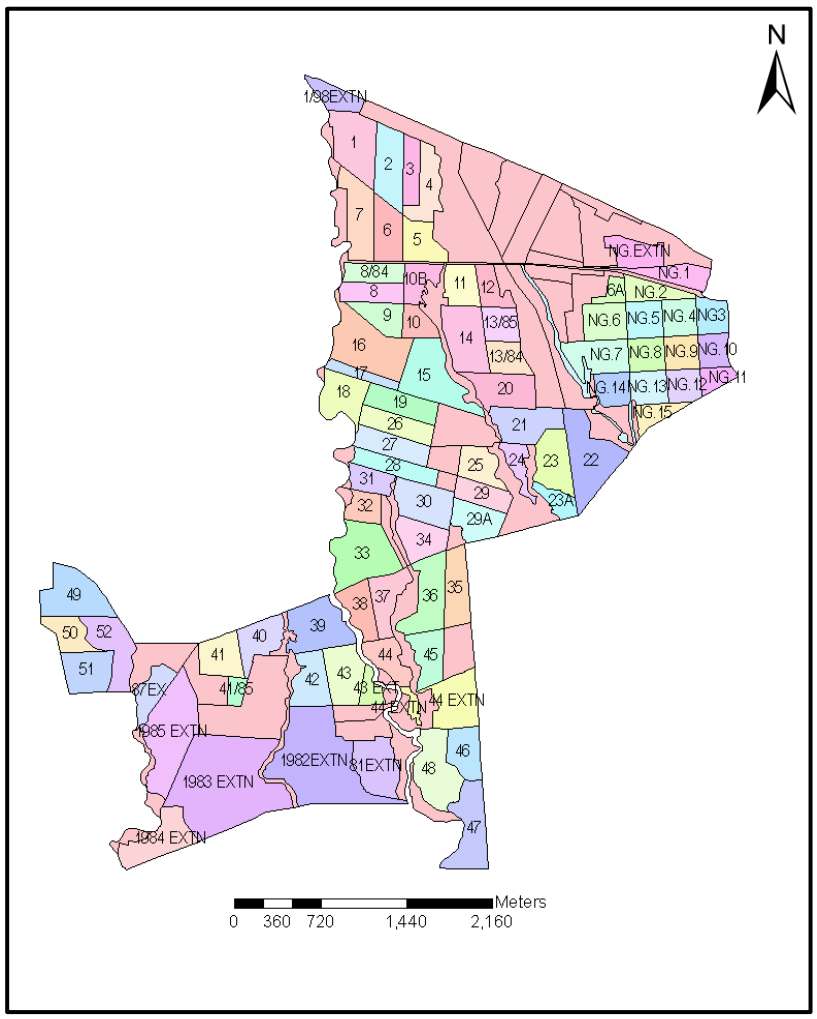
P22: BIRPARA TE



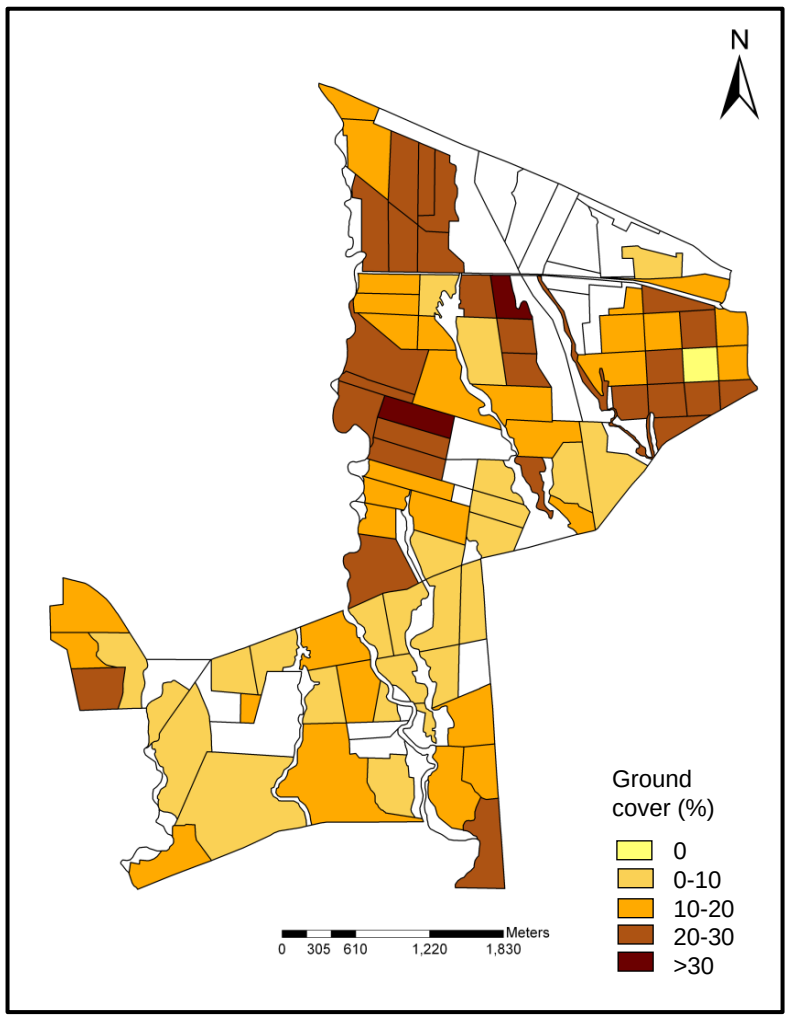
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse

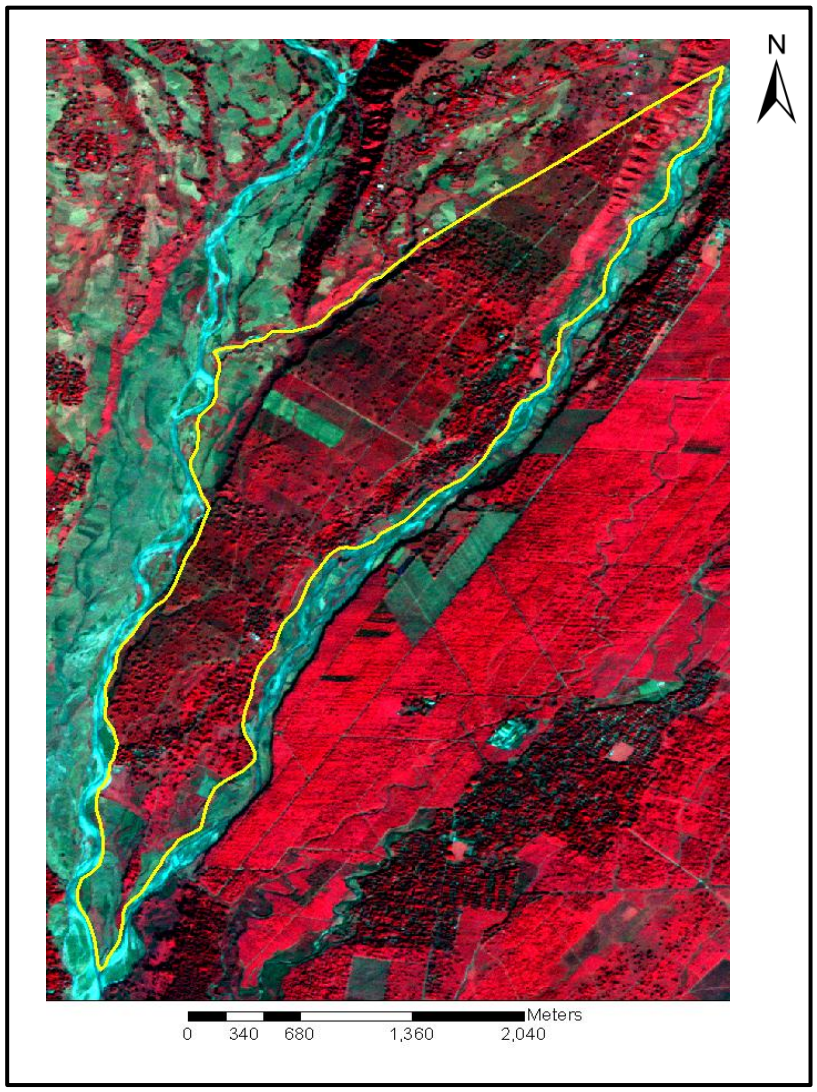


c. Section Boundaries of the Estate

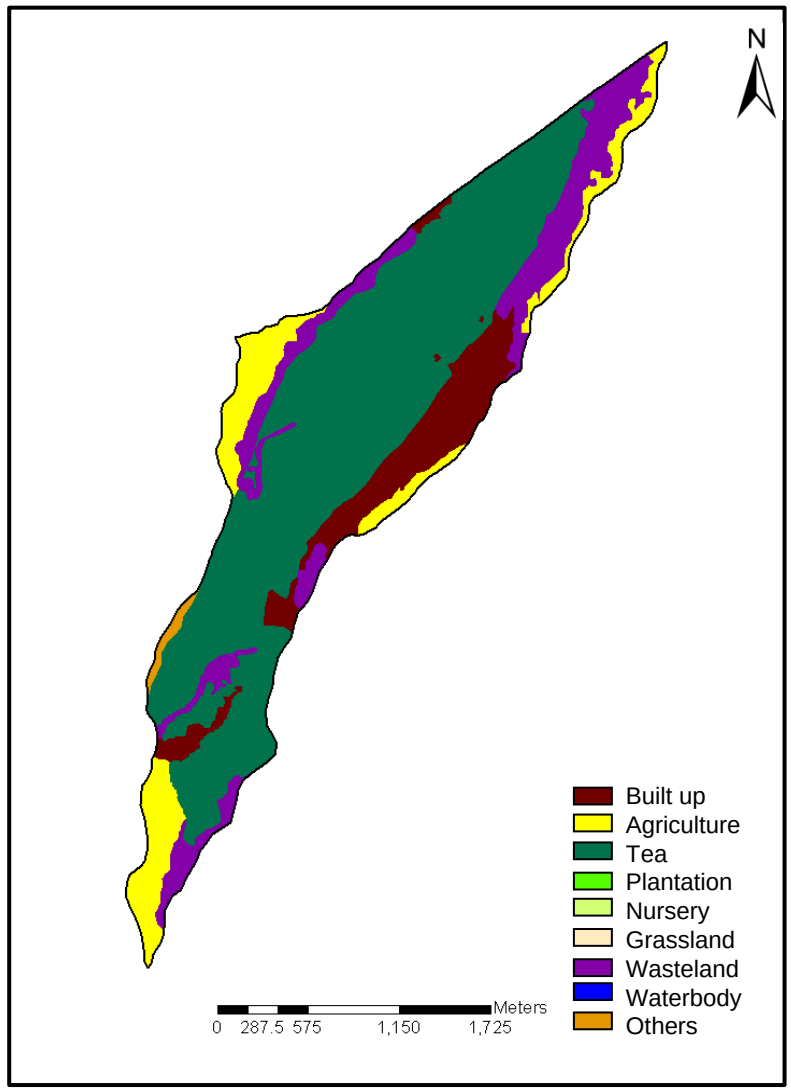


d. Shade Tree Density in Sections

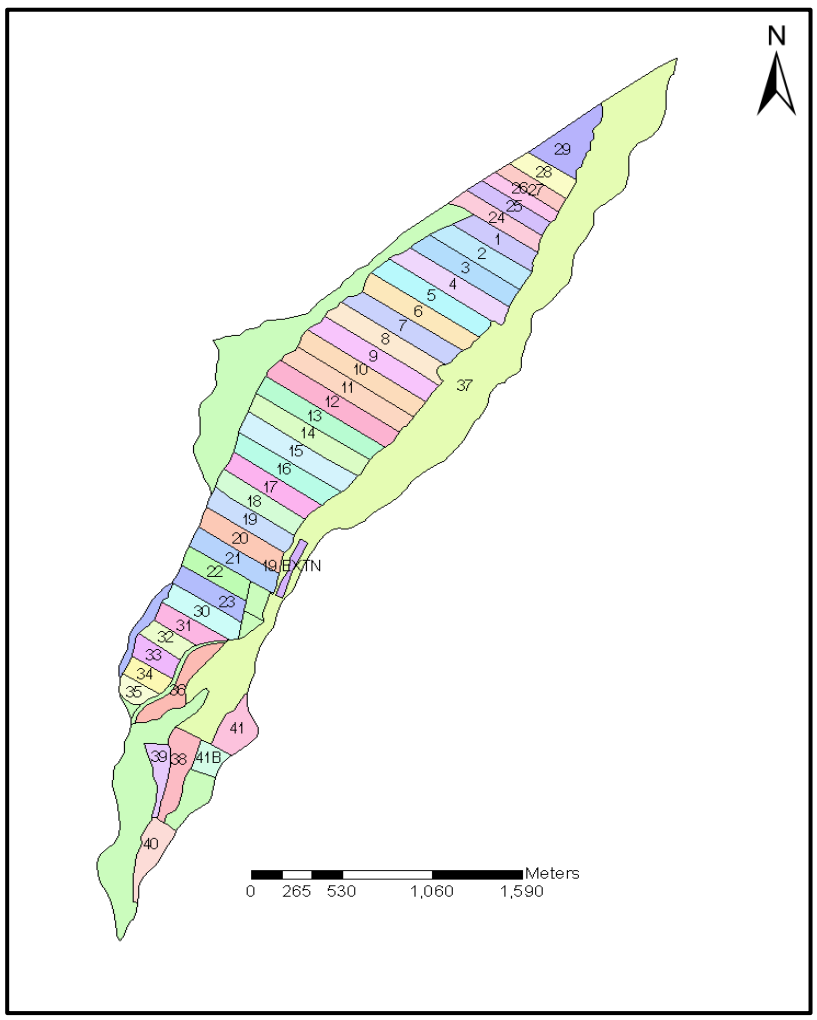
P23: CARRON TE



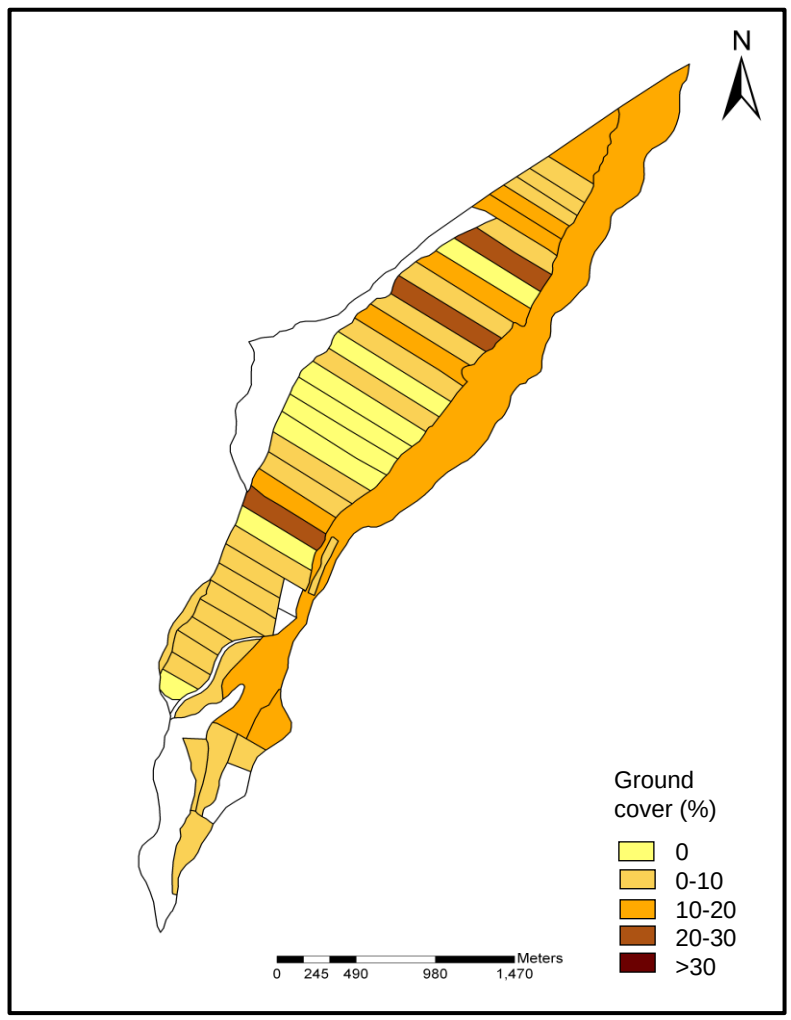
a. False Colour Composite of IRS LISS IV



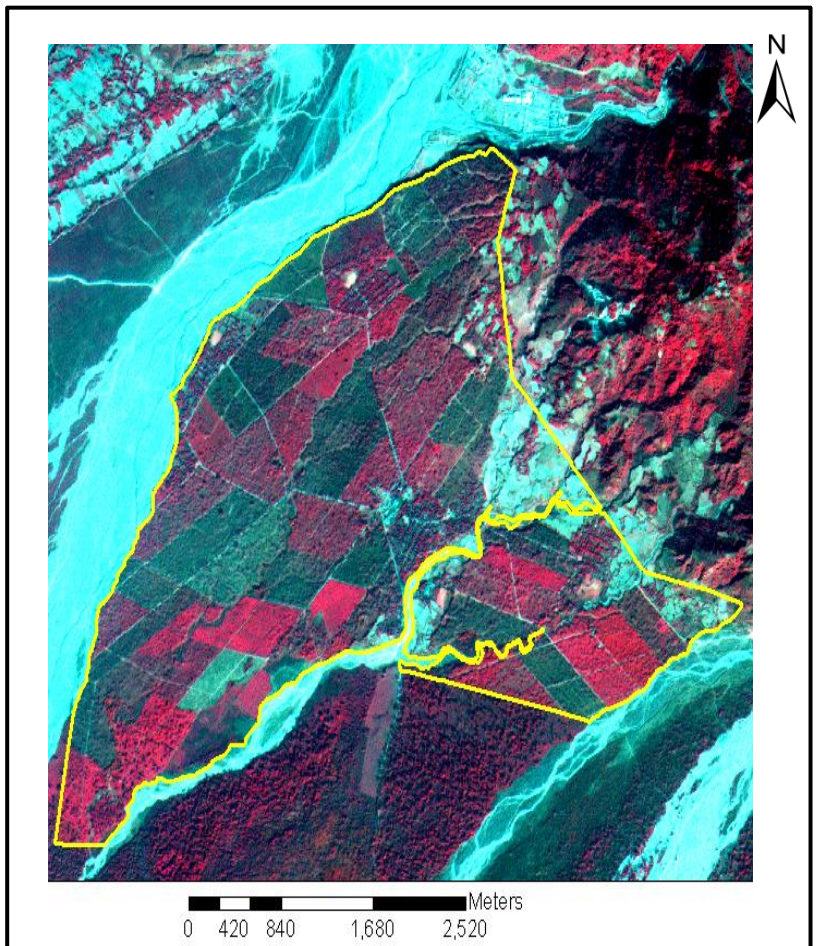
b. Tea Estate Landuse



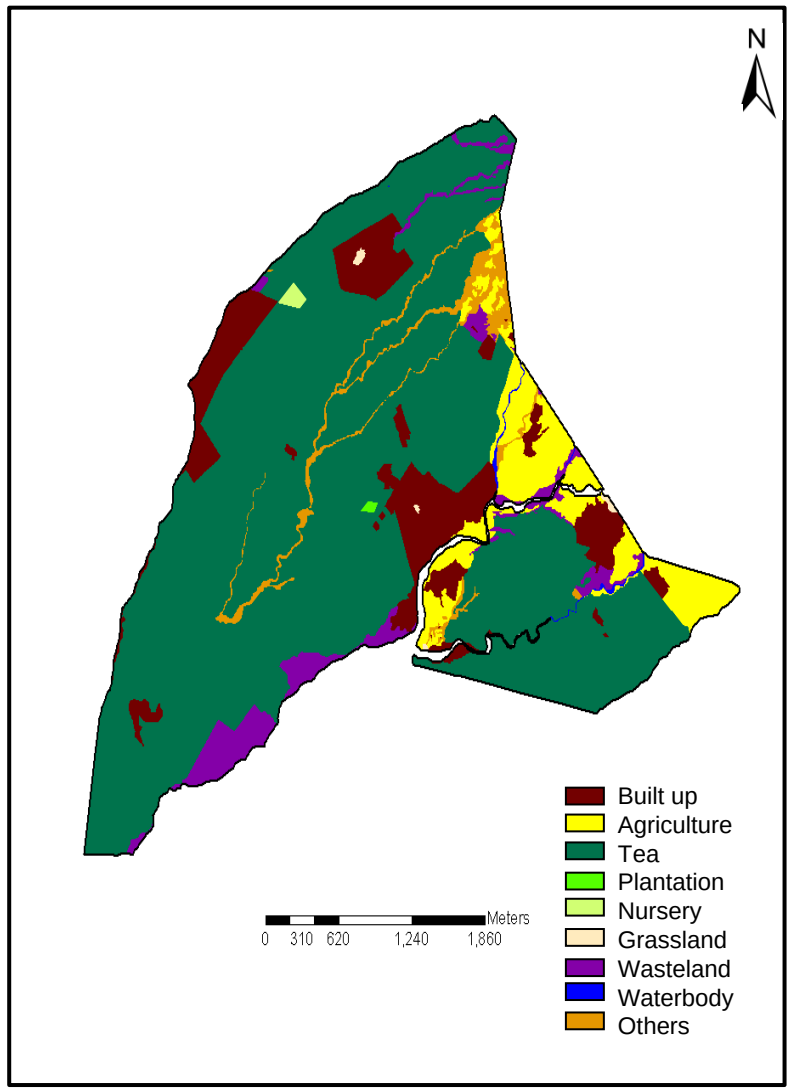
c. Section Boundaries of the Estate



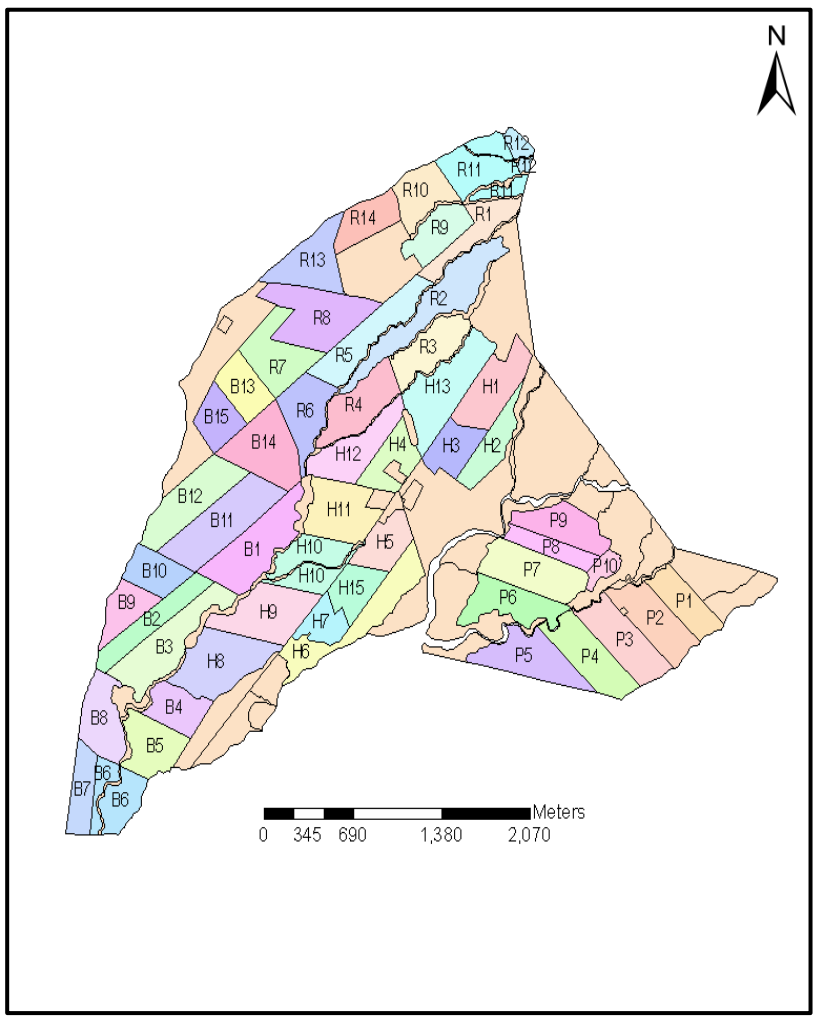
d. Shade Tree Density in Sections



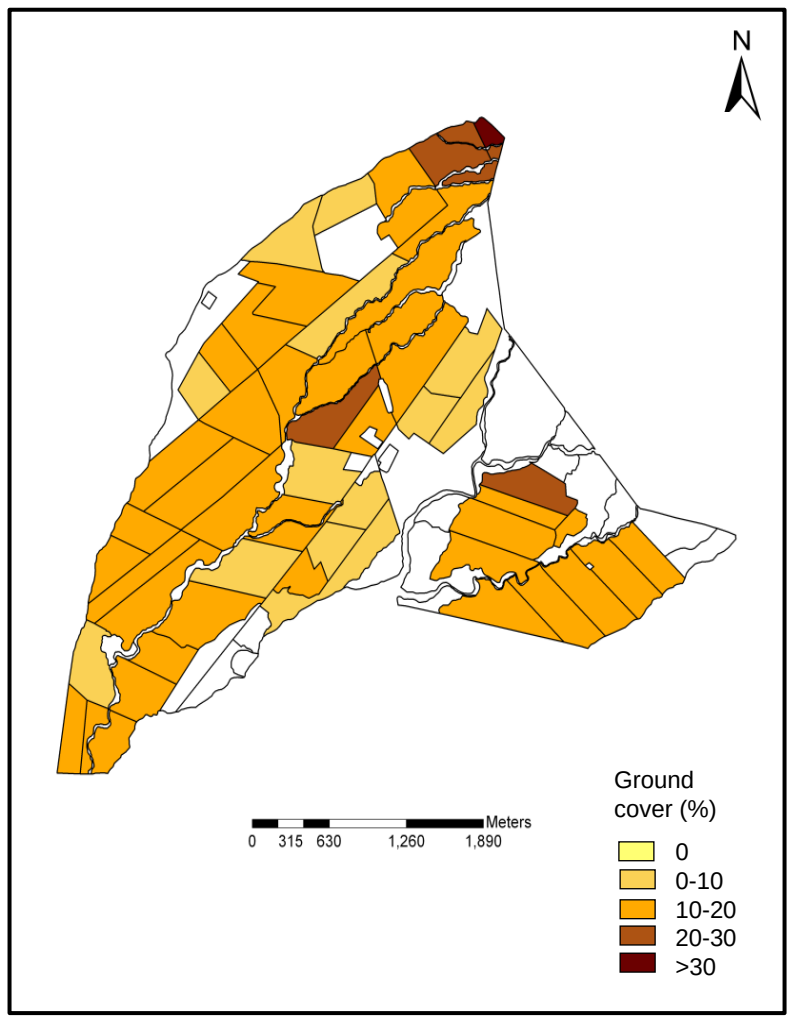
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

e. General Information

1. General	
Contact address	PO: Panabasti, Dist: Jalpaiguri PIN: 735226
Contact phone	03566-206015
Name of the company	Mcleod Russel India Ltd.
Name of the village where it falls	Panabasti
Leased area of the estate (ha)	1225.60
Tea grown area of the estate (ha)	818.66
No. of divisions / sections	4 div/56 sec
Year of establishment	1900
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	Nil

3. Amenities	
Availability of health care / dispensary	Yes
Availability of school	Yes

4. Shade trees	
Shade tree density (garden level)	Medium
Plant to plant spacing (m)	11.33 x 11.33
Row to row spacing (m)	16.66 x 16.66

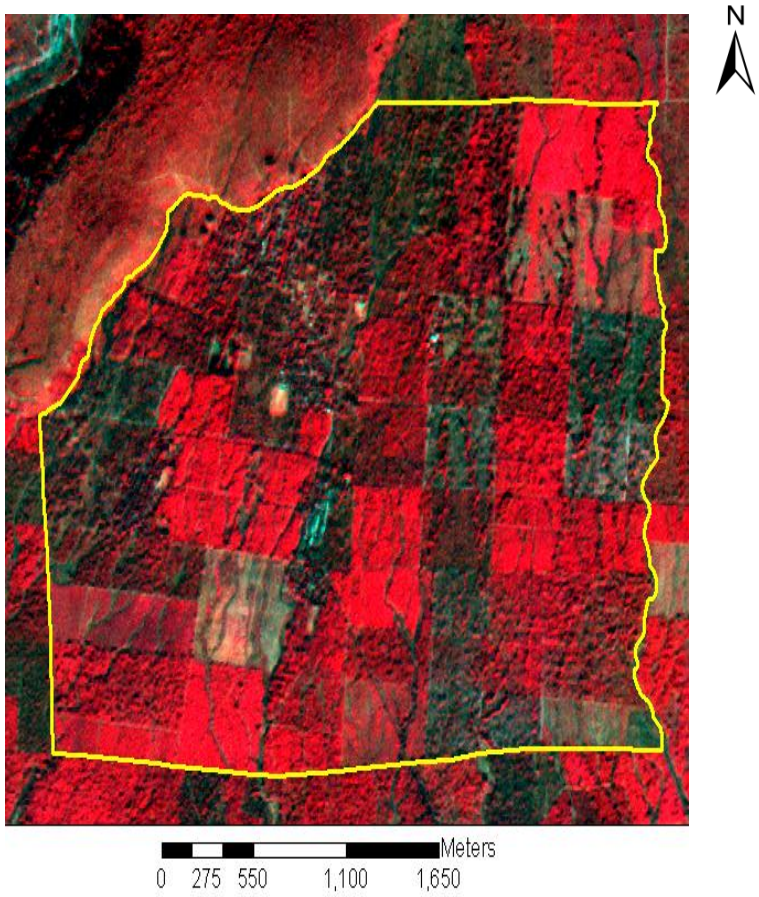
5. Natural resources constraints	
Drainage congestion and water logging	Yes
Scarcity of water during summer	No
River bank erosion	Yes
Major diseases and duration	--
Major pests and duration	*Helopeltis*, greenfly, RSM, looper (whole year)
Damage due to wildlife	Yes

6. Yield / production	
Peak plucking periods	mid May-mid Oct
Annual green leaf yield	6911 kg/ha
Annual production of processed tea	1211365 kg

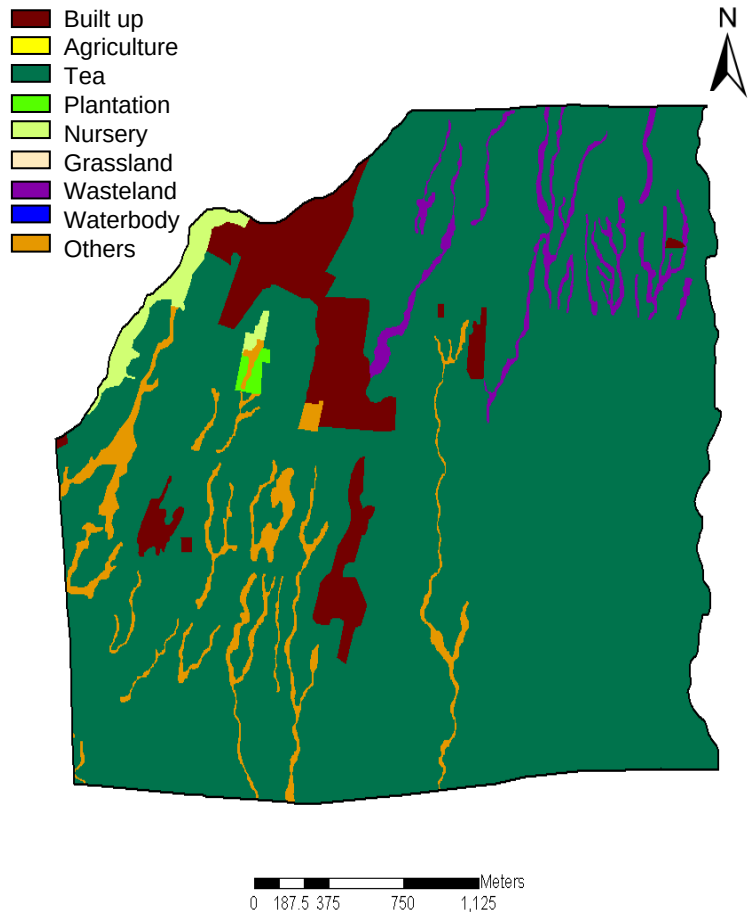
7. Pruning	
Time of pruning	Nov-Jan
Pruning cycle	3 yr/2 yr
Types of pruning	US-MS/DS-UP

8. Fertilizer use	
Types of N, P, K fertilizers used	Urea, RP, MOP
Dose of Nitrogen (kg/ha)	239
Dose of Phosphorous (kg/ha)	200
Dose of Potash (kg/ha)	121
Whether lime is applied, if yes dose	Yes (4 kg/200 L water)

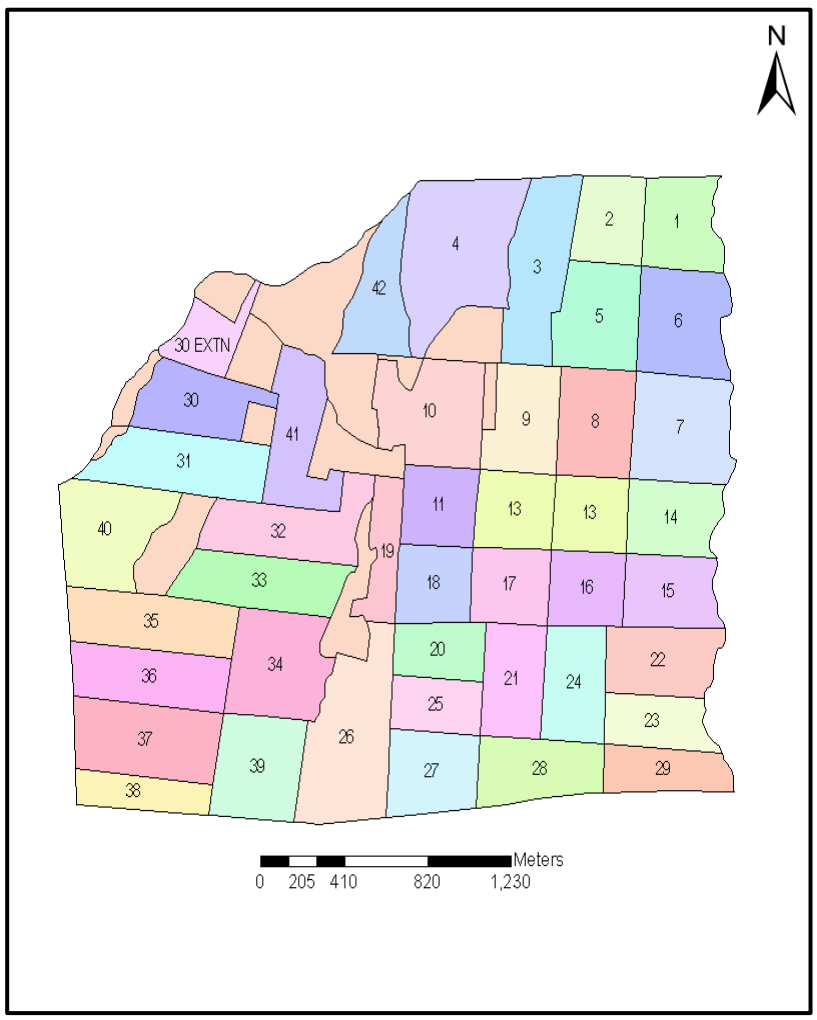
P25: CHALOUNI TE



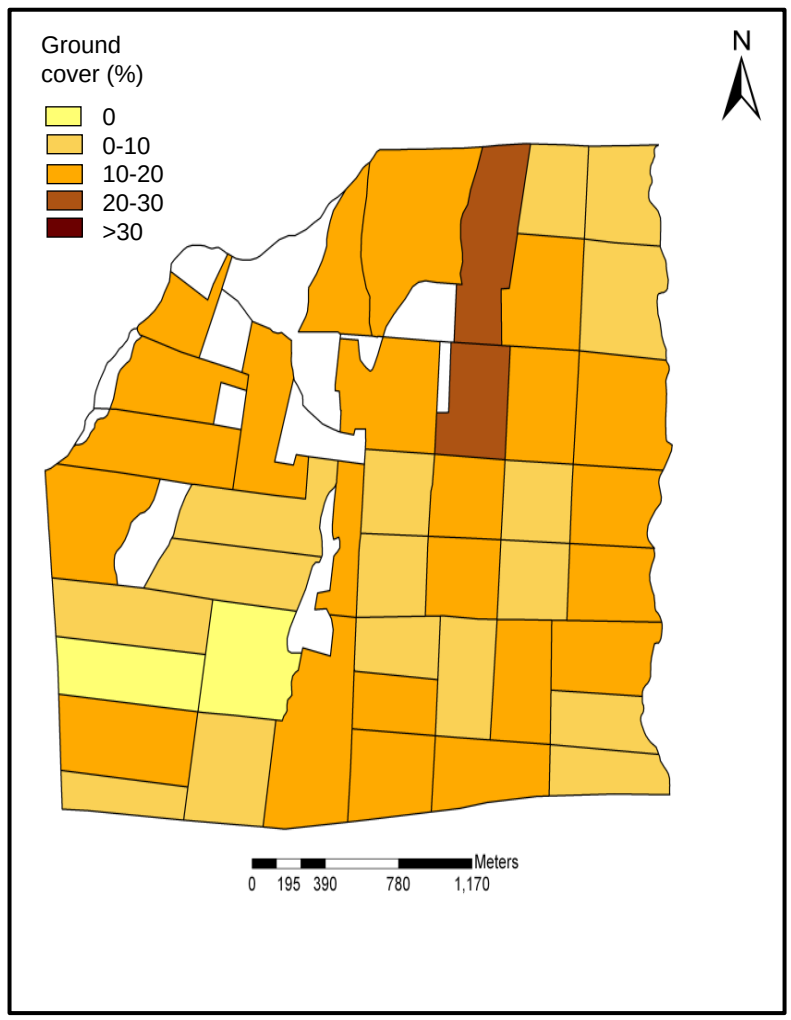
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse

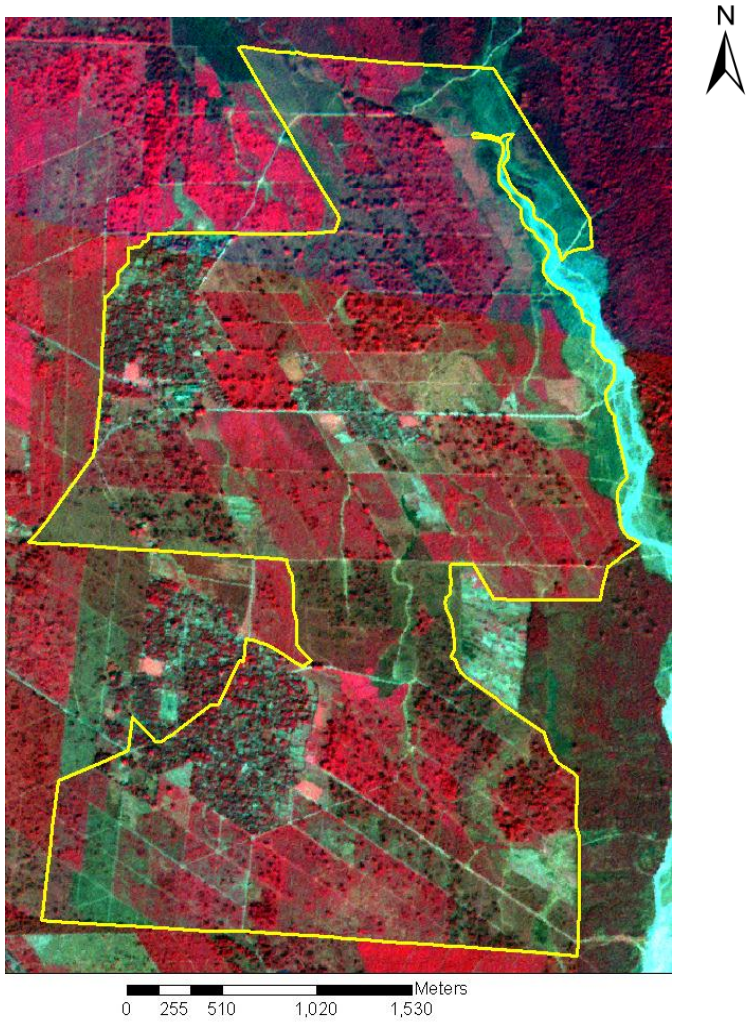


c. Section Boundaries of the Estate

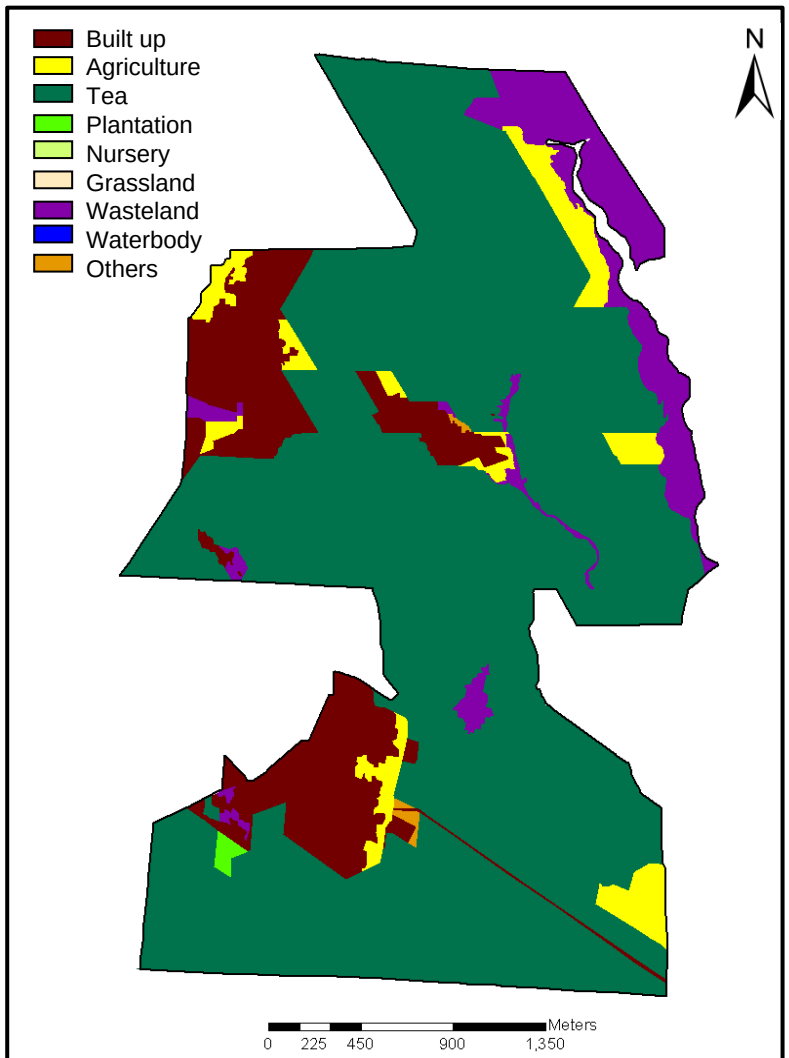


d. Shade Tree Density in Sections

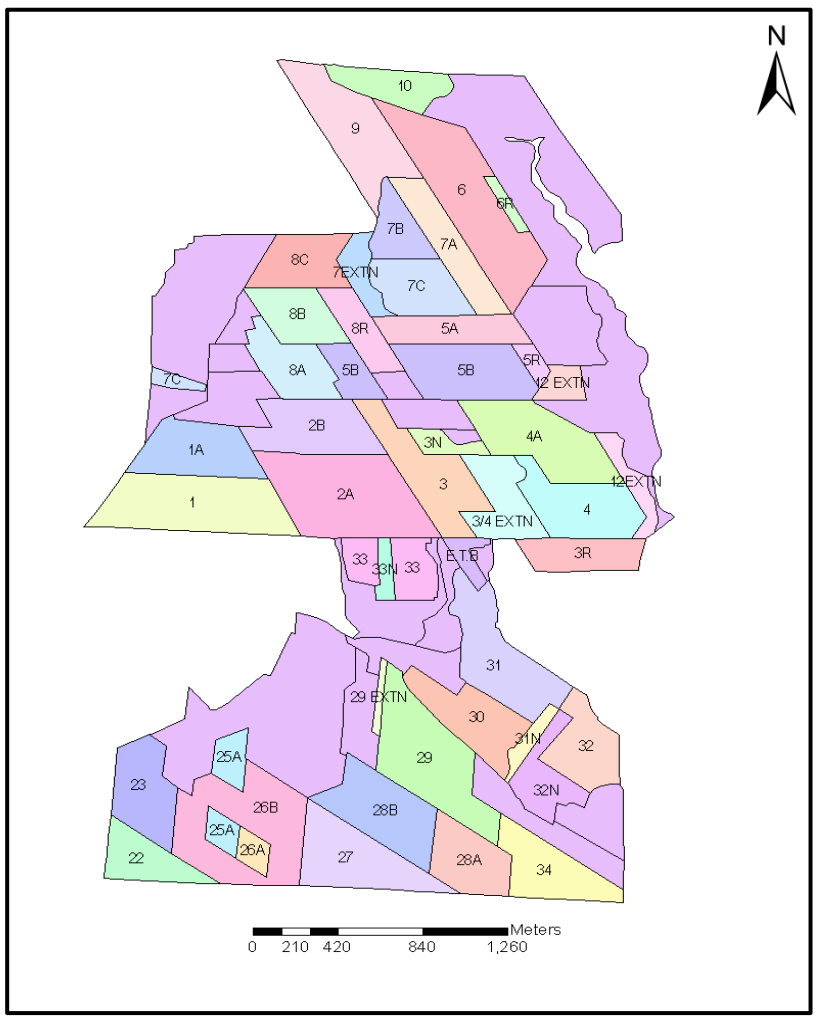
P26: CHINCHULA TE



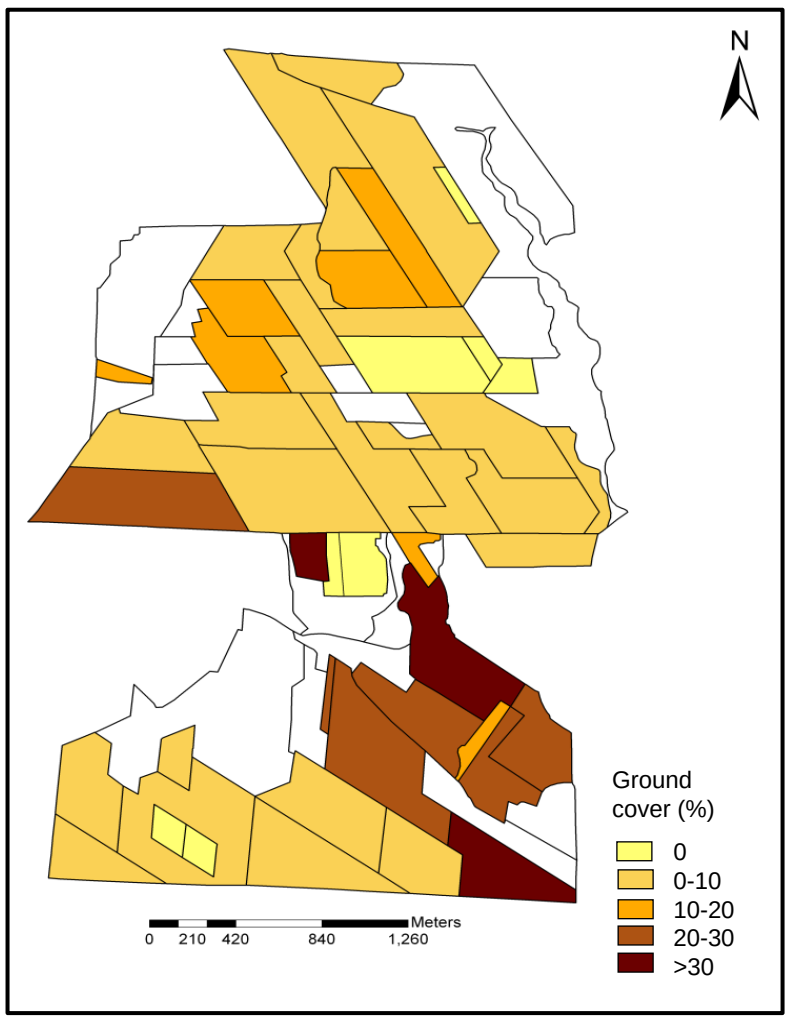
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse

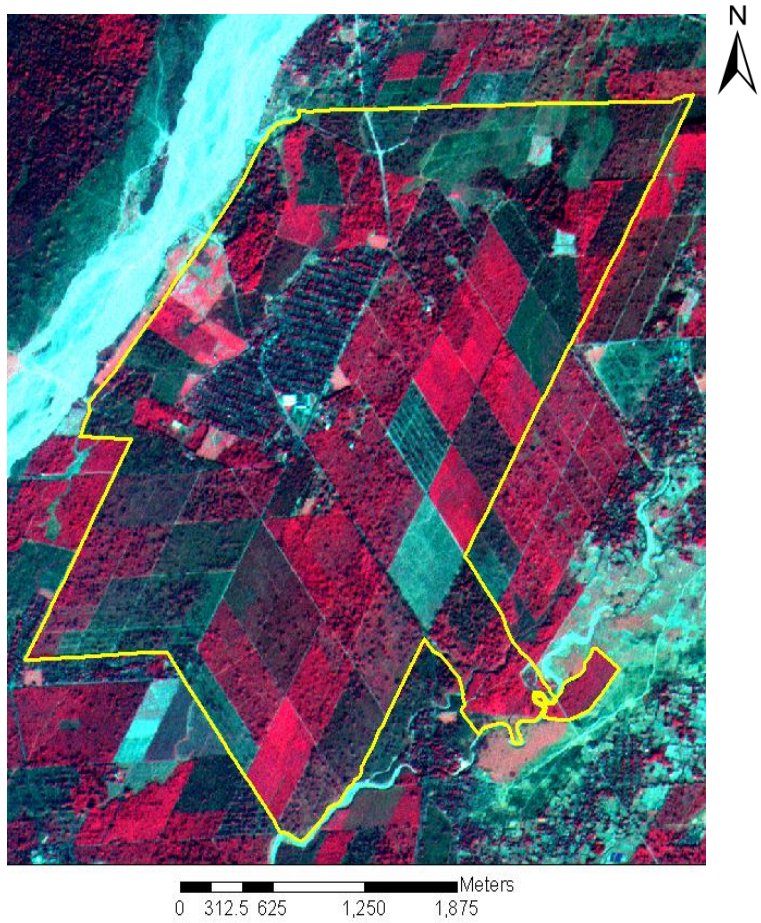


c. Section Boundaries of the Estate

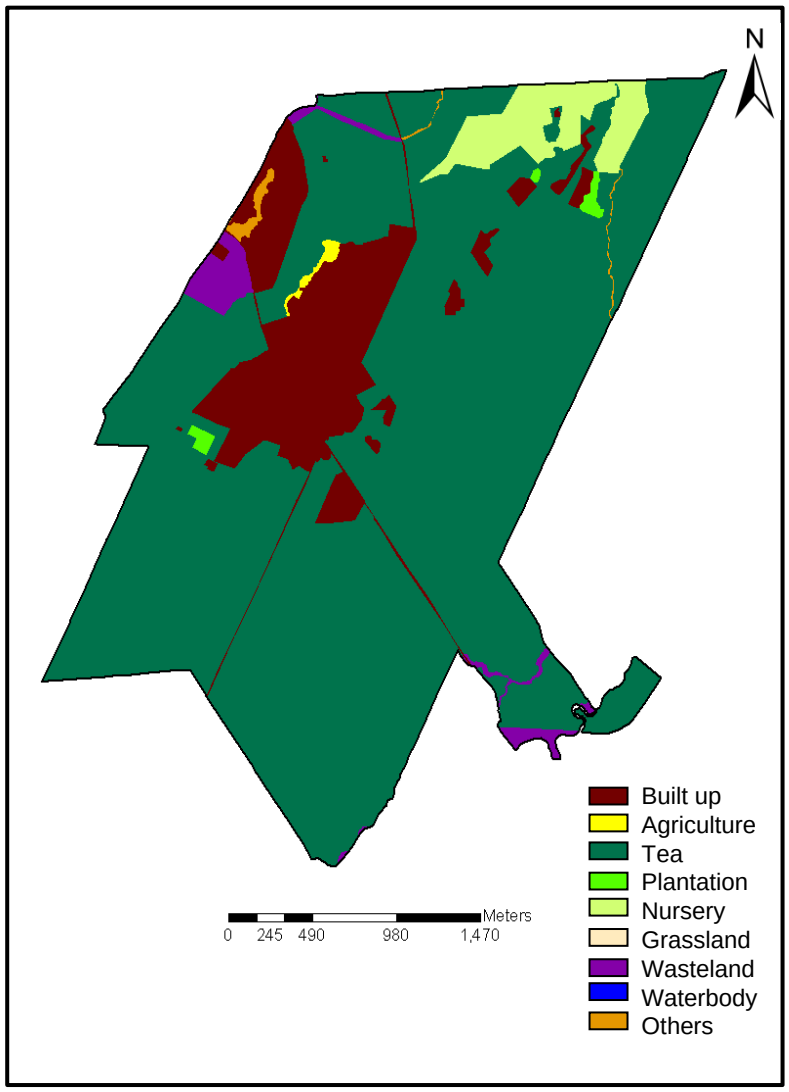


d. Shade Tree Density in Sections

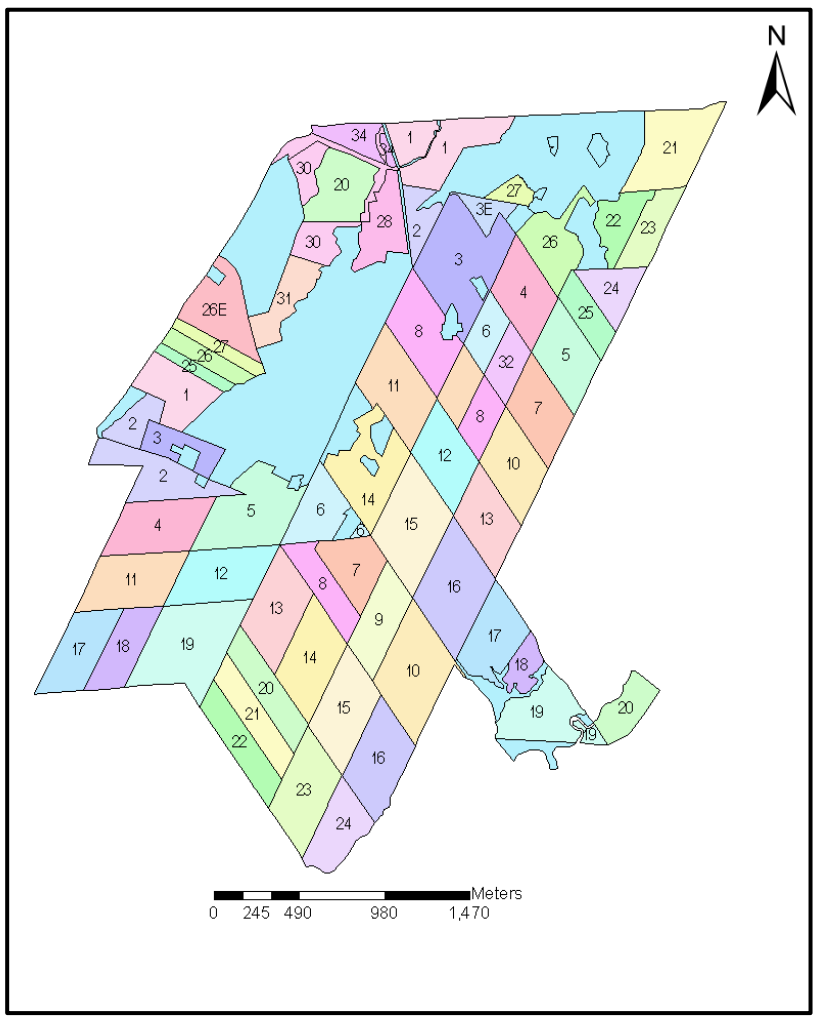
P27: CHUAPARA TE



a. False Colour Composite of IRS LISS IV



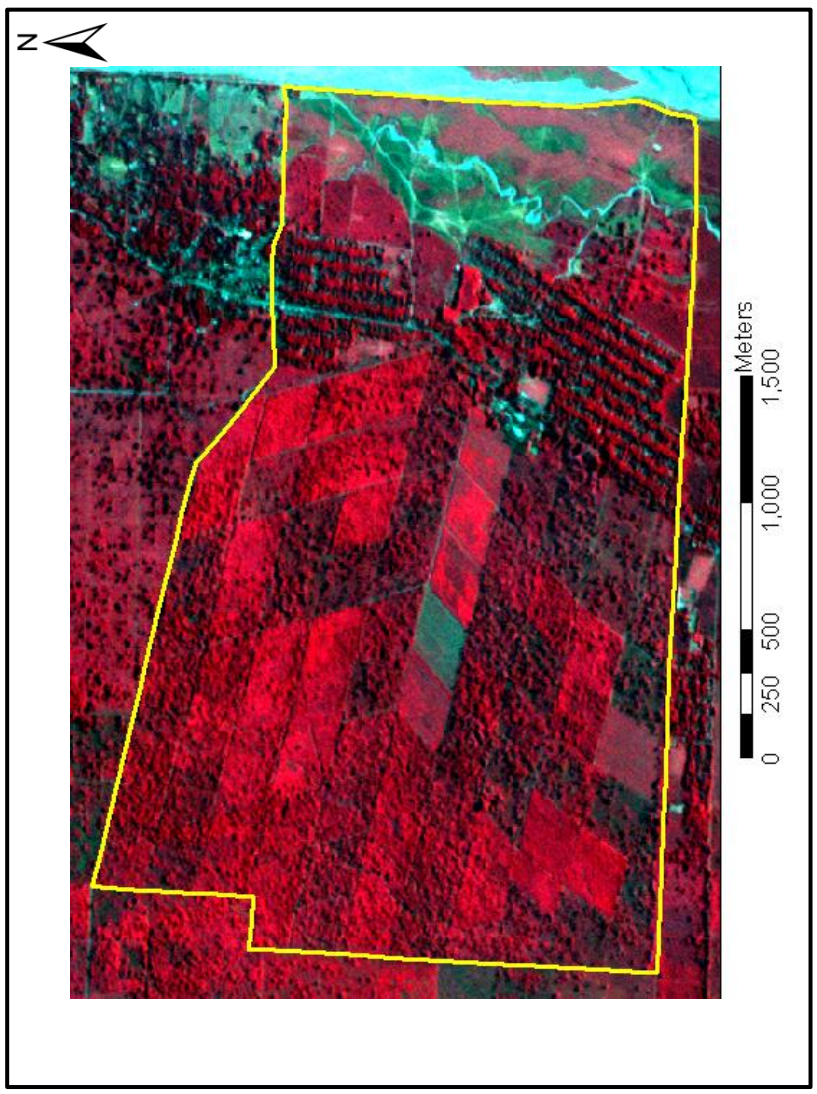
b. Tea Estate Landuse



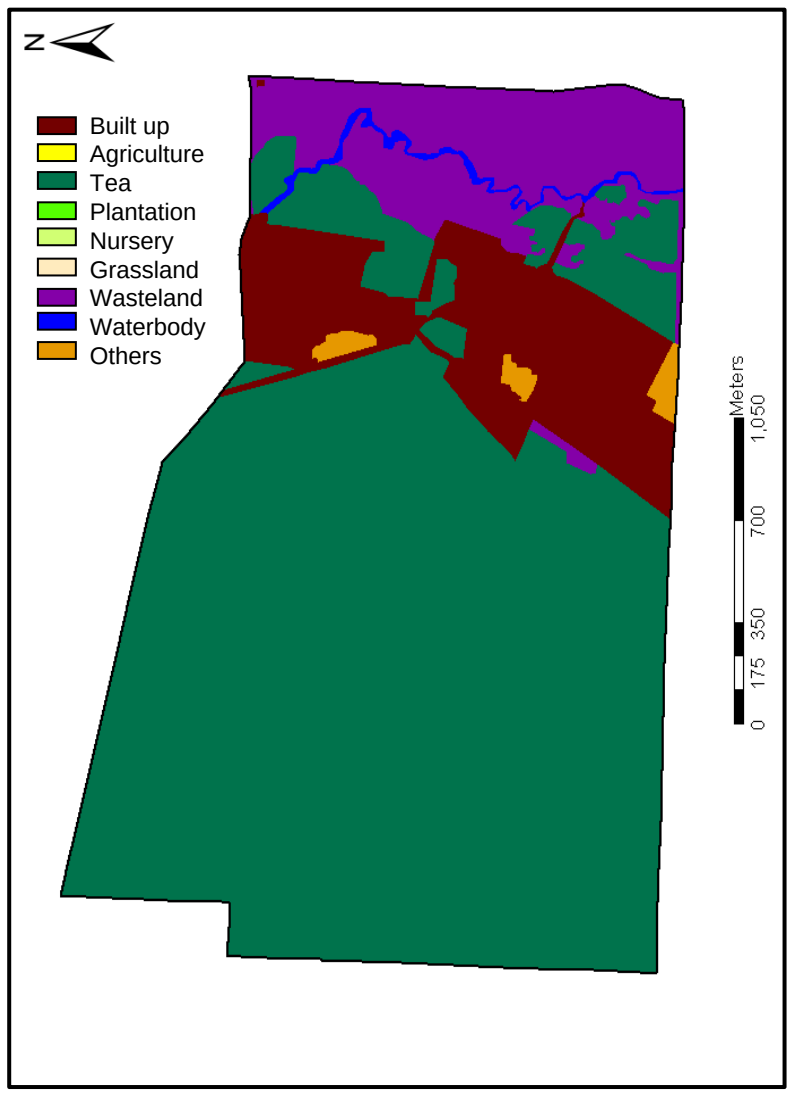
c. Section Boundaries of the Estate

d. Shade Tree Density in Sections

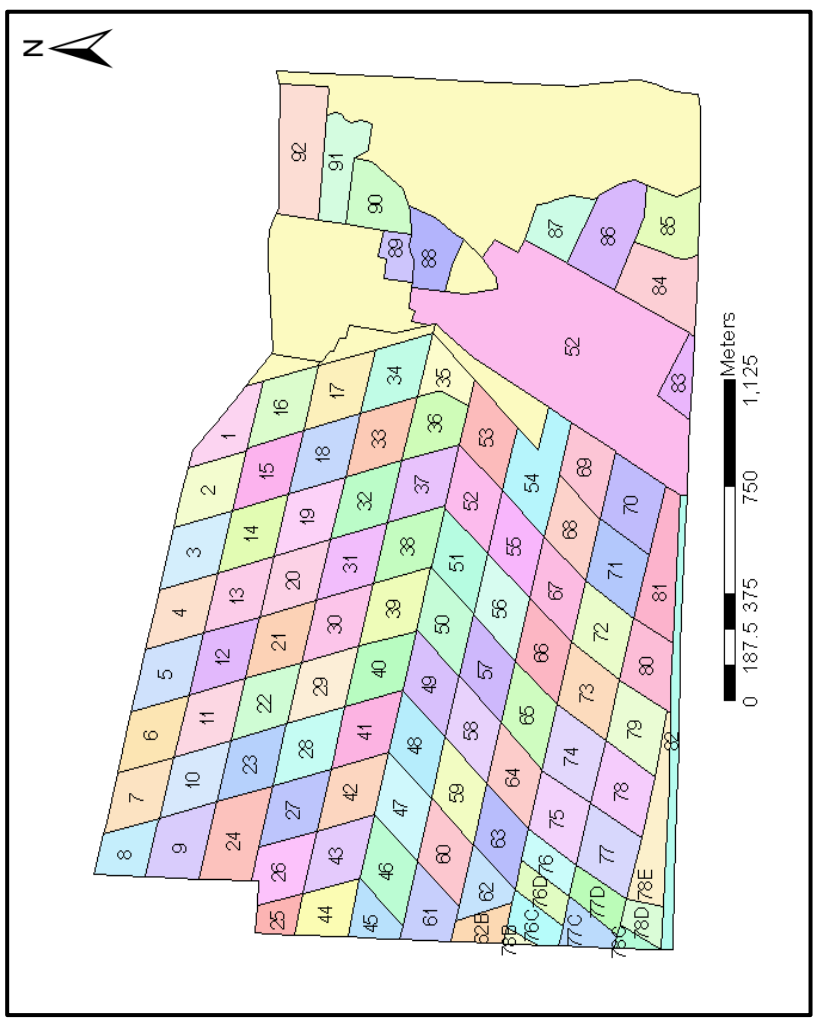
P28: CHUNABHUTTI TE



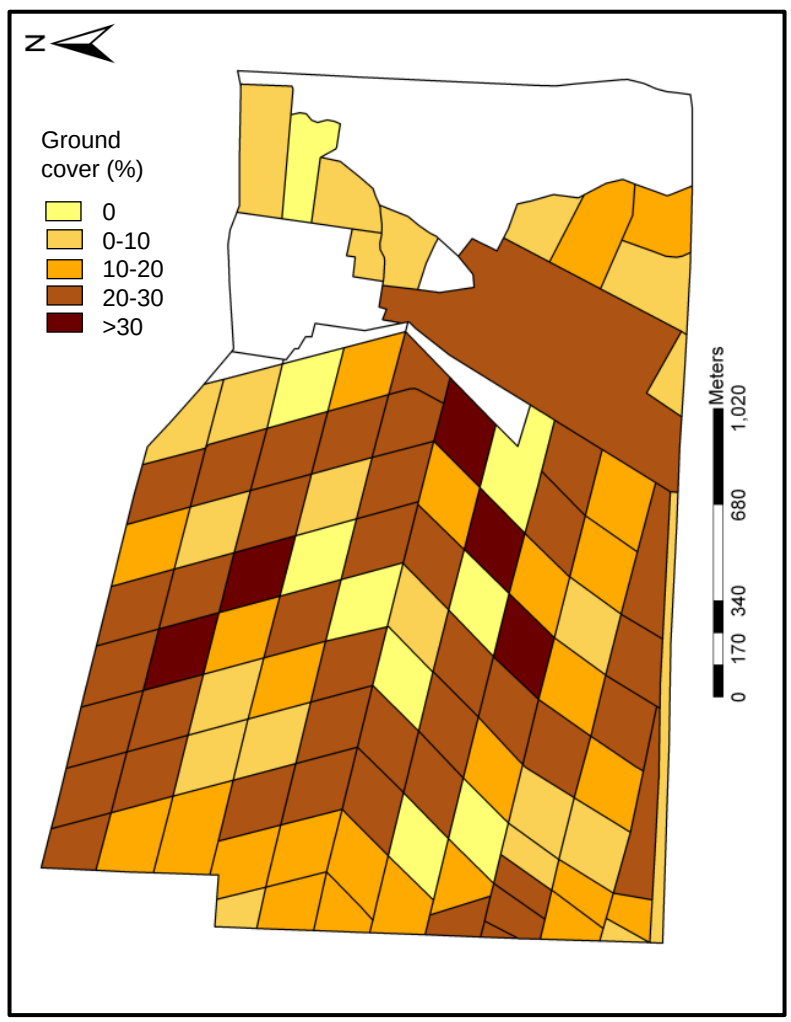
a. False Colour Composite of IRS LISS IV



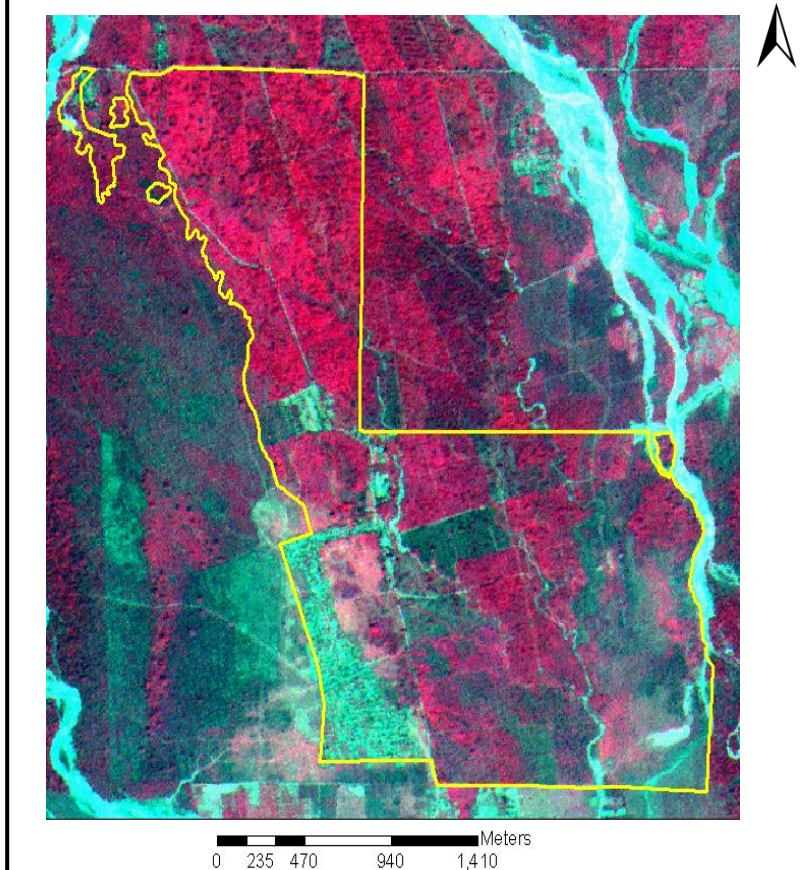
b. Tea Estate Landuse



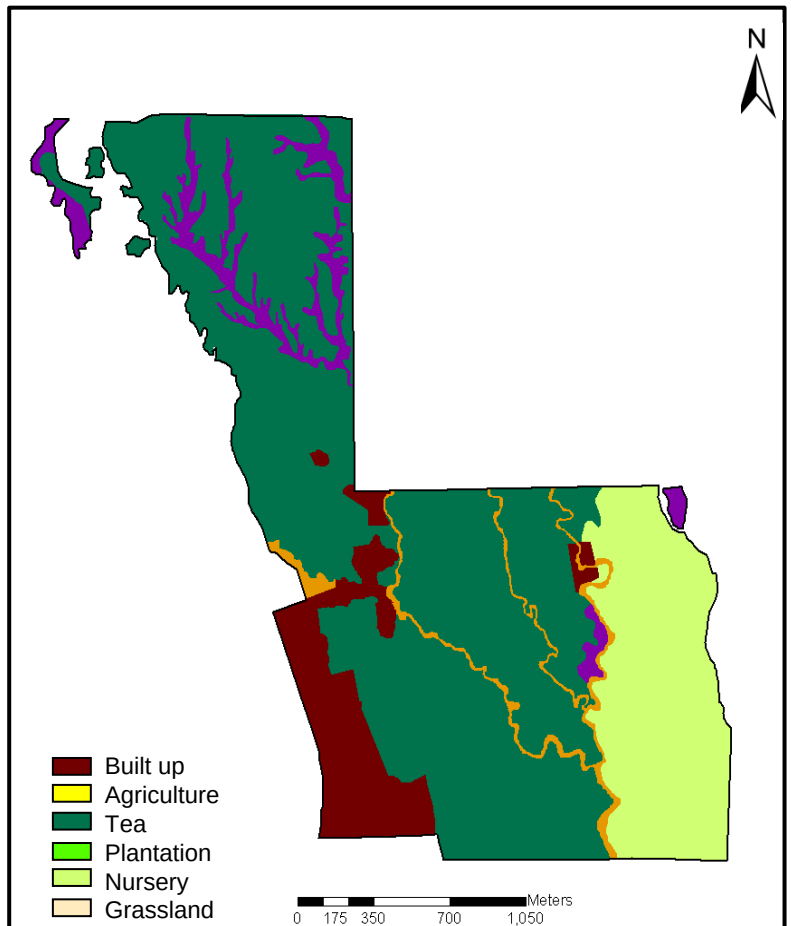
c. Section Boundaries of the Estate



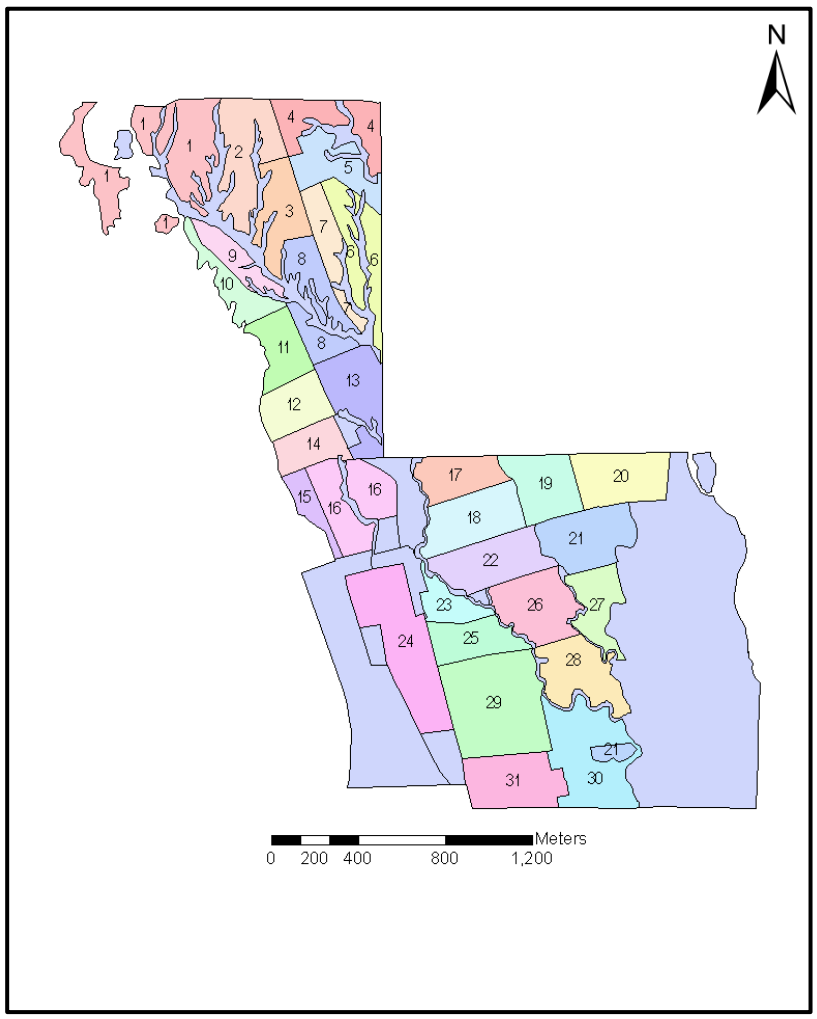
d. Shade Tree Density in Sections



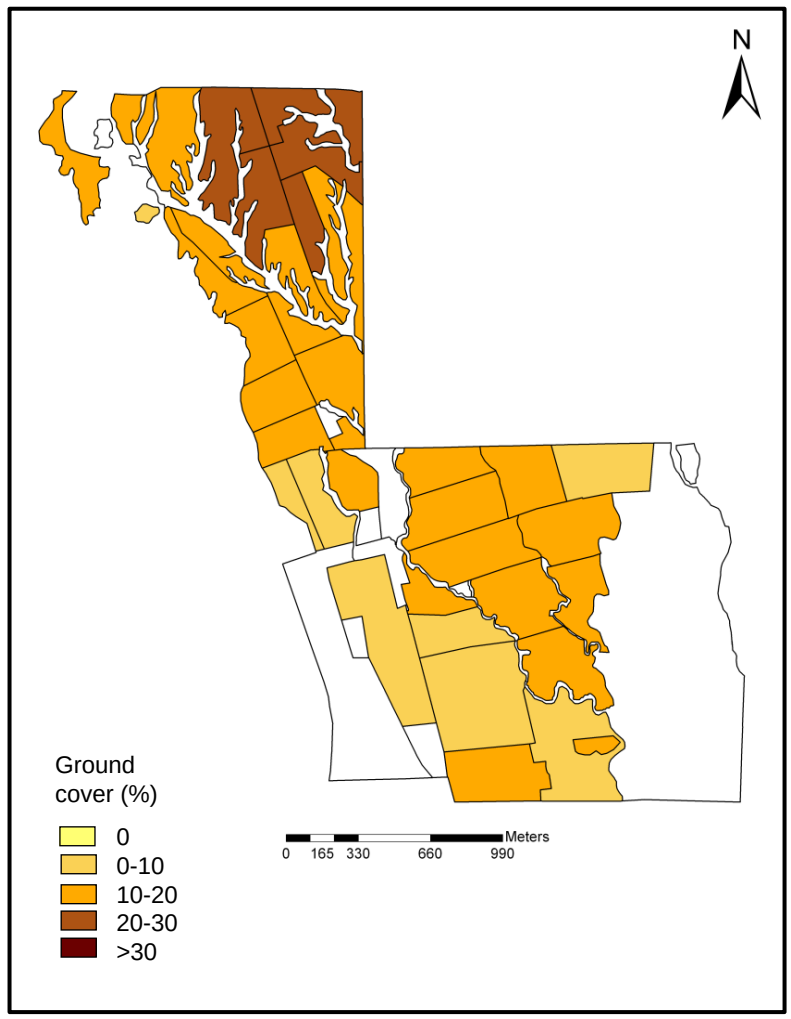
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



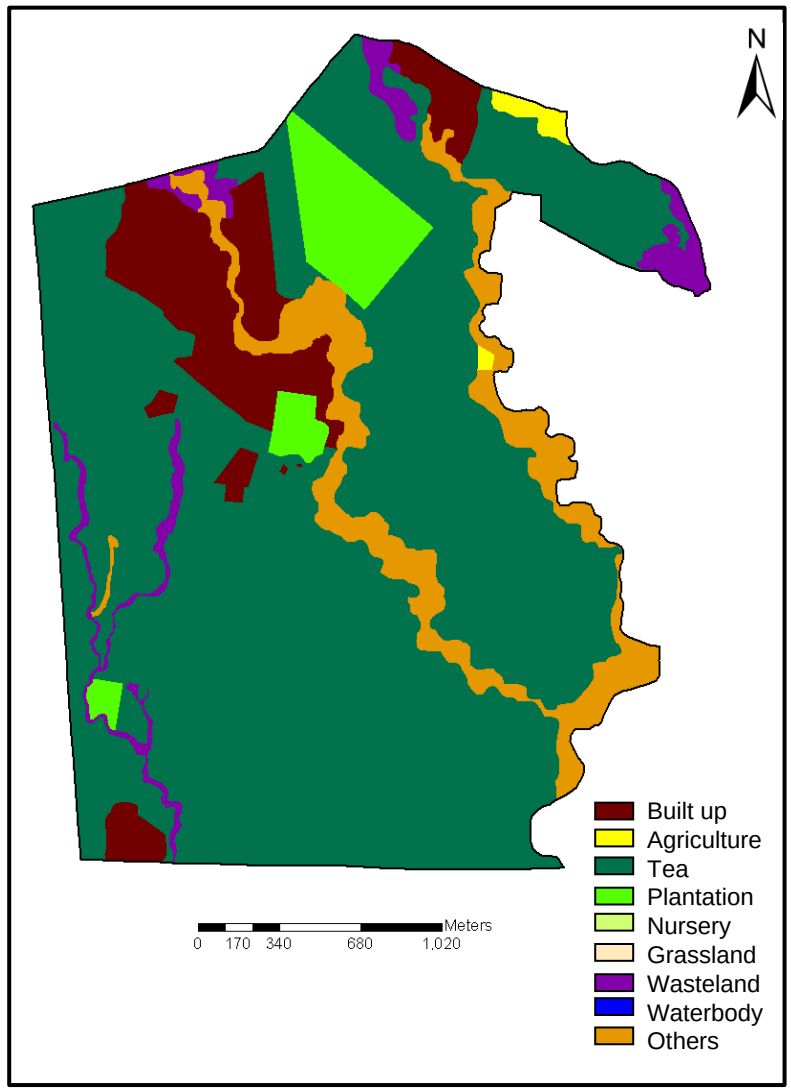
c. Section Boundaries of the Estate



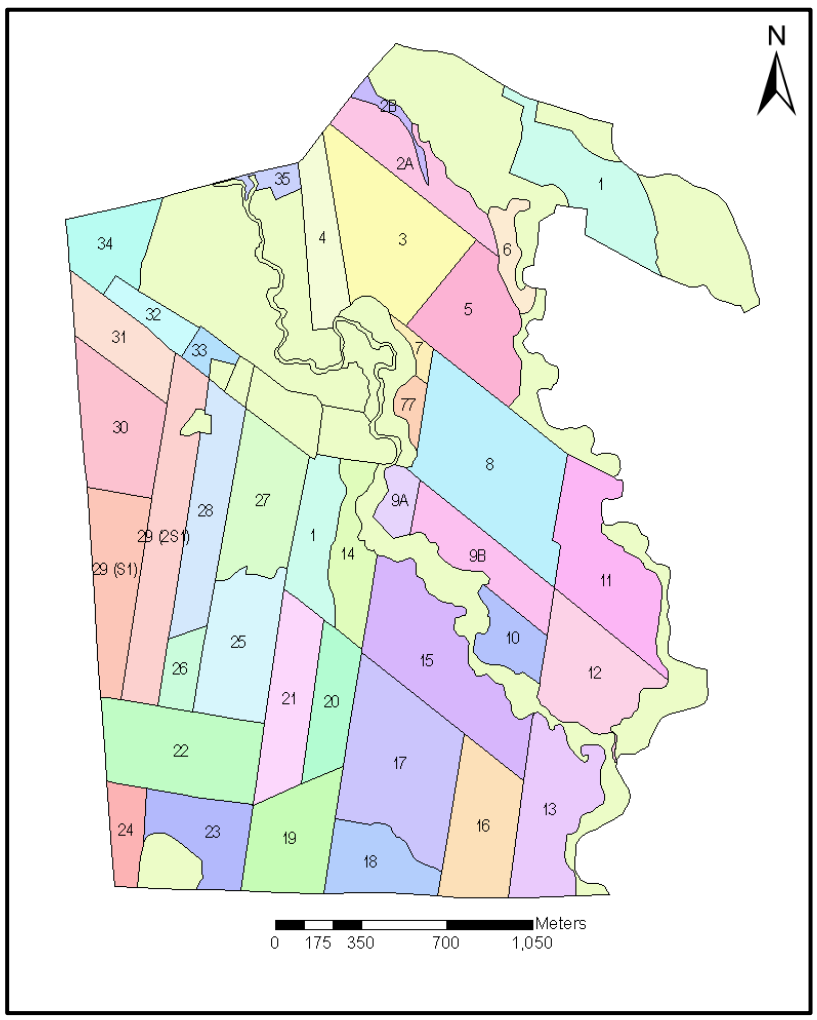
d. Shade Tree Density in Sections

P30: DALGAON TE

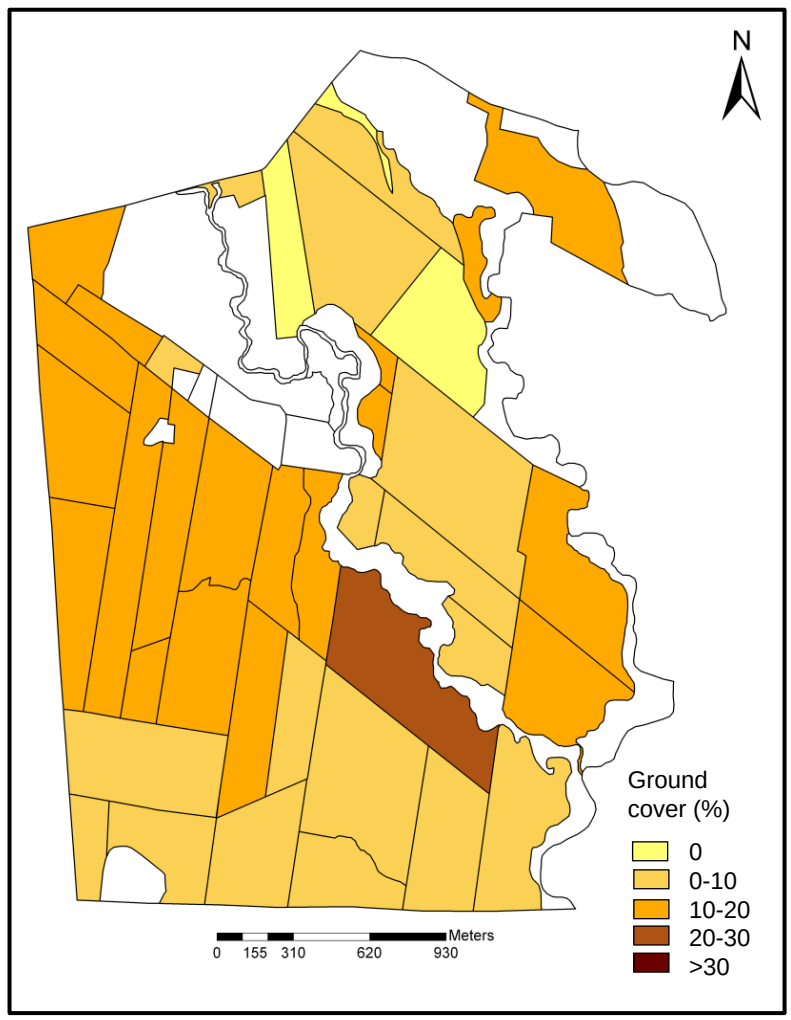
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse

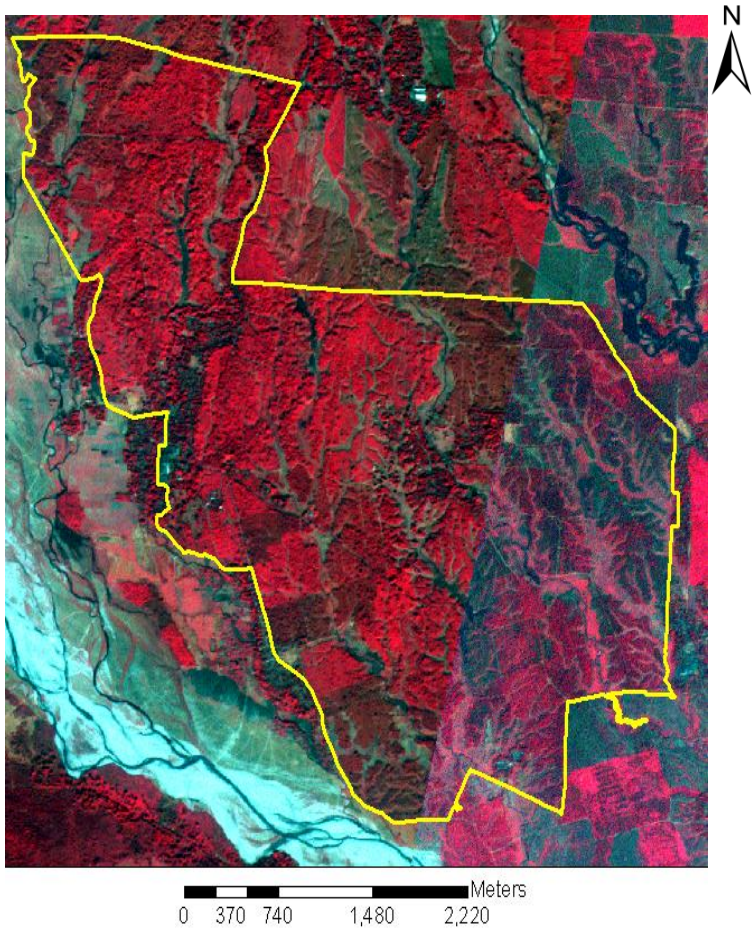


c. Section Boundaries of the Estate

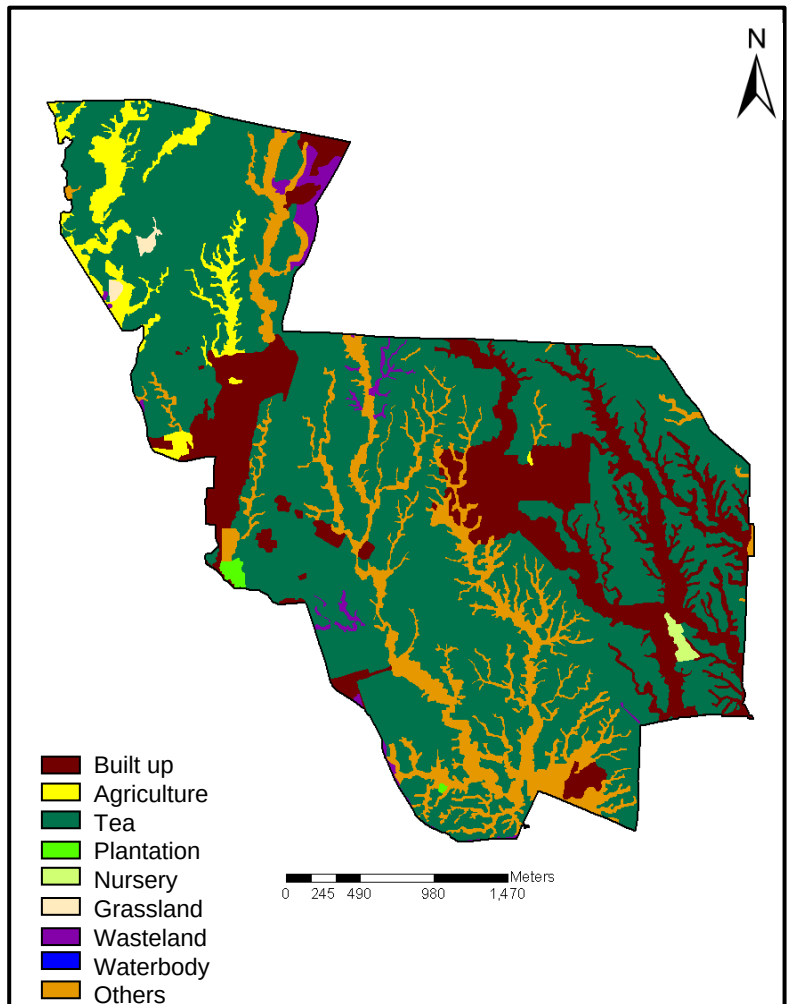


d. Shade Tree Density in Sections

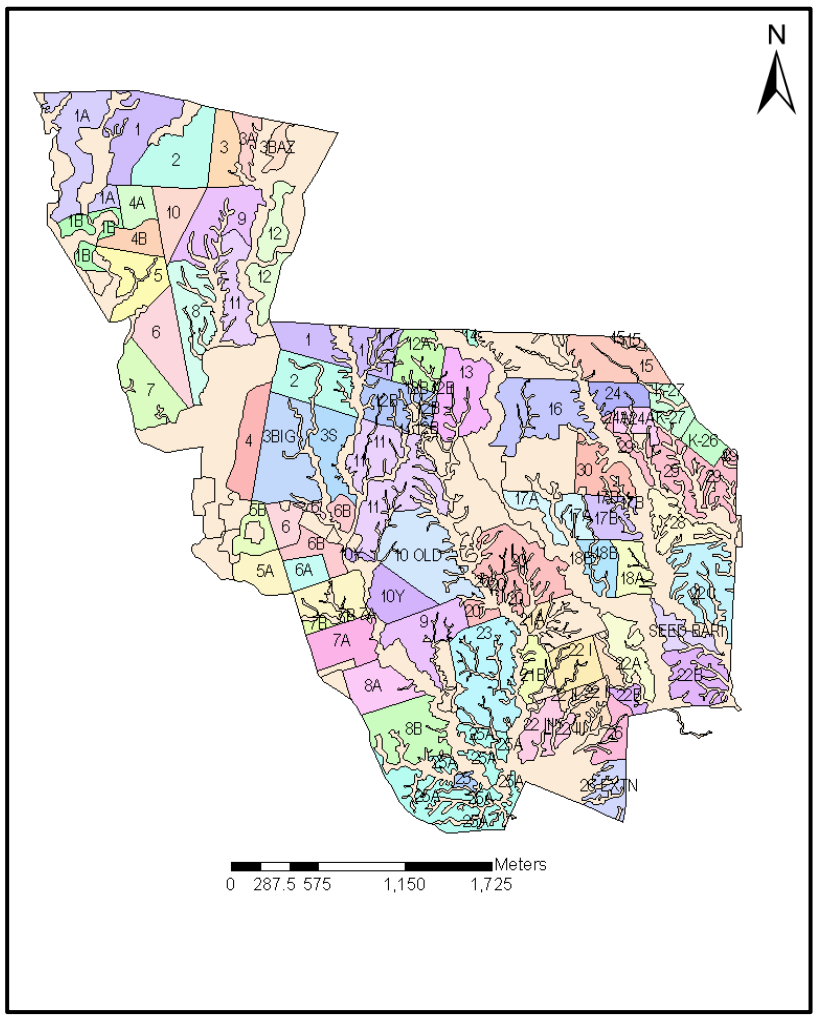
P31: DAMDIM TE



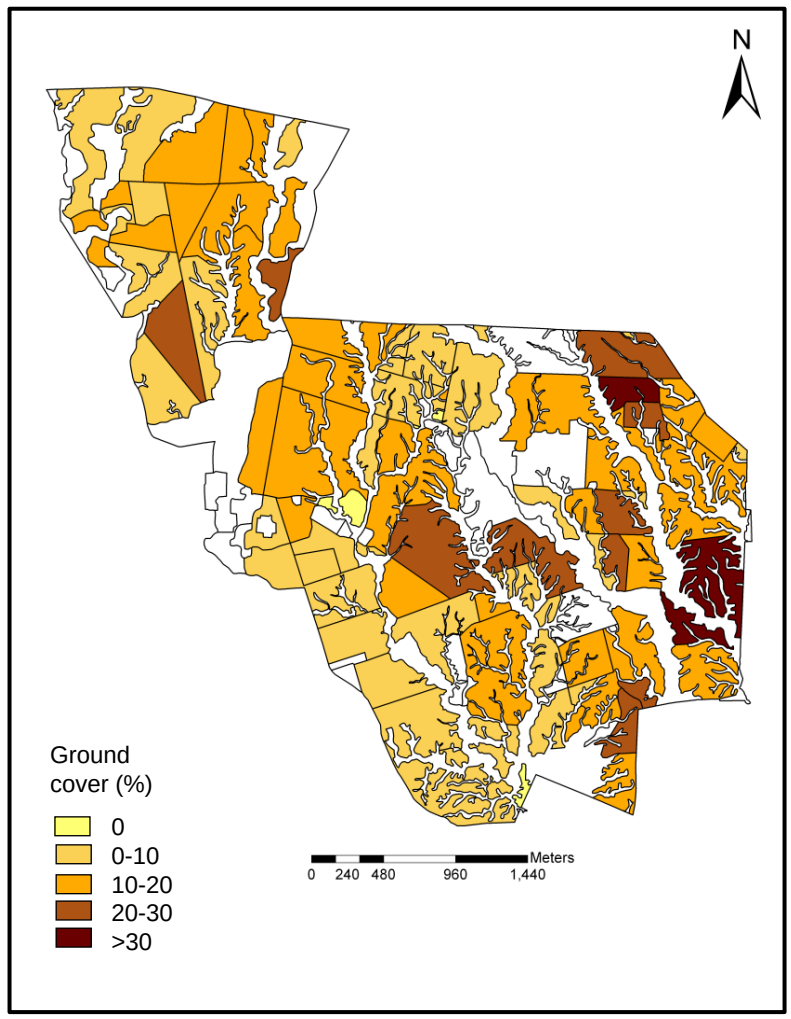
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

e. General Information

1. General	
Contact address	PO: Damdim, Dist: Jalpaiguri PIN: 735209
Contact phone	03562-221305
Name of the company	--
Name of the village where it falls	Damdim Gram Panchyat
Leased area of the estate (ha)	1361.51
Tea grown area of the estate (ha)	738.02
No. of divisions / sections	3 div/73 sec
Year of establishment / age	--
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 (primary)

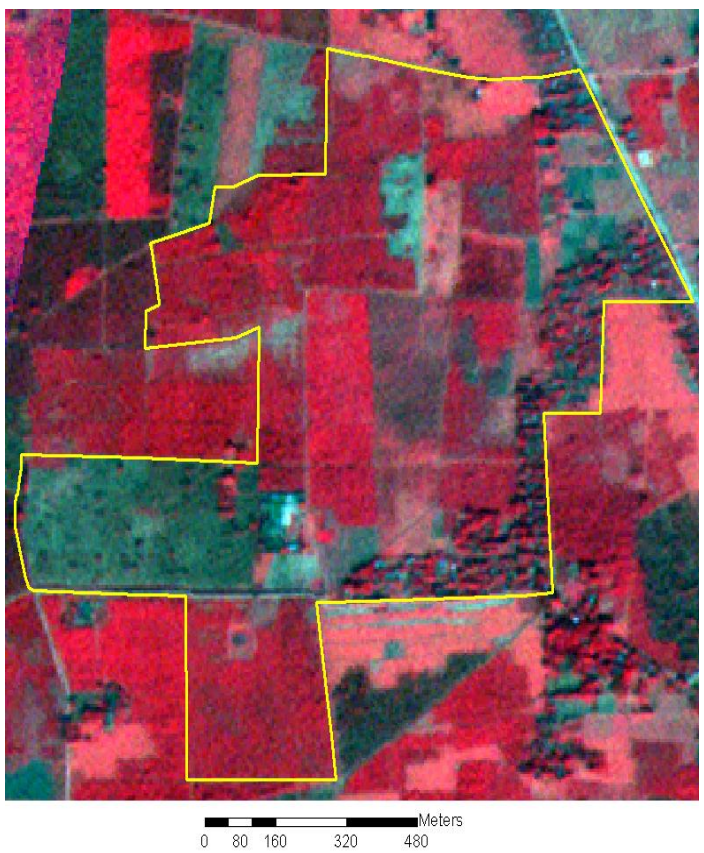
4. Shade trees	
Shade tree density (garden level)	Medium
Plant to plant spacing (m)	11.66 x 11.66
Row to row spacing (m)	5.83 x 5.83

5. Natural resources constraints	
Drainage congestion and water logging	No
Scarcity of water during summer	No
River bank erosion	Yes
Major diseases and duration	Nil
Major pests and duration	Looper, *Helopeltis*, RSM (Mar-Oct)
Damage due to wildlife	Yes (elephant depredation)

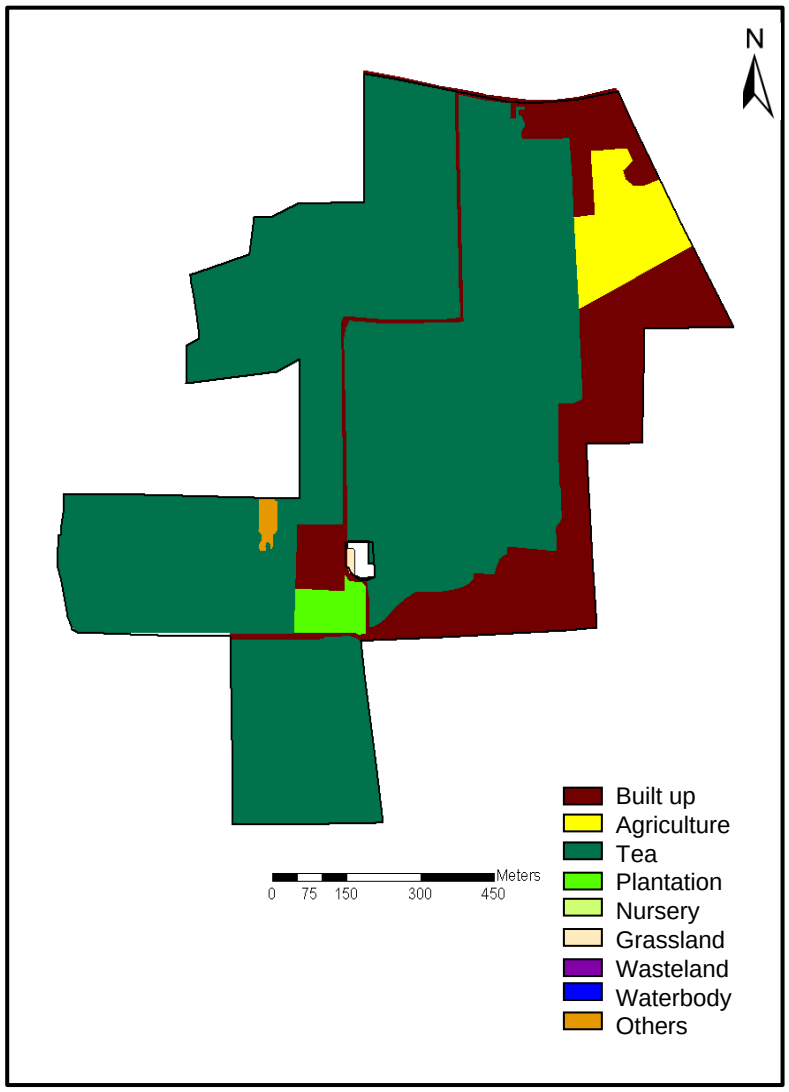
6. Yield / production	
Peak plucking periods	Jun-Oct
Annual green leaf yield	8478 kg/ha
Annual production of processed tea	1431400 kg

7. Pruning	
Time of pruning	Mid Dec-3rd week of Jan
Pruning cycle	3 yr/4 yr
Types of pruning	CA-UP-UP, CA-UP-DS-UP

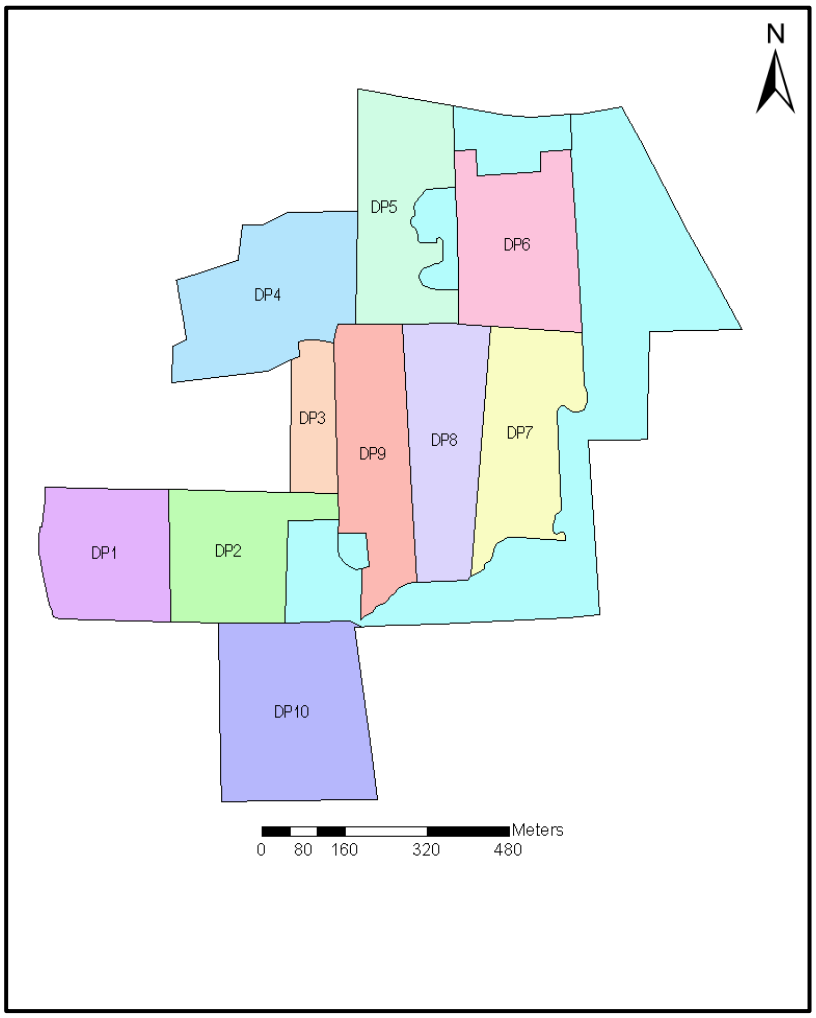
8. Fertilizer use	
Types of N, P, K fertilizers used	Urea, MOP, RP
Dose of Nitrogen (kg/ha)	119
Dose of Phosphorous (kg/ha)	36
Dose of Potash (kg/ha)	92
Whether lime is applied, if yes dose	Nil



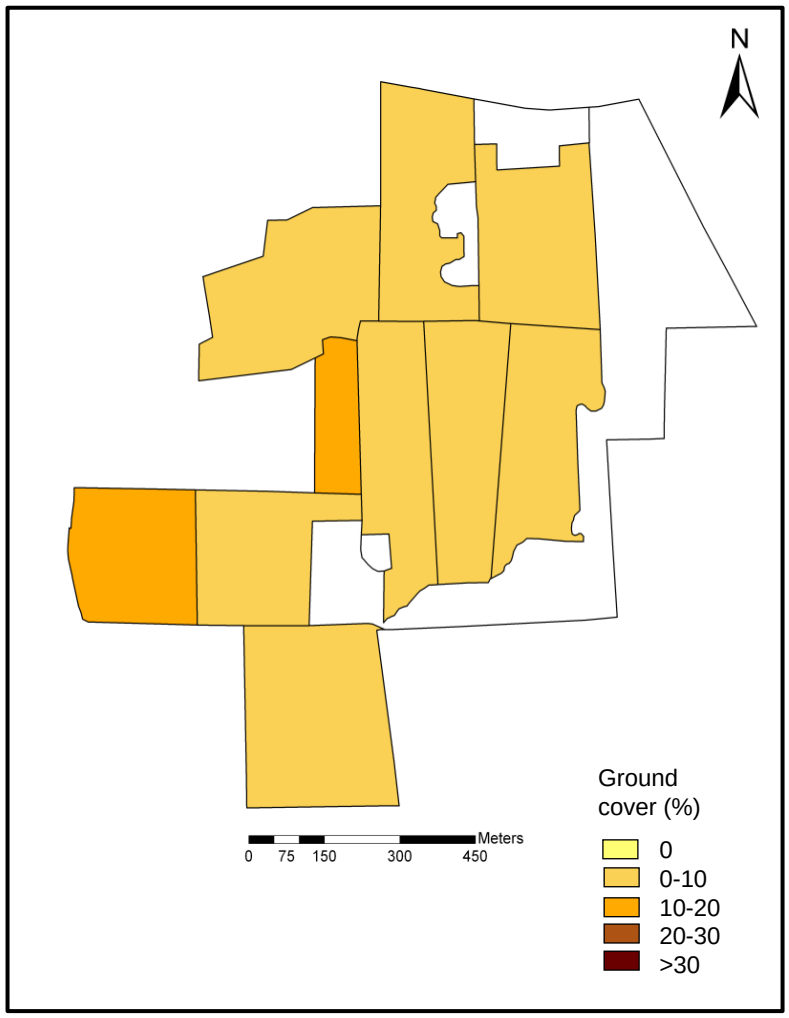
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

e. General Information

1. General	
Contact address	PO: Rajadanga, Dist: Jalpaiguri
Contact phone	09933020942, 09933361562
Name of the company	Dewakipur Tea plantations (Pvt.) Ltd.
Name of the village where it falls	Anandapur
Leased area of the estate (ha)	85.91
Tea grown area of the estate (ha)	80.0
No. of divisions / sections	0 div/10 sec
Year of establishment	1990
Type of tea produced	--

2. Infrastructure	
Availability of processing factory	Yes
Availability of workers colony	Yes
Availability of internet facility / e-mail id	No
Meteorological observations taken	Nil

3. Amenities	
Availability of health care / dispensary	Yes
Availability of school	Yes

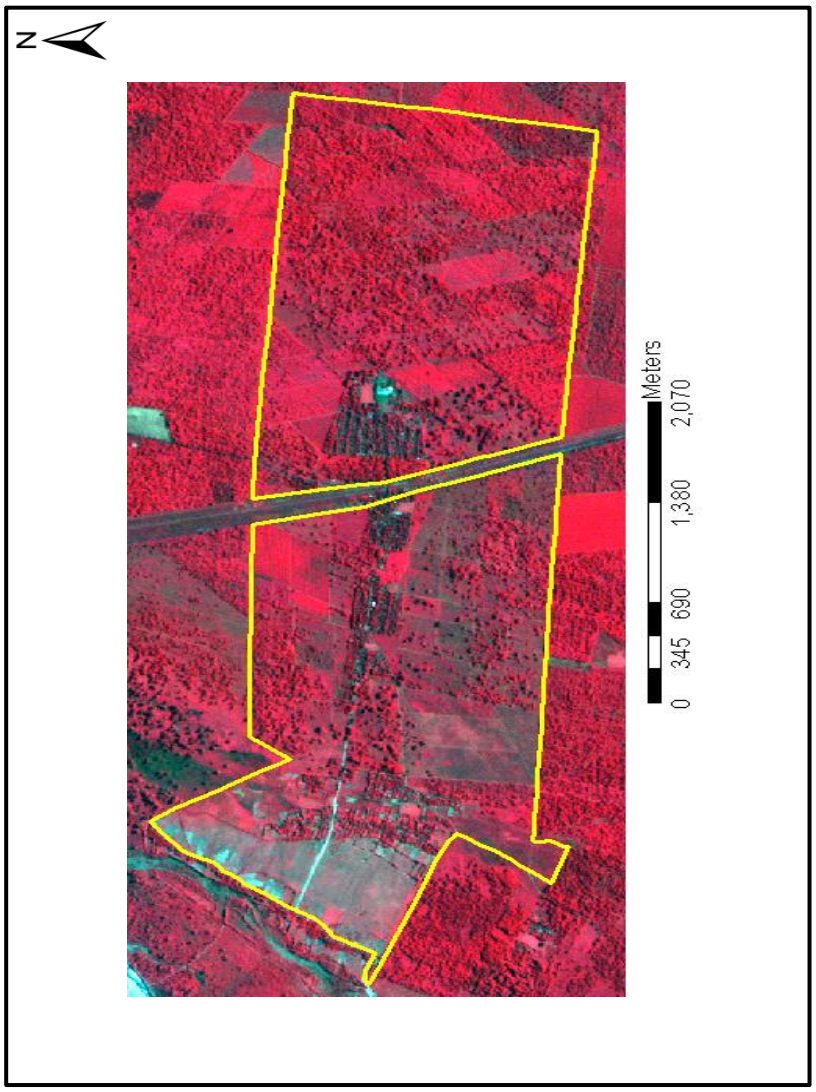
4. Shade trees	
Shade tree density (garden level)	Low
Plant to plant spacing (m)	--
Row to row spacing (m)	--

5. Natural resources constraints	
Drainage congestion and water logging	Yes
Scarcity of water during summer	No
River bank erosion	Yes
Major diseases and duration	Red rust
Major pests and duration	Looper, *Helopeltis* (4 and 5 months)
Damage due to wildlife	No

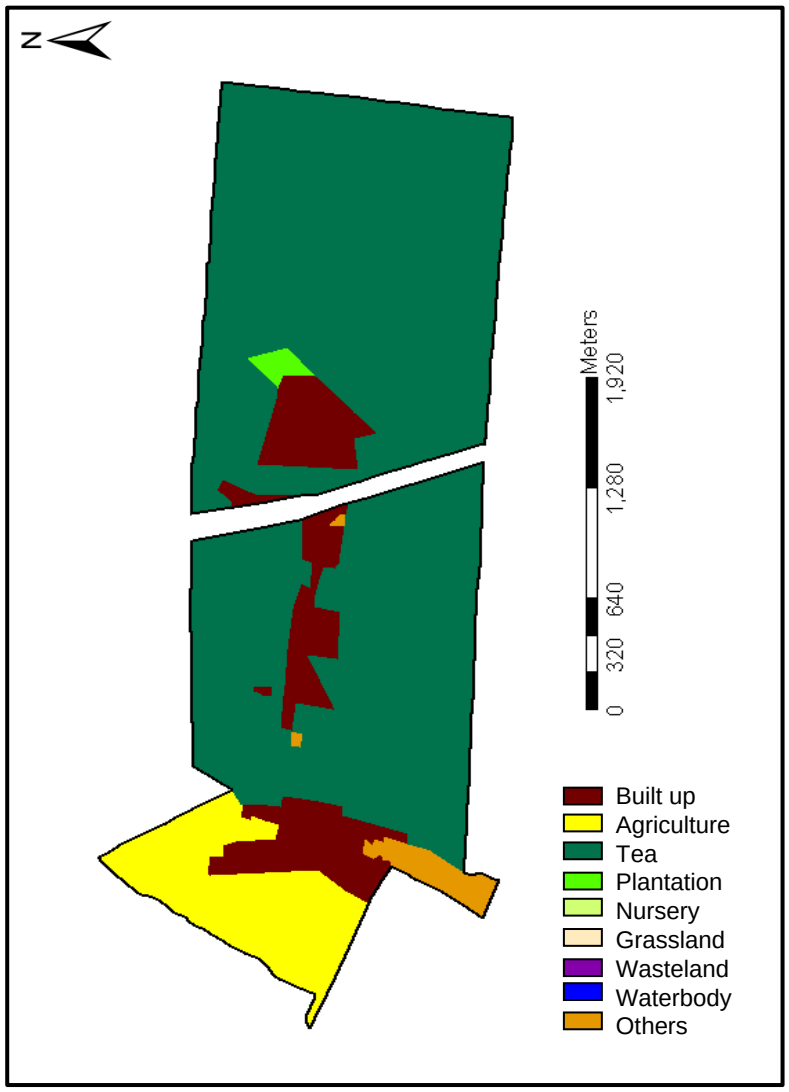
6. Yield / production	
Peak plucking periods	Mar and May
Annual green leaf yield	10426 kg/ha
Annual production of processed tea	NA

7. Pruning	
Time of pruning	Nov-Jan
Pruning cycle	--
Types of pruning	LP-LOS-DS-LS

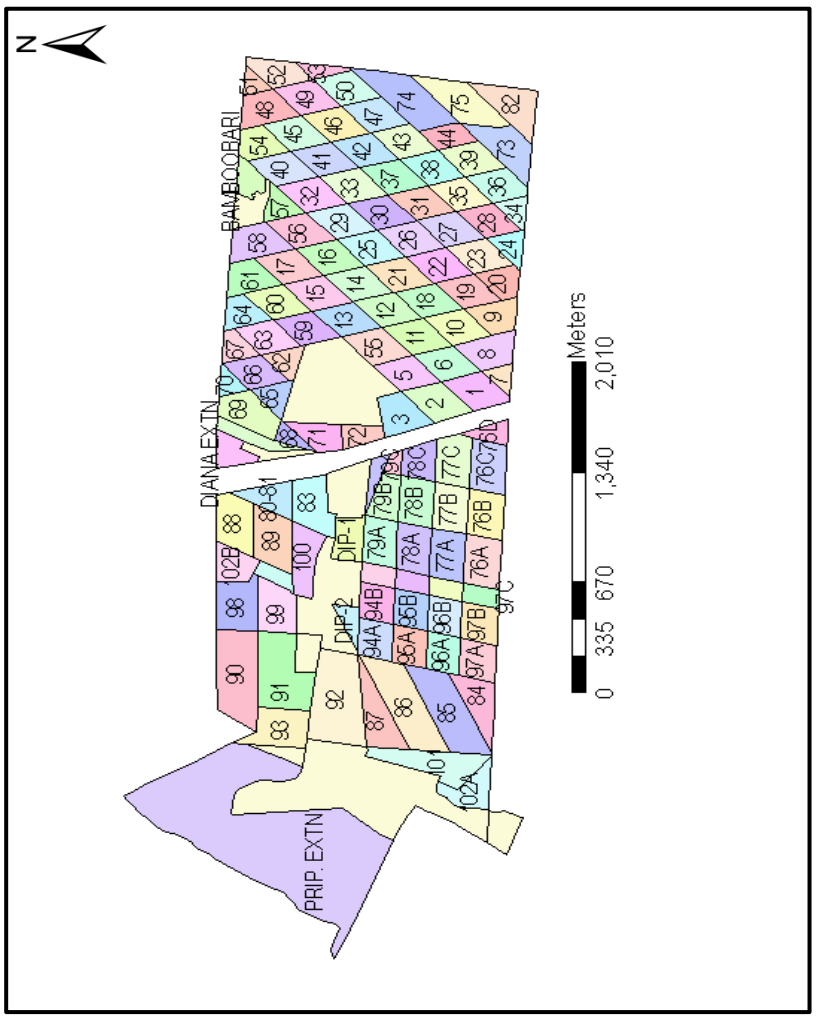
8. Fertilizer use	
Types of N, P, K fertilizers used	Urea, MOP, RP
Dose of Nitrogen (kg/ha)	165
Dose of Phosphorous (kg/ha)	50
Dose of Potash (kg/ha)	165
Whether lime is applied, if yes dose	No



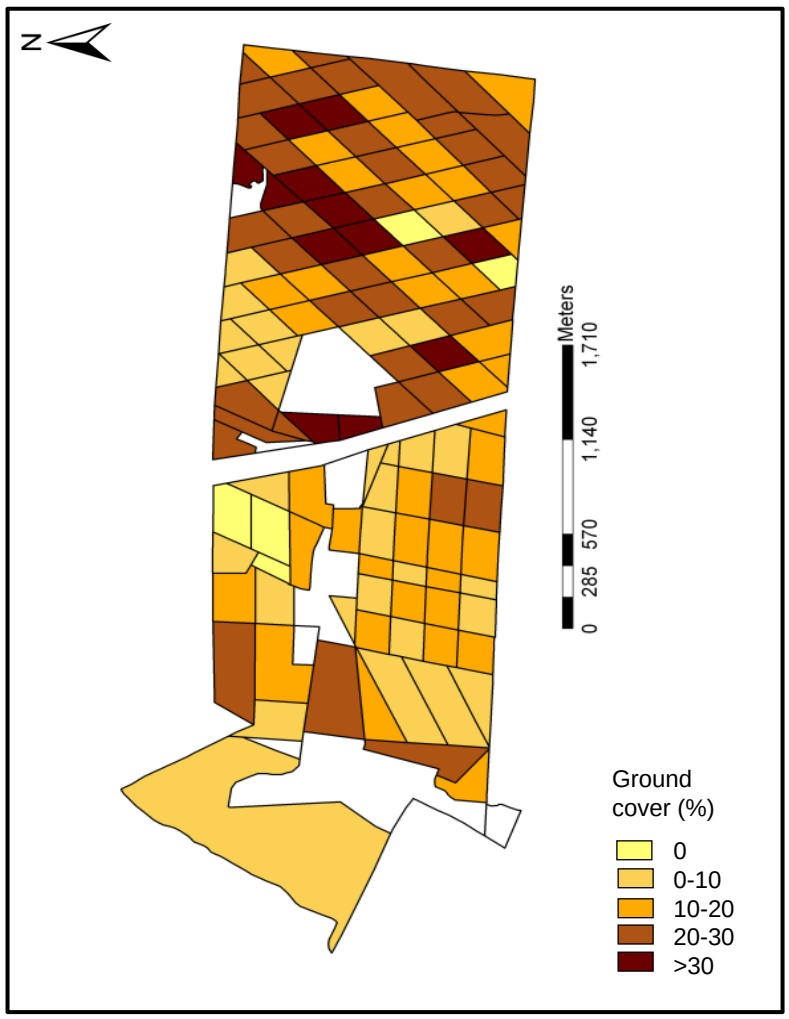
a. False Colour Composite of IRS LISS IV



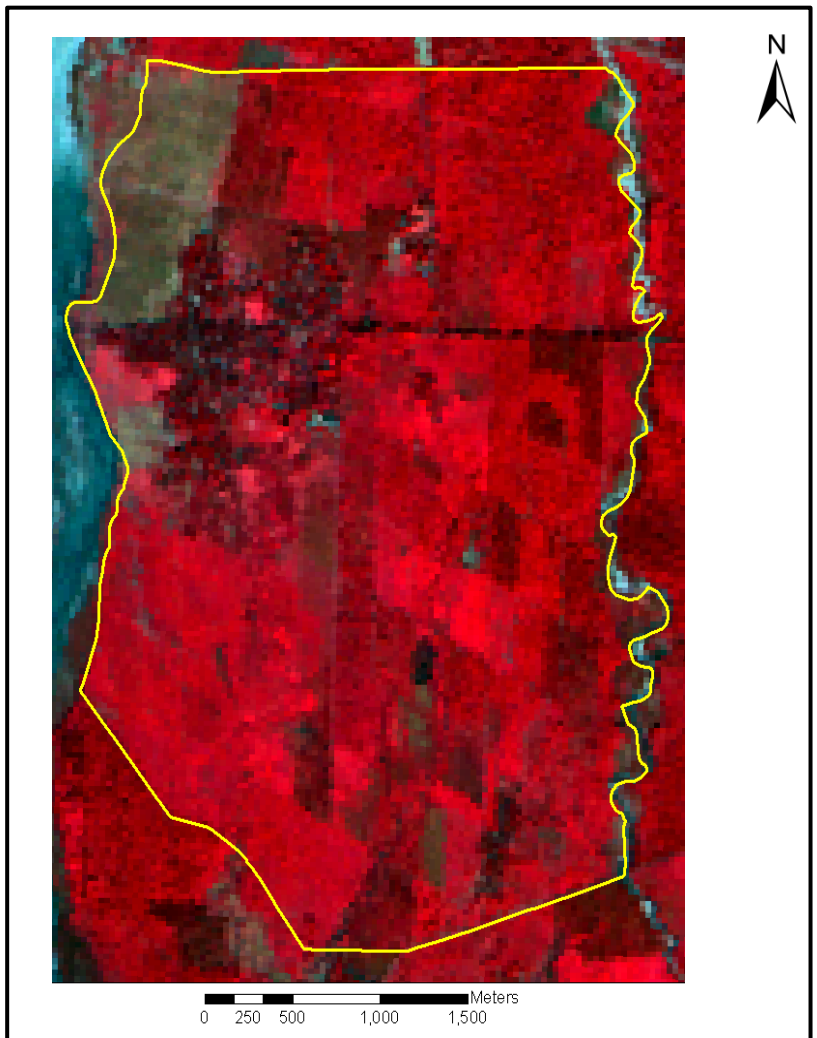
b. Tea Estate Landuse



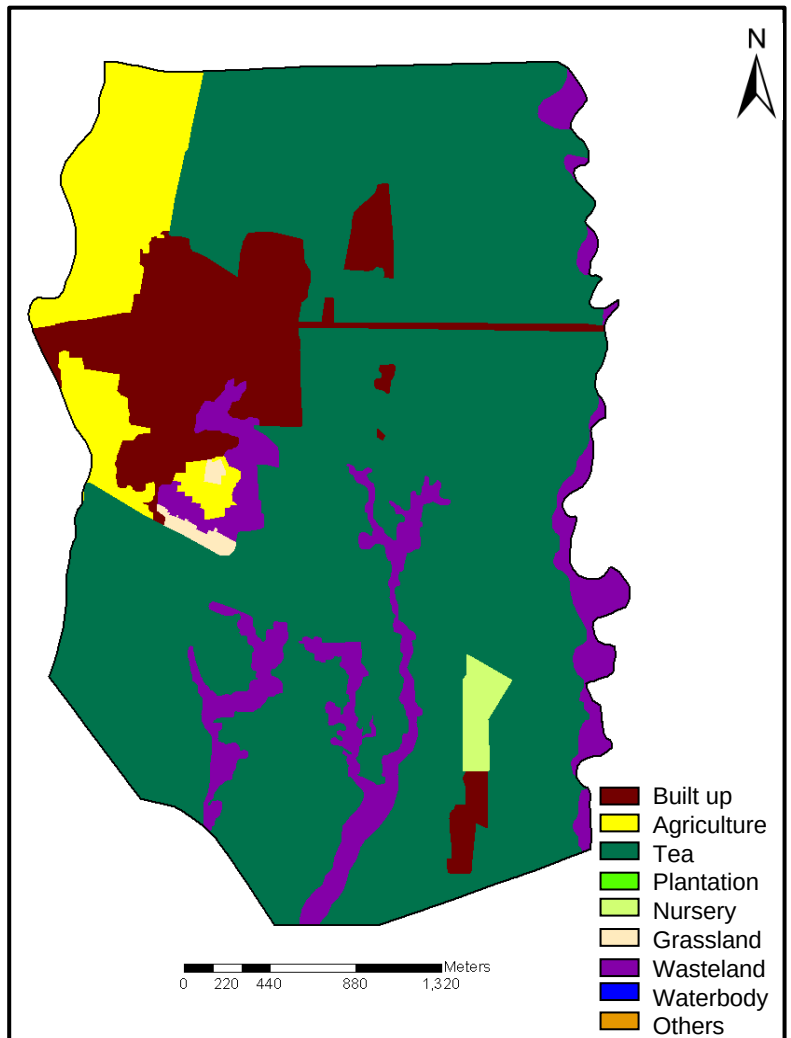
c. Section Boundaries of the Estate



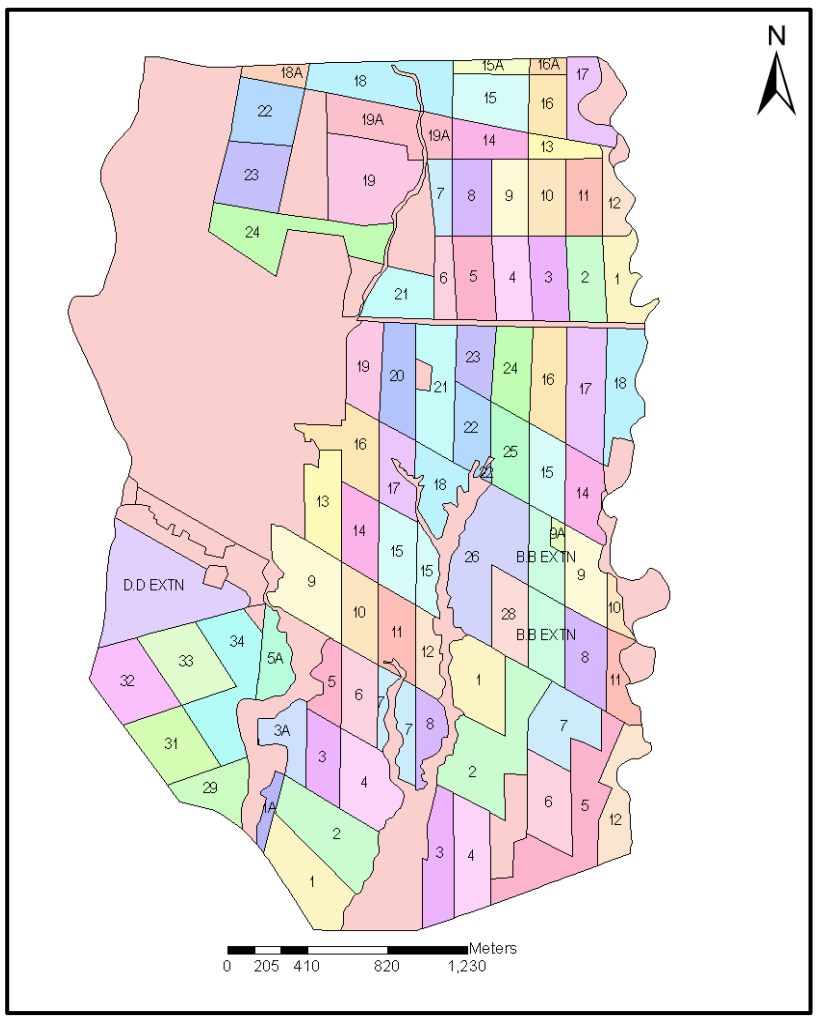
d. Shade Tree Density in Sections



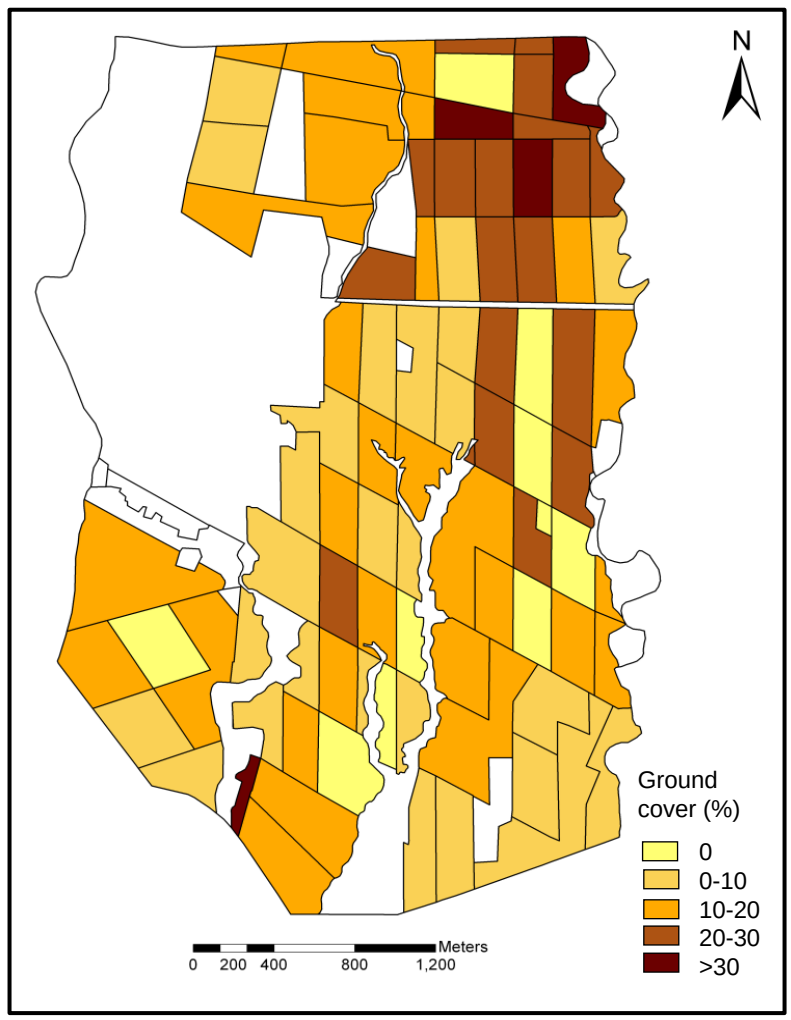
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



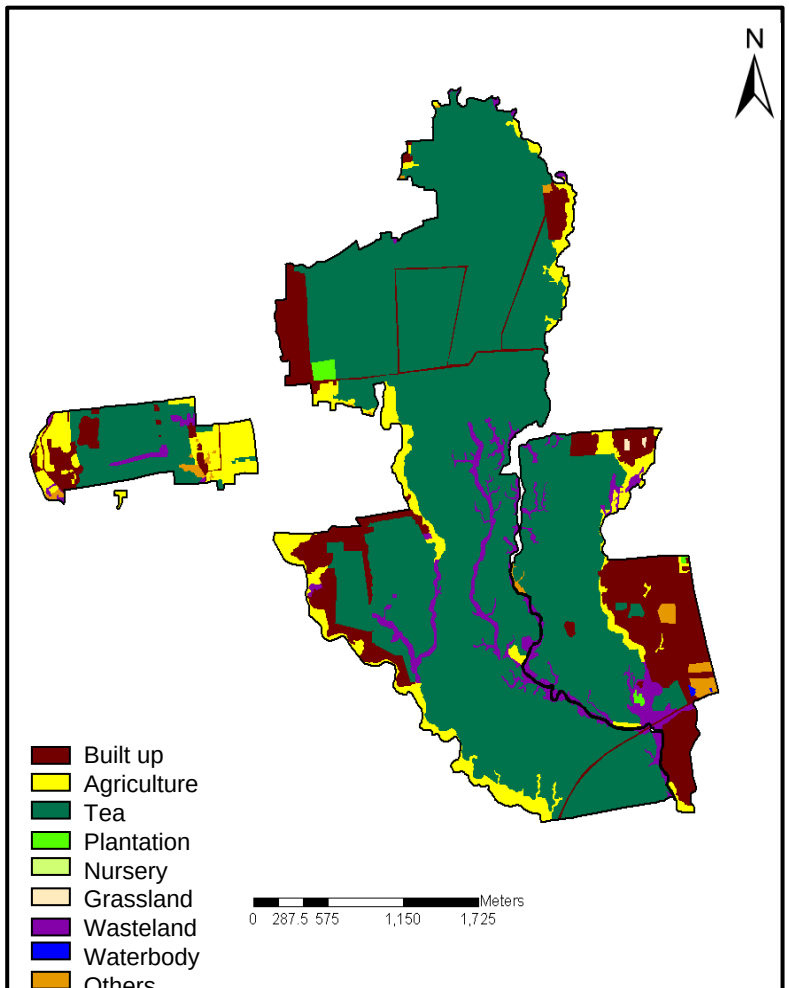
c. Section Boundaries of the Estate



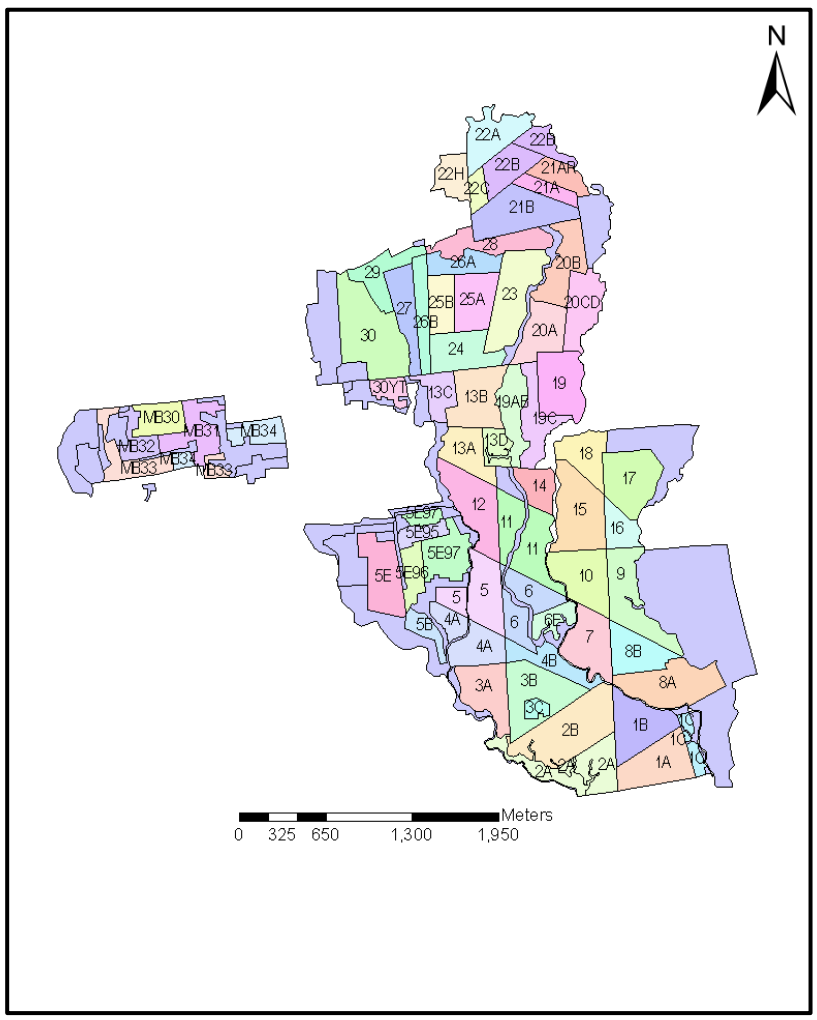
d. Shade Tree Density in Sections

P35: DENGUAJHAR TE

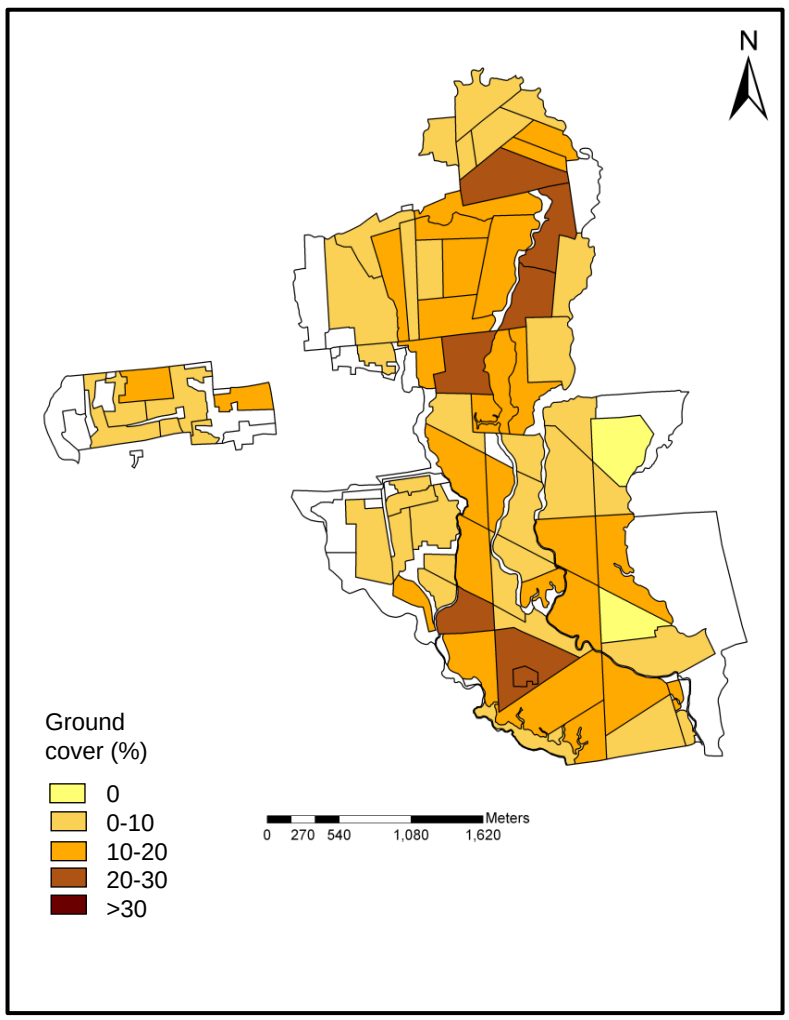
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

e. General Information

1. General	
Contact address	PO: Danguajhar, Dist: Jalpaiguri PIN: 735121
Contact phone	03561-256529
Name of the company	Goodricke Group Ltd.
Name of the village where it falls	Paharpur
Leased area of the estate (ha)	963.90
Tea grown area of the estate (ha)	692.84
No. of divisions / sections	3 div/63 sec
Year of establishment	1924
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

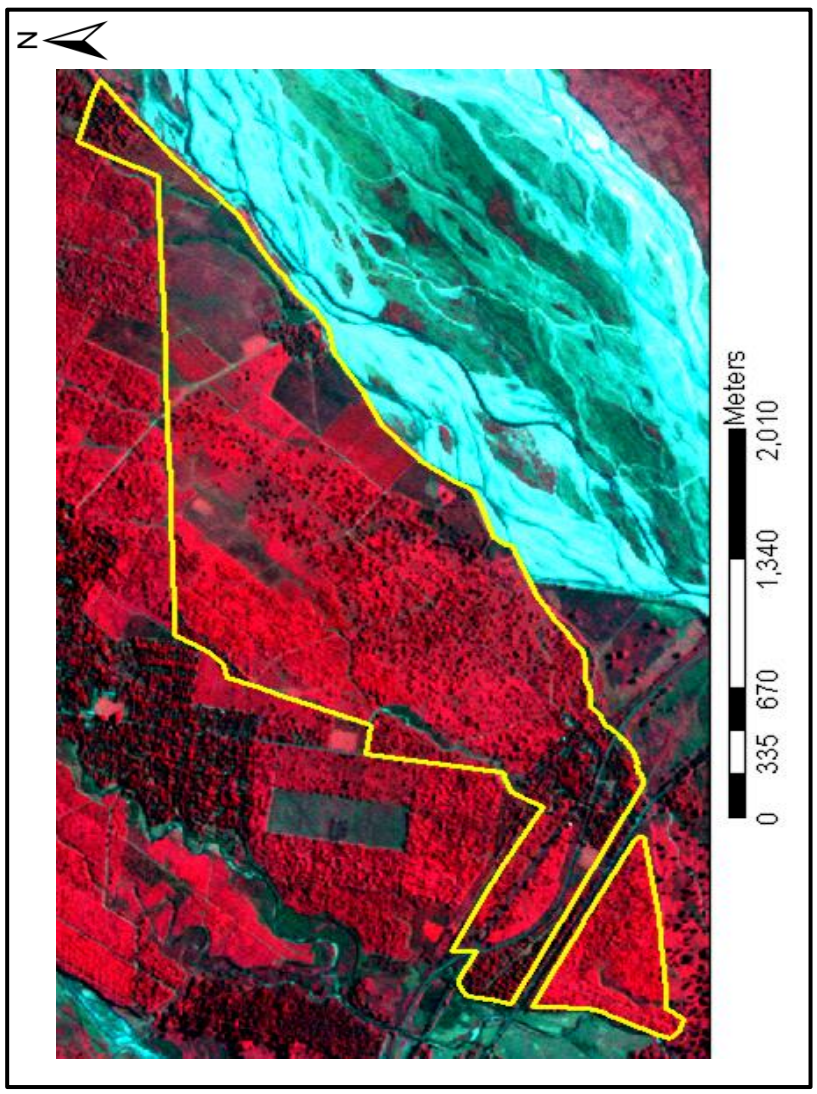
4. Shade trees	
Shade tree density (garden level)	Optimum
Plant to plant spacing (m)	13.33 x 6.66
Row to row spacing (m)	13.33 x 13.33

5. Natural resources constraints	
Drainage congestion and water logging	Yes
Scarcity of water during summer	Yes
River bank erosion	No
Major diseases and duration	Red rust (Apr-Aug)
Major pests and duration	Red spider (Feb-Jul)
Damage due to wildlife	No

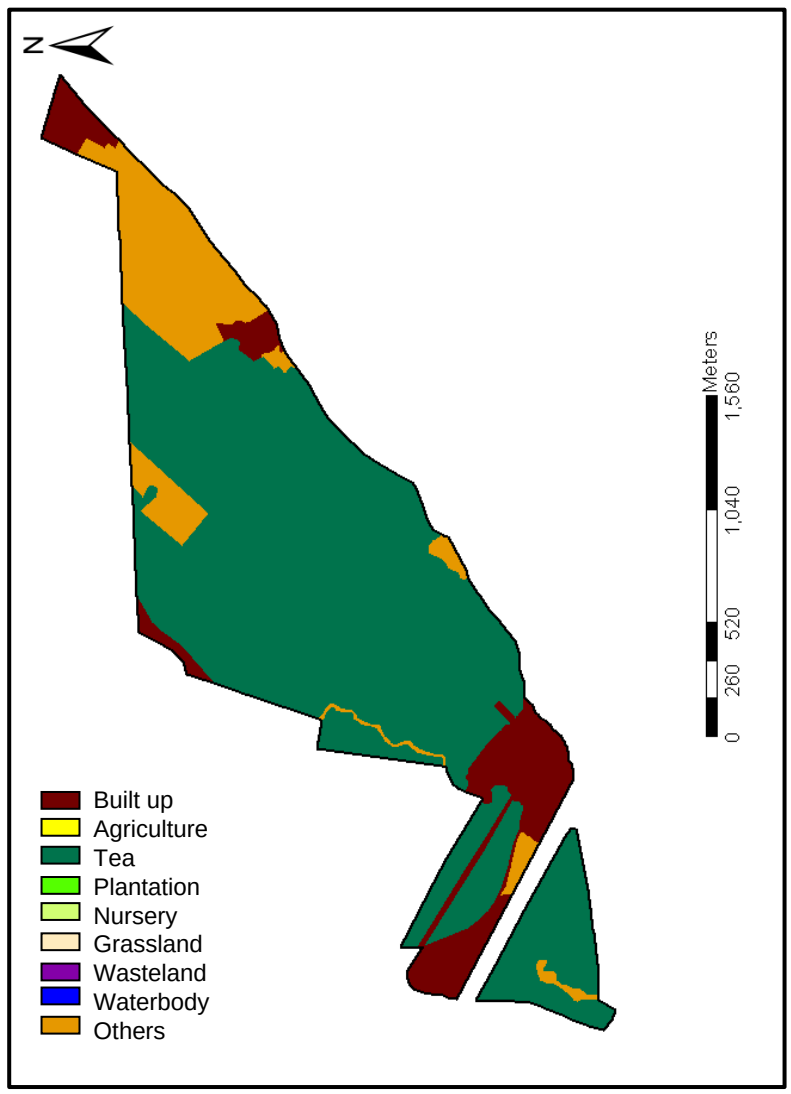
6. Yield / production	
Peak plucking periods	End May-Mid Nov
Annual green leaf yield	2145 kg/ha
Annual production of processed tea	1298233 kg

7. Pruning	
Time of pruning	End May-Mid Nov
Pruning cycle	--
Types of pruning	LP-UP-DS-UP and LP-UP-UP/MS-LP

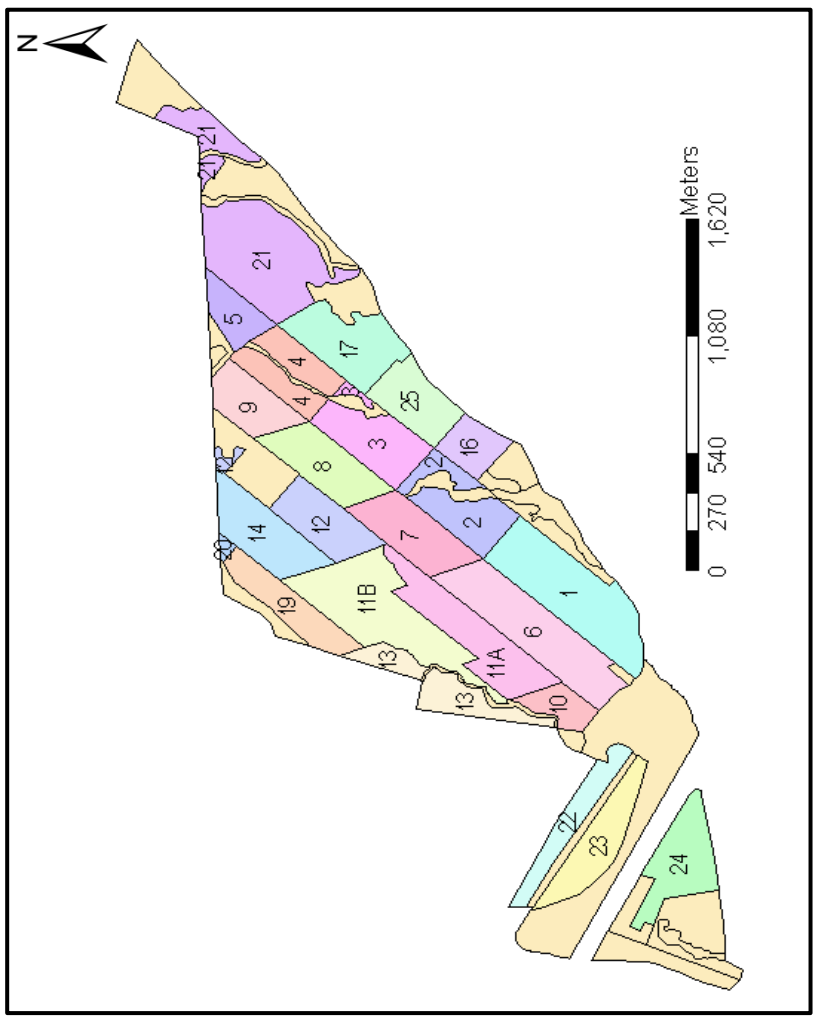
8. Fertilizer use	
Types of N,P,K fertilizers used	Urea, RP, MOP
Dose of Nitrogen (kg/ha)	90-180
Dose of Phosphorous (kg/ha)	40-80
Dose of Potash (kg/ha)	55-180
Whether lime is applied, if yes dose	Dolomite is applied post LP



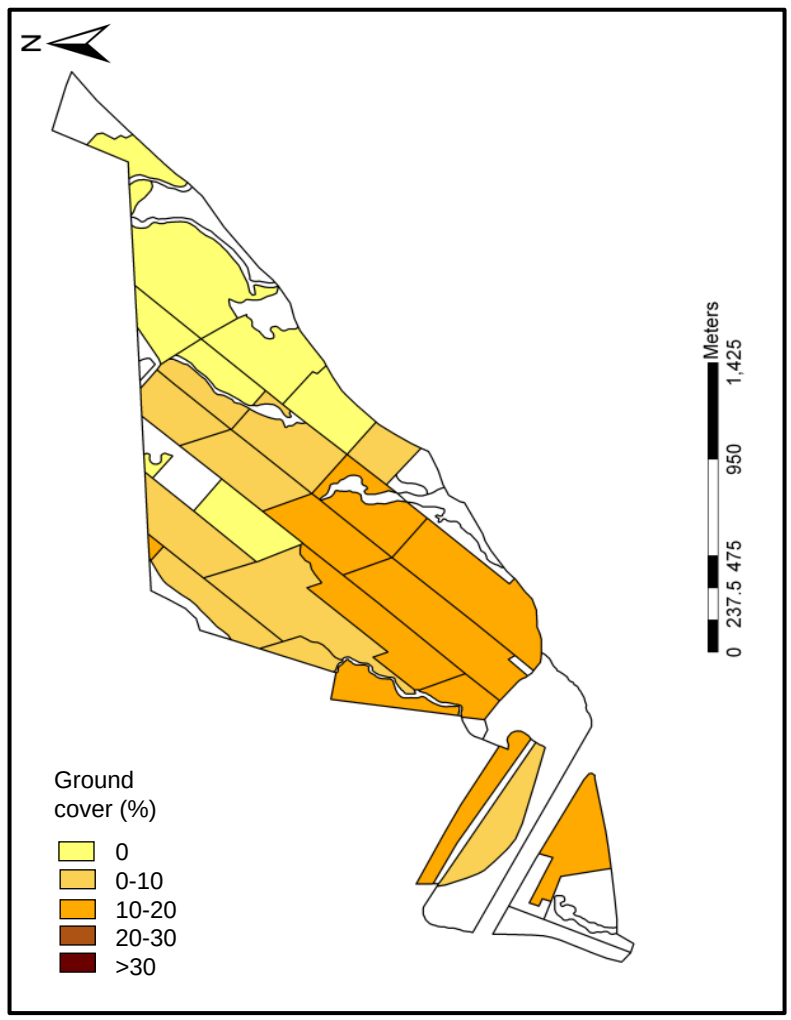
a. False Colour Composite of IRS LISS IV



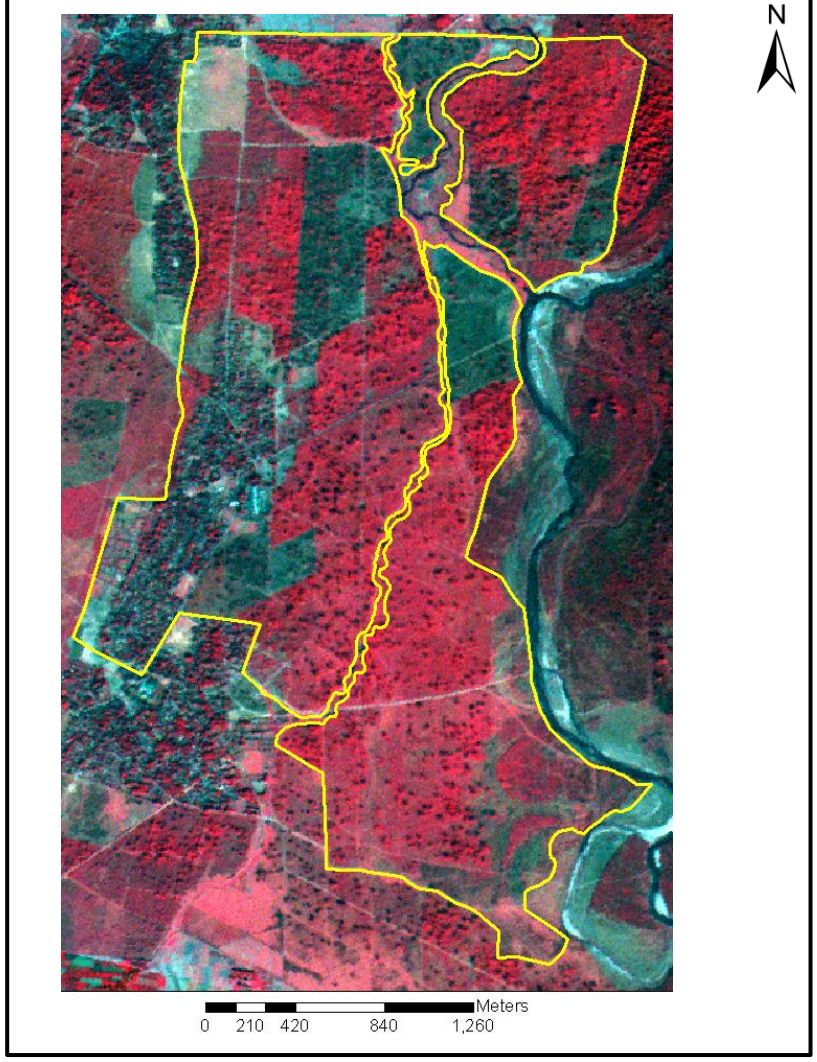
b. Tea Estate Landuse



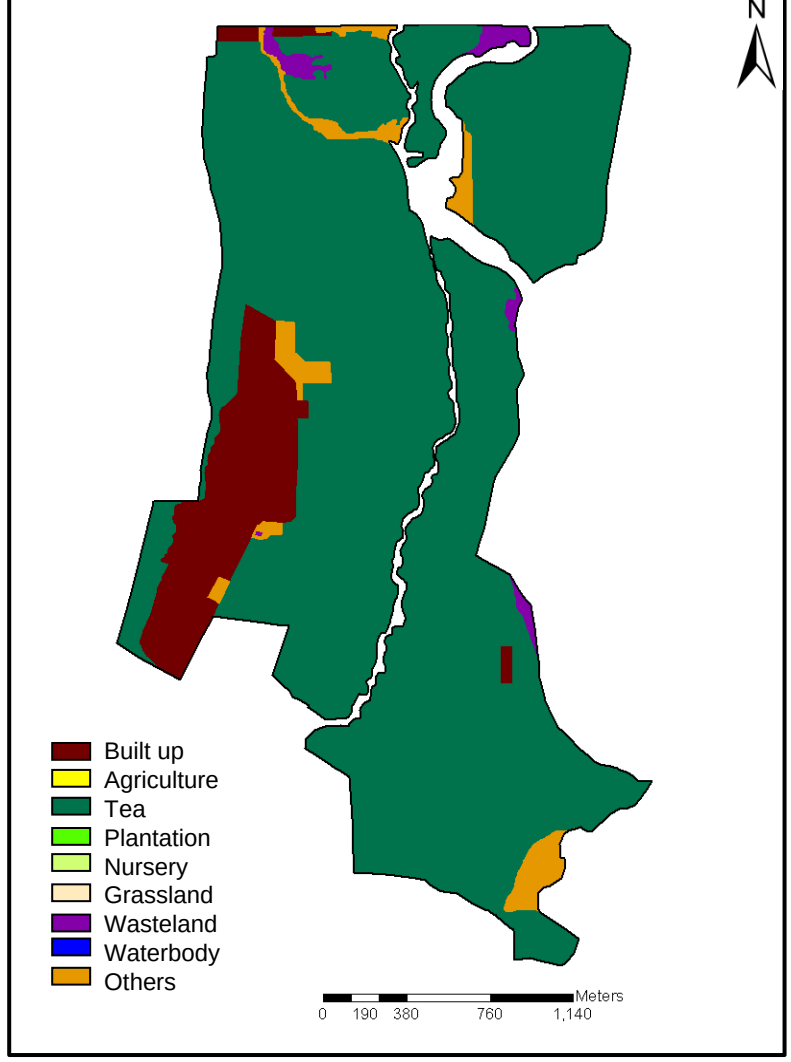
c. Section Boundaries of the Estate



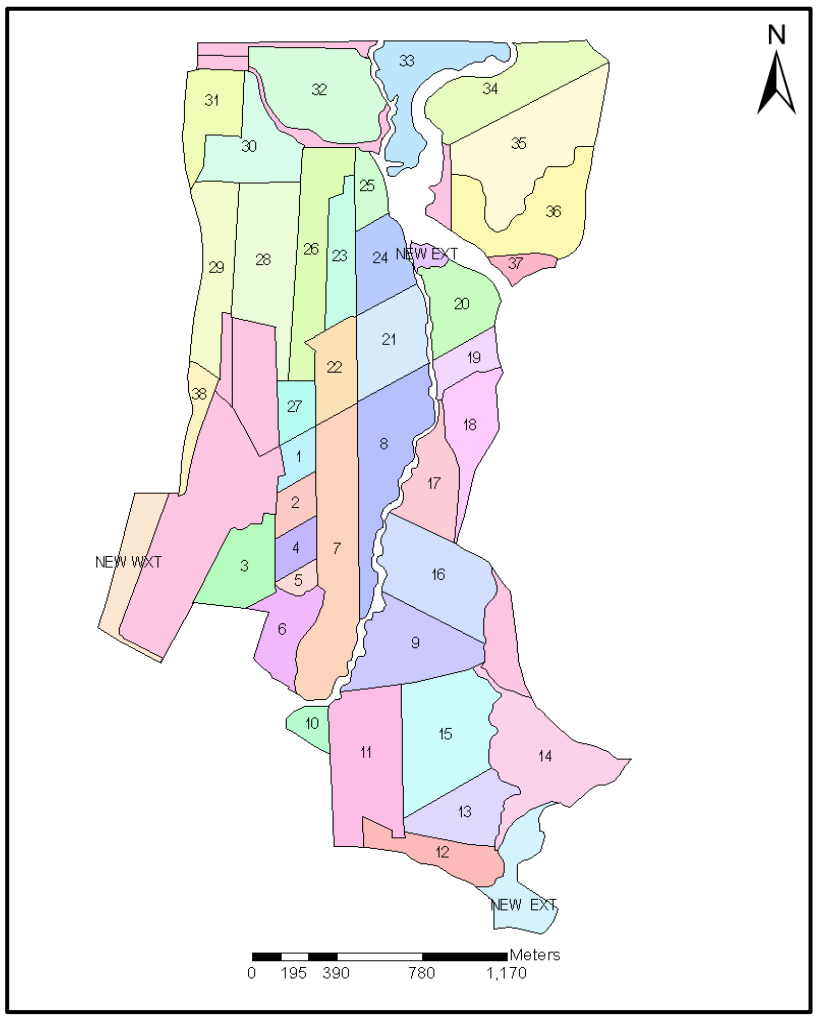
d. Shade Tree Density in Sections



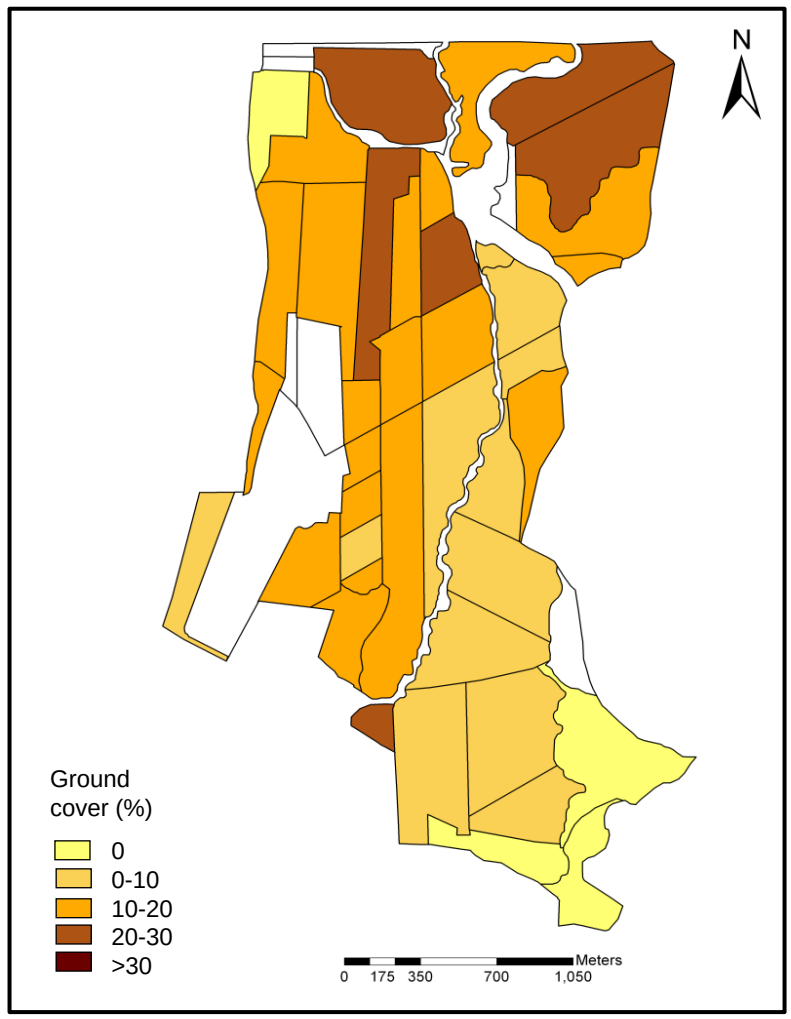
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

e. General Information

1. General	
Contact address	PO: Dhowlajhora, Dist: Jalpaiguri PIN: 736206
Contact phone	03564-240042
Name of the company	The Bengal Dooars National Tea Co. Ltd.
Name of the village where it falls	Samuktala
Leased area of the estate (ha)	608.92
Tea grown area of the estate (ha)	434
No. of divisions / sections	1 div/40 sec
Year of establishment	1912
Type of tea produced	CTC

2. Infrastructure	
Availability of processing factory	Yes
Availability of workers colony	Yes
Availability of internet facility / e-mail id	No
Meteorological observations taken	Rainfall

3. Amenities	
Availability of health care / dispensary	Yes
Availability of school	Yes

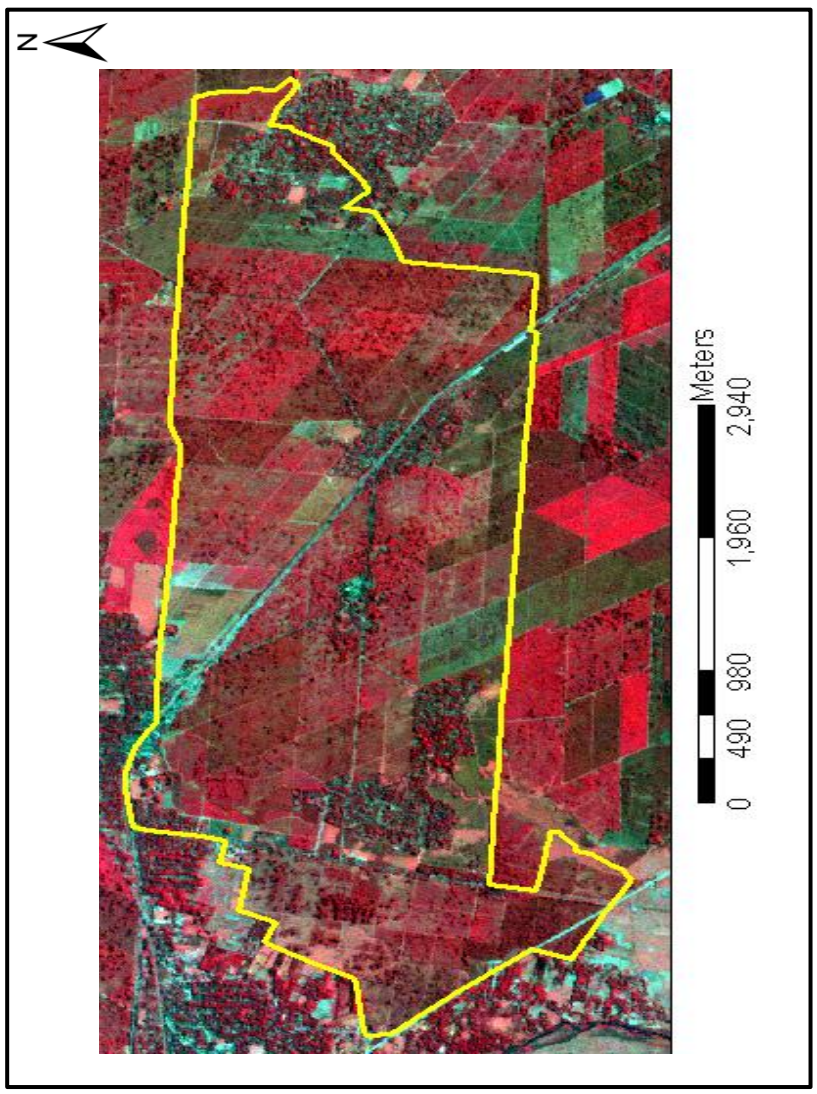
4. Shade trees	
Shade tree density (garden level)	Medium
Plant to plant spacing (m)	13.33 x 13.33
Row to row spacing (m)	13.33 x 13.33

5. Natural resources constraints	
Drainage congestion and water logging	No
Scarcity of water during summer	Yes
River bank erosion	Yes
Major diseases and duration	--
Major pests and duration	Looper, mites, greenfly
Damage due to wildlife	Yes

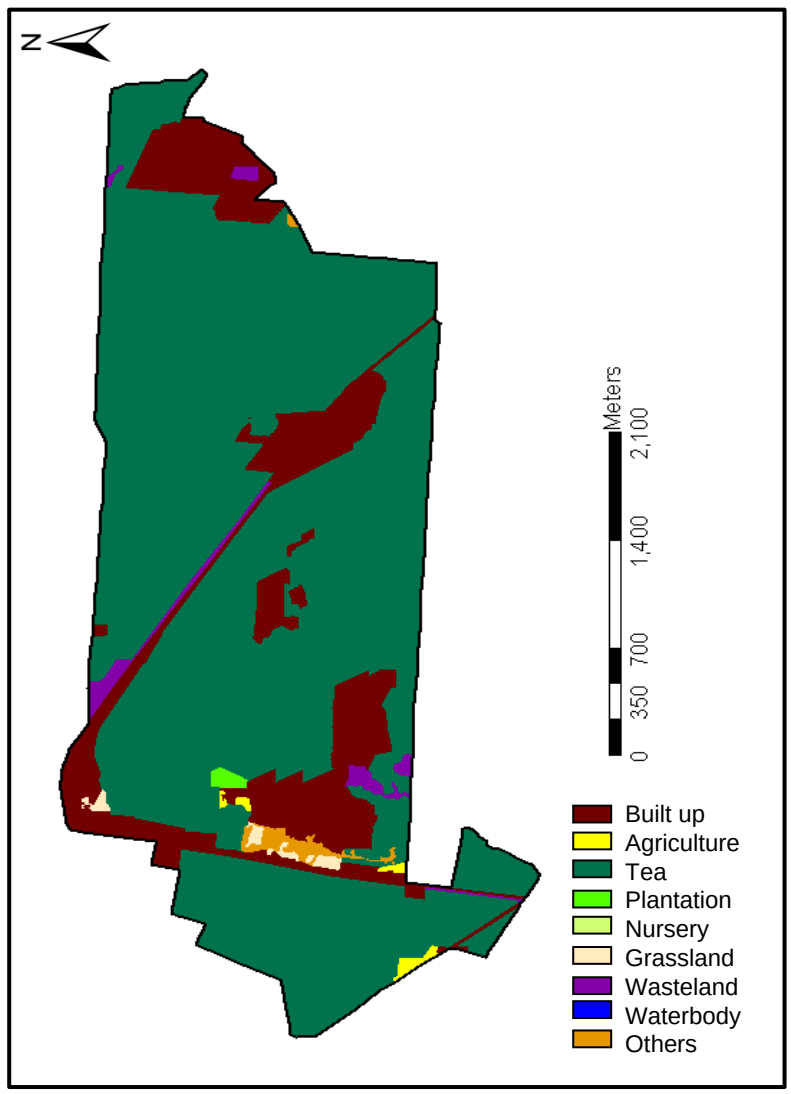
6. Yield / production	
Peak plucking periods	Apr-Oct
Annual green leaf yield	7012.8 kg/ha
Annual production of processed tea	657163.2

7. Pruning	
Time of pruning	Dec (last week)-Jan
Pruning cycle	4 yrs
Types of pruning	--

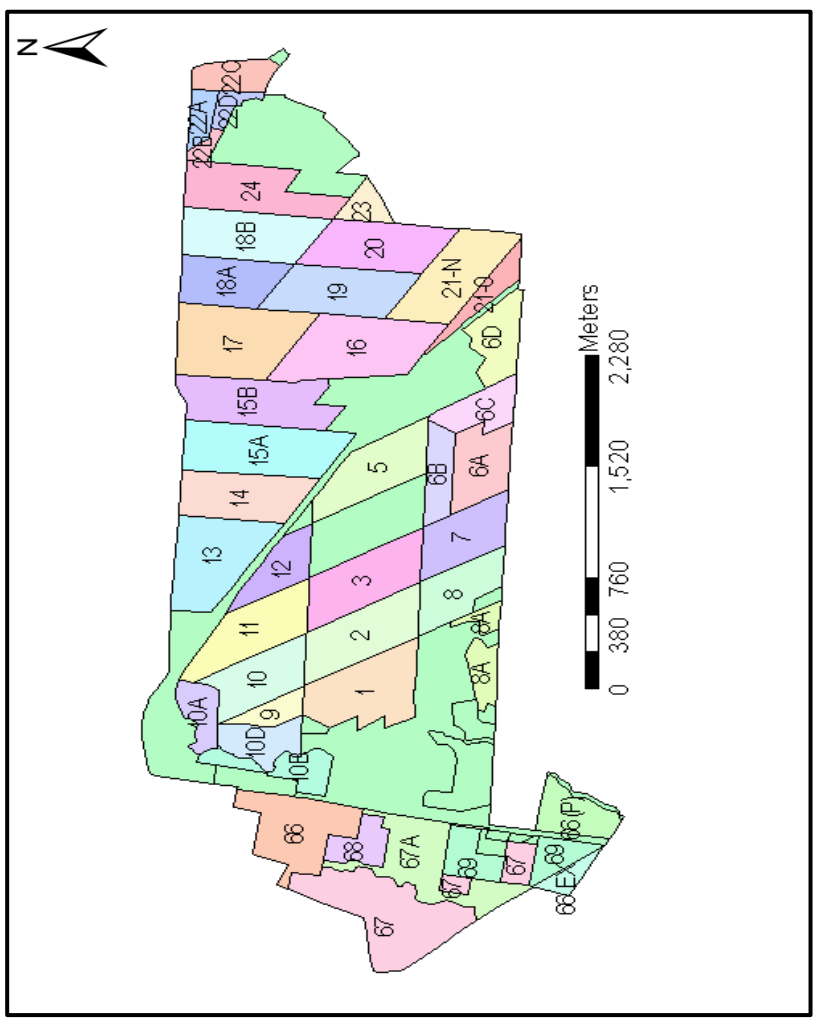
8. Fertilizer use	
Types of N, P, K fertilizers used	Urea, DAP, MOP, SSP
Dose of Nitrogen (kg/ha)	135
Dose of Phosphorous (kg/ha)	--
Dose of Potash (kg/ha)	135
Whether lime is applied, if yes dose	Dolomite is applied post LP



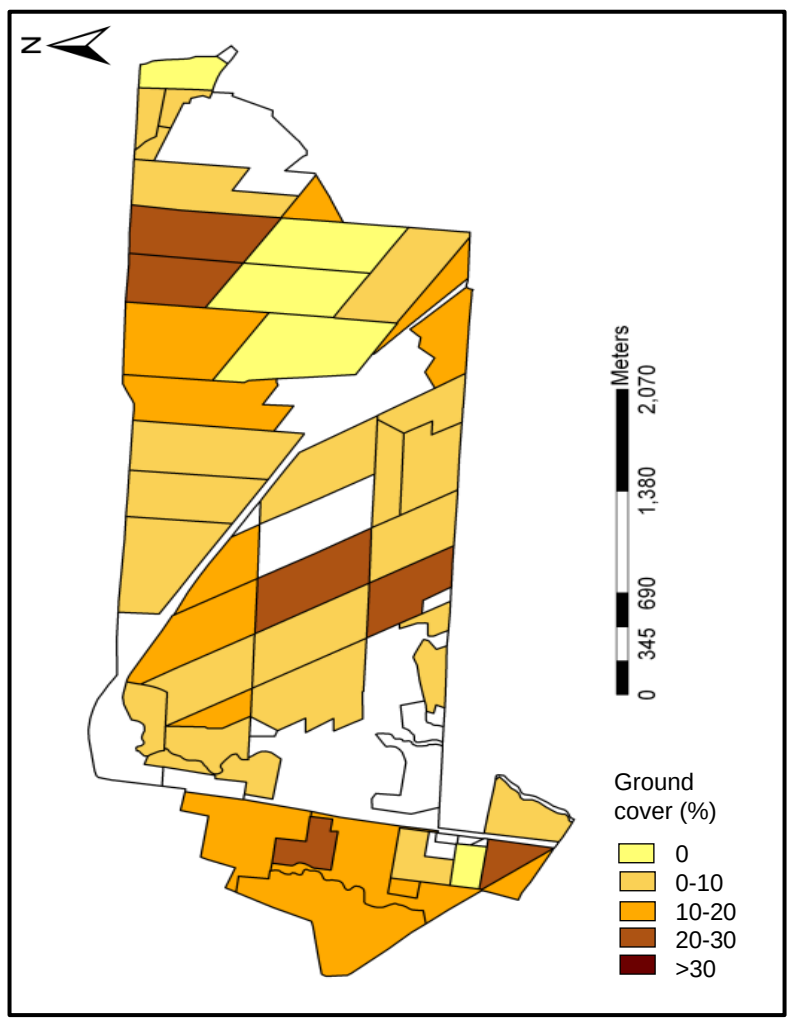
a. False Colour Composite of IRS LISS IV



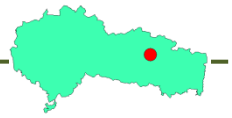
b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections



e. General Information

1. General	
Contact address	PO: Kalachini Dist: Jalpaiguri, PIN: 735217
Contact phone	03566-240240, 200140
Name of the company	Surajgovind Estate Pvt. Ltd.
Name of the village where it falls	Dima
Leased area of the estate (ha)	956.31
Tea grown area of the estate (ha)	718
No. of divisions / sections	2 div/51 sec
Year of establishment	1905
Type of tea produced	CTC

2. Infrastructure	
Availability of processing factory	Yes
Availability of workers colony	Yes
Availability of internet facility / e-mail id	No
Meteorological observations taken	Nil

3. Amenities	
Availability of health care / dispensary	Yes
Availability of school	No

4. Shade trees	
Shade tree density (garden level)	Low
Plant to plant spacing (m)	13.33 x 13.33, 6.66 x 10
Row to row spacing (m)	13.33 x 13.33, 6.66 x 10

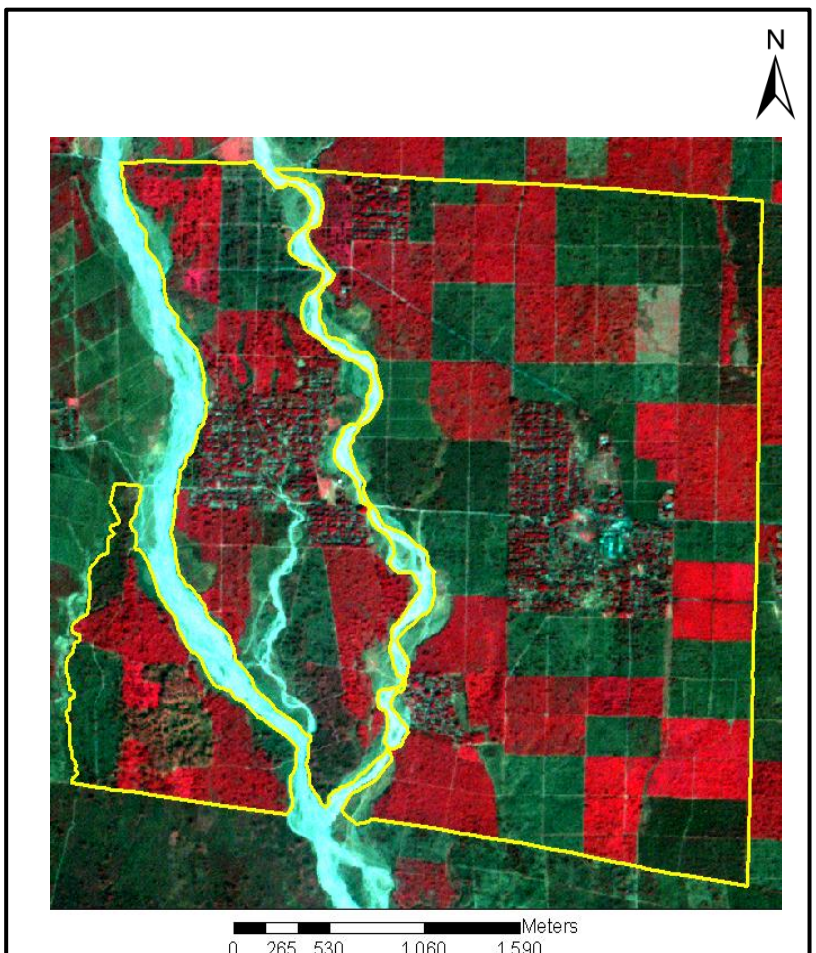
5. Natural resources constraints	
Drainage congestion and water logging	Yes
Scarcity of water during summer	No
River bank erosion	Yes
Major diseases and duration	Red Rust, Black Rot (3-6 months)
Major pests and duration	RSM, looper, thrips, *Helopeltis*
Damage due to wildlife	No

6. Yield / production	
Peak plucking periods	Mar-Nov
Annual green leaf yield	5597.17 kg/ha
Annual production of processed tea	852753 kg

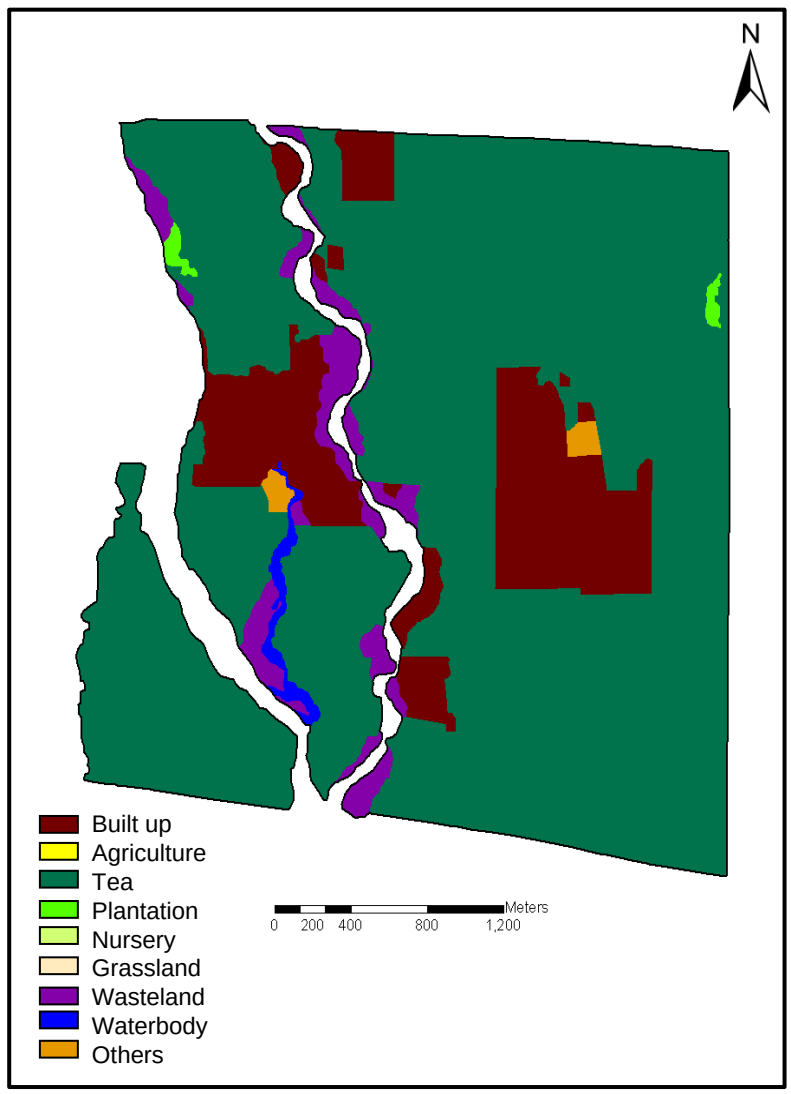
7. Pruning	
Time of pruning	Dec-Feb (five fortnights)
Pruning cycle	4 yrs
Types of pruning	--

8. Fertilizer use	
Types of N, P, K fertilizers used	Urea, MOP, RP
Dose of Nitrogen (kg/ha)	60-90
Dose of Phosphorous (kg/ha)	40
Dose of Potash (kg/ha)	60-80
Whether lime is applied, if yes dose	No

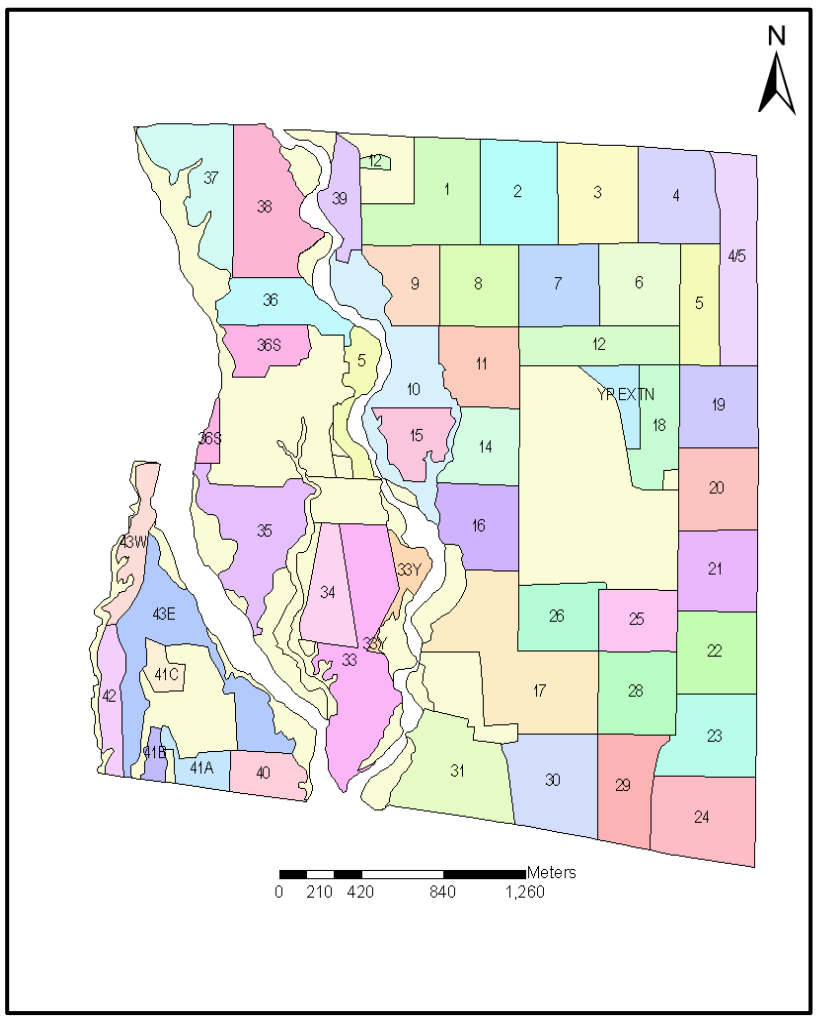
P39: DUMCHIPARA TE



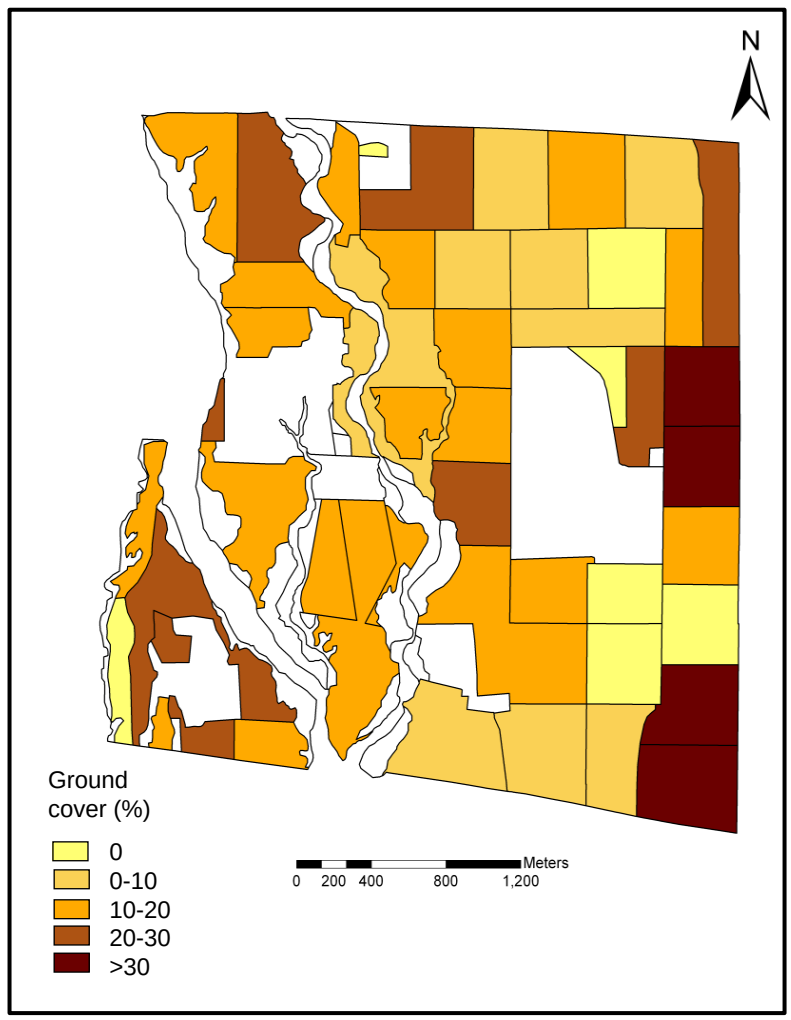
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse

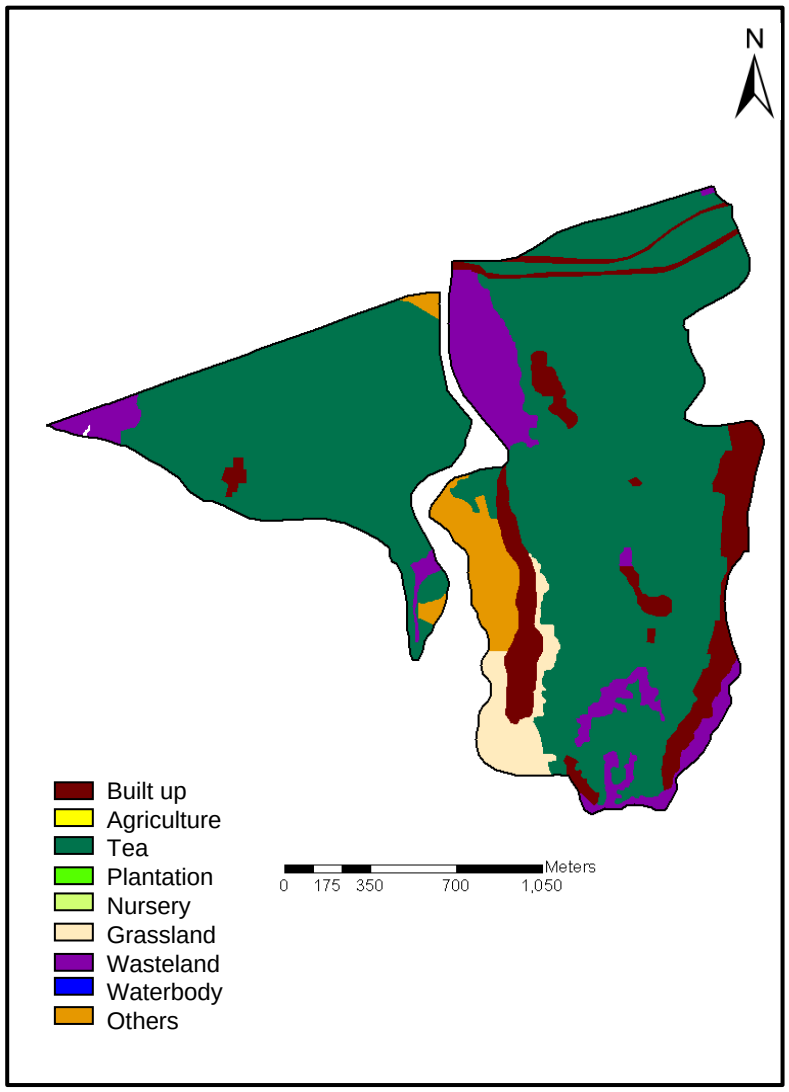


c. Section Boundaries of the Estate

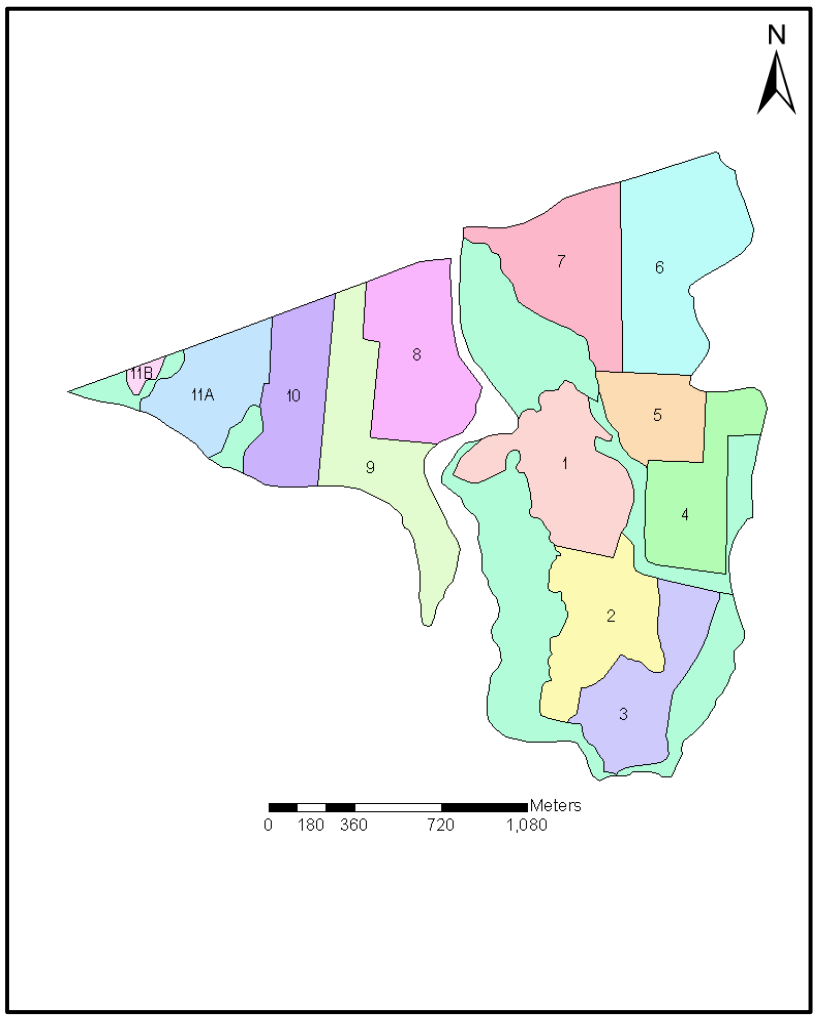


d. Shade Tree Density in Sections

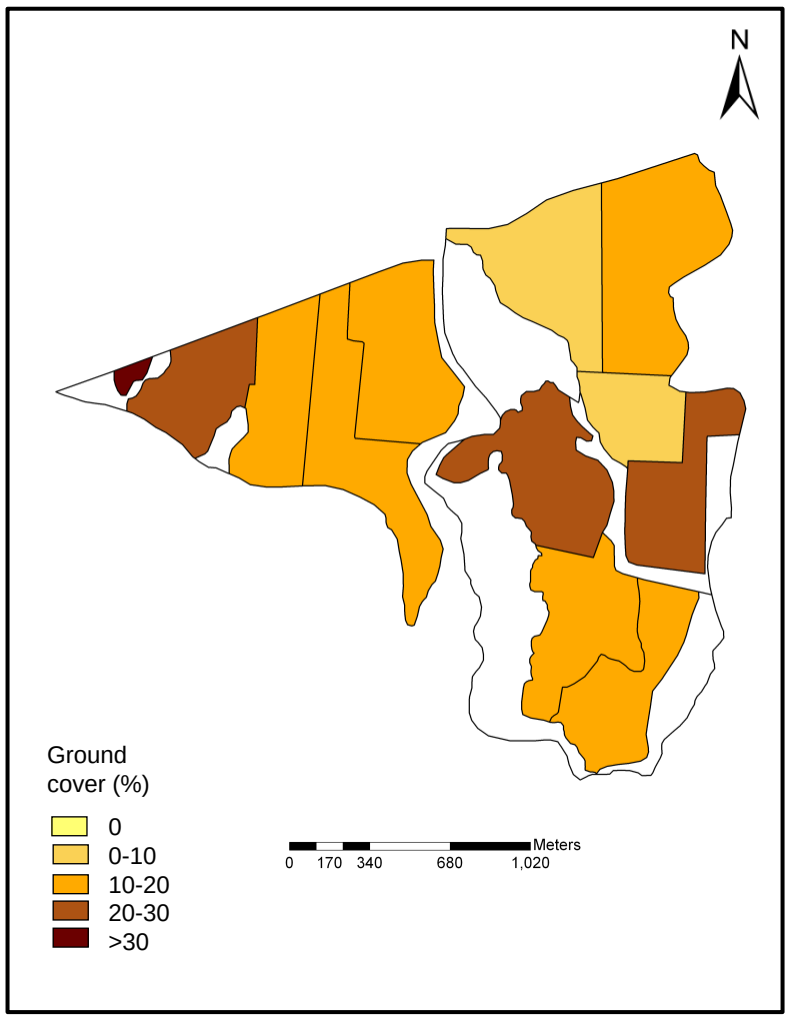
a. False Colour Composite of IRS LISS IV



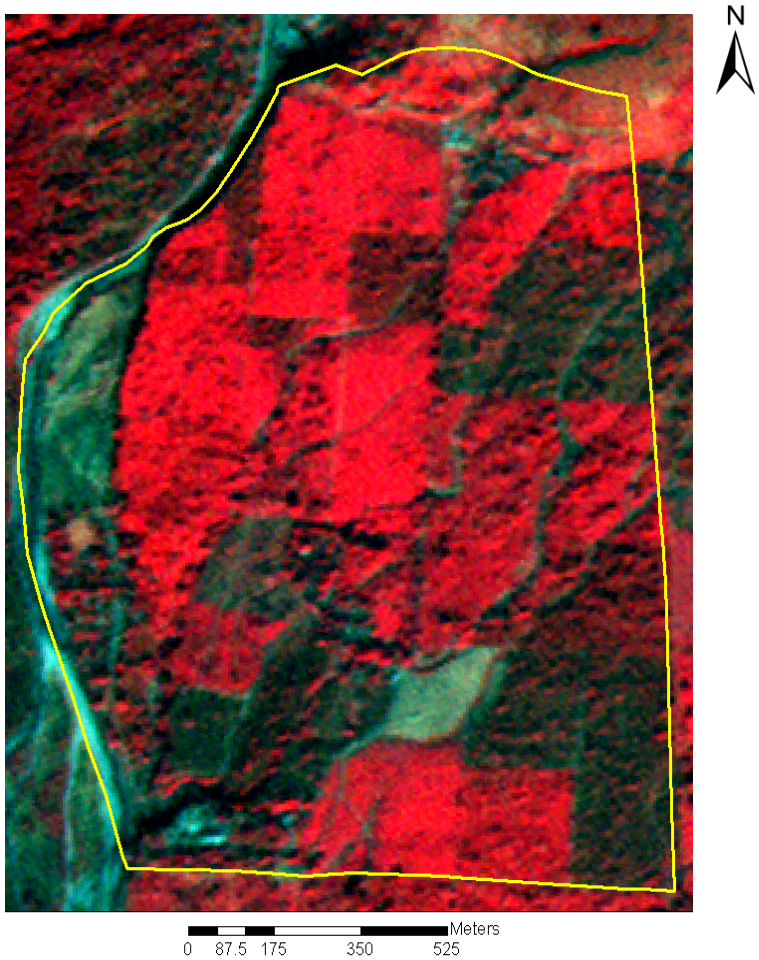
b. Tea Estate Landuse



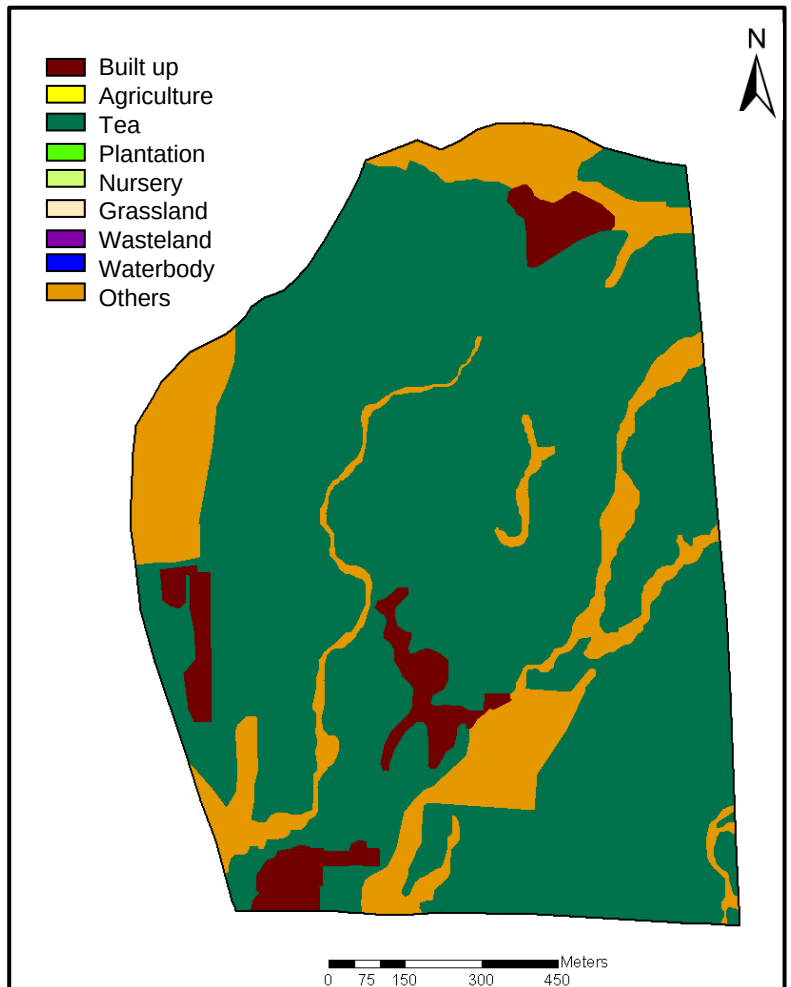
c. Section Boundaries of the Estate



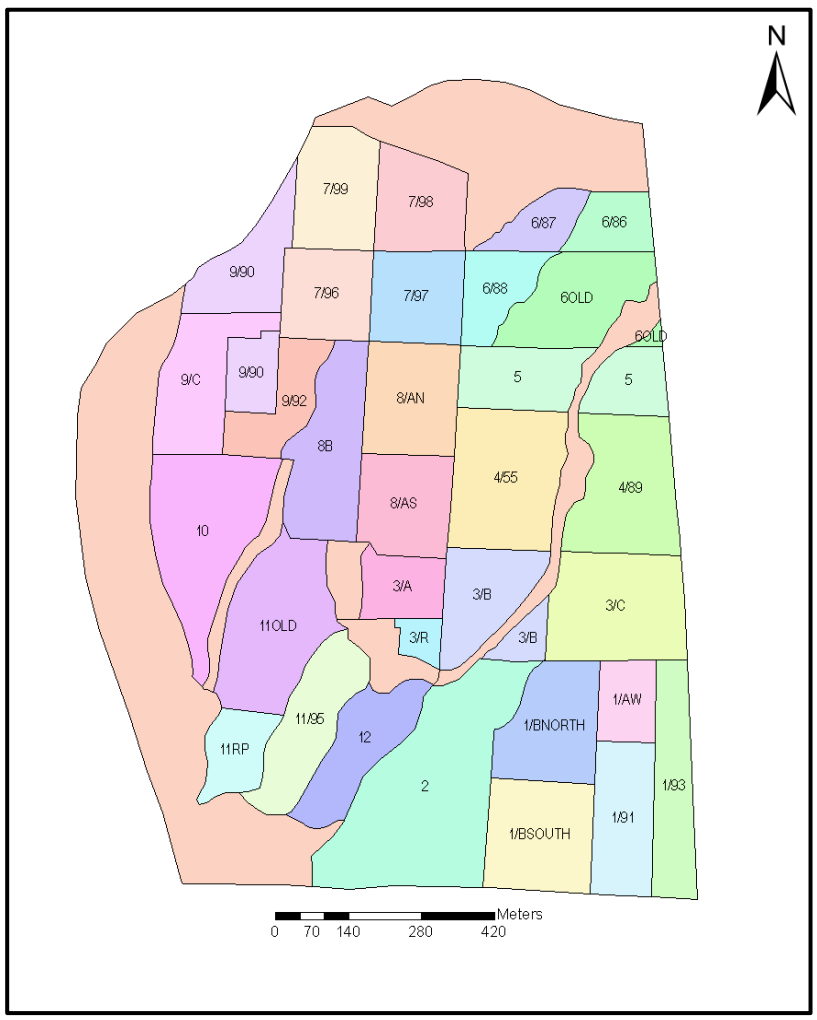
d. Shade Tree Density in Sections



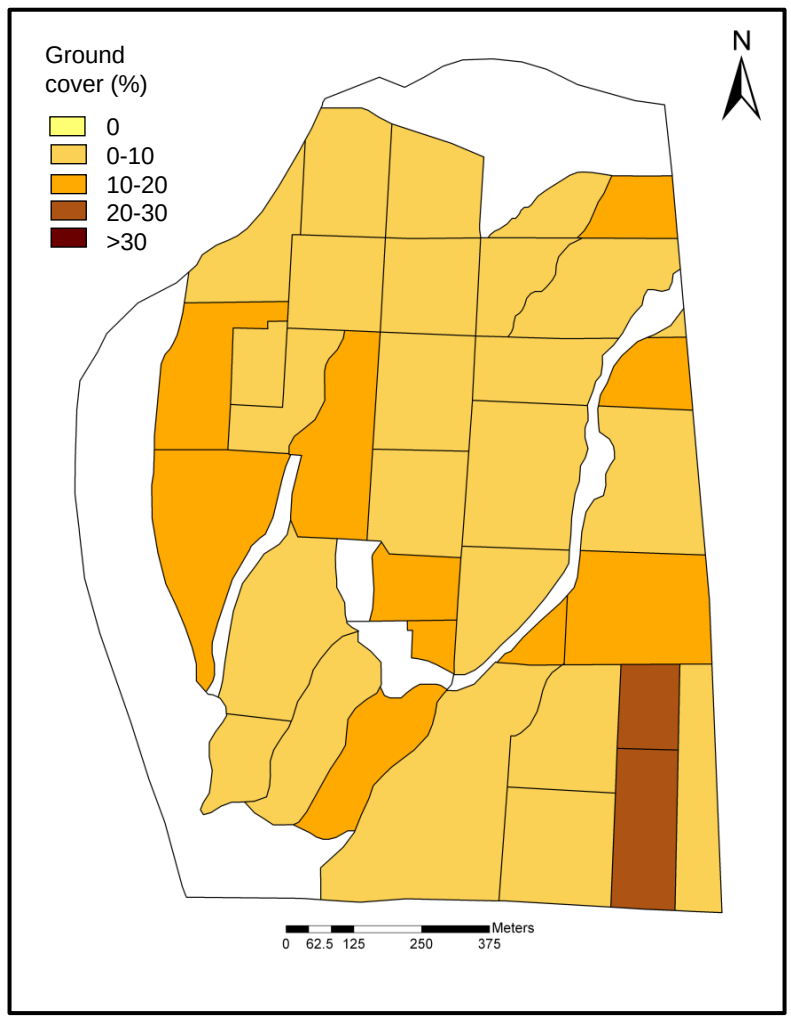
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



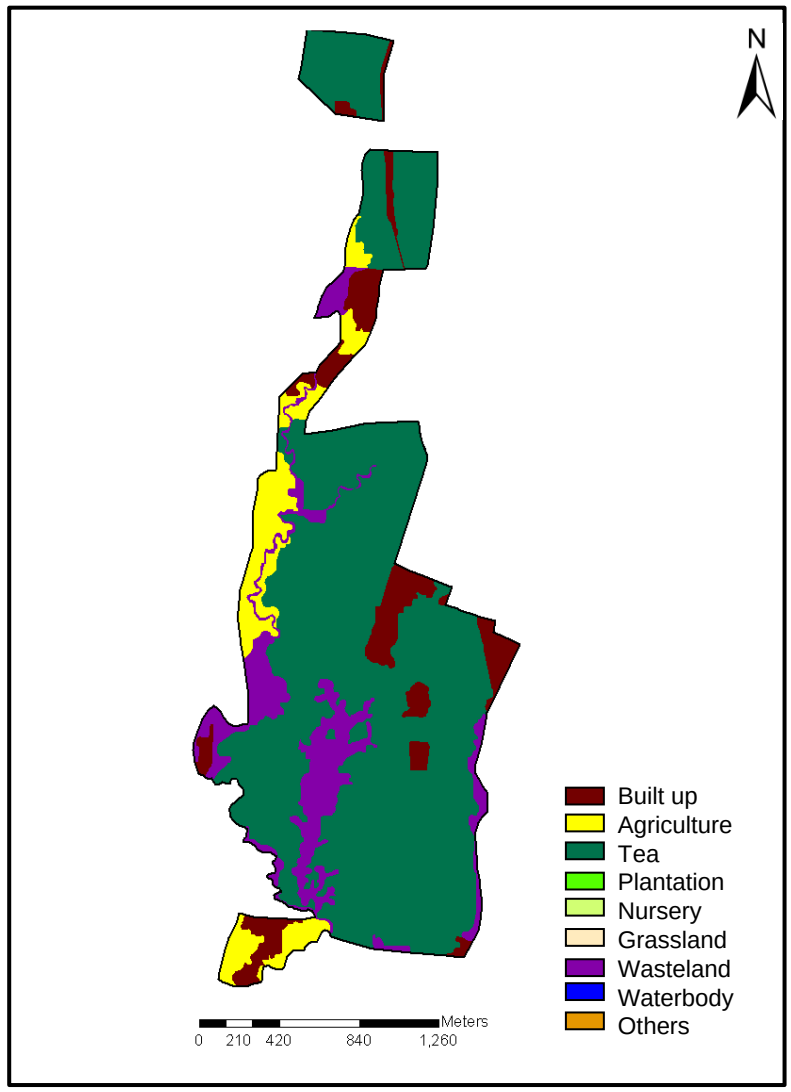
c. Section Boundaries of the Estate



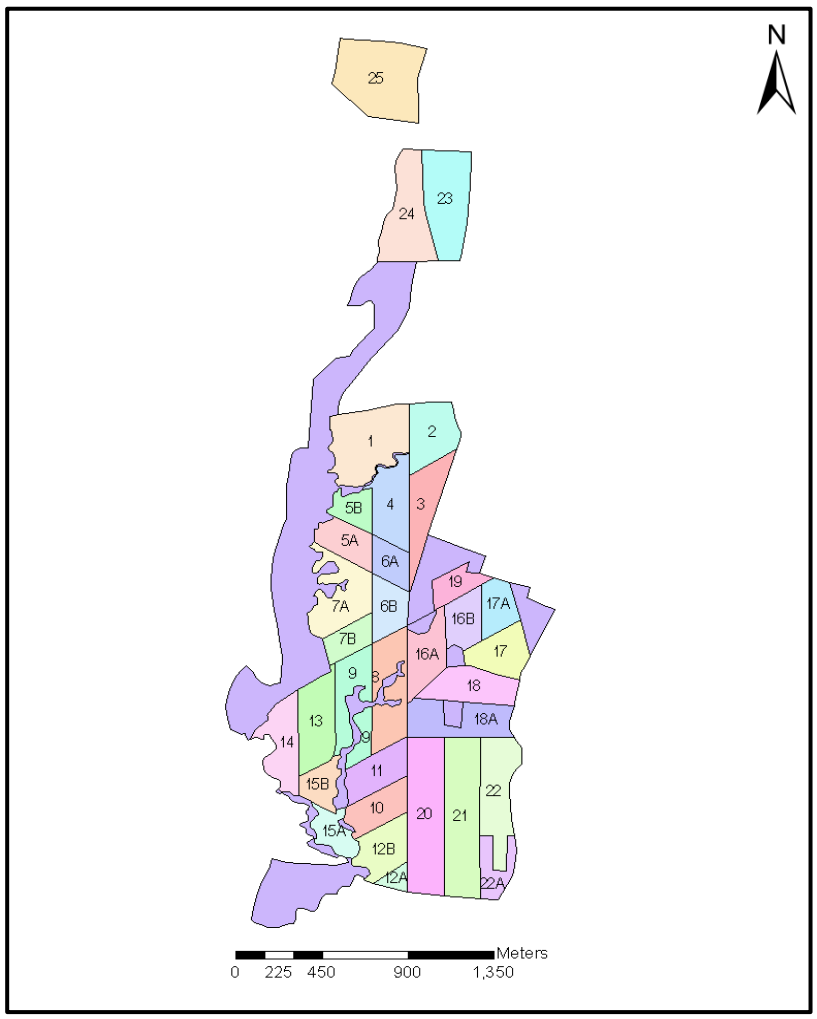
d. Shade Tree Density in Sections

P42: ETHELBARI TE

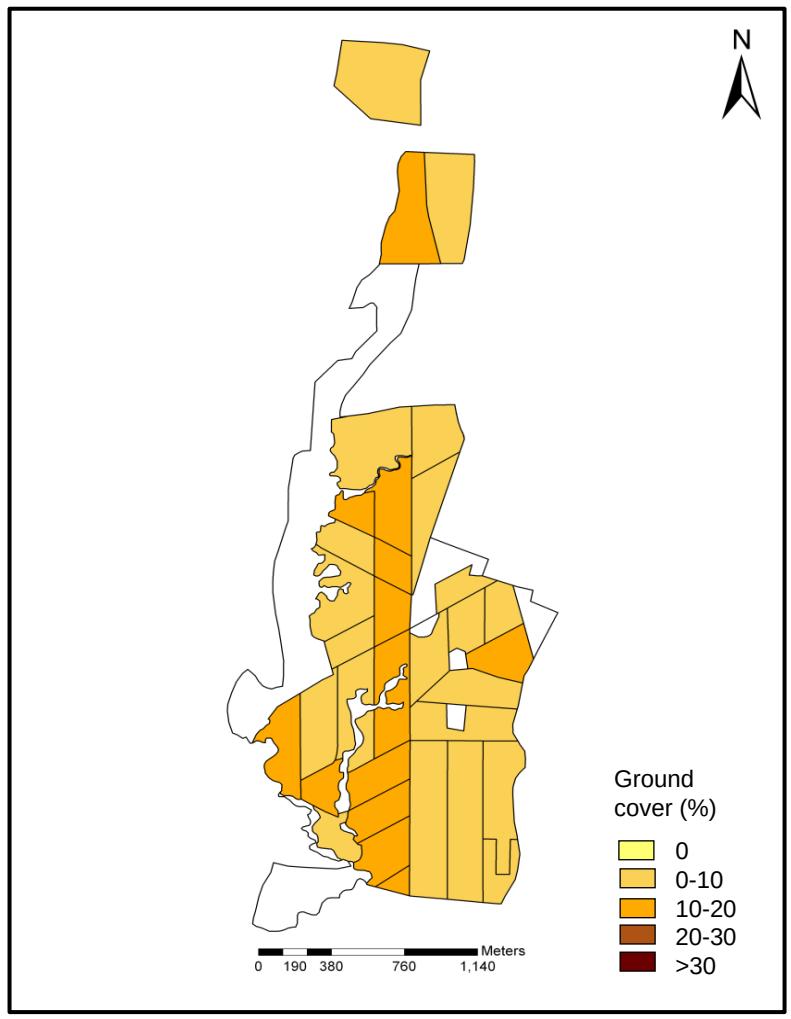
a. False Colour Composite of IRS LISS IV



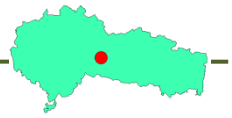
b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections



e. General Information

1. General	
Contact address	PO: Birpara, Dist: Jalpaiguri PIN: 735204
Contact phone	03563-264030, 03563-264340
Name of the company	The Ethelbari Tea Company Ltd.
Name of the village where it falls	Dhanirampur GP-1
Leased area of the estate (ha)	364.18
Tea grown area of the estate (ha)	270.52
No. of divisions / sections	0 div/25 sec
Year of establishment	1932
Type of tea produced	CTC

2. Infrastructure	
Availability of processing factory	Yes
Availability of workers colony	Yes
Availability of internet facility / e-mail id	No
Meteorological observations taken	Tmax, Tmin, Rainfall

3. Amenities	
Availability of health care / dispensary	Yes
Availability of school	Yes (primary)

4. Shade trees	
Shade tree density (garden level)	Medium
Plant to plant spacing (m)	13.33 x 13.33
Row to row spacing (m)	14 x 14

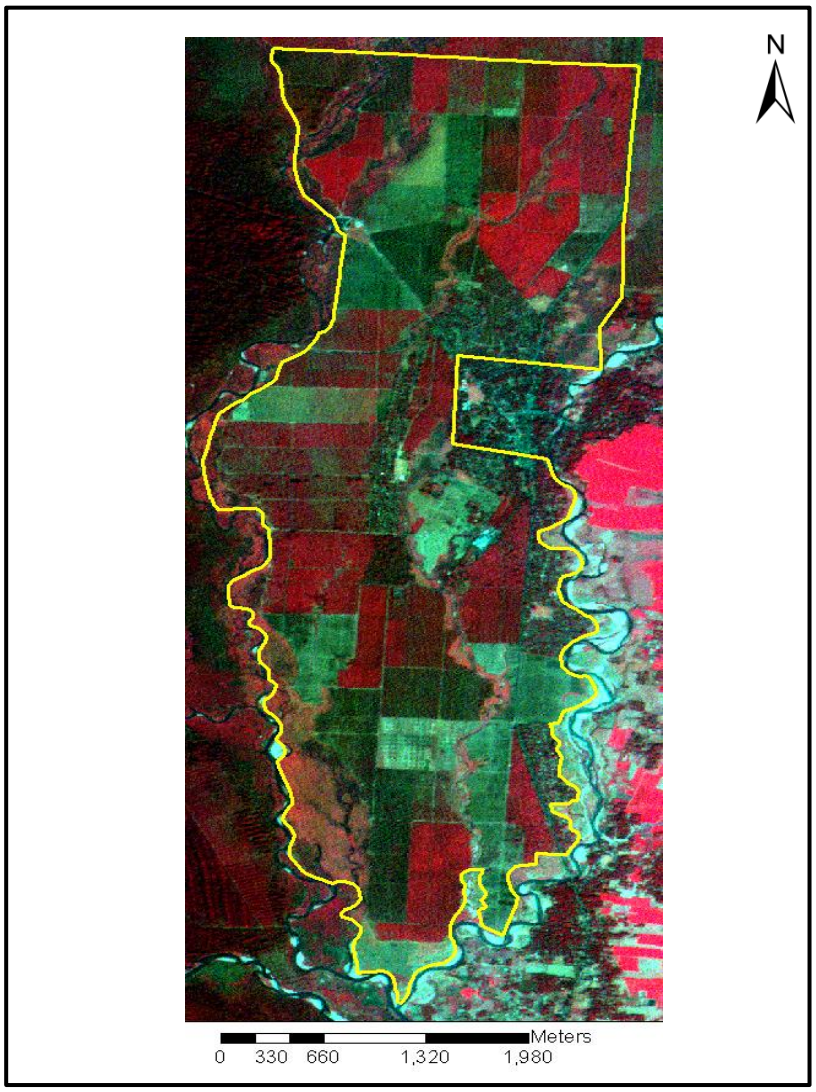
5. Natural resources constraints	
Drainage congestion and water logging	Yes
Scarcity of water during summer	Yes
River bank erosion	Yes
Major diseases and duration	Red rust (2 months)
Major pests and duration	Looper (9 months), RSM (6 months), *Helopeltis* (3 months)
Damage due to wildlife	No

6. Yield / production	
Peak plucking periods	--
Annual green leaf yield	1465 kg/ha
Annual production of processed tea	378350 kg

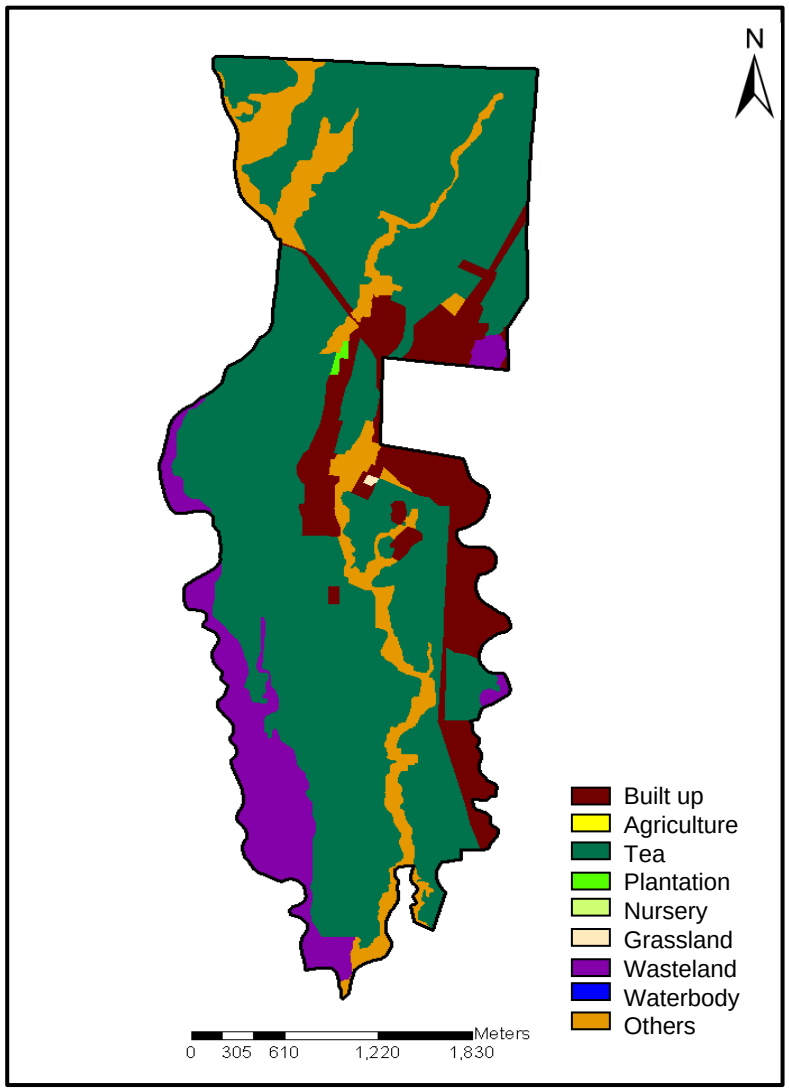
7. Pruning	
Time of pruning	Dec
Pruning cycle	4 yr
Types of pruning	--

8. Fertilizer use	
Types of N, P, K fertilizers used	Urea, MOP, RP, SSP
Dose of Nitrogen (kg/ha)	140
Dose of Phosphorous (kg/ha)	40
Dose of Potash (kg/ha)	120
Whether lime is applied, if yes dose	No

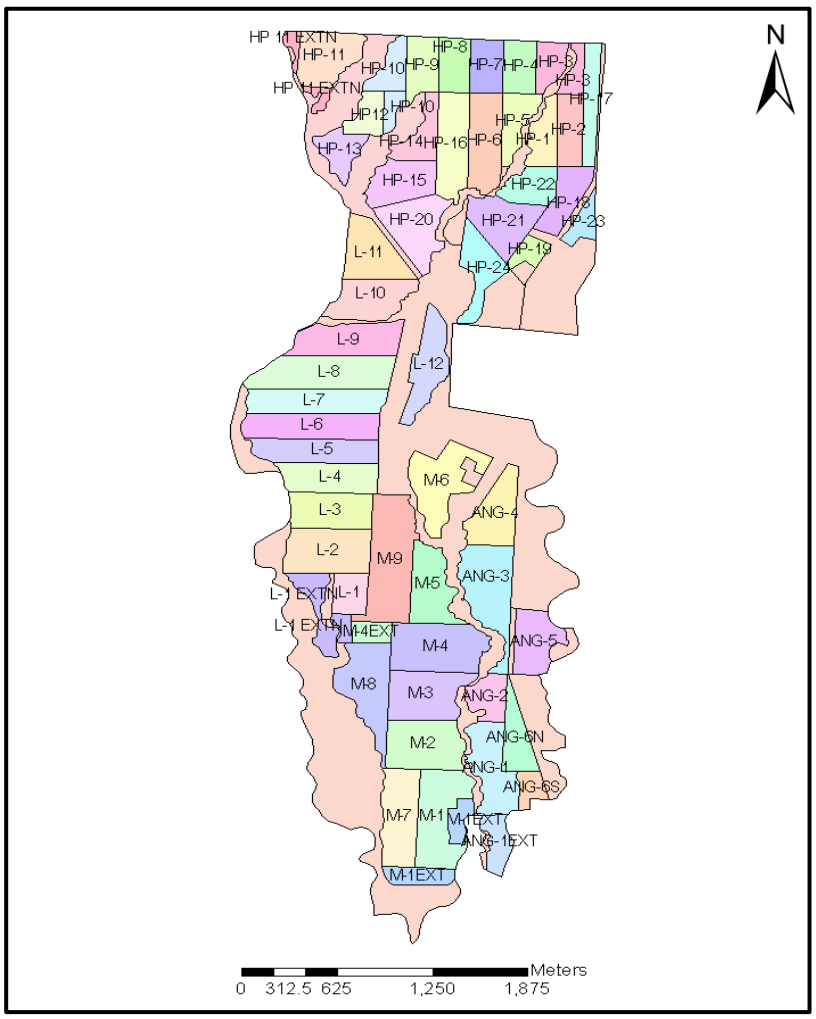
P43: GAIRKATA TE



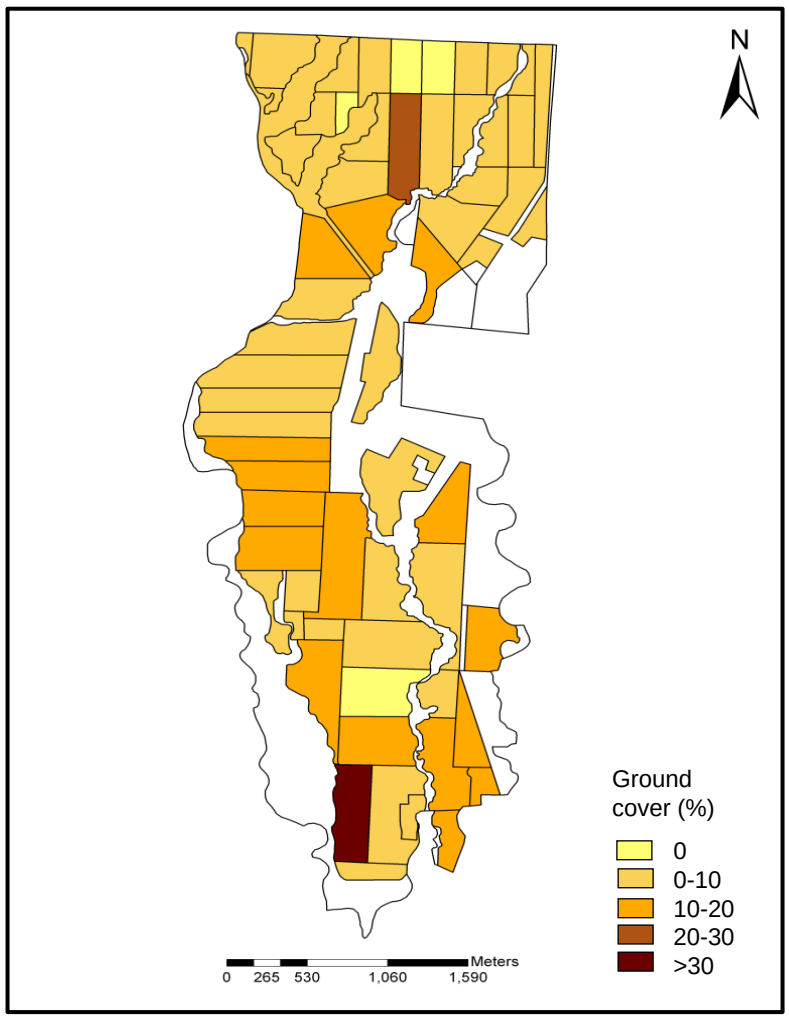
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

e. General Information

1. General	
Contact address	PO: Gairkhata, Dist: Jalpaiguri
Contact phone	05663-233548
Name of the company	--
Name of the village where it falls	Angrabhasa
Leased area of the estate (ha)	1030.7
Tea grown area of the estate (ha)	710.63
No. of divisions / sections	2 div/54 sec
Year of establishment	1890
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, RH, Rainfall

3. Amenities	
Availability of health care / dispensary	Yes
Availability of school	Yes

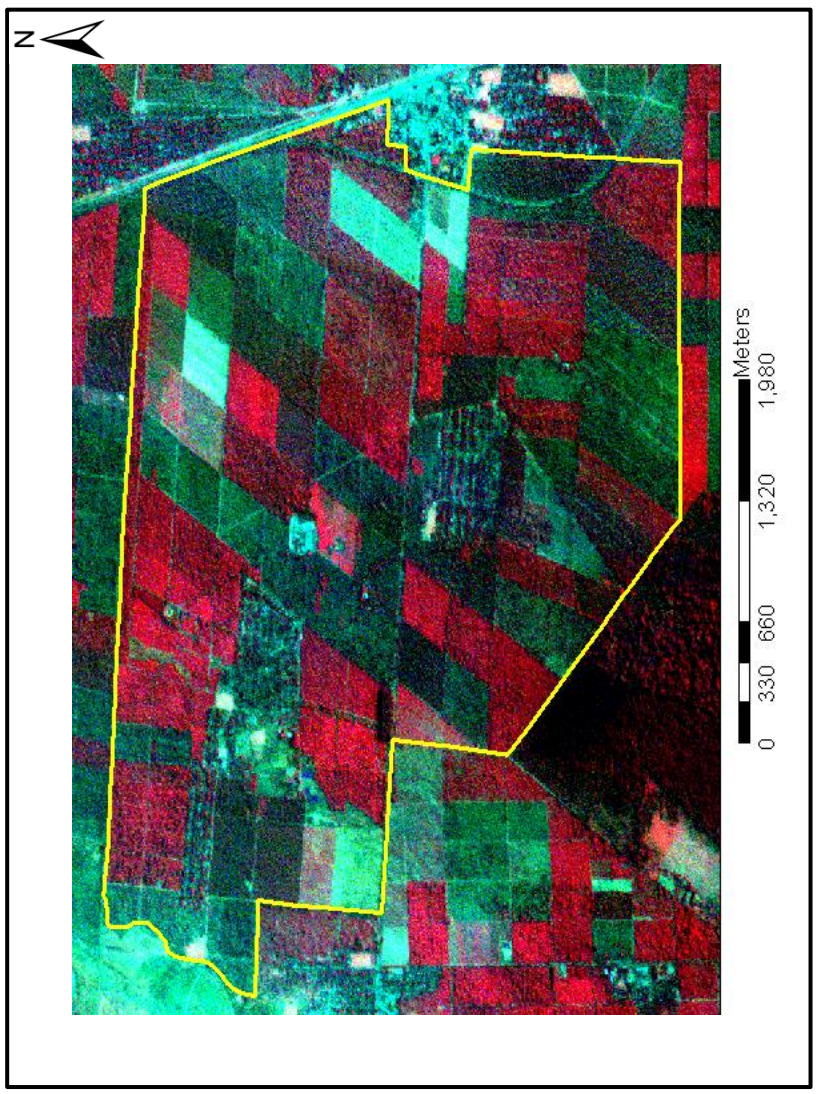
4. Shade trees	
Shade tree density (garden level)	Medium
Plant to plant spacing (m)	6.66 x 6.66
Row to row spacing (m)	6.66 x 6.66

5. Natural resources constraints	
Drainage congestion and water logging	No
Scarcity of water during summer	No
River bank erosion	Yes
Major diseases and duration	Red rust
Major pests and duration	Looper, *Helopeltis*, red slub, RSM (whole year)
Damage due to wildlife	Yes

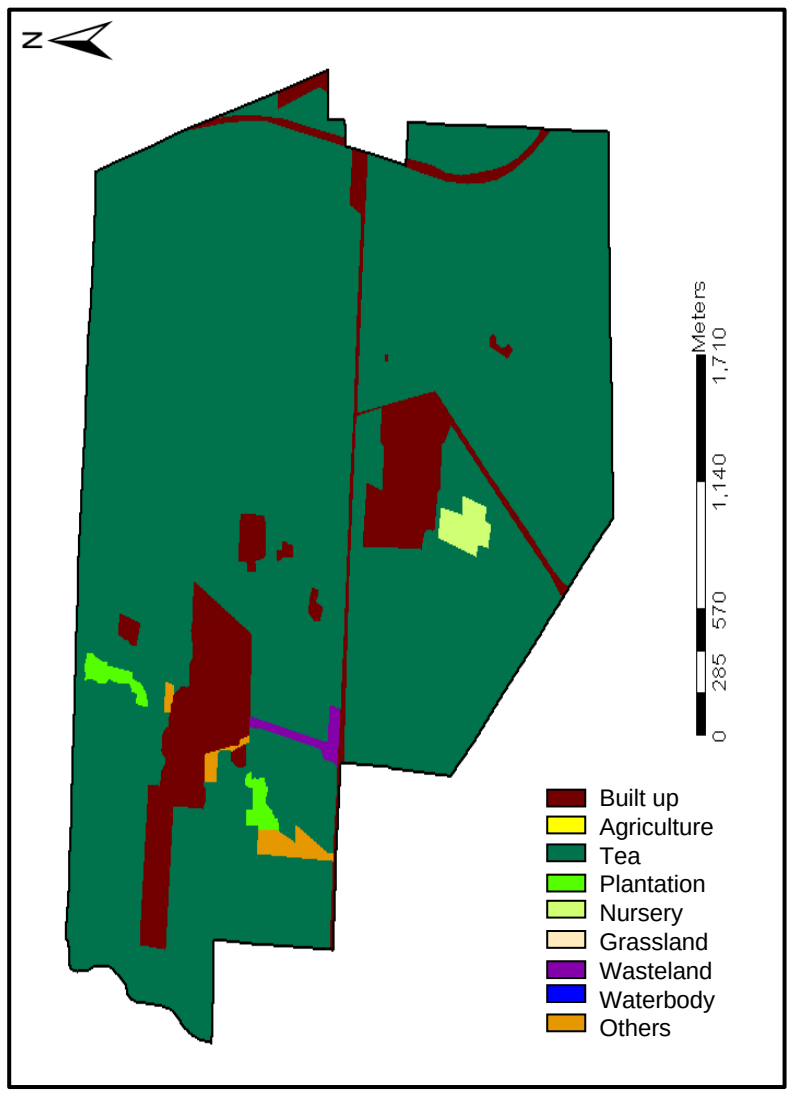
6. Yield / production	
Peak plucking periods	Mar-Dec
Annual green leaf yield	1906.8 kg/ha
Annual production of processed tea	1188903.2

7. Pruning	
Time of pruning	Dec-Jan
Pruning cycle	3 yrs
Types of pruning	LP-LO-DS/MS-LO

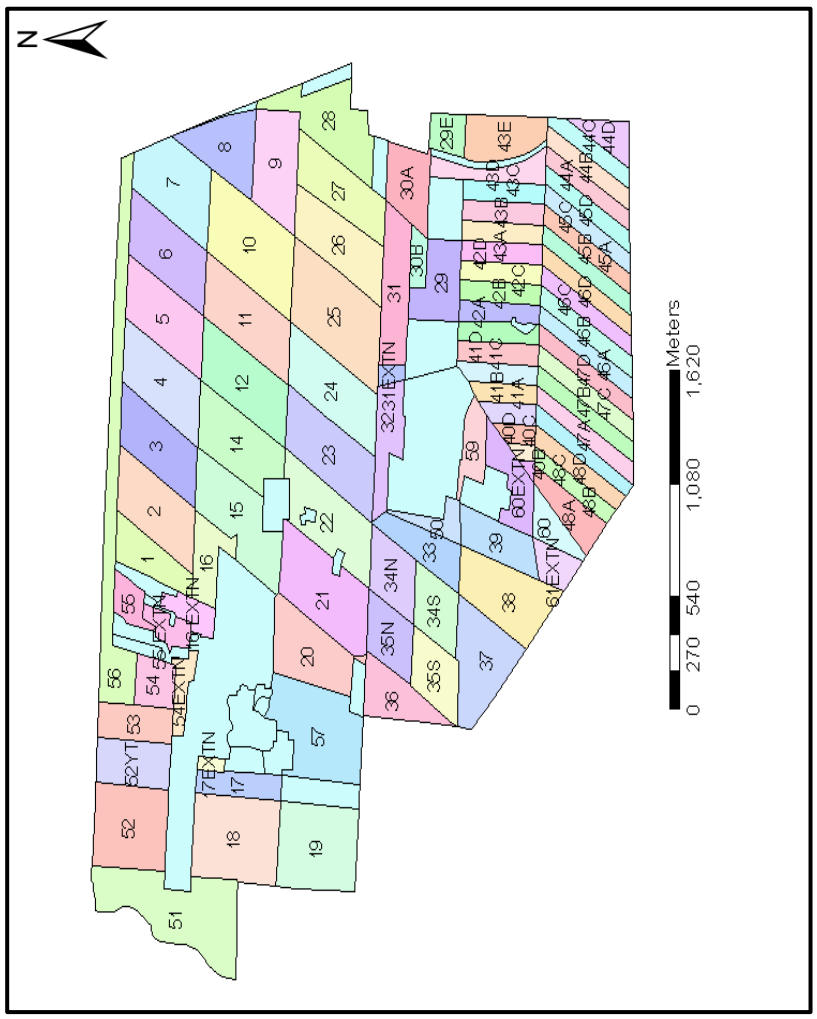
8. Fertilizer use	
Types of N, P, K fertilizers used	Urea, RP, MOP, TSP, SSP
Dose of Nitrogen (kg/ha)	0 yr planting YTD 400 kg
Dose of Phosphorous (kg/ha)	1 yr planting YTD 600 kg
Dose of Potash (kg/ha)	2 yr plan. YTD 800 kg, 3 yr plan. YTD 1000 kg
Whether lime is applied, if yes dose	No



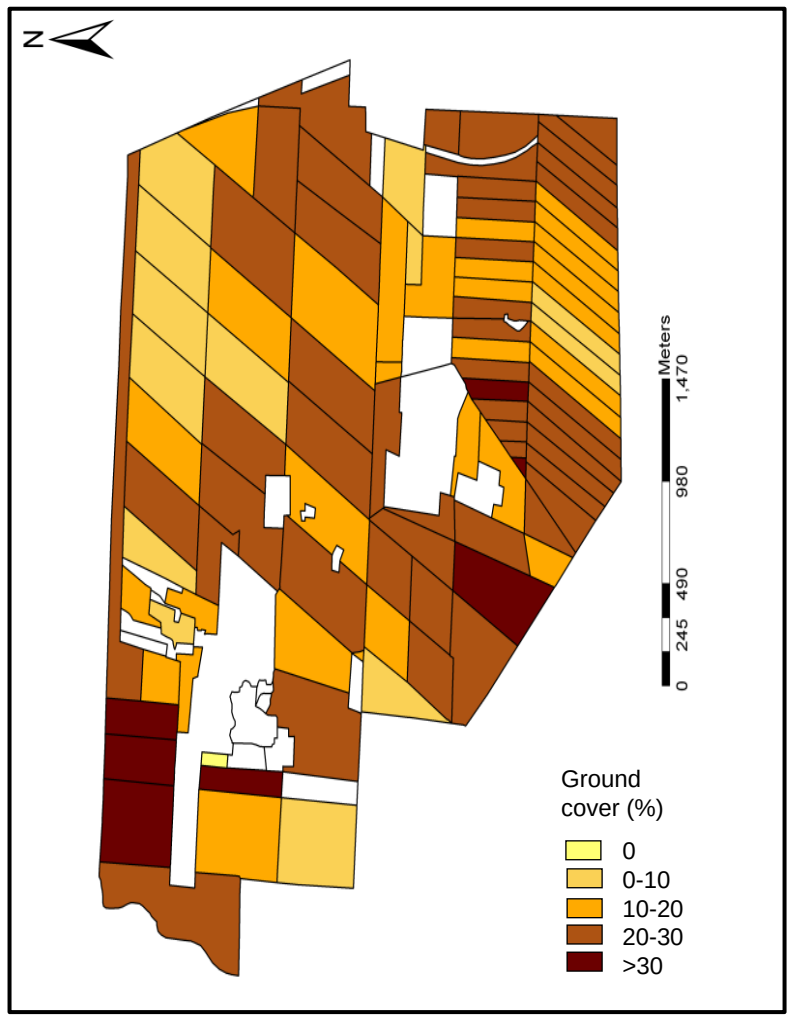
a. False Colour Composite of IRS LISS IV



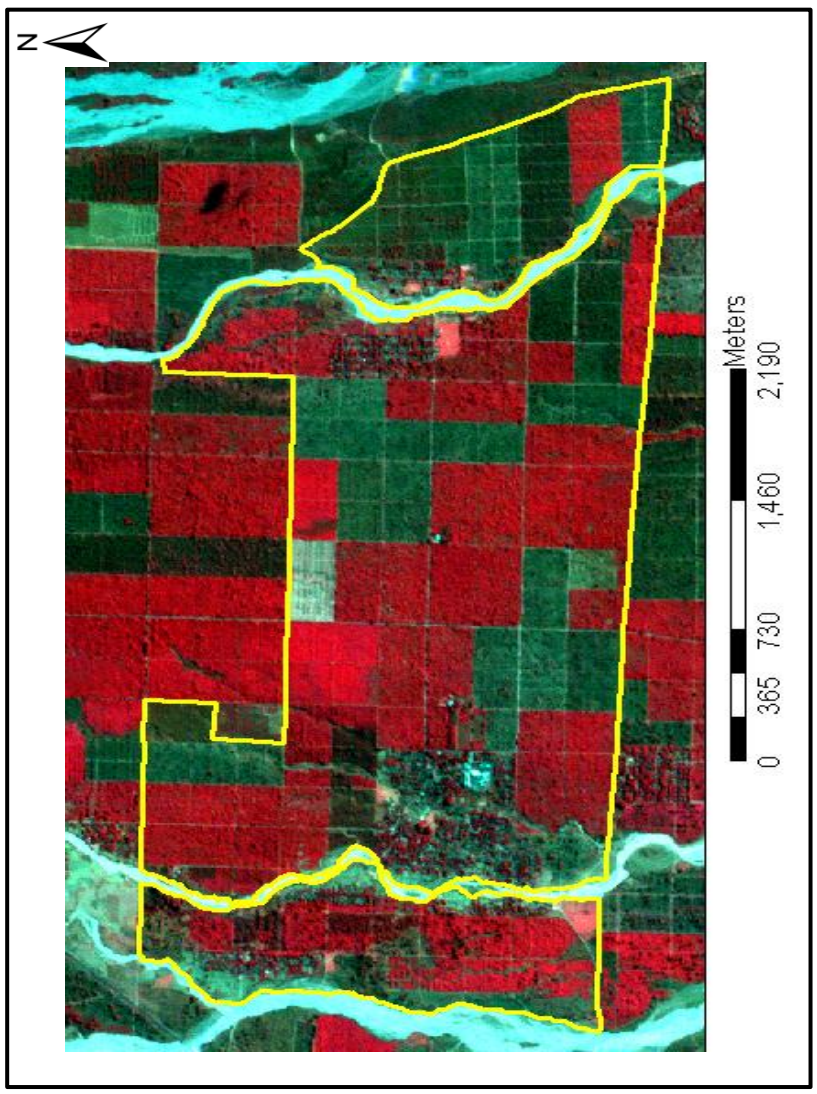
b. Tea Estate Landuse



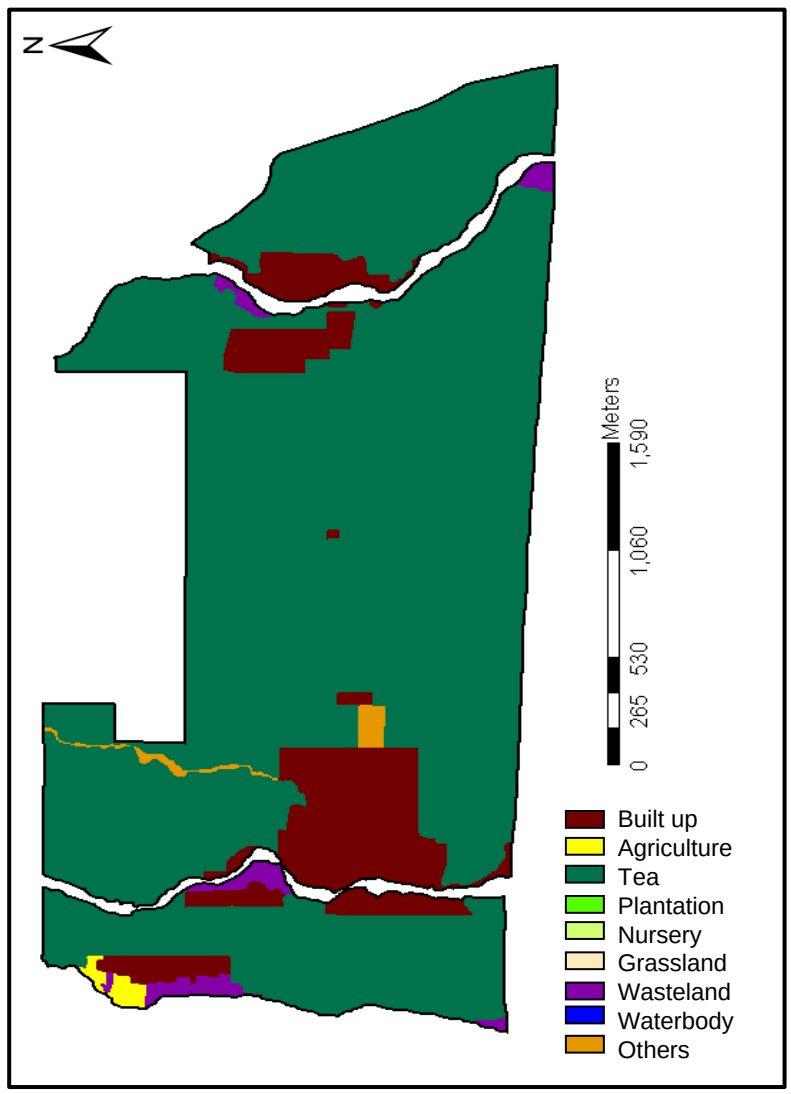
c. Section Boundaries of the Estate



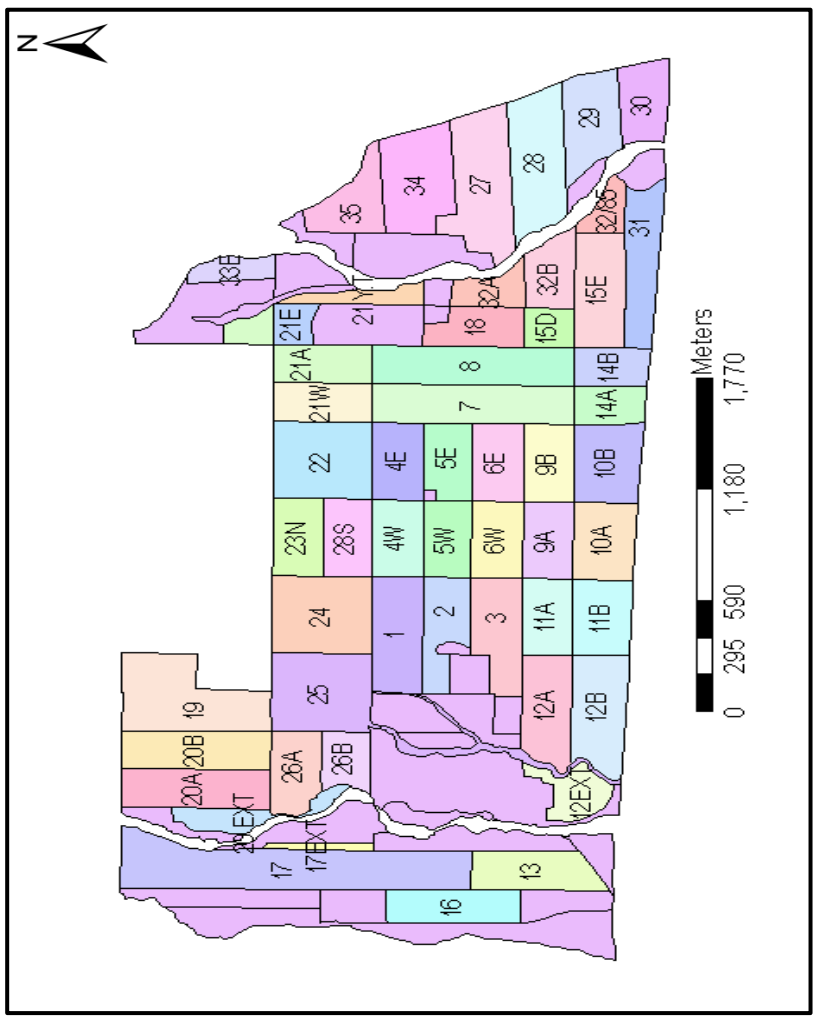
d. Shade Tree Density in Sections



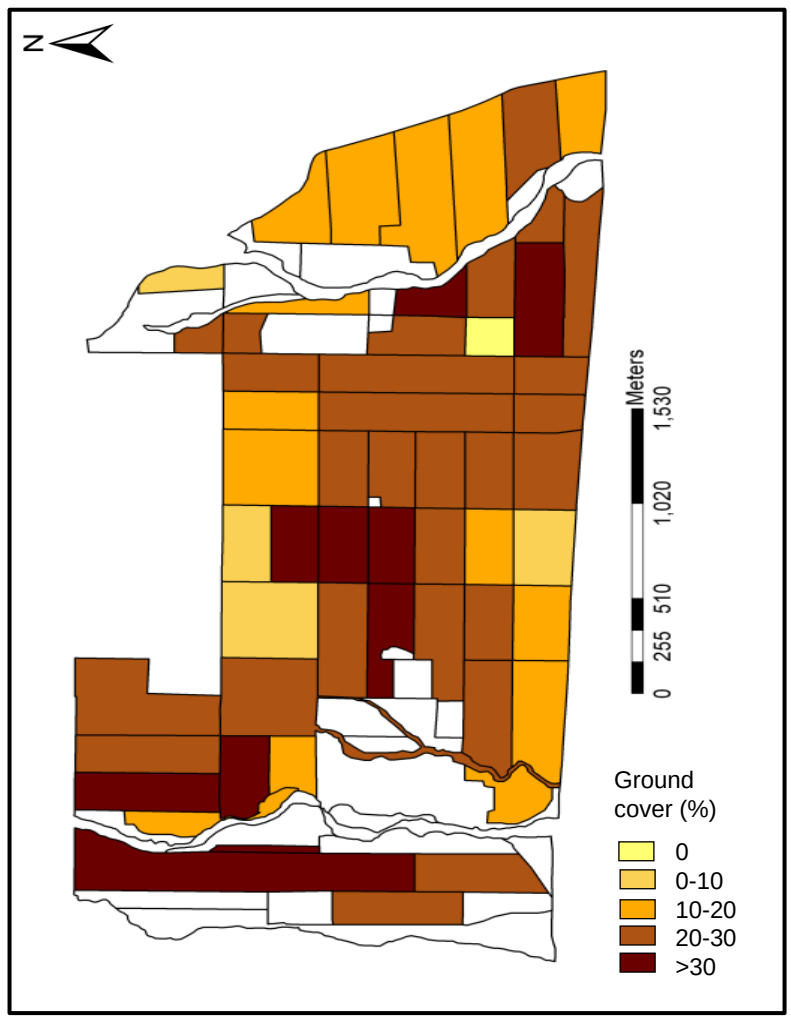
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

e. General Information

1. General	
Contact address	PO: Ramjhora, Dist: Jalpaiguri
Contact phone	9333057980
Name of the company	Duncans Industries Limited
Name of the village where it falls	Ramjhora
Leased area of the estate (ha)	764.48
Tea grown area of the estate (ha)	528.36
No. of divisions / sections	2 div/59 sec
Year of establishment	1900
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

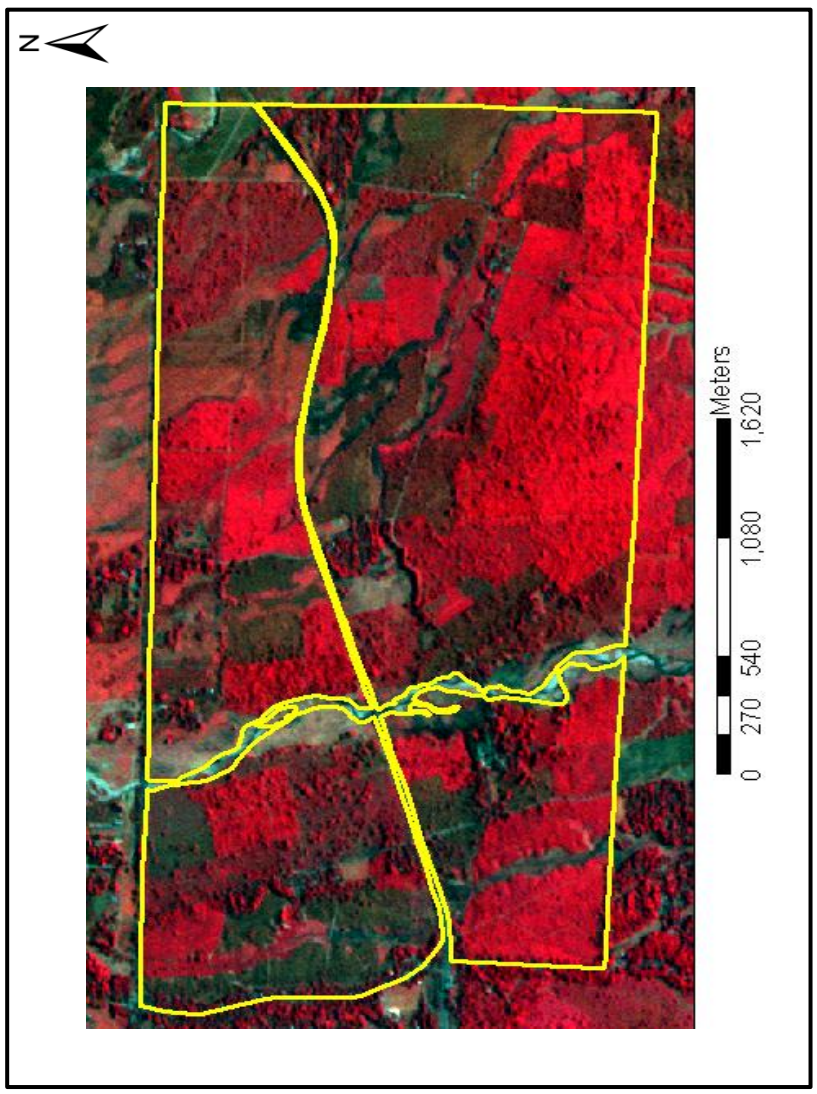
4. Shade trees	
Shade tree density (garden level)	Optimum
Plant to plant spacing	105 cm x 65 cm
Row to row spacing	65 cm

5. Natural resources constraints	
Drainage congestion and water logging	Yes
Scarcity of water during summer	Yes
River bank erosion	Yes
Major diseases and duration	--
Major pests and duration	Looper, caterpiller, RSM, *Helopeltis*
Damage due to wildlife	Yes

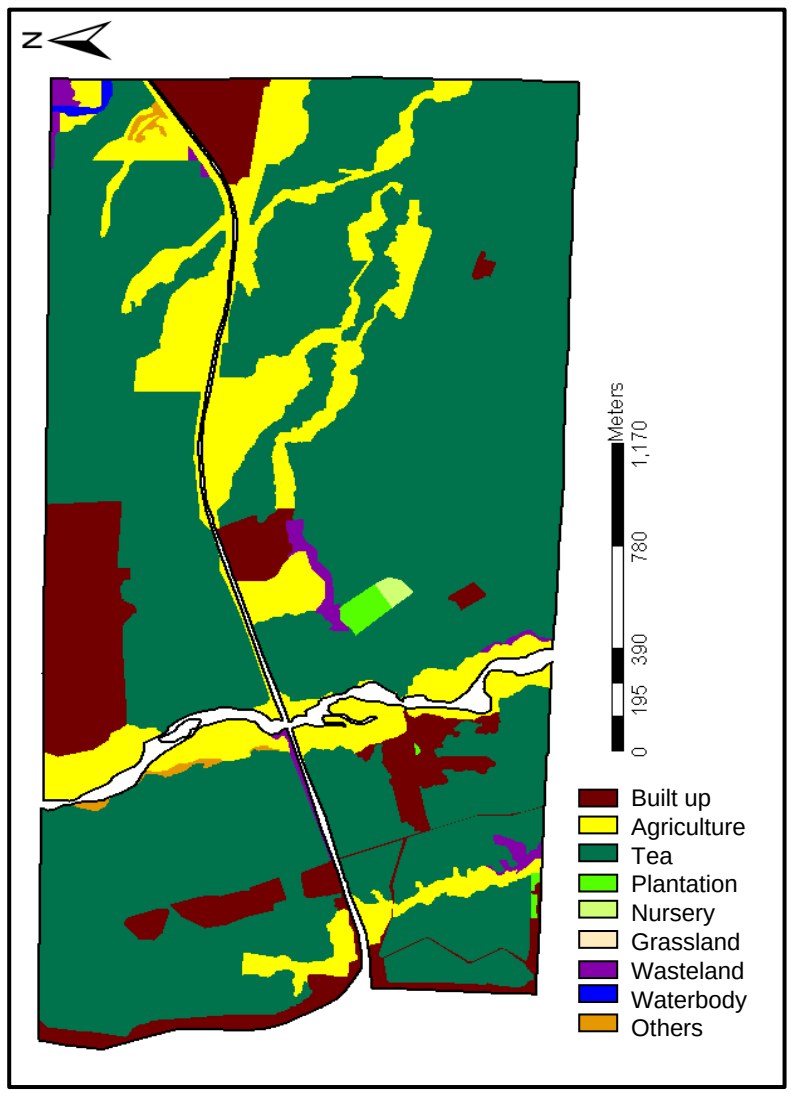
6. Yield / production	
Peak plucking periods	Jul-Oct
Annual green leaf yield	7078.73 kg/ha
Annual production of processed tea	849395 kg

7. Pruning	
Time of pruning	2nd fortnight of Nov-1st fortnight of Jan
Pruning cycle	3 yrs
Types of pruning	LP-UP-UP

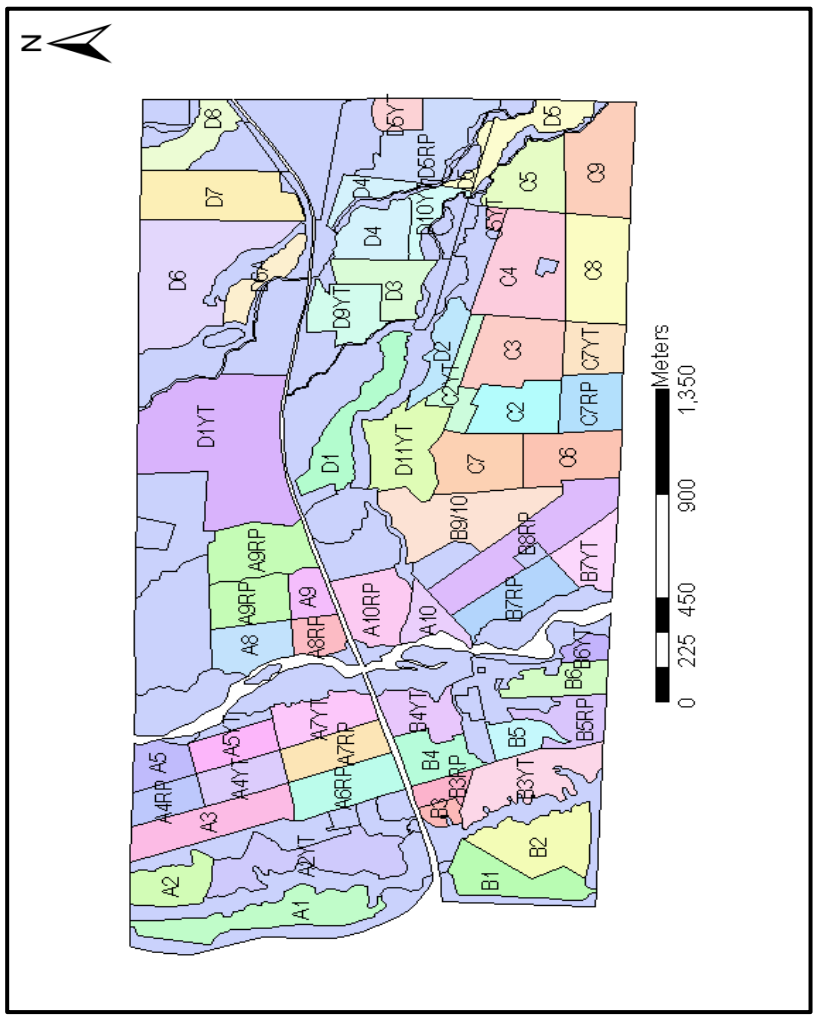
8. Fertilizer use	
Types of N, P, K fertilizers used	Urea, RP, MOP
Dose of Nitrogen (kg/ha)	120-180
Dose of Phosphorous (kg/ha)	48
Dose of Potash (kg/ha)	90
Whether lime is applied, if yes dose	Yes, 2000 kg/ha



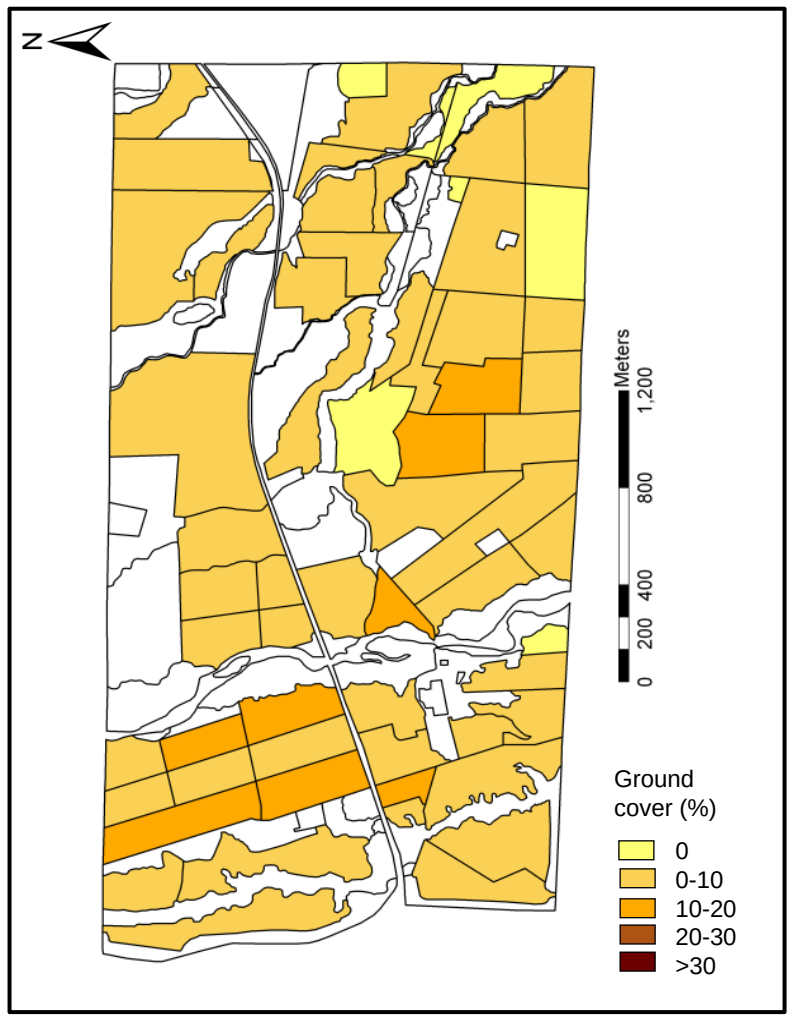
a. False Colour Composite of IRS LISS IV



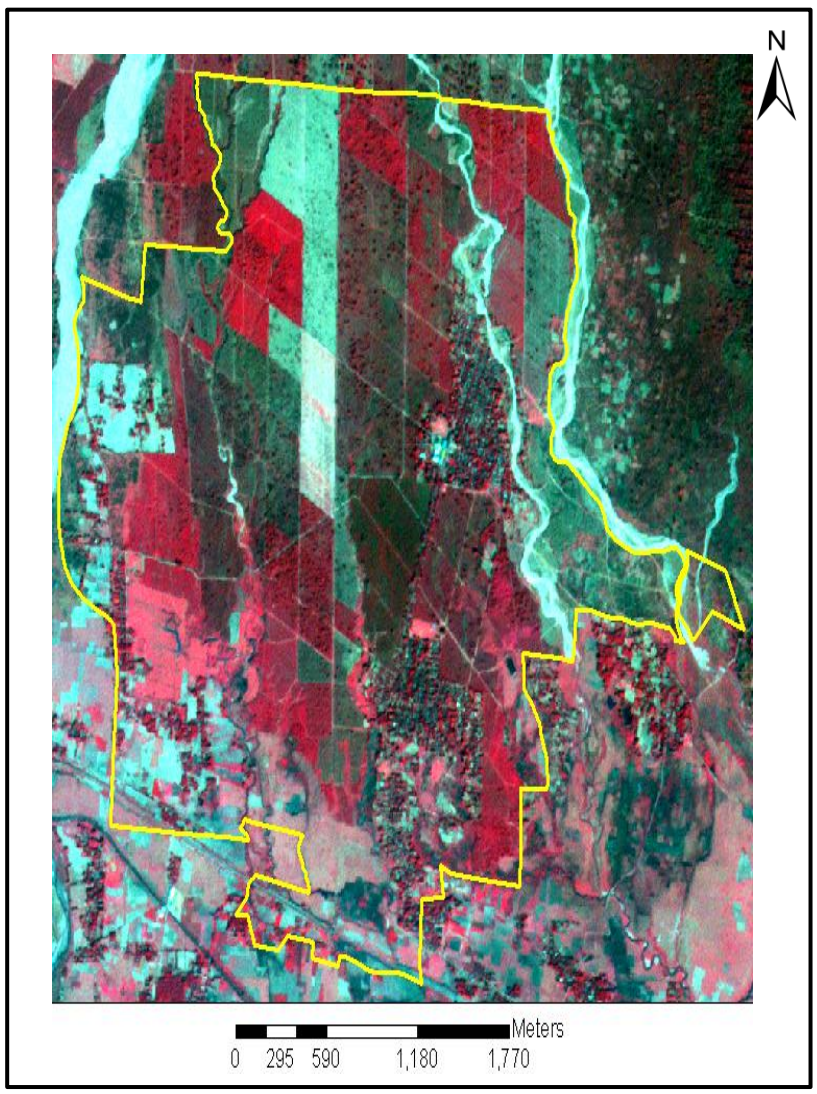
b. Tea Estate Landuse



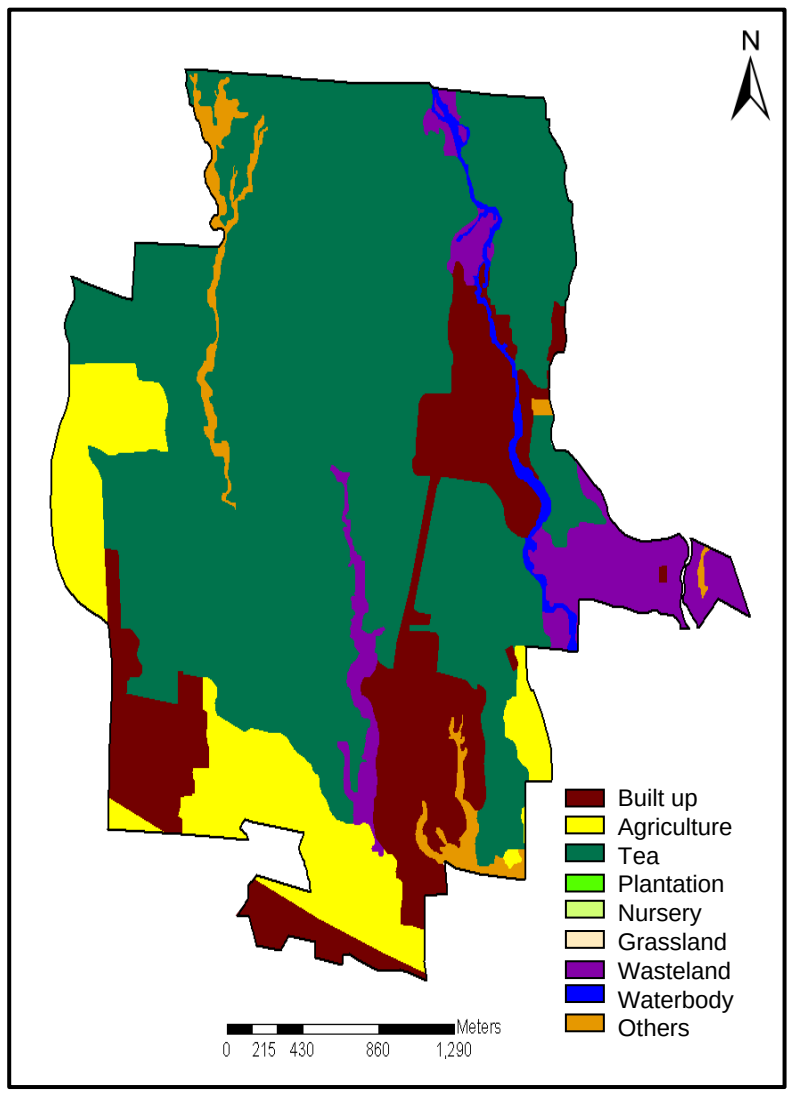
c. Section Boundaries of the Estate



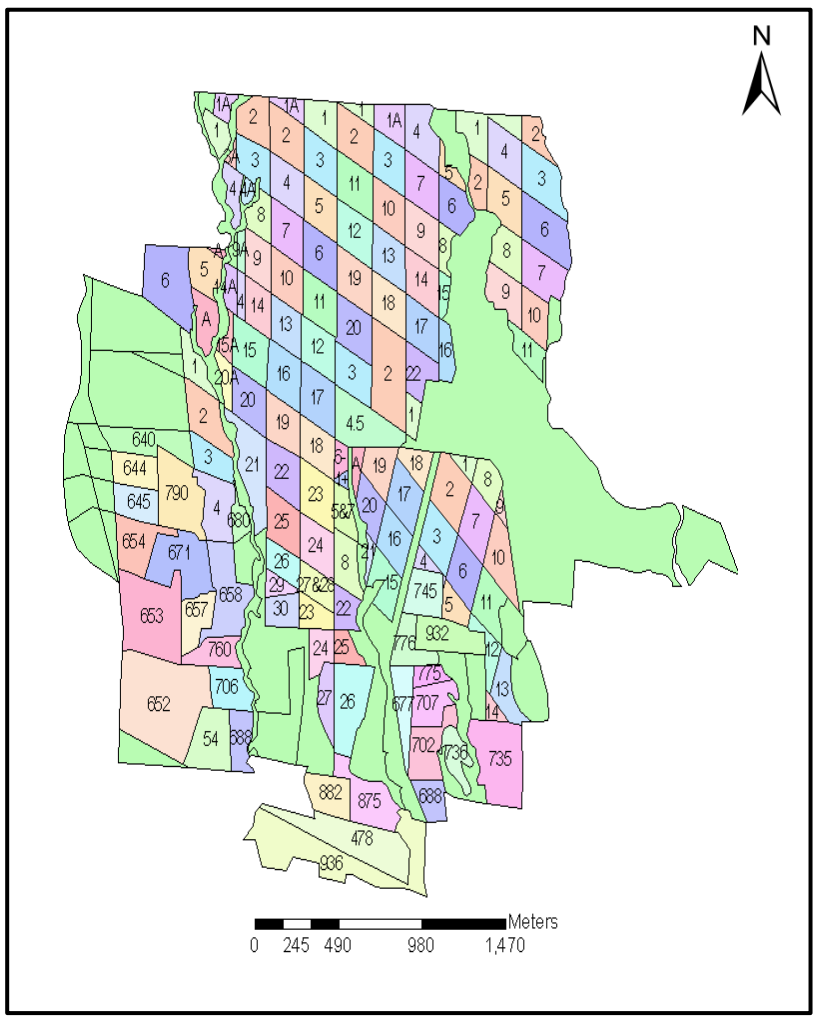
d. Shade Tree Density in Sections



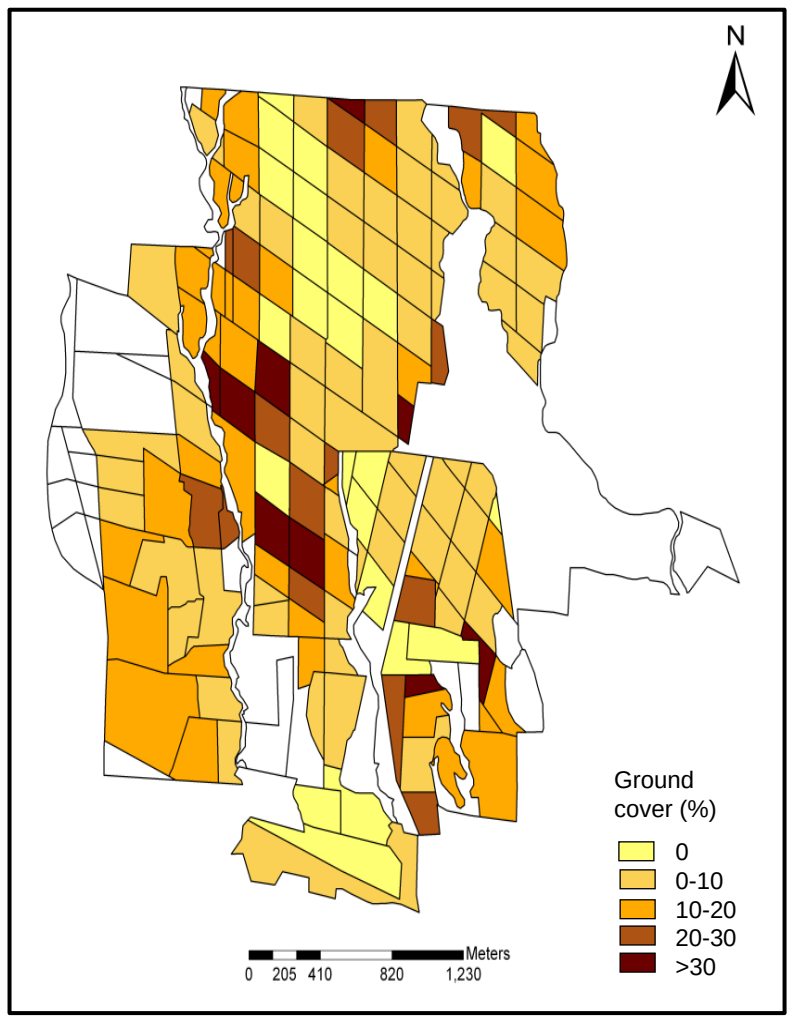
a. False Colour Composite of IRS LISS IV



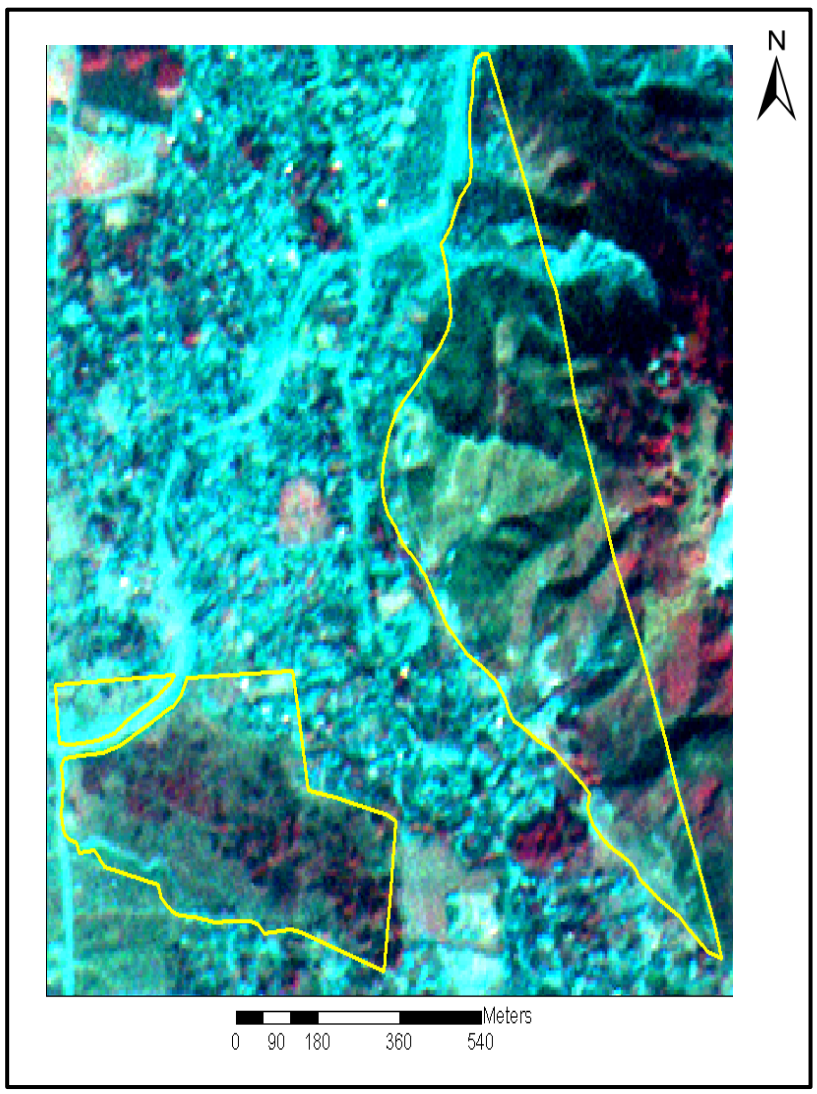
b. Tea Estate Landuse



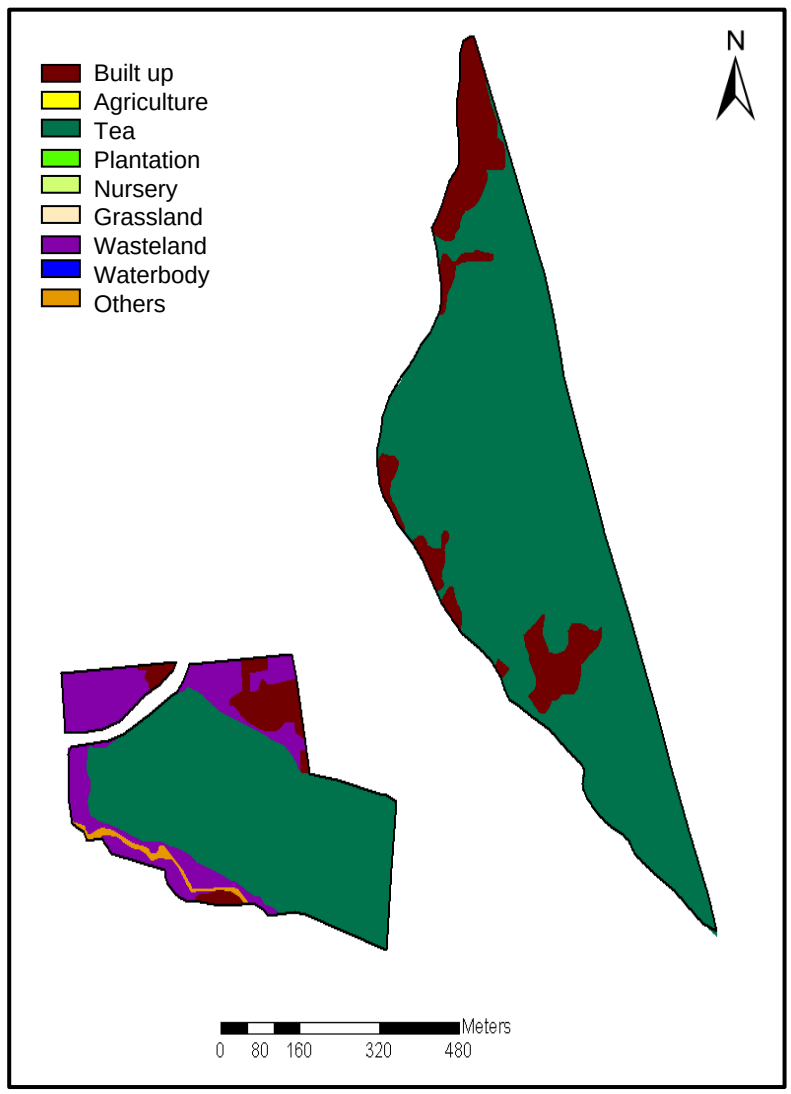
c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

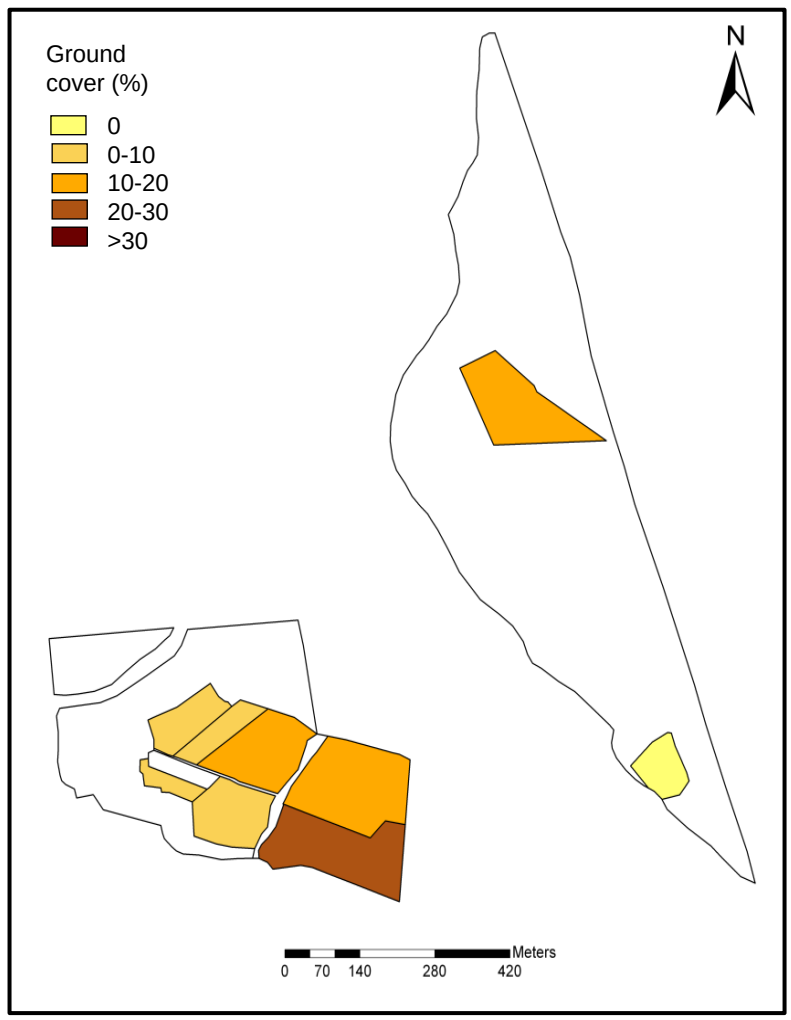


a. False Colour Composite of IRS LISS IV

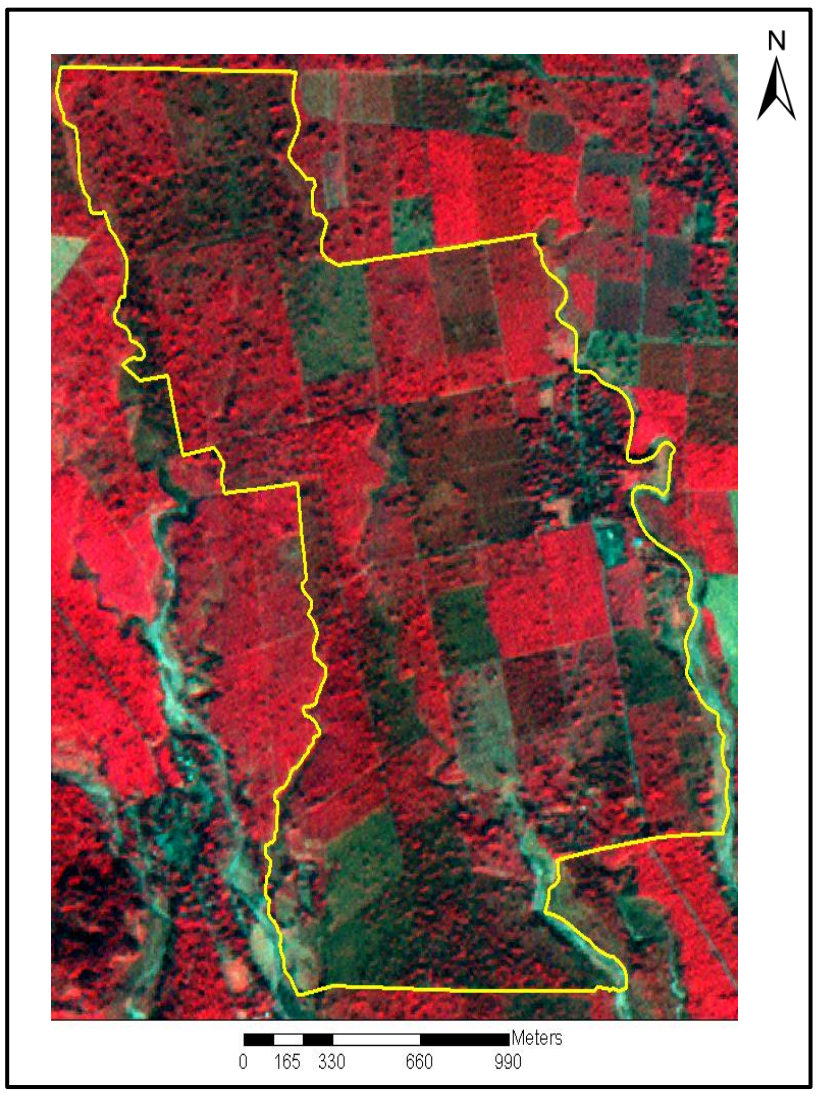


b. Tea Estate Landuse

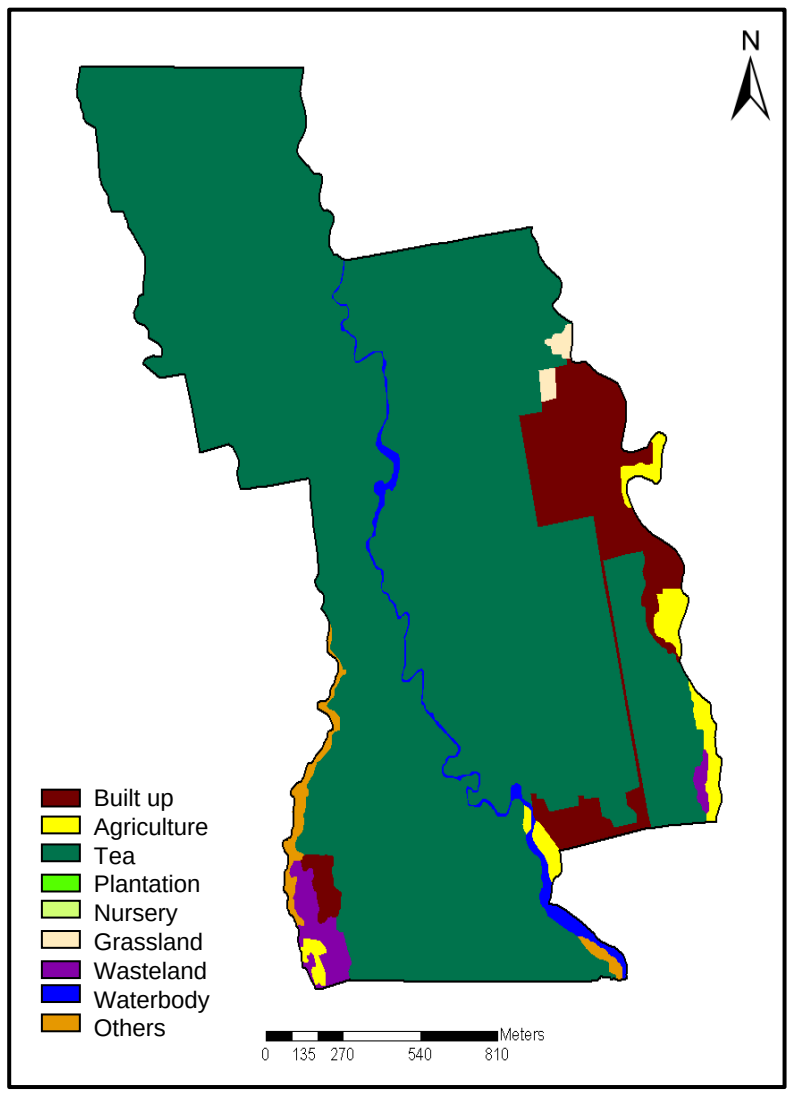
c. Section Boundaries of the Estate



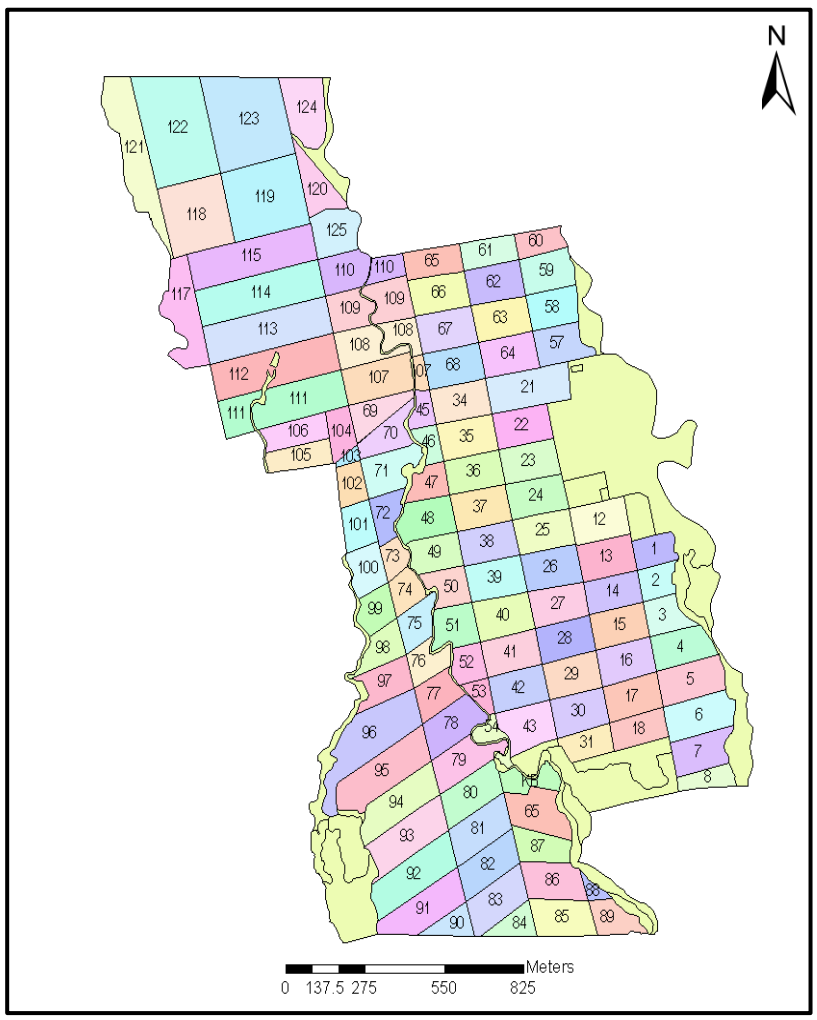
d. Shade Tree Density in Sections



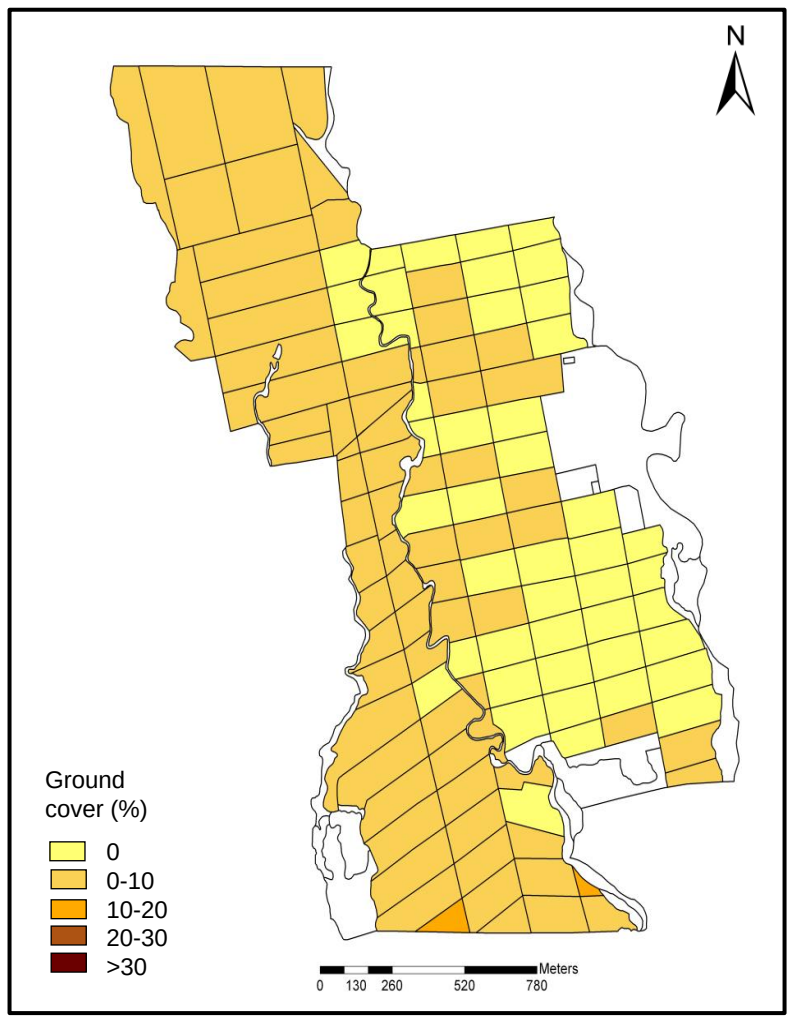
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse

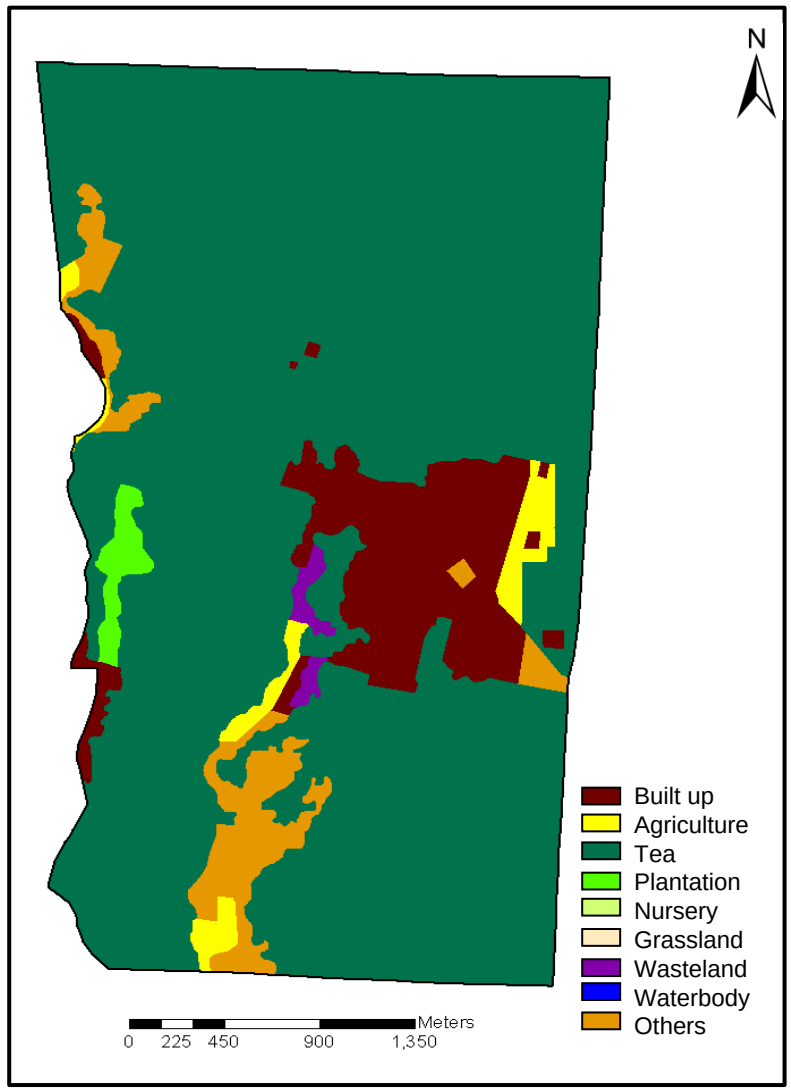


c. Section Boundaries of the Estate

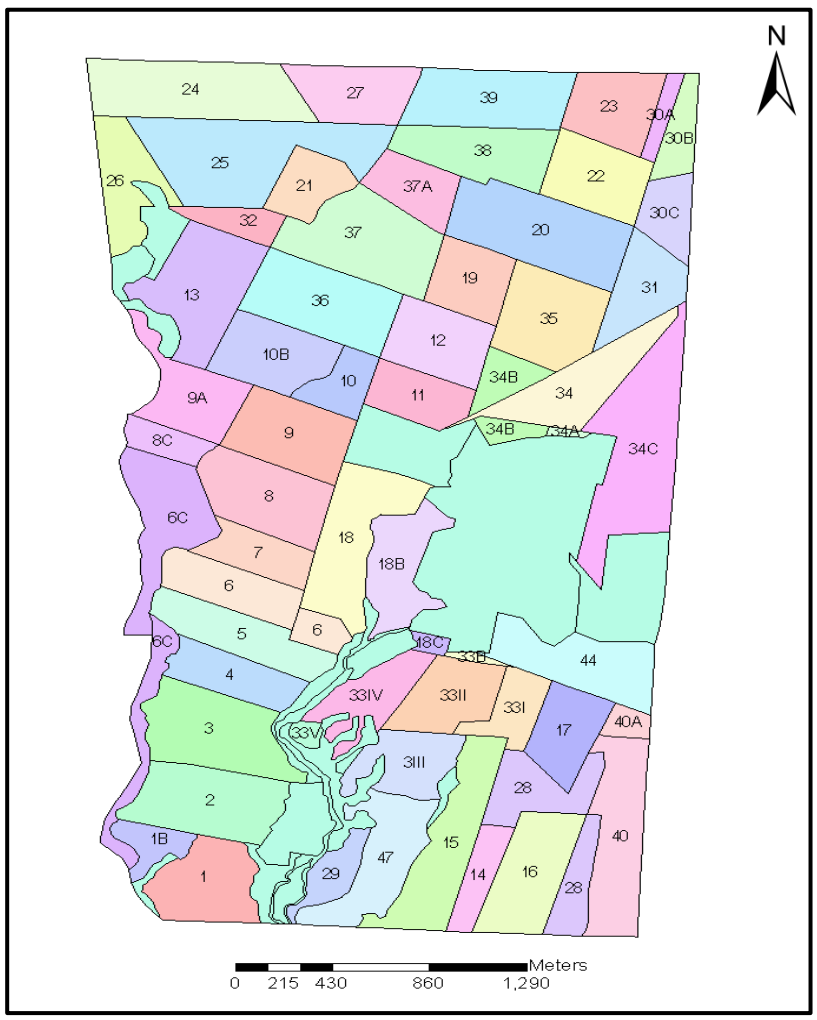


d. Shade Tree Density in Sections

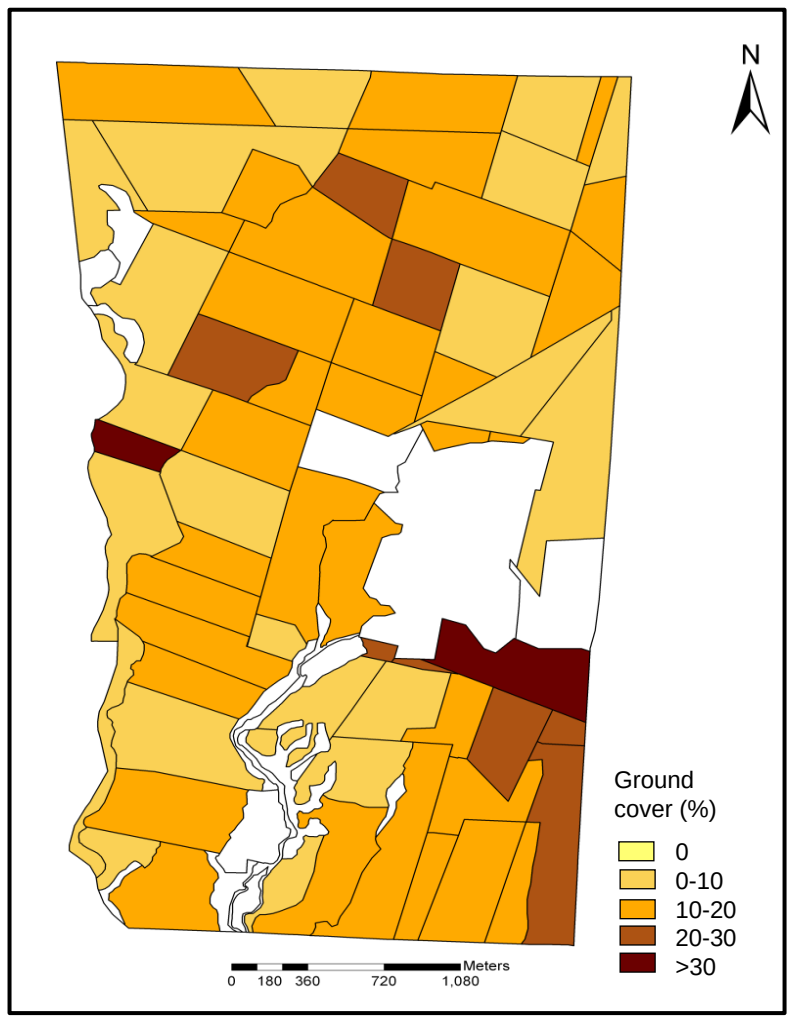
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse

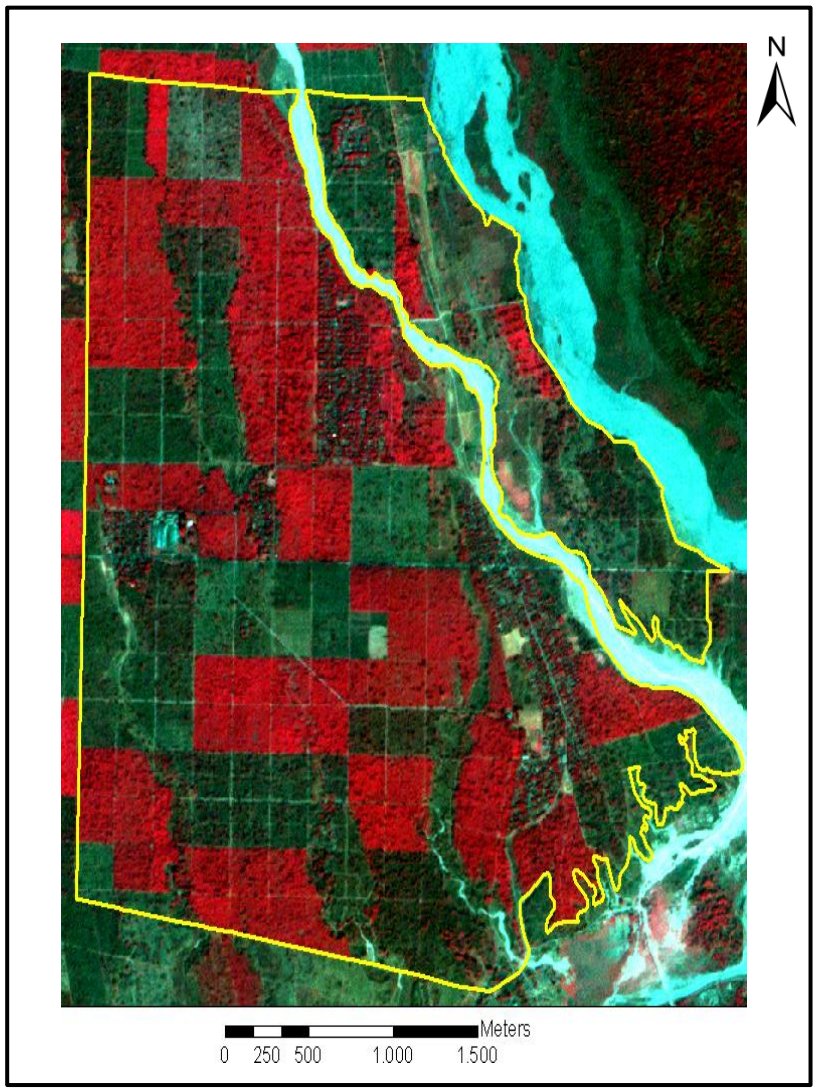


c. Section Boundaries of the Estate

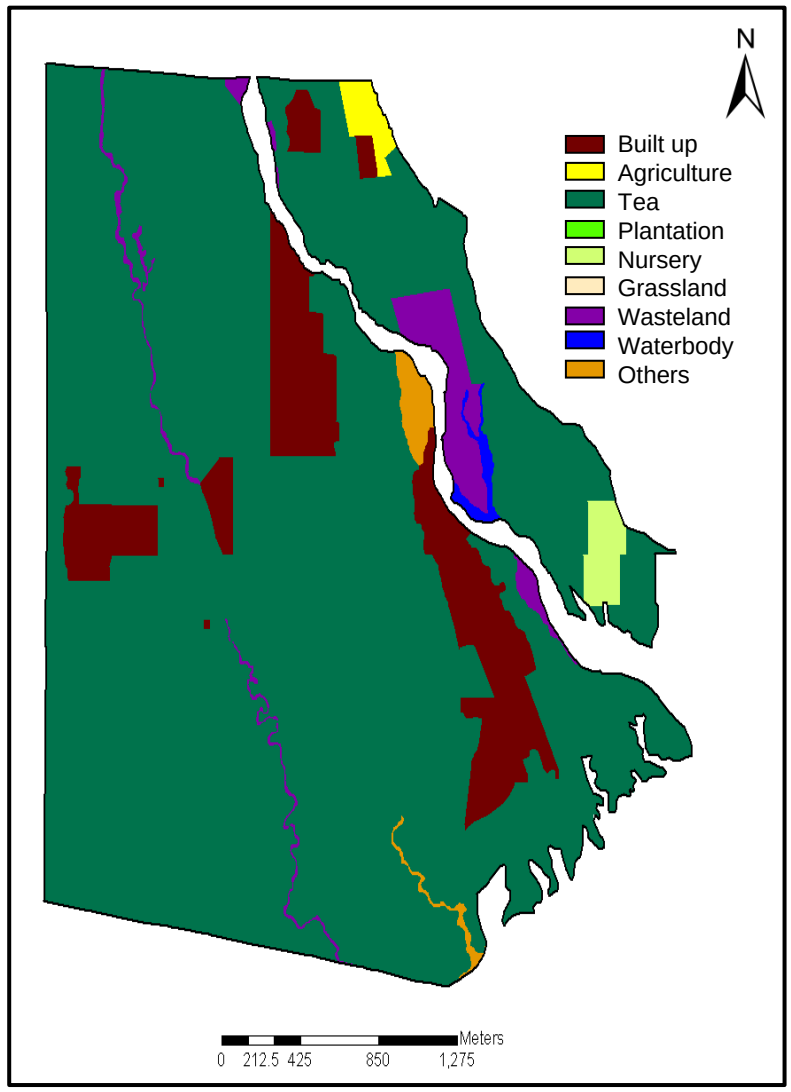


d. Shade Tree Density in Sections

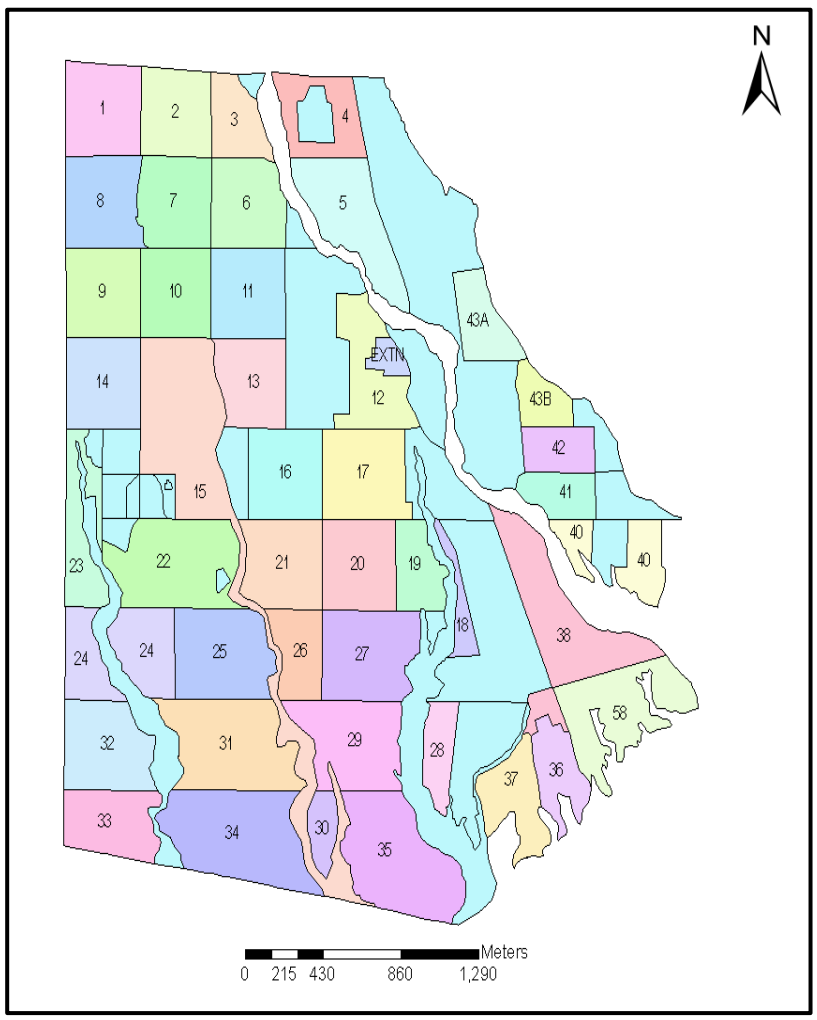
P51: HANTAPARA TE



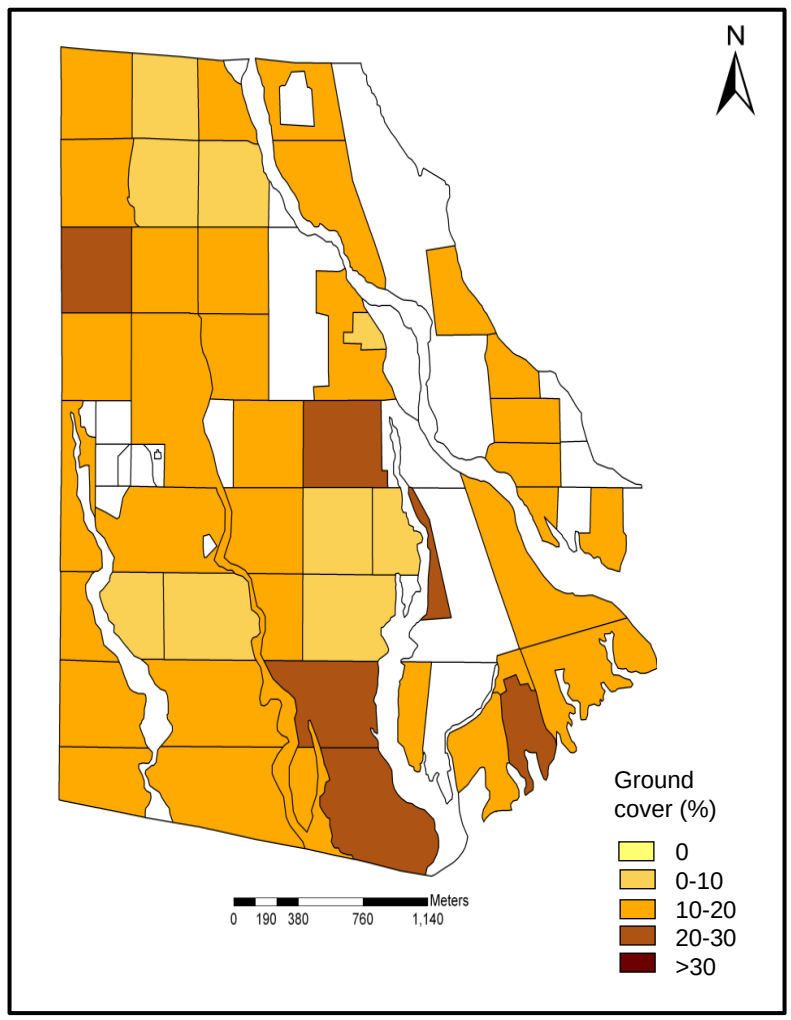
a. False Colour Composite of IRS LISS IV



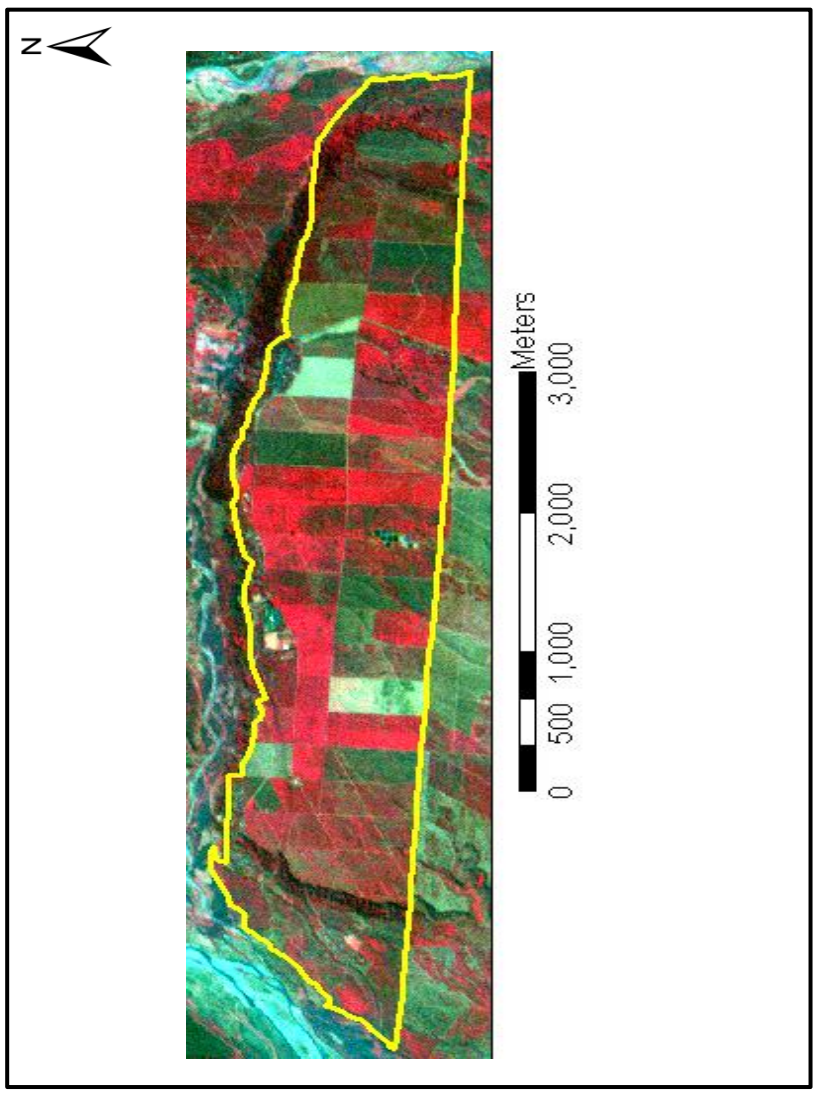
b. Tea Estate Landuse



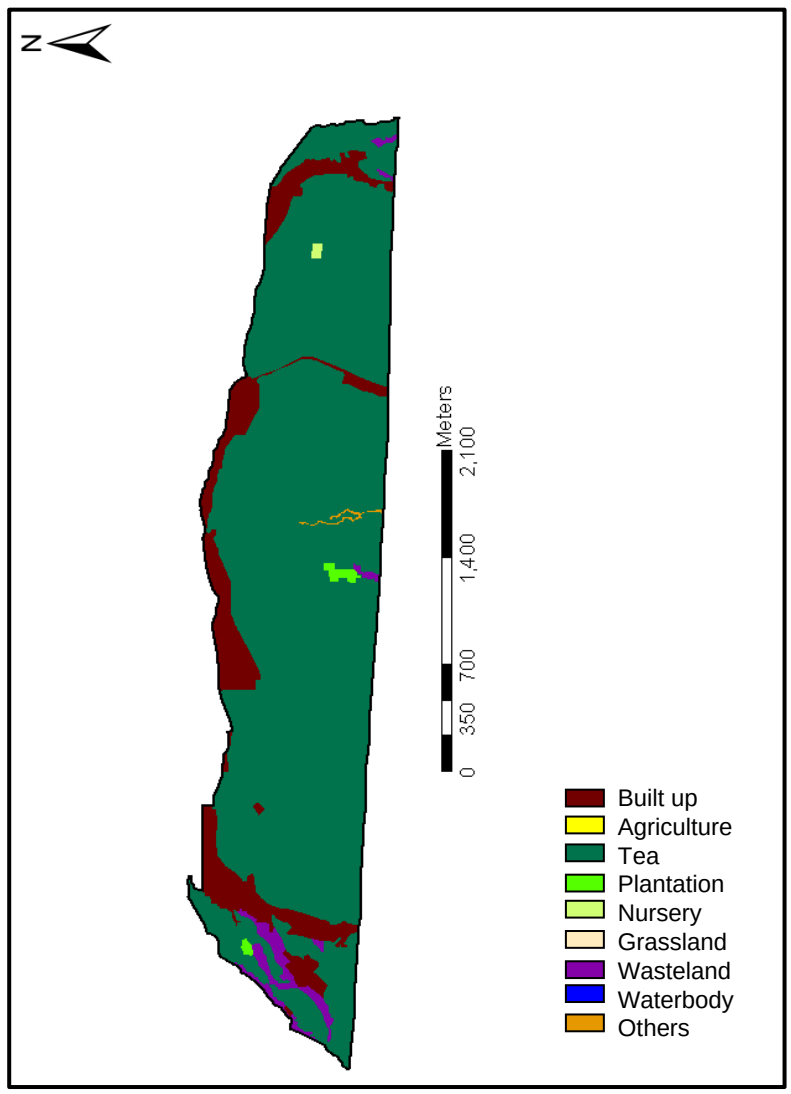
c. Section Boundaries of the Estate



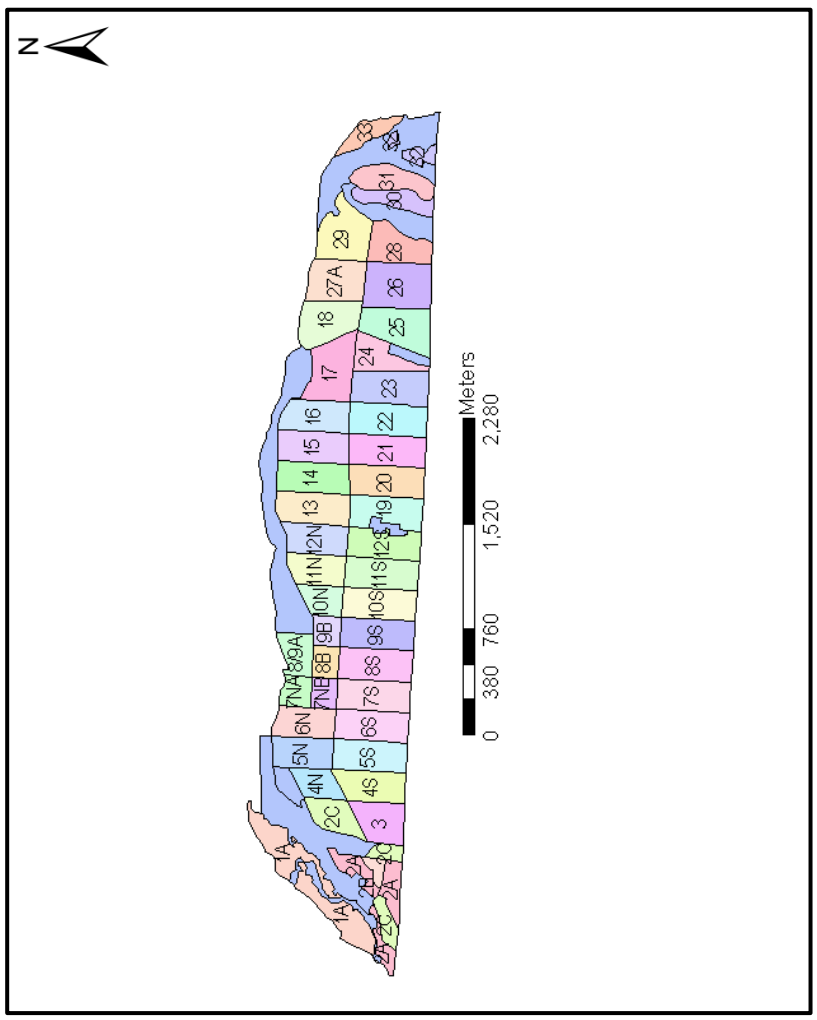
d. Shade Tree Density in Sections



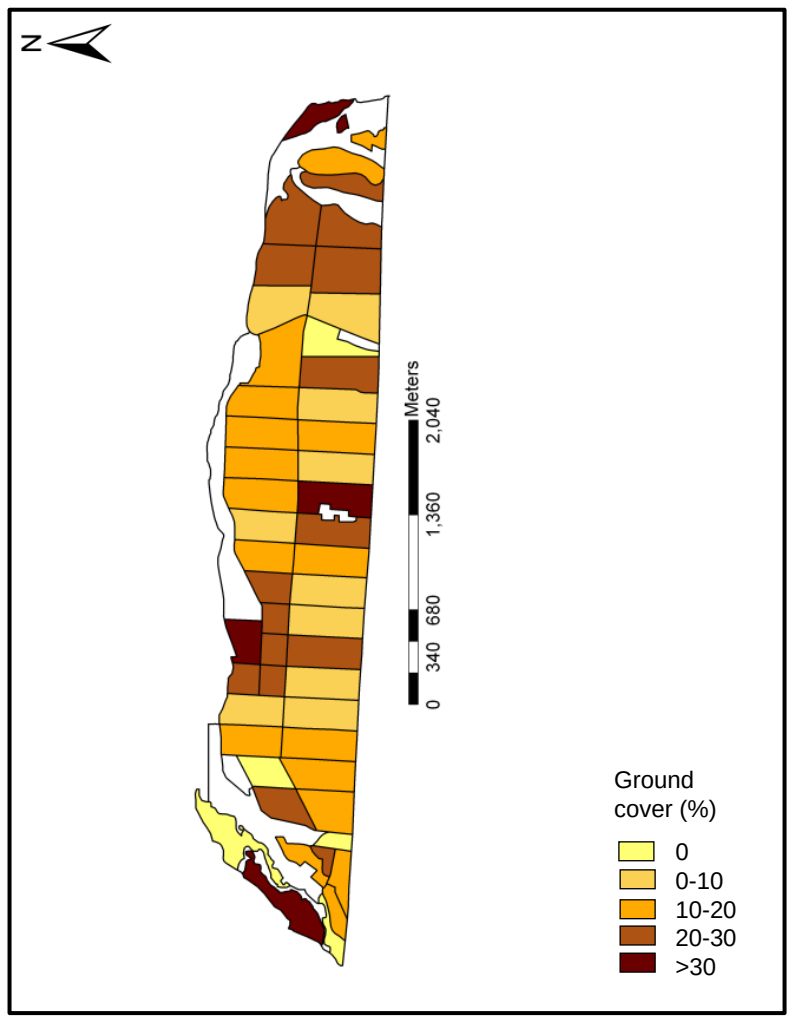
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

e. General Information

1. General	
Contact address	PO: Nagrakata, Dist: Jalpaiguri PIN: 735225
Contact phone	03565-270202 03565-270201
Name of the company	Goodricke Group Ltd.
Name of the village where it falls	Hope
Leased area of the estate (ha)	679.57
Tea grown area of the estate (ha)	432.12
No. of divisions / sections	0 div/48 sec
Year of establishment	1895
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)	Medium
Plant to plant spacing (m)	6.66 x 6.66
Row to row spacing (m)	6.66 x 6.66

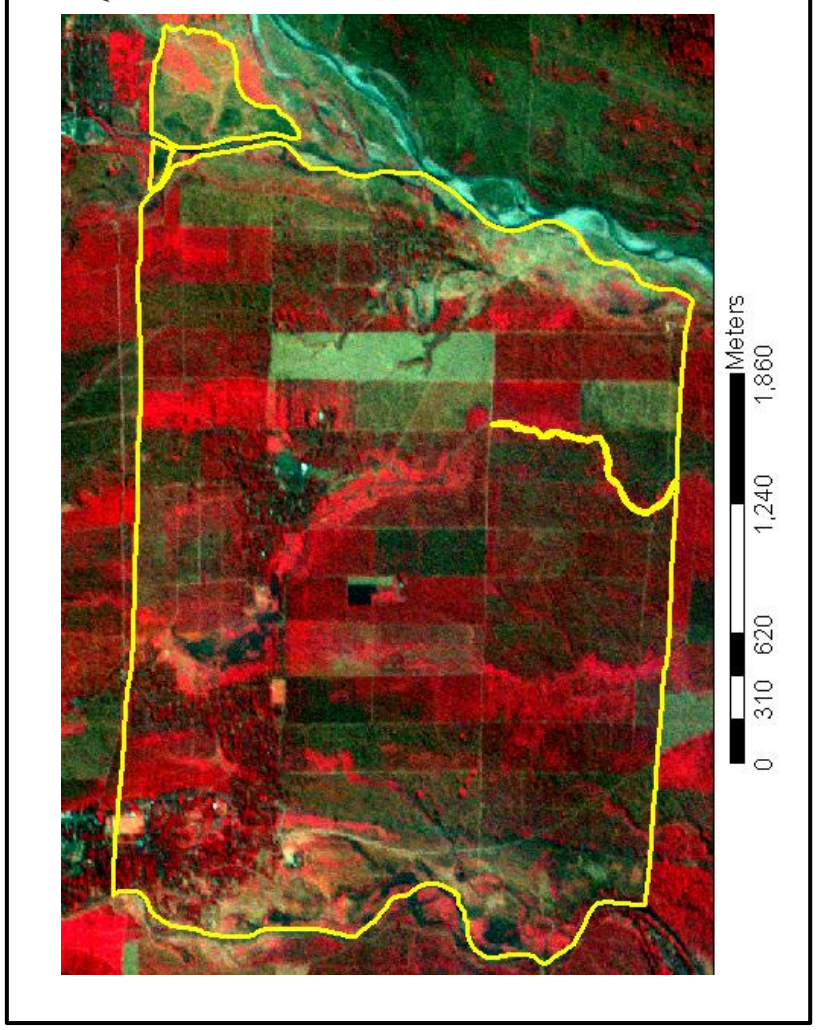
5. Natural resources constraints	
Drainage congestion and water logging	Yes
Scarcity of water during summer	Yes
River bank erosion	Yes
Major diseases and duration	--
Major pests and duration	*Helopeltis*, looper
Damage due to wildlife	Yes

6. Yield / production	
Peak plucking periods	Jun-Oct
Annual green leaf yield	7933.74 kg/ha
Annual production of processed tea	756807 kg

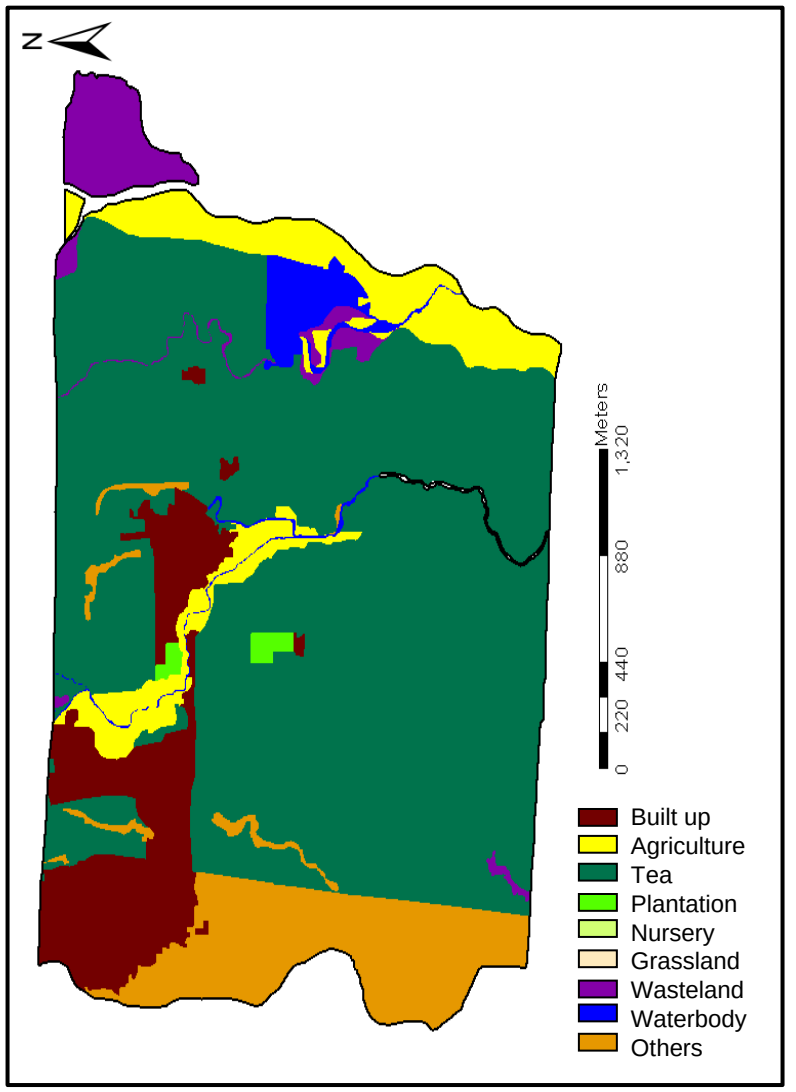
7. Pruning	
Time of pruning	End Nov-Early Jan
Pruning cycle	3 yr/4 yr
Types of pruning	LP-UP-DS/ LP-UP-DS-UP

8. Fertilizer use	
Types of N, P, K fertilizers used	Urea, RP, SSP, MOP
Dose of Nitrogen (kg/ha)	As per company guideline/TRA
Dose of Phosphorous (kg/ha)	As per company guideline/TRA
Dose of Potash (kg/ha)	As per company guideline/TRA
Whether lime is applied, if yes dose	If advised by TRA

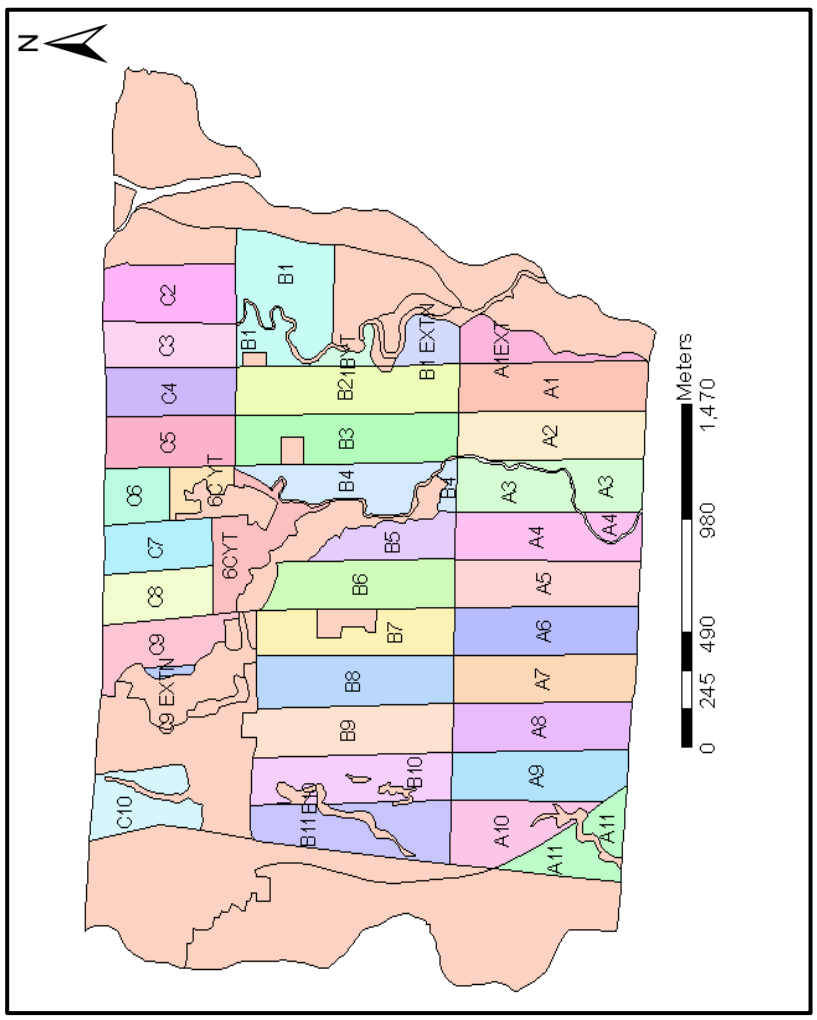
P53: INDGONG TE



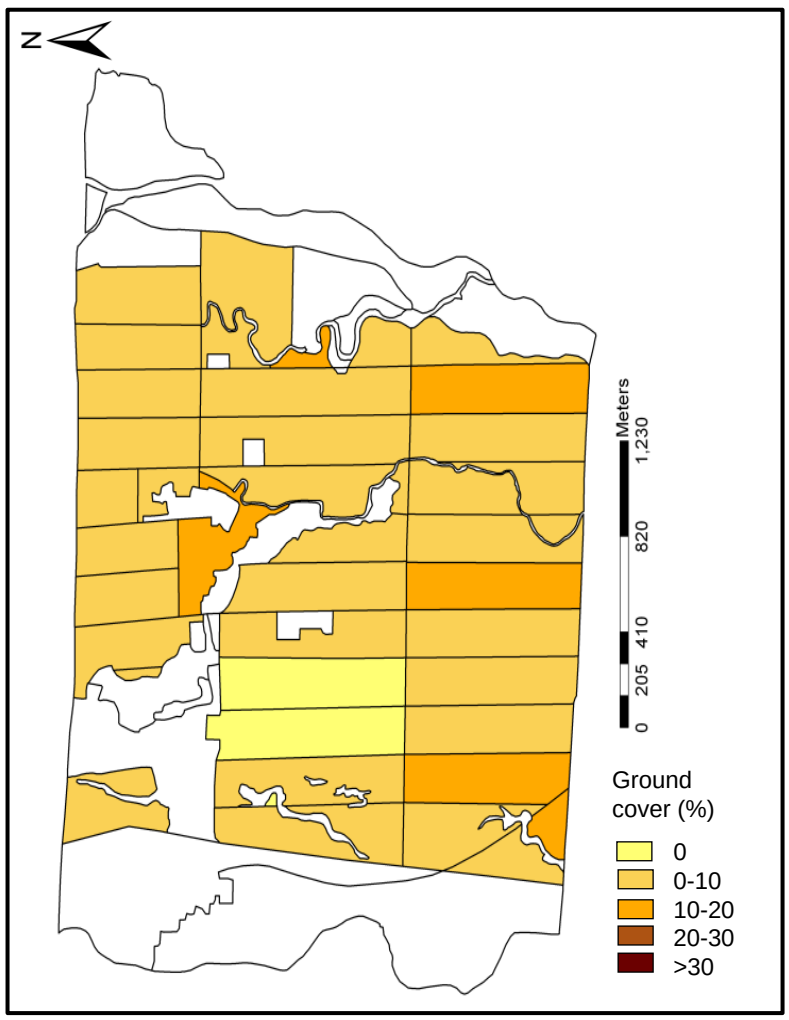
a. False Colour Composite of IRS LISS IV



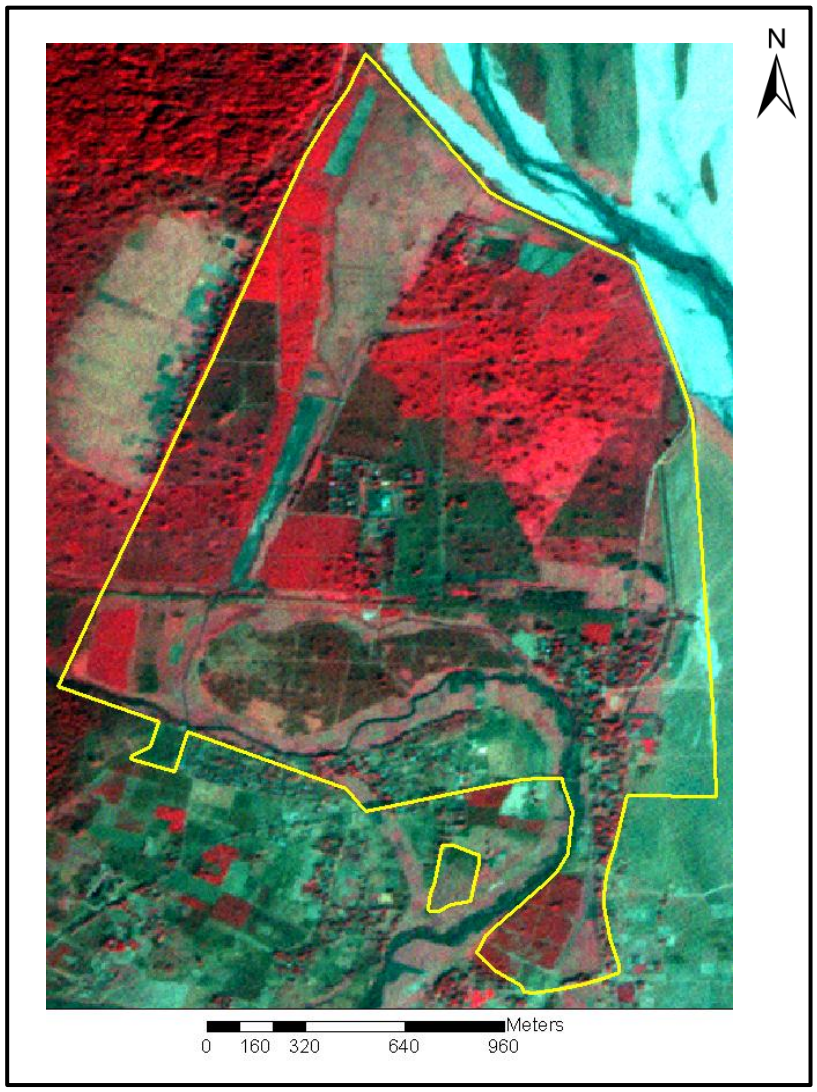
b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections



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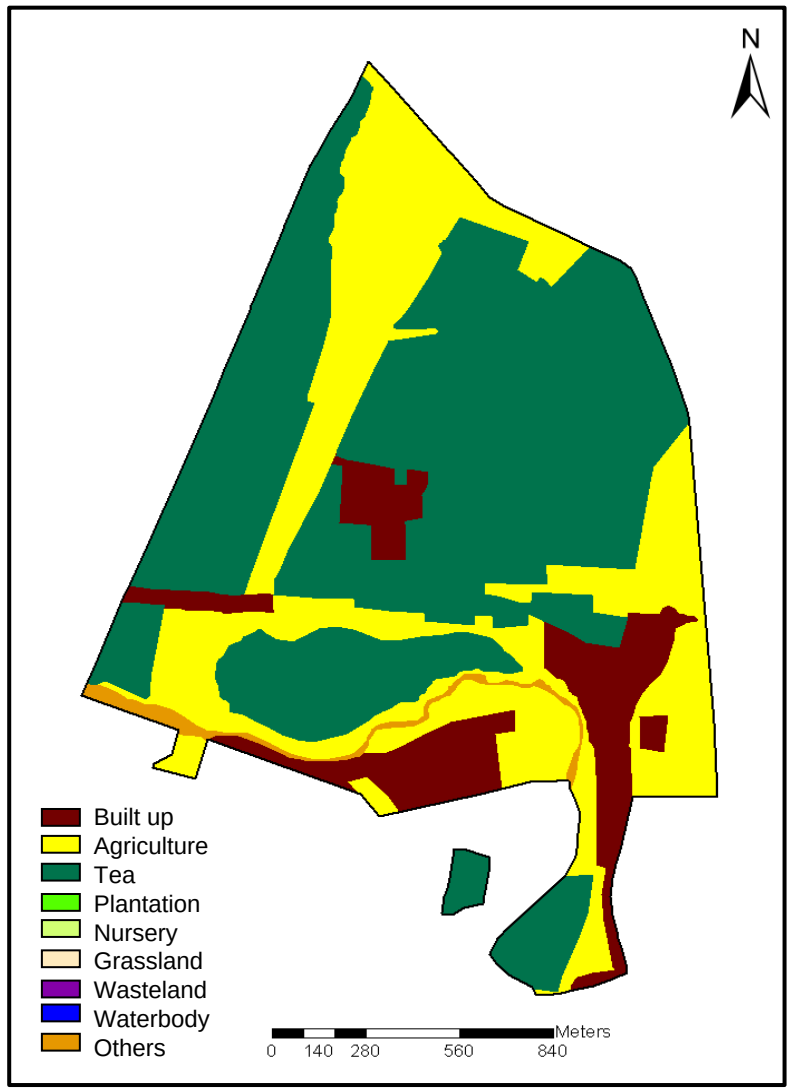
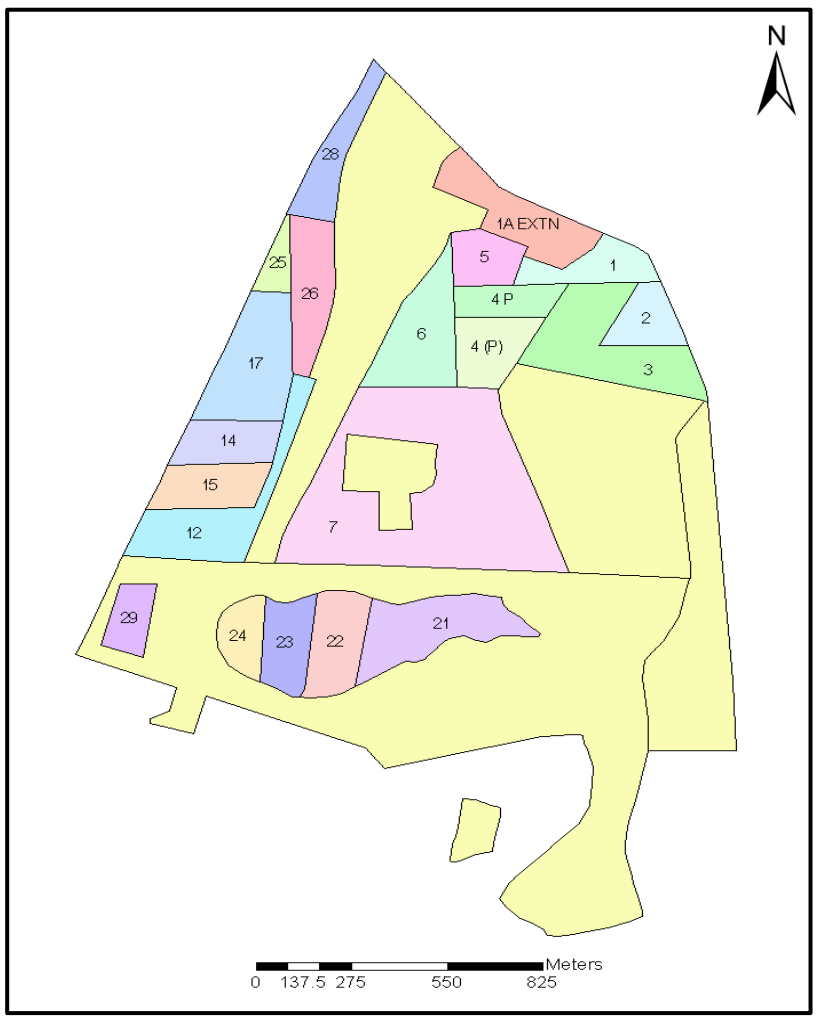
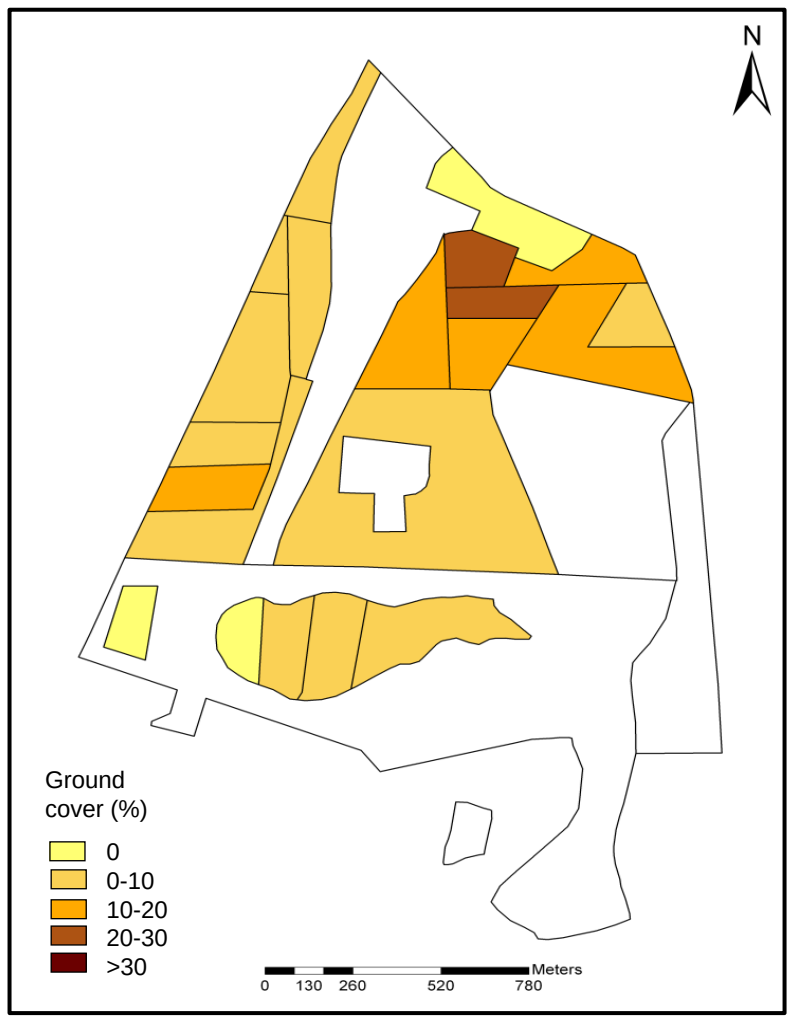


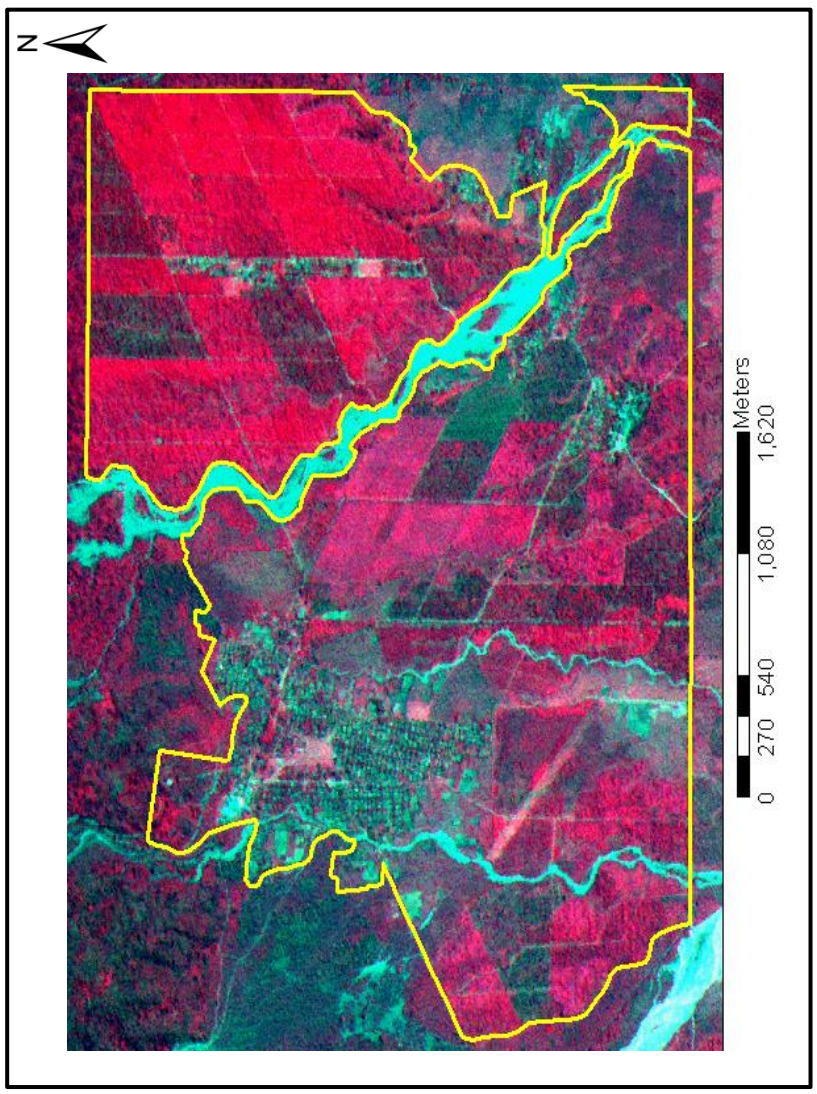
b. Tea Estate Landuse



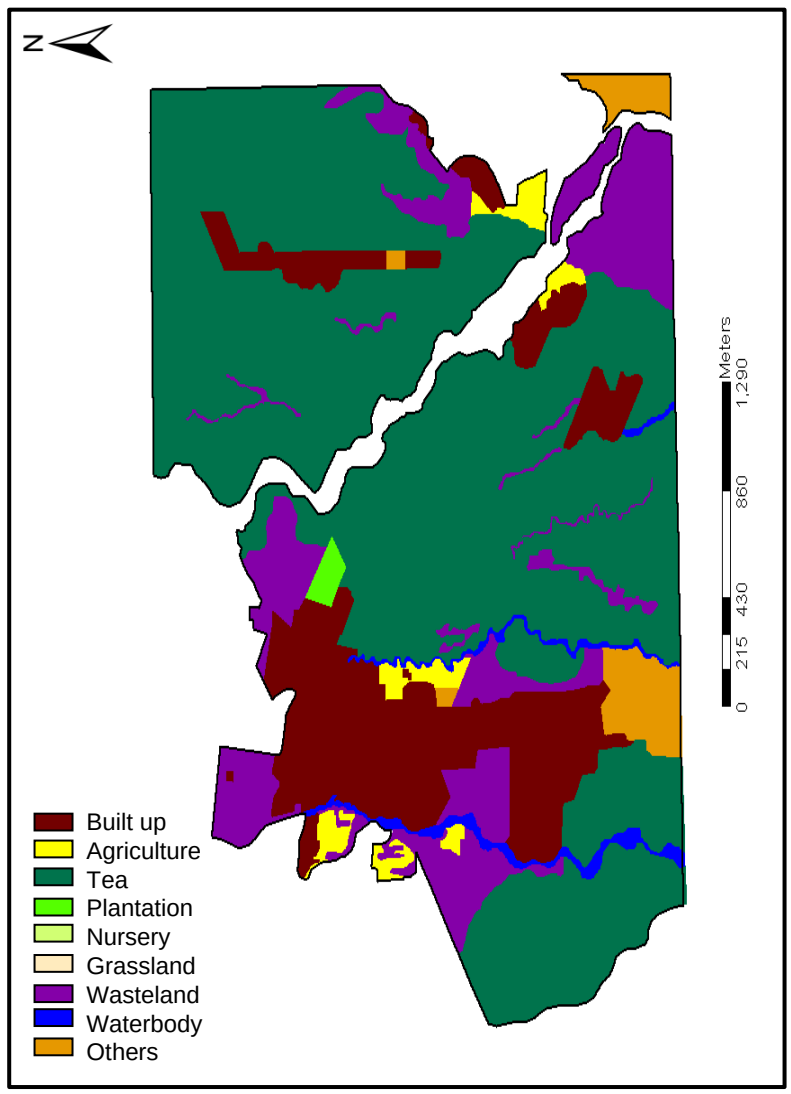
c. Section Boundaries of the Estate



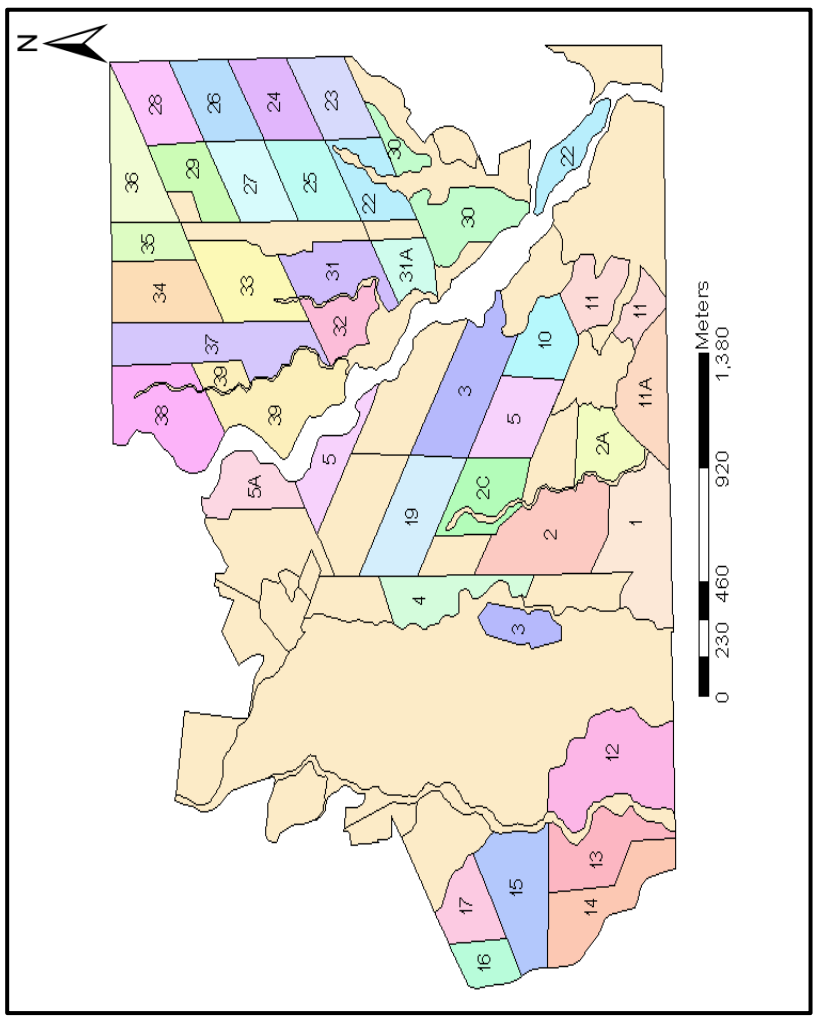
d. Shade Tree Density in Sections



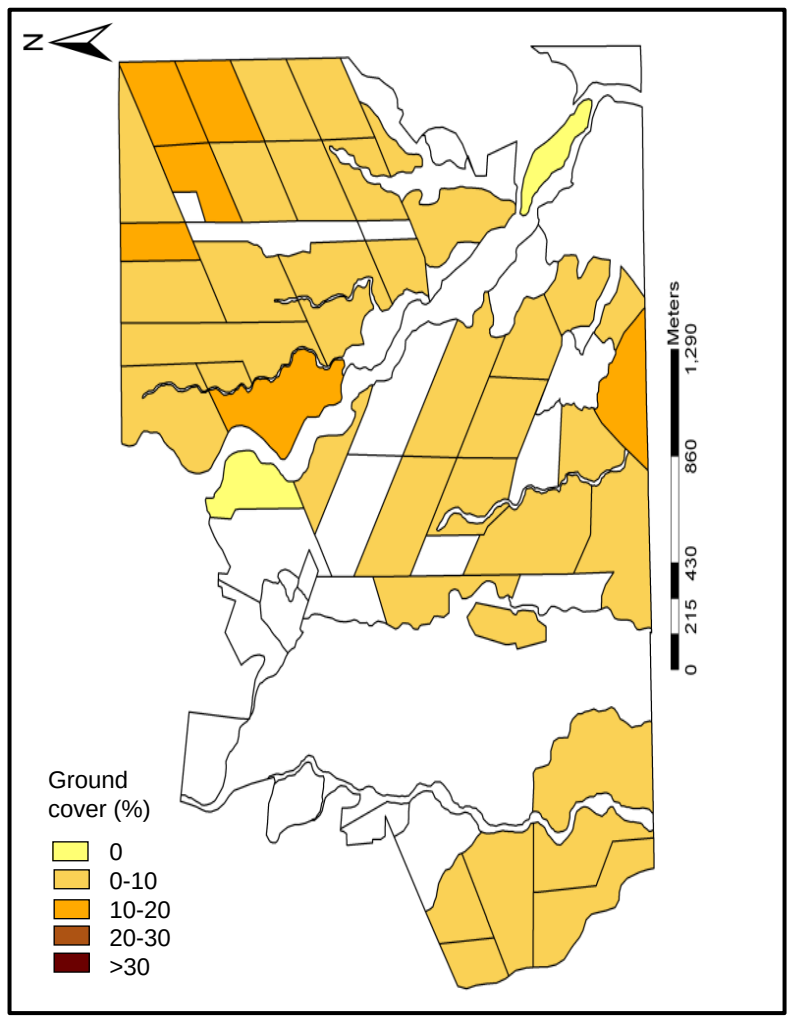
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

e. General Information

1. General	
Contact address	PO: Hatipotha, Dist: Jalpaiguri PIN: 736201
Contact phone	03562-282956, 09775496991, 09733422402, 09434707455
Name of the company	McLeod Russel India Ltd.
Name of the village where it falls	Hatipotha, Limbudhura
Leased area of the estate (ha)	827.51
Tea grown area of the estate (ha)	411.95
No. of divisions / sections	2 div/49 sec
Year of establishment / age	--
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 / jainti@wmg.co.in
Meteorological observations taken	Tmax, Tmin, Rainfall

3. Amenities	
Availability of health care / dispensary	Yes
Availability of school	Yes

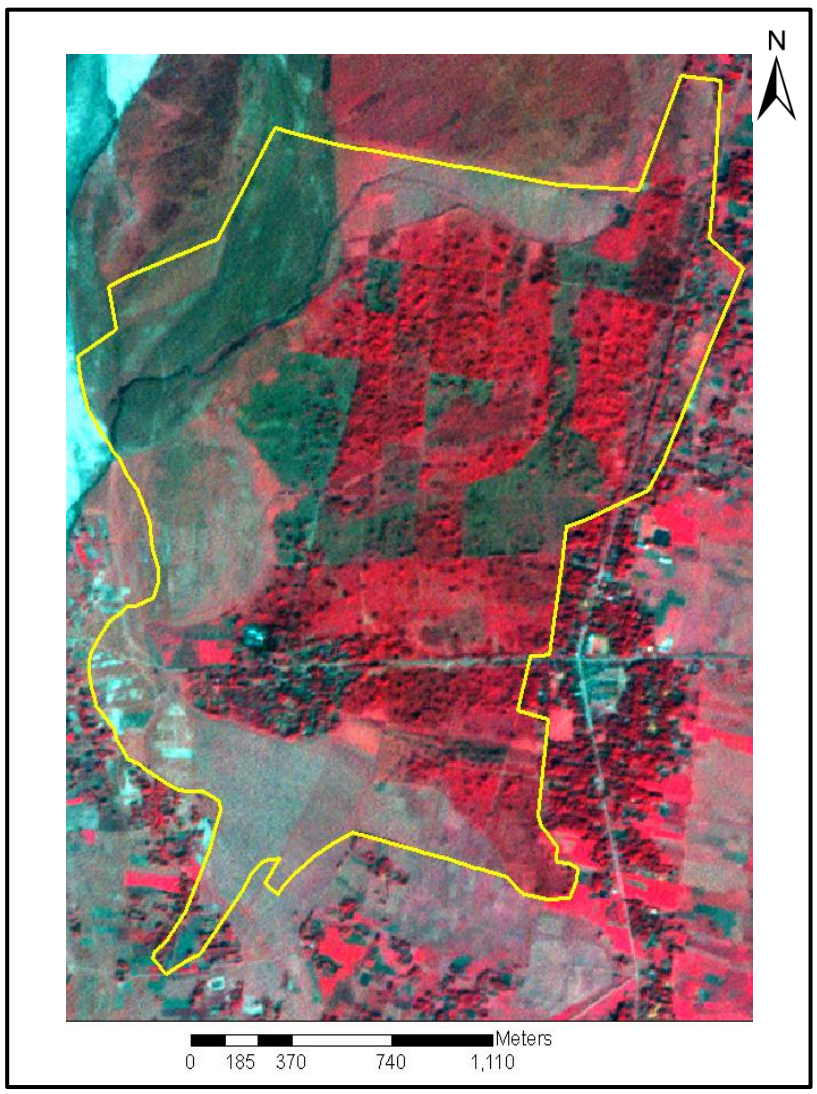
4. Shade trees	
Shade tree density (garden level)	Low-medium
Plant to plant spacing (m)	Variable
Row to row spacing (m)	Variable

5. Natural resources constraints	
Drainage congestion and water logging	No
Scarcity of water during summer	Yes
River bank erosion	Yes
Major diseases and duration	--
Major pests and duration	--
Damage due to wildlife	Yes

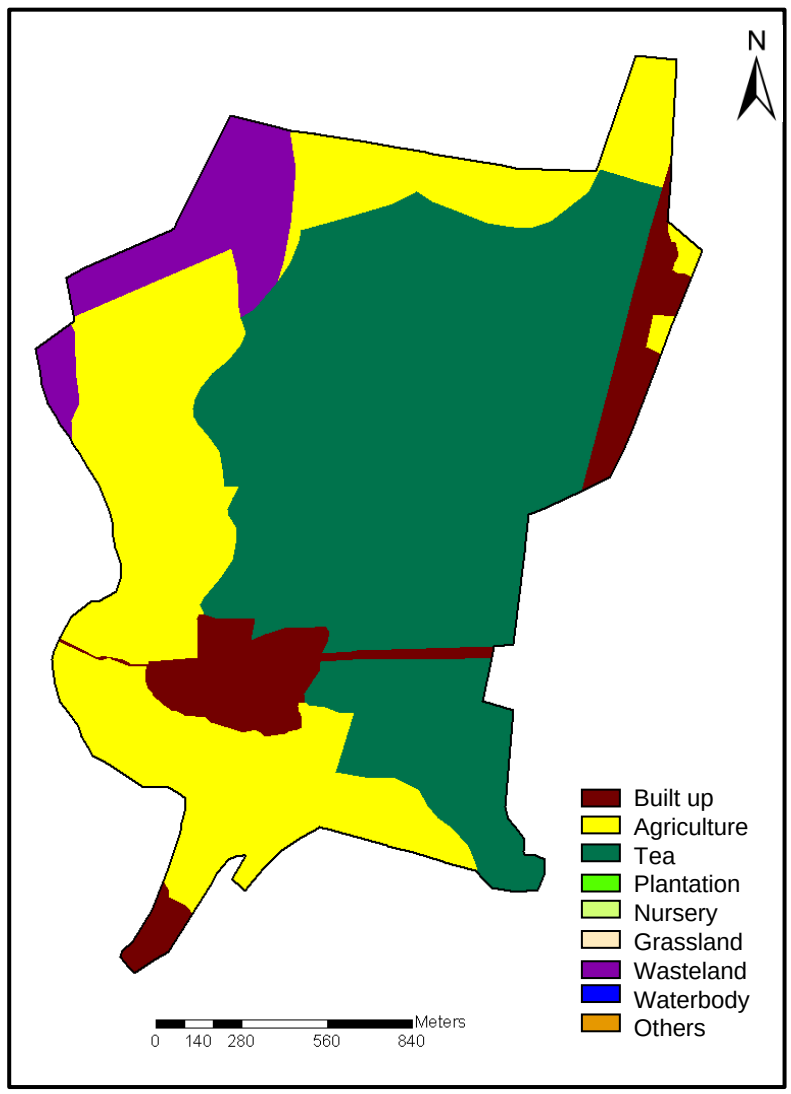
6. Yield / production	
Peak plucking periods	Jul-Sep
Annual green leaf yield	9235.12 kg/ha
Annual production of processed tea	845424 kg

7. Pruning	
Time of pruning	Dec-Feb
Pruning cycle	4 yrs
Types of pruning	--

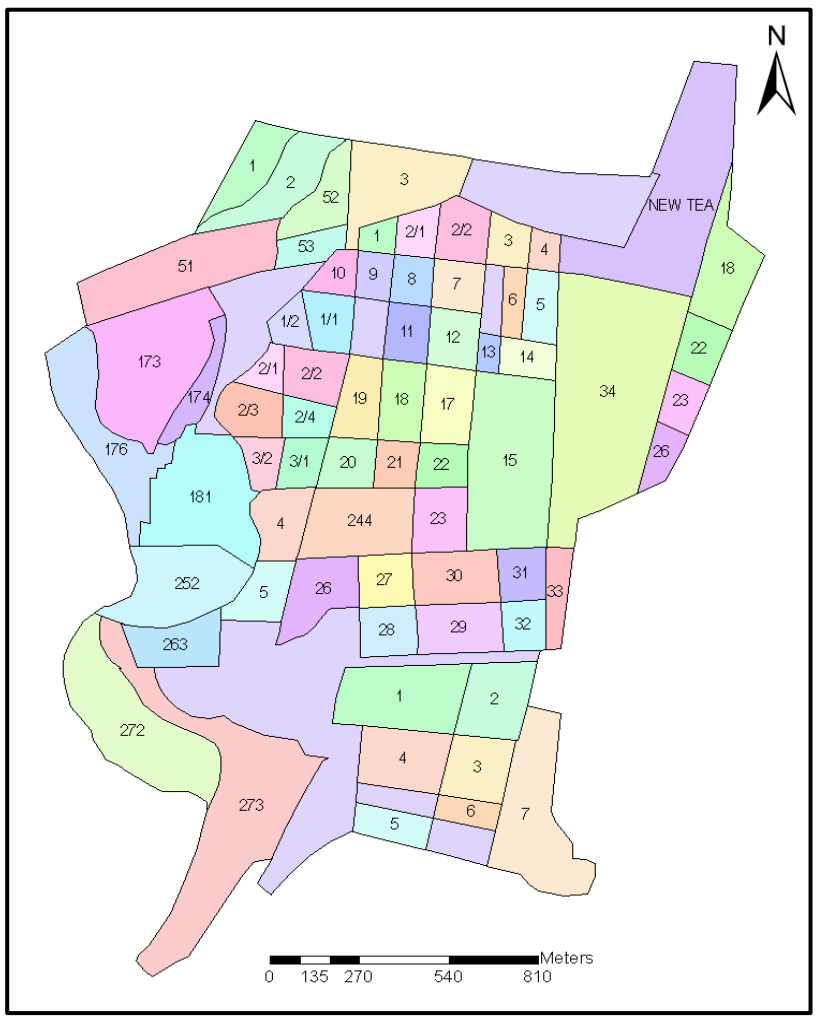
8. Fertilizer use	
Types of N, P, K fertilizers used	Urea, RP, MOP
Dose of Nitrogen (kg/ha)	120
Dose of Phosphorous (kg/ha)	20
Dose of Potash (kg/ha)	25
Whether lime is applied, if yes dose	No



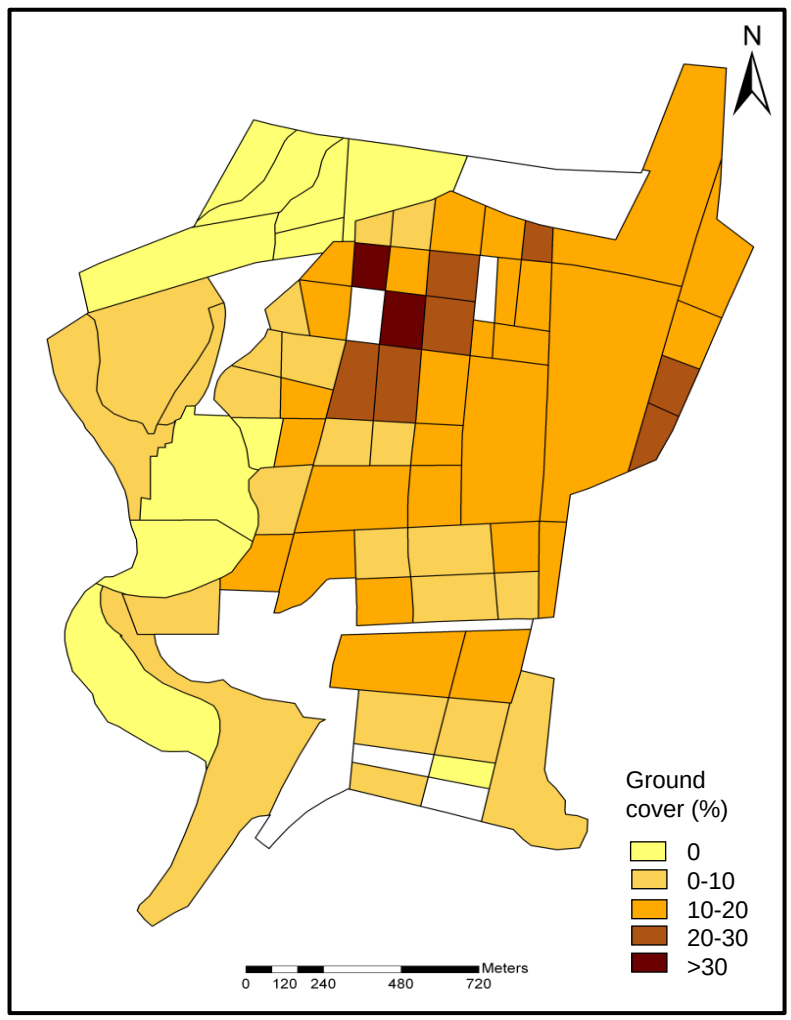
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

e. General Information

1. General	
Contact address	PO: Nathuahat, Dist: Jalpaiguri
Contact phone	03563-246045, 03563-246047, 09774938986
Name of the company	Jaldacca Tea Plantation Pvt. Ltd.
Name of the village where it falls	Nathuahat
Leased area of the estate (ha)	405.37
Tea grown area of the estate (ha)	192.47
No. of divisions / sections	1 div/55 sec
Year of establishment	1910
Type of tea produced	Green tea, orthodox

2. Infrastructure	
Availability of processing factory	Yes
Availability of workers colony	Yes
Availability of internet facility / e-mail id	No
Meteorological observations taken	No

3. Amenities	
Availability of health care / dispensary	Yes
Availability of school	Yes

4. Shade trees	
Shade tree density (garden level)	Low
Plant to plant spacing (m)	6.66 x 6.66
Row to row spacing (m)	6.66 x 6.66

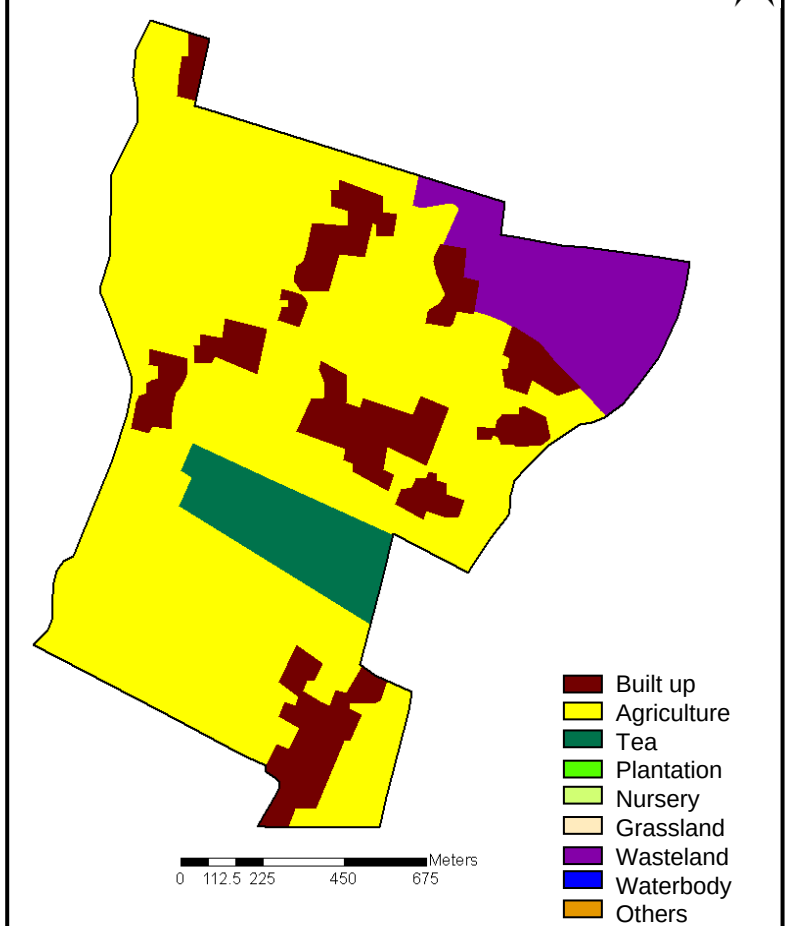
5. Natural resources constraints	
Drainage congestion and water logging	Yes
Scarcity of water during summer	Yes
River bank erosion	Yes
Major diseases and duration	--
Major pests and duration	*Helopeltis*, looper, RSM
Damage due to wildlife	No

6. Yield / production	
Peak plucking periods	Apr-Nov
Annual green leaf yield	4576.76 kg/ha
Annual production of processed tea	220752 kg

7. Pruning	
Time of pruning	Dec–Jan
Pruning cycle	4 yr
Types of pruning	--

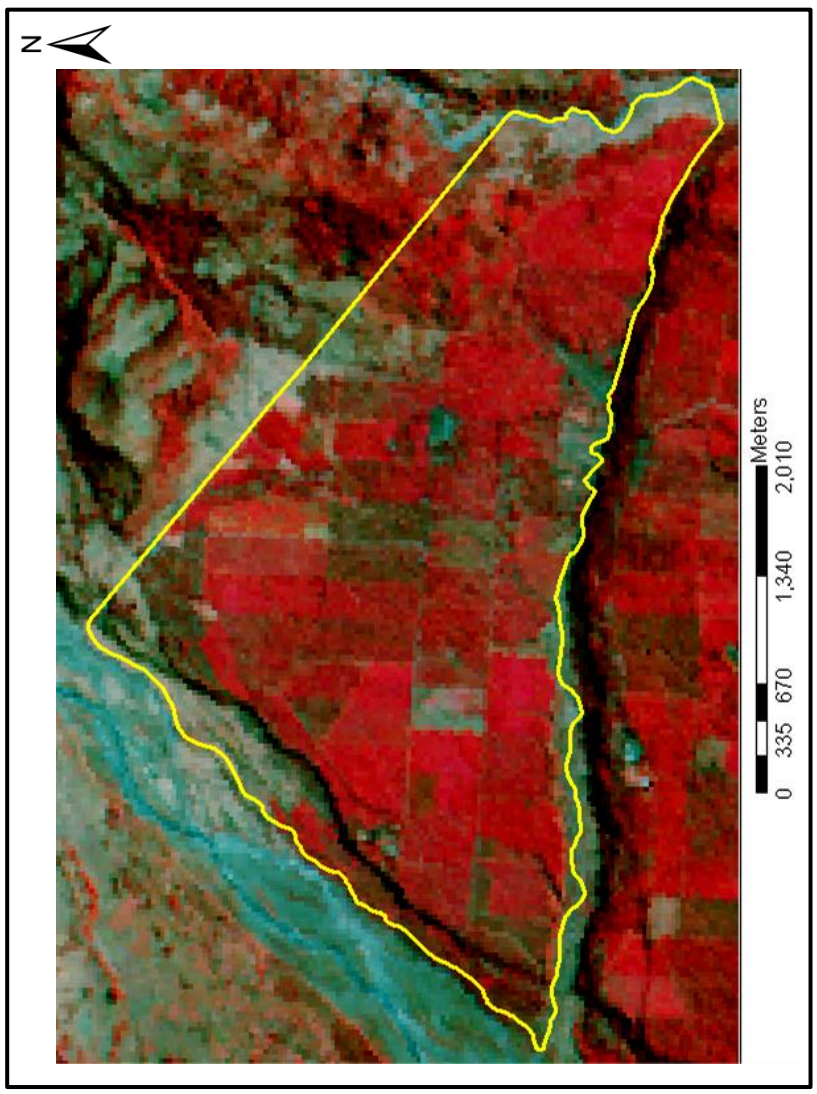
8. Fertilizer use	
Types of N, P, K fertilizers used	Urea, RP, MOP
Dose of Nitrogen (kg/ha)	135
Dose of Phosphorous (kg/ha)	200
Dose of Potash (kg/ha)	135
Whether lime is applied, if yes dose	No

a. False Colour Composite of IRS LISS IV

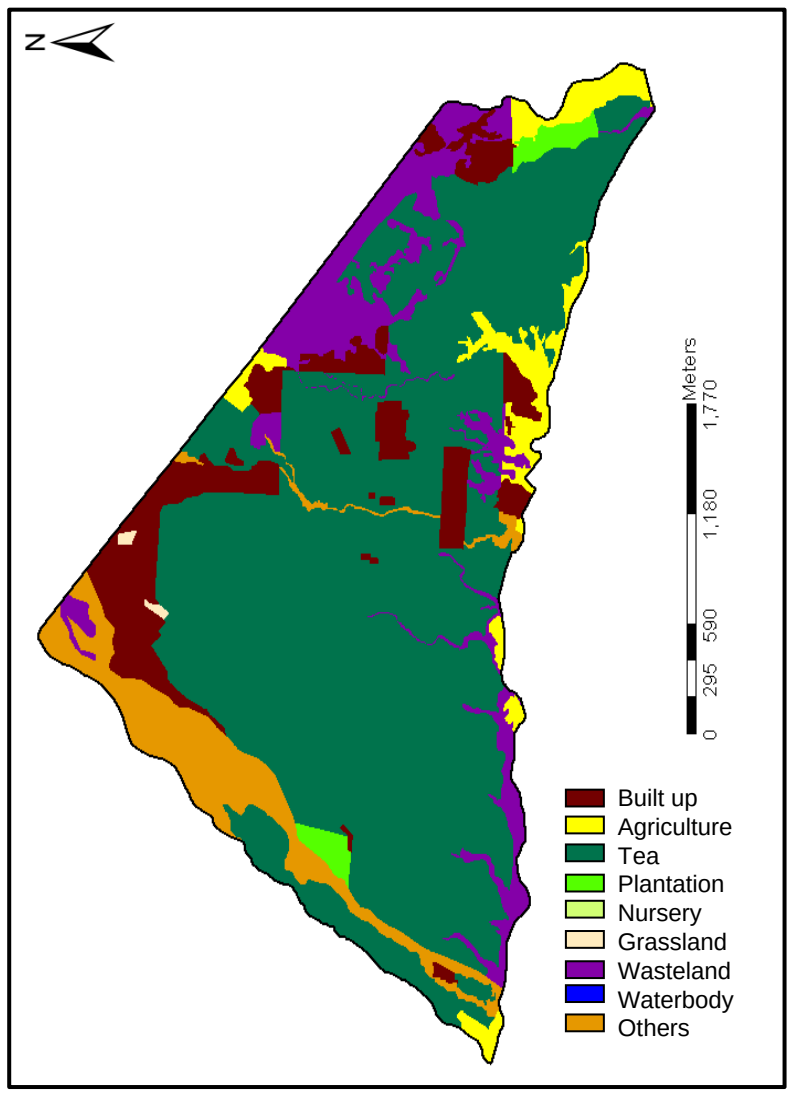


b. Tea Estate Landuse

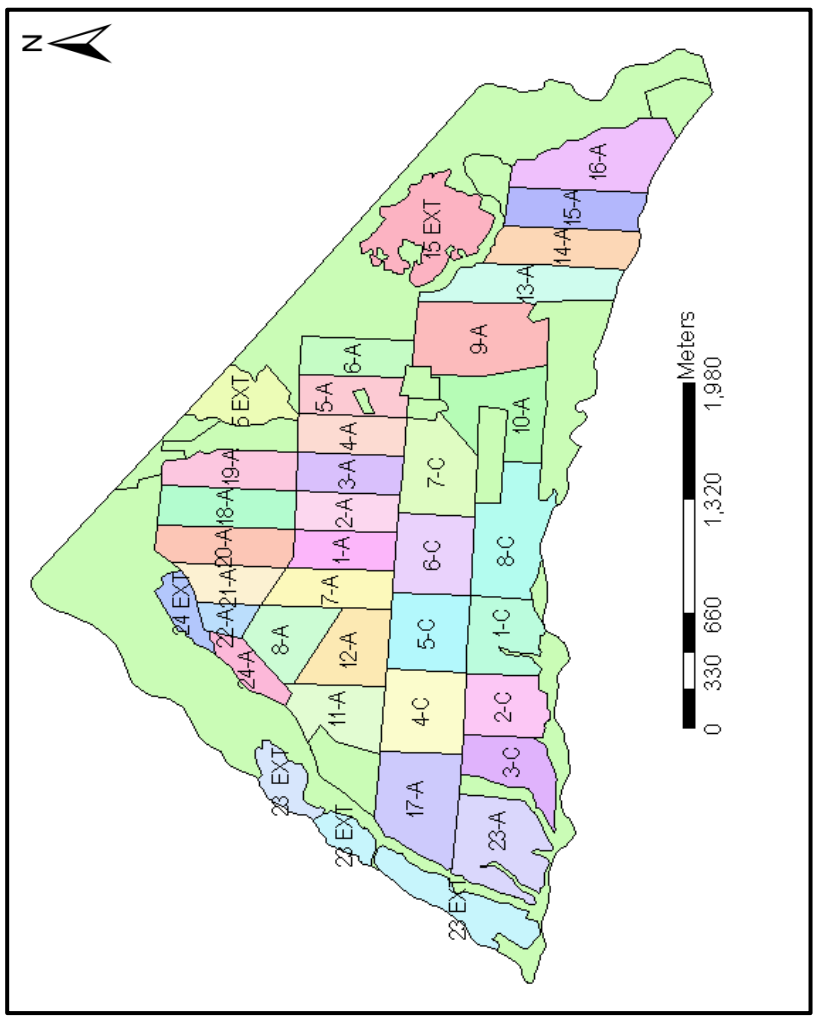
The tea estate does not have any sections and hence shade tree density was not analyzed



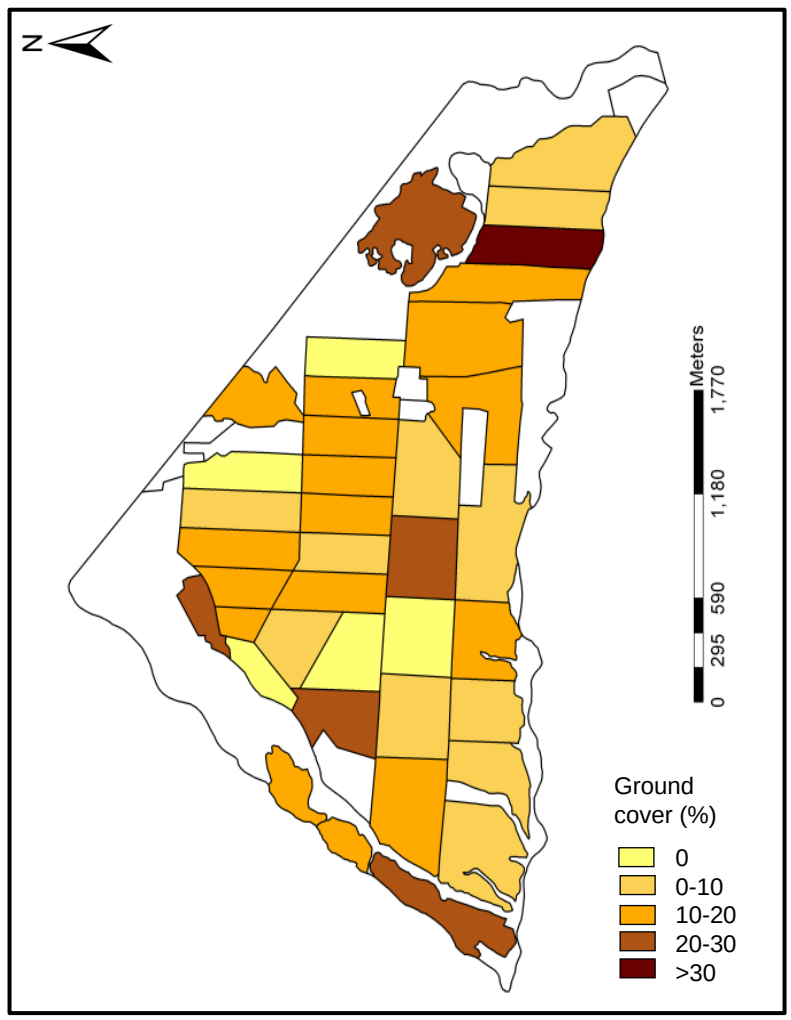
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate

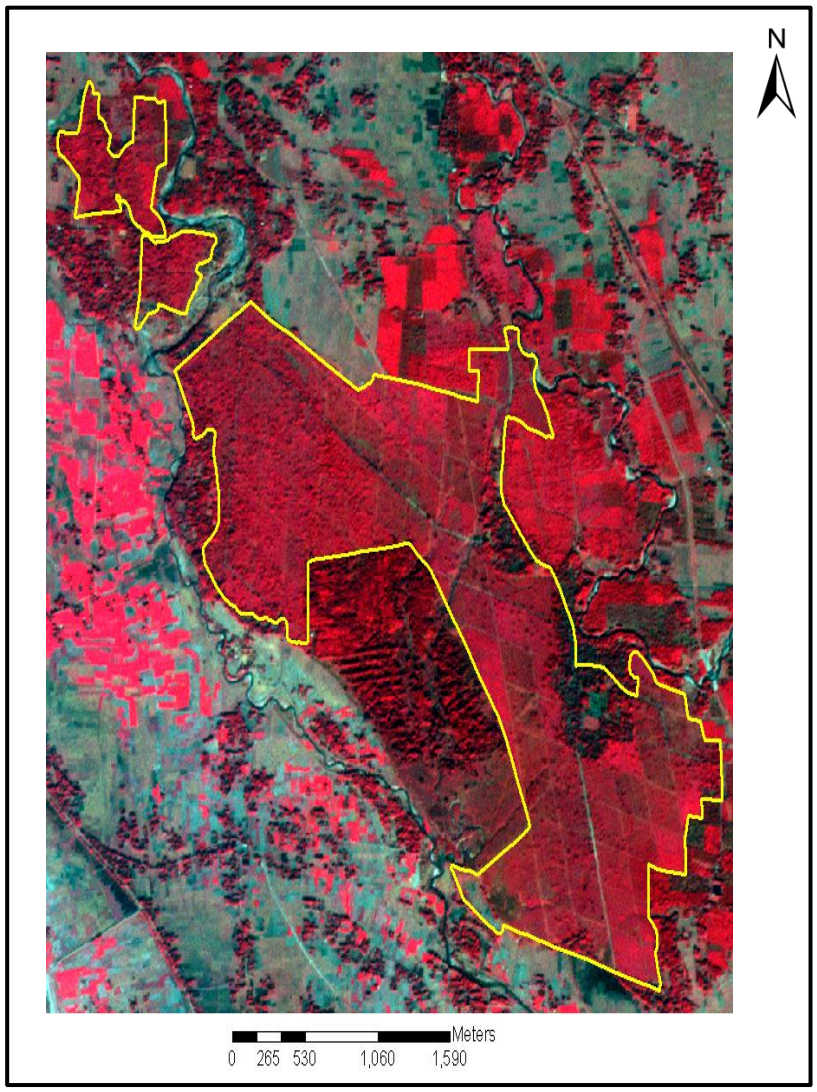


d. Shade Tree Density in Sections

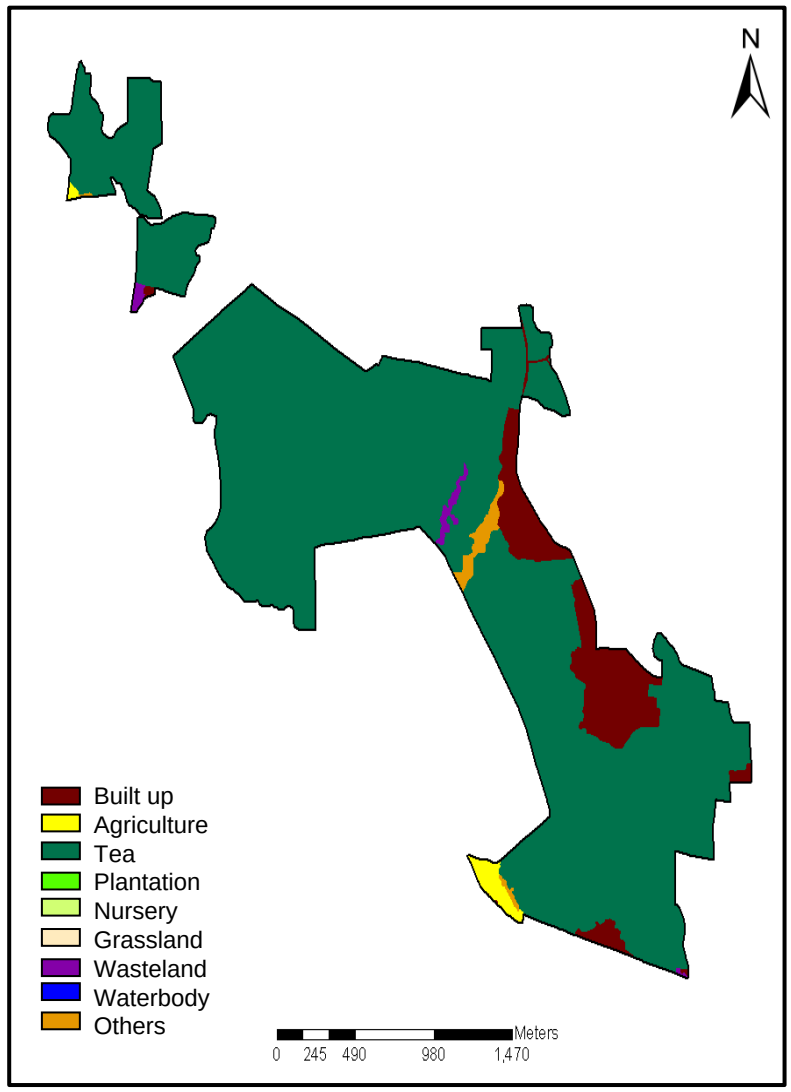
e. General Information

1. General	
Contact address	P.O: Nagrakata, Dist: Jalpaiguri PIN: 735225
Contact phone	03565-270219
Name of the company	Goodricke Group Limited
Name of the village where it falls	Thaljhora
Leased area of the estate (ha)	934.46
Tea grown area of the estate (ha)	580.23
No. of divisions / sections	2 div/57sec
Year of establishment	1878
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)	6.33 x 13.33
Row to row spacing (m)	13.33 x 13.33

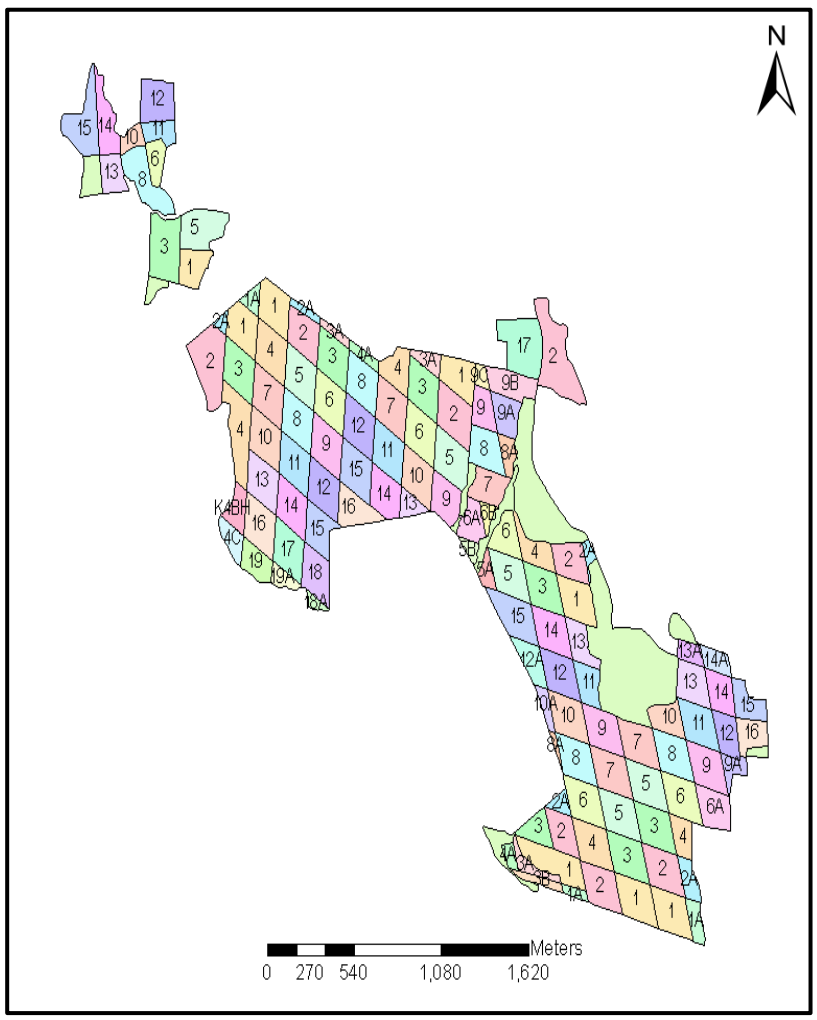
5. Natural resources constraints	
Drainage congestion and water logging	Yes
Scarcity of water during summer	Yes
River bank erosion	Yes
Major diseases and duration	Black Rot (monsoon), Red Slug (monsoon)
Major pests and duration	Looper (6-months), *Helopeltis* (8-months), thrips (4-months), greenfly (4-months), RSM (6-months)
Damage due to wildlife	Yes
6. Yield / production	
Peak plucking periods	Jul-Oct
Annual green leaf yield	3149.44 kg/ha
Annual production of processed tea	815333 kg
7. Pruning	
Time of pruning	20th Nov-15thJan
Pruning cycle	--
Types of pruning	LP-UP-MS/DS-UP
8. Fertilizer use	
Types of N, P, K fertilizers used	Urea, RP, SSP, MOP
Dose of Nitrogen (kg/ha)	370 kg
Dose of Phosphorous (kg/ha)	184 kg
Dose of Potash (kg/ha)	280 kg
Whether lime is applied, if yes dose	4 kg/ha, W.soda 24 kg/ha



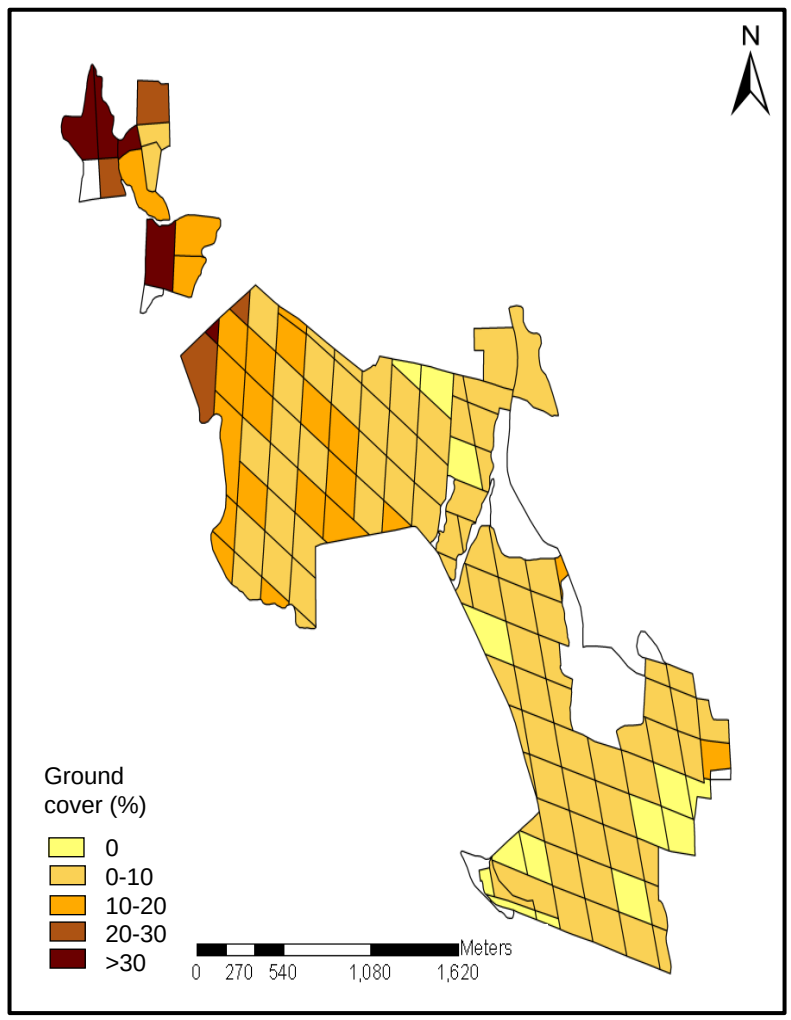
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

e. General Information

1. General	
Contact address	PO: Malihat, Dist: Jalpaiguri
Contact phone	9609967477
Name of the company	Malhati Tea and Industries Ltd.
Name of the village where it falls	Malhati
Leased area of the estate (ha)	577.11
Tea grown area of the estate (ha)	463.39
No. of divisions / sections	2 div/117 sec
Year of establishment	1927
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 (primary)

4. Shade trees	
Shade tree density (garden level)	Low
Plant to plant spacing (m)	13.33 x 13.33
Row to row spacing (m)	13.33 x 13.33

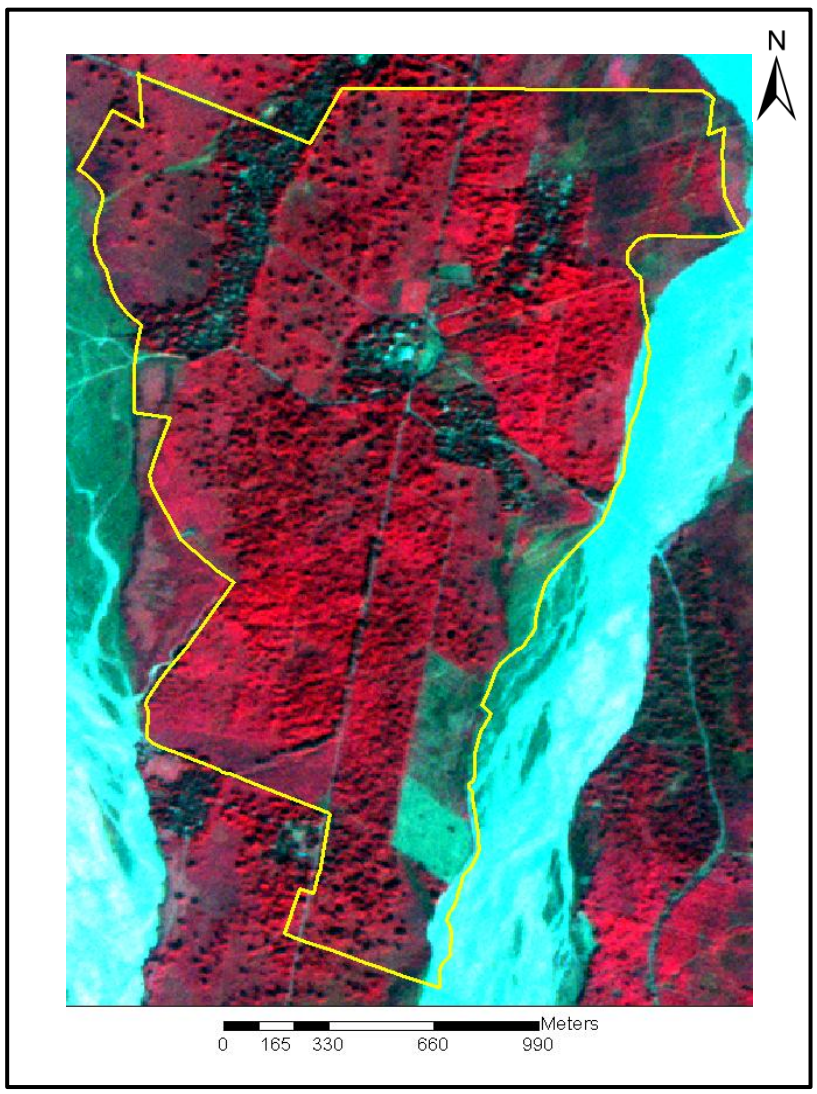
5. Natural resources constraints	
Drainage congestion and water logging	Yes
Scarcity of water during summer	Yes
River bank erosion	No
Major diseases and duration	Red rust, black rot
Major pests and duration	RSM, looper, *Helopeltis*
Damage due to wildlife	Yes

6. Yield / production	
Peak plucking periods	May-Oct
Annual green leaf yield	5395 kg/ha
Annual production of processed tea	550000 kg

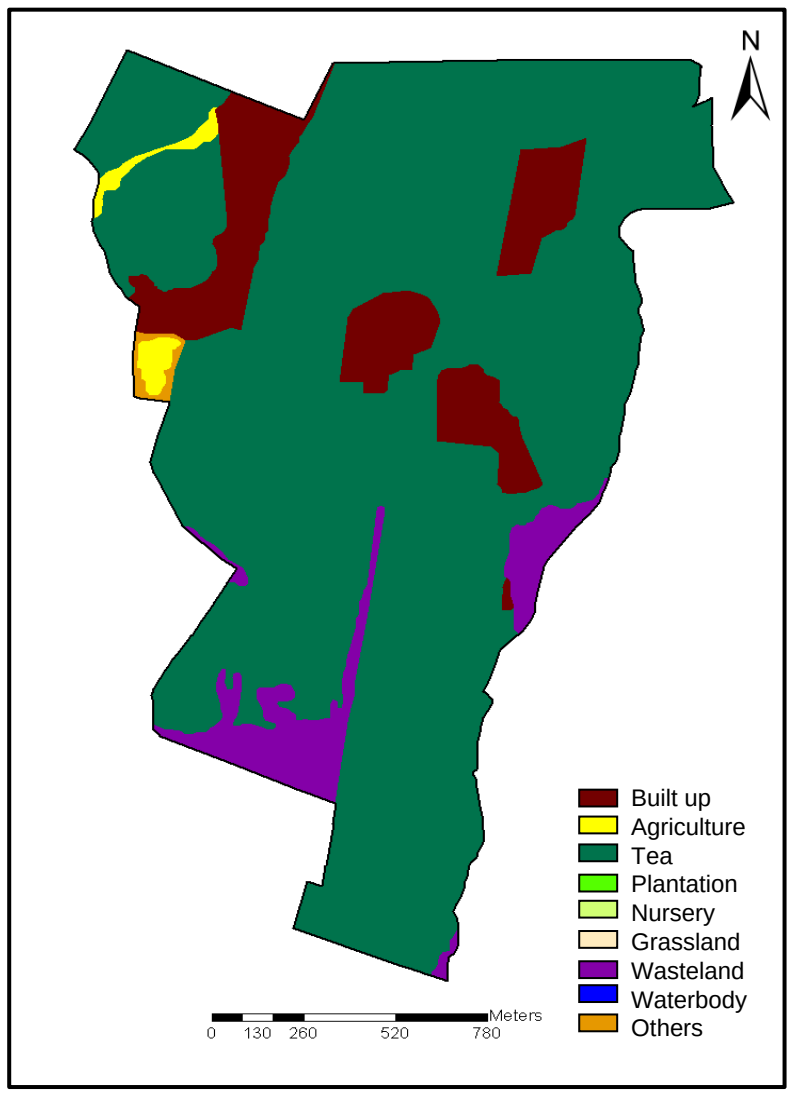
7. Pruning	
Time of pruning	Dec-Feb
Pruning cycle	4 yrs
Types of pruning	LP-UP-DS/MS-UP

8. Fertilizer use	
Types of N, P, K fertilizers used	Urea, RP, MOP, SSP
Dose of Nitrogen (kg/ha)	90-120
Dose of Phosphorous (kg/ha)	70-80
Dose of Potash (kg/ha)	60-90
Whether lime is applied, if yes dose	No

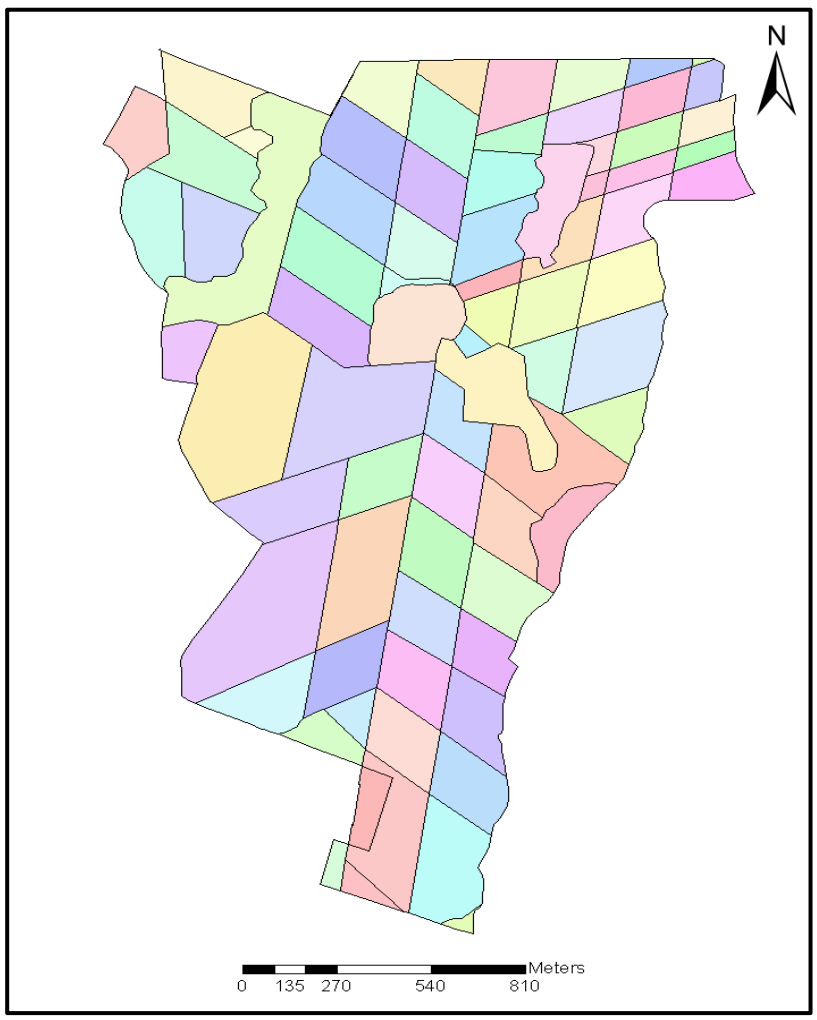
P60: JOYBIRPARA TE



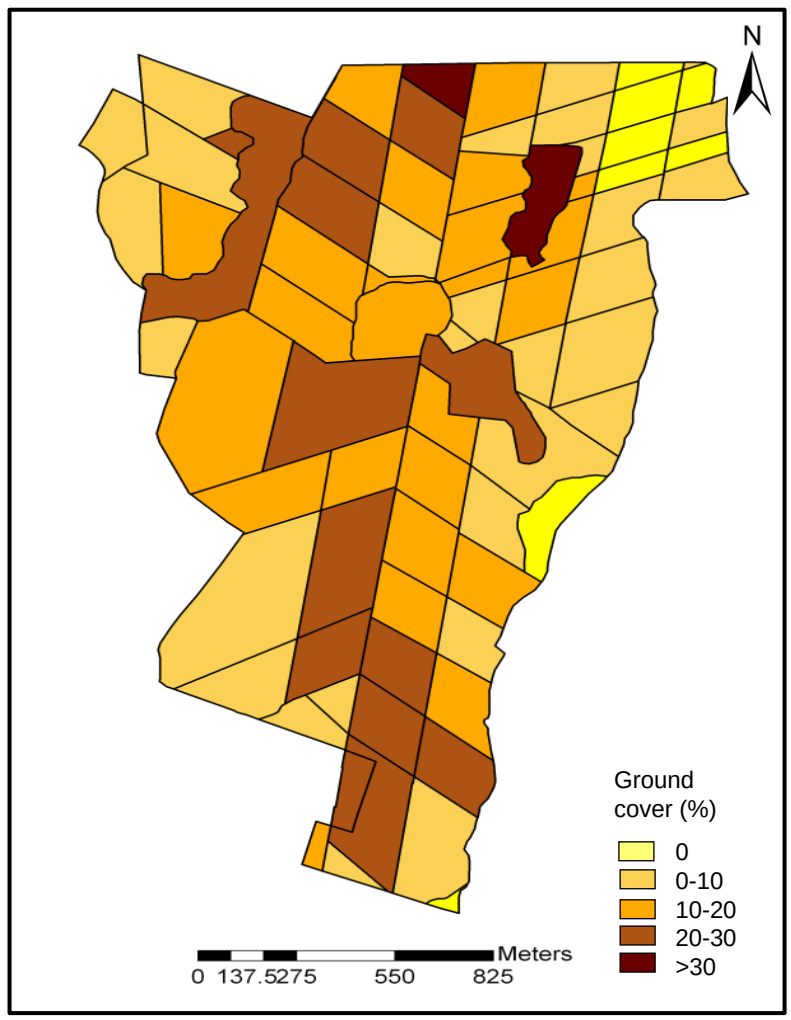
a. False Colour Composite of IRS LISS IV



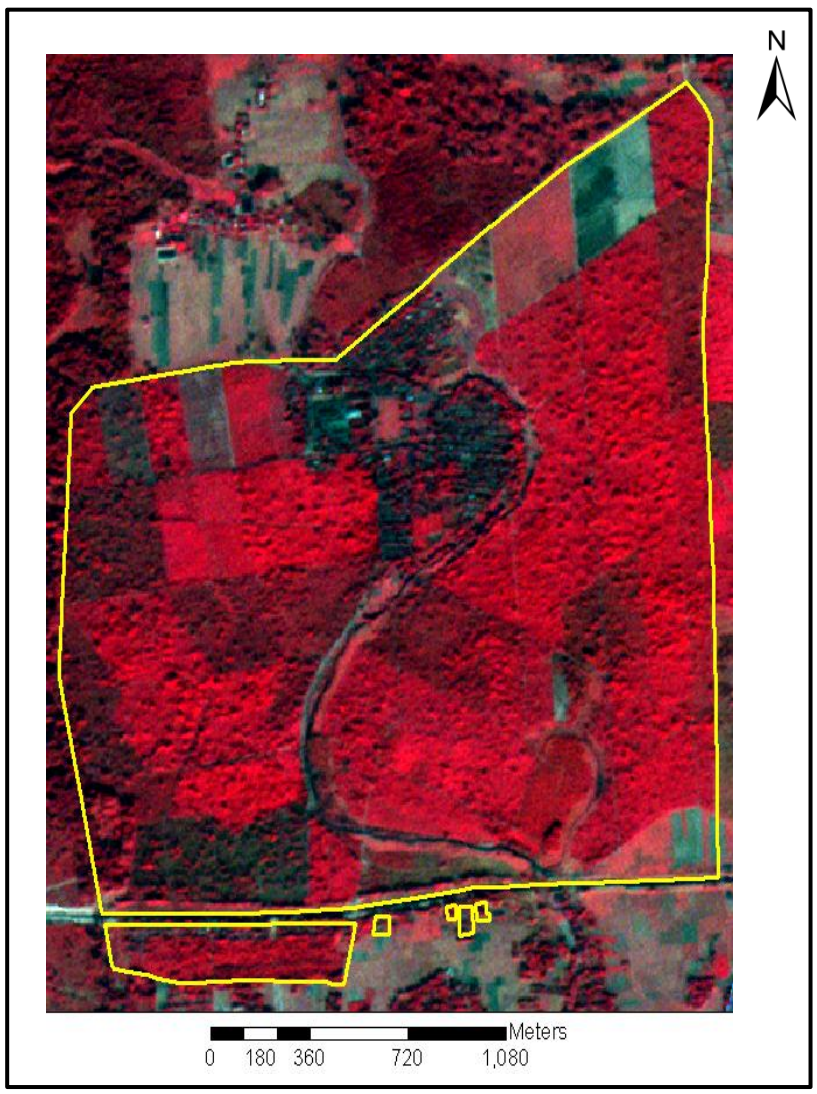
b. Tea Estate Landuse



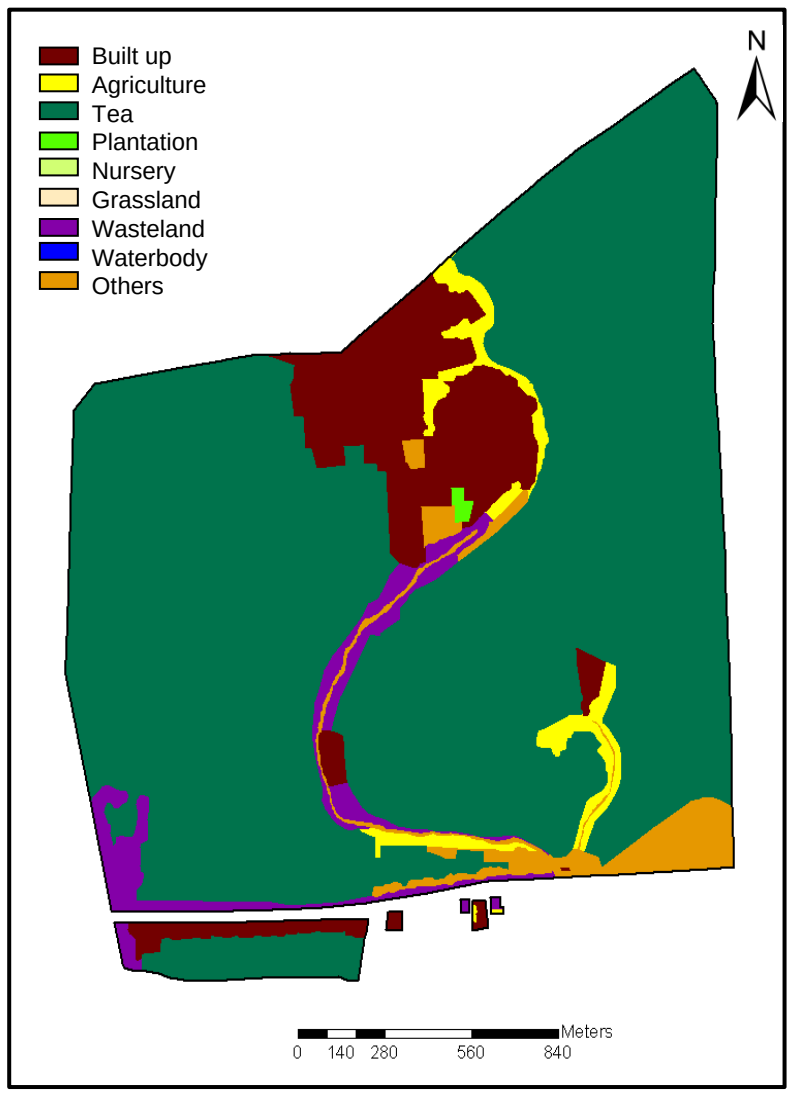
c. Section Boundaries of the Estate



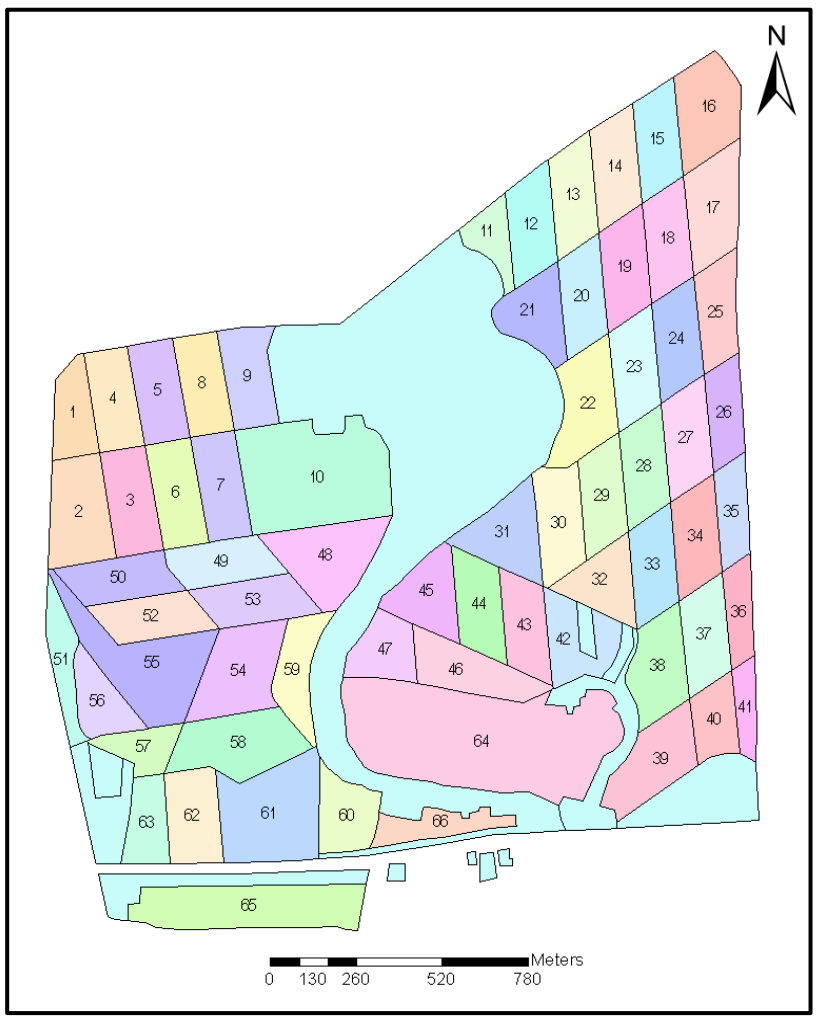
d. Shade Tree Density in Sections



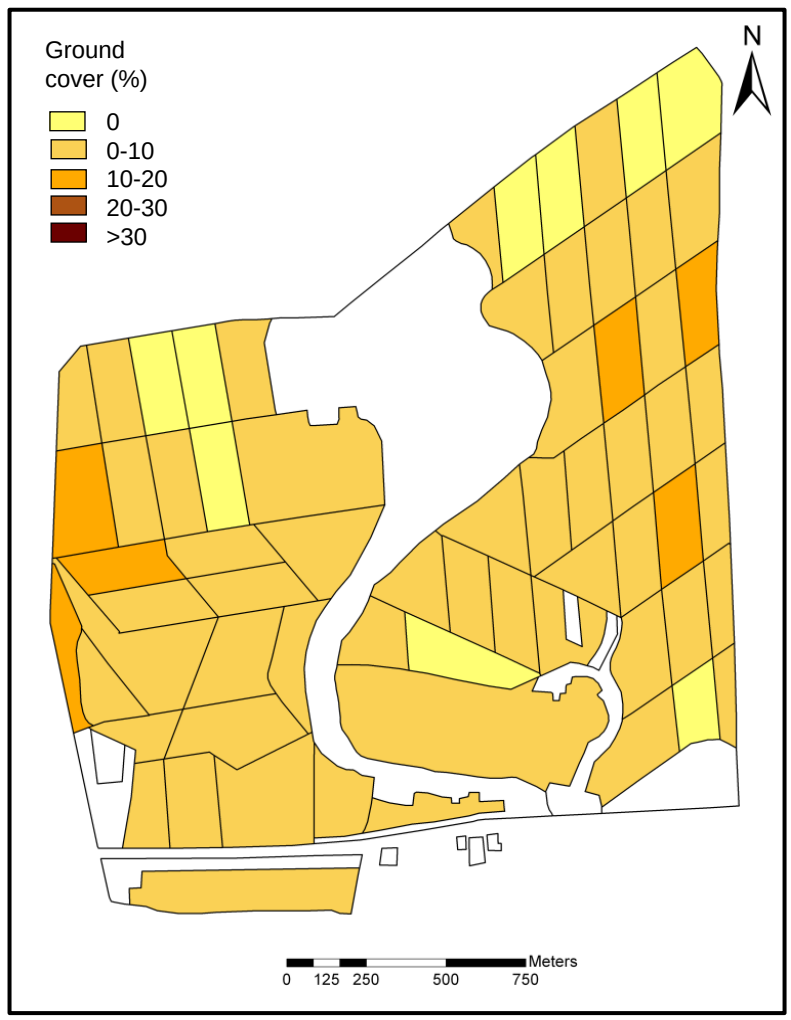
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

e. General Information

1. General	
Contact address	P.O: Kailashpur, Dist: Jalpaiguri PIN: 735218
Contact phone	03561-282296, 9233537377
Name of the company	The Friends Tea Company Ltd.
Name of the village where it falls	Rajadanga
Leased area of the estate (ha)	285.02
Tea grown area of the estate (ha)	294.54
No. of divisions / sections	0 div/66 Sec
Year of establishment	1944
Type of tea produced	CTC, Green Tea

2. Infrastructure	
Availability of processing factory	Yes
Availability of workers colony	Yes
Availability of internet facility / e-mail id	Yes, kpte.jal@gmail.com
Meteorological observations taken	Tmax, Tmin, Rainfall

3. Amenities	
Availability of health care / dispensary	Yes
Availability of school	Yes

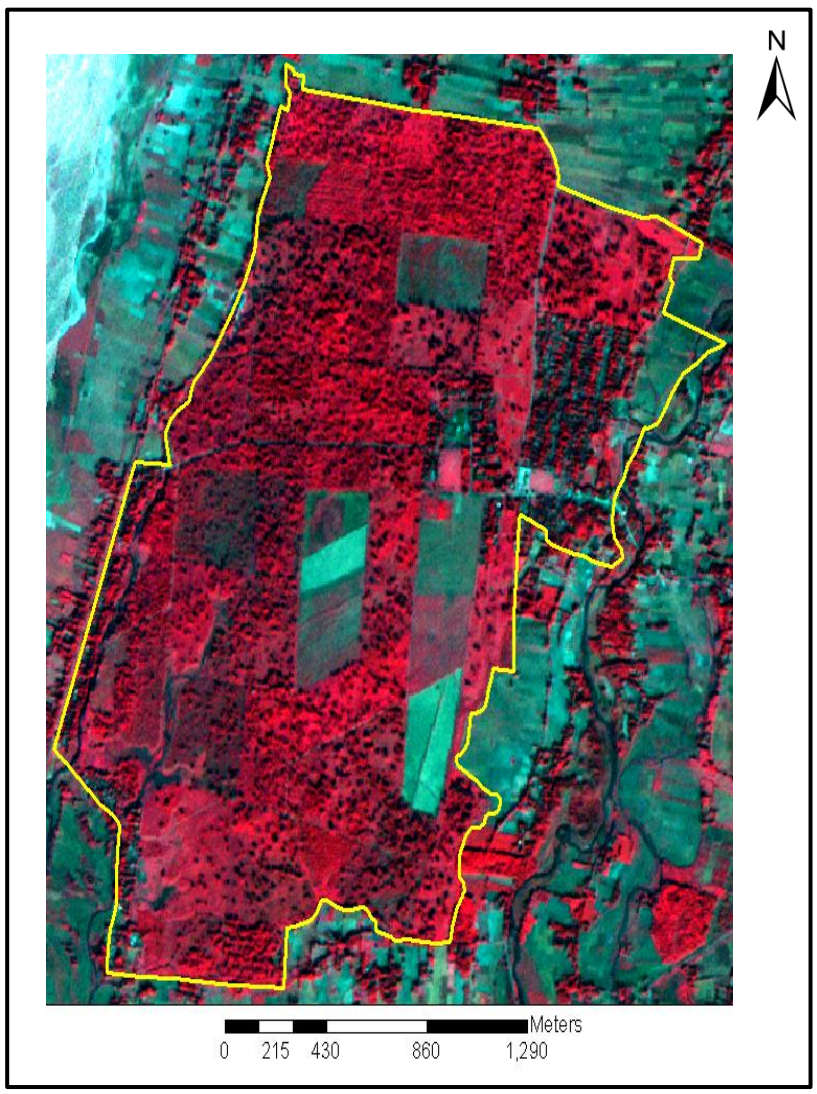
4. Shade trees	
Shade tree density (garden level)	Medium
Plant to plant spacing (m)	13.33 x 13.33
Row to row spacing (m)	14 x 14

5. Natural resources constraints	
Drainage congestion and water logging	Yes
Scarcity of water during summer	Yes
River bank erosion	No
Major diseases and duration	Black Rot, Red Rust (3-4 months)
Major pests and duration	Looper , *Helopeltis* (whole year)
Damage due to wildlife	Yes

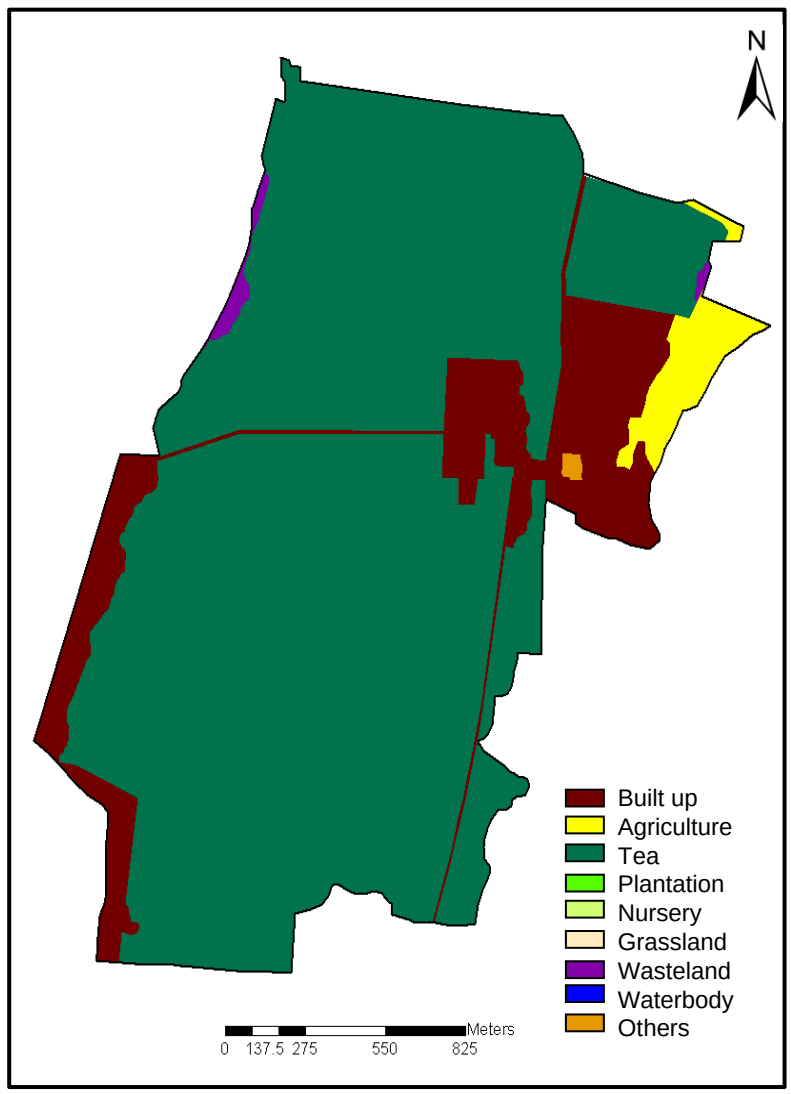
6. Yield / production	
Peak plucking periods	May-Oct
Annual green leaf yield	12400 kg/ha
Annual production of processed tea	742000

7. Pruning	
Time of pruning	2nd fortnight of Nov-2nd fortnight of Dec
Pruning cycle	--
Types of pruning	LP-UP-MS-UP

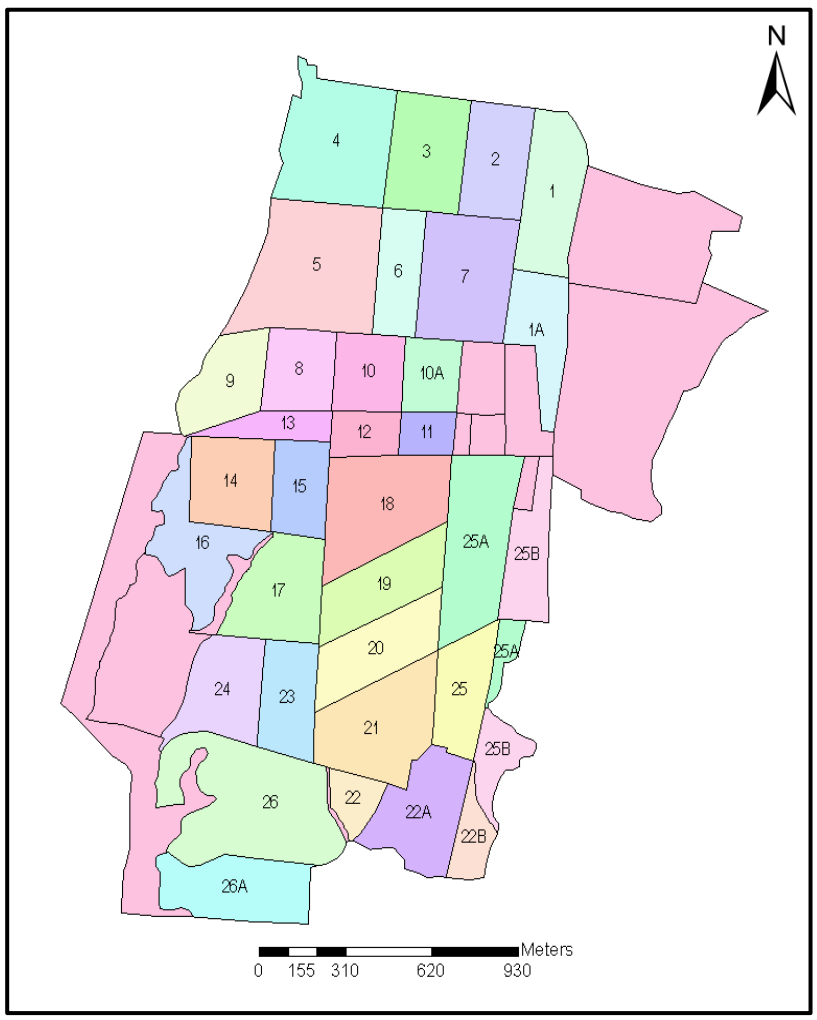
8. Fertilizer use	
Types of N, P, K fertilizers used	SOA, Urea, MOP, SSP, RP
Dose of Nitrogen (kg/ha)	160
Dose of Phosphorous (kg/ha)	50
Dose of Potash (kg/ha)	140
Whether lime is applied, if yes dose	No



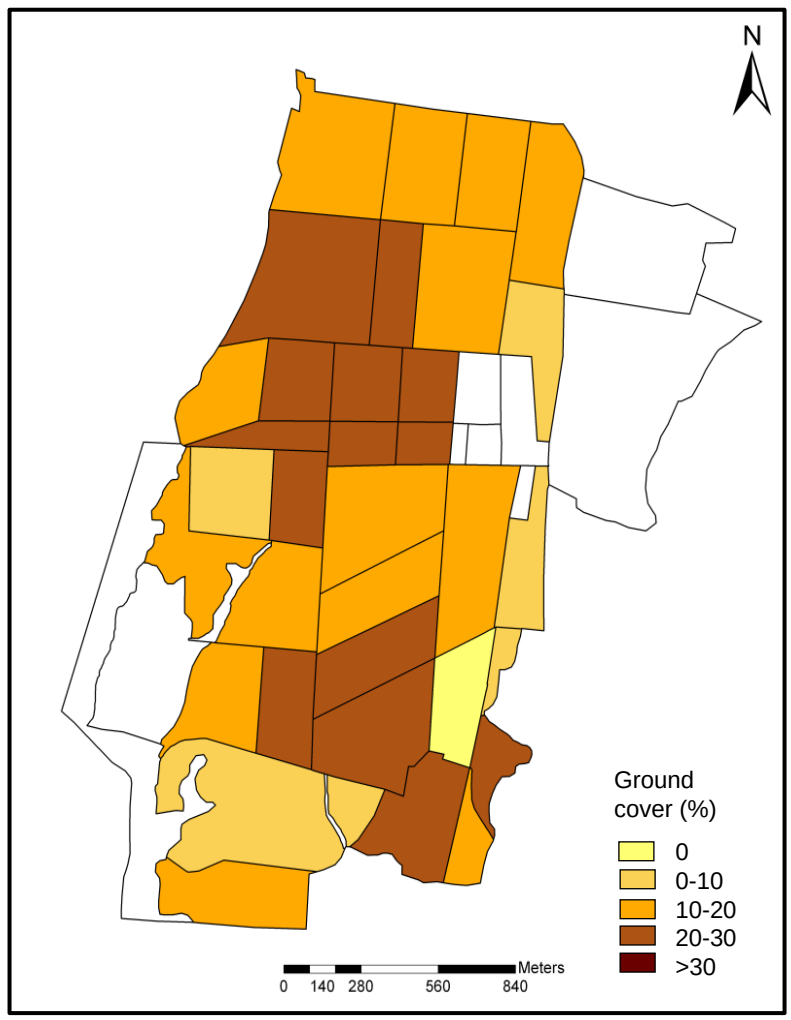
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

e. General Information

1. General	
Contact address	PO: Kalabari bagan, Dist: Jalpaiguri PIN: 735202
Contact phone	03563-270838, 09932351968
Name of the company	The Eastern Tea Company Ltd.
Name of the village where it falls	Angrabhasa-I
Leased area of the estate (ha)	539.50
Tea grown area of the estate (ha)	310.36
No. of divisions / sections	0 div/36 sec
Year of establishment	1913
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)	Medium
Plant to plant spacing	60 cm, 75 cm, 135 cm
Row to row spacing	105 cm, 120 cm, 135 cm

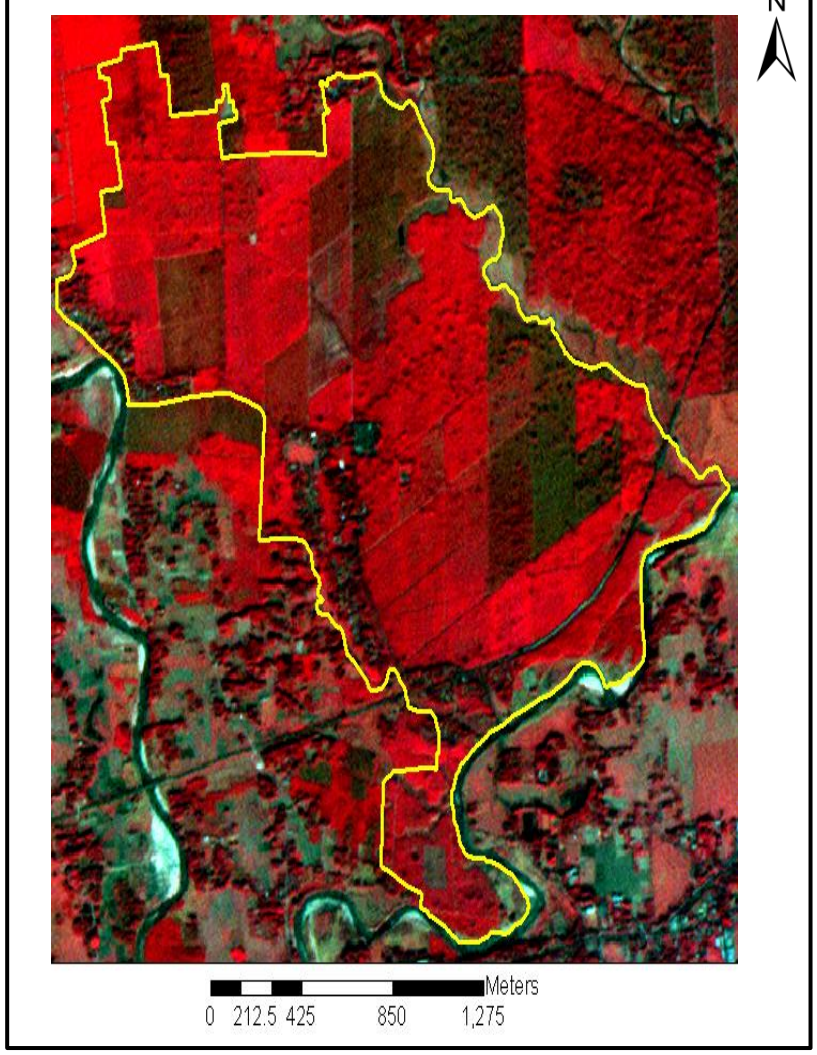
5. Natural resources constraints	
Drainage congestion and water logging	Yes
Scarcity of water during summer	Yes
River bank erosion	Yes
Major diseases and duration	Black rot, Red rust (whole year)
Major pests and duration	Looper, *Helopeltis*, mites, red slug (whole year)
Damage due to wildlife	Yes

6. Yield / production	
Peak plucking periods	Jul-Oct
Annual green leaf yield	61338.01
Annual production of processed tea	431076 kg

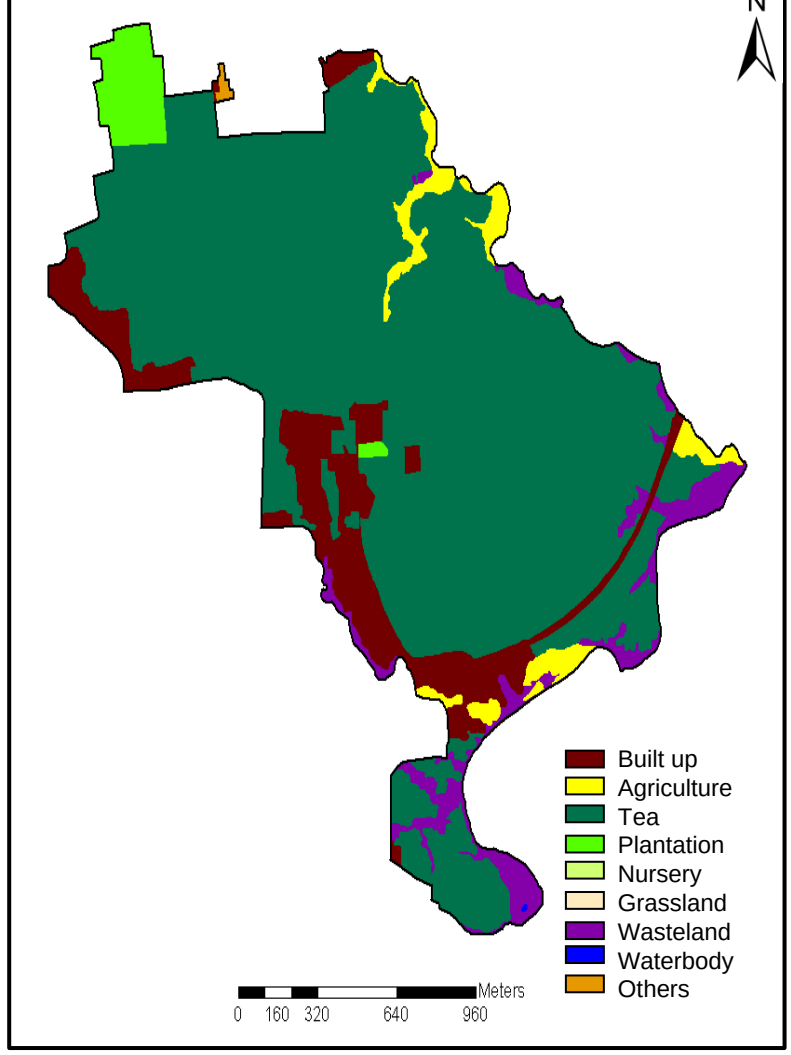
7. Pruning	
Time of pruning	November 2nd fortnight
Pruning cycle	4 yrs
Types of pruning	--

8. Fertilizer use	
Types of N, P, K fertilizers used	Urea, RP, SSP, MOP
Dose of Nitrogen (kg/ha)	90-175 kg
Dose of Phosphorous (kg/ha)	20-40 kg
Dose of Potash (kg/ha)	--
Whether lime is applied, if yes dose	After caustic wash in LP and HRP area

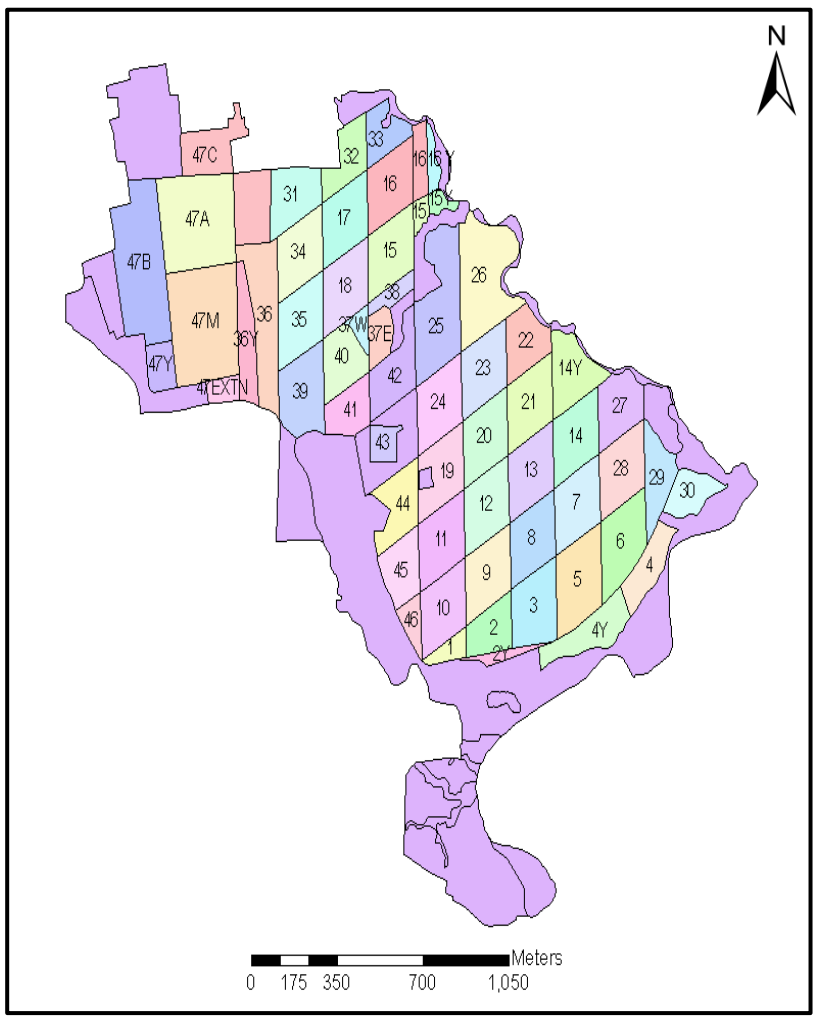
P63: KARALA VALLEY TE



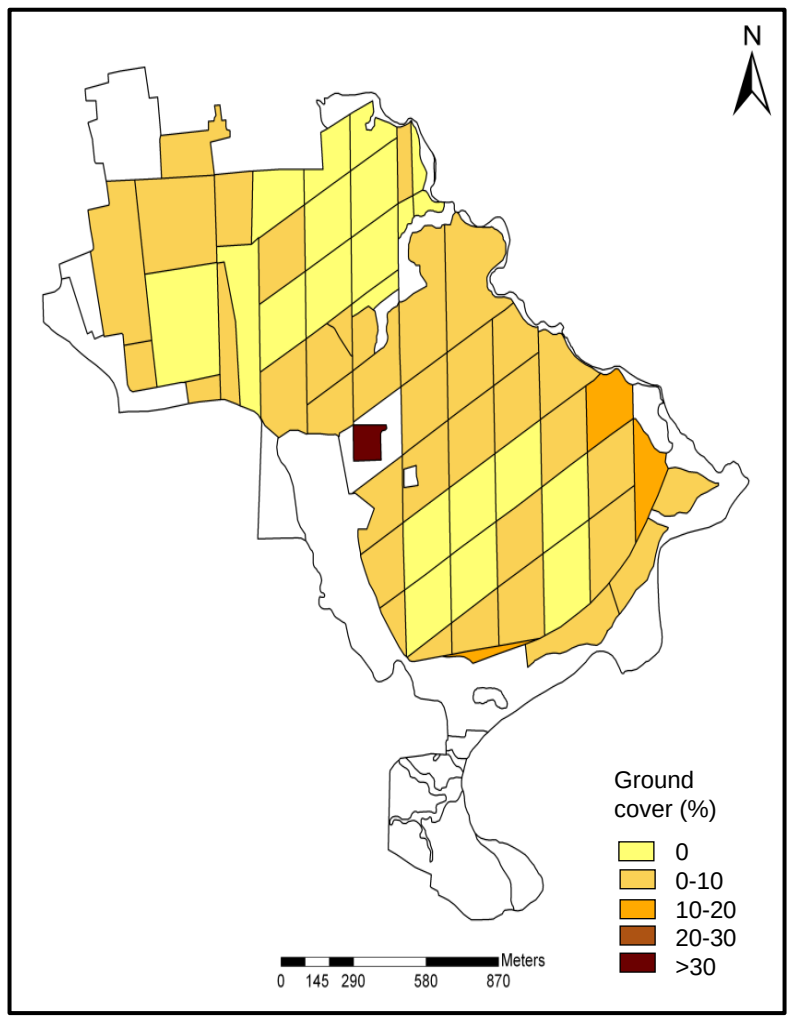
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

e. General Information

1. General	
Contact address	PO: Mohit nagar, Dist: Jalpaiguri
Contact phone	03561-255363 (O), 03561-255365 (R) 09434607515
Name of the company	Darjeeling Dooars Plantations (Tea) Ltd.
Name of the village where it falls	Mohit nagar
Leased area of the estate (ha)	331.84
Tea grown area of the estate (ha)	224.30
No. of divisions / sections	0 div/47 sec
Year of establishment / age	--
Type of tea produced	CTC

2. Infrastructure	
Availability of processing factory	Yes
Availability of workers colony	Yes
Availability of internet facility / e-mail id	No
Meteorological observations taken	Tmax, Tmin, RHmax, RHmin, Rainfall

3. Amenities	
Availability of health care / dispensary	Yes
Availability of school	Yes

4. Shade trees	
Shade tree density (garden level)	Mature tea (poor), Young tea (optimum)
Plant to plant spacing	35'- 40'
Row to row spacing	35'-40'

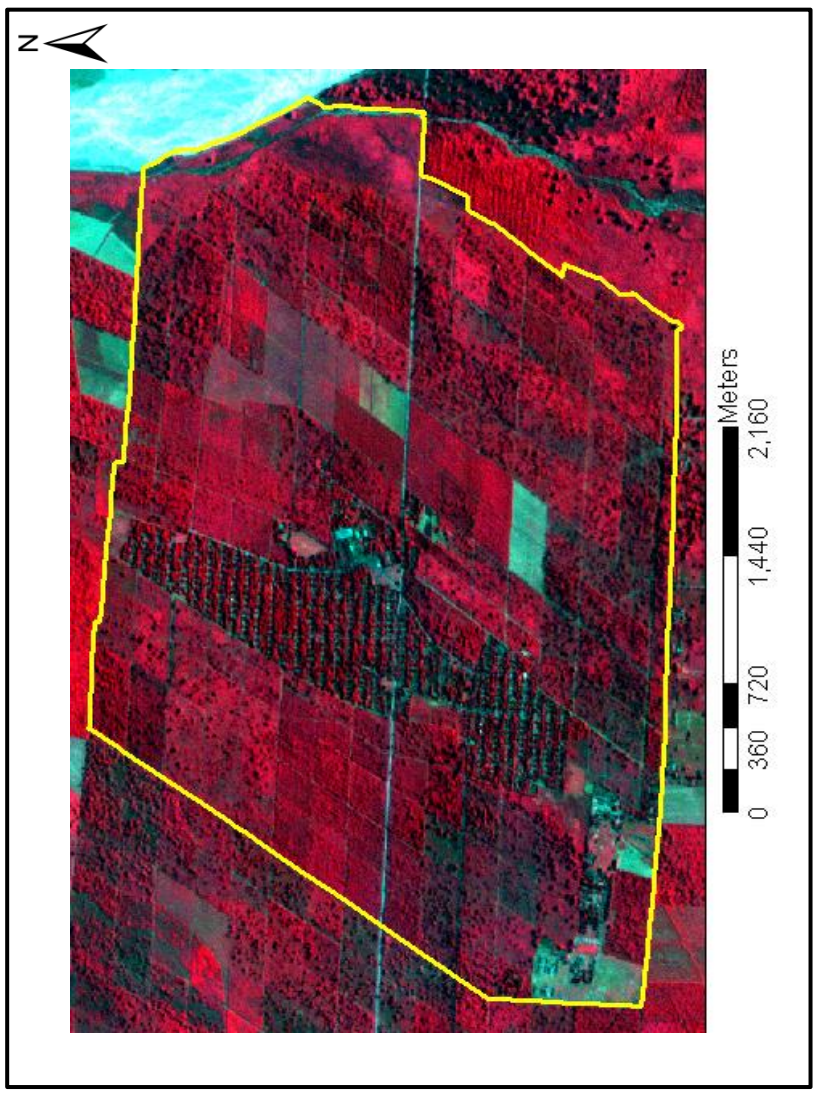
5. Natural resources constraints	
Drainage congestion and water logging	Yes (some parts)
Scarcity of water during summer	No
River bank erosion	Yes
Major diseases and duration	Minor gray/brown blight, red rust and poria
Major pests and duration	RSM, looper, Red slug, *Helopeltis*, thrips, jassids
Damage due to wildlife	No

6. Yield / production	
Peak plucking periods	Jun-Oct
Annual green leaf yield	10266.9 kg/ha
Annual production of processed tea	529088 kg

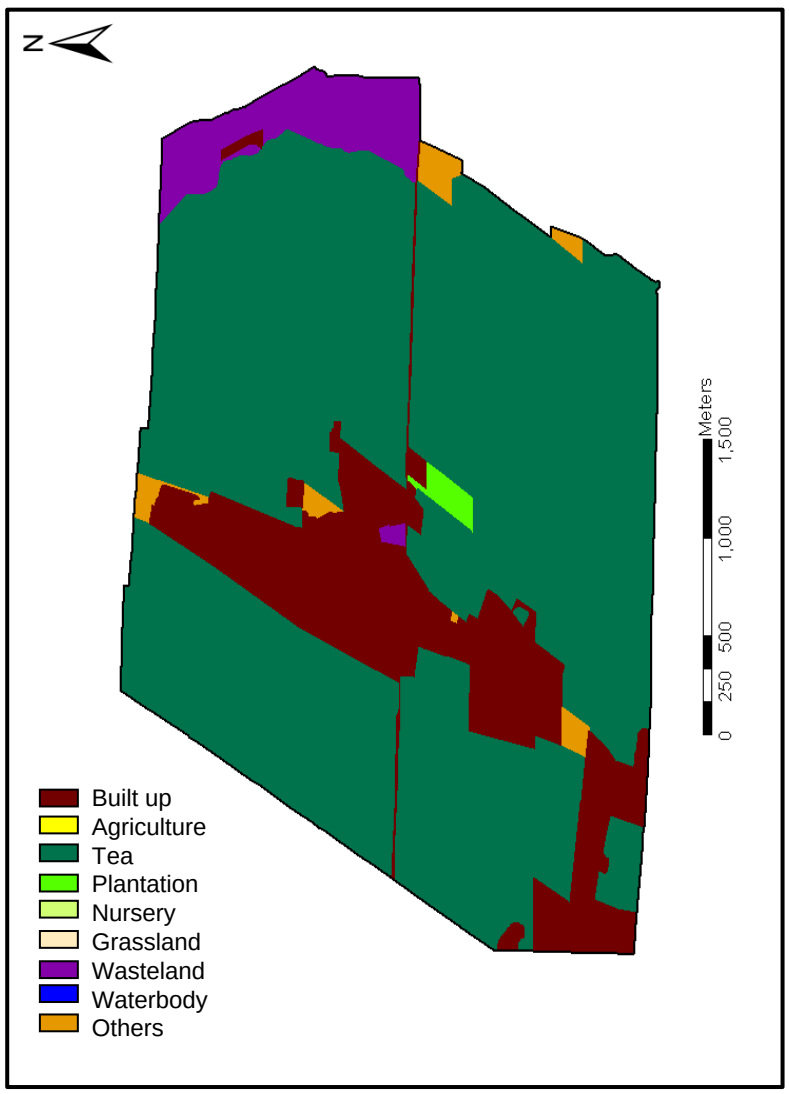
7. Pruning	
Time of pruning	3rd fortnight of Nov-1st fortnight of Feb
Pruning cycle	3 yr
Types of pruning	LP-UT-UT

8. Fertilizer use	
Types of N, P, K fertilizers used	Urea, RP, MOP
Dose of Nitrogen (kg/ha)	100-170
Dose of Phosphorous (kg/ha)	20-50
Dose of Potash (kg/ha)	60-160
Whether lime is applied, if yes dose	Dolomite based on soil pH

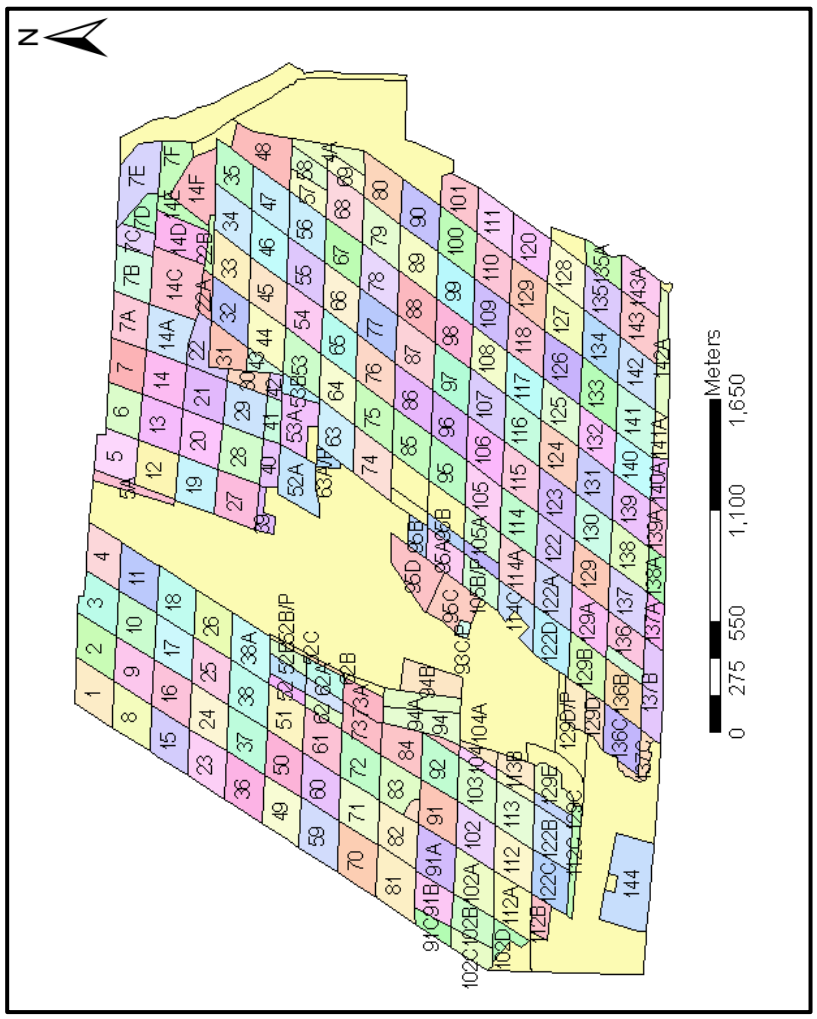
P64: KARBALLA TE



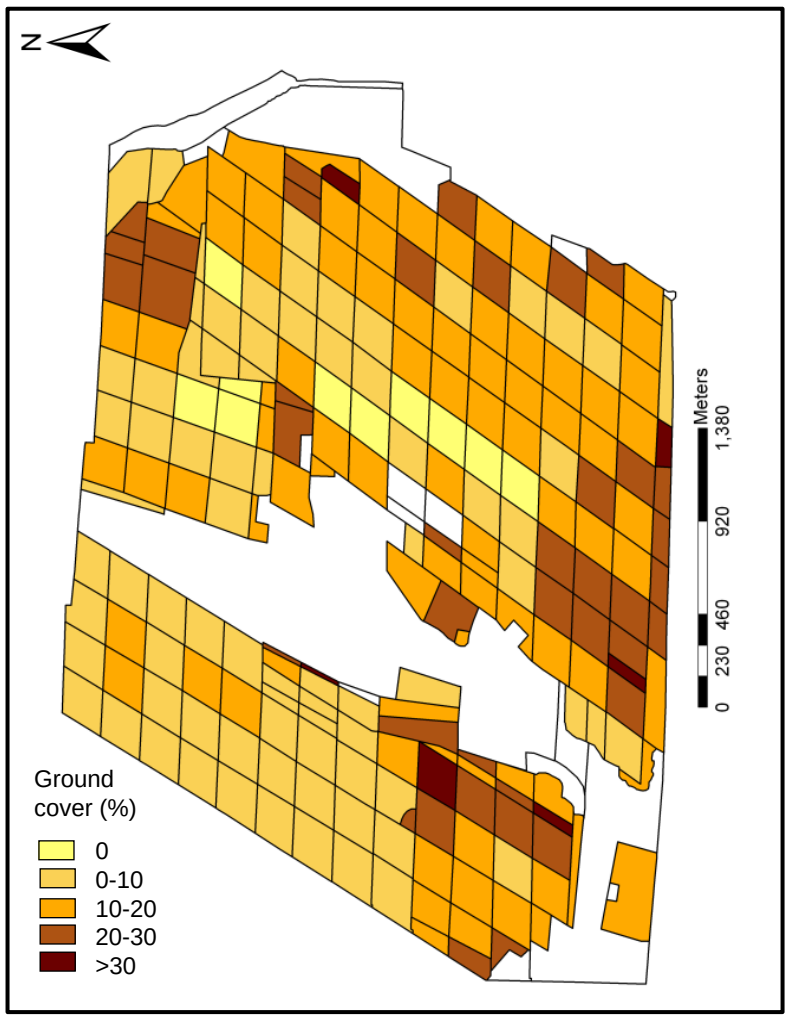
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

e. General Information

1. General	
Contact address	P.O: Banarhat, Dist: Jalpaiguri
Contact phone	03563-252005
Name of the company	Andrew Yule & Company Limited
Name of the village where it falls	Karballa
Leased area of the estate (ha)	1021.95
Tea grown area of the estate (ha)	755.25
No. of divisions / sections	3 div/223 sec
Year of establishment	1896
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, RHmax, RHmin, Rainfall

3. Amenities	
Availability of health care / dispensary	Yes
Availability of school	Yes

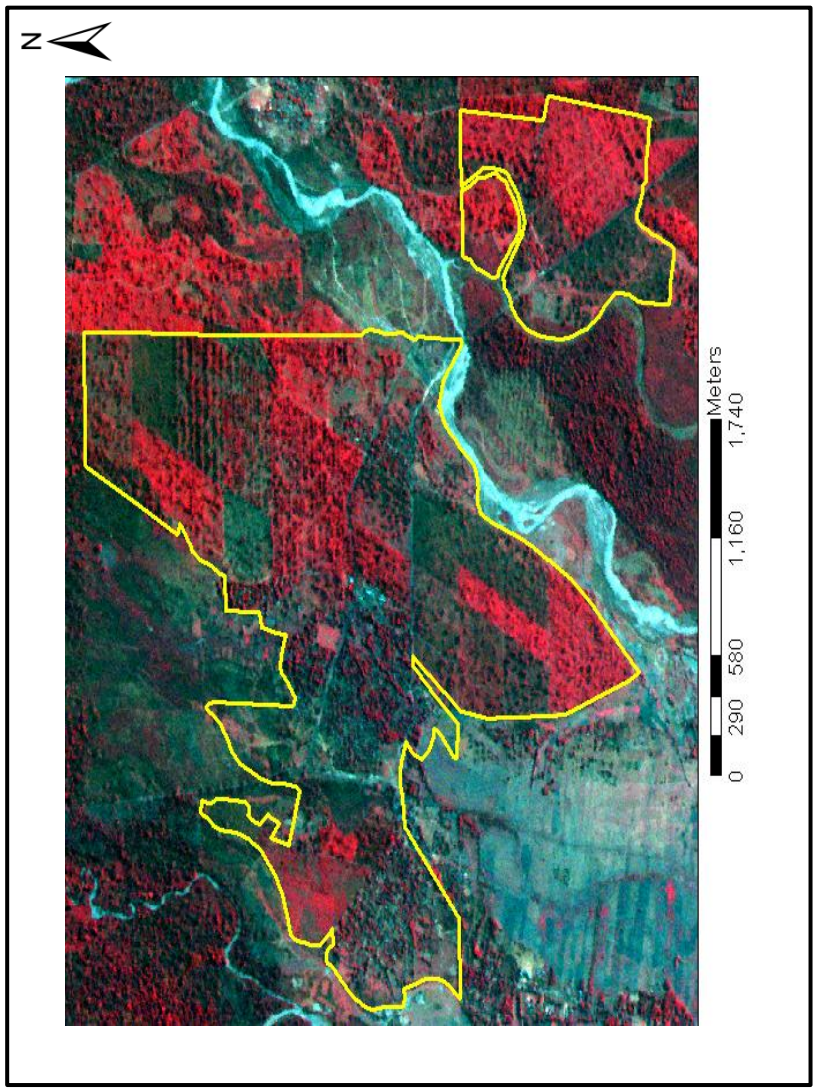
4. Shade trees	
Shade tree density (garden level)	Medium
Plant to plant spacing (m)	11 x 11
Row to row spacing (m)	11 x 11

5. Natural resources constraints	
Drainage congestion and water logging	Yes
Scarcity of water during summer	Yes
River bank erosion	Yes
Major diseases and duration	Red rust (7 months)
Major pests and duration	Looper, *Helopeltis*, RSM
Damage due to wildlife	--

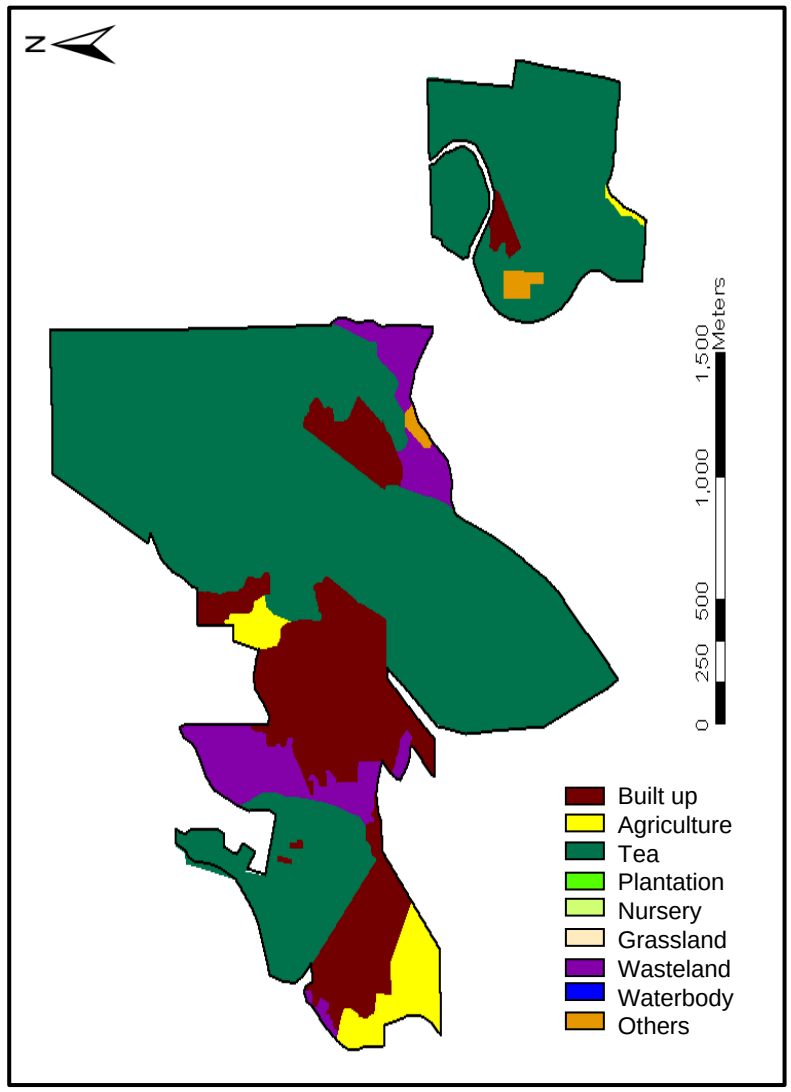
6. Yield / production	
Peak plucking periods	May-Oct
Annual green leaf yield	6039 kg/ha
Annual production of processed tea	1013546 kg

7. Pruning	
Time of pruning	20th Nov-25th Jan
Pruning cycle	--
Types of pruning	LP-UP-UP-LP, LP-UP-DS-UP-LP

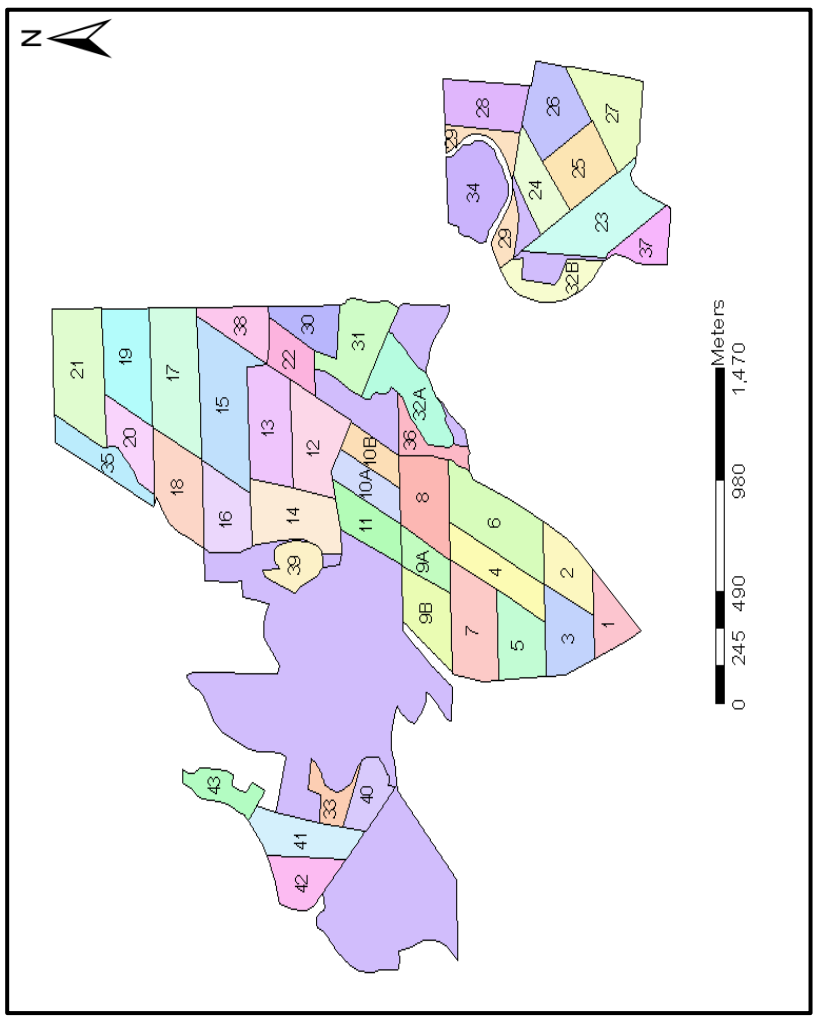
8. Fertilizer use	
Types of N, P, K fertilizers used	Urea, MOP, RP, SOA, SSP
Dose of Nitrogen (kg/ha)	110-130
Dose of Phosphorous (kg/ha)	20
Dose of Potash (kg/ha)	110-130
Whether lime is applied, if yes dose	No



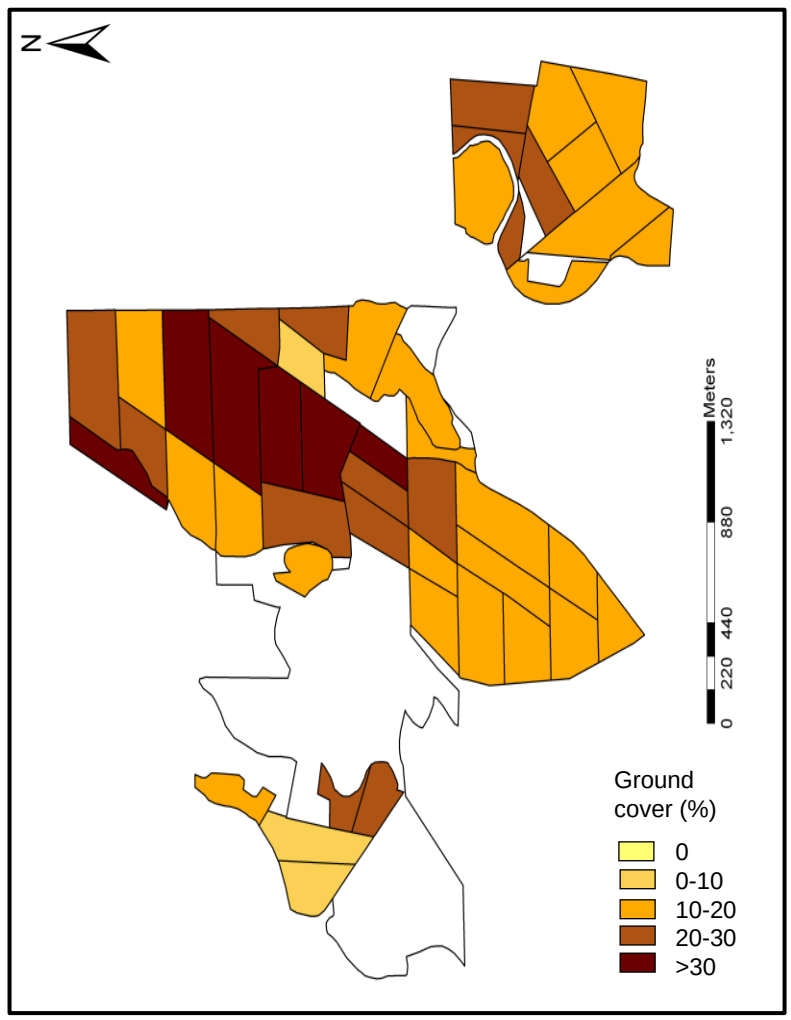
a. False Colour Composite of IRS LISS IV



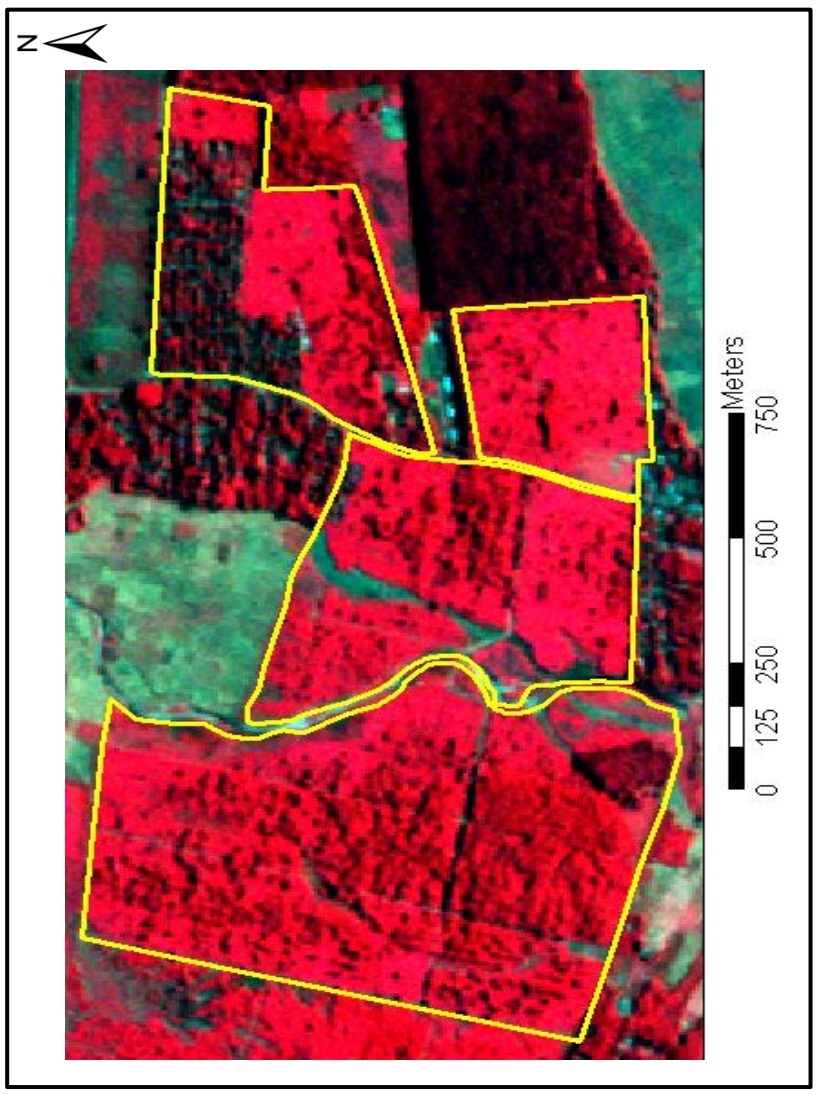
b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections



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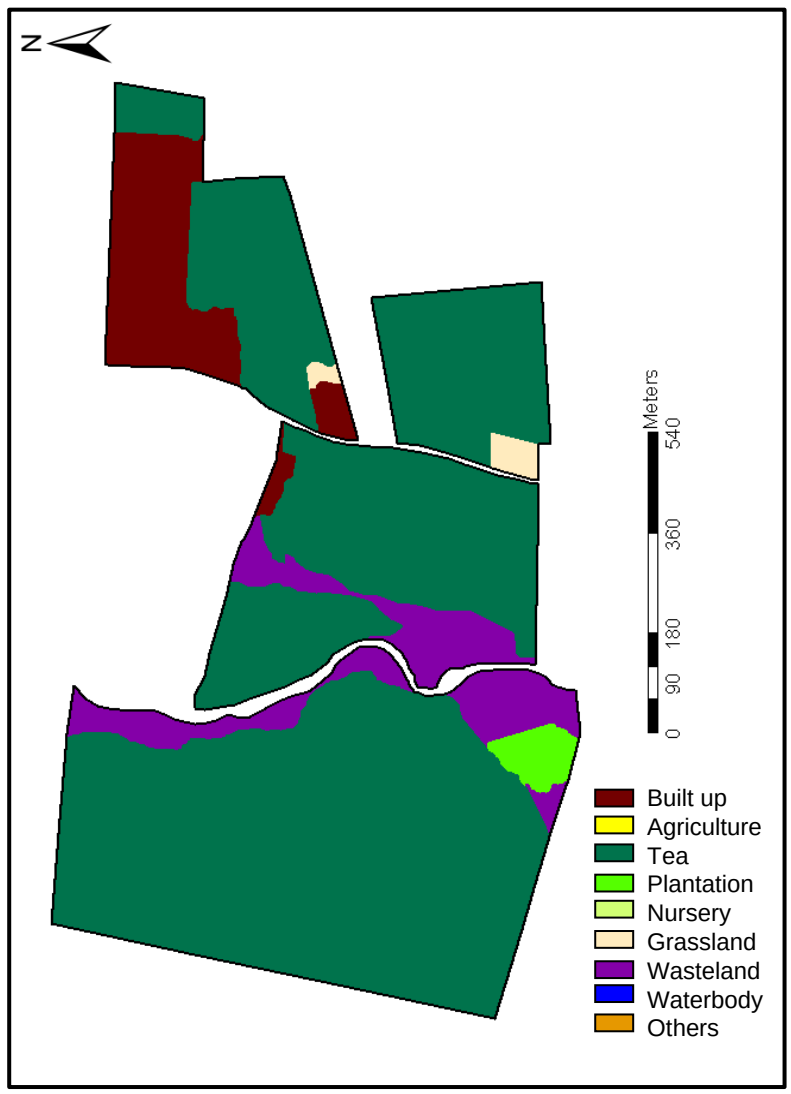

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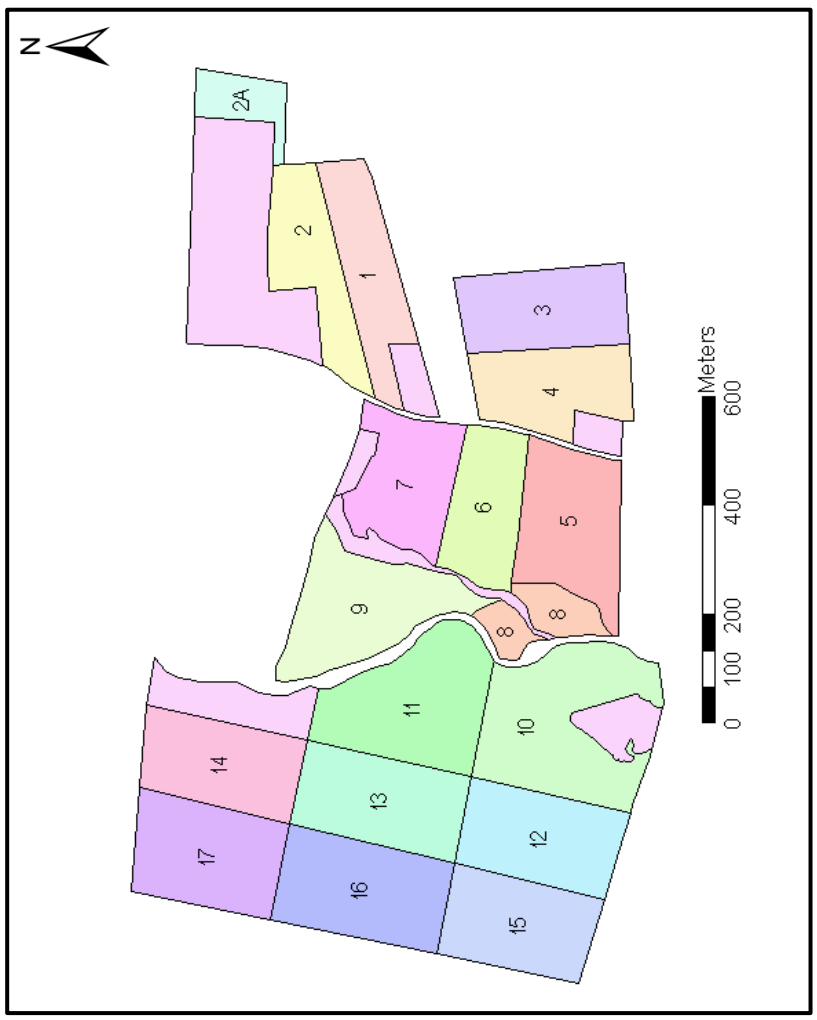

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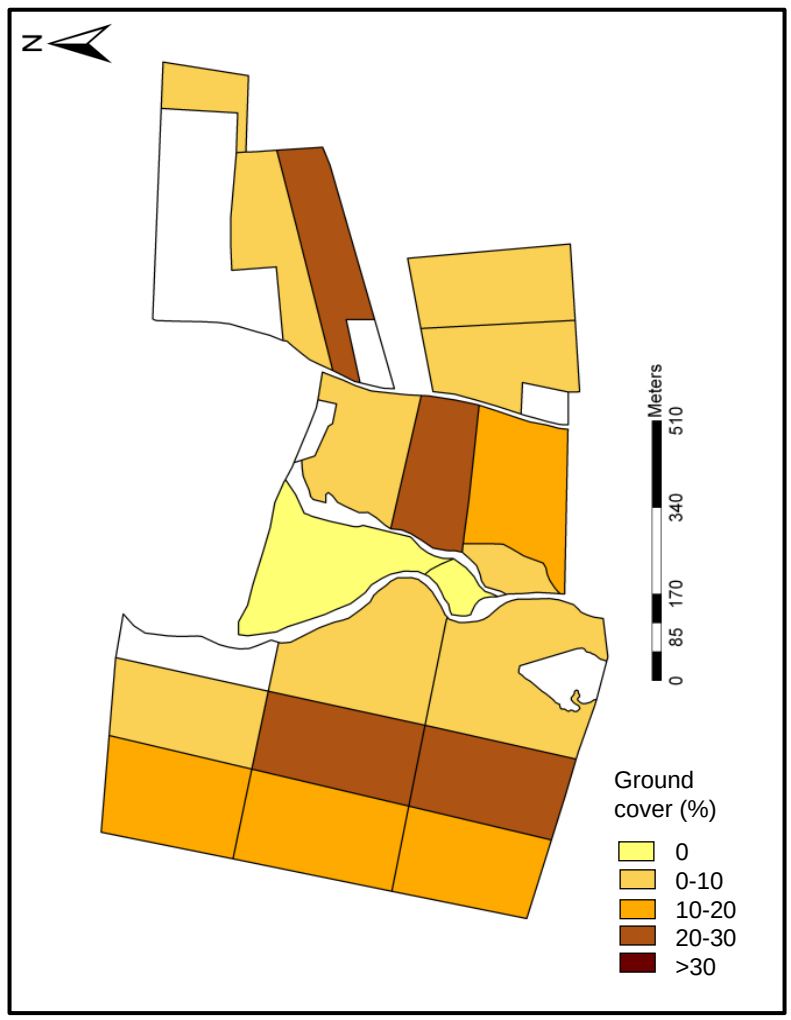
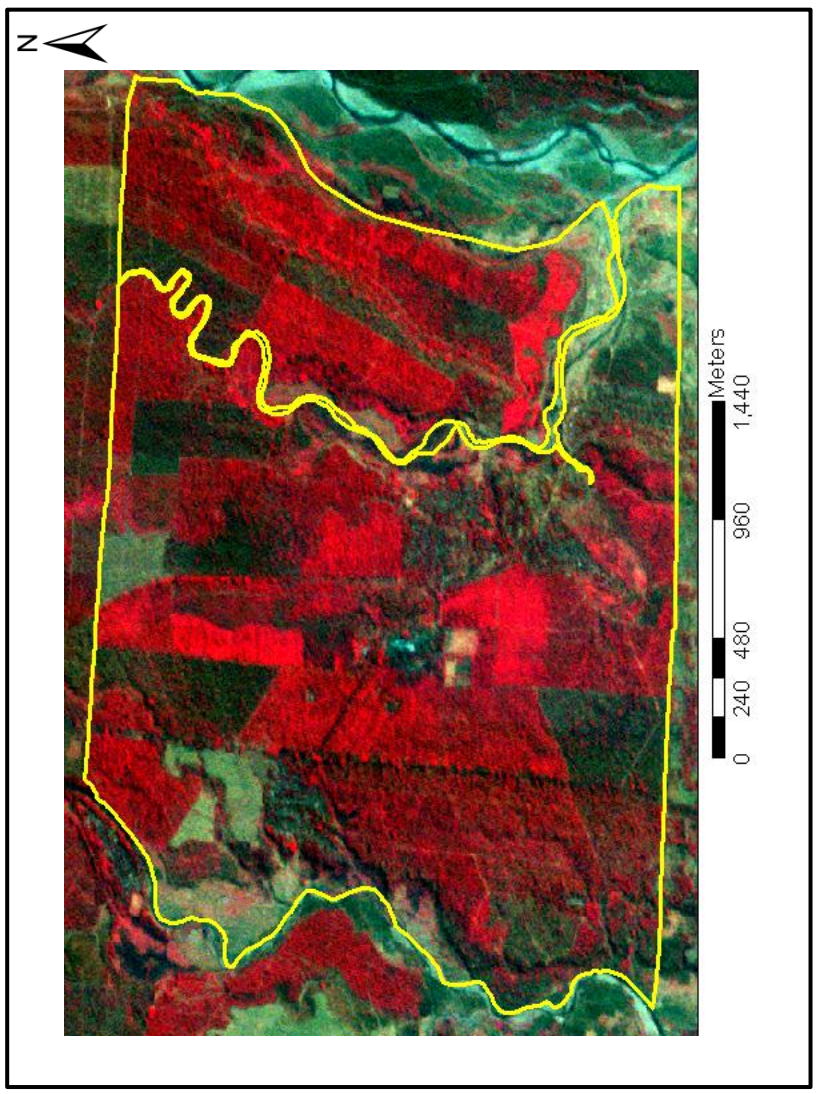


d. Shade Tree Density in Sections



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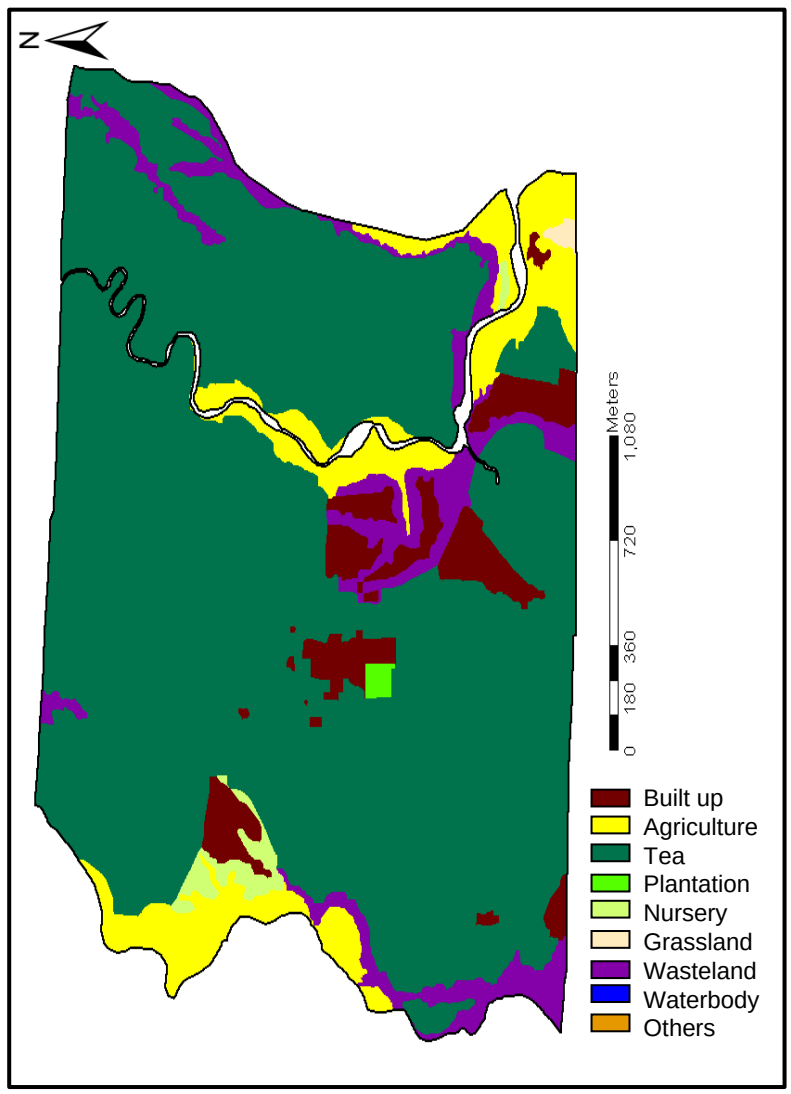

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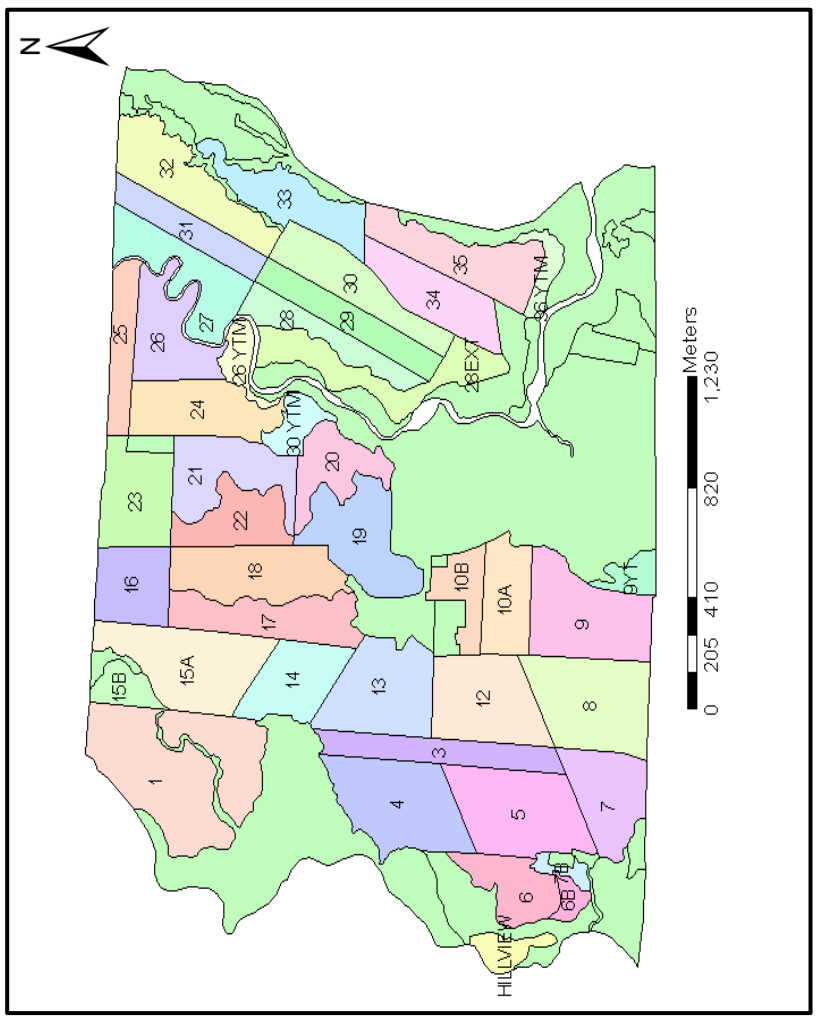
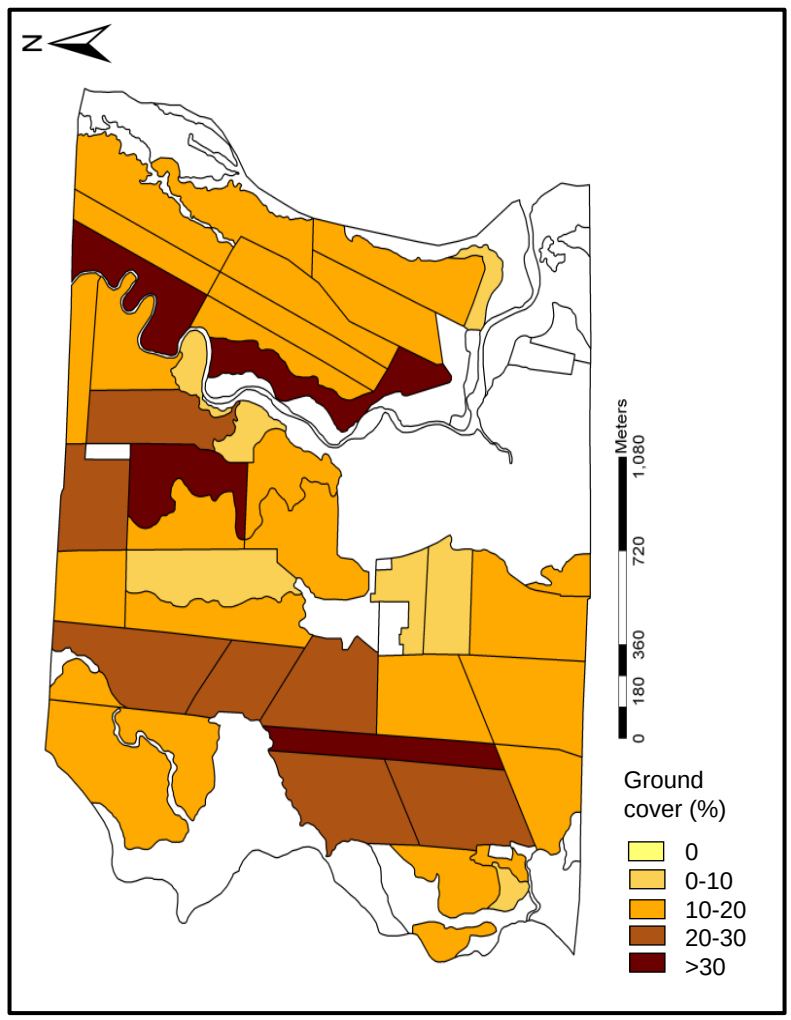


c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

P68: KOHINOOR TE

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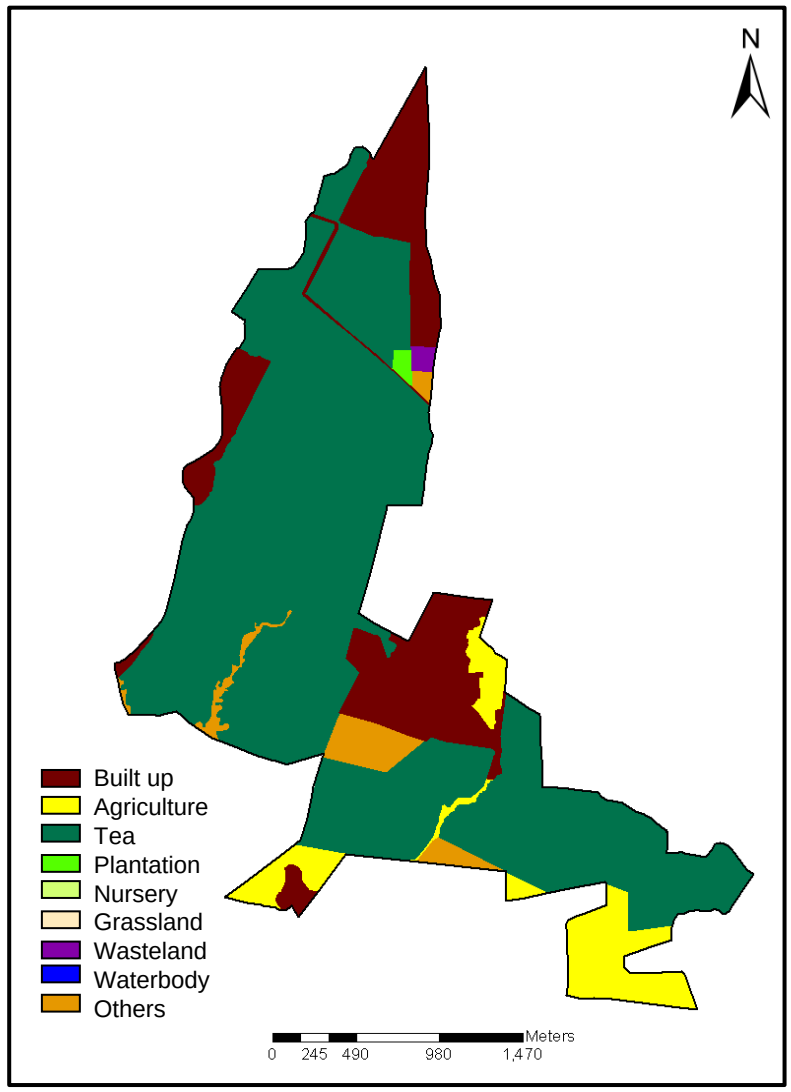

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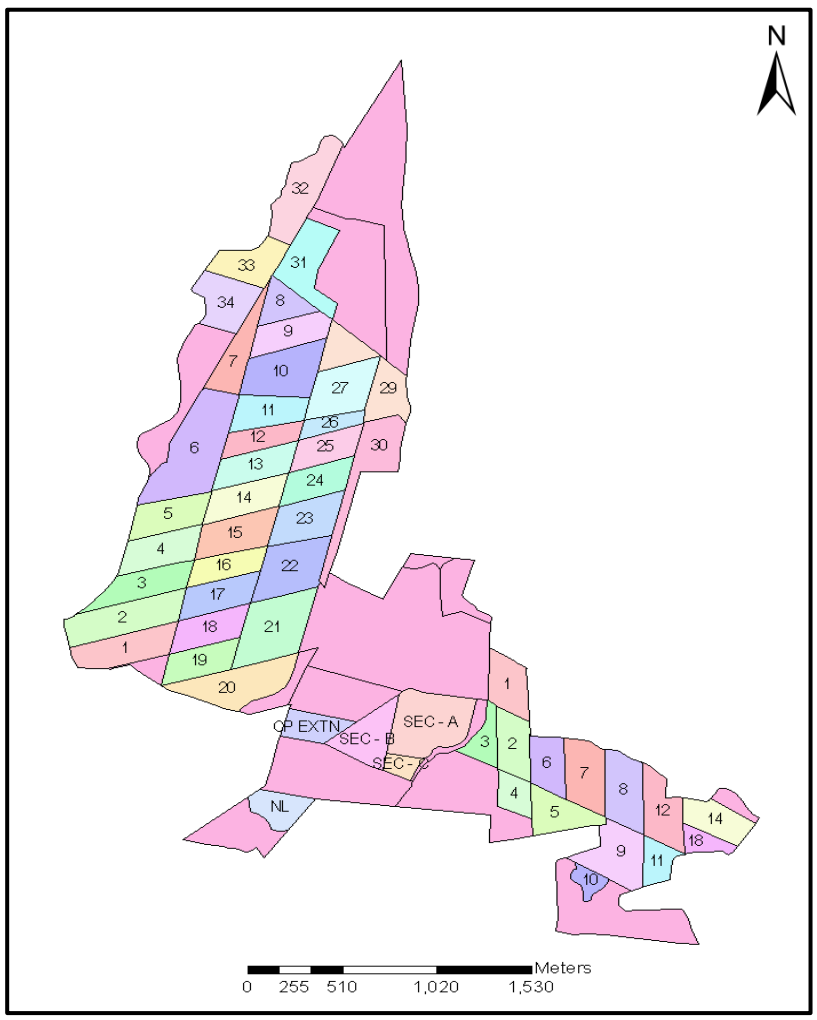
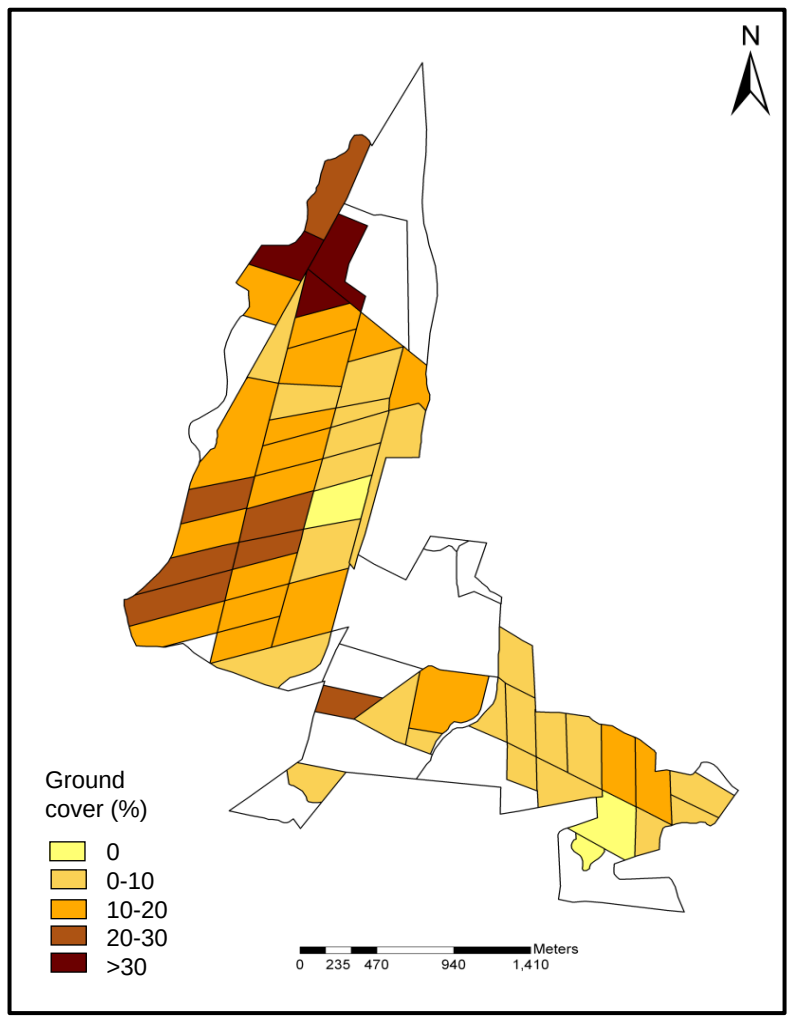
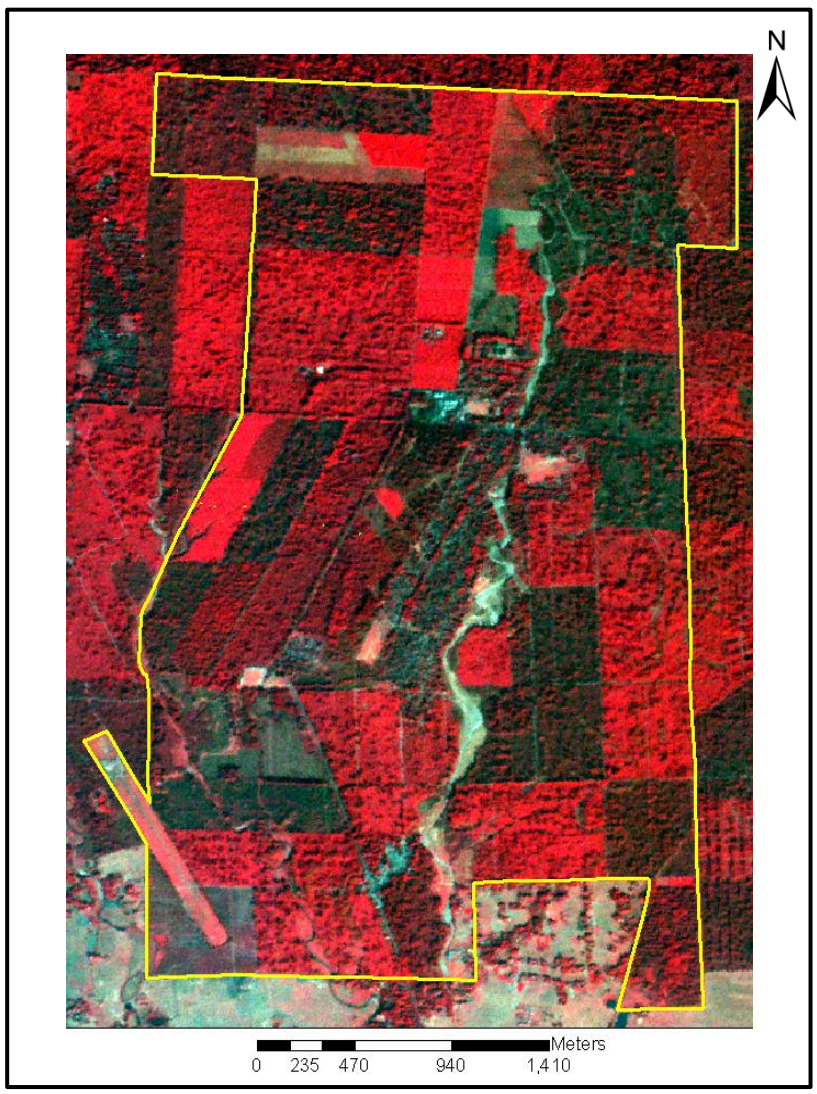


c. Section Boundaries of the Estate

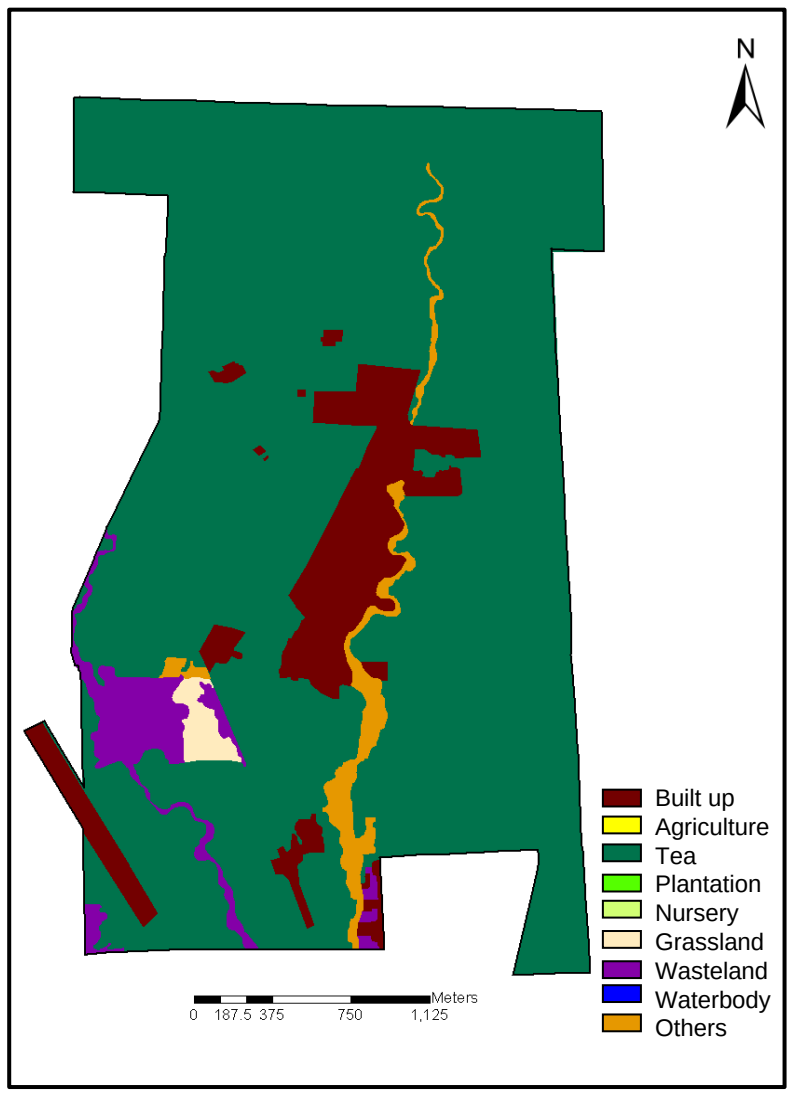


d. Shade Tree Density in Sections

P69: KUMARGRAM TE



a. False Colour Composite of IRS LISS IV



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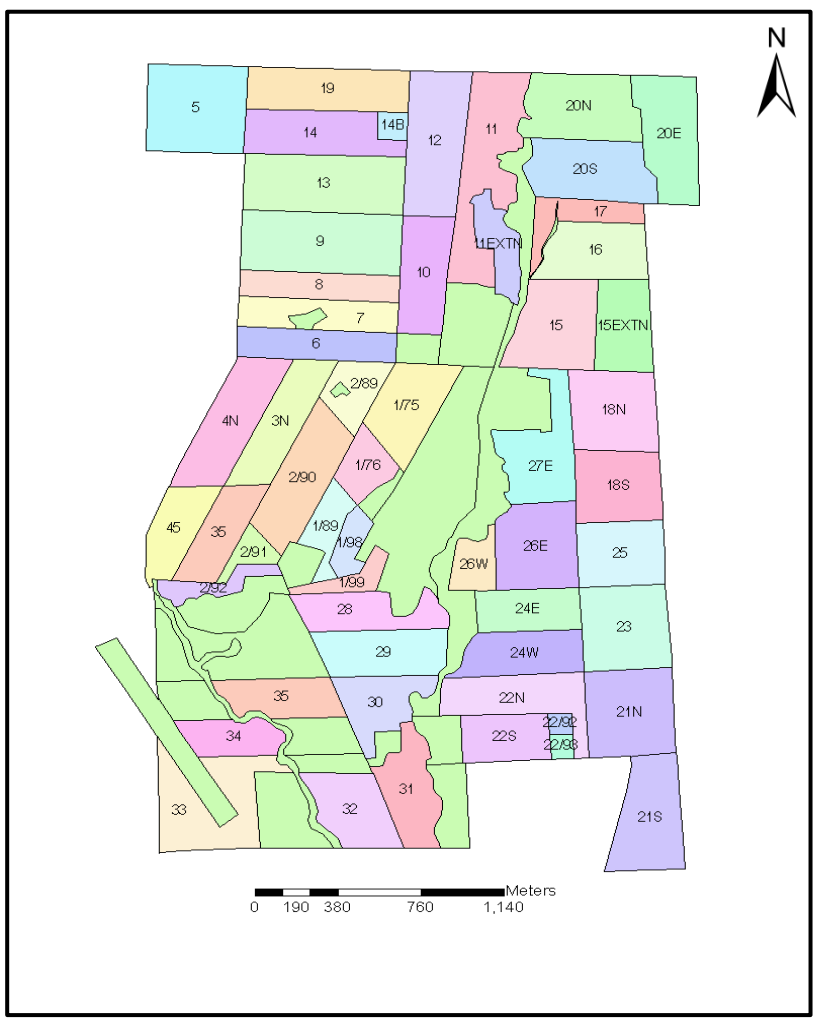
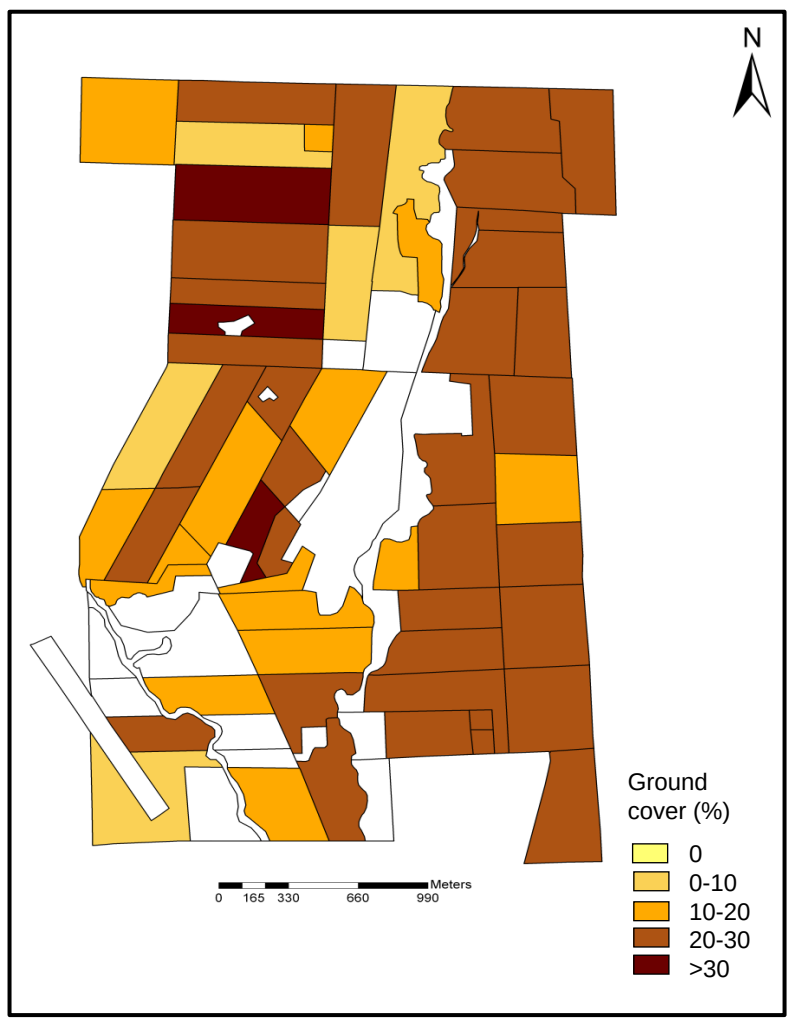
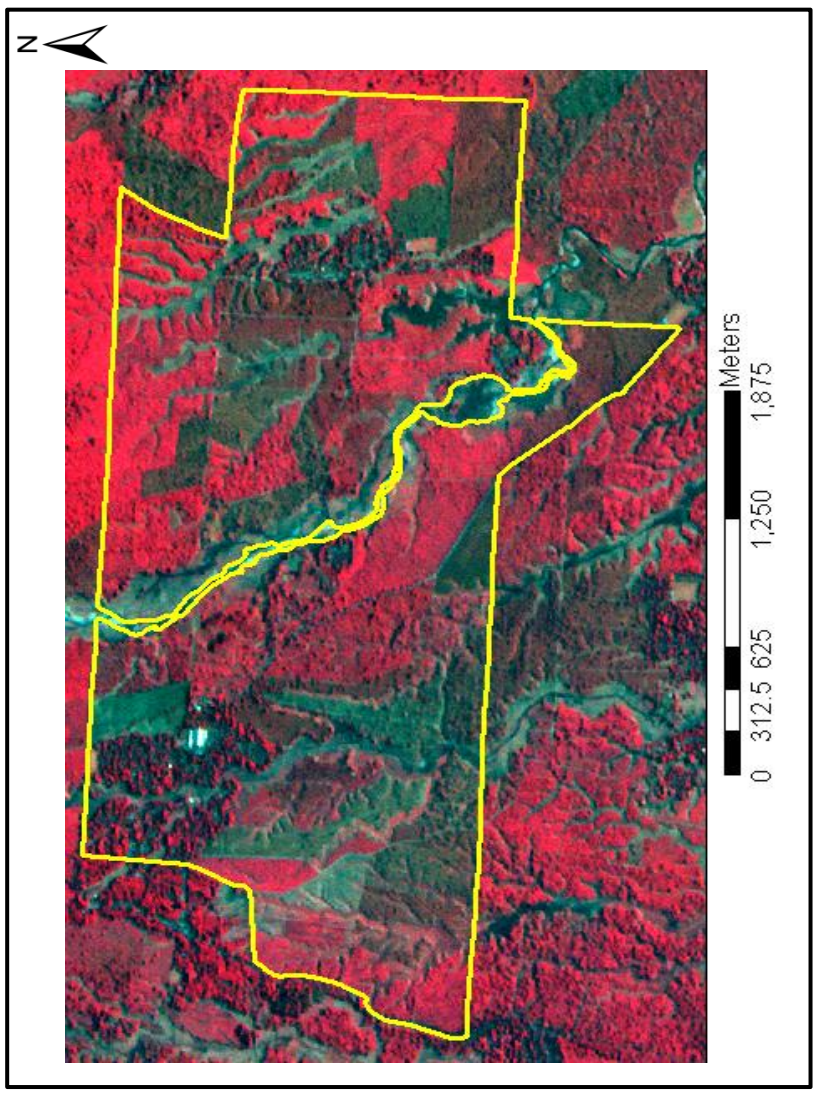


c. Section Boundaries of the Estate



d. Shade Tree Density in Sections



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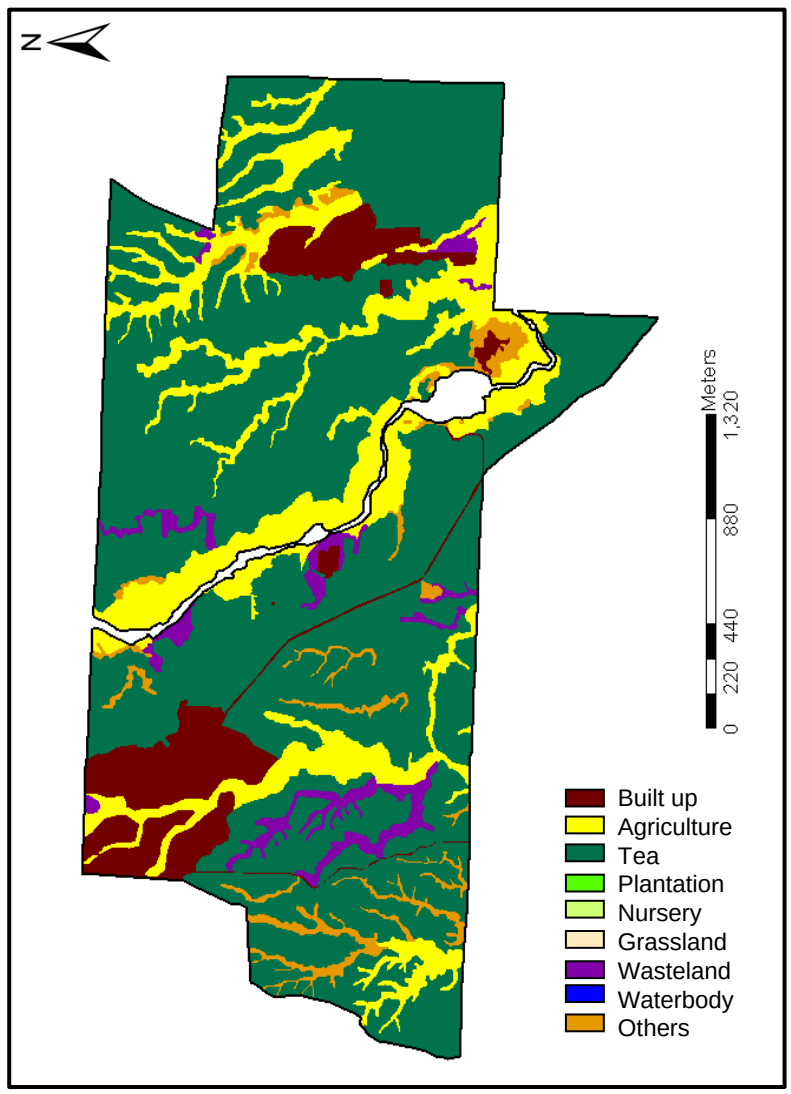
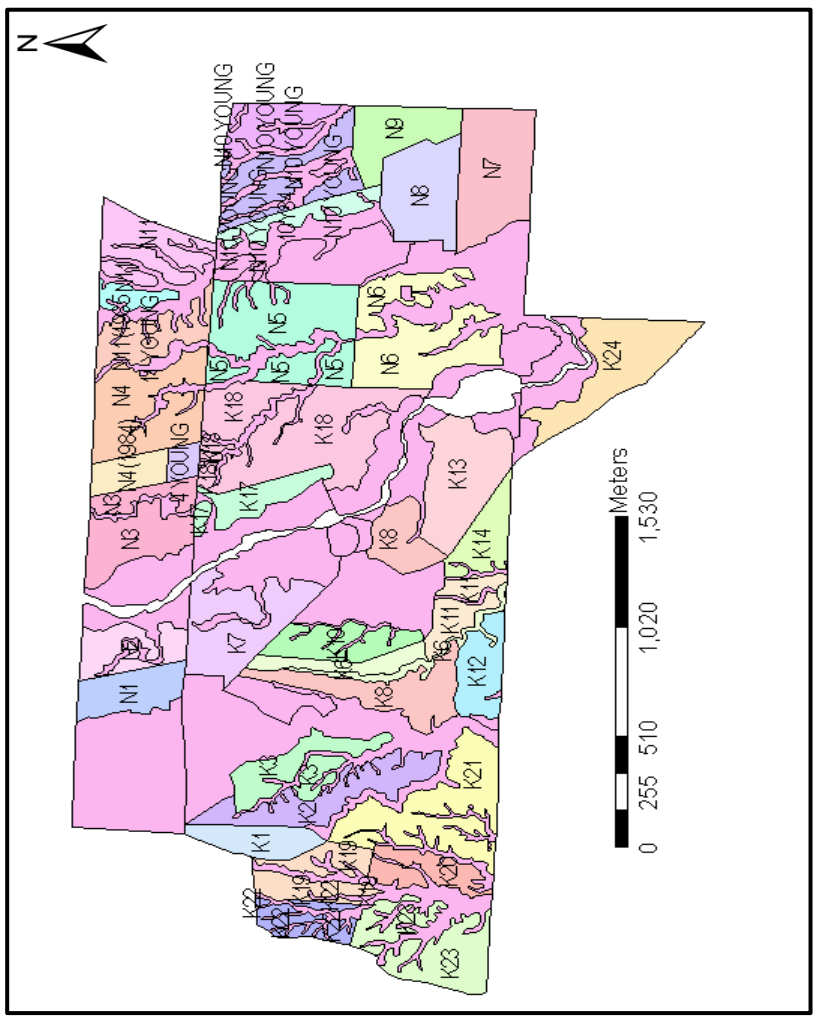
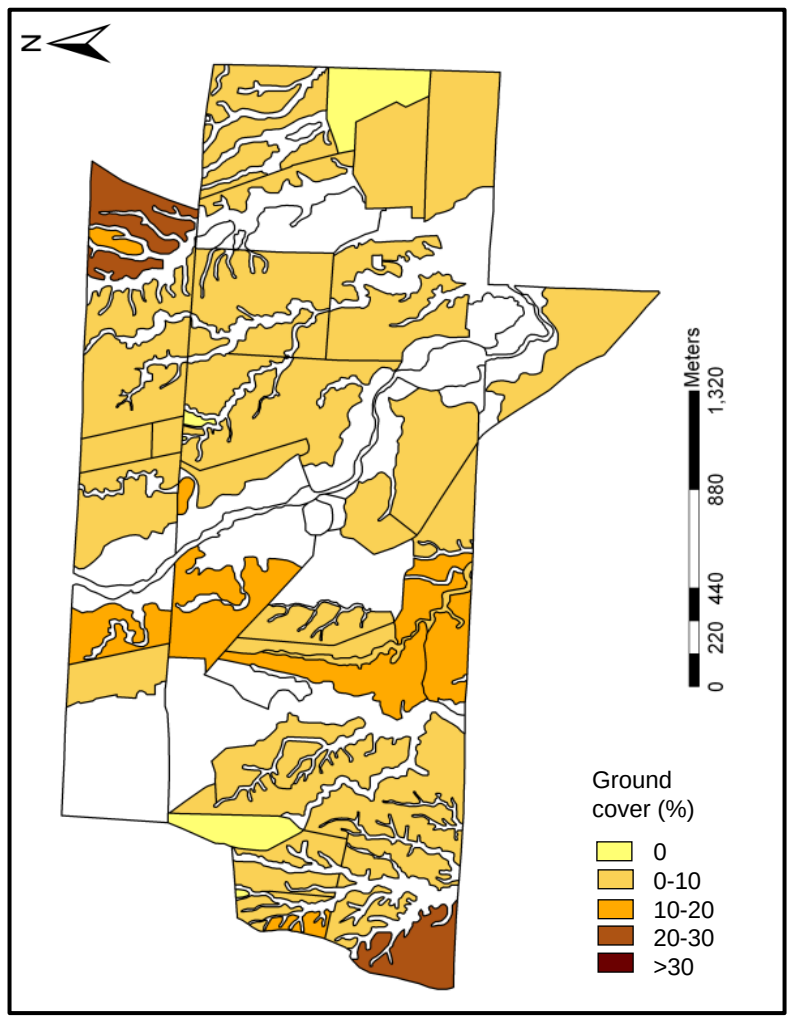


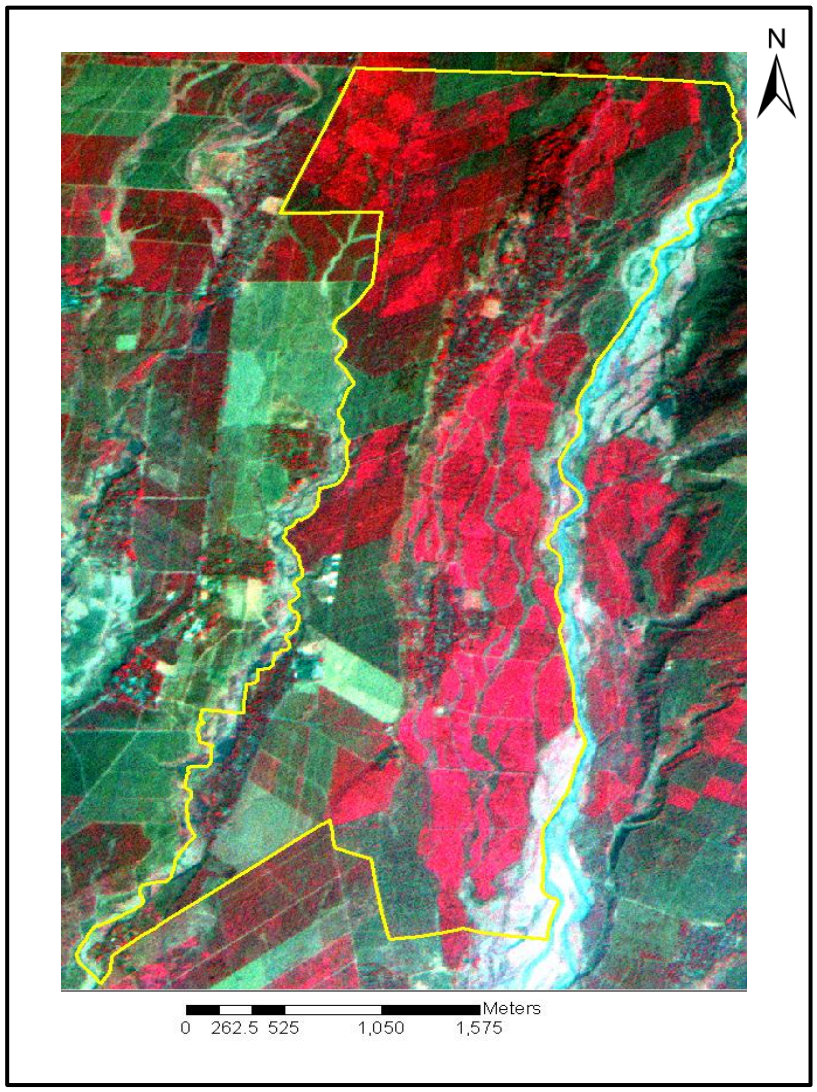
b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections



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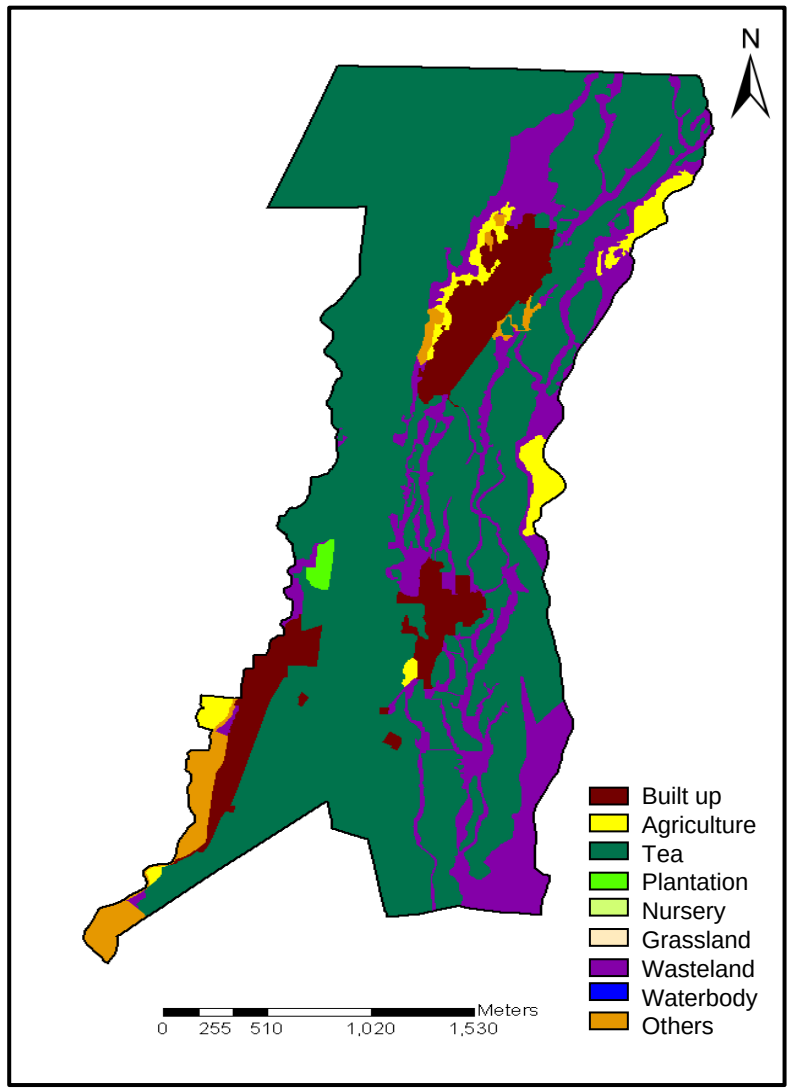
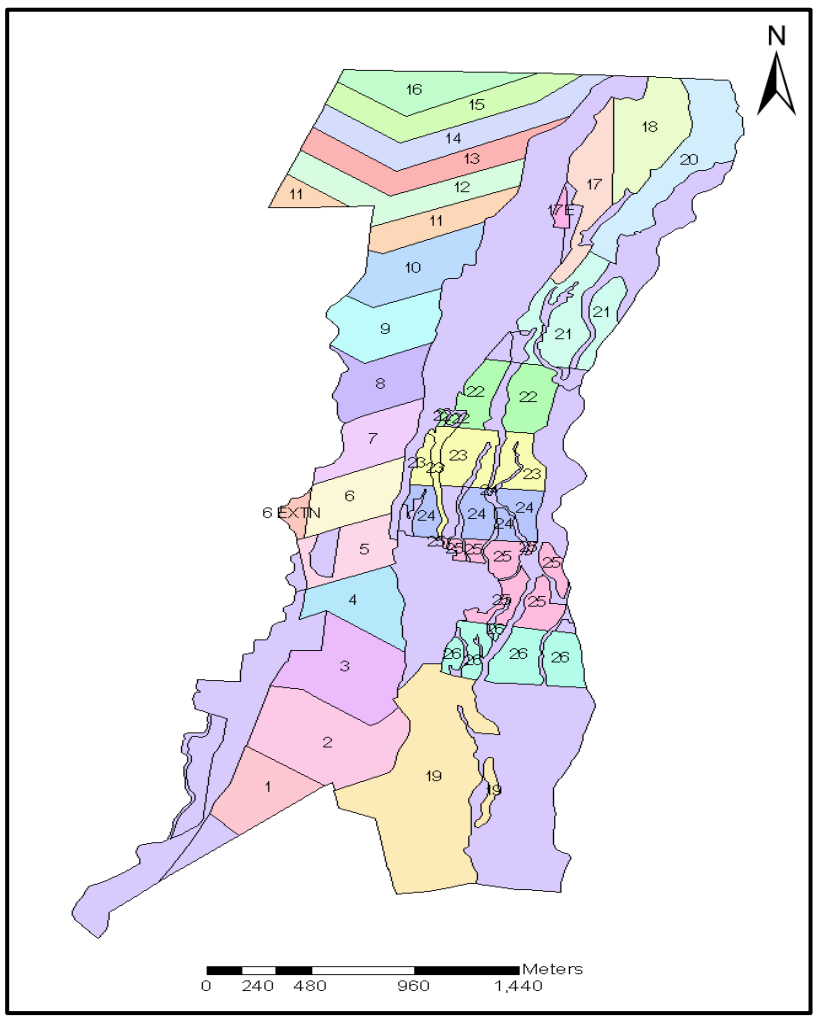


b. Tea Estate Landuse



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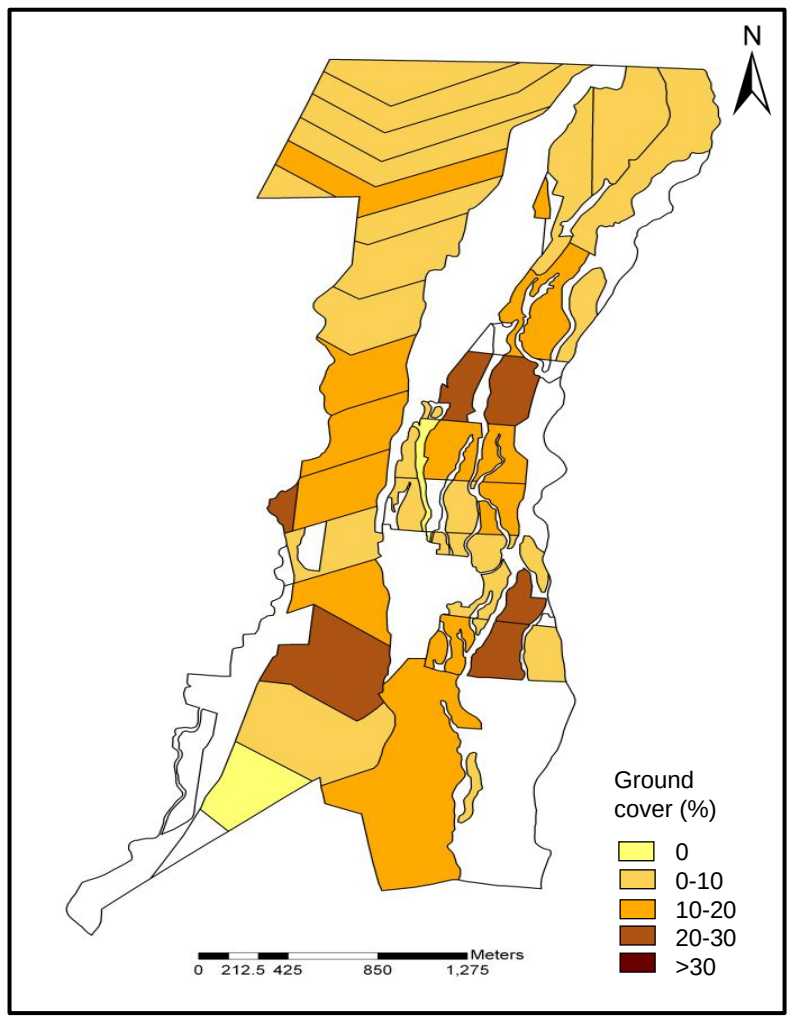
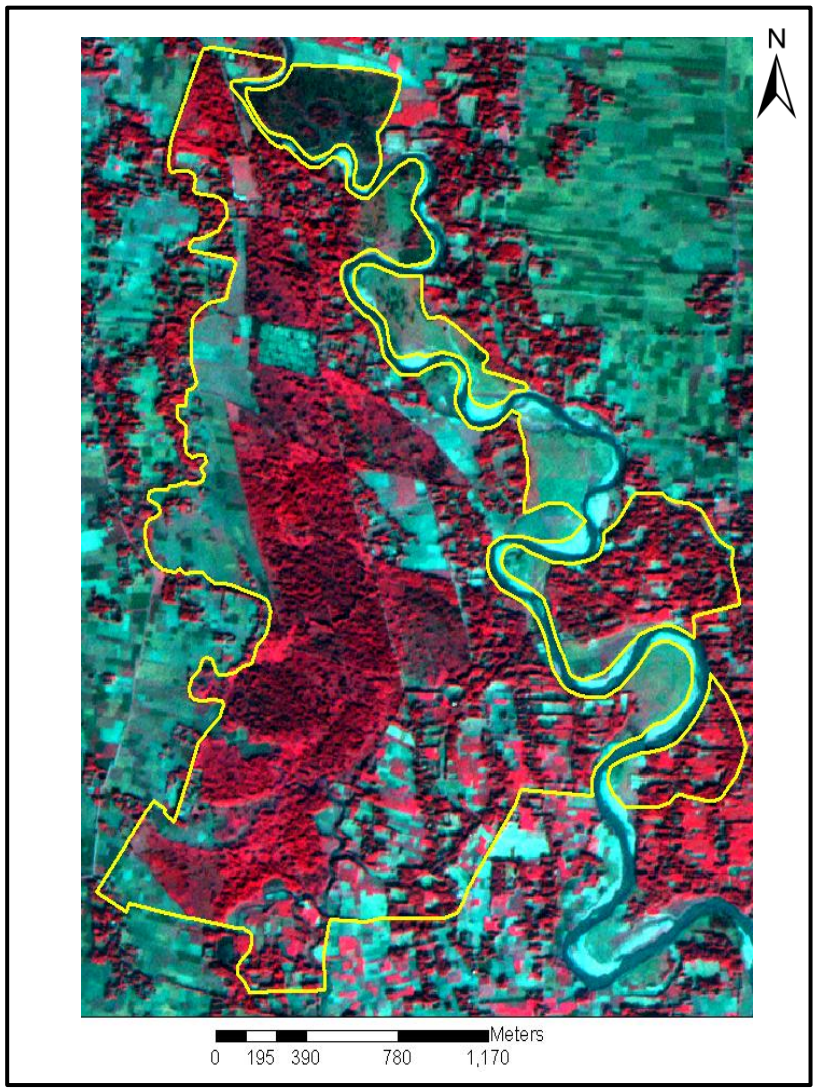


d. Shade Tree Density in Sections



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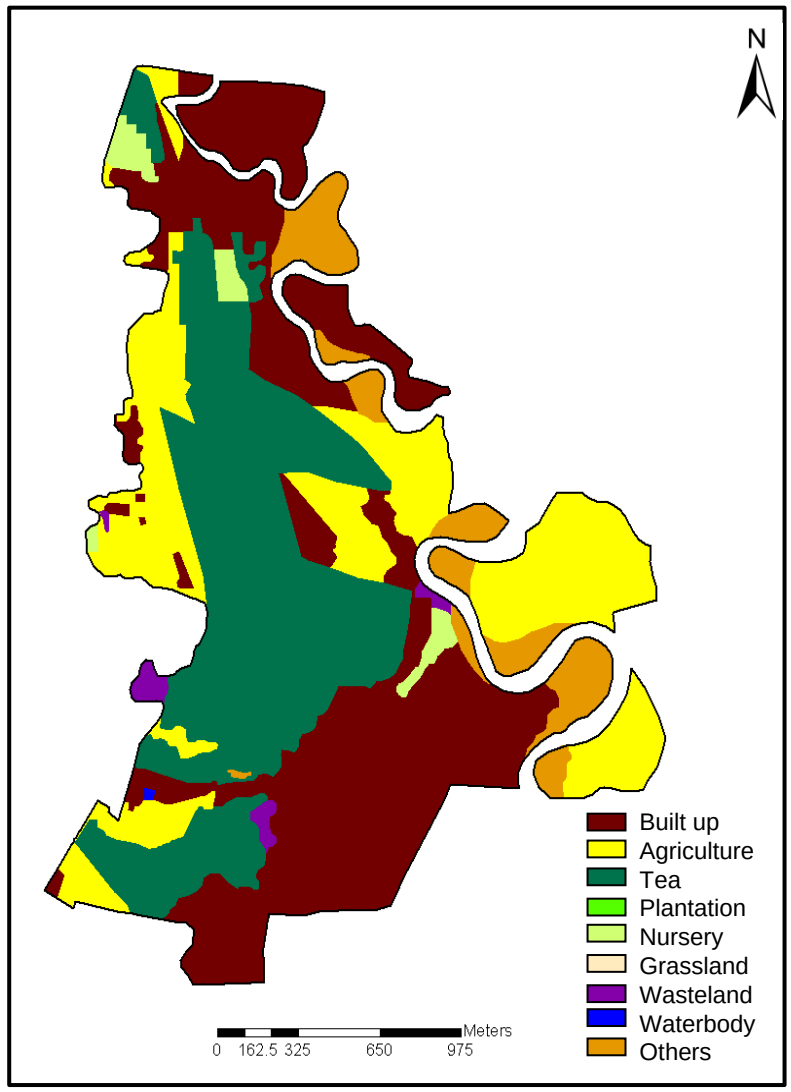
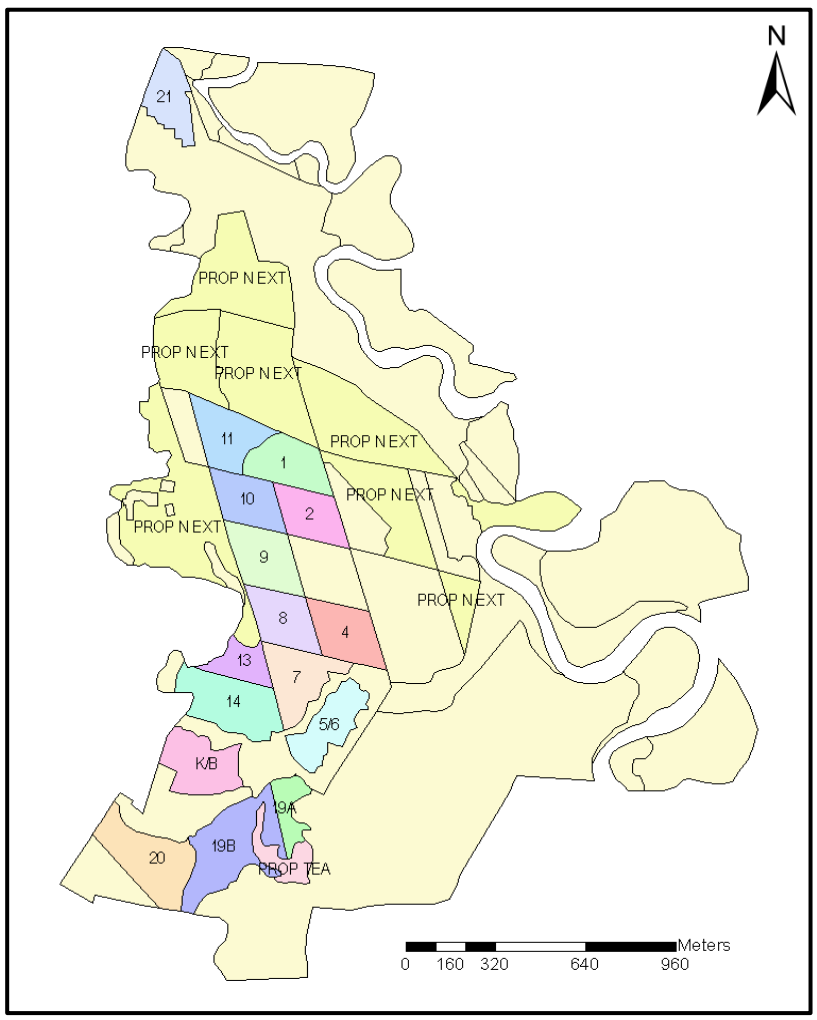


b. Tea Estate Landuse



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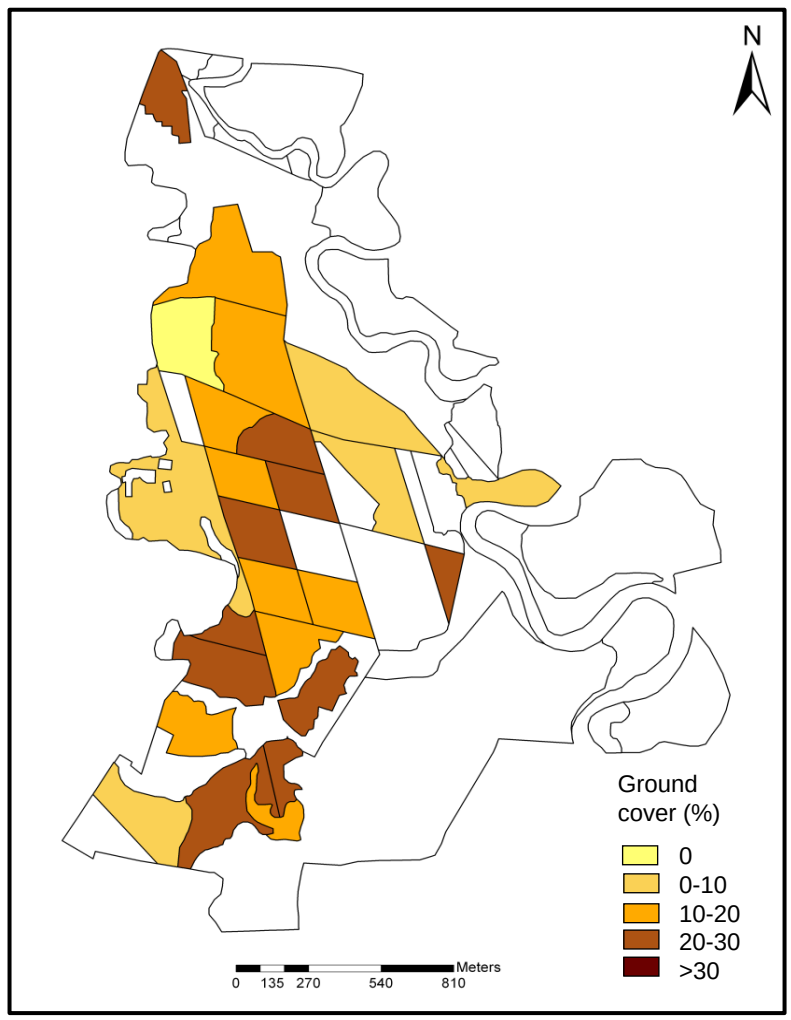
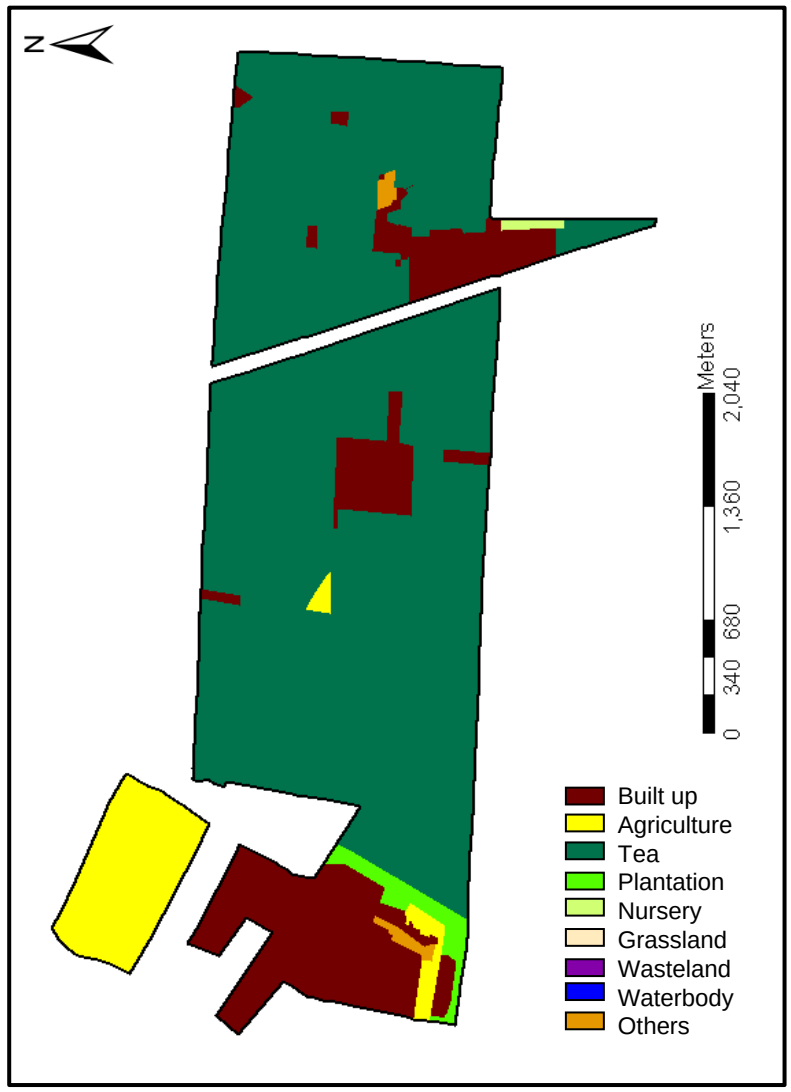
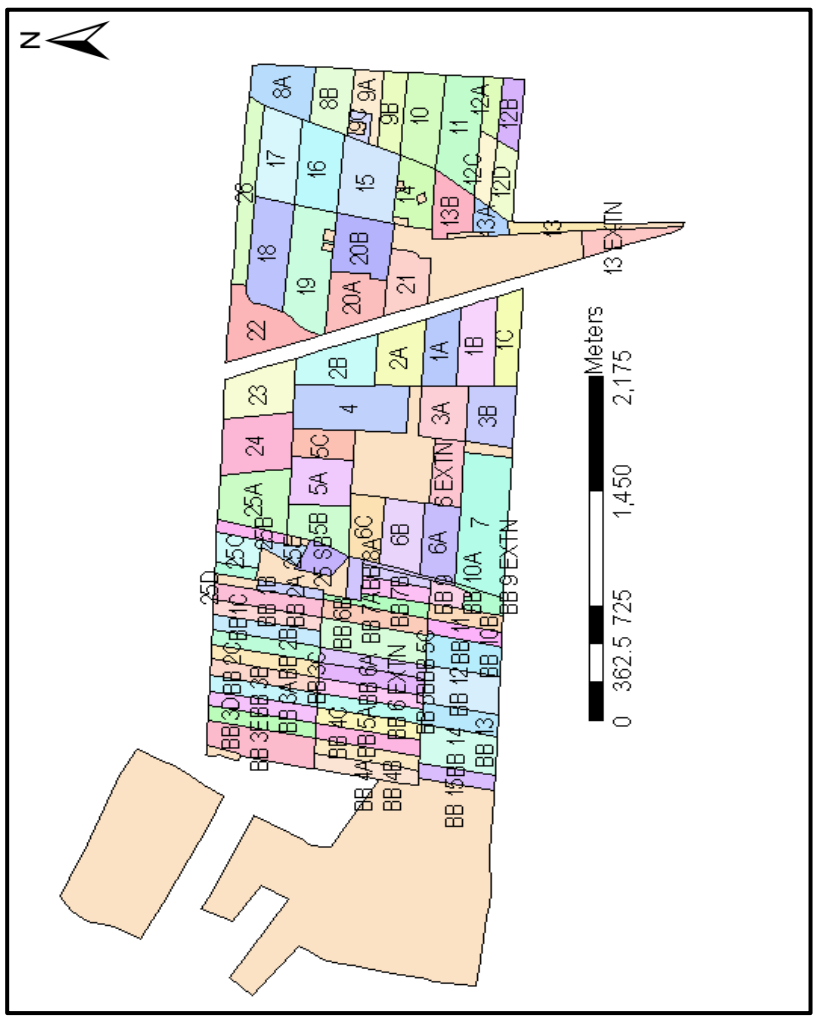


d. Shade Tree Density in Sections

a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



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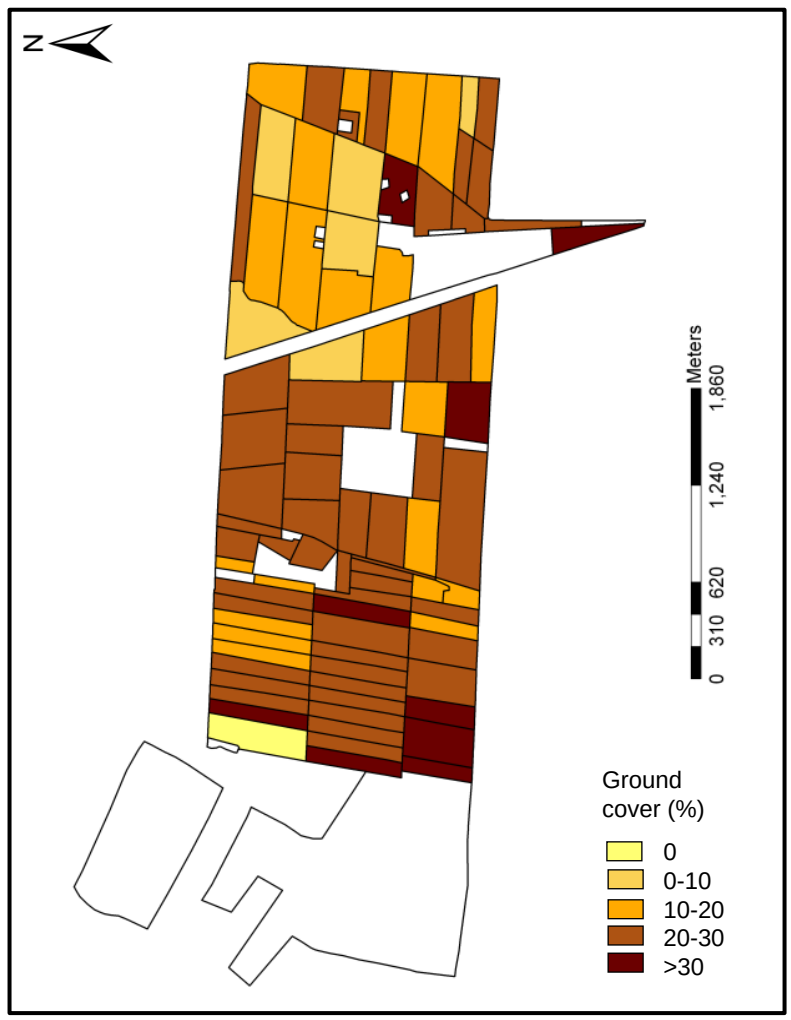
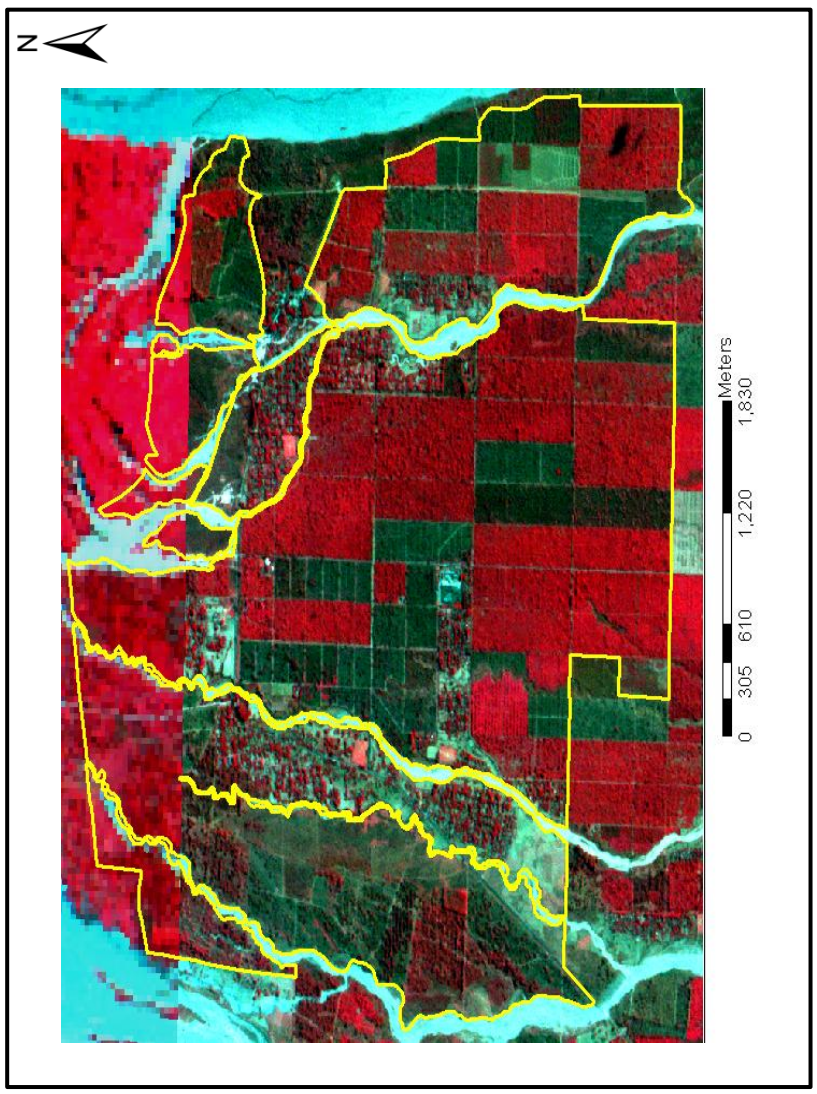


d. Shade Tree Density in Sections



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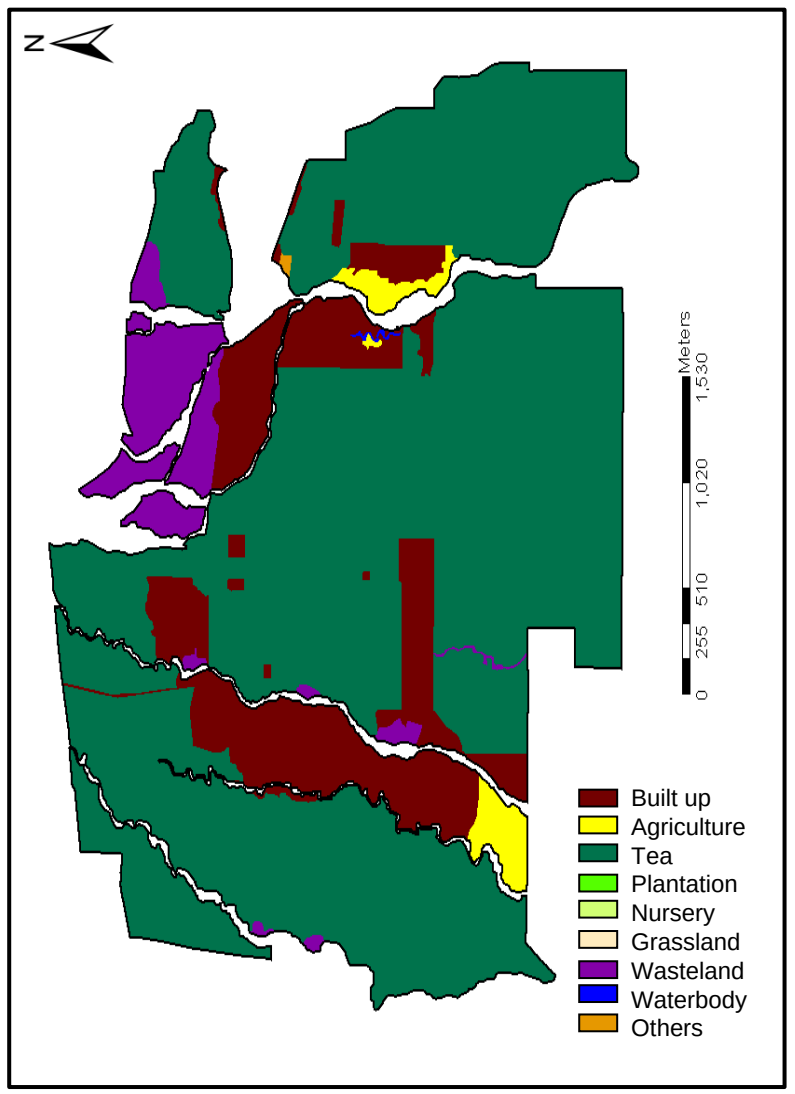
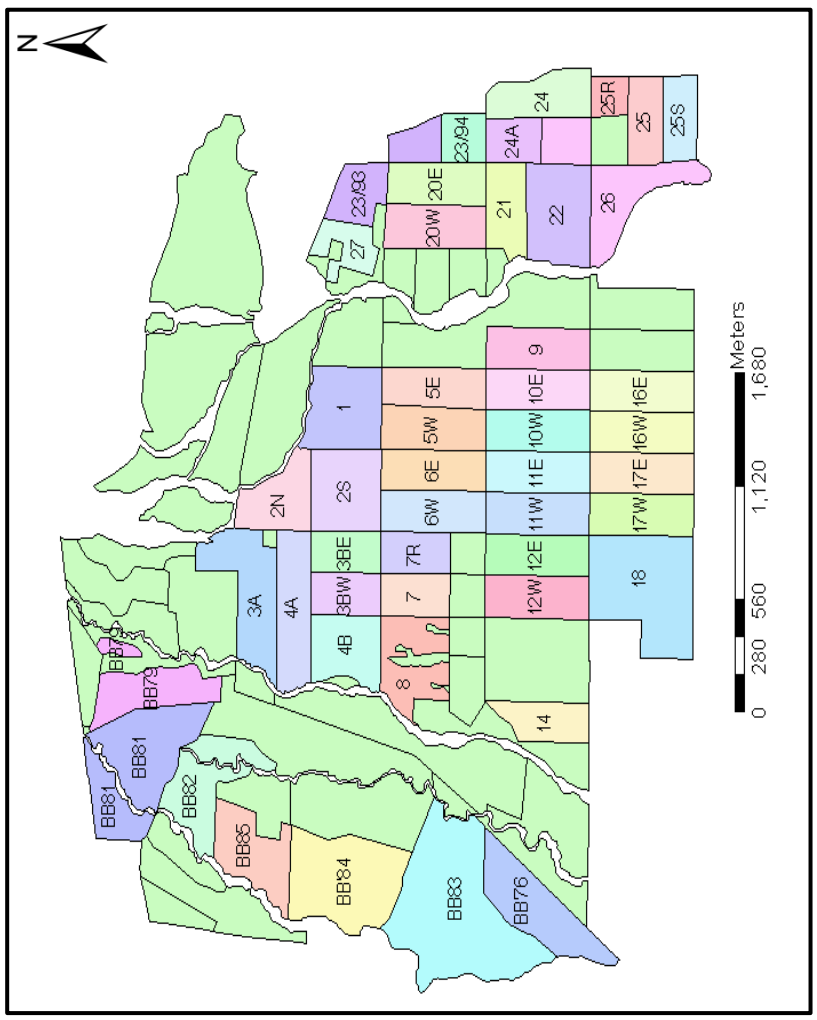


b. Tea Estate Landuse



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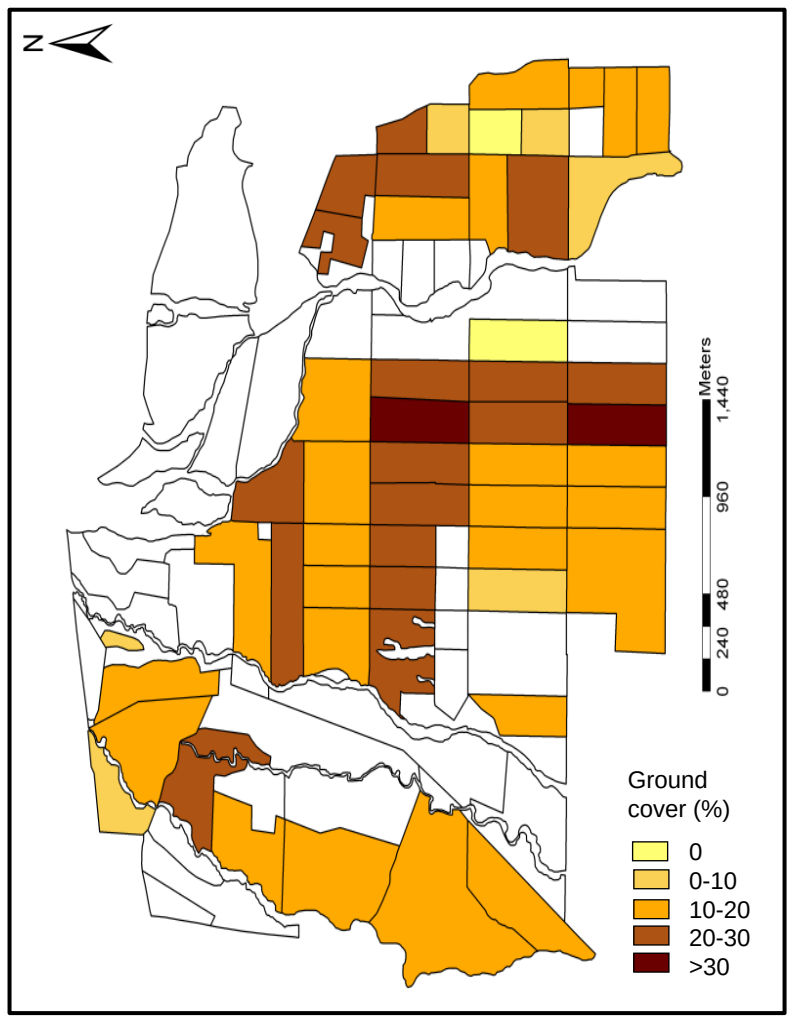
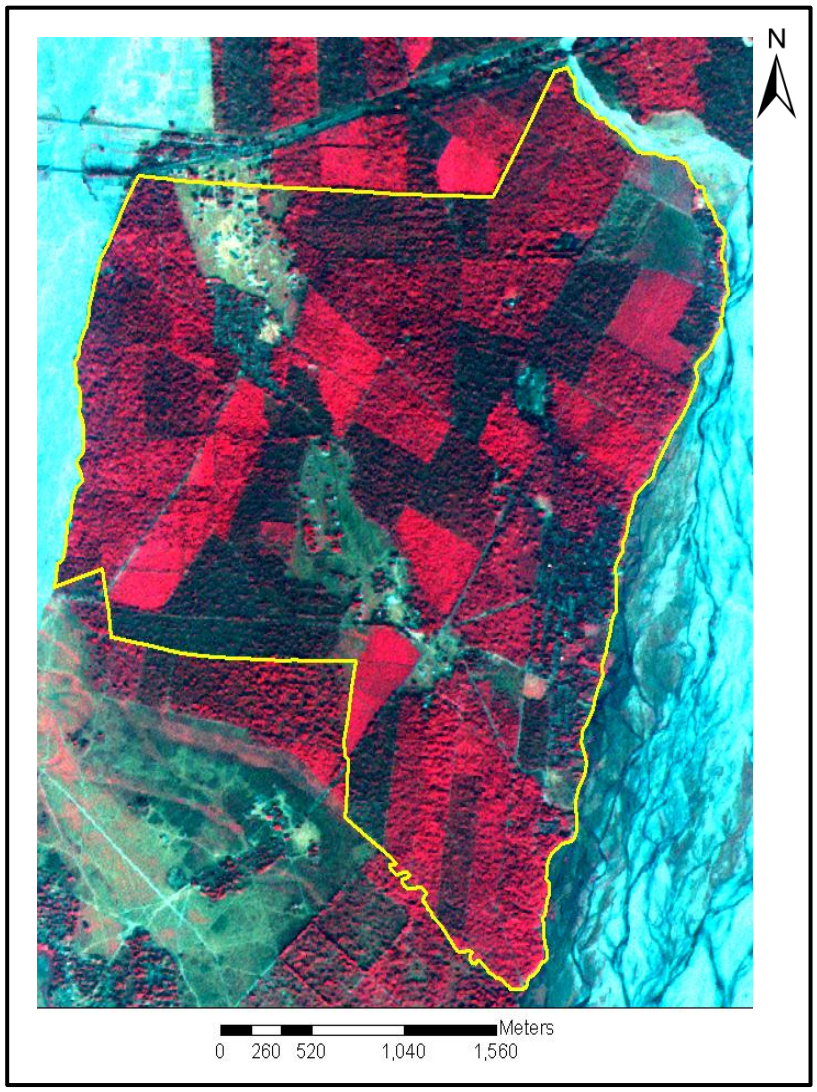


d. Shade Tree Density in Sections



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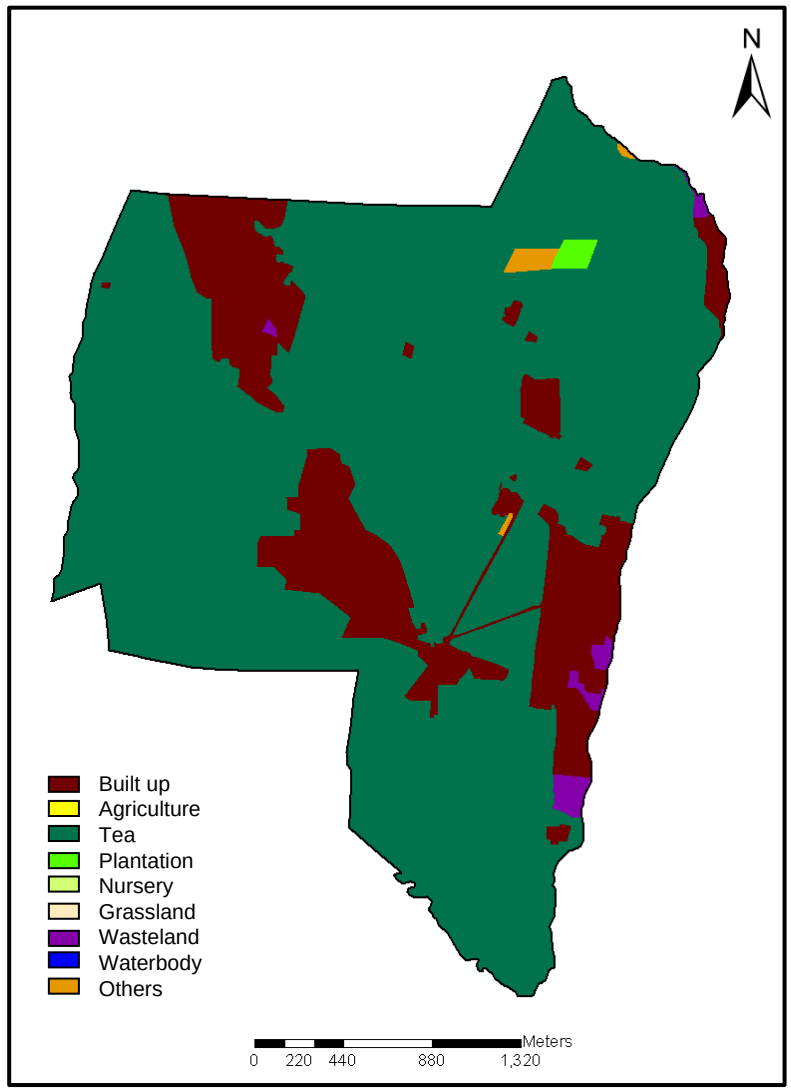
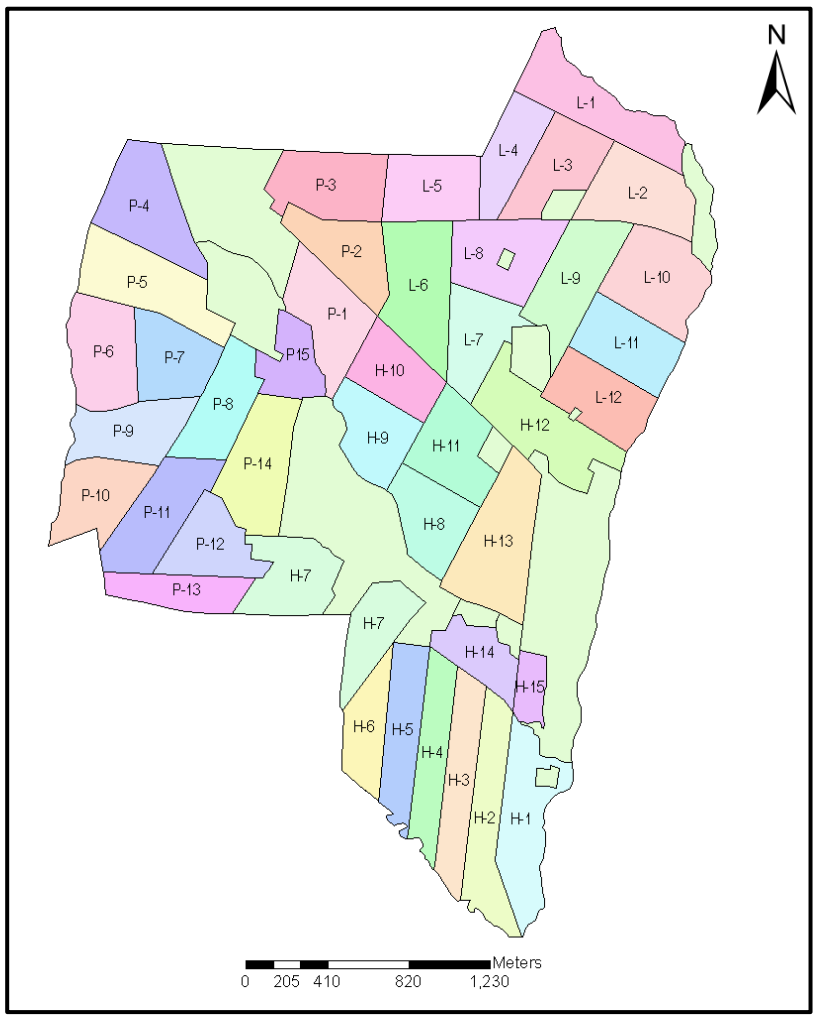
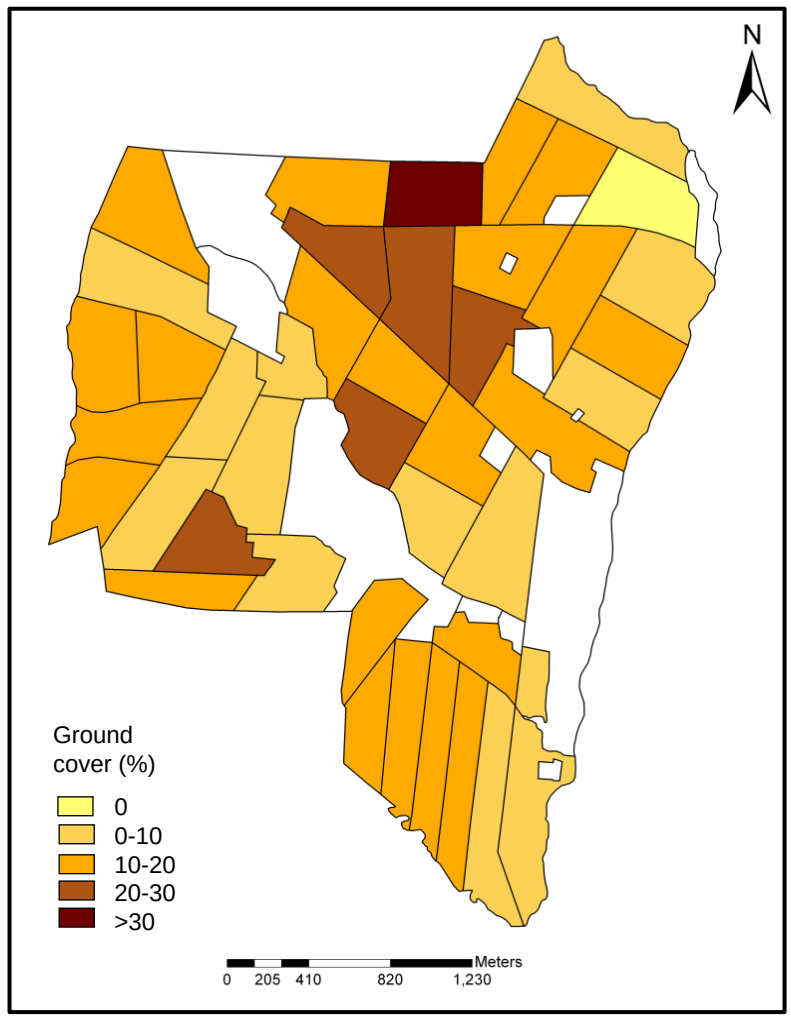


b. Tea Estate Landuse

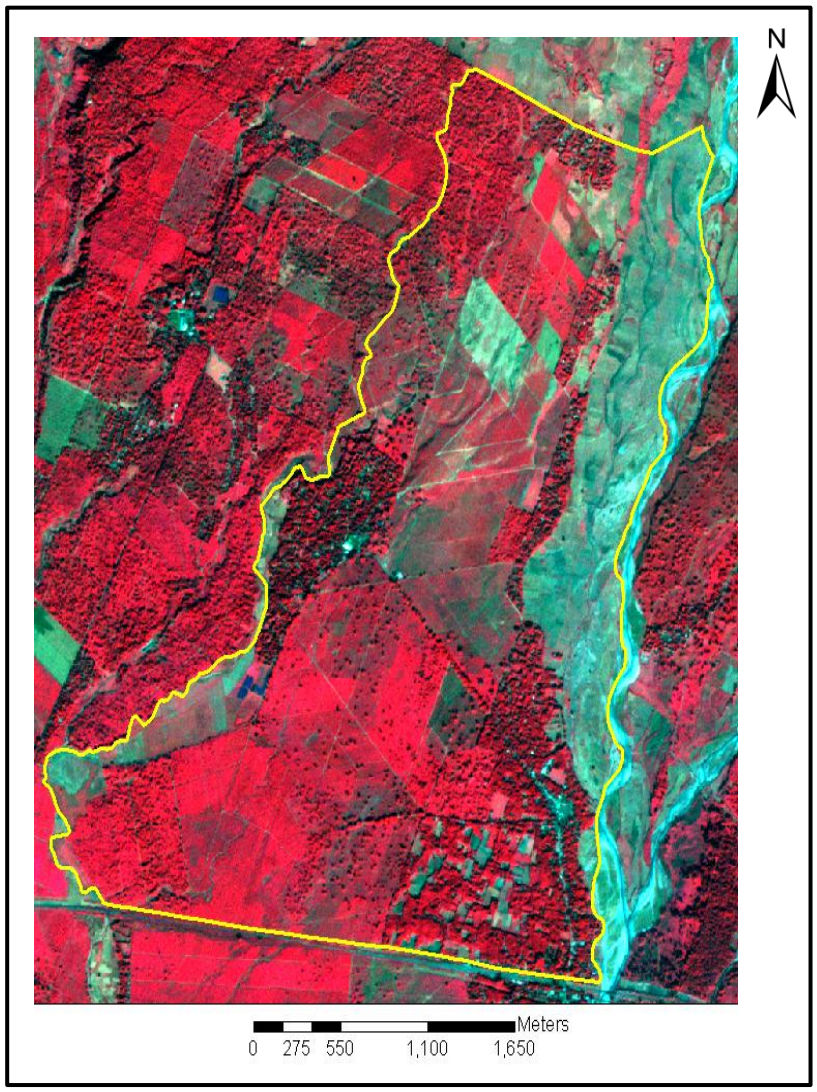


c. Section Boundaries of the Estate

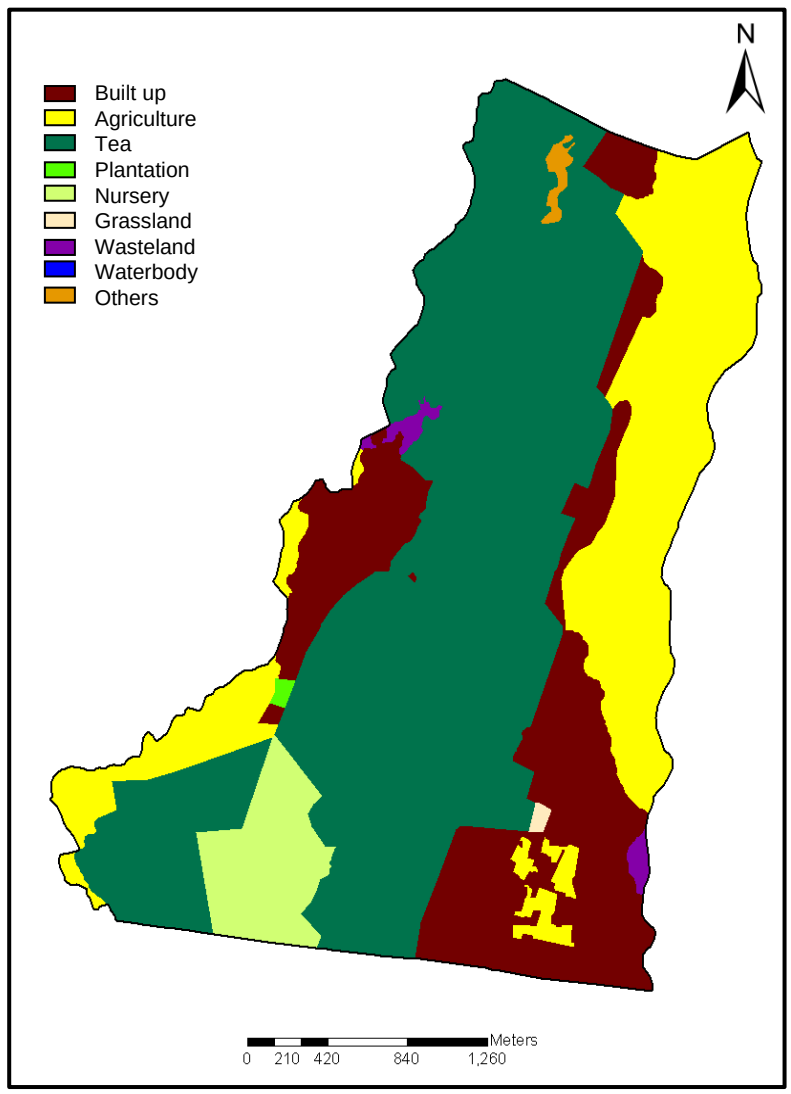


d. Shade Tree Density in Sections

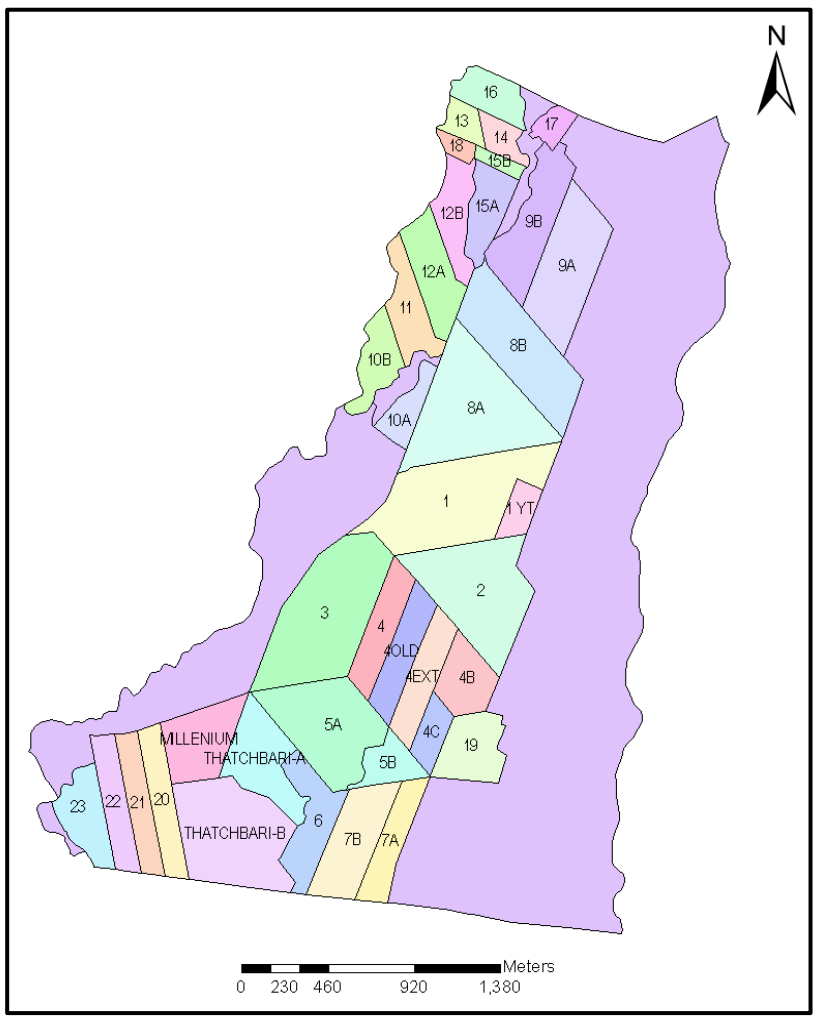
P76: LOOKSUN TE



a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



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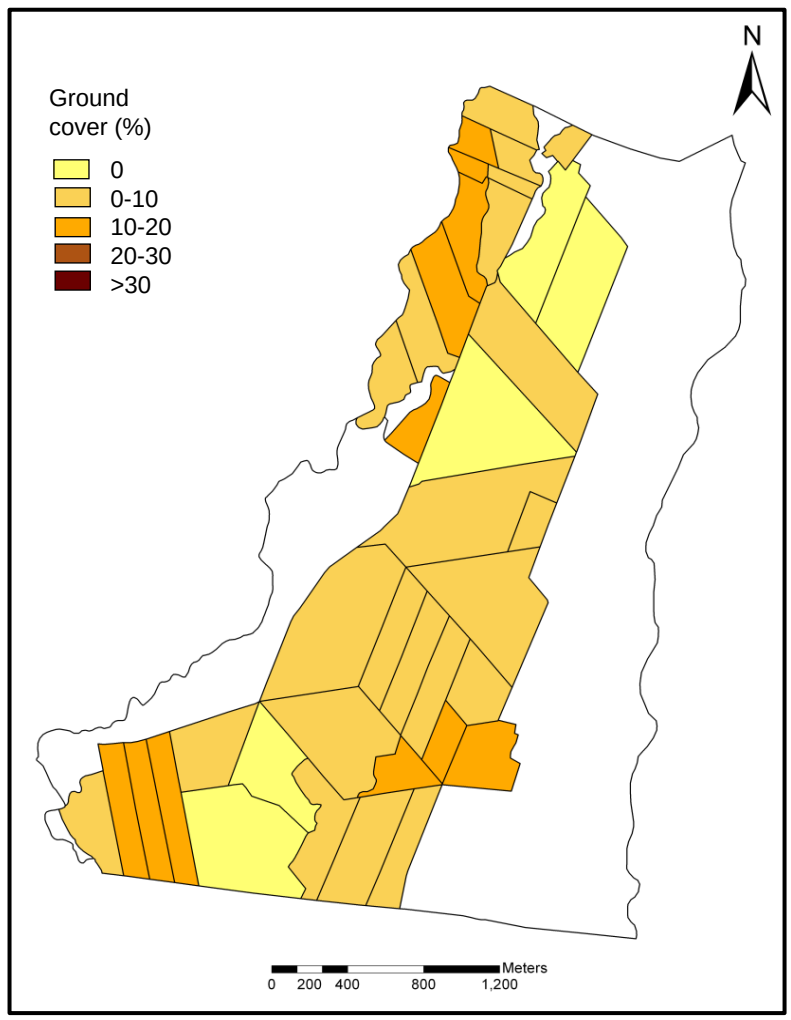
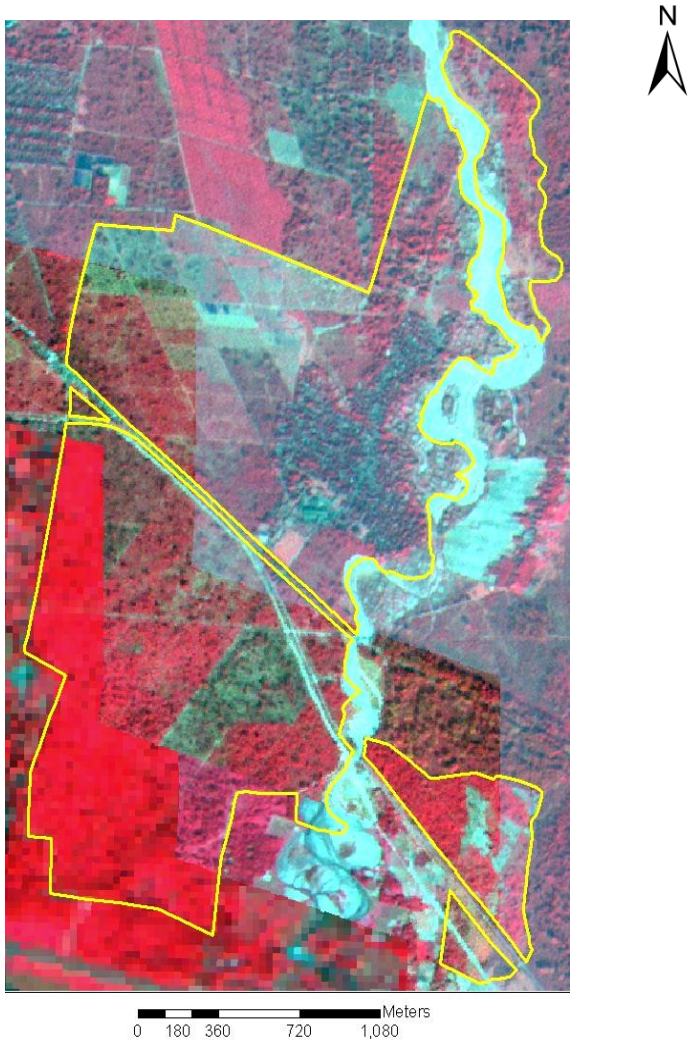
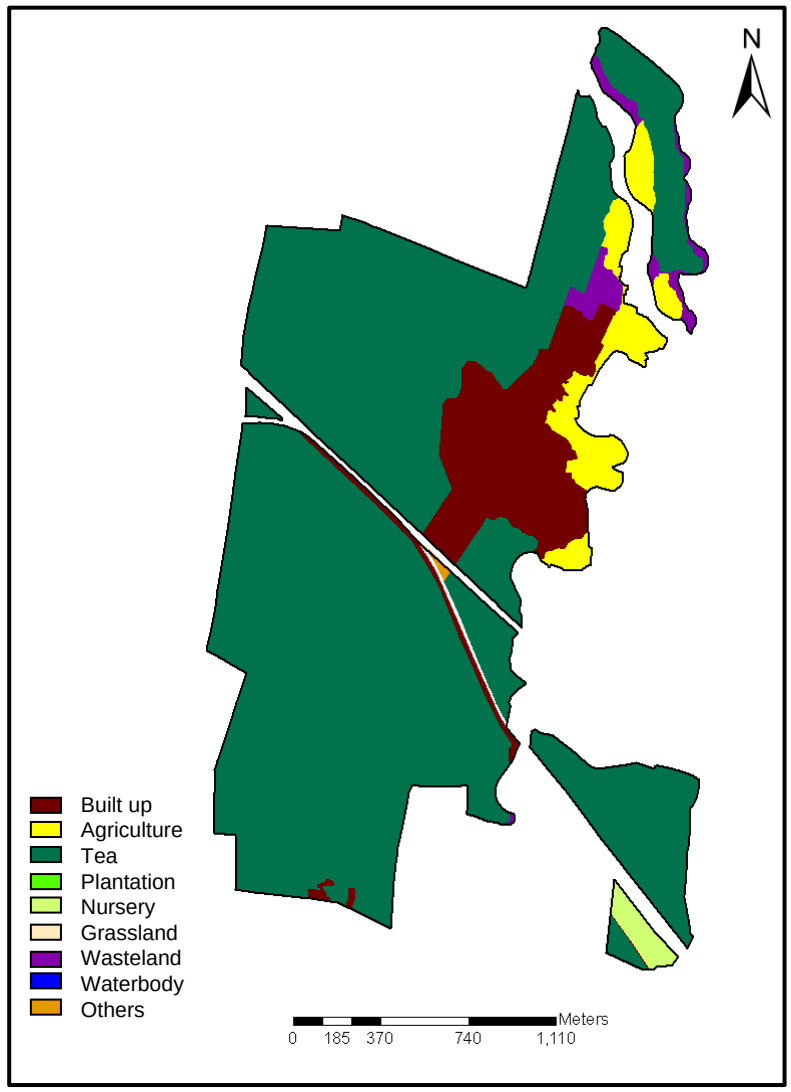


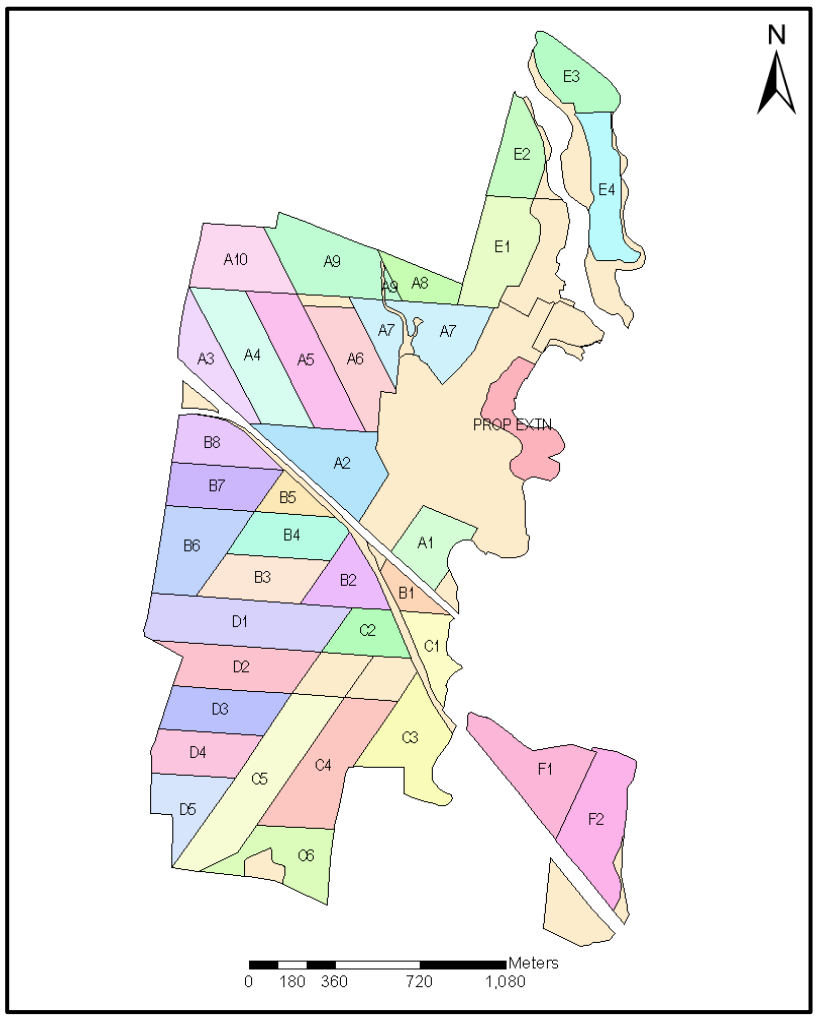
d. Shade Tree Density in Sections



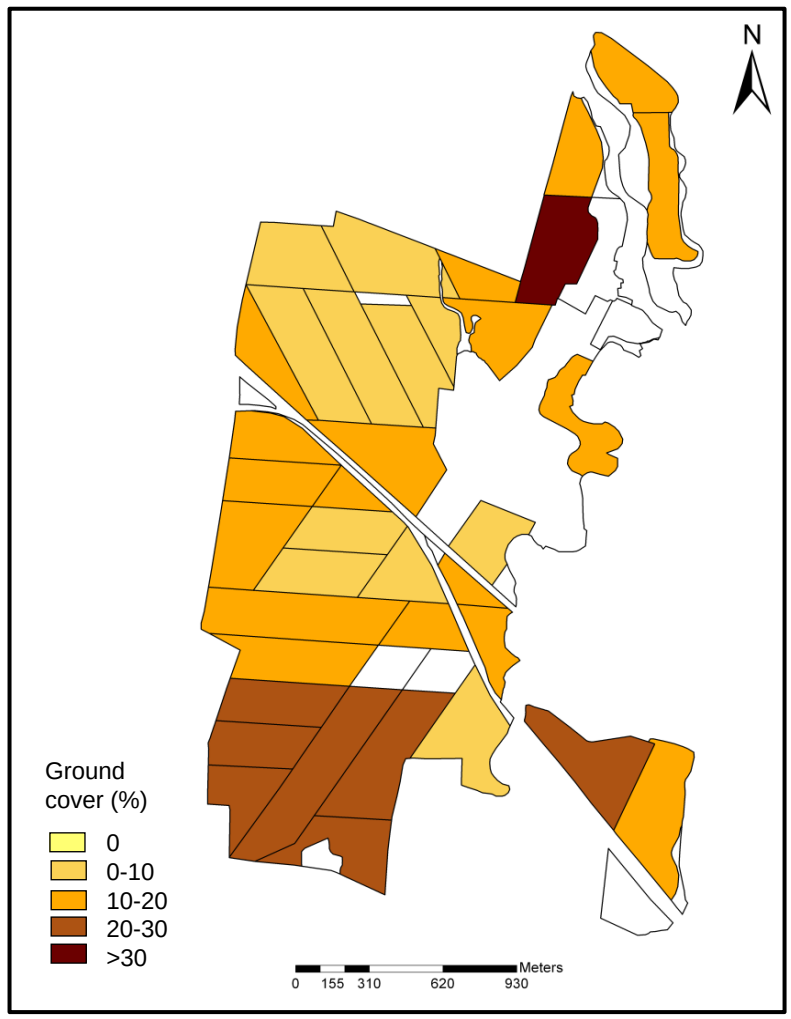
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

e. General Information

1. General	
Contact address	PO: Madhu bagan, Hasimara Dist: Jalpaiguri, PIN: 735215
Contact phone	03566-255652, 9476220562
Name of the company	Goodricke Group Ltd.
Name of the village where it falls	Madhu bagan
Leased area of the estate (ha)	451.42
Tea grown area of the estate (ha)	323.08
No. of divisions / sections	2 div/35 sec
Year of establishment	1933
Type of tea produced	CTC

2. Infrastructure	
Availability of processing factory	Yes
Availability of workers colony	Yes
Availability of internet facility / e-mail id	No
Meteorological observations taken	Tmax, Tmin, Rainfall, Wind, SSH

3. Amenities	
Availability of health care / dispensary	Yes
Availability of school	Yes

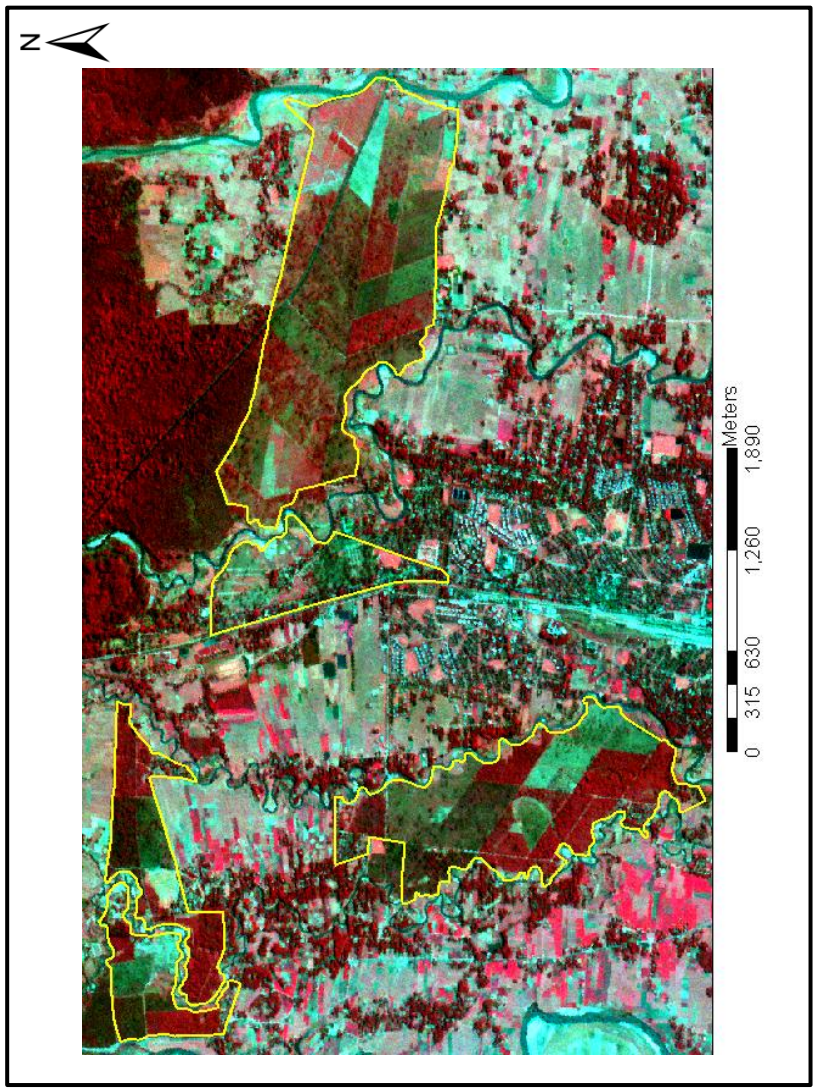
4. Shade trees	
Shade tree density (garden level)	Medium
Plant to plant spacing	20’
Row to row spacing	21’

5. Natural resources constraints	
Drainage congestion and water logging	Yes
Scarcity of water during summer	Yes
River bank erosion	Yes
Major diseases and duration	Black rot (Jun-Aug)
Major pests and duration	Looper , RSM, red slug
Damage due to wildlife	Yes

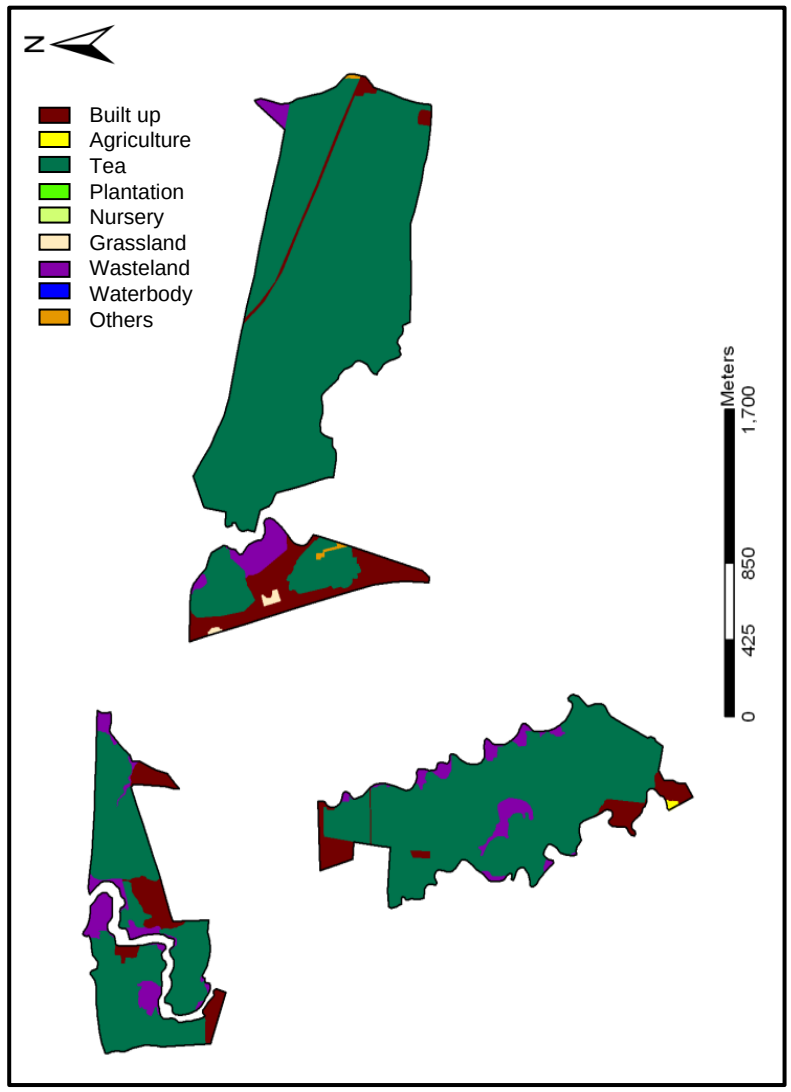
6. Yield / production	
Peak plucking periods	Jun-Oct
Annual green leaf yield	427139.2
Annual production of processed tea	--

7. Pruning	
Time of pruning	Dec-Jan
Pruning cycle	4 yr
Types of pruning	LP-UP-DS-UP

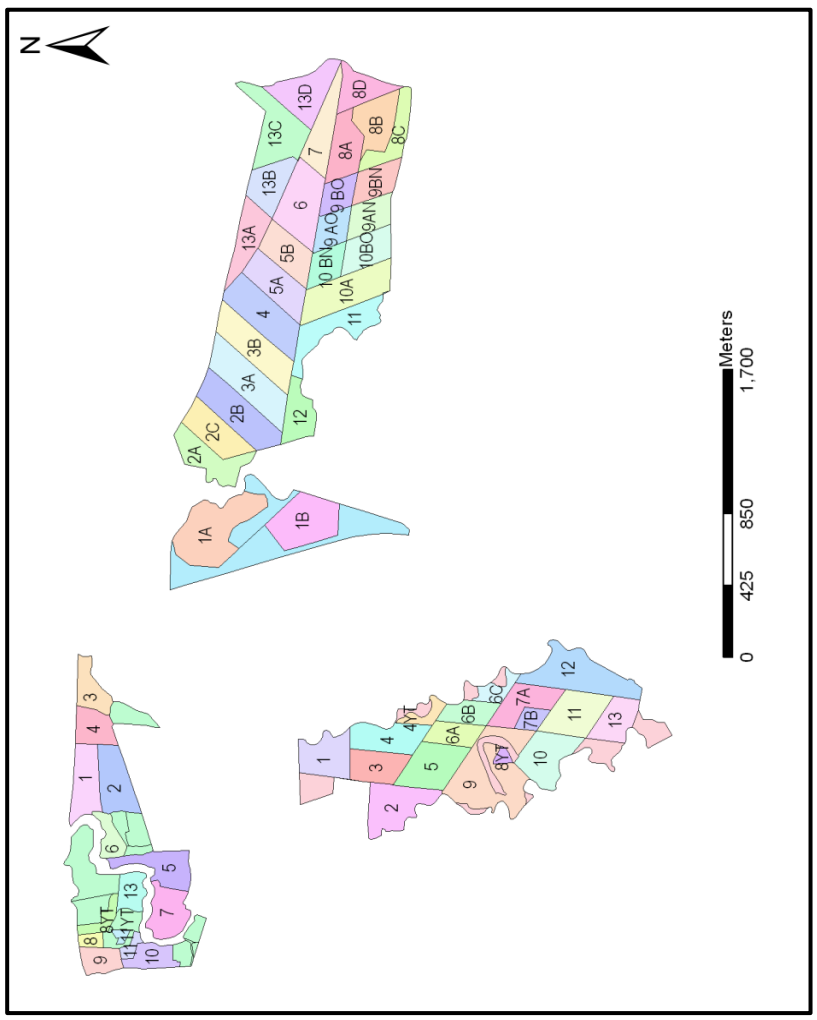
8. Fertilizer use	
Types of N, P, K fertilizers used	Urea, RP, MOP
Dose of Nitrogen (kg/ha)	120
Dose of Phosphorous (kg/ha)	40
Dose of Potash (kg/ha)	90
Whether lime is applied, if yes dose	--



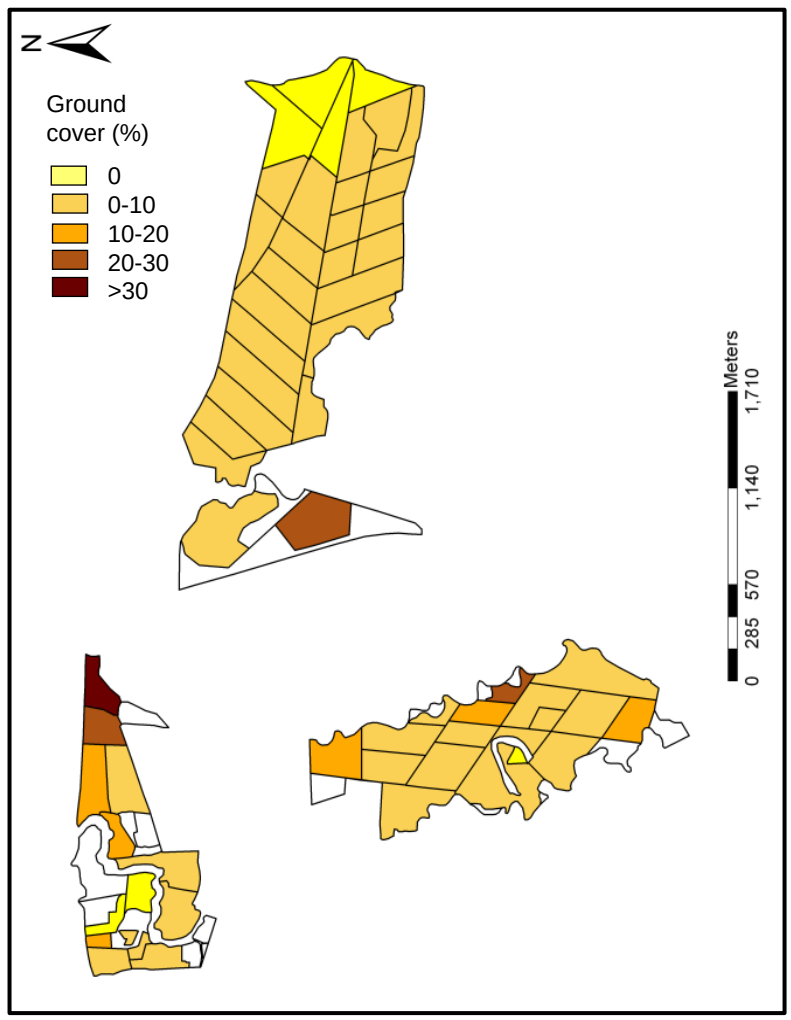
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

e. General Information

1. General

Contact address	P.O: Alipurduar, Dist: Jalpaiguri PIN: 736121
Contact phone	03564-270469
Name of the company	Rangpur Tea Association Limited
Name of the village where it falls	Majherdabri
Leased area of the estate (ha)	486.50
Tea grown area of the estate (ha)	382.27
No. of divisions / sections	3 div/62 sec
Year of establishment	1918
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	Rainfall

3. Amenities

Availability of health care / dispensary	Yes
Availability of school	Yes

4. Shade trees

Shade tree density (garden level)	Medium-High
Plant to plant spacing (m)	6.66 x 8.33
Row to row spacing (m)	6.66 x 6.66

5. Natural resources constraints

Drainage congestion and water logging	Yes
Scarcity of water during summer	No
River bank erosion	Yes
Major diseases and duration	Red rust, black rot (Apr-Sep)
Major pests and duration	RSM, looper, *Helopeltis*, greenfly
Damage due to wildlife	Yes

6. Yield / production

Peak plucking periods	Jul-Oct
Annual green leaf yield	6792.09 kg/ha
Annual production of processed tea	600118 kg

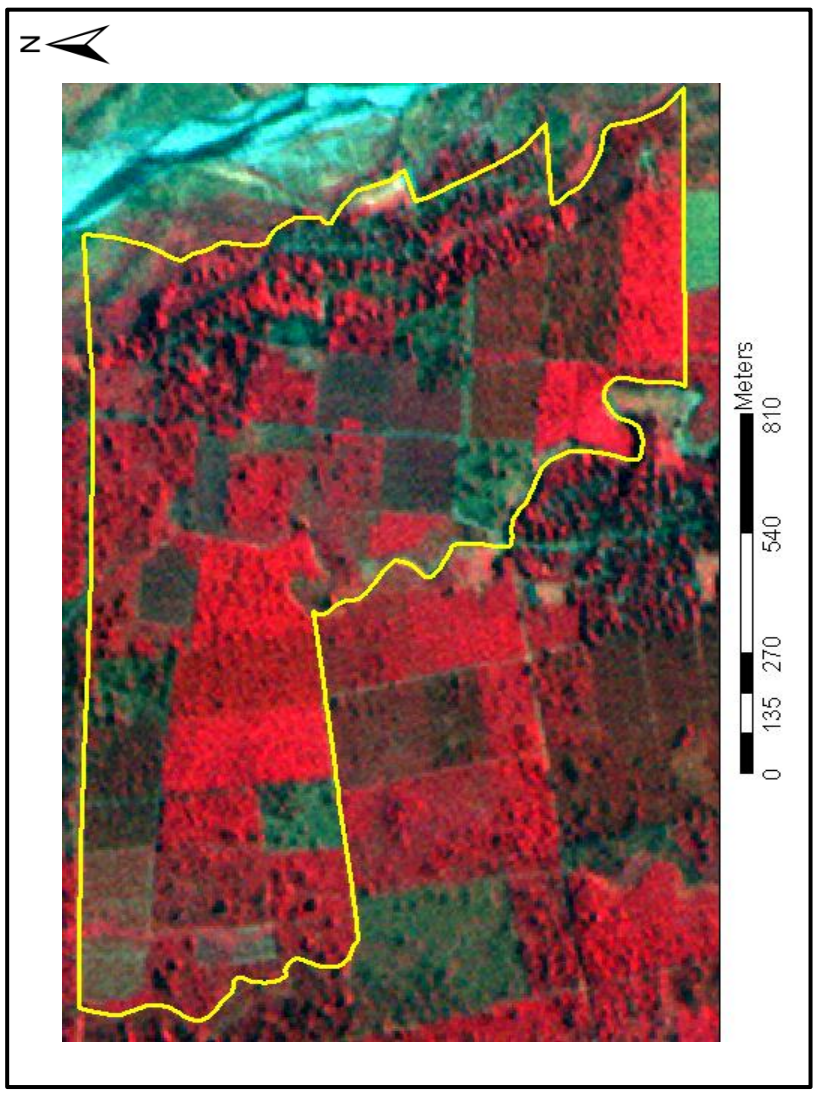
7. Pruning

Time of pruning	End of Nov-Mid of Jan
Pruning cycle	3 yrs
Types of pruning	--

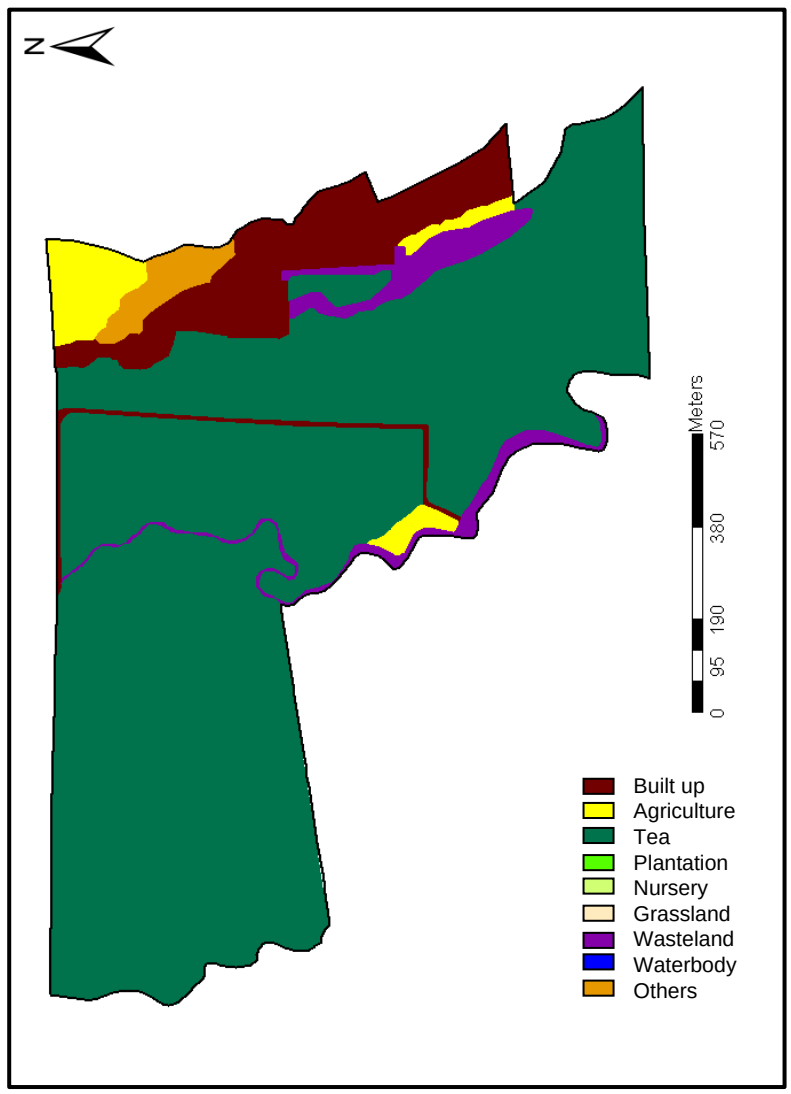
8. Fertilizer use

Types of N, P, K fertilizers used	Urea, MOP, SP, RP
Dose of Nitrogen (kg/ha)	90-140
Dose of Phosphorous (kg/ha)	60-130
Dose of Potash (kg/ha)	--
Whether lime is applied, if yes dose	Yes, 500-2000 kg/ha

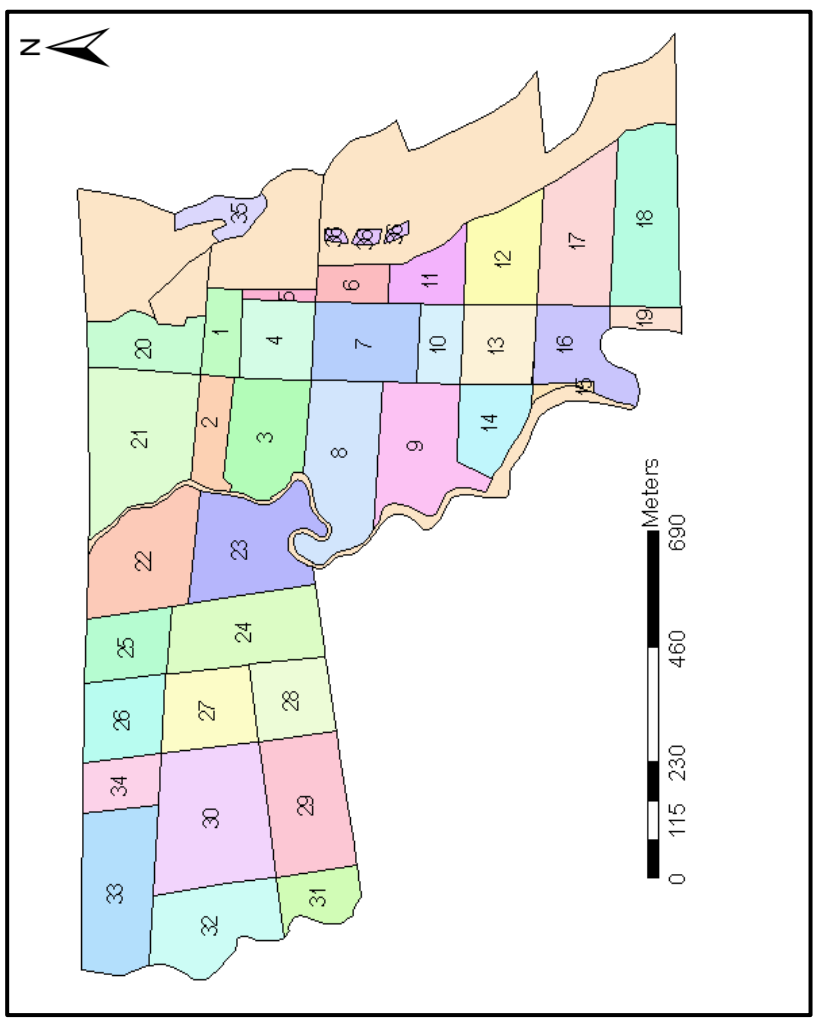
P79: MALNUDDY TE



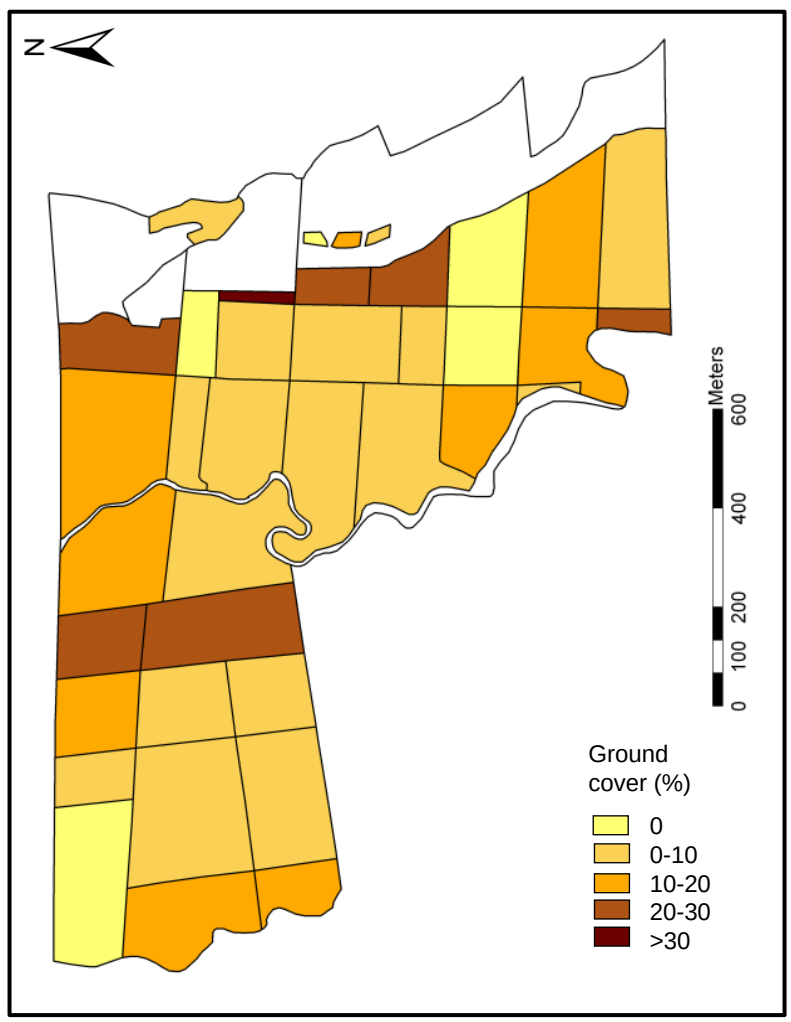
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

e. General Information

1. General	
Contact address	P.O: Mal; Dist: Jalpaiguri PIN: 735221
Contact phone	9434745235; 9434339664
Name of the company	Malnuddy Tea Estate Pvt. Ltd.
Name of the village where it falls	Malnuddy
Leased area of the estate (ha)	144.28
Tea grown area of the estate (ha)	97.69
No. of divisions / sections	1 div/36 sec
Year of establishment	1892
Type of tea produced	Green tea

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)	13.33 x 13.33
Row to row spacing (m)	13.33 x 13.33

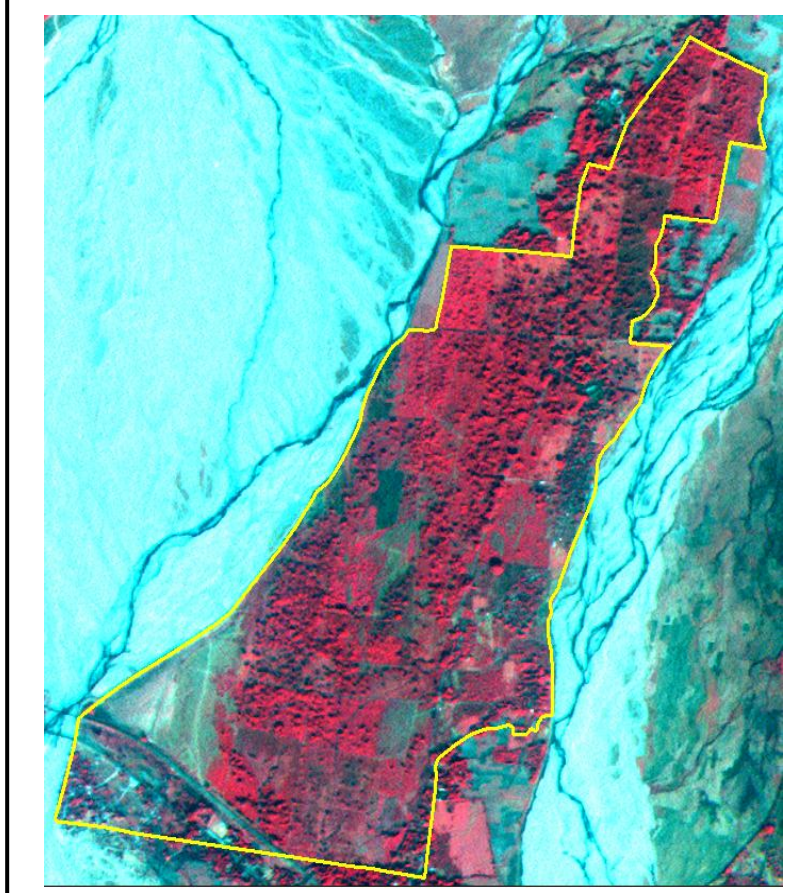
5. Natural resources constraints	
Drainage congestion and water logging	Yes
Scarcity of water during summer	Yes
River bank erosion	Yes
Major diseases and duration	Red rust, root rot, stem rot (monsoon)
Major pests and duration	Looper, *Helopeltis* (throughout the year)
Damage due to wildlife	Yes

6. Yield / production	
Peak plucking periods	Jul-Oct
Annual green leaf yield	7731.17 kg/ha
Annual production of processed tea	167835 kg

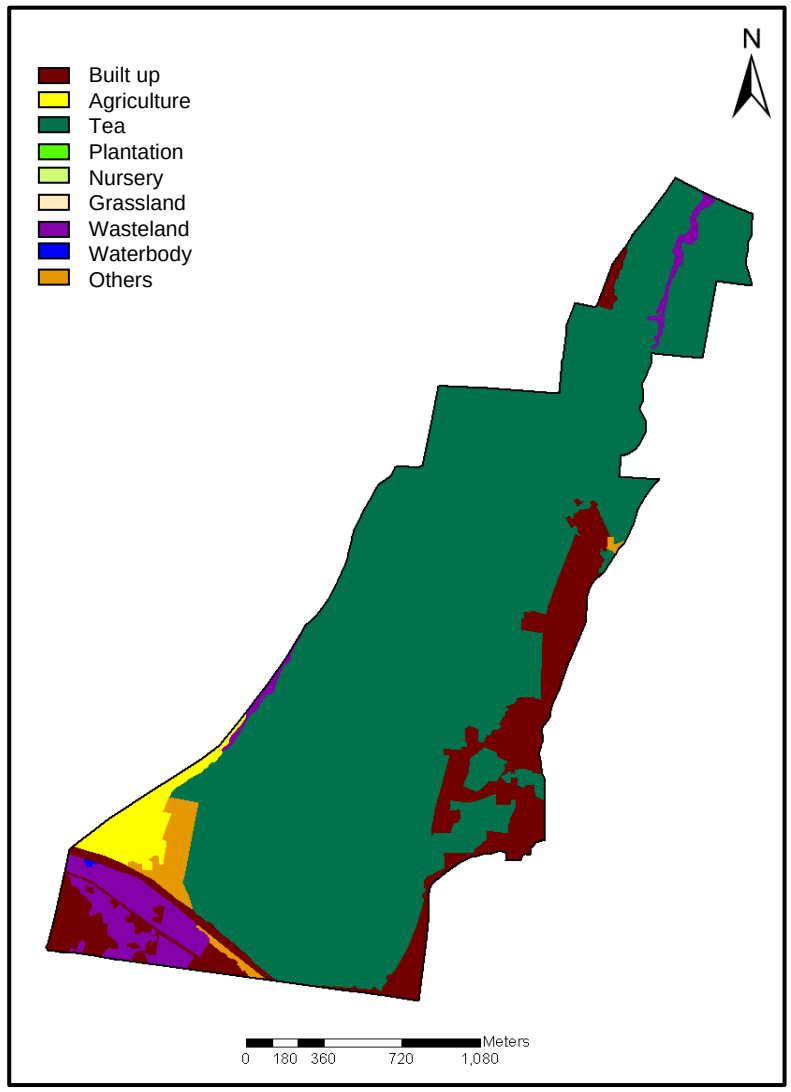
7. Pruning	
Time of pruning	Dec-Jan
Pruning cycle	3 yrs/4 yrs
Types of pruning	--

8. Fertilizer use	
Types of N, P, K fertilizers used	Urea, MOP, SSP, RP, DAP
Dose of Nitrogen (kg/ha)	--
Dose of Phosphorous (kg/ha)	--
Dose of Potash (kg/ha)	--
Whether lime is applied, if yes dose	Dolomite

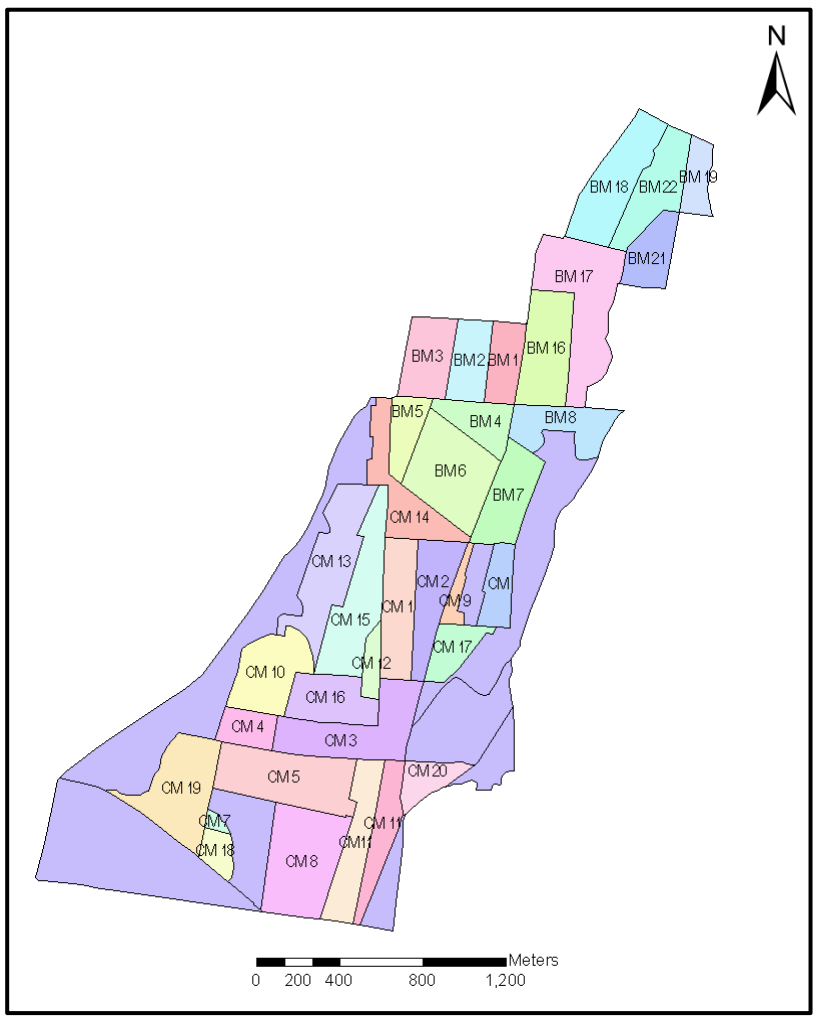
P80: MANABARIE TE



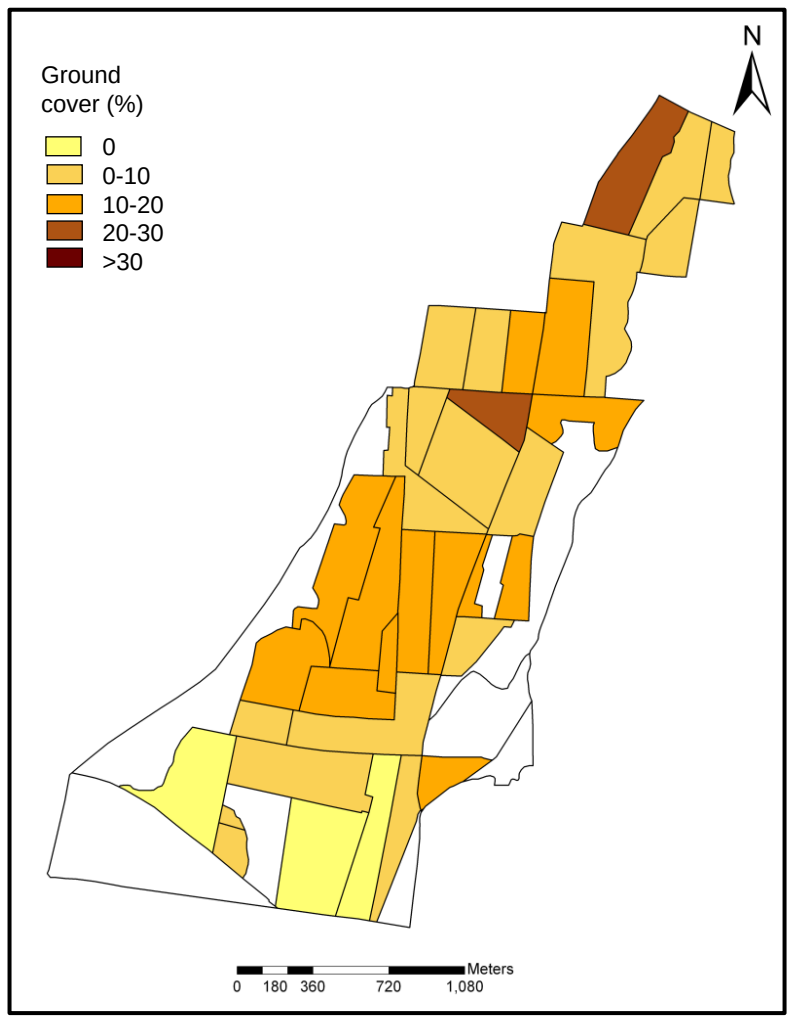
a. False Colour Composite of IRS LISS IV



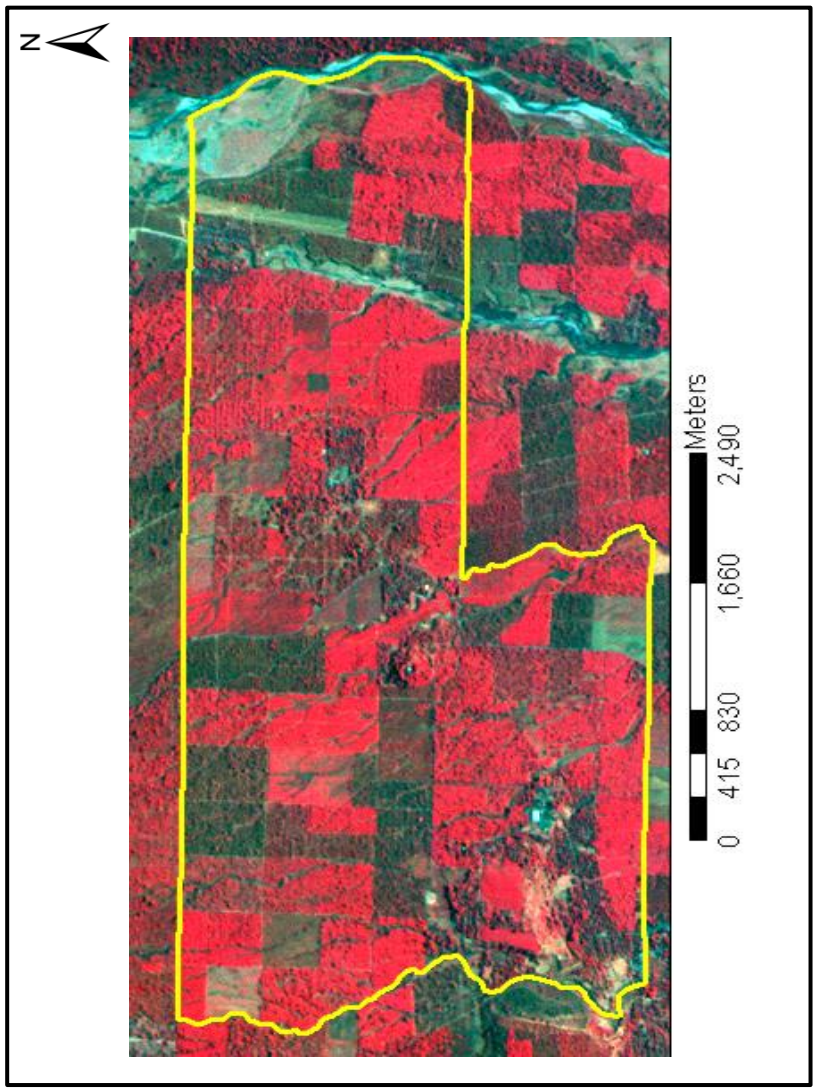
b. Tea Estate Landuse



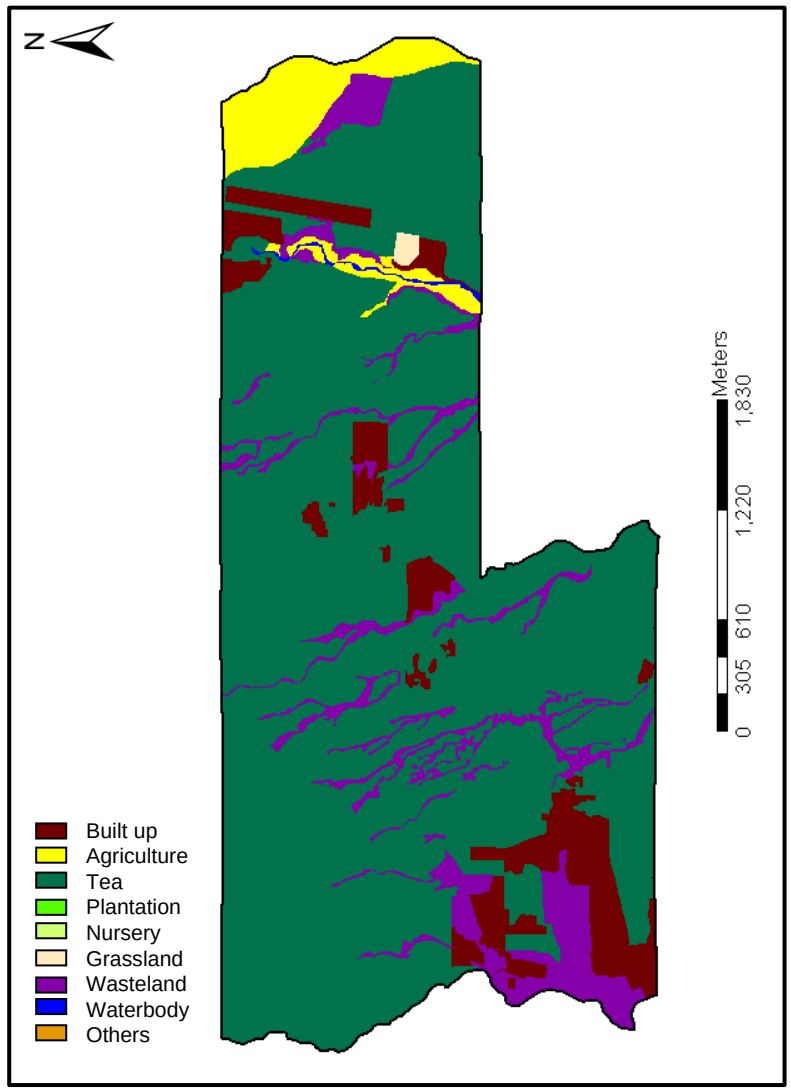
c. Section Boundaries of the Estate



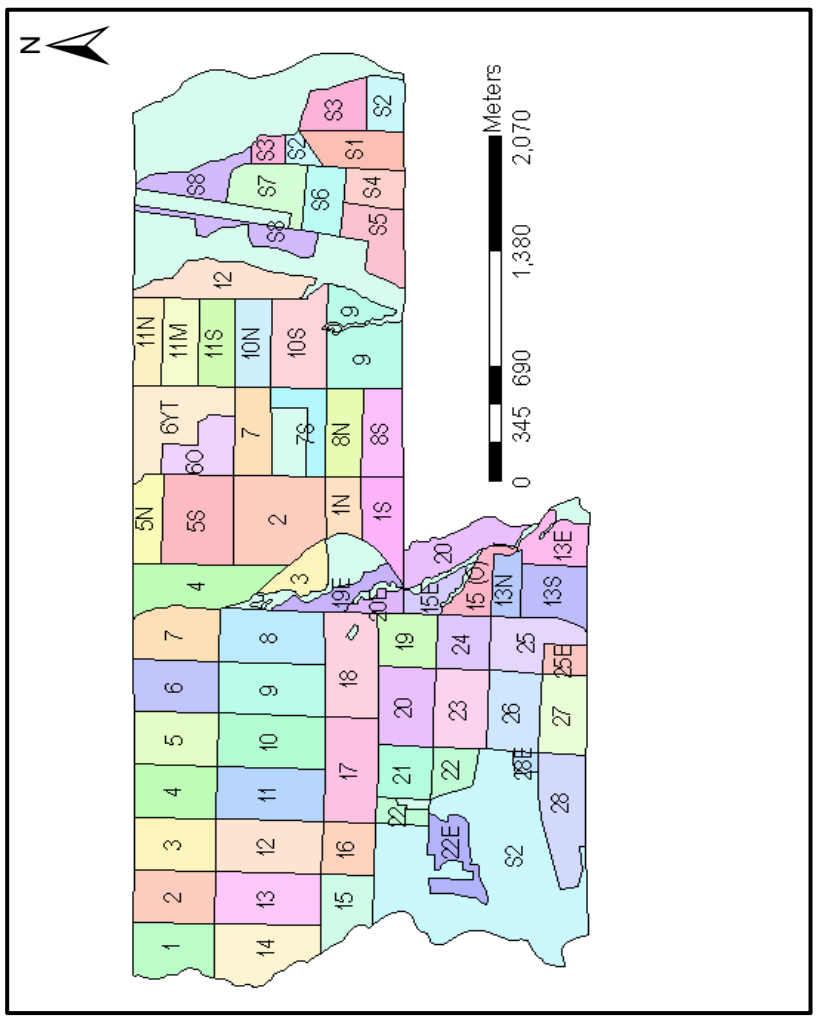
d. Shade Tree Density in Sections



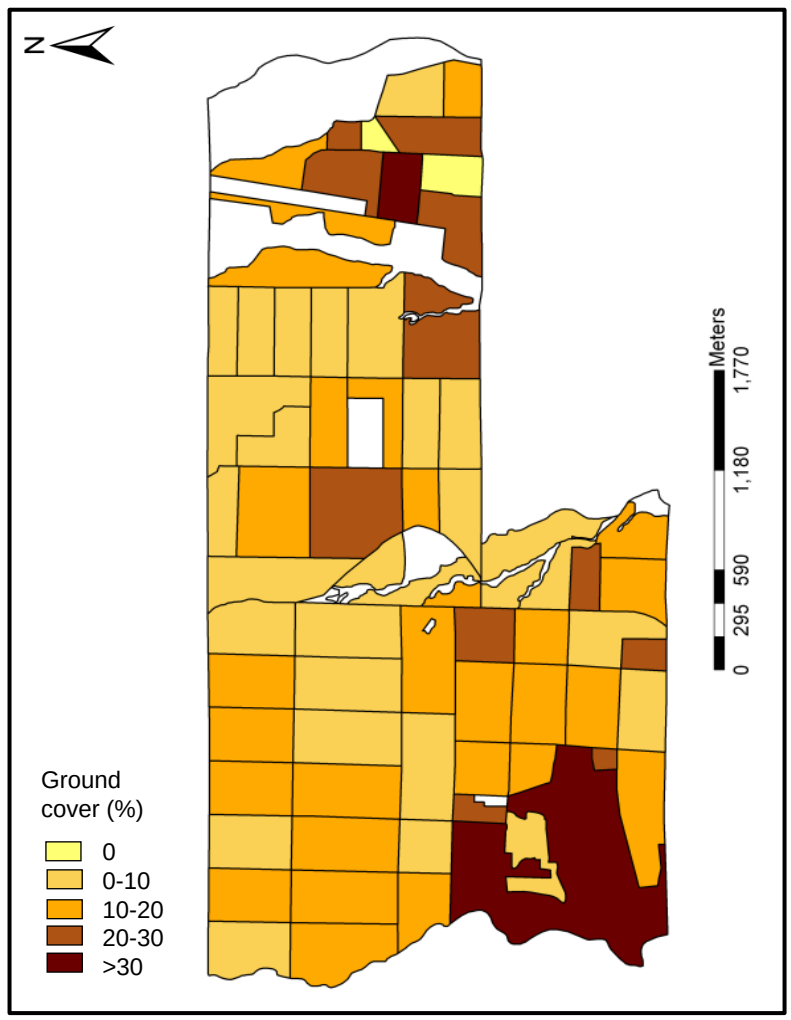
a. False Colour Composite of IRS LISS IV



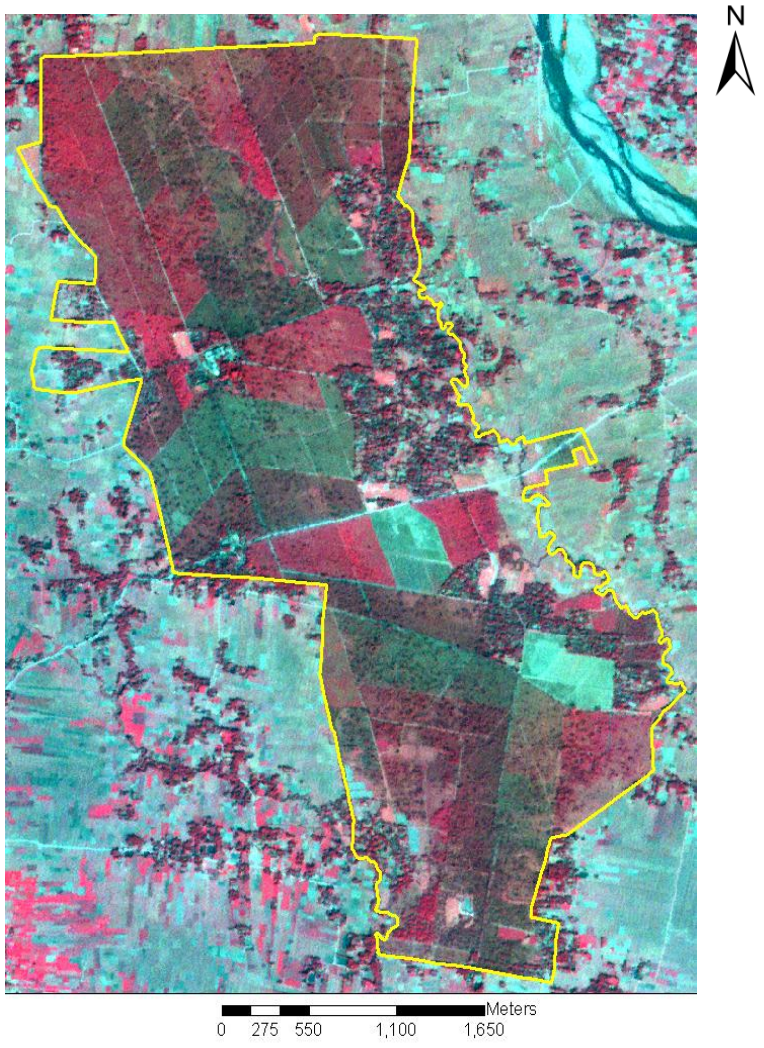
b. Tea Estate Landuse



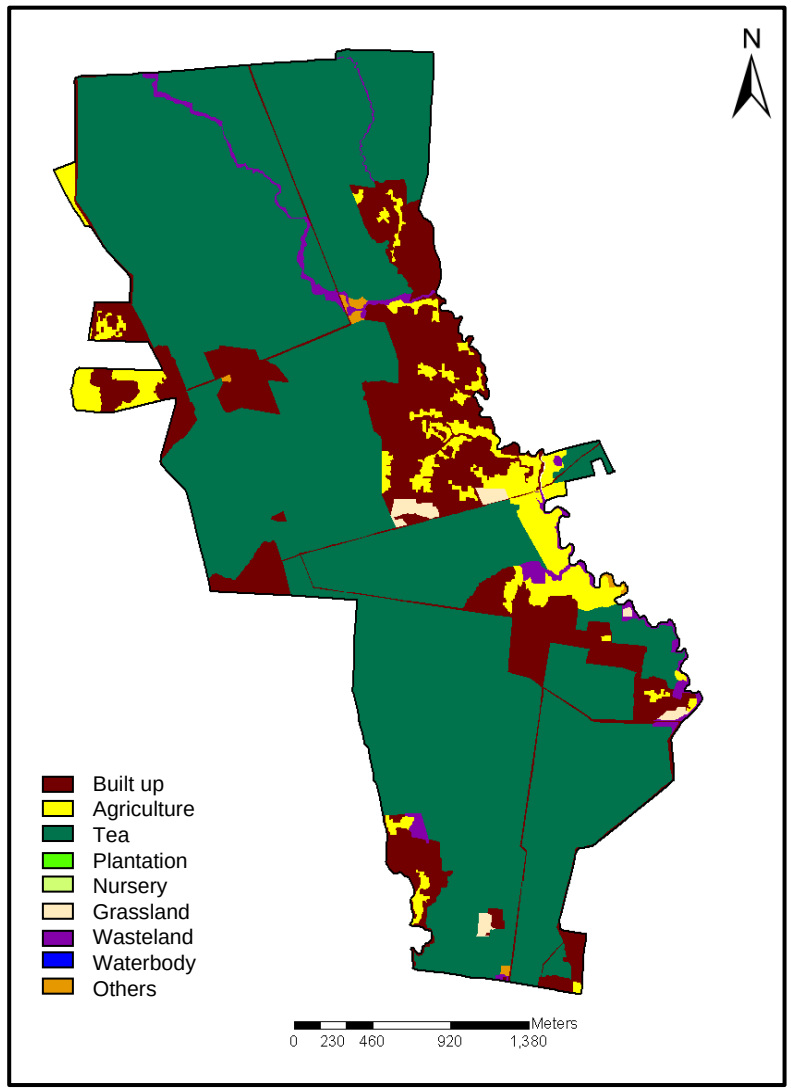
c. Section Boundaries of the Estate



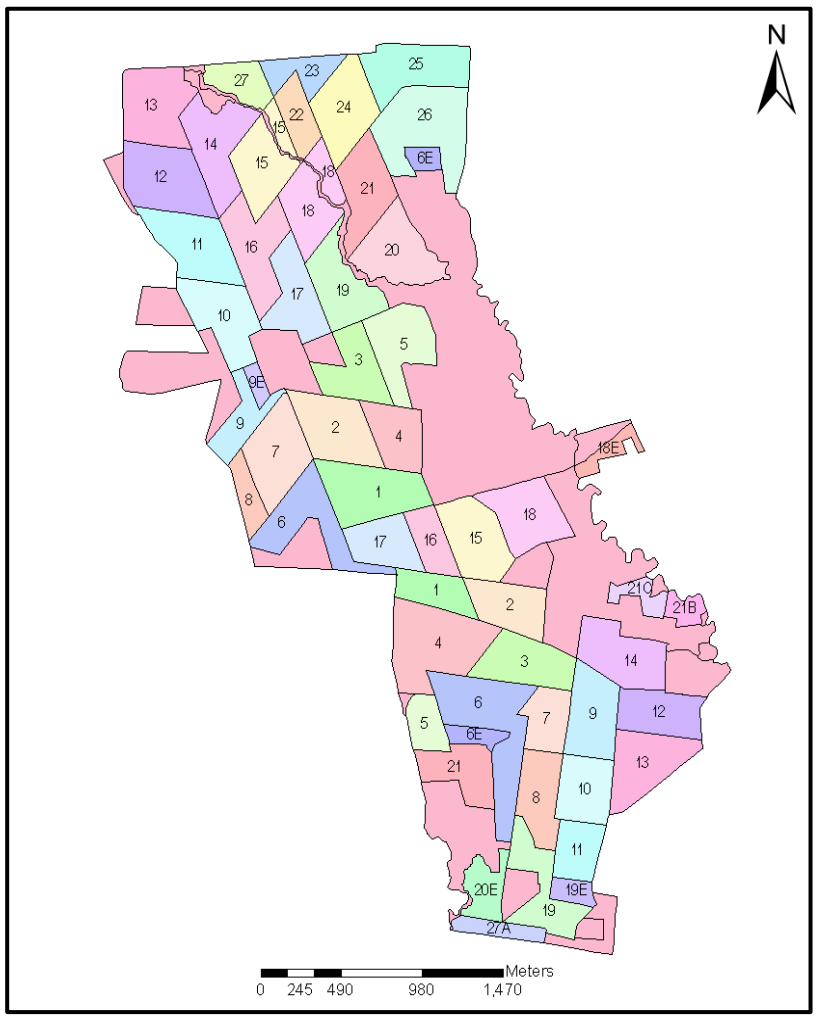
d. Shade Tree Density in Sections



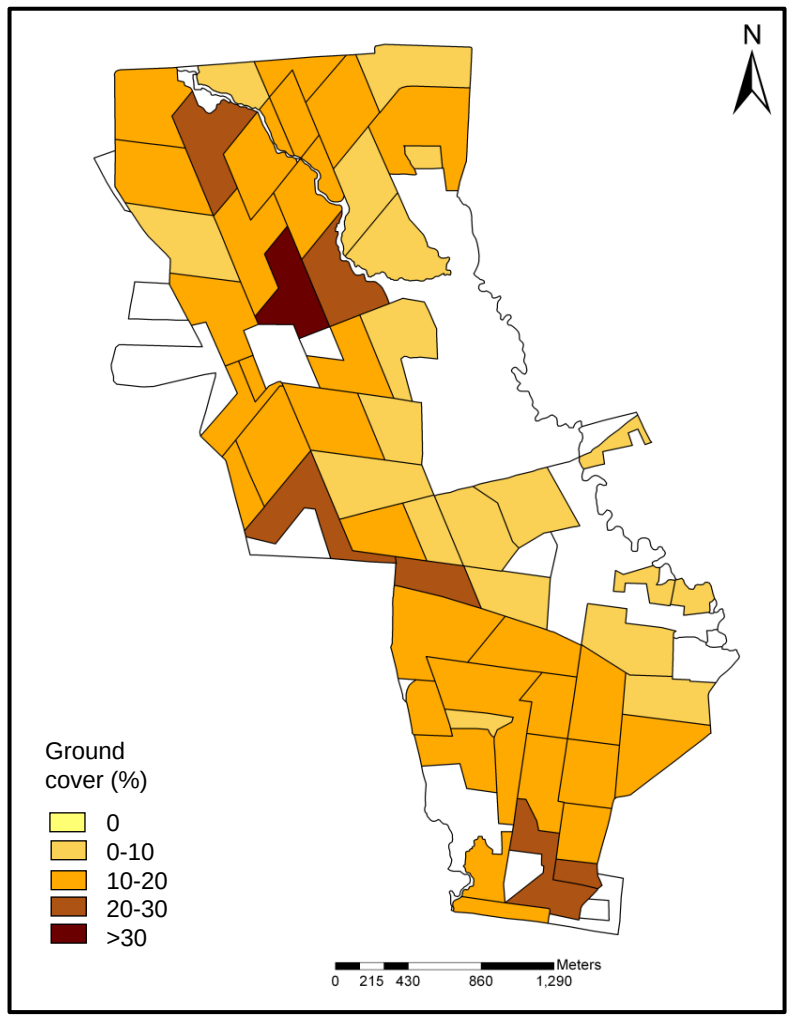
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

e. General Information

1. General	
Contact address	PO: Mathura Bagan, Dist: Jalpaiguri, PIN:736204
Contact phone	03564-203134
Name of the company	McLeod Russel India Ltd.
Name of the village where it falls	Mathura Gram Panchayat
Leased area of the estate (ha)	984.01
Tea grown area of the estate (ha)	701.18
No. of divisions / sections	2 div/48 sec
Year of establishment	1919
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)	Low
Plant to plant spacing (m)	6.66 x 6.66
Row to row spacing (m)	13.33 x 13.33

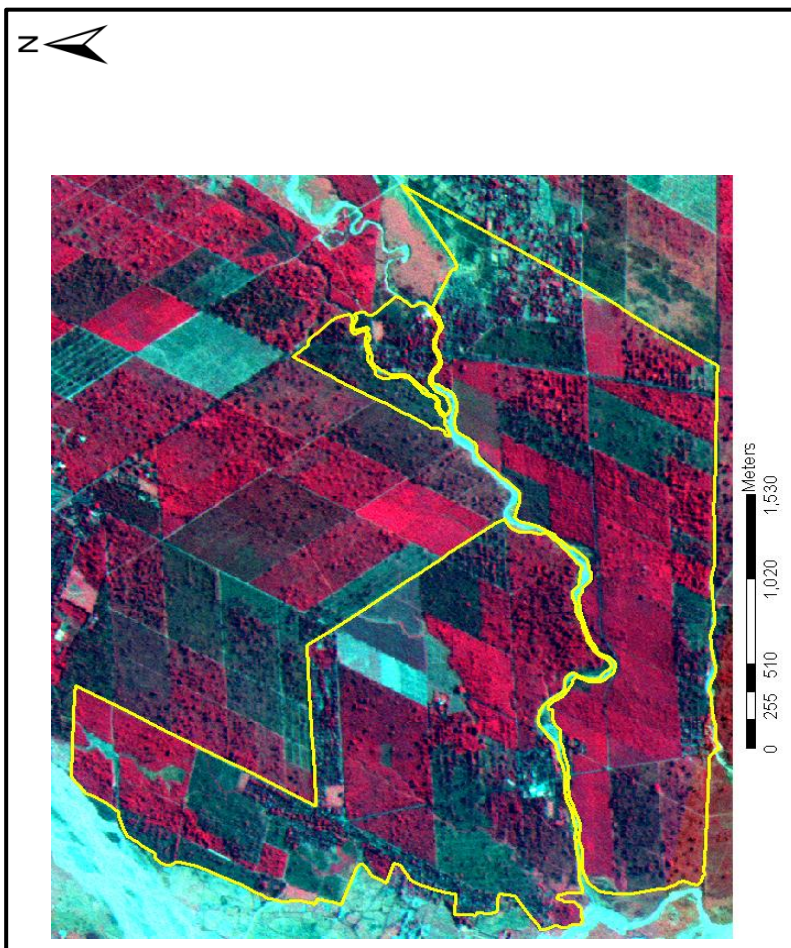
5. Natural resources constraints	
Drainage congestion and water logging	Yes
Scarcity of water during summer	Yes
River bank erosion	Yes
Major diseases and duration	Red rust (May-Aug)
Major pests and duration	RSM (whole yr), red slug(Mar-Jun) looper (whole yr), *Helopeltis* (Jun-Oct)
Damage due to wildlife	Yes

6. Yield / production	
Peak plucking periods	May-Oct
Annual green leaf yield	6494.67 kg/ha
Annual production of processed tea	1033847 kg

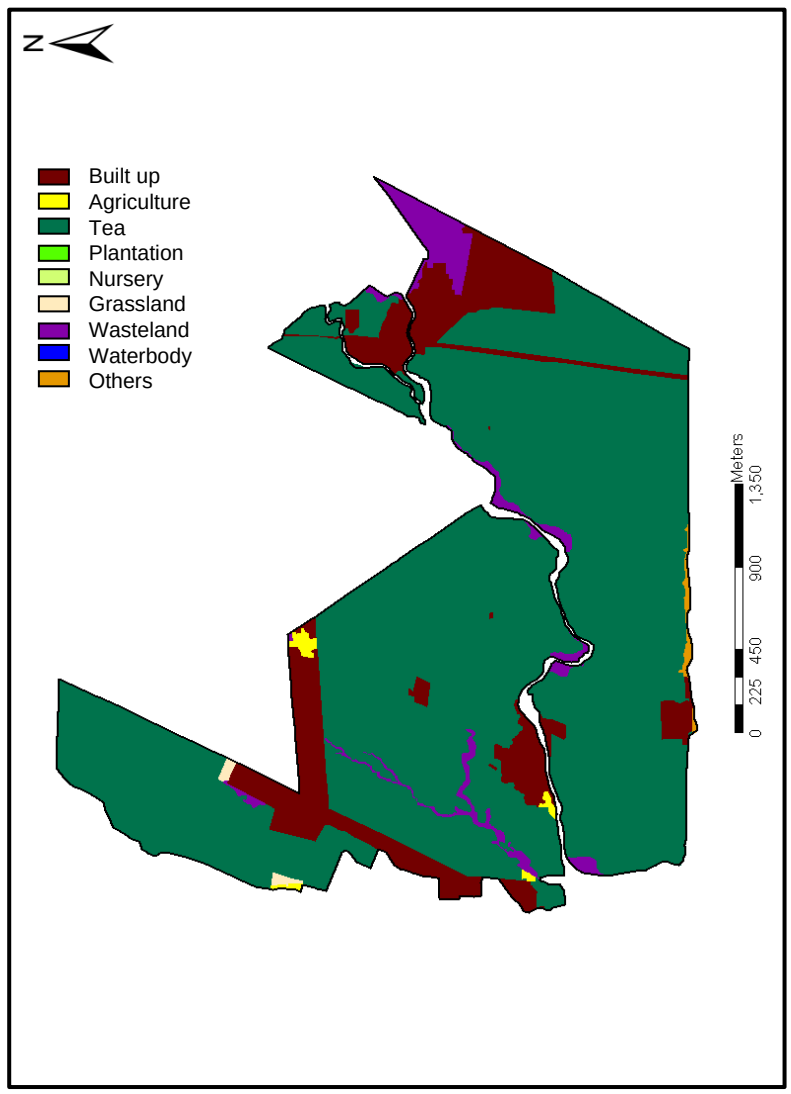
7. Pruning	
Time of pruning	Dec-Jan
Pruning cycle	4 yrs
Types of pruning	TP-UP-DS-LS

8. Fertilizer use	
Types of N, P, K fertilizers used	Urea, MOP, SSP, RP
Dose of Nitrogen (kg/ha)	120
Dose of Phosphorous (kg/ha)	40
Dose of Potash (kg/ha)	120
Whether lime is applied, if yes dose	Dolomite after uprooting

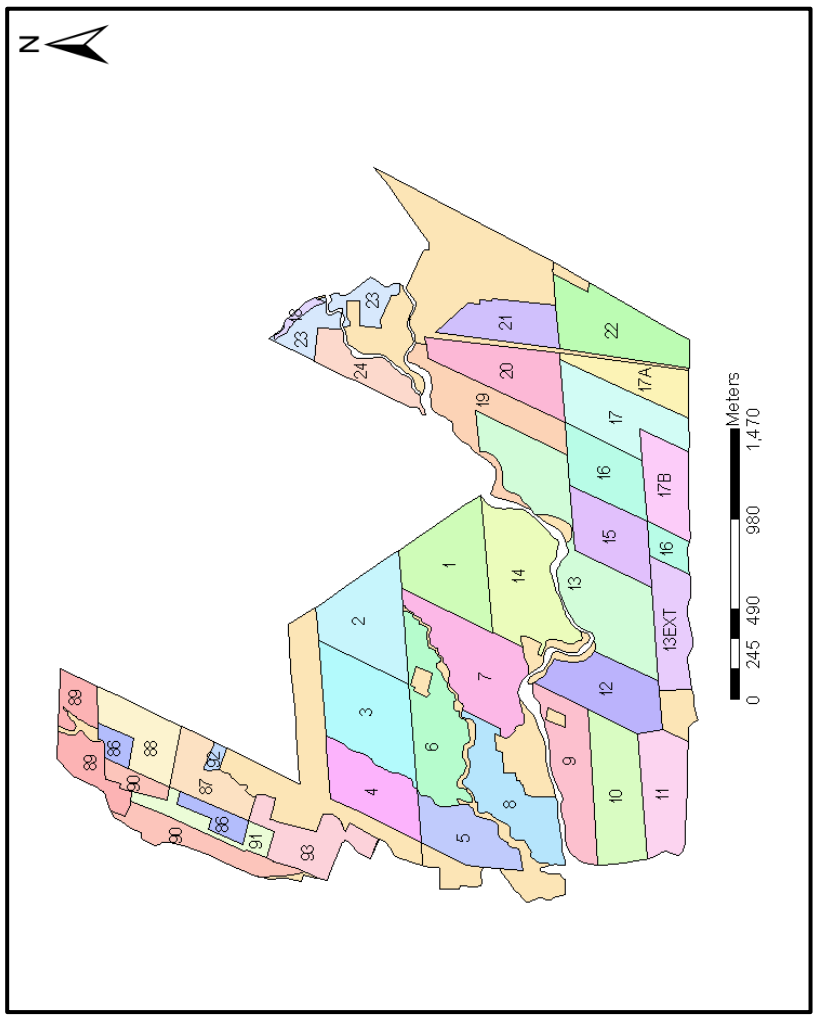
P83: MACHAPARA TE



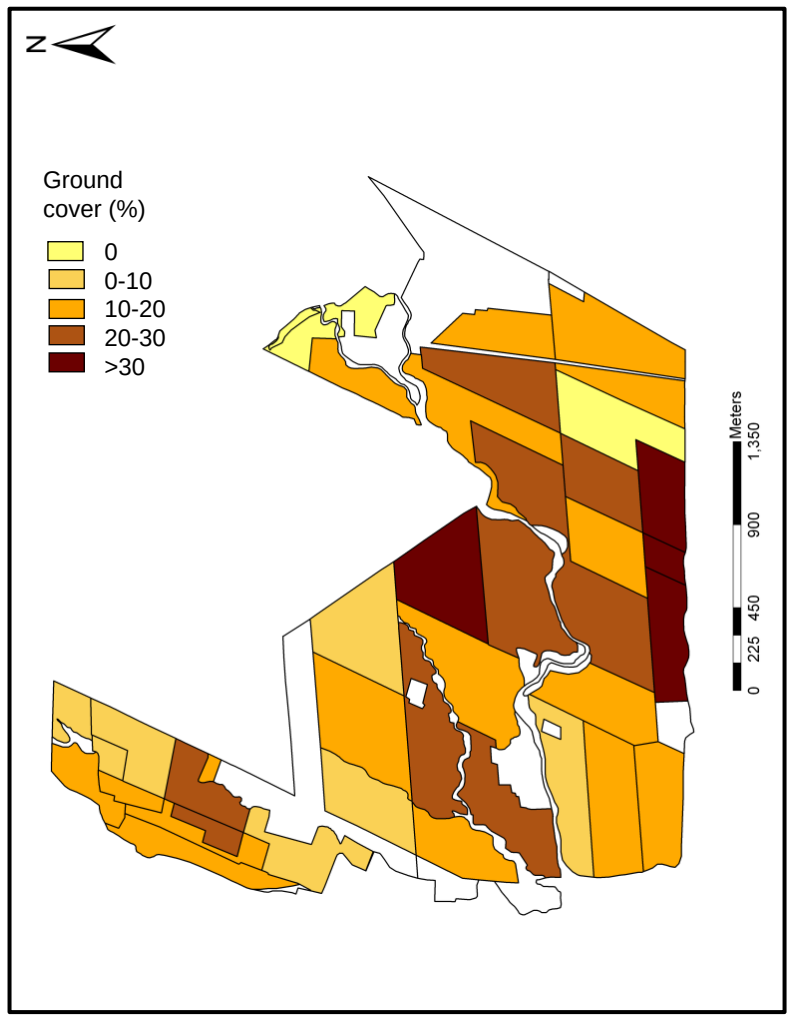
a. False Colour Composite of IRS LISS IV



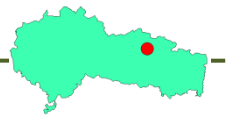
b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections



e. General Information

1. General	
Contact address	PO: Kalchine, Dist: Jalpaiguri PIN: 735217
Contact phone	92335-52005 (O), 92335-52001 (R) 09733190313
Name of the company	Darjeeling Dooars Plantations (Tea) Ltd.
Name of the village where it falls	Kalchini
Leased area of the estate (ha)	752.45
Tea grown area of the estate (ha)	516.00
No. of divisions / sections	2 div/24 sec
Year of establishment / age	--
Type of tea produced	CTC

2. Infrastructure	
Availability of processing factory	Yes
Availability of workers colony	Yes
Availability of internet facility / e-mail id	No
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)	11.66 x 13.33
Row to row spacing (m)	11.66 x 13.33

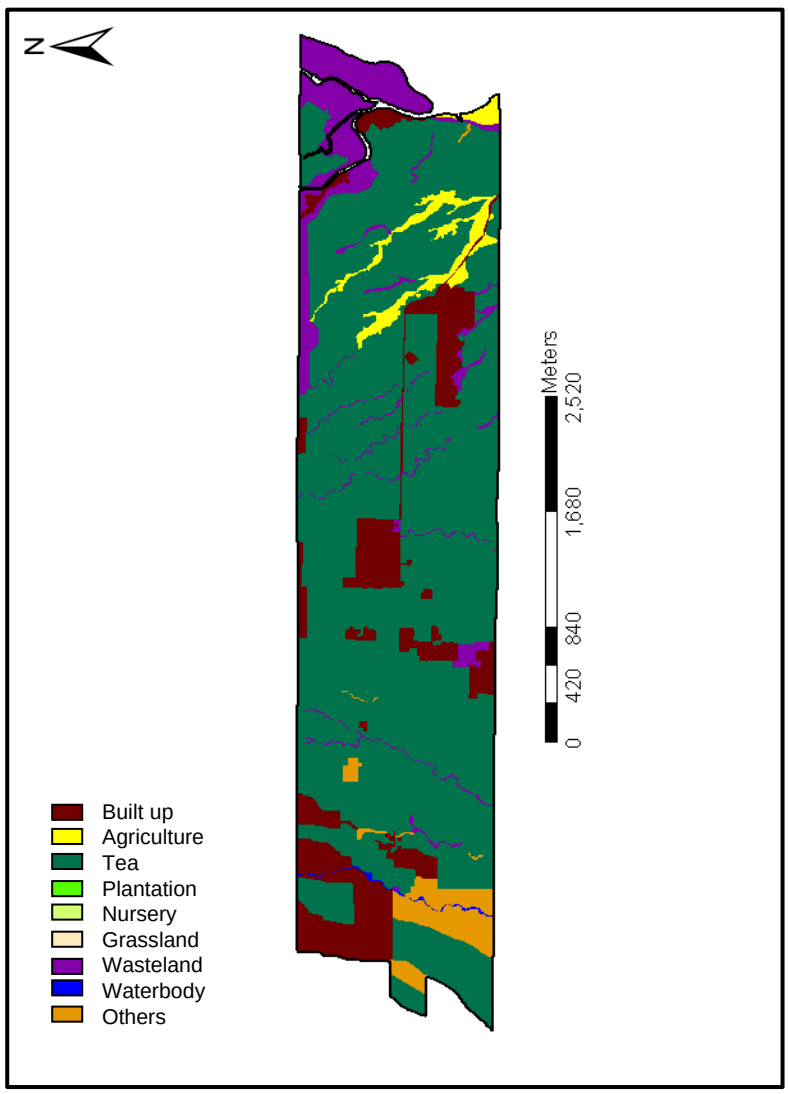
5. Natural resources constraints	
Drainage congestion and water logging	Yes
Scarcity of water during summer	No
River bank erosion	Yes
Major diseases and duration	Blister blight, red rust, black rot, poria
Major pests and duration	Looper, red slug, *Helopeltis*, RSM, thrips, jassid (Feb-Dec)
Damage due to wildlife	Yes

6. Yield / production	
Peak plucking periods	Mar-Oct
Annual green leaf yield	9295.56 kg/ha
Annual production of processed tea	1053369 kg

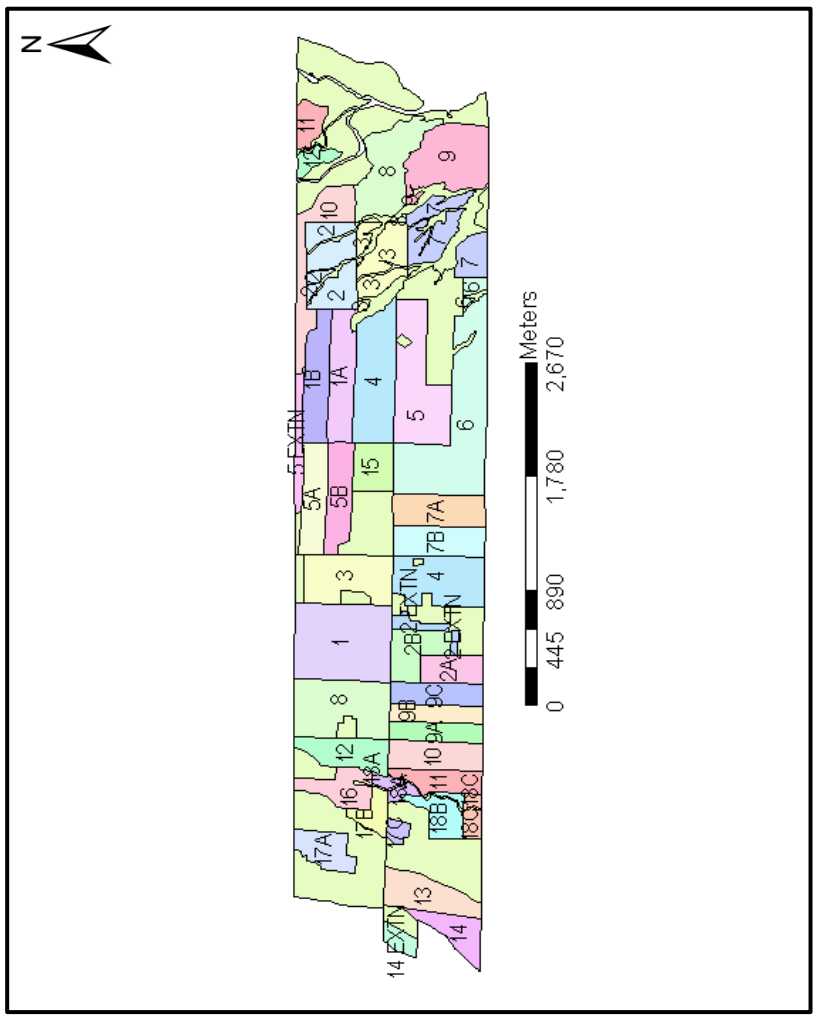
7. Pruning	
Time of pruning	2nd fortnight of Nov-1st fortnight of Feb
Pruning cycle	3 yrs
Types of pruning	LP-UT-UT

8. Fertilizer use	
Types of N, P, K fertilizers used	Urea, RP, MOP
Dose of Nitrogen (kg/ha)	100-170
Dose of Phosphorous (kg/ha)	20-50
Dose of Potash (kg/ha)	60-160
Whether lime is applied, if yes dose	Dolomite depending on soil pH

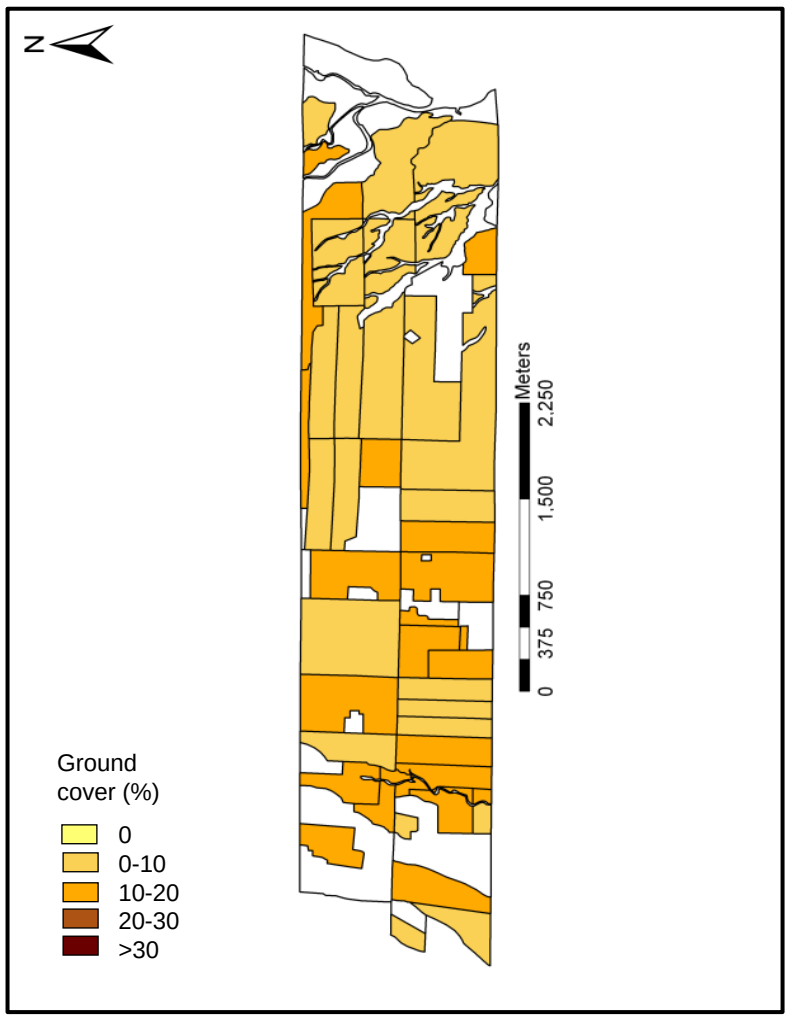
a. False Colour Composite of IRS LISS IV



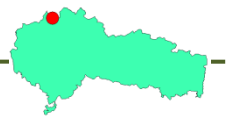
b. Tea Estate Landuse



c. Section Boundaries of the Estate



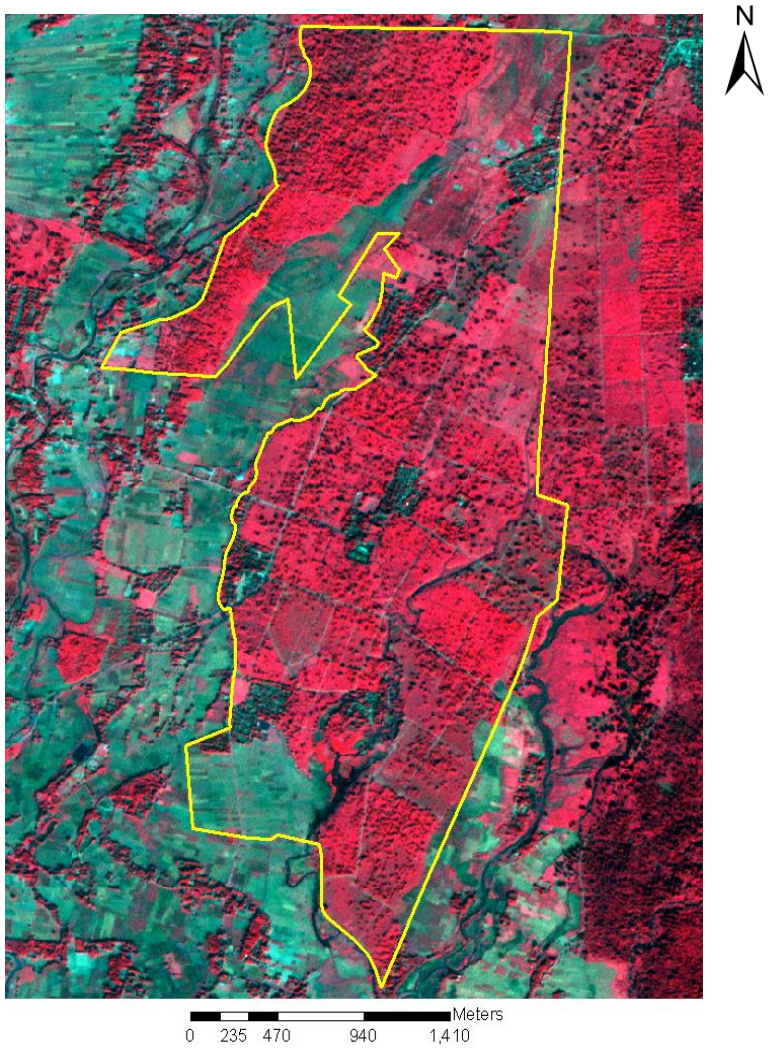
d. Shade Tree Density in Sections



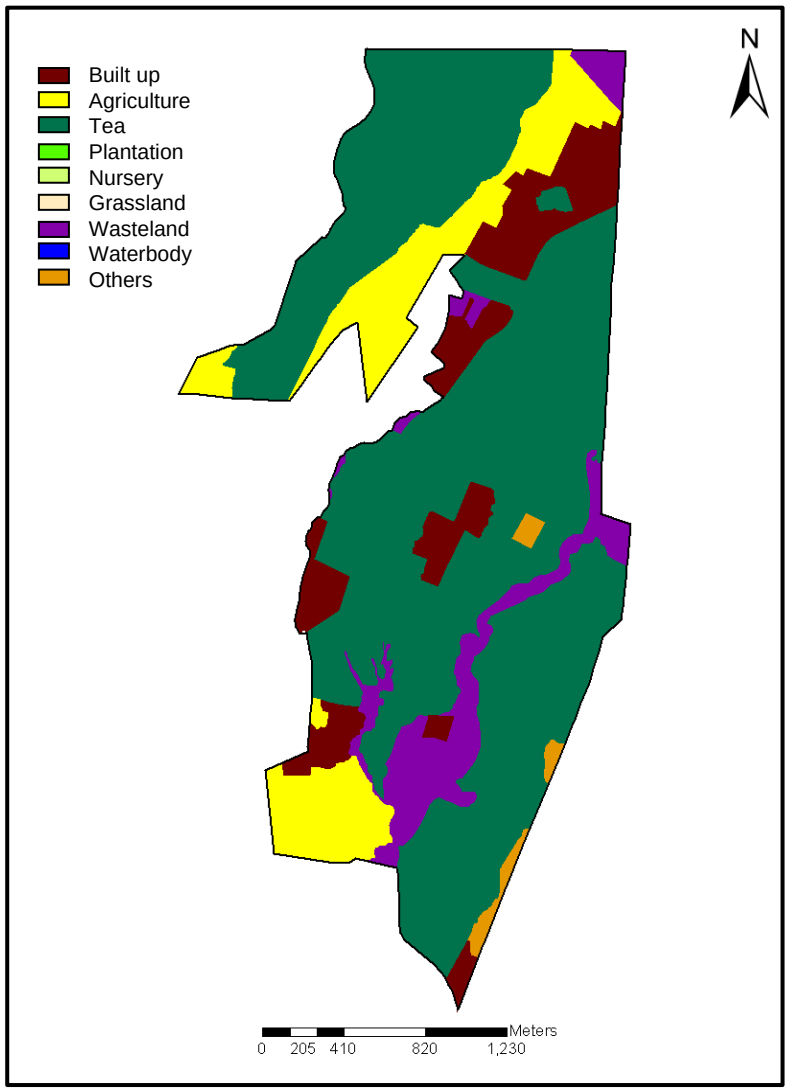
e. General Information

1. General	
Contact address	P.O: Sailihat, Dist: Jalpaiguri, PIN: 735229
Contact phone	03561-282134, 9233791401
Name of the company	Goodricke Group Ltd.
Name of the village where it falls	Meenglas (Rungamuttee GP)
Leased area of the estate (ha)	928.56
Tea grown area of the estate (ha)	643.96
No. of divisions / sections	2 div/30 sec
Year of establishment	1881
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)	Fair
Plant to plant spacing (m)	6.66 x 13.33
Row to row spacing (m)	6.66 x 6.66

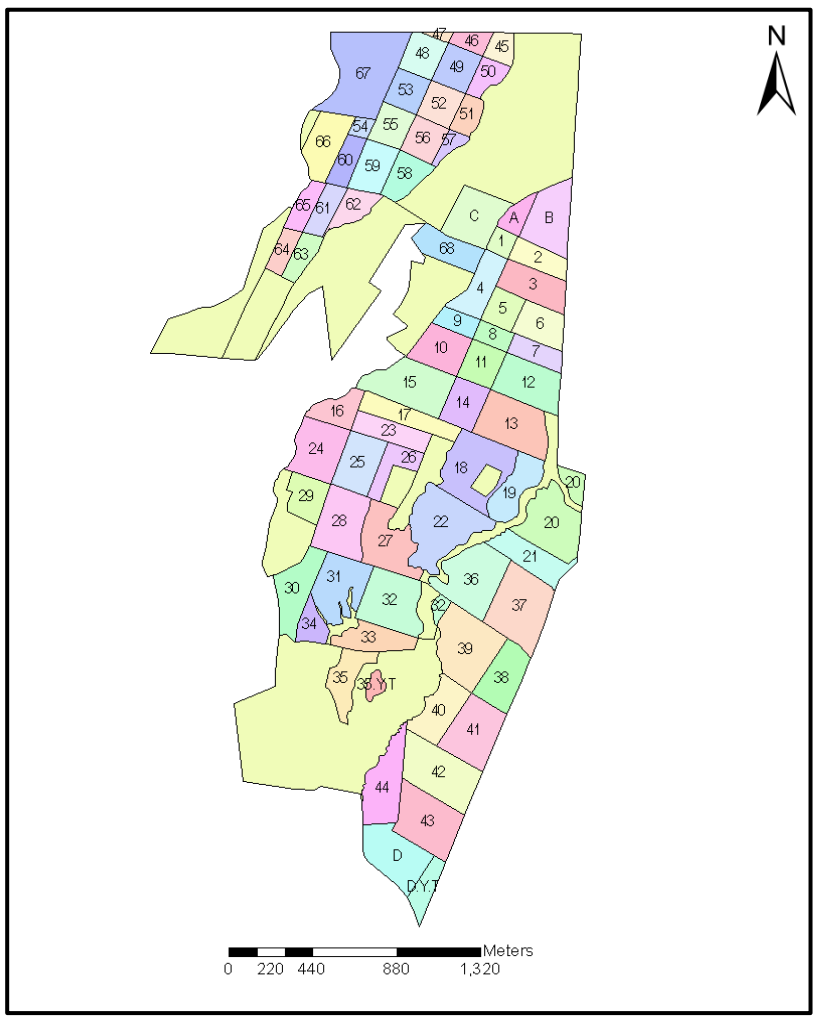
5. Natural resources constraints	
Drainage congestion and water logging	Yes
Scarcity of water during summer	No
River bank erosion	Yes
Major diseases and duration	Black rot (6 months)
Major pests and duration	RSM, looper (9 months), *Helopeltis*
Damage due to wildlife	Yes
6. Yield / production	
Peak plucking periods	Apr-Nov
Annual green leaf yield	10171.44 kg/ha
Annual production of processed tea	1450000 kg
7. Pruning	
Time of pruning	Dec -Jan
Pruning cycle	--
Types of pruning	LP-UP-DS/MS
8. Fertilizer use	
Types of N, P, K fertilizers used	Urea, MOP, SSP, RP
Dose of Nitrogen (kg/ha)	150
Dose of Phosphorous (kg/ha)	35
Dose of Potash (kg/ha)	150
Whether lime is applied, if yes dose	No



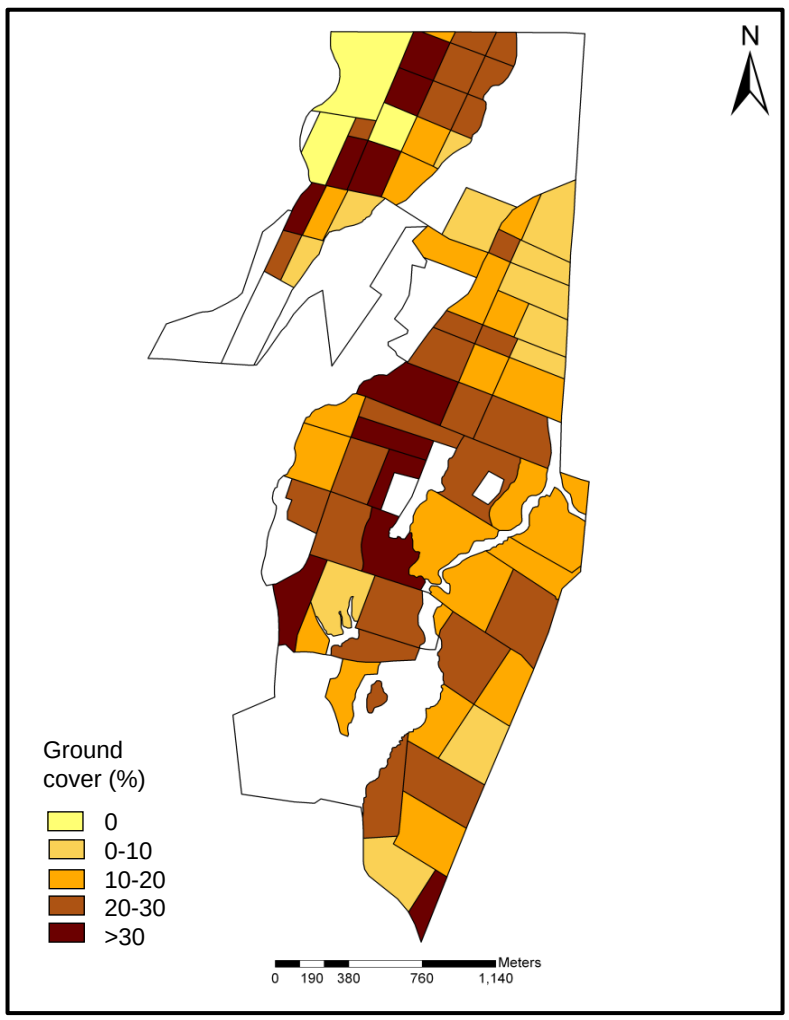
a. False Colour Composite of IRS LISS IV



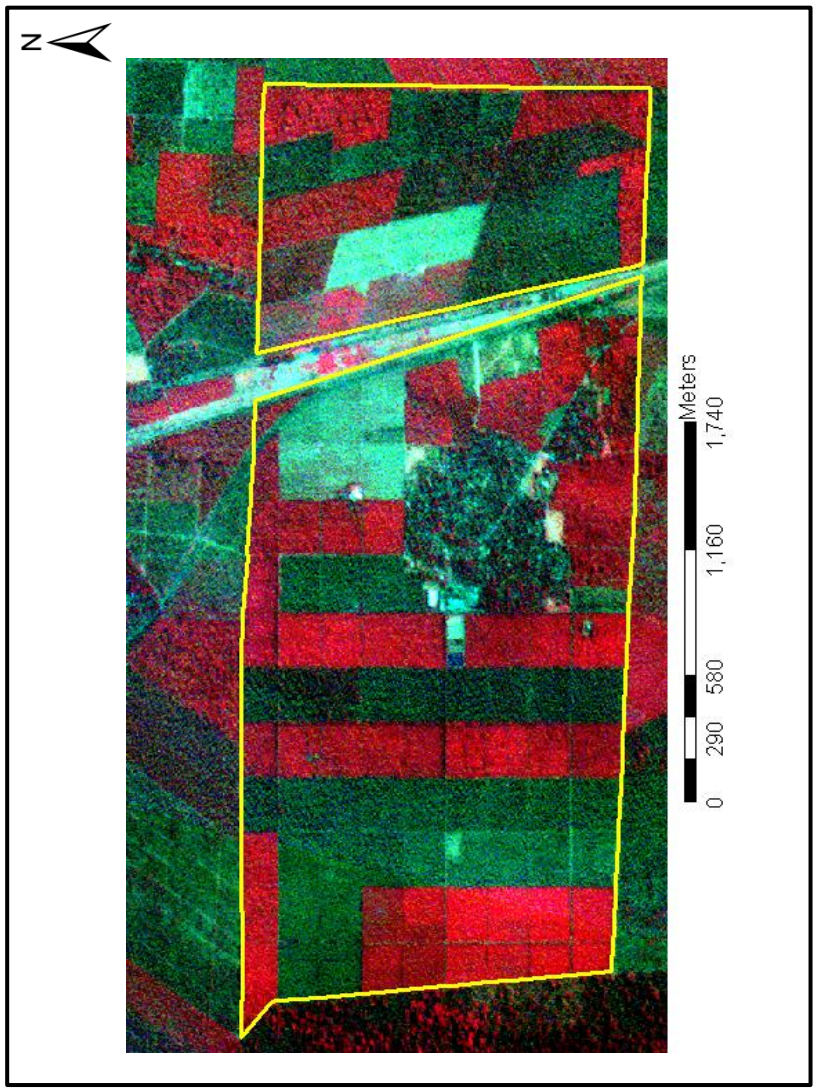
b. Tea Estate Landuse



c. Section Boundaries of the Estate

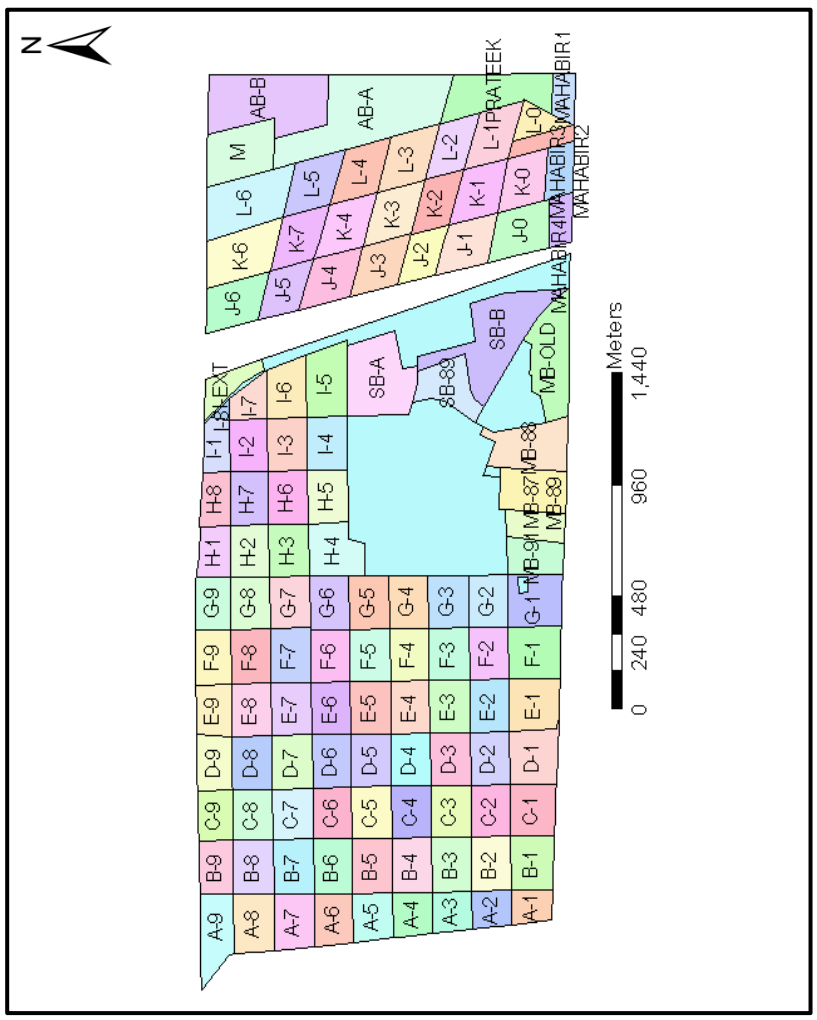


d. Shade Tree Density in Sections

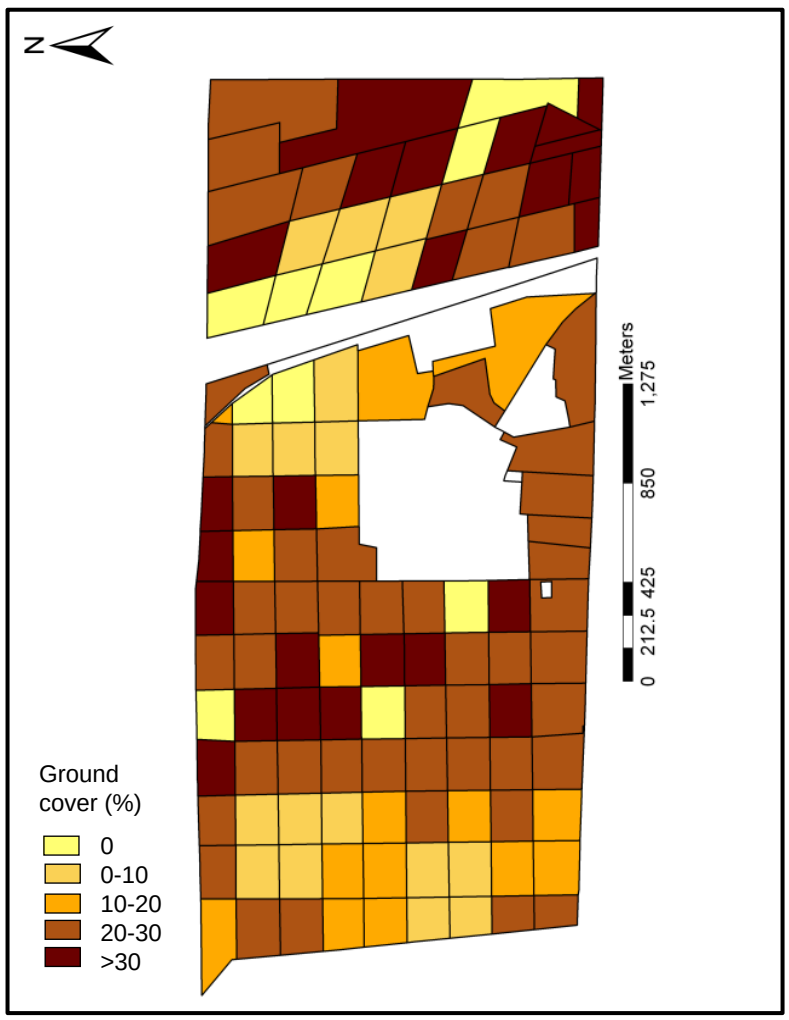


a. False Colour Composite of IRS LISS IV

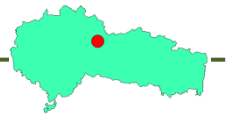
b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections



e. General Information

1. General	
Contact address	PO: Binaguri, Dist:Jalpaiguri, PIN: 735203
Contact phone	03563-203008
Name of the company	Binaguri Tea company Pvt. Ltd.
Name of the village where it falls	Binaguri
Leased area of the estate (ha)	604.38
Tea grown area of the estate (ha)	514.86
No. of divisions / sections	2 div/111 sec
Year of establishment	1915
Type of tea produced	CTC, green tea

2. Infrastructure	
Availability of processing factory	Yes
Availability of workers colony	Yes
Availability of internet facility / e-mail id	Yes / addabarie@wmg.co.in
Meteorological observations taken	Tmax, Tmin, Rainfall

3. Amenities	
Availability of health care / dispensary	Yes
Availability of school	Yes

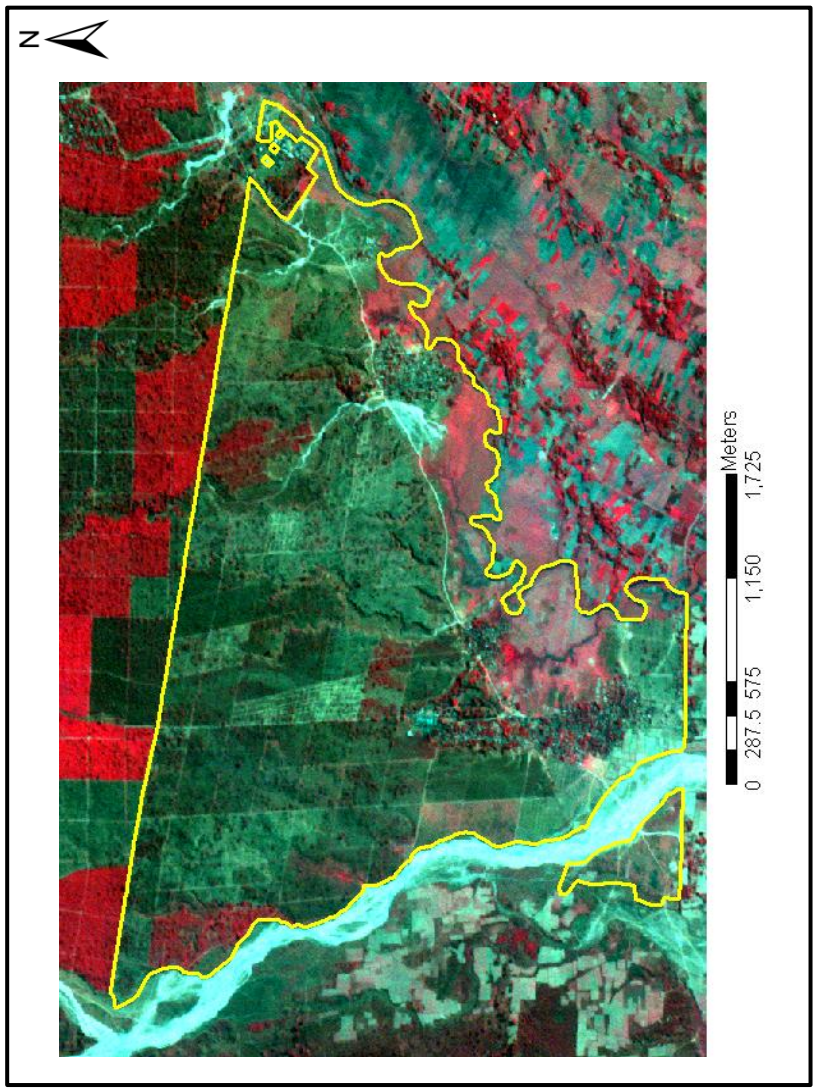
4. Shade trees	
Shade tree density (garden level)	High
Plant to plant spacing	105 cm - 65 cm
Row to row spacing	105 cm

5. Natural resources constraints	
Drainage congestion and water logging	No
Scarcity of water during summer	No
River bank erosion	Yes
Major diseases and duration	Red rust, black rot (monsoon)
Major pests and duration	Looper, caterpillar, *Helopeltis* (whole yr)
Damage due to wildlife	Yes (elephant corridor)

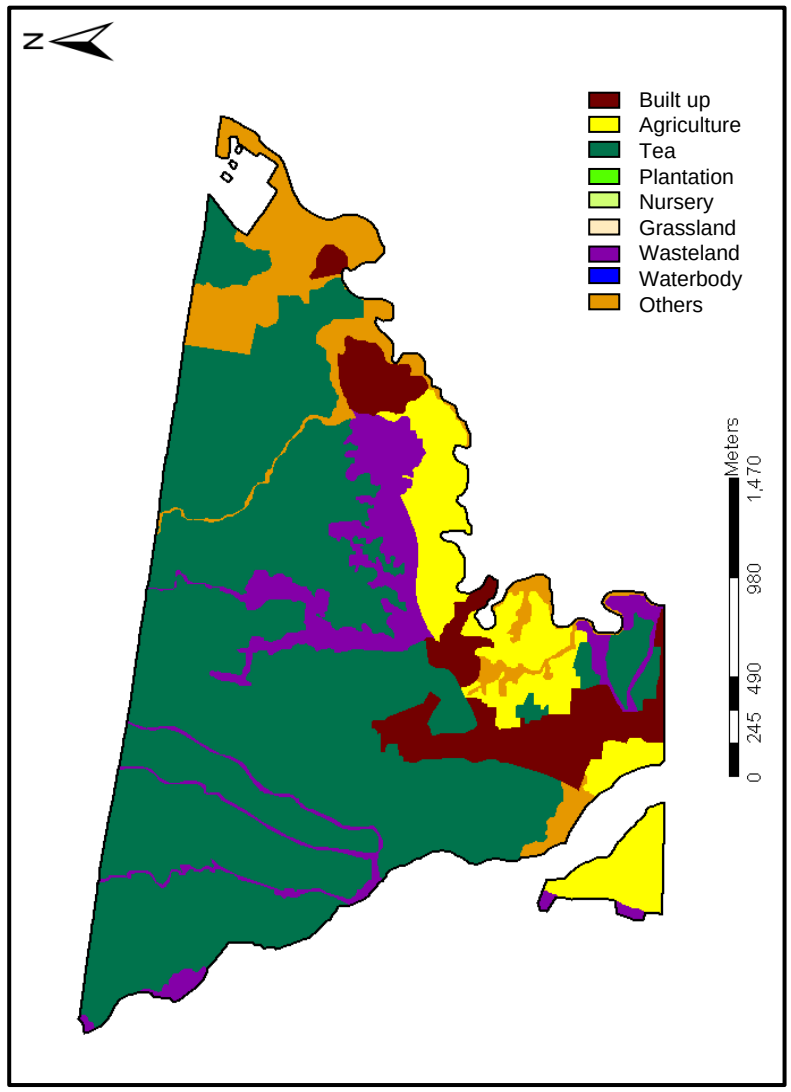
6. Yield / production	
Peak plucking periods	20th May-Oct
Annual green leaf yield	9340.74 kg/ha
Annual production of processed tea	1075738 Kg

7. Pruning	
Time of pruning	2nd fortnight of Nov-2nd fortnight of Jan
Pruning cycle	4 yr
Types of pruning	LP-UP-DS-UP

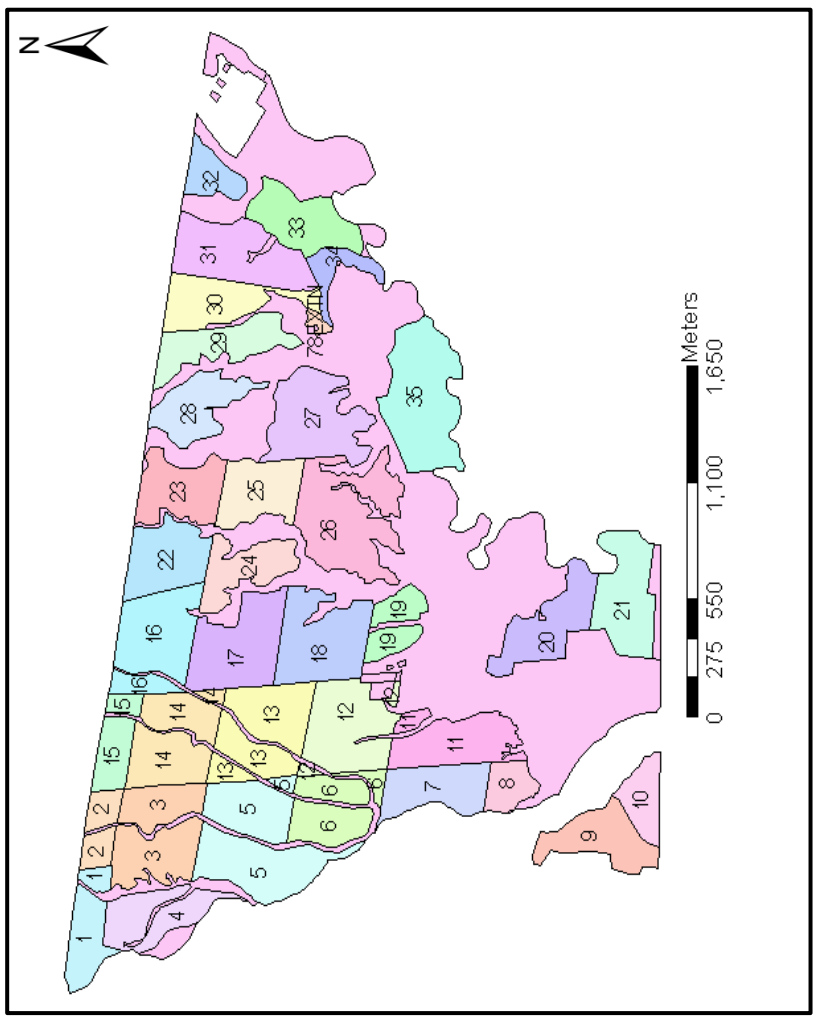
8. Fertilizer use	
Types of N, P, K fertilizers used	Urea, MOP, RP, DAP
Dose of Nitrogen (kg/ha)	180
Dose of Phosphorous (kg/ha)	40
Dose of Potash (kg/ha)	150
Whether lime is applied, if yes dose	Dolomite after soil analysis



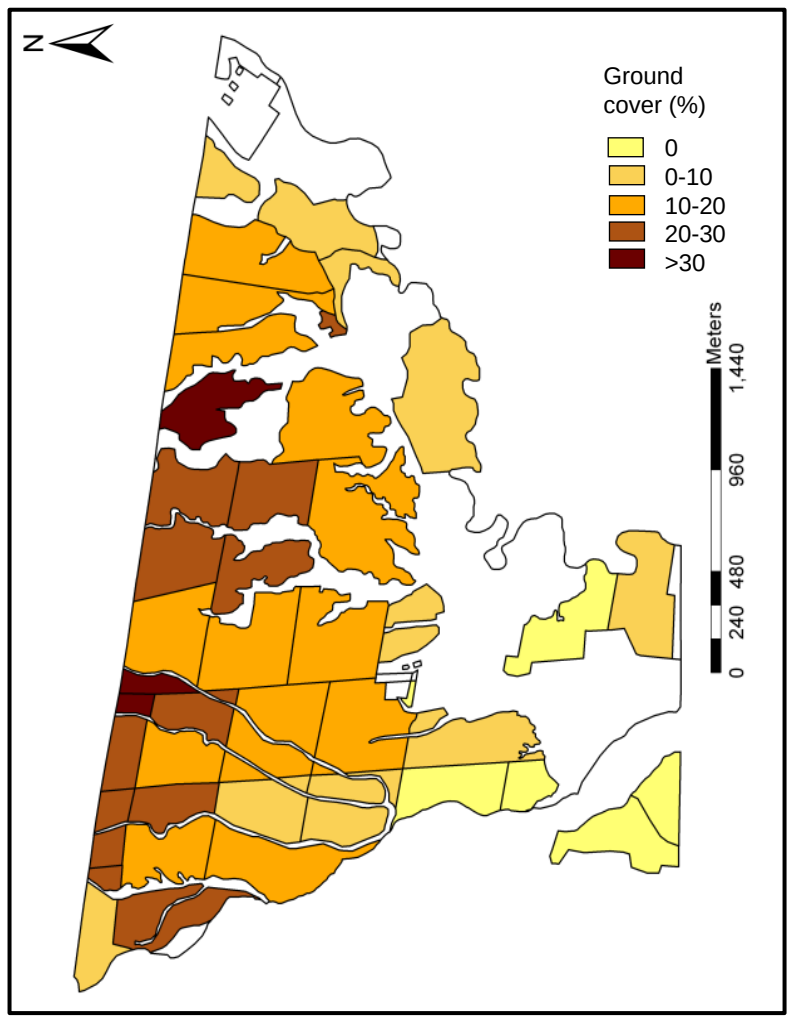
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

e. General Information

1. General	
Contact address	PO: Mujnai, Dist:Jalpaiguri, PIN: 735228
Contact phone	03563-203008
Name of the company	-
Name of the village where it falls	Mujnai
Leased area of the estate (ha)	699.0
Tea grown area of the estate (ha)	400
No. of divisions / sections	2 div/35 sec
Year of establishment	1889
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	RH, Rainfall

3. Amenities	
Availability of health care / dispensary	Yes
Availability of school	Yes

4. Shade trees	
Shade tree density (garden level)	Low
Plant to plant spacing	1219 cm
Row to row spacing	1219 cm

5. Natural resources constraints	
Drainage congestion and water logging	Yes
Scarcity of water during summer	Yes
River bank erosion	Yes
Major diseases and duration	--
Major pests and duration	Whole year
Damage due to wildlife	Yes

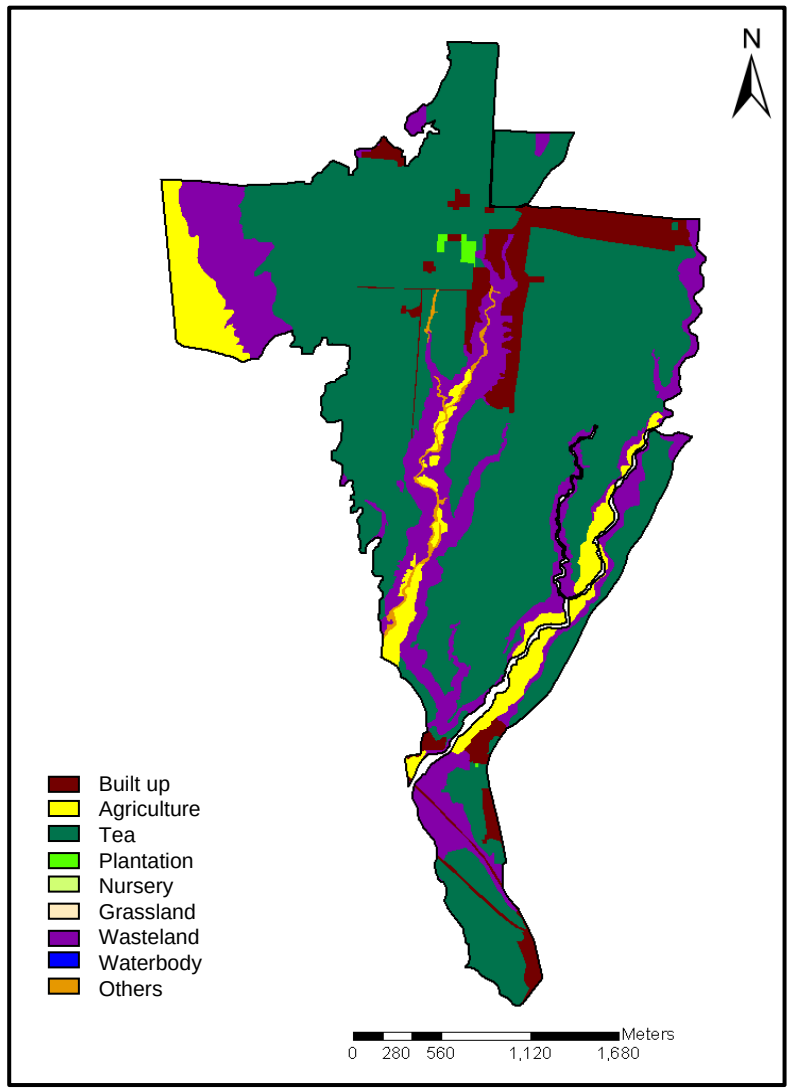
6. Yield / production	
Peak plucking periods	May-Oct
Annual green leaf yield	2173 kg/ha
Annual production of processed tea	380000 Kg

7. Pruning	
Time of pruning	2nd fortnight of Dec-1st fortnight of Feb
Pruning cycle	4 yr
Types of pruning	--

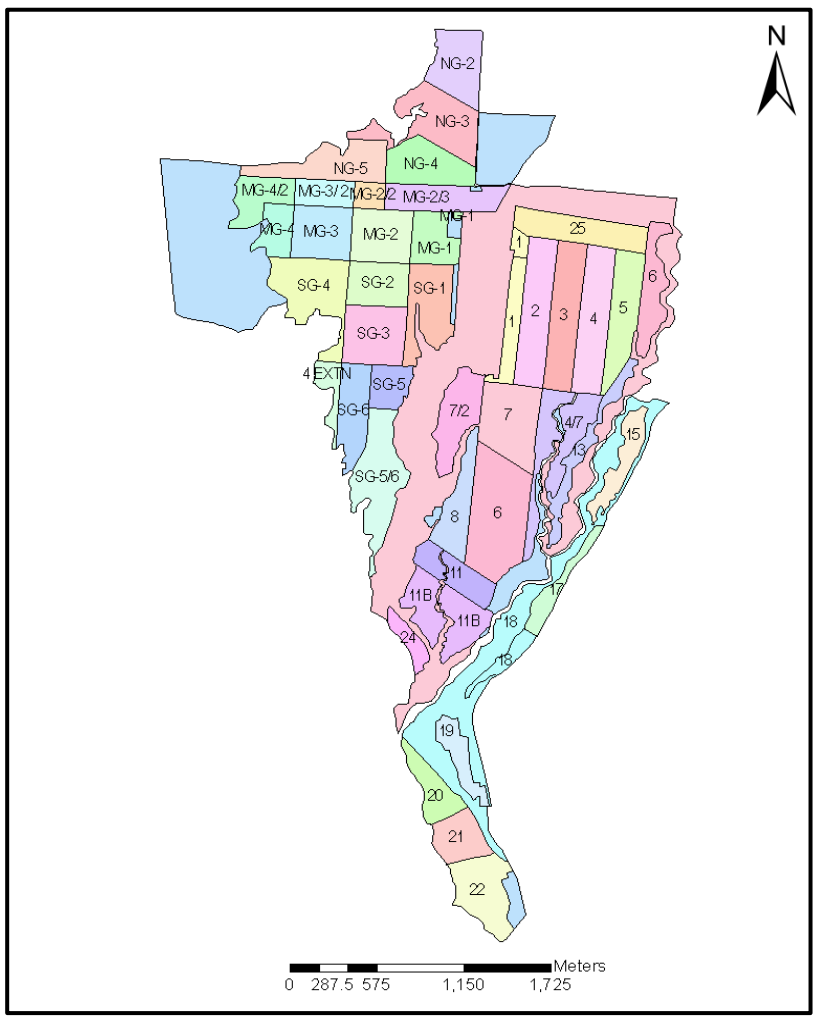
8. Fertilizer use	
Types of N, P, K fertilizers used	Urea, MOP, RP, SSP
Dose of Nitrogen (kg/ha)	100
Dose of Phosphorous (kg/ha)	30
Dose of Potash (kg/ha)	100
Whether lime is applied, if yes dose	--

P88: NAGRAKATA TE

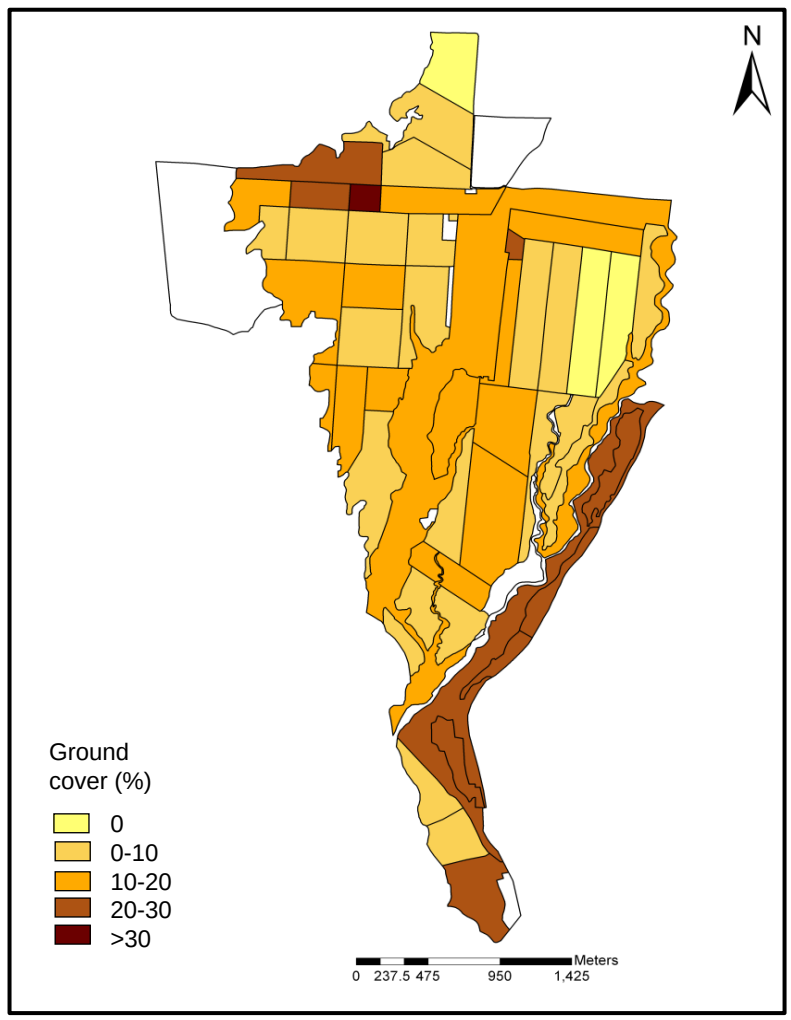
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate

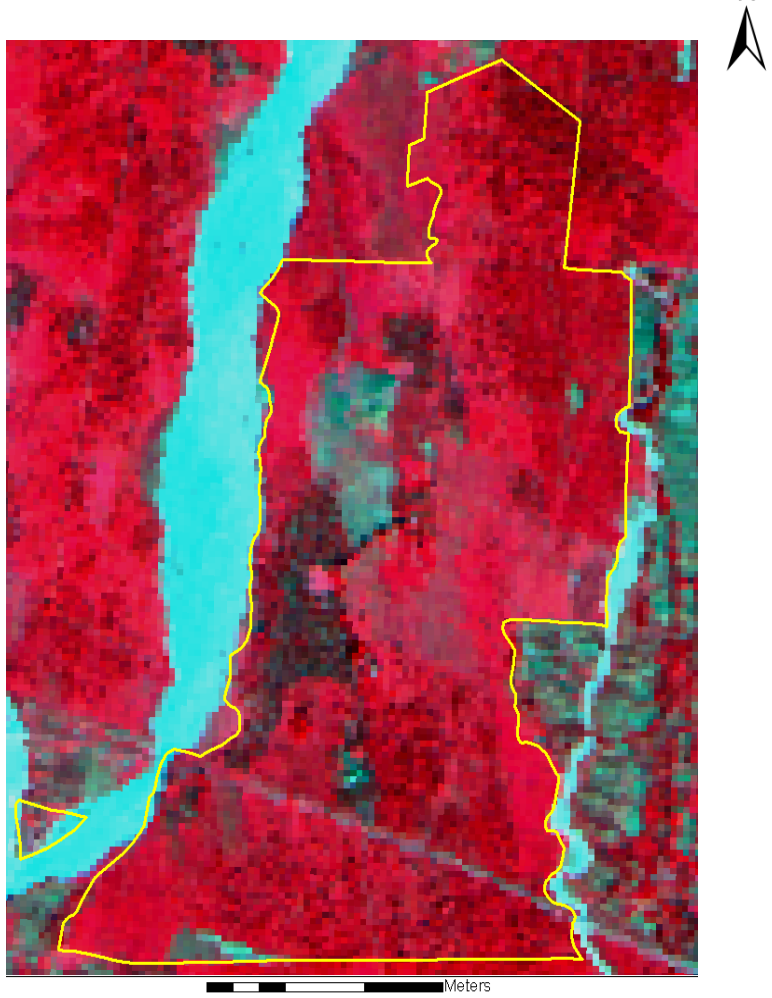


d. Shade Tree Density in Sections

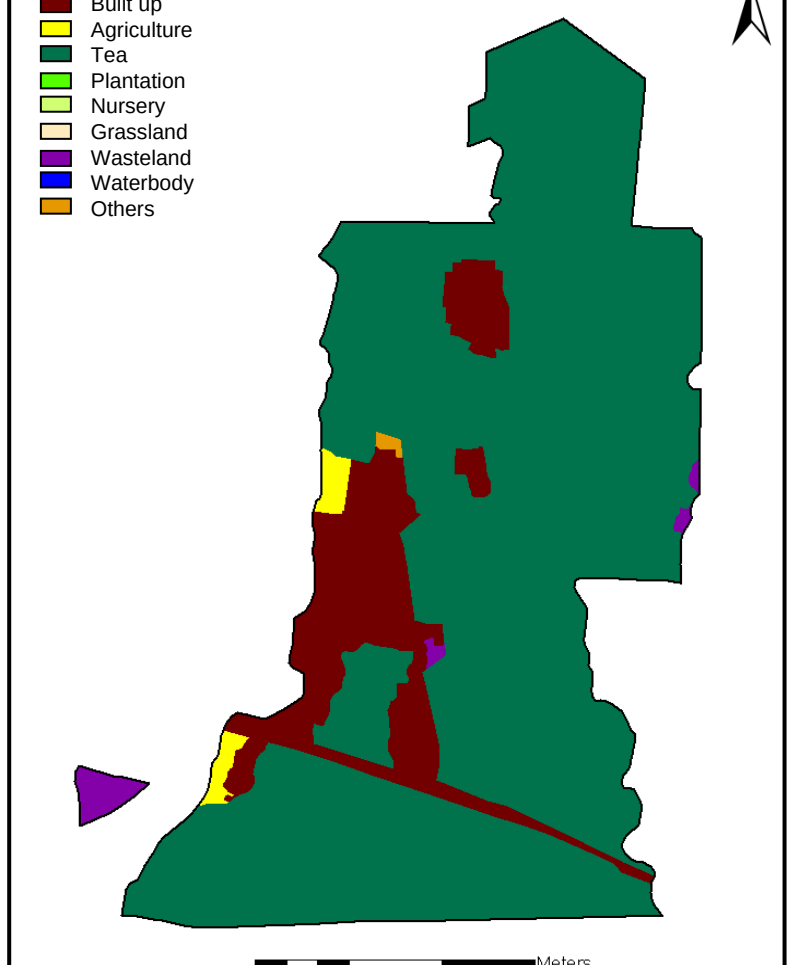
e. General Information

1. General	
Contact address	PO: Nagrakata, Dist: Jalpaiguri PIN: 735225
Contact phone	03565-20008, 0963515553
Name of the company	--
Name of the village where it falls	Nagrakata
Leased area of the estate (ha)	934.90
Tea grown area of the estate (ha)	549.78
No. of divisions / sections	3 div/48 sec
Year of establishment	1900
Type of tea produced	CTC
2. Infrastructure	
Availability of processing factory	No
Availability of workers colony	Yes
Availability of internet facility / e-mail id	No
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)	Medium
Plant to plant spacing	40’
Row to row spacing	40’

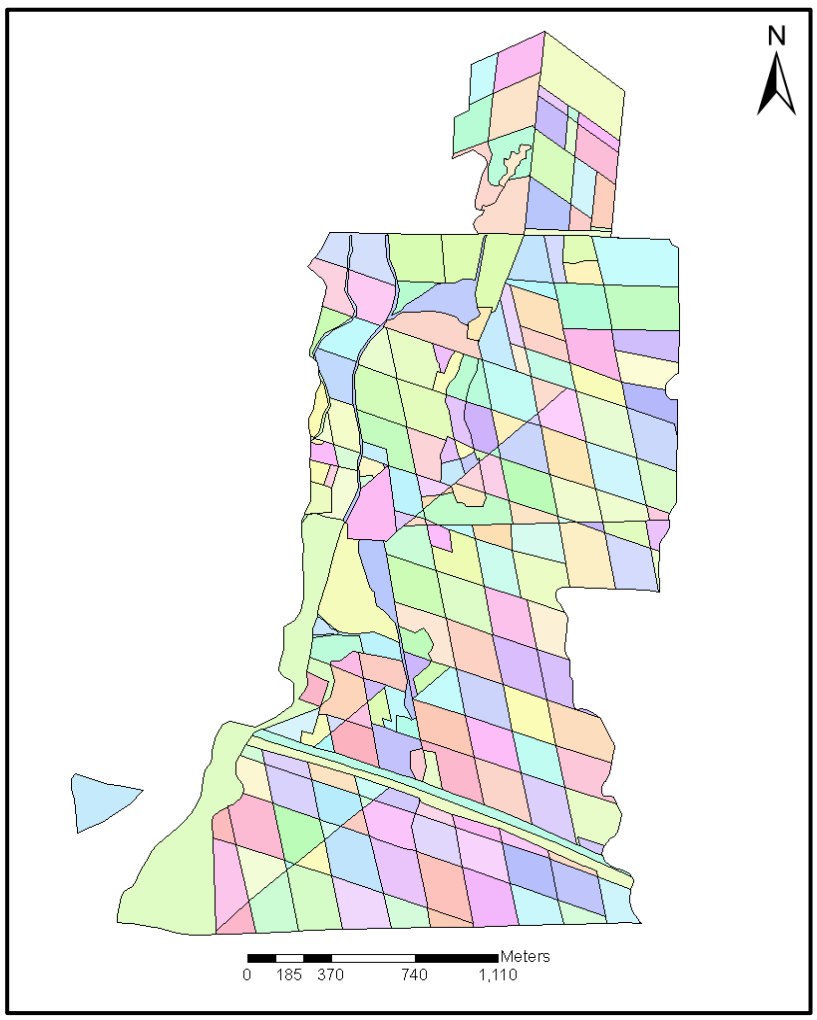
5. Natural resources constraints	
Drainage congestion and water logging	Yes
Scarcity of water during summer	Yes
River bank erosion	Yes
Major diseases and duration	Fungal
Major pests and duration	Looper, mites, *Helopeltis*
Damage due to wildlife	Yes
6. Yield / production	
Peak plucking periods	Jul-Oct
Annual green leaf yield	2200 kg/ha
Annual production of processed tea	1050000 kg
7. Pruning	
Time of pruning	Nov-Jan
Pruning cycle	4 yr
Types of pruning	--
8. Fertilizer use	
Types of N, P, K fertilizers used	Urea, MOP, RP
Dose of Nitrogen (kg/ha)	100
Dose of Phosphorous (kg/ha)	30
Dose of Potash (kg/ha)	100
Whether lime is applied, if yes dose	--



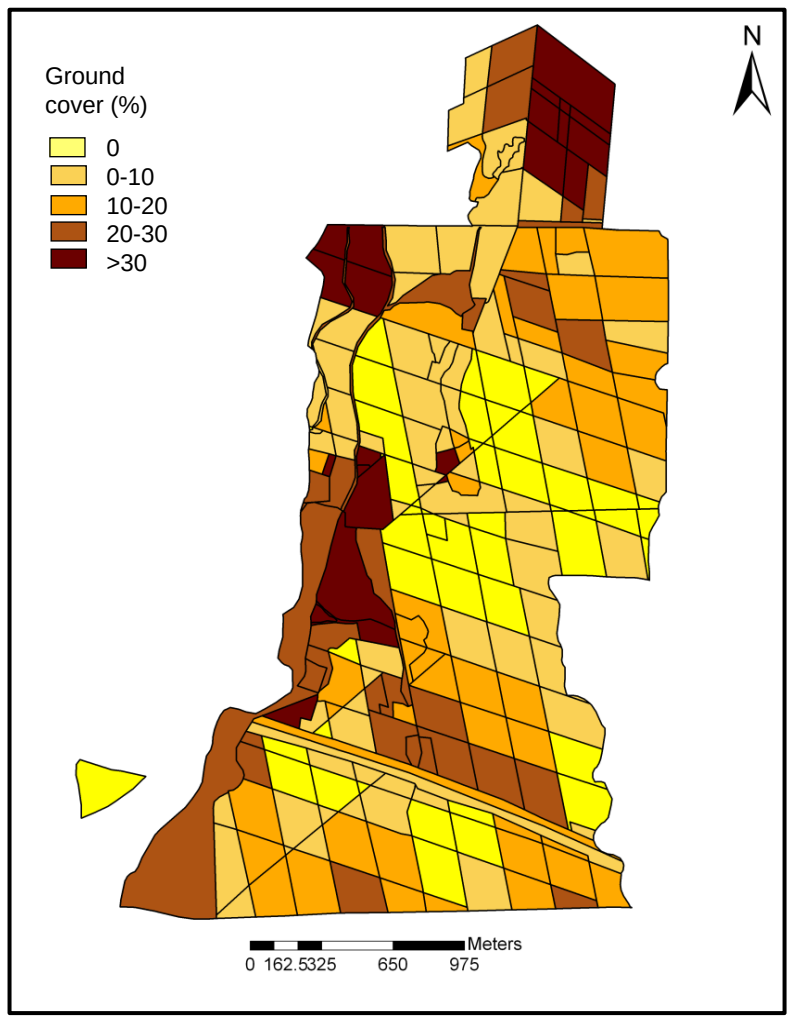
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

e. General Information

1. General	
Contact address	PO: Birpara , Dist: Jalpaiguri, PIN:735204
Contact phone	03563-266001,266065
Name of the company	M.K Tea Pvt. Limited
Name of the village where it falls	Nangdala TE
Leased area of the estate (ha)	870.07
Tea grown area of the estate (ha)	479.82
No. of divisions / sections	NA
Year of establishment	1919
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

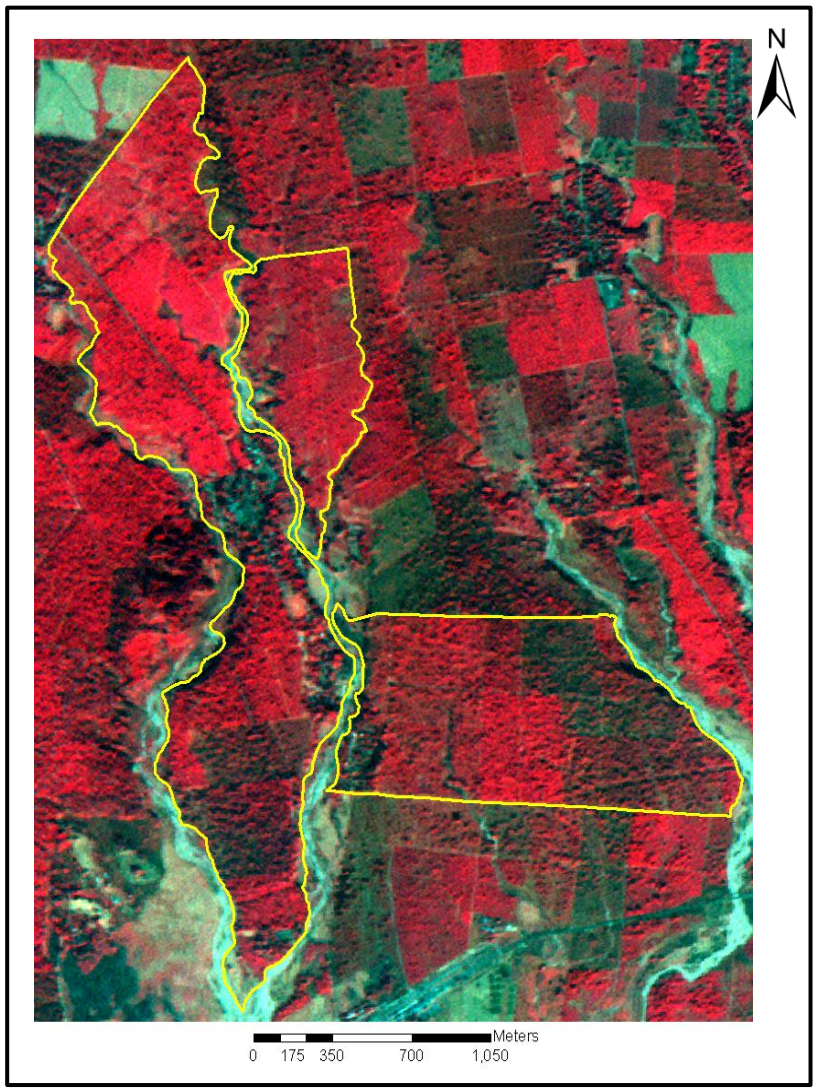
4. Shade trees	
Shade tree density (garden level)	Optimum
Plant to plant spacing (m)	16.66 x 16.66
Row to row spacing (m)	13.33 x 13.33

5. Natural resources constraints	
Drainage congestion and water logging	Yes
Scarcity of water during summer	Yes
River bank erosion	Yes
Major diseases and duration	Black rot
Major pests and duration	Looper, *Helopeltis*, thrips (whole year)
Damage due to wildlife	Yes

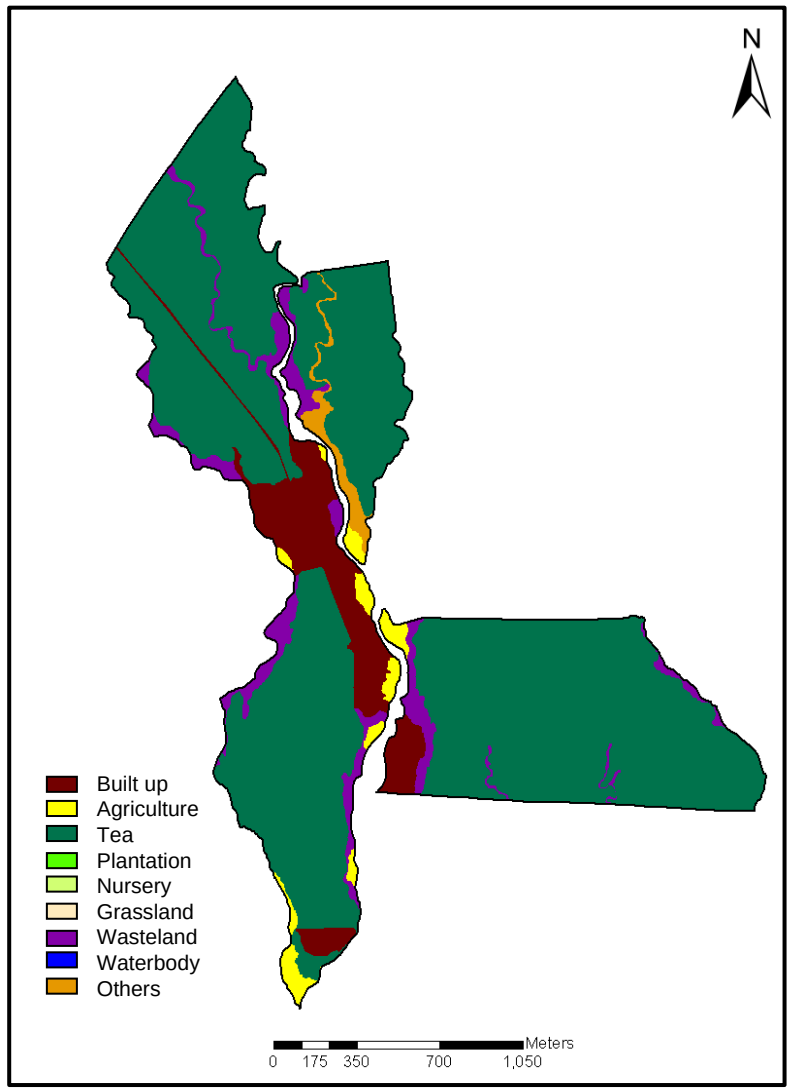
6. Yield / production	
Peak plucking periods	Jul-Oct
Annual green leaf yield	4356.96 kg/ha
Annual production of processed tea	497248 kg

7. Pruning	
Time of pruning	Nov-Jan
Pruning cycle	4 yr
Types of pruning	--

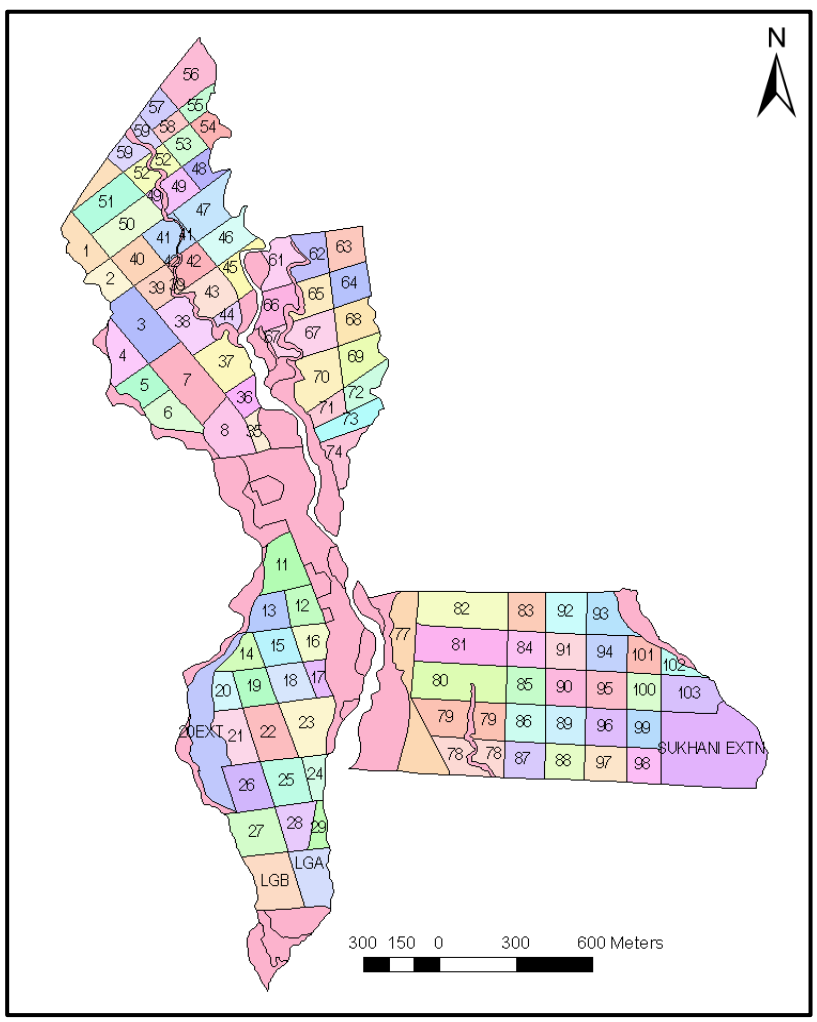
8. Fertilizer use	
Types of N, P, K fertilizers used	Urea, MOP, RP
Dose of Nitrogen (kg/ha)	20
Dose of Phosphorous (kg/ha)	40
Dose of Potash (kg/ha)	160
Whether lime is applied, if yes dose	No



a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



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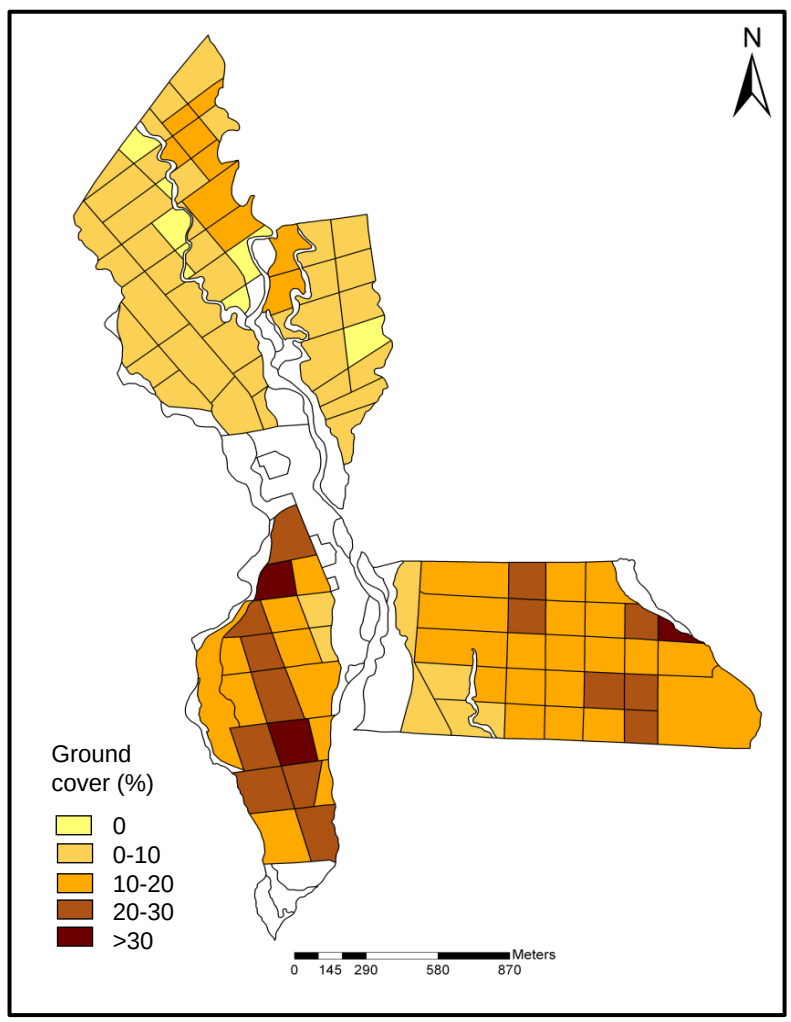
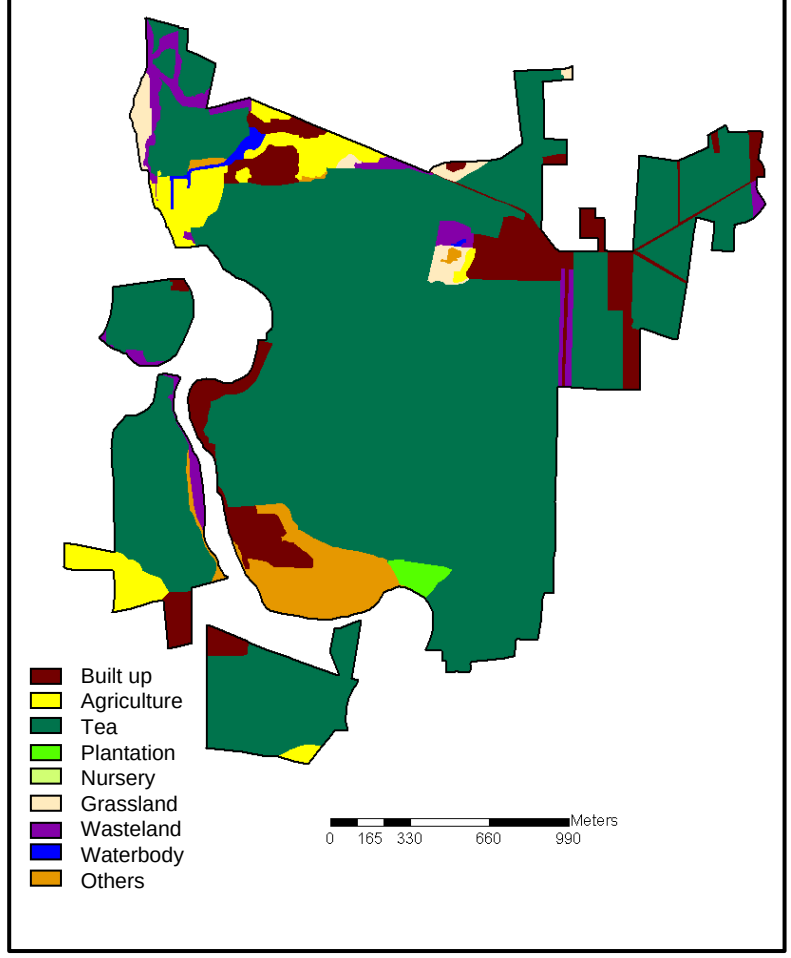
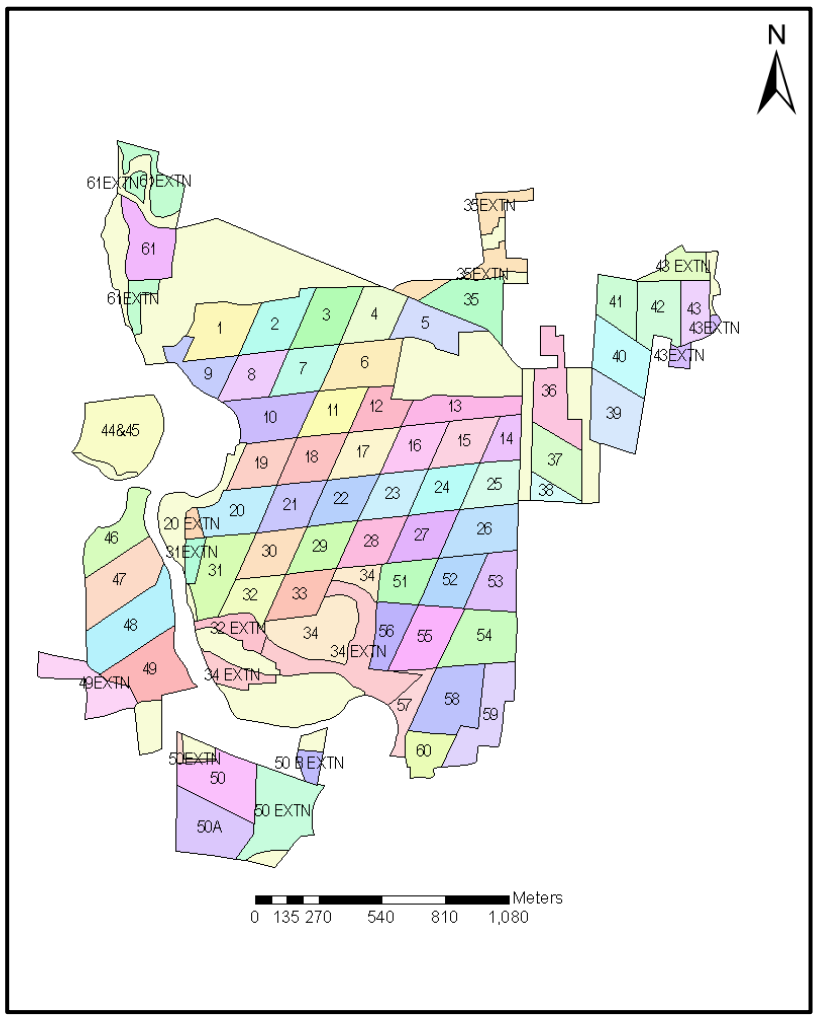


d. Shade Tree Density in Sections

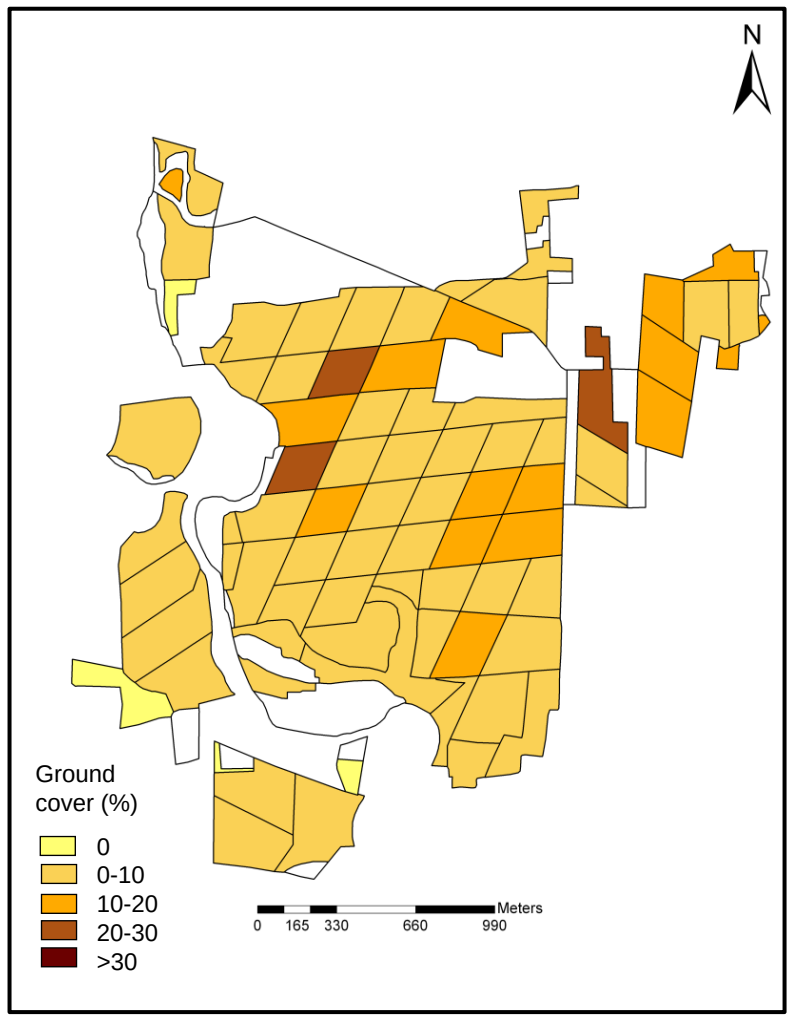
a. False Colour Composite of IRS LISS IV



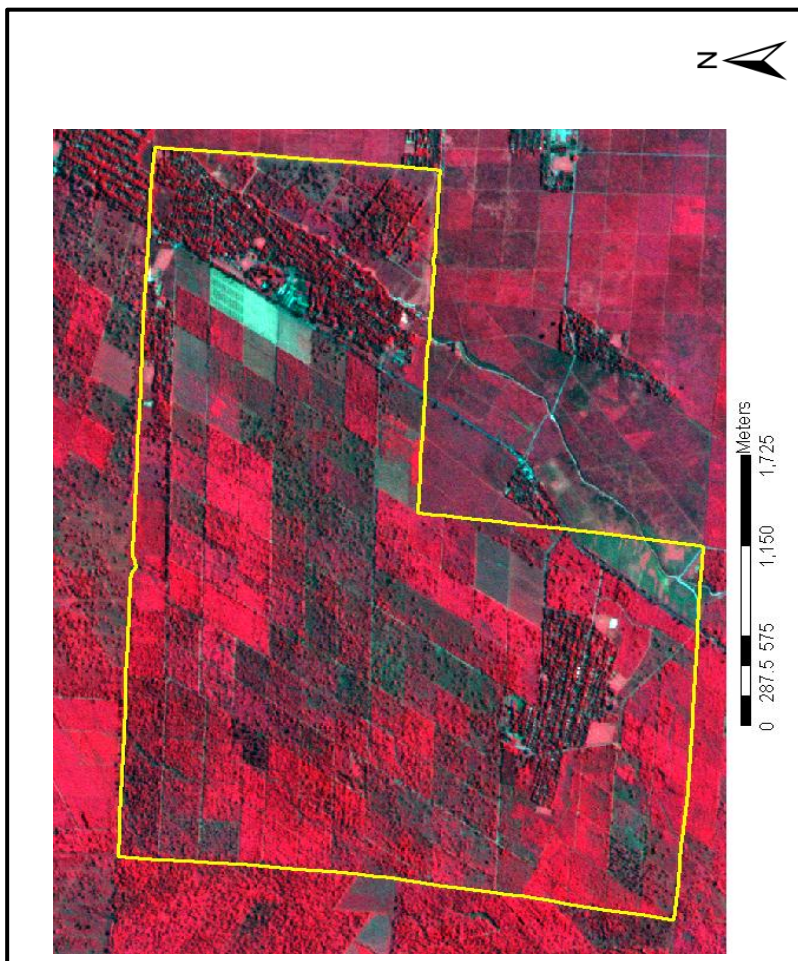
b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections



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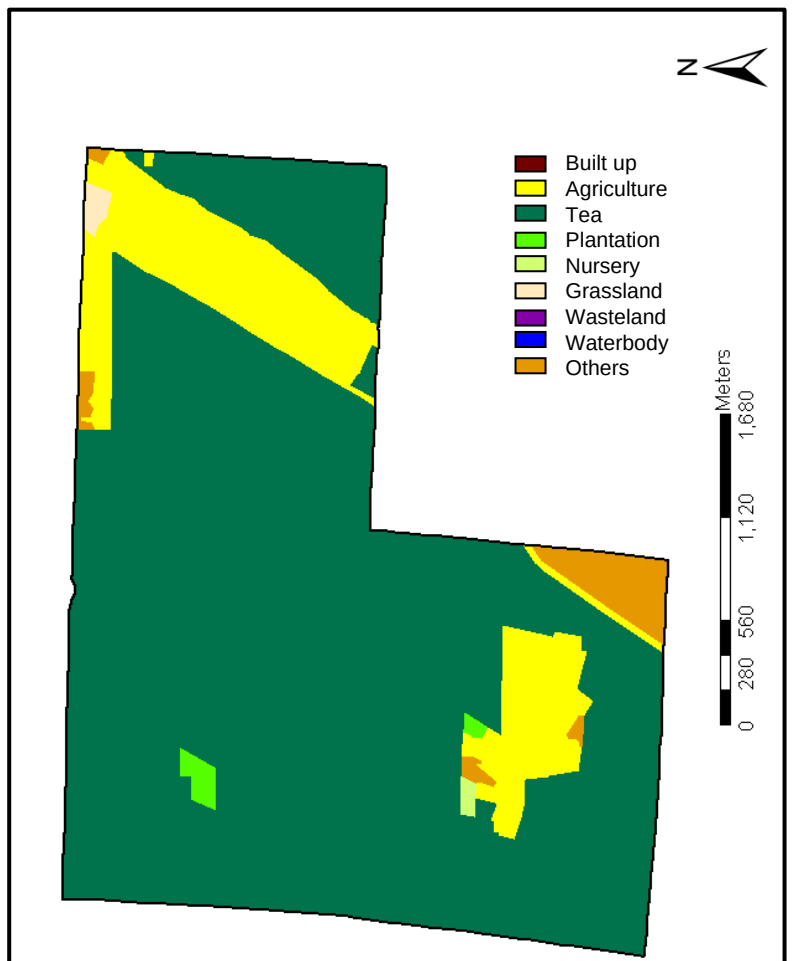
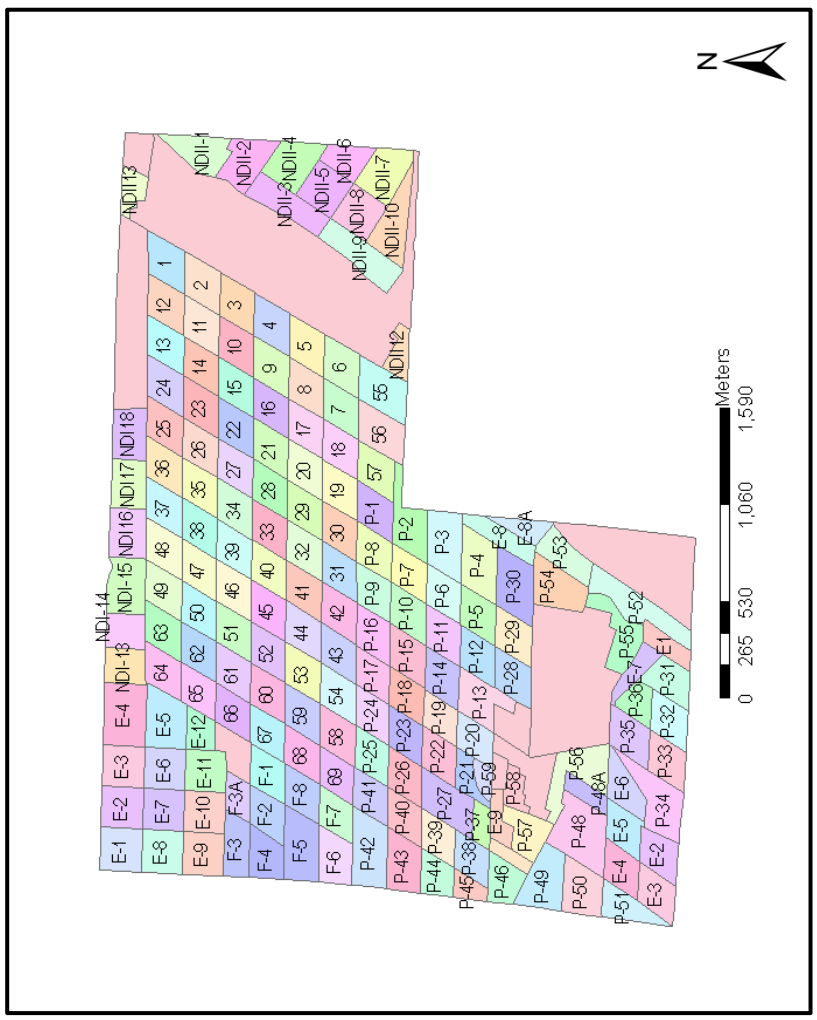
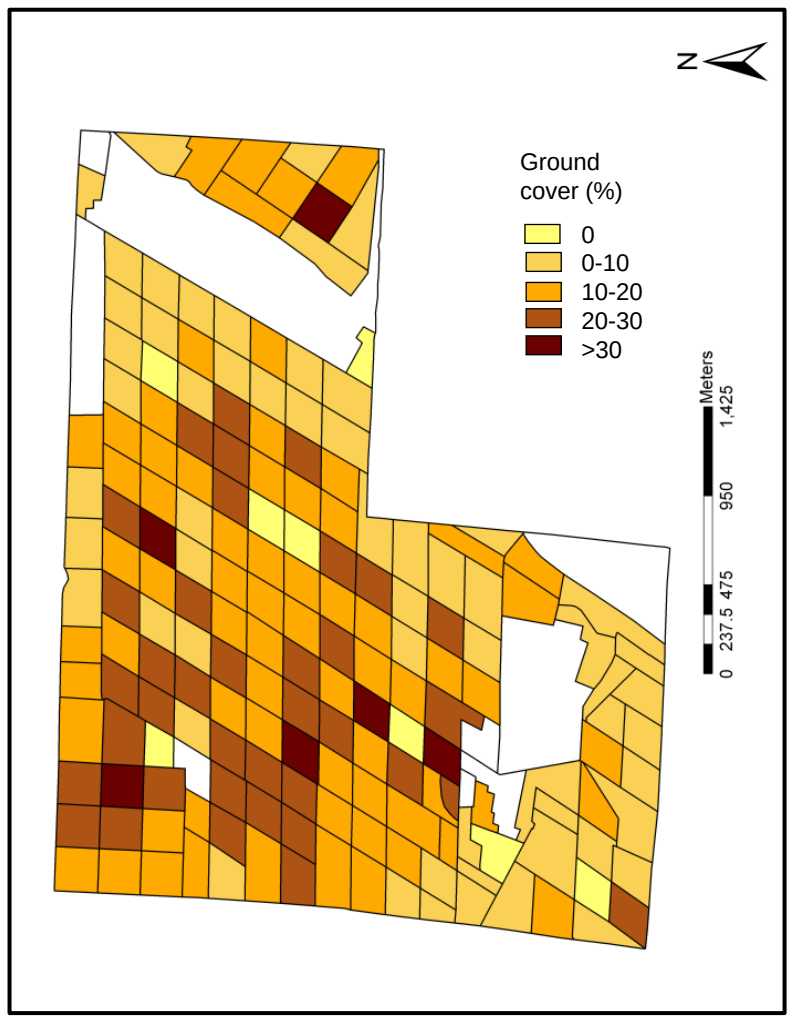


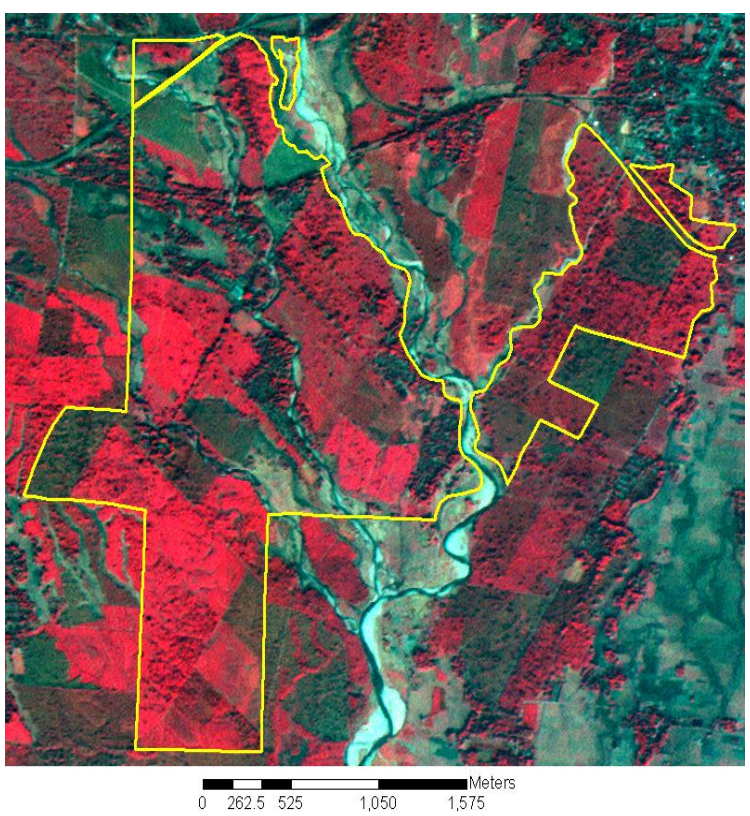
b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections



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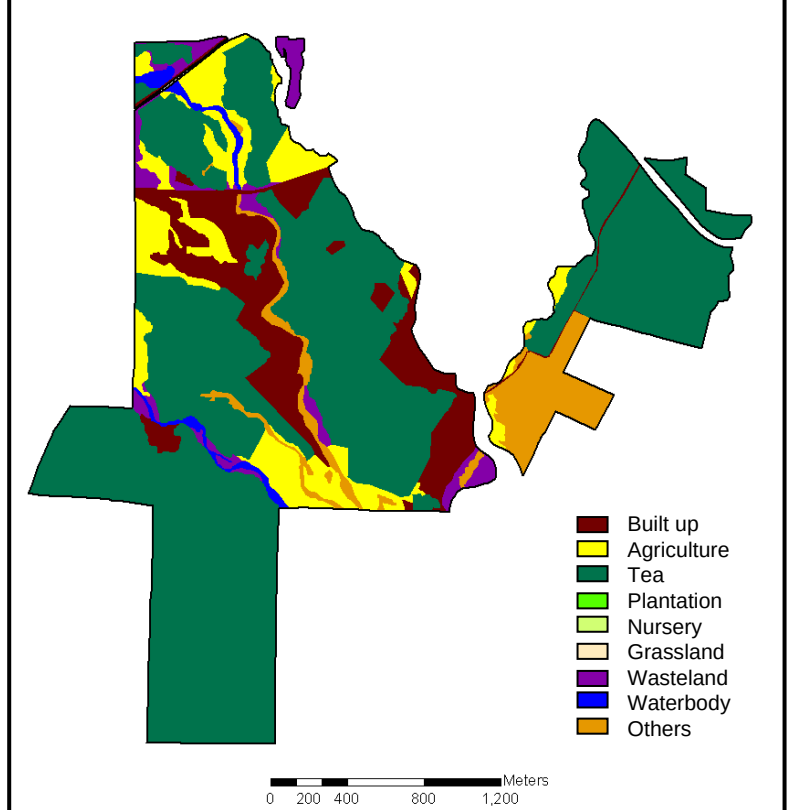
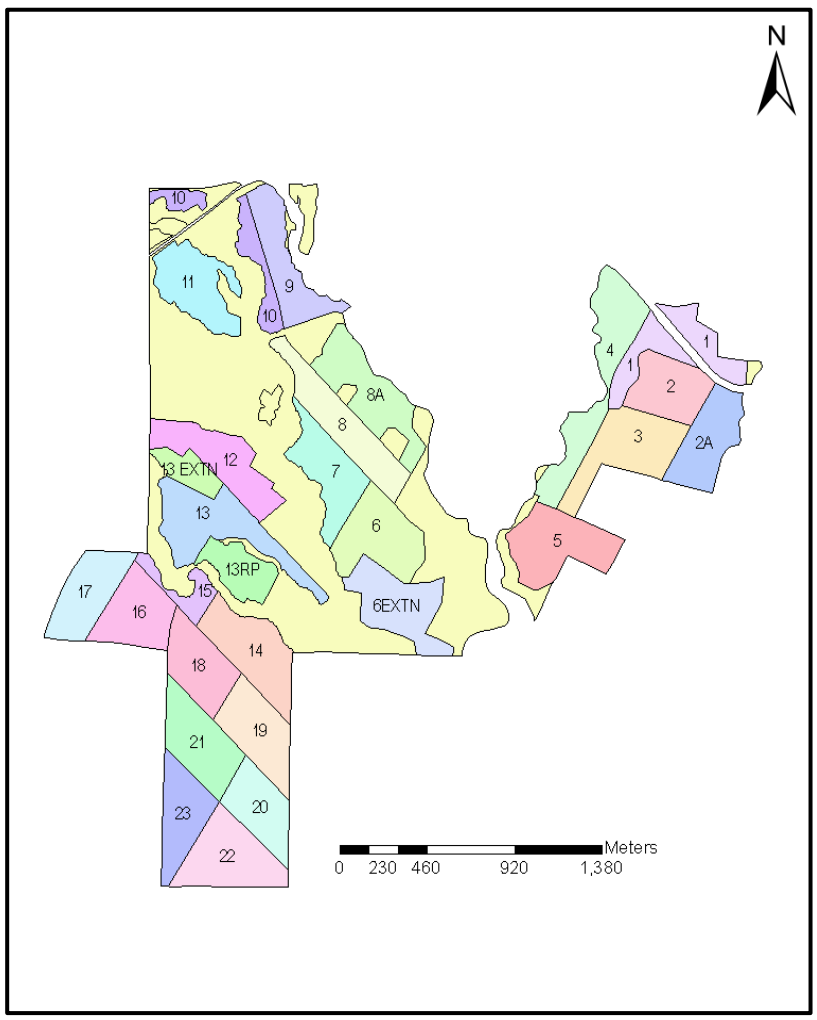
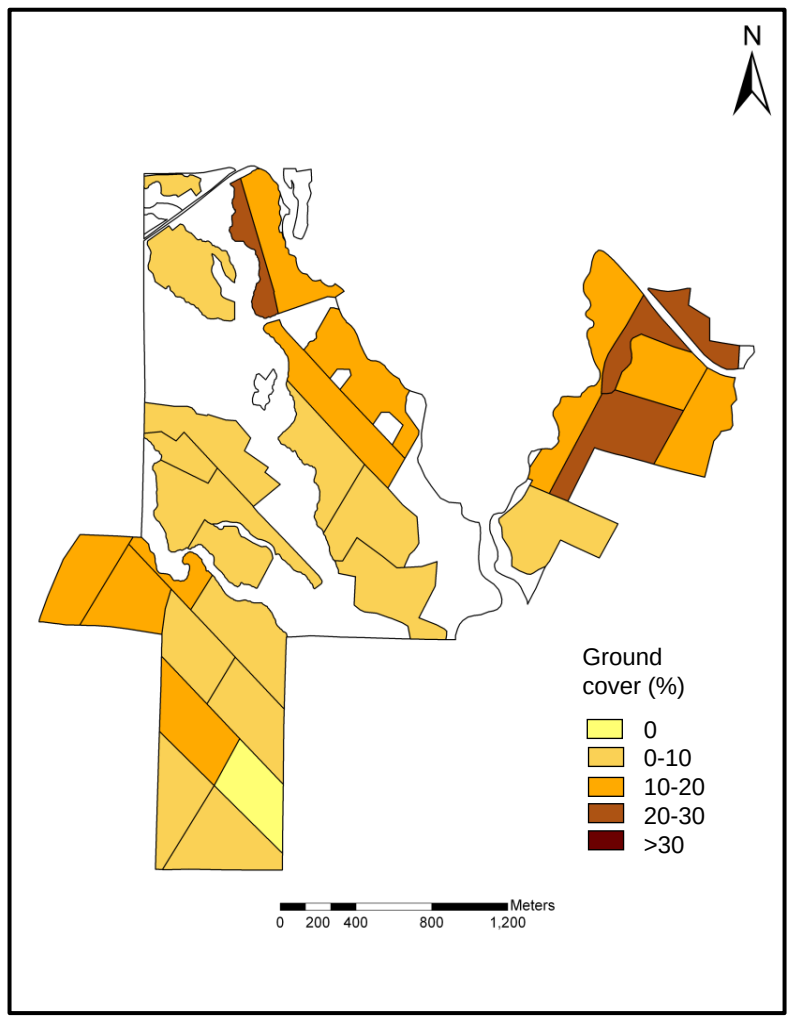


b. Tea Estate Landuse

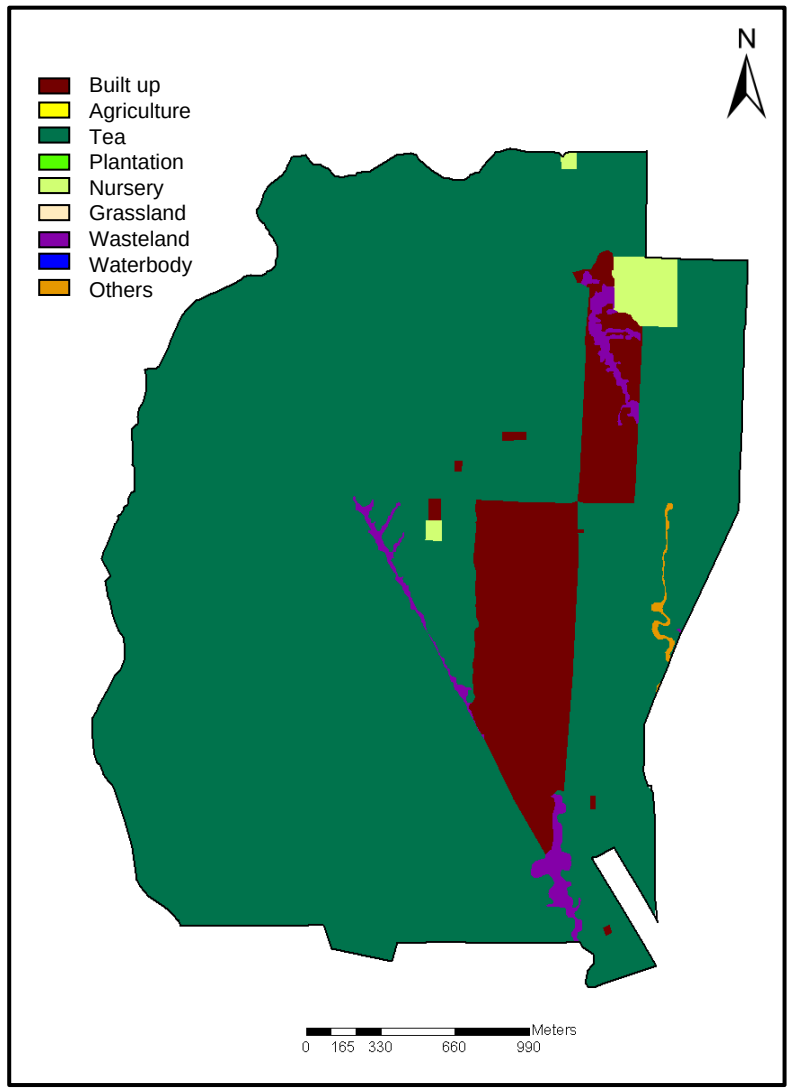


c. Section Boundaries of the Estate

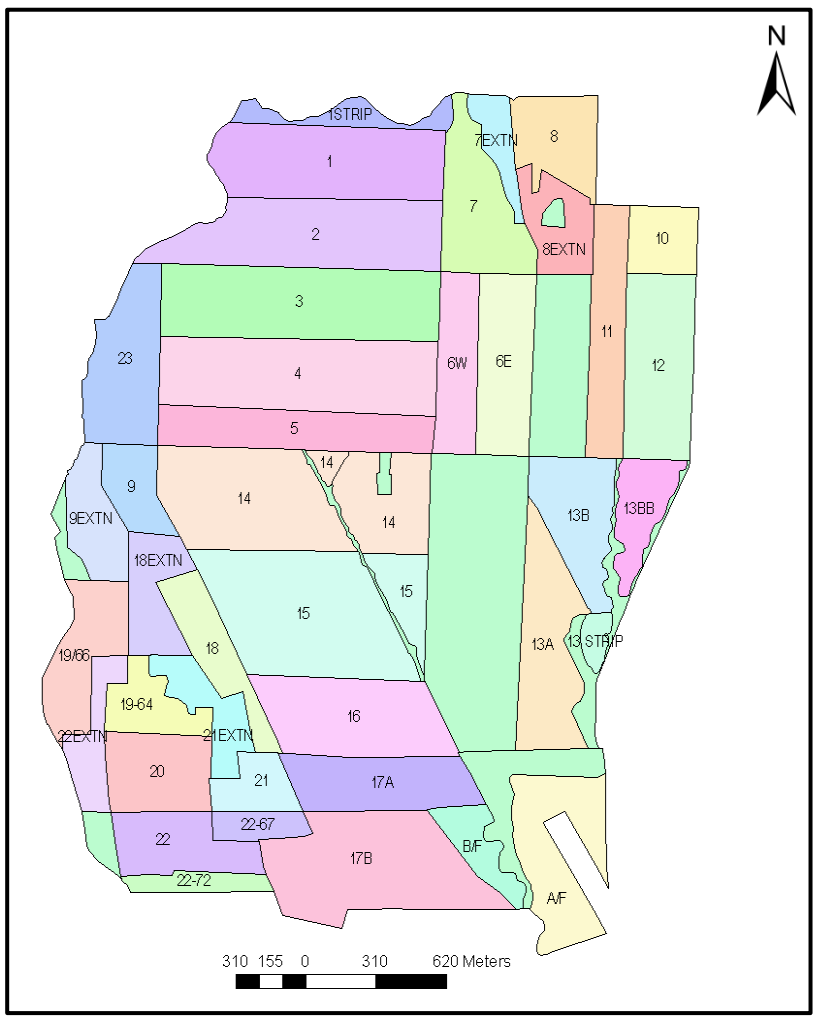


d. Shade Tree Density in Sections

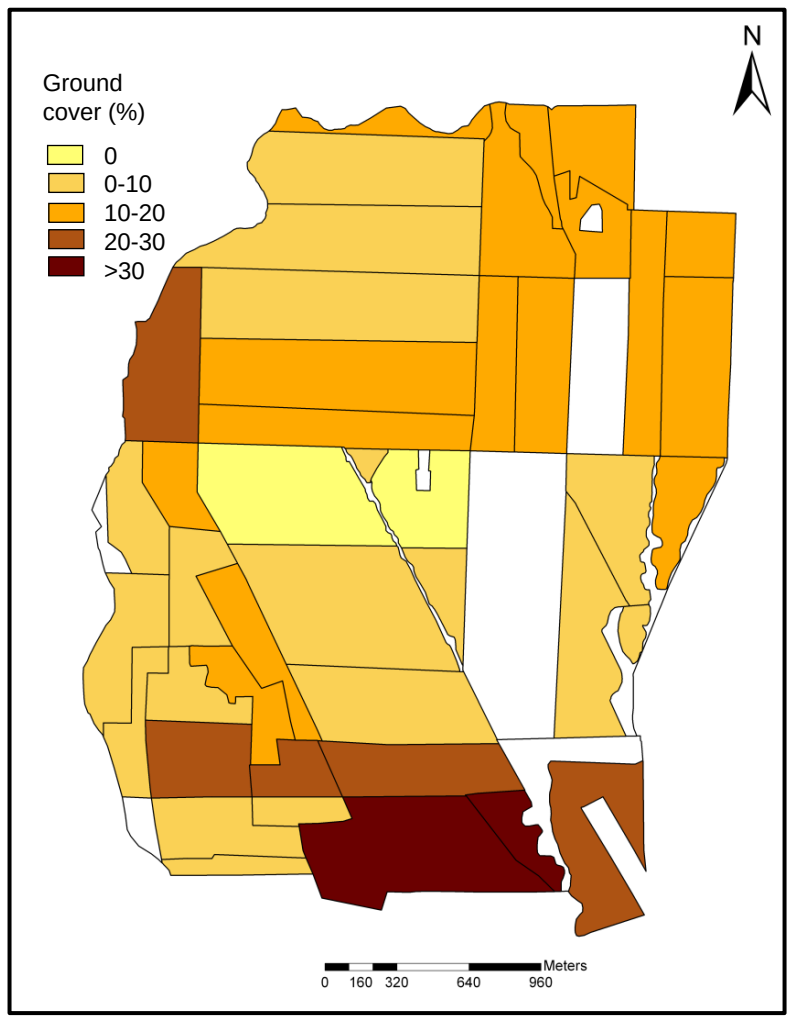
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse

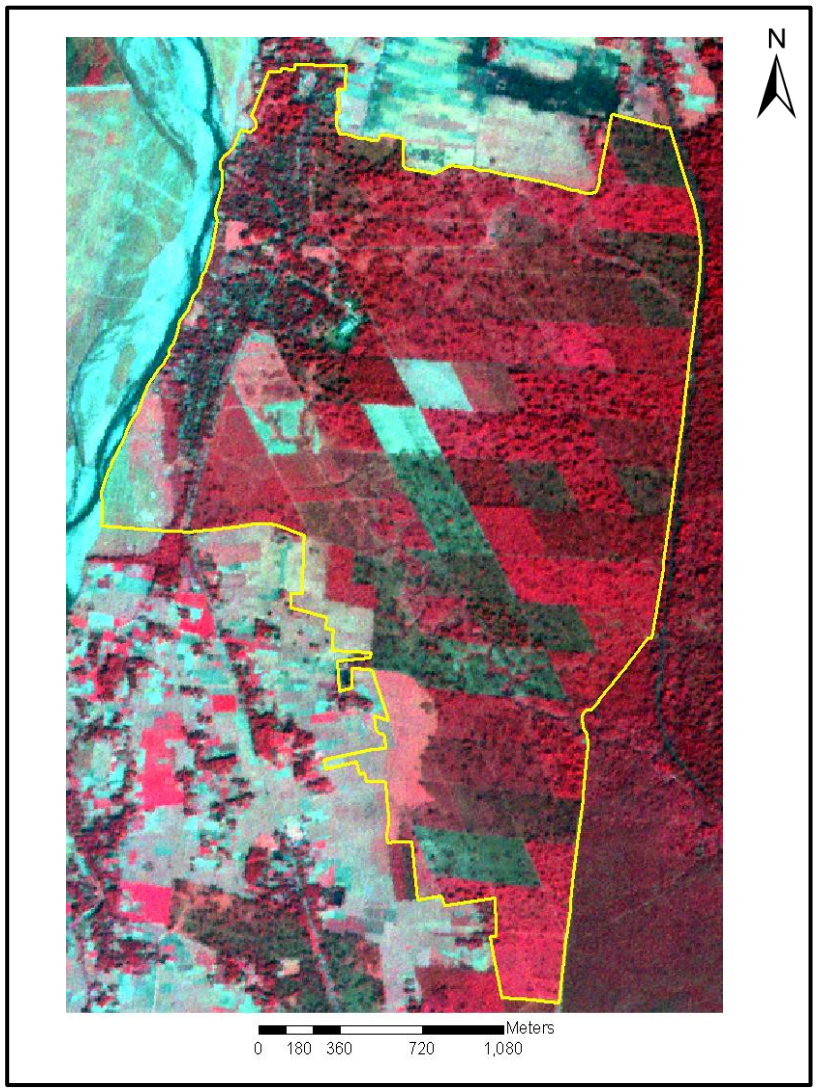


c. Section Boundaries of the Estate

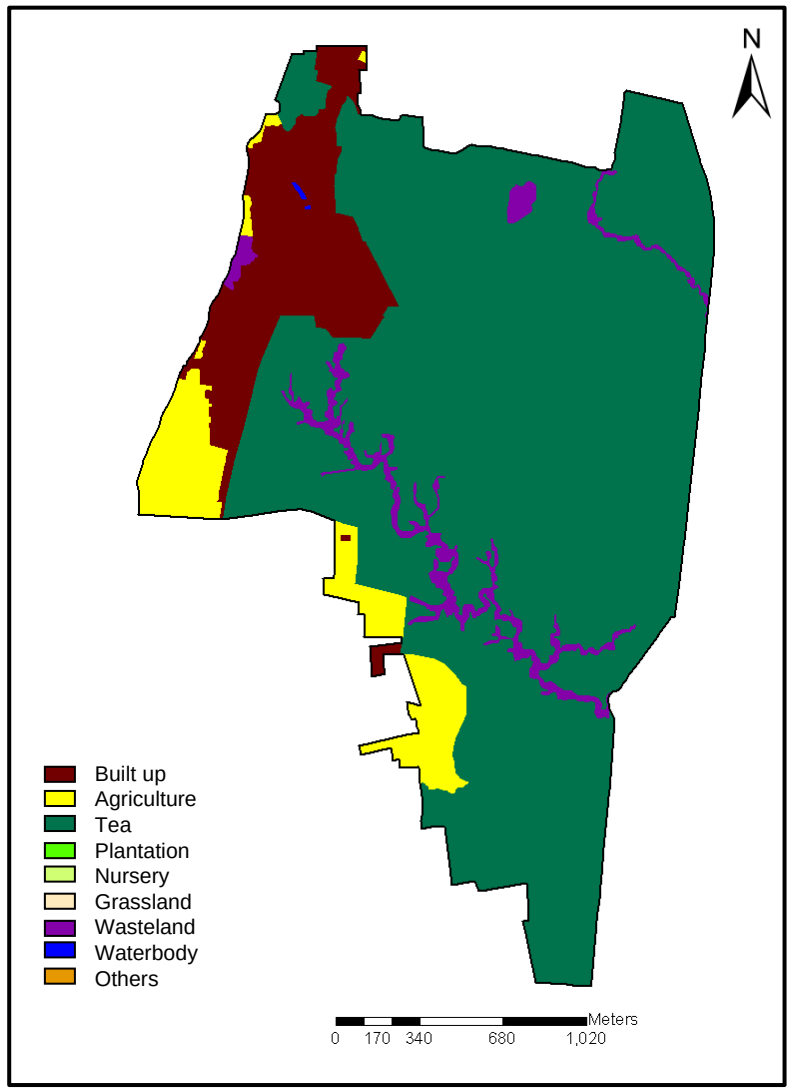


d. Shade Tree Density in Sections

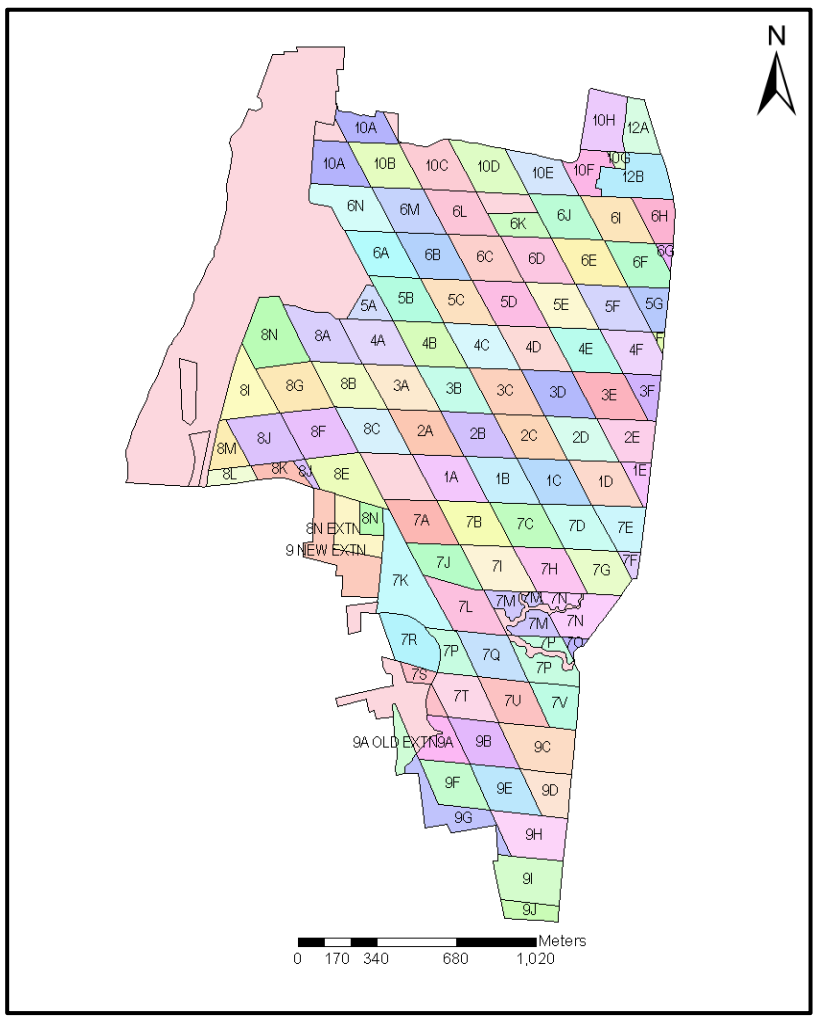
P95: NIMTIJHORA TE



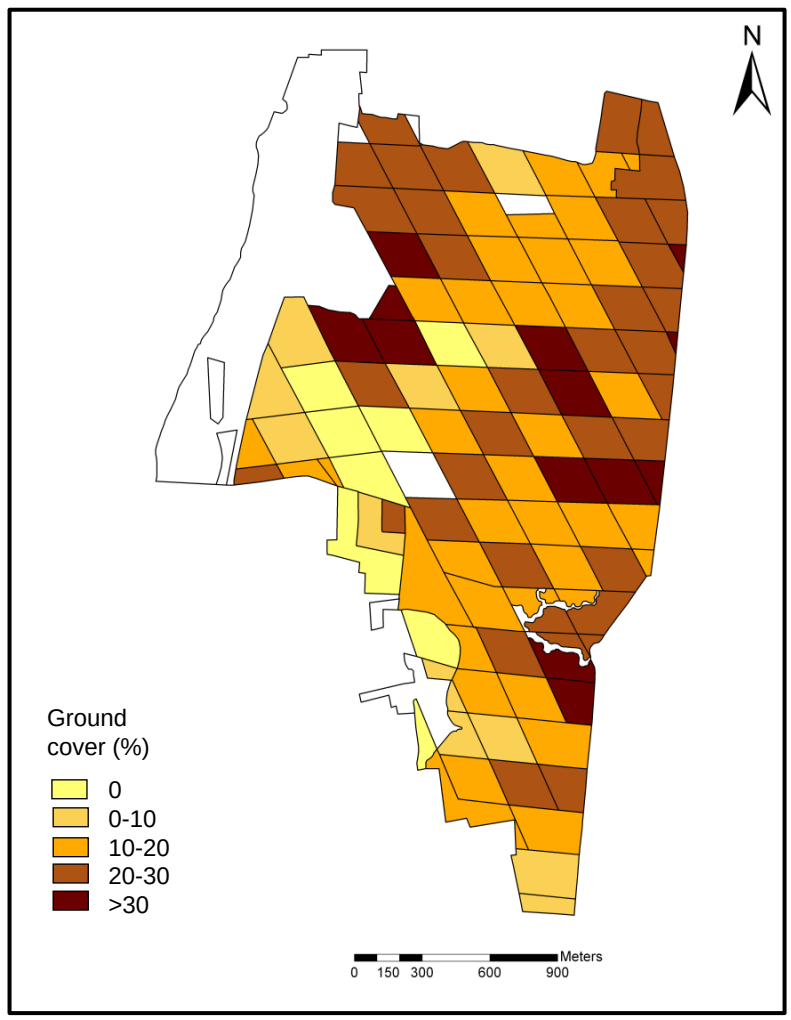
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

e. General Information

1. General	
Contact address	PO: Nimtidomohani, Dist: Jalpaiguri
Contact phone	9232502654
Name of the company	Khayerbari Tea Co. Ltd.
Name of the village where it falls	Nimtijhora TE
Leased area of the estate (ha)	575.45
Tea grown area of the estate (ha)	391.25
No. of divisions / sections	14 div/111 sec
Year of establishment	1912
Type of tea produced	CTC, green tea

2. Infrastructure	
Availability of processing factory	Yes
Availability of workers colony	Yes
Availability of internet facility / e-mail id	No
Meteorological observations taken	Rainfall

3. Amenities	
Availability of health care / dispensary	Yes
Availability of school	Yes

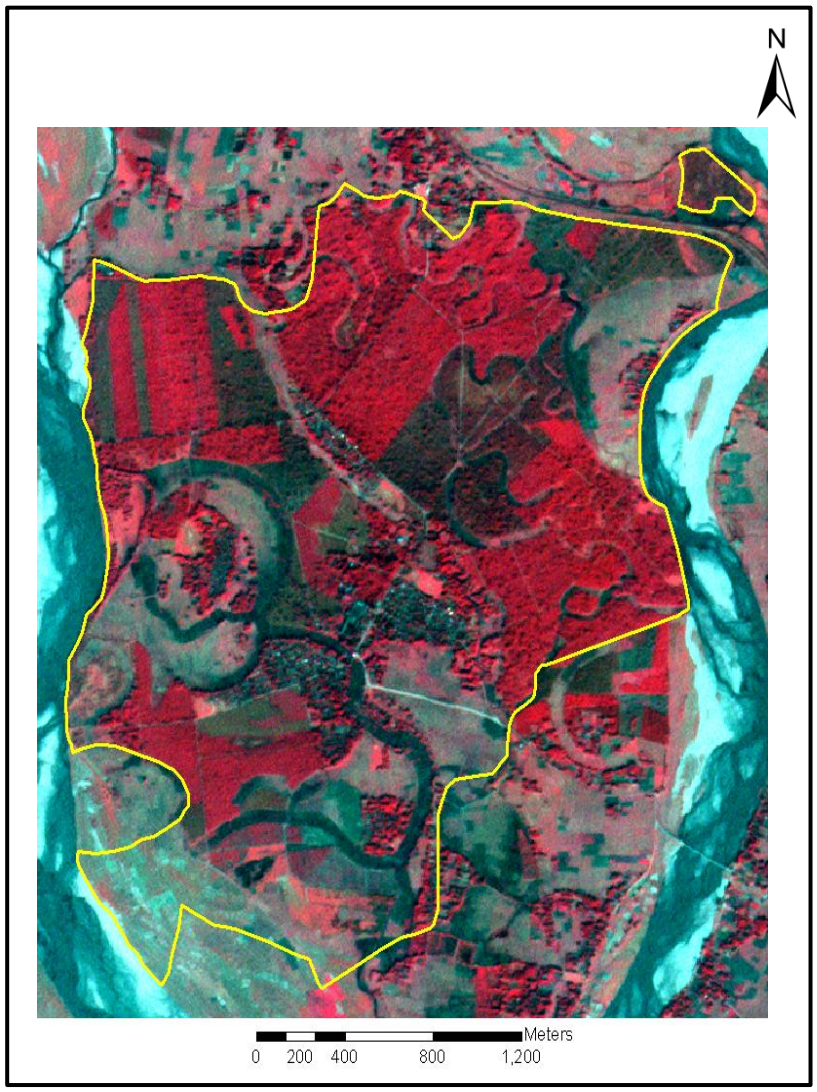
4. Shade trees	
Shade tree density (garden level)	Medium
Plant to plant spacing	5.5‘ x 2.5', 4.5’ x 2.5’
Row to row spacing	5.5‘ x 2.5', 4.5’ x 2.5’

5. Natural resources constraints	
Drainage congestion and water logging	Yes
Scarcity of water during summer	No
River bank erosion	Yes
Major diseases and duration	Red rust, black rot
Major pests and duration	RSM, looper, red slug, *Helopeltis*
Damage due to wildlife	Cattle damage (pig, goat, cow)

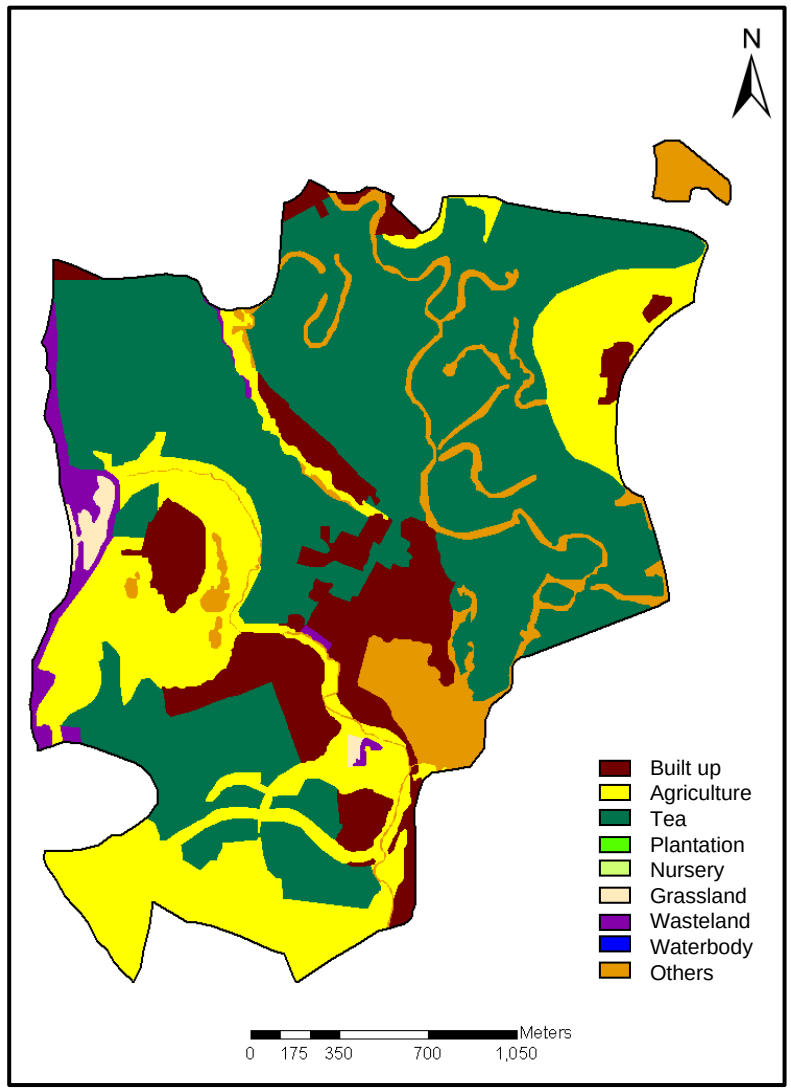
6. Yield / production	
Peak plucking periods	Apr-Nov
Annual green leaf yield	7511.4
Annual production of processed tea	661838.5 kg

7. Pruning	
Time of pruning	Nov-Jan
Pruning cycle	--
Types of pruning	LP-UP-MS-UP

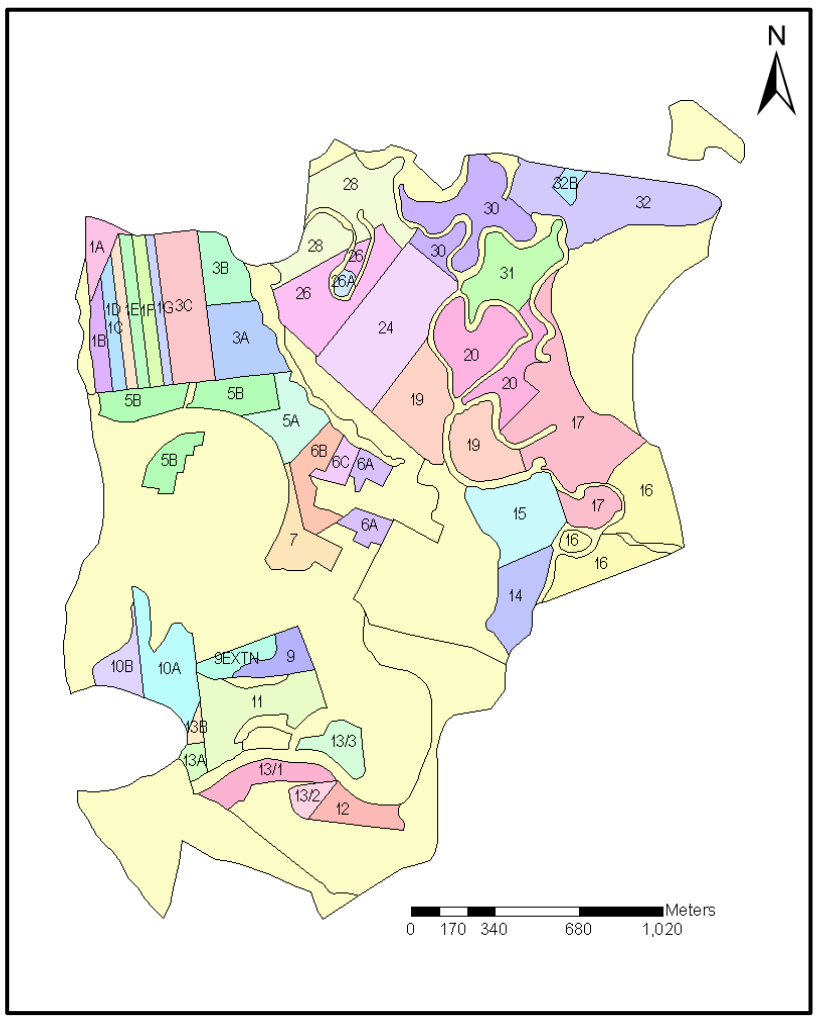
8. Fertilizer use	
Types of N, P, K fertilizers used	Urea, MOP, RP
Dose of Nitrogen (kg/ha)	100-140
Dose of Phosphorous (kg/ha)	40
Dose of Potash (kg/ha)	80-120
Whether lime is applied, if yes dose	Yes, 2000 kg/ha



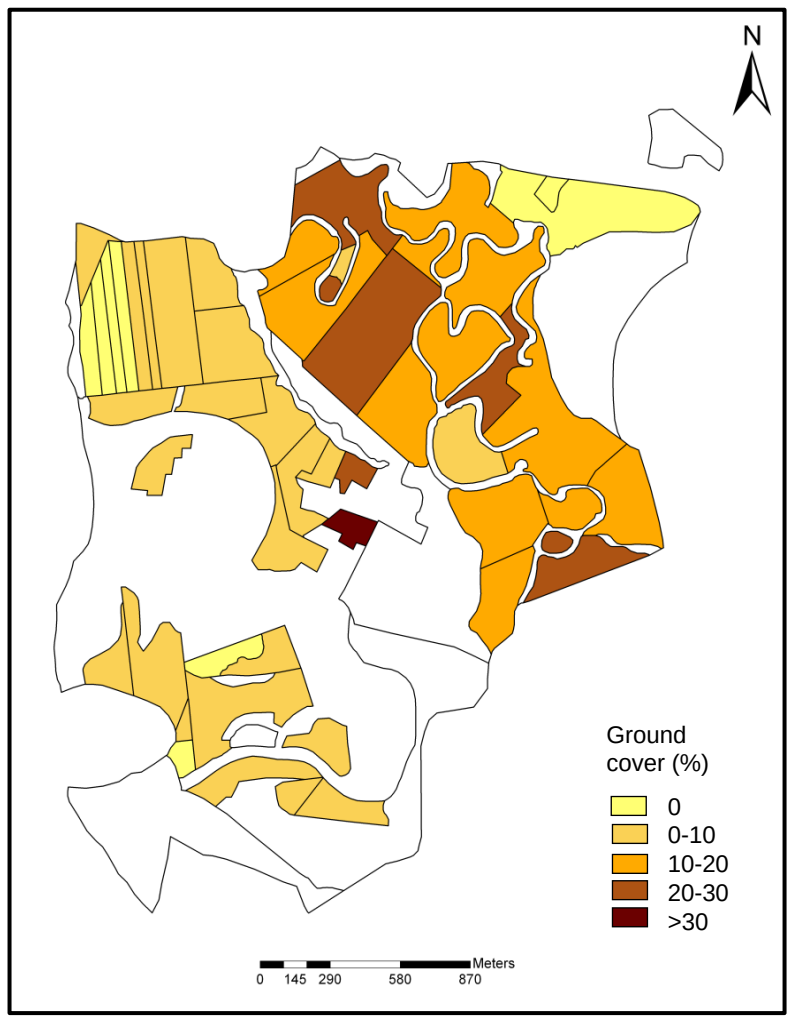
a. False Colour Composite of IRS LISS IV



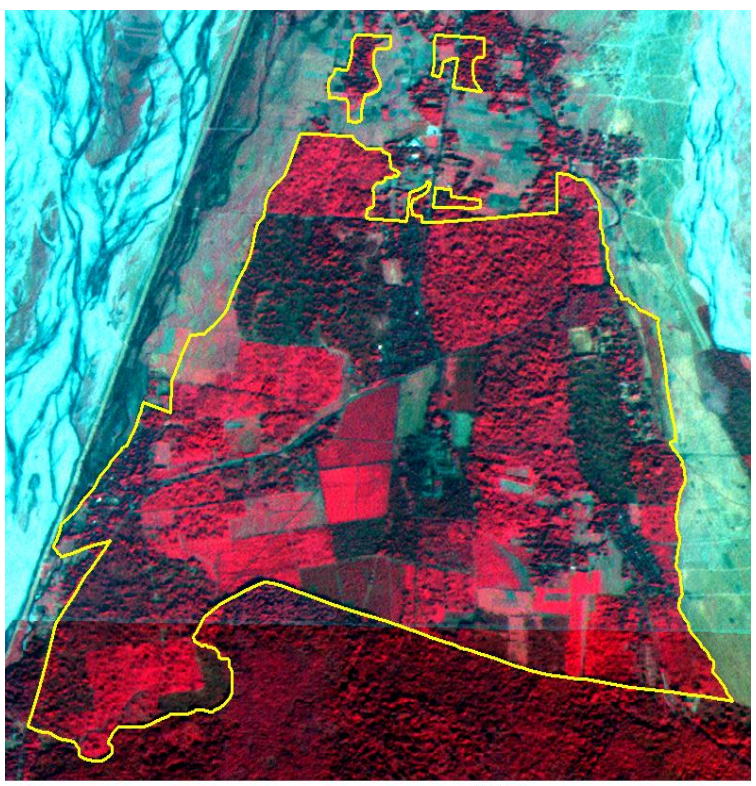
b. Tea Estate Landuse



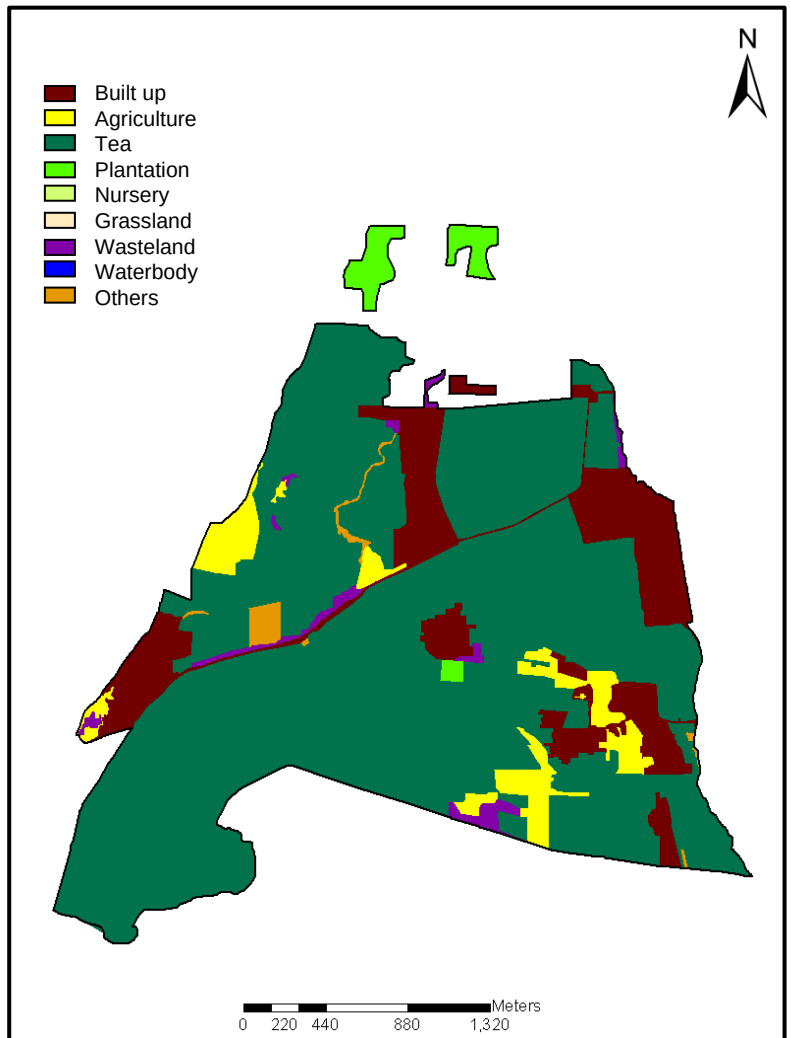
c. Section Boundaries of the Estate



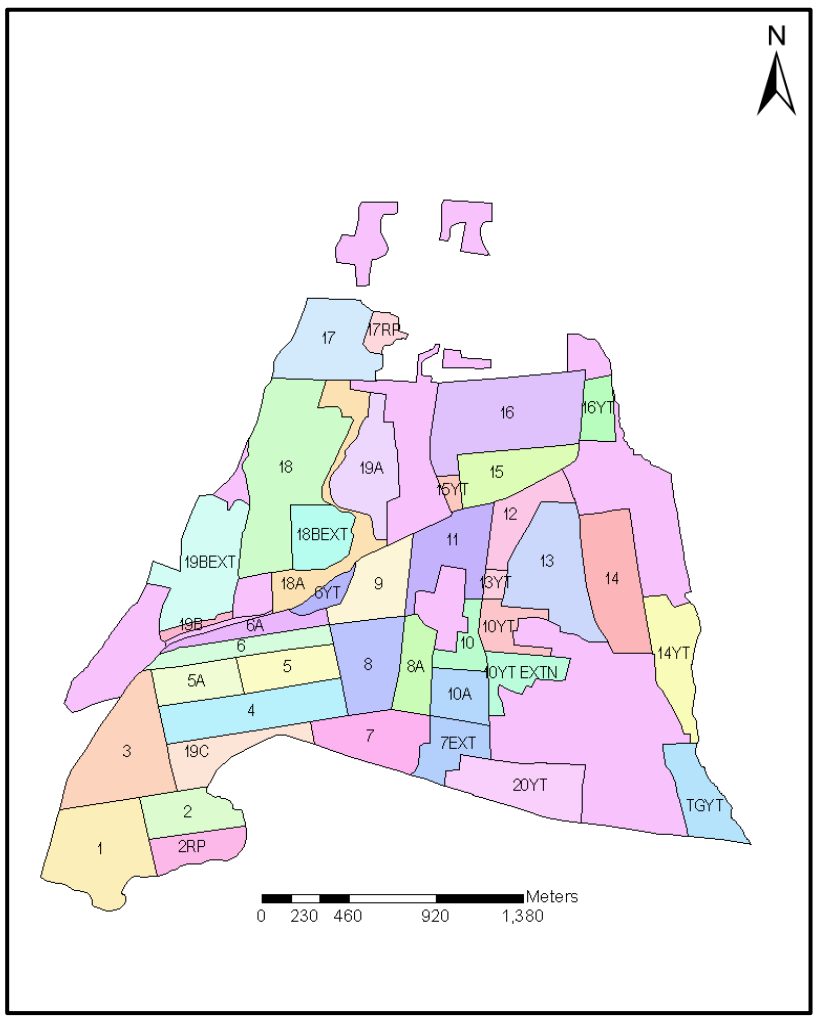
d. Shade Tree Density in Sections



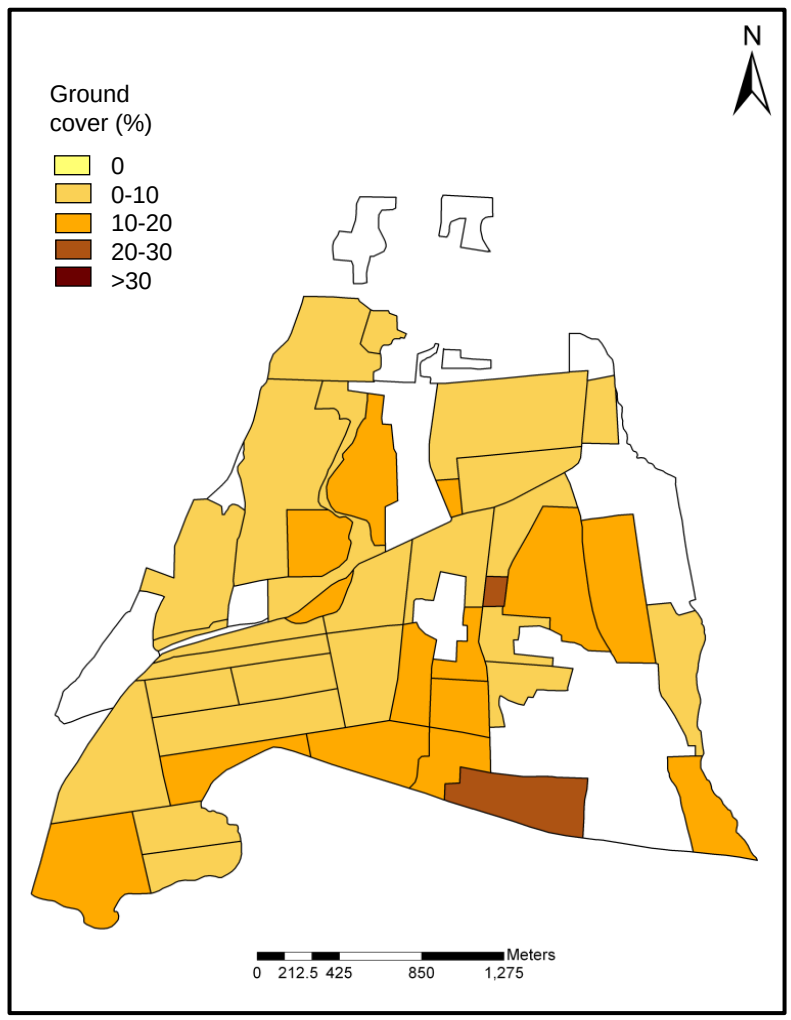
a. False Colour Composite of IRS LISS IV



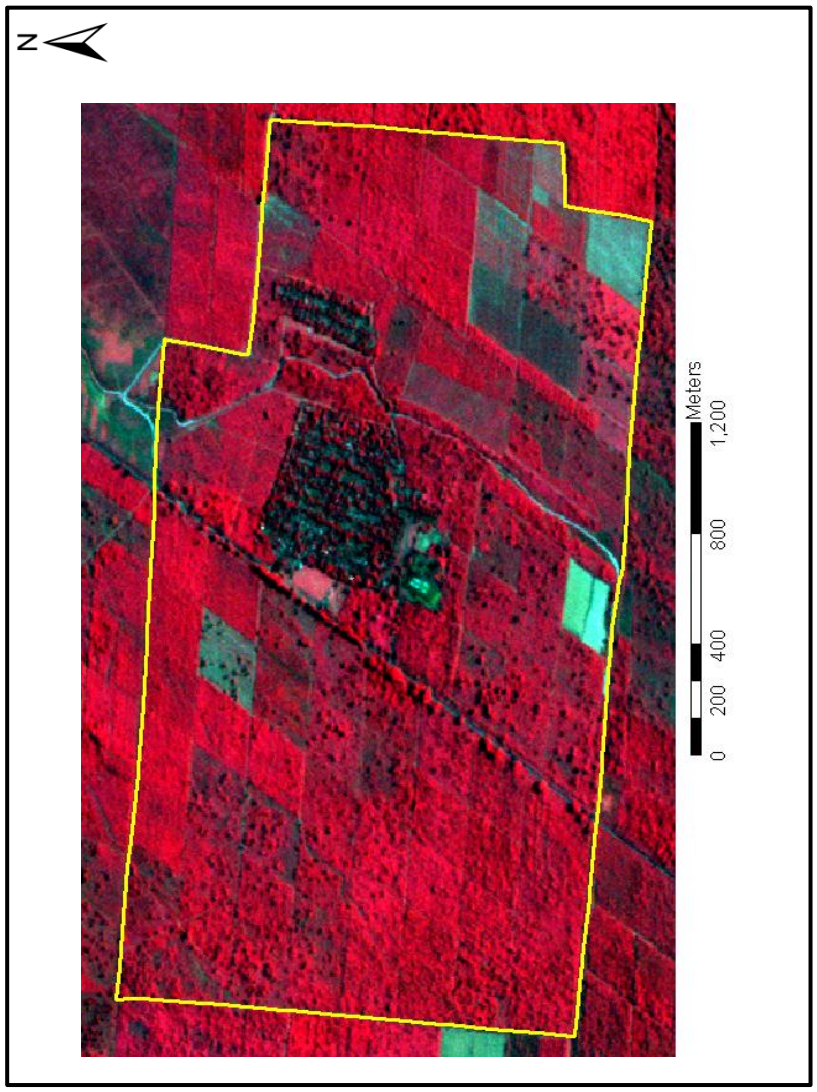
b. Tea Estate Landuse



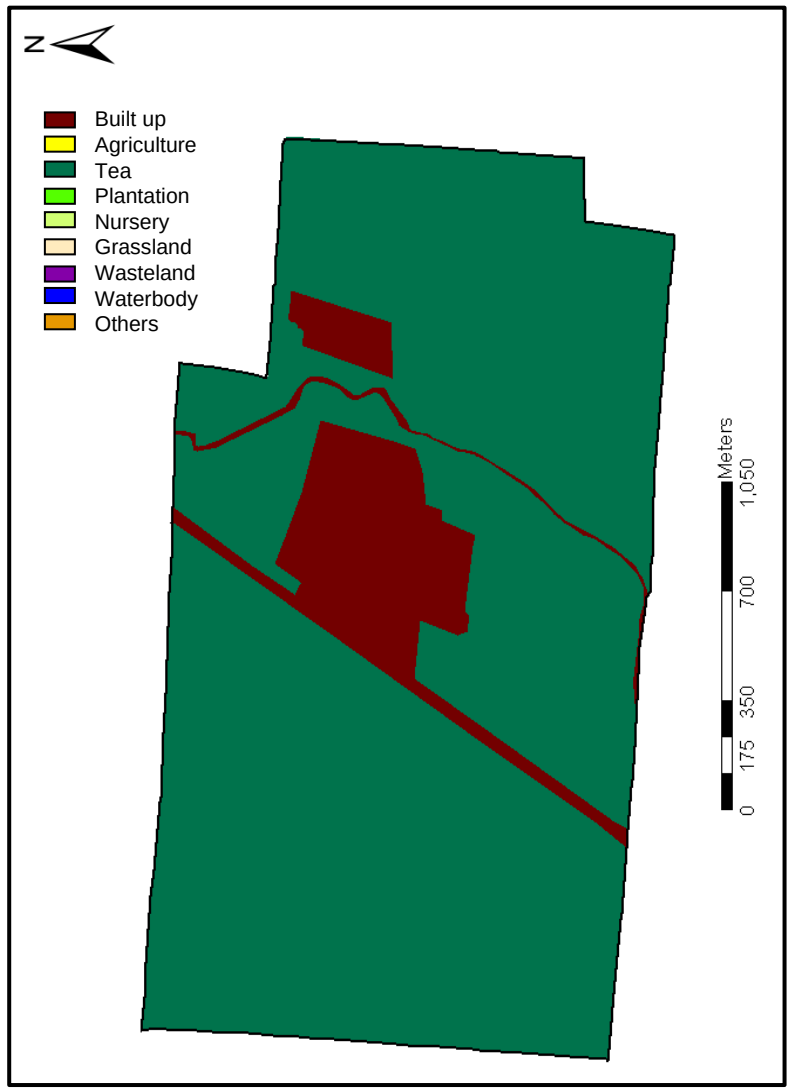
c. Section Boundaries of the Estate



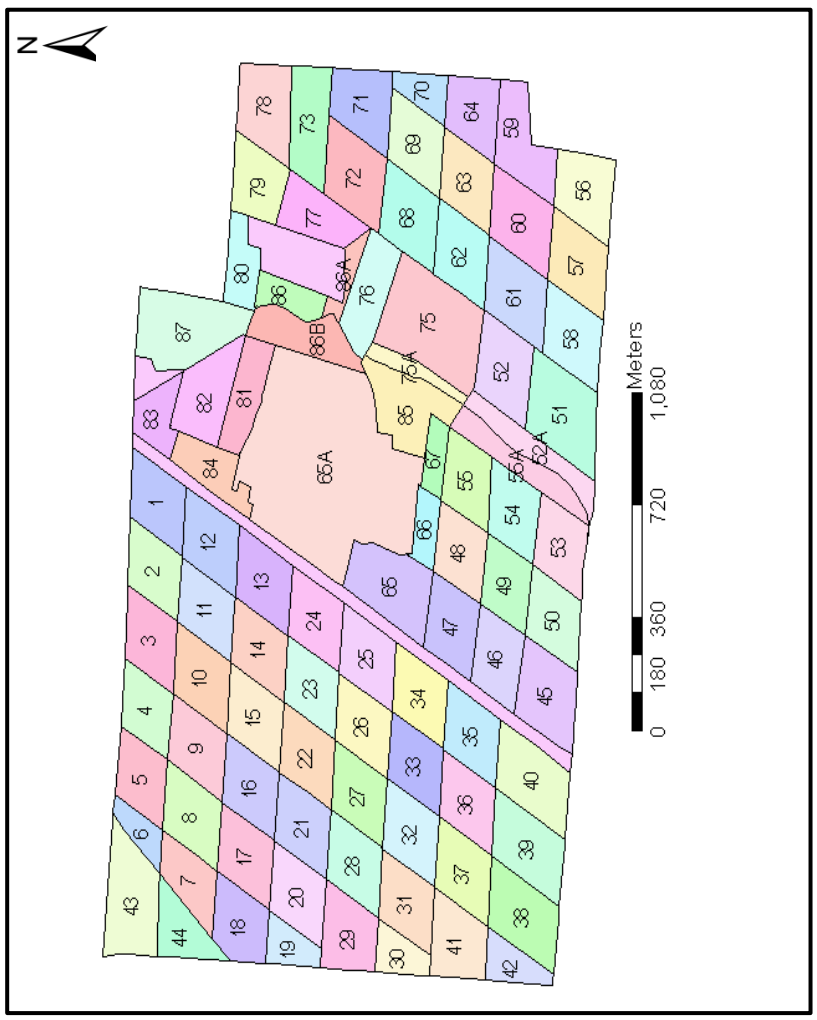
d. Shade Tree Density in Sections



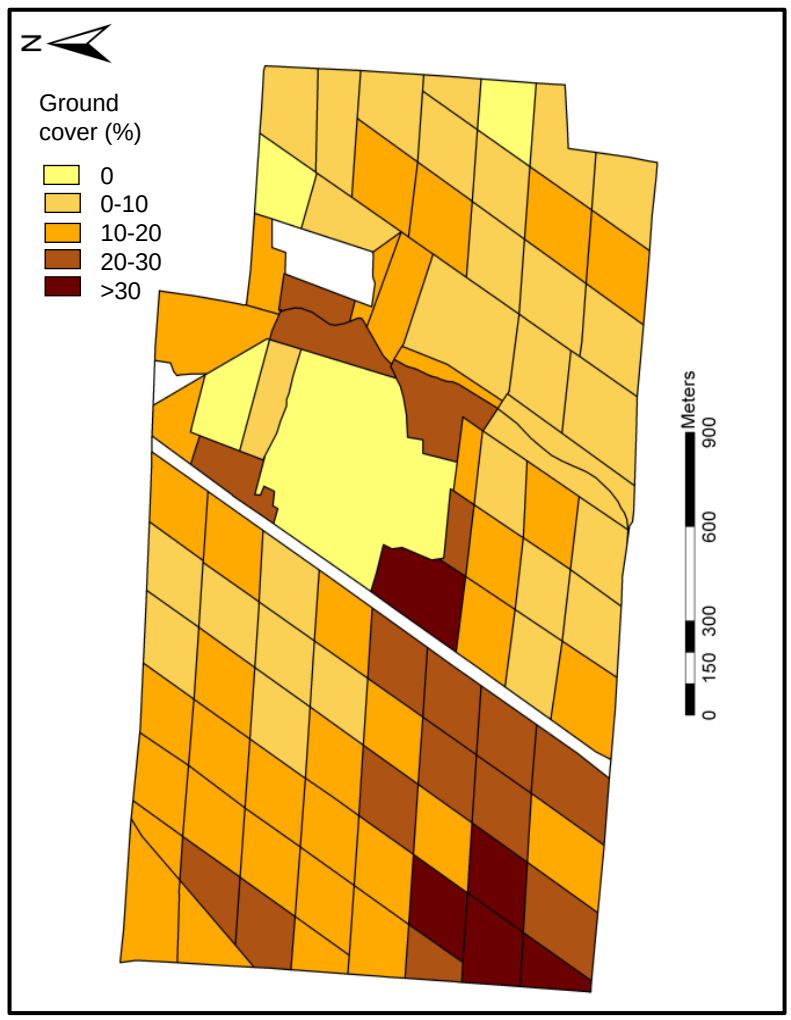
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse

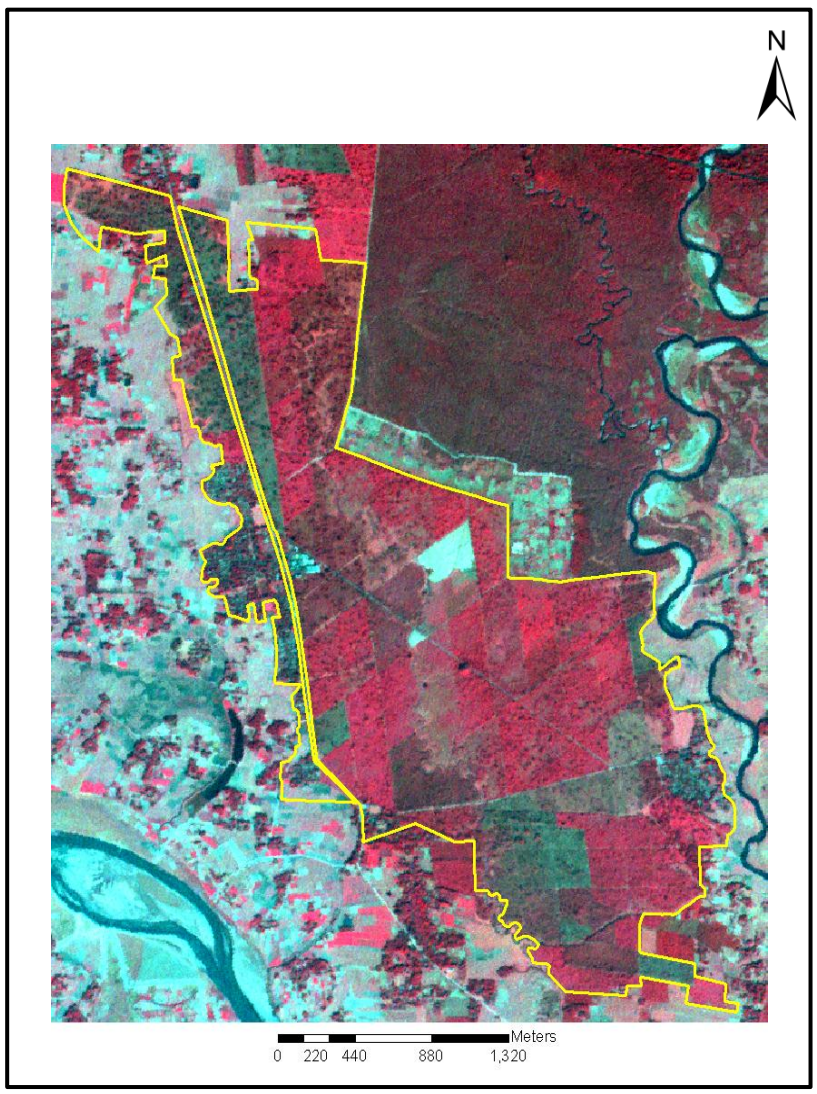


c. Section Boundaries of the Estate

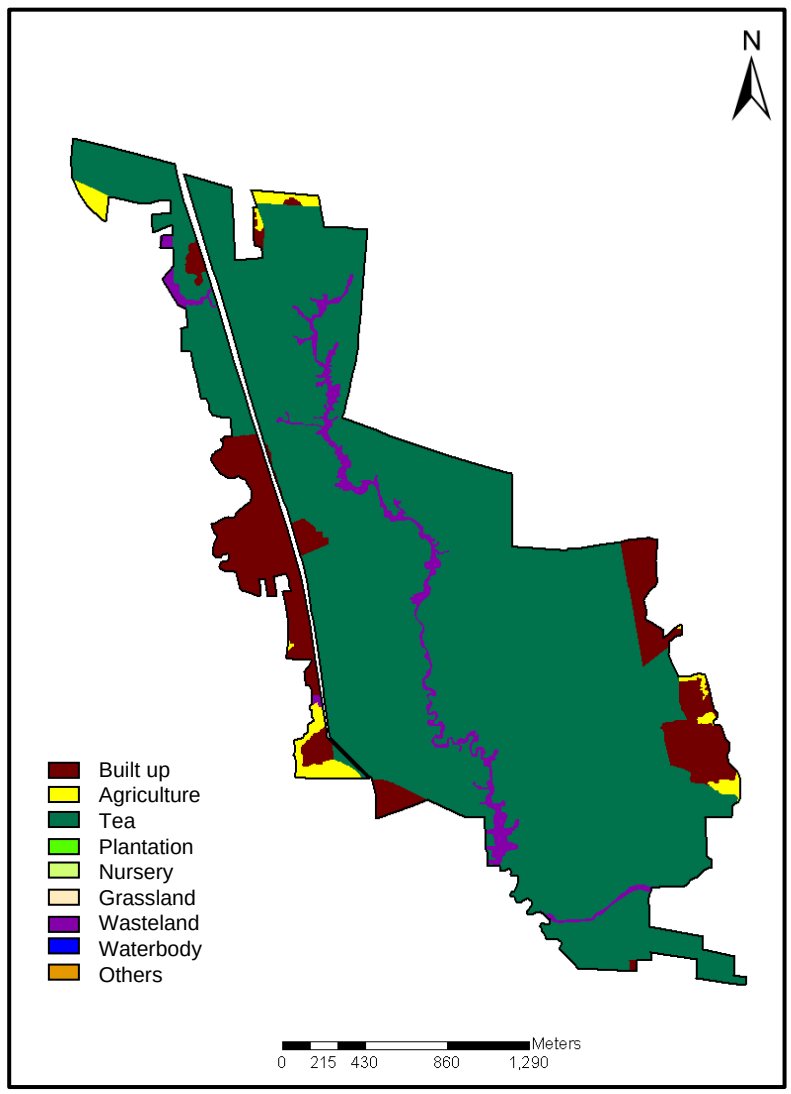


d. Shade Tree Density in Sections

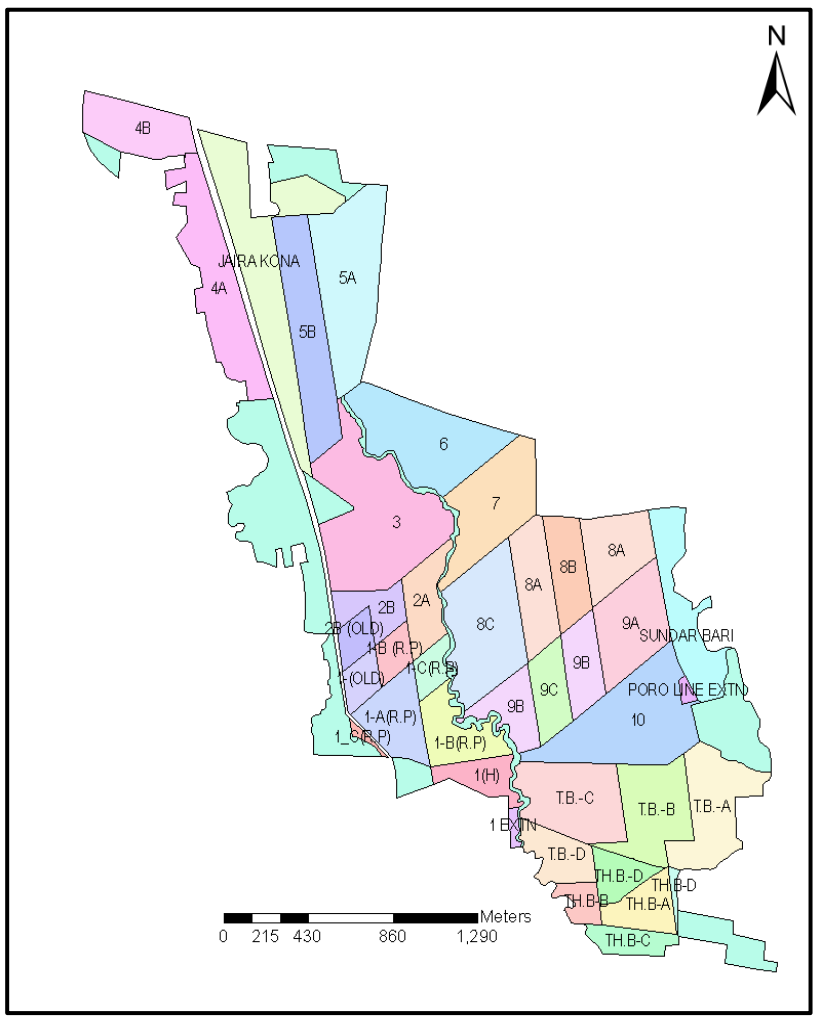
P99: PATKAPARA TE



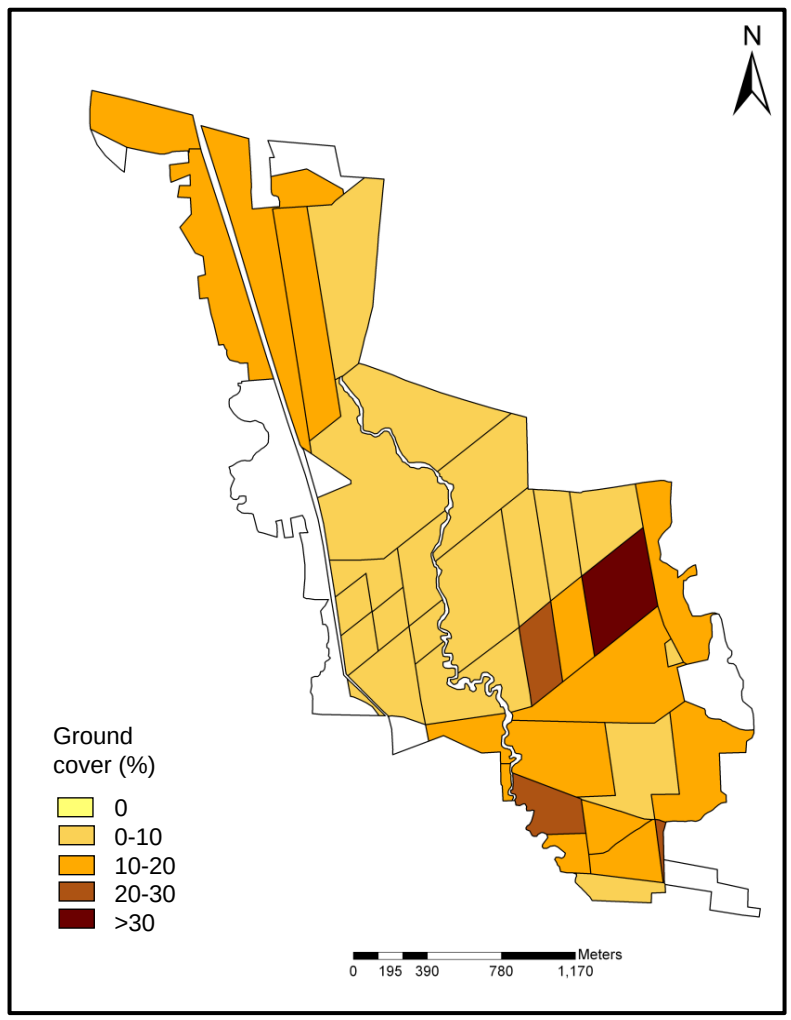
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

e. General Information

1. General	
Contact address	PO: Alipurduar, Dist: Jalpaiguri
Contact phone	9593959192, 03564203193
Name of the company	Dooars Plantations and Industries Ltd.
Name of the village where it falls	Patkapara
Leased area of the estate (ha)	592.58
Tea grown area of the estate (ha)	470.65
No. of divisions / sections	0 div /38 sec
Year of establishment	1914
Type of tea produced	CTC

2. Infrastructure	
Availability of processing factory	Yes
Availability of workers colony	Yes
Availability of internet facility / e-mail id	No
Meteorological observations taken	Tmax, Tmin, Rainfall

3. Amenities	
Availability of health care / dispensary	Yes
Availability of school	Yes

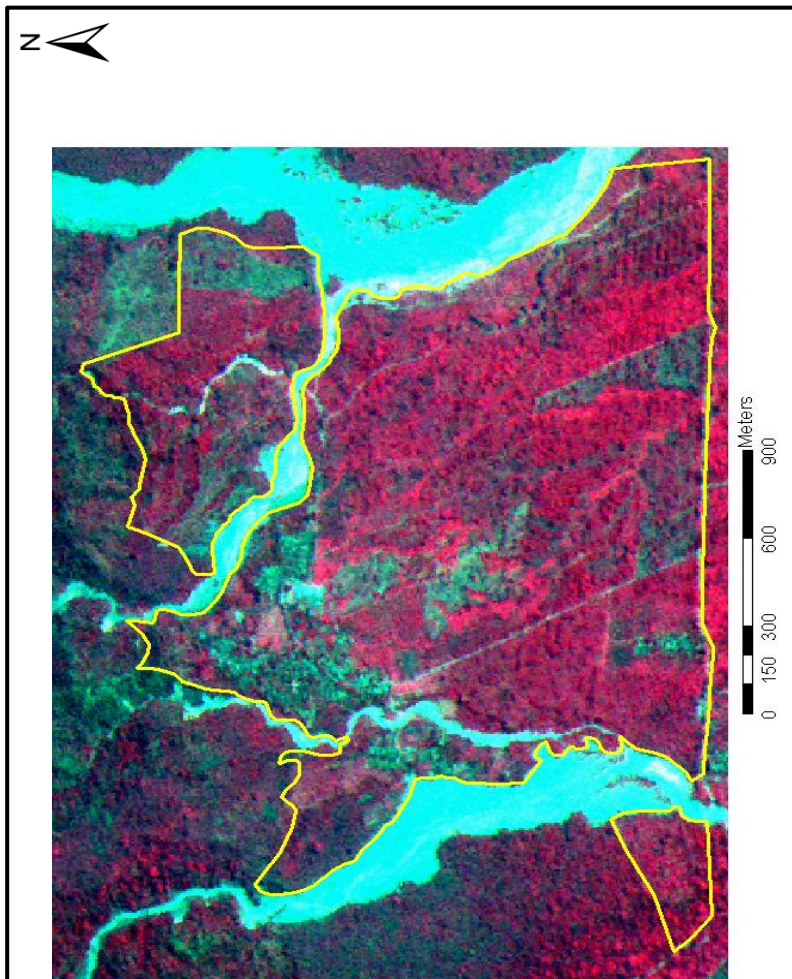
4. Shade trees	
Shade tree density (garden level)	Medium
Plant to plant spacing (m)	13.33 x 13.33
Row to row spacing (m)	13.33 x 13.33

5. Natural resources constraints	
Drainage congestion and water logging	Yes
Scarcity of water during summer	No
River bank erosion	No
Major diseases and duration	Red rust, black rot (4 or 5 months/year)
Major pests and duration	Looper, *Helopeltis*, RSM, thrips (whole yr)
Damage due to wildlife	Yes

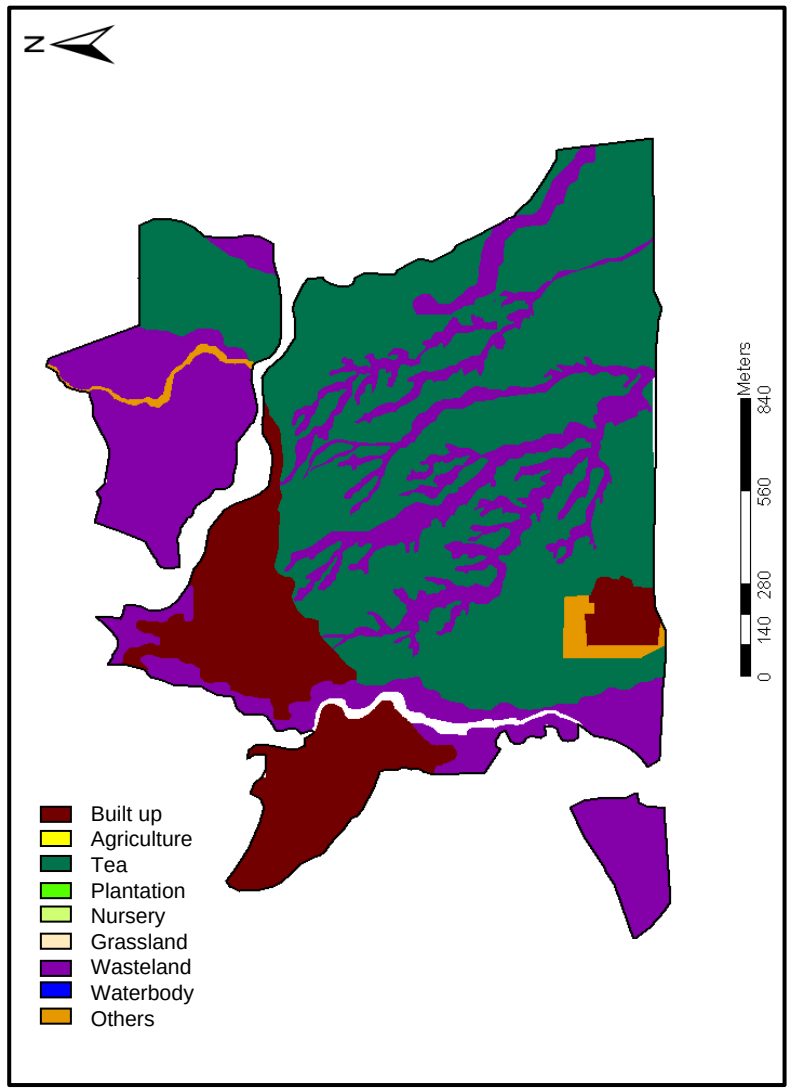
6. Yield / production	
Peak plucking periods	Jul-Oct
Annual green leaf yield	6374 kg/ha
Annual production of processed tea	850000 kg

7. Pruning	
Time of pruning	15th Nov-Jan
Pruning cycle	4 yrs
Types of pruning	--

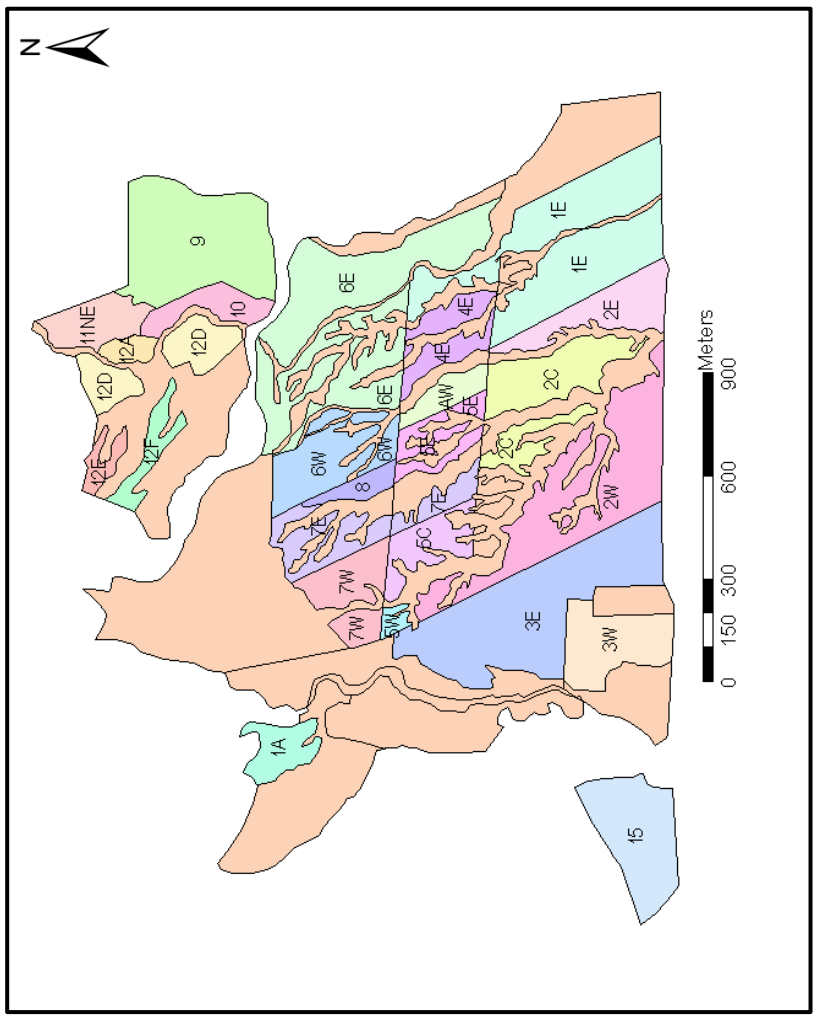
8. Fertilizer use	
Types of N, P, K fertilizers used	Urea, RP, MOP
Dose of Nitrogen (kg/ha)	100
Dose of Phosphorous (kg/ha)	30
Dose of Potash (kg/ha)	80
Whether lime is applied, if yes dose	No



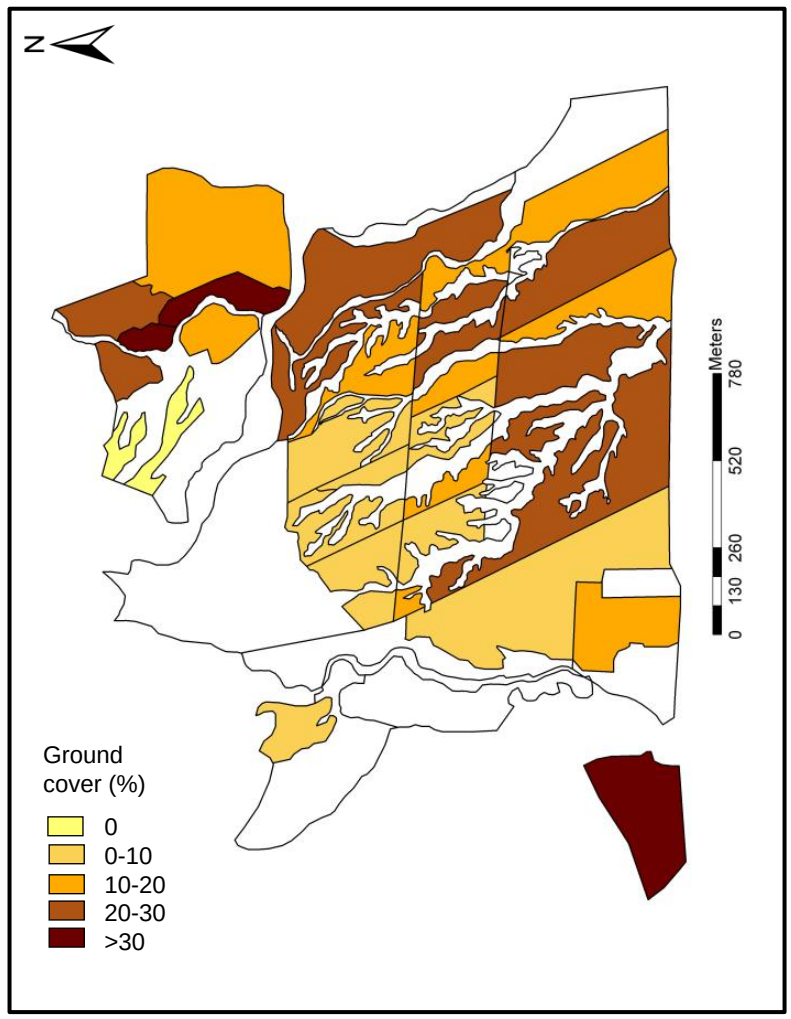
a. False Colour Composite of IRS LISS IV



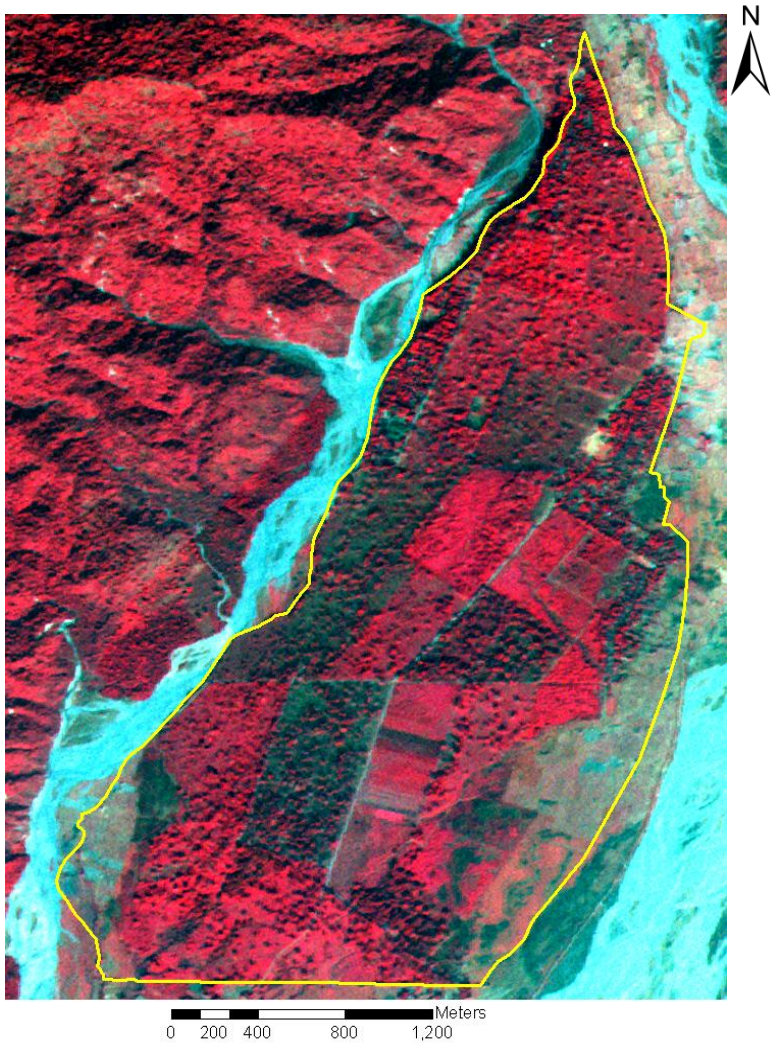
b. Tea Estate Landuse



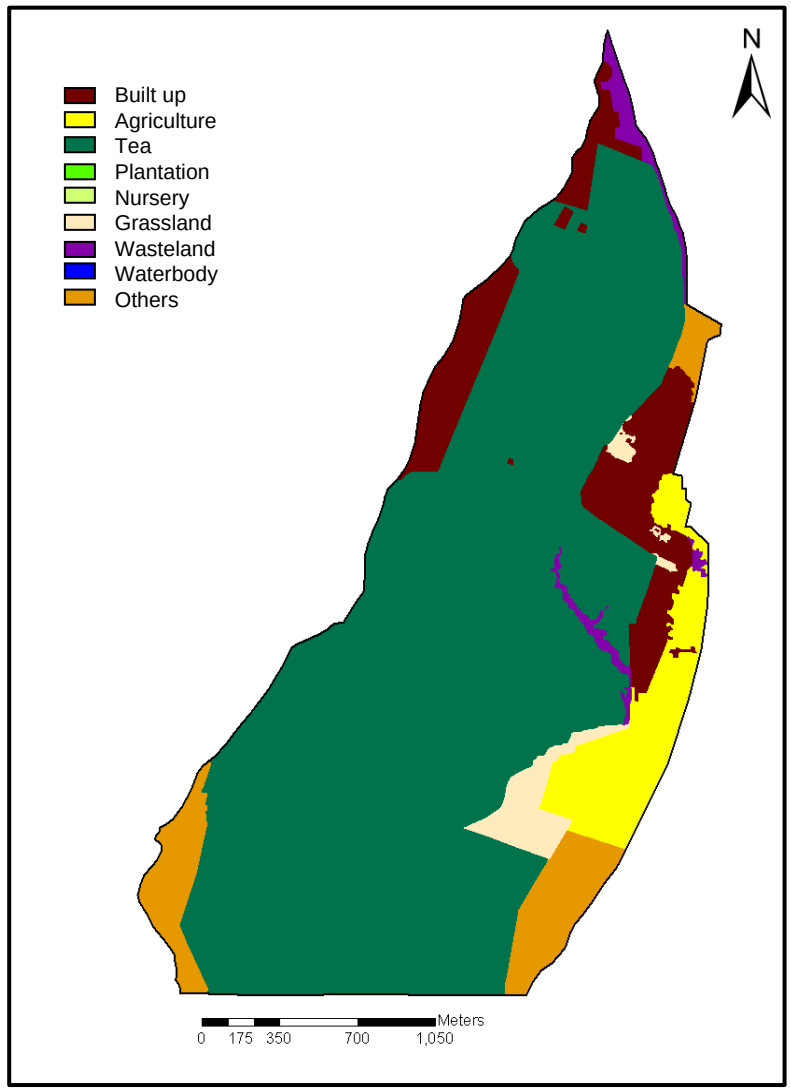
c. Section Boundaries of the Estate



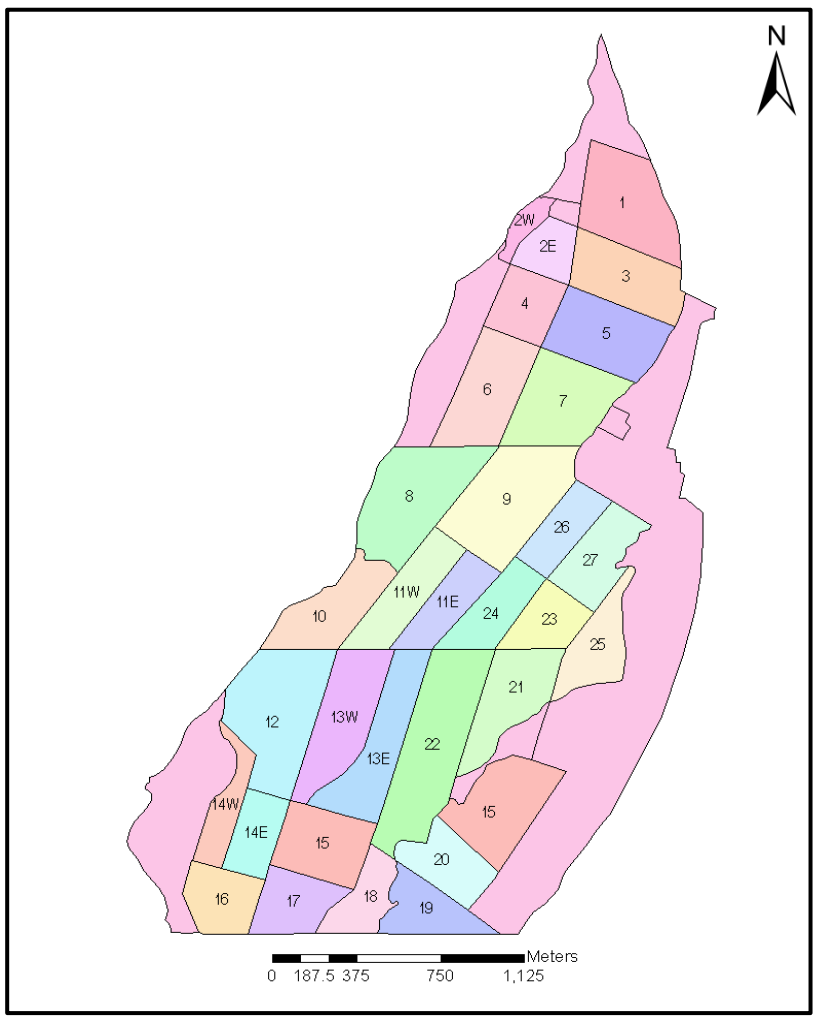
d. Shade Tree Density in Sections



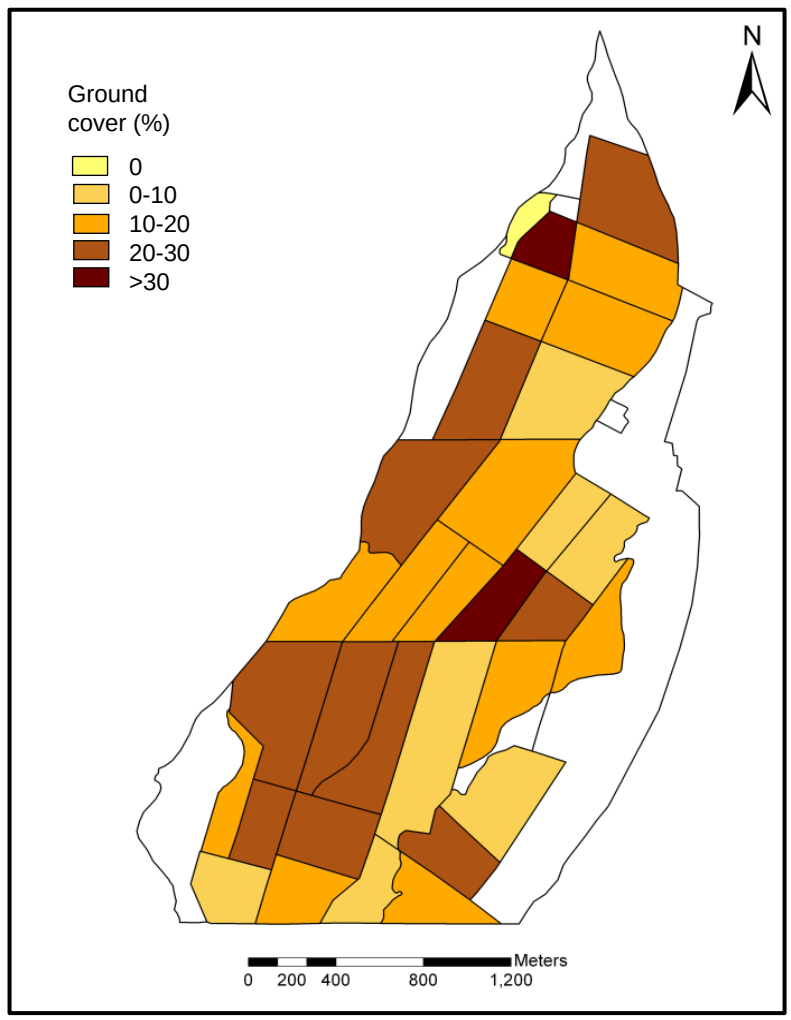
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

e. General Information

1. General	
Contact address	PO: Manabari, Dist: Jalpaiguri, PIN: 735222
Contact phone	09434079907
Name of the company	Putharjhora Tea Garden Pvt. Ltd.
Name of the village where it falls	--
Leased area of the estate (ha)	560.80
Tea grown area of the estate (ha)	369.44
No. of divisions / sections	0 div/31 sec
Year of establishment	1924
Type of tea produced	CTC, orthodox

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 (25 bed hospital)
Availability of school	Yes (primary, middle)

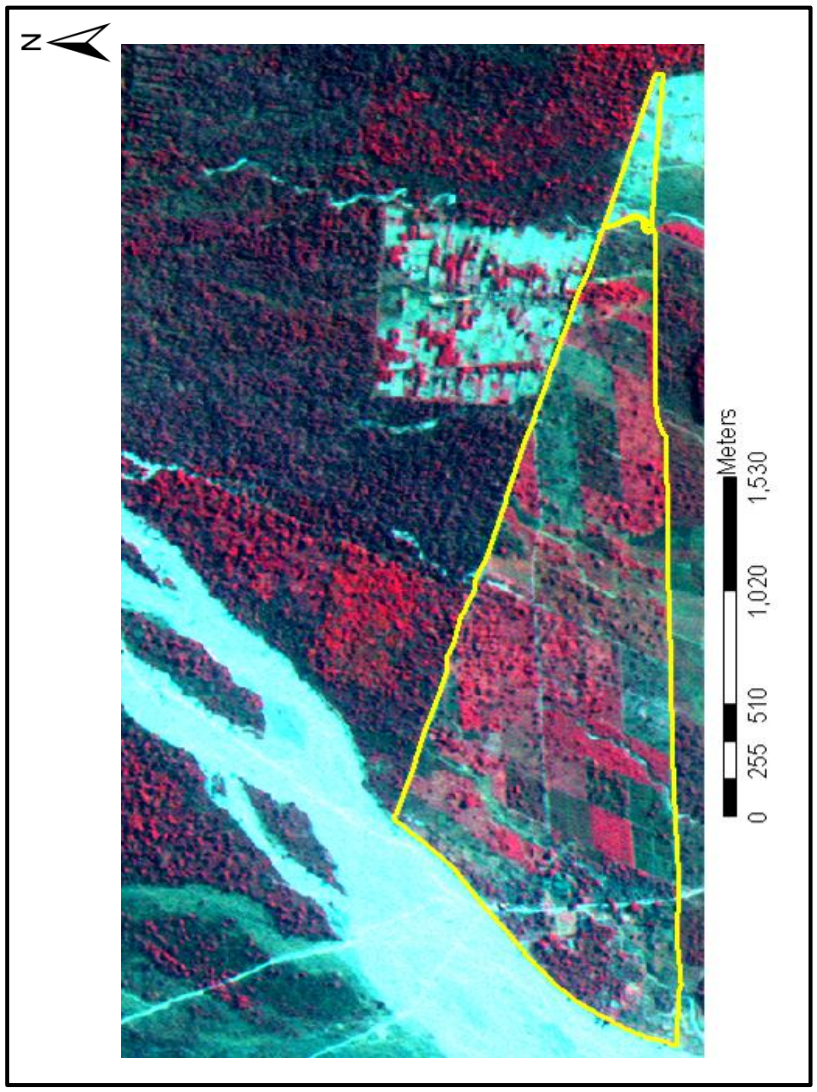
4. Shade trees	
Shade tree density (garden level)	Medium
Plant to plant spacing (m)	13.33 x 13.33
Row to row spacing (m)	13.33 x 13.33

5. Natural resources constraints	
Drainage congestion and water logging	No
Scarcity of water during summer	Yes
River bank erosion	Yes
Major diseases and duration	--
Major pests and duration	*Helopeltis* (6 months)
Damage due to wildlife	Yes

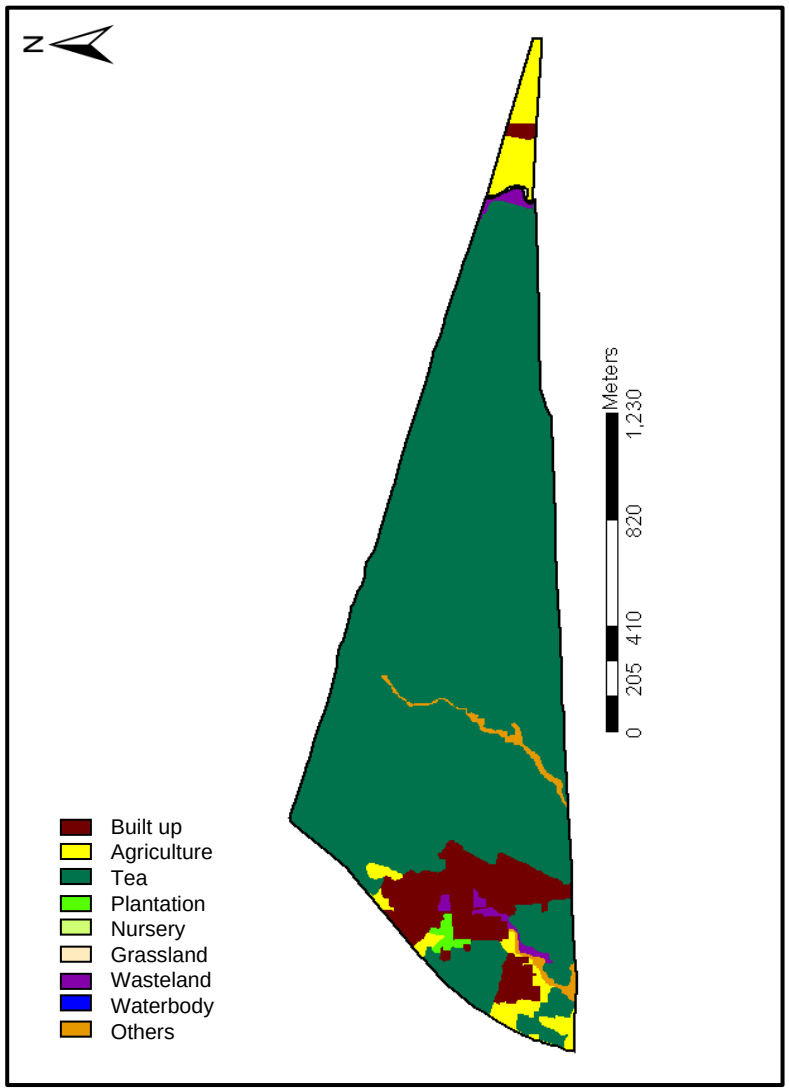
6. Yield / production	
Peak plucking periods	Jun-Sep
Annual green leaf yield	4049.22 kg/ha
Annual production of processed tea	318000 kg

7. Pruning	
Time of pruning	3rd fortnight of Dec - Jan
Pruning cycle	4 yrs
Types of pruning	--

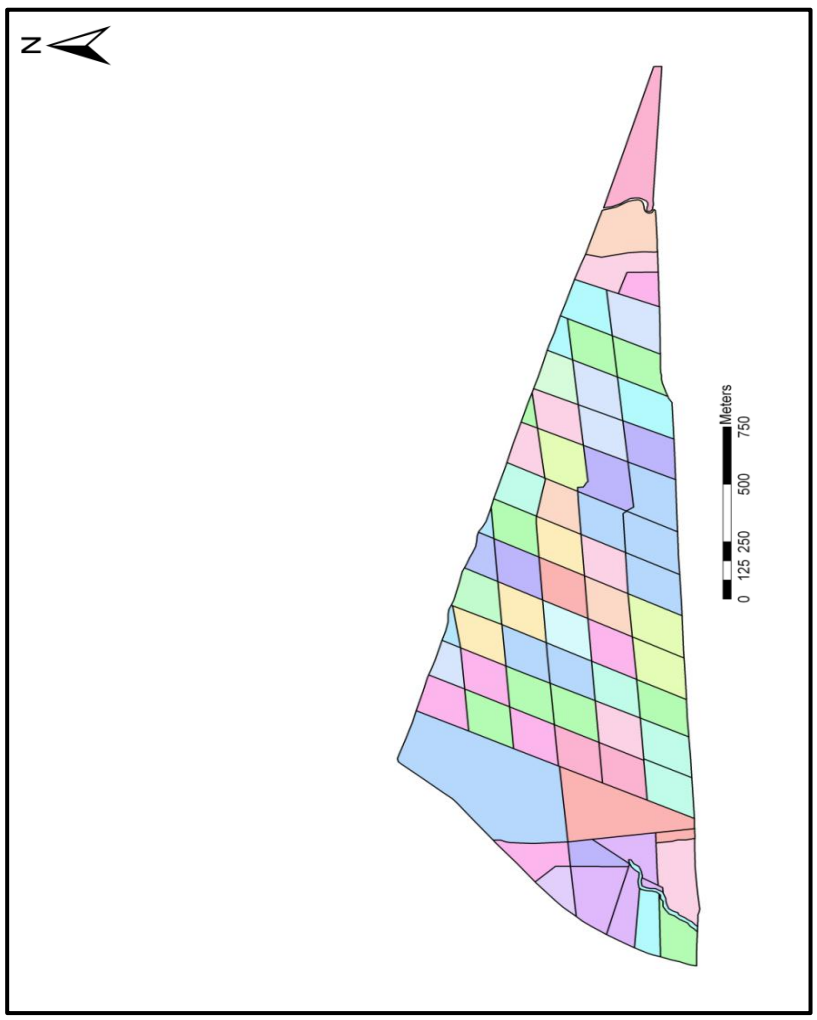
8. Fertilizer use	
Types of N, P, K fertilizers used	--
Dose of Nitrogen (kg/ha)	120
Dose of Phosphorous (kg/ha)	160
Dose of Potash (kg/ha)	110
Whether lime is applied, if yes dose	No



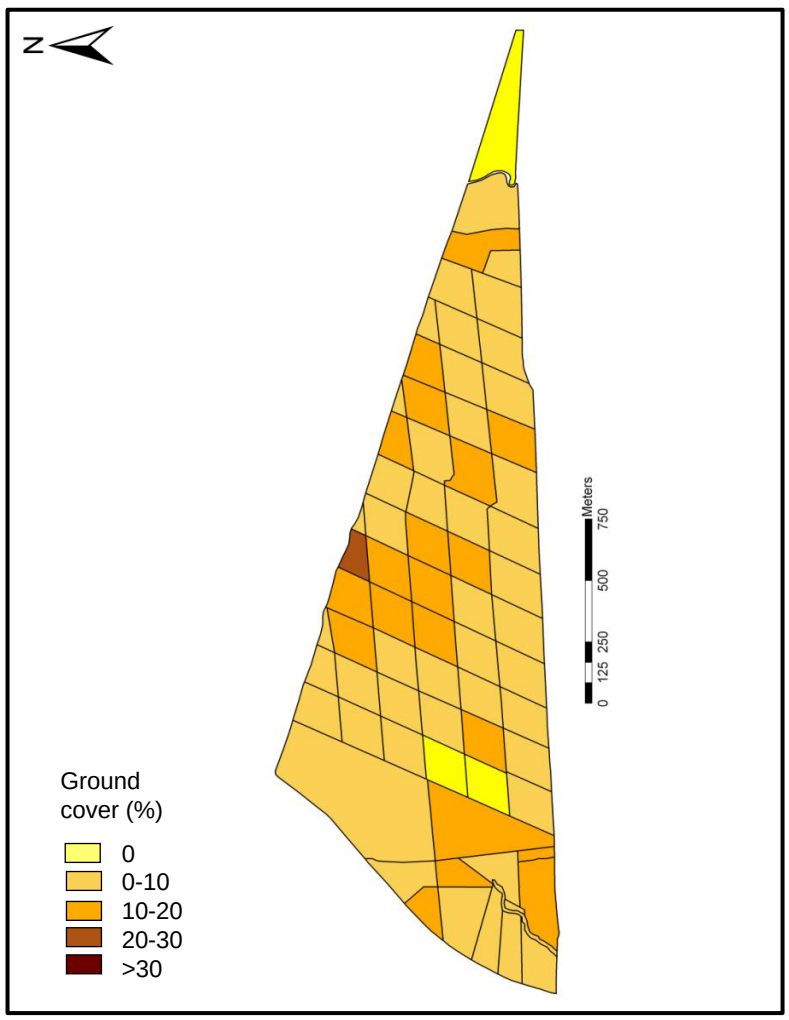
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse

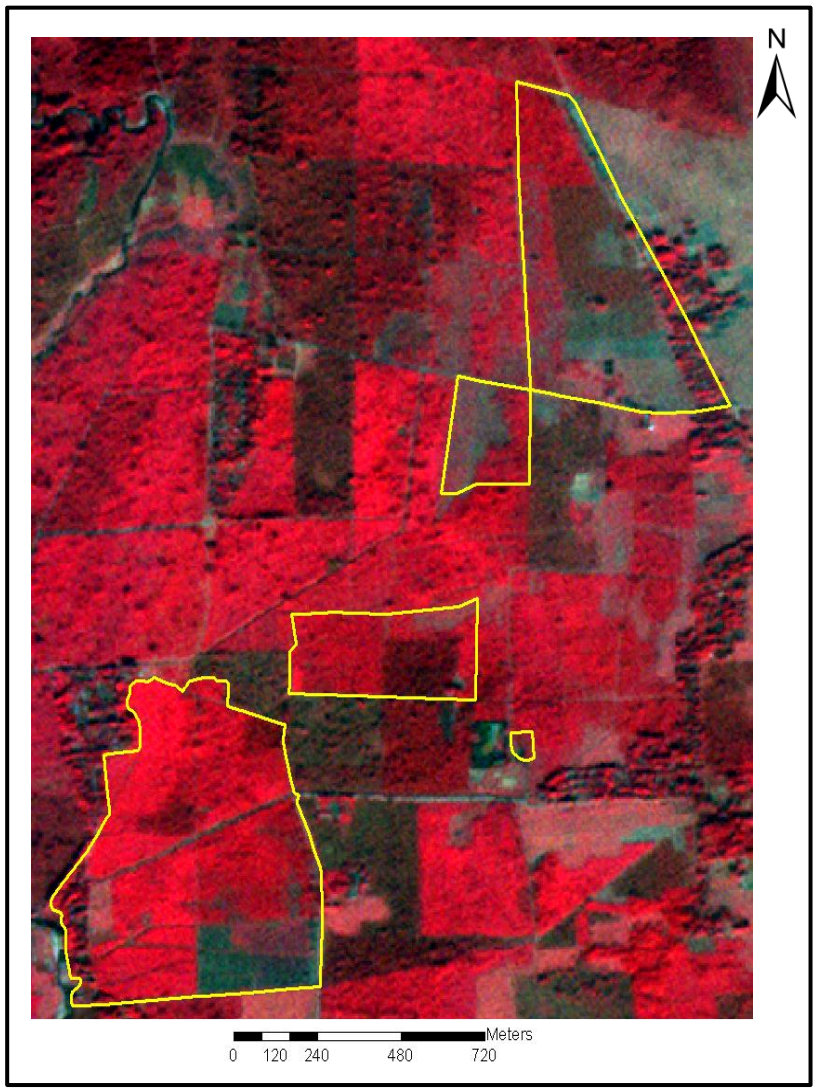


c. Section Boundaries of the Estate

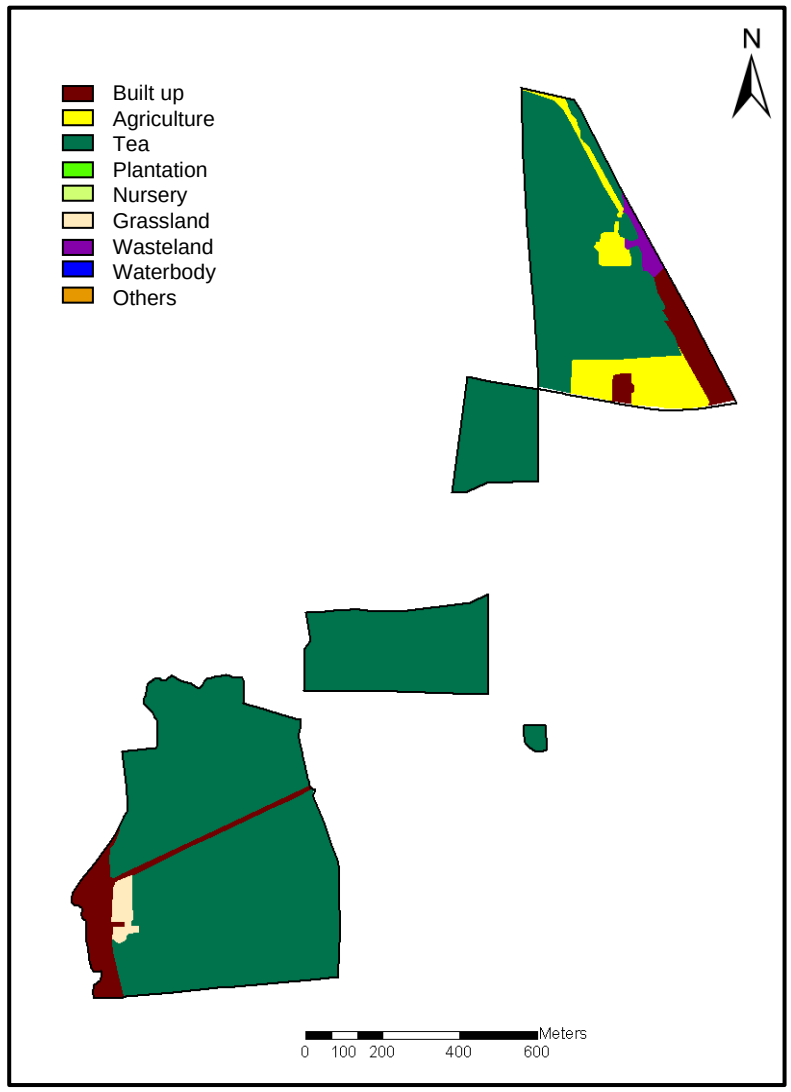


d. Shade Tree Density in Sections

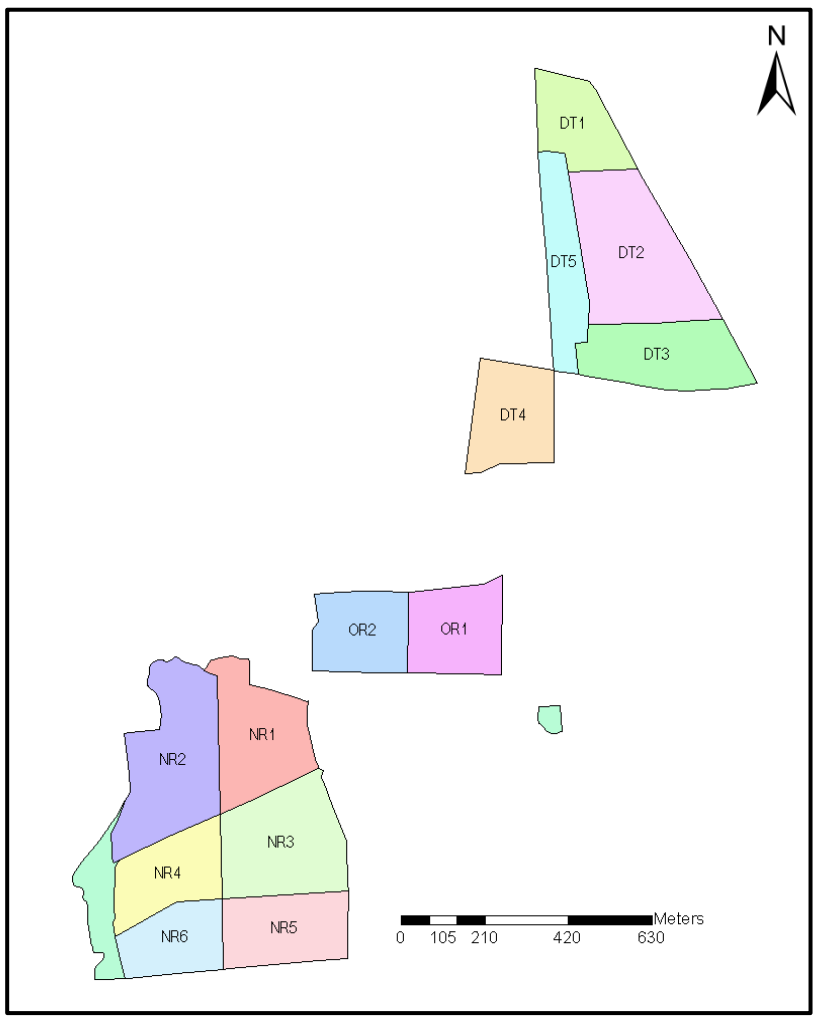
P103: RAGHU UTKARSH TE



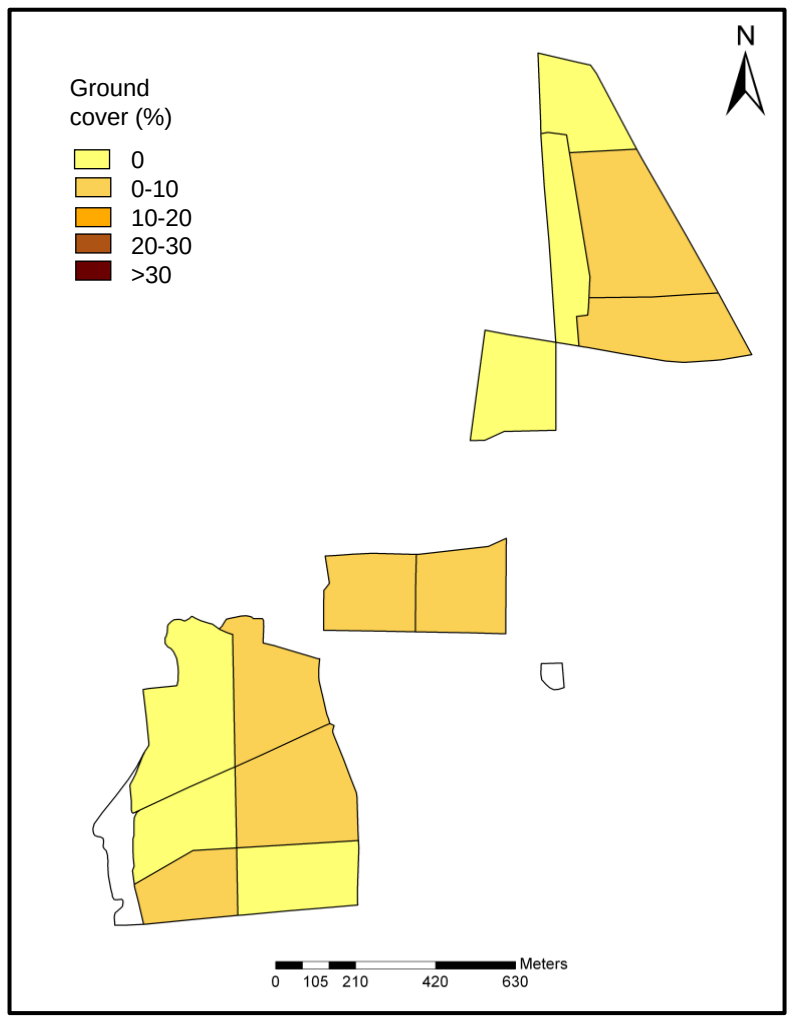
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

e. General Information

1. General	
Contact address	PO: Rajadanga, Dist: Jalpaiguri
Contact phone	09933020942, 09933361562
Name of the company	Raghu Utkarsh Tea plantations (Pvt.) Ltd.
Name of the village where it falls	Anandapur
Leased area of the estate (ha)	51.29
Tea grown area of the estate (ha)	48.0
No. of divisions / sections	0 div/14 sec
Year of establishment	1993
Type of tea produced	--

2. Infrastructure	
Availability of processing factory	Yes
Availability of workers colony	Yes
Availability of internet facility / e-mail id	No
Meteorological observations taken	Rainfall

3. Amenities	
Availability of health care / dispensary	Yes
Availability of school	Yes

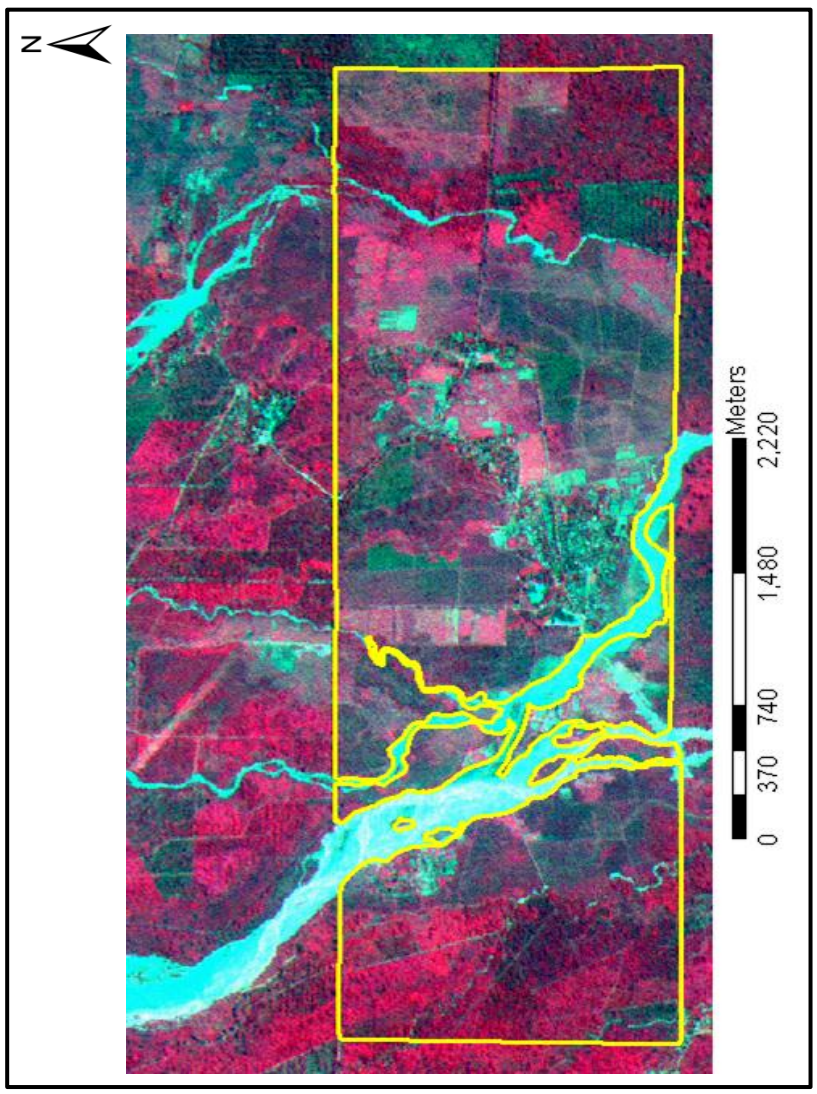
4. Shade trees	
Shade tree density (garden level)	Low
Plant to plant spacing (m)	--
Row to row spacing (m)	--

5. Natural resources constraints	
Drainage congestion and water logging	Yes
Scarcity of water during summer	No
River bank erosion	--
Major diseases and duration	Red rust
Major pests and duration	Looper, *Helopeltis* (4 and 5 months)
Damage due to wildlife	No

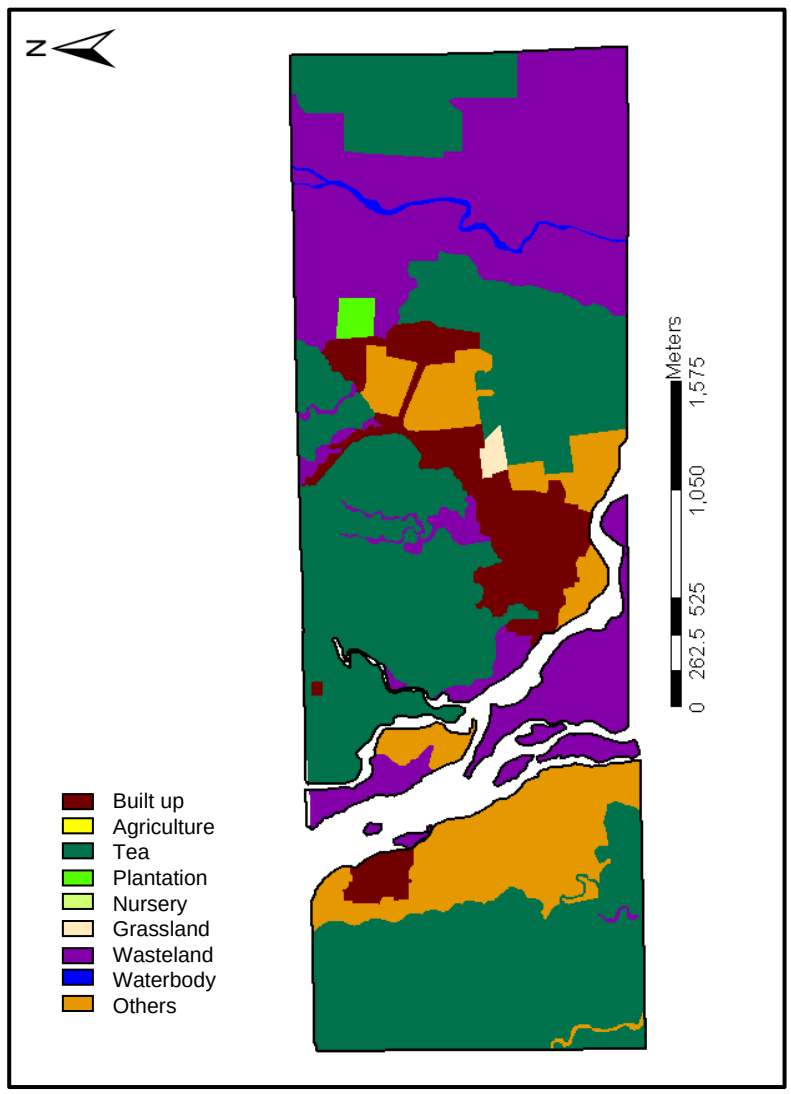
6. Yield / production	
Peak plucking periods	Mar and May-Oct
Annual green leaf yield	10330 kg/ha
Annual production of processed tea	--

7. Pruning	
Time of pruning	End of Nov-Jan
Pruning cycle	--
Types of pruning	LP-LOS-DS-LS

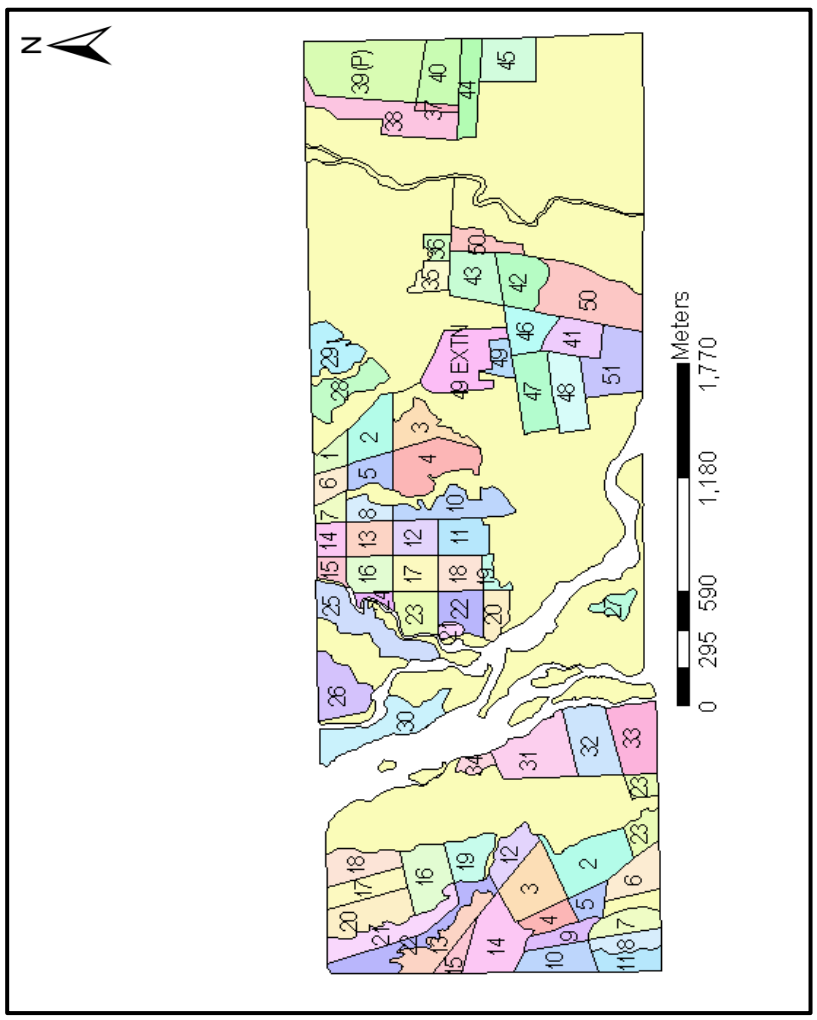
8. Fertilizer use	
Types of N, P, K fertilizers used	Urea, MOP, RP
Dose of Nitrogen (kg/ha)	165
Dose of Phosphorous (kg/ha)	50
Dose of Potash (kg/ha)	165
Whether lime is applied, if yes dose	No



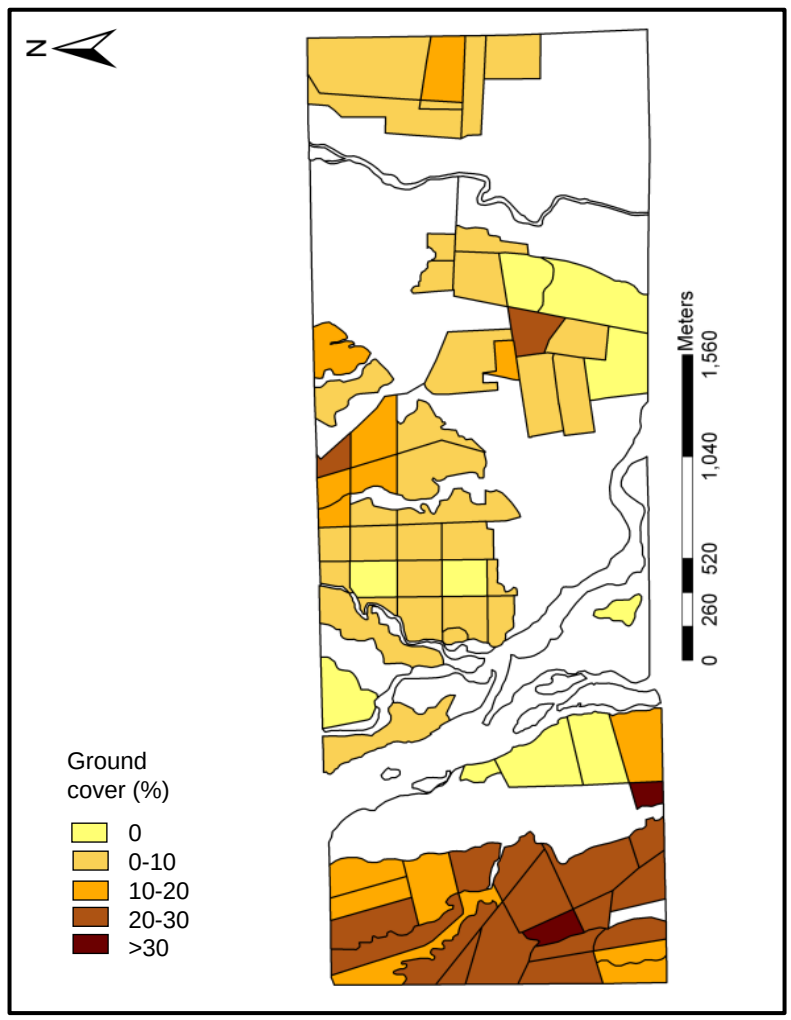
a. False Colour Composite of IRS LISS IV



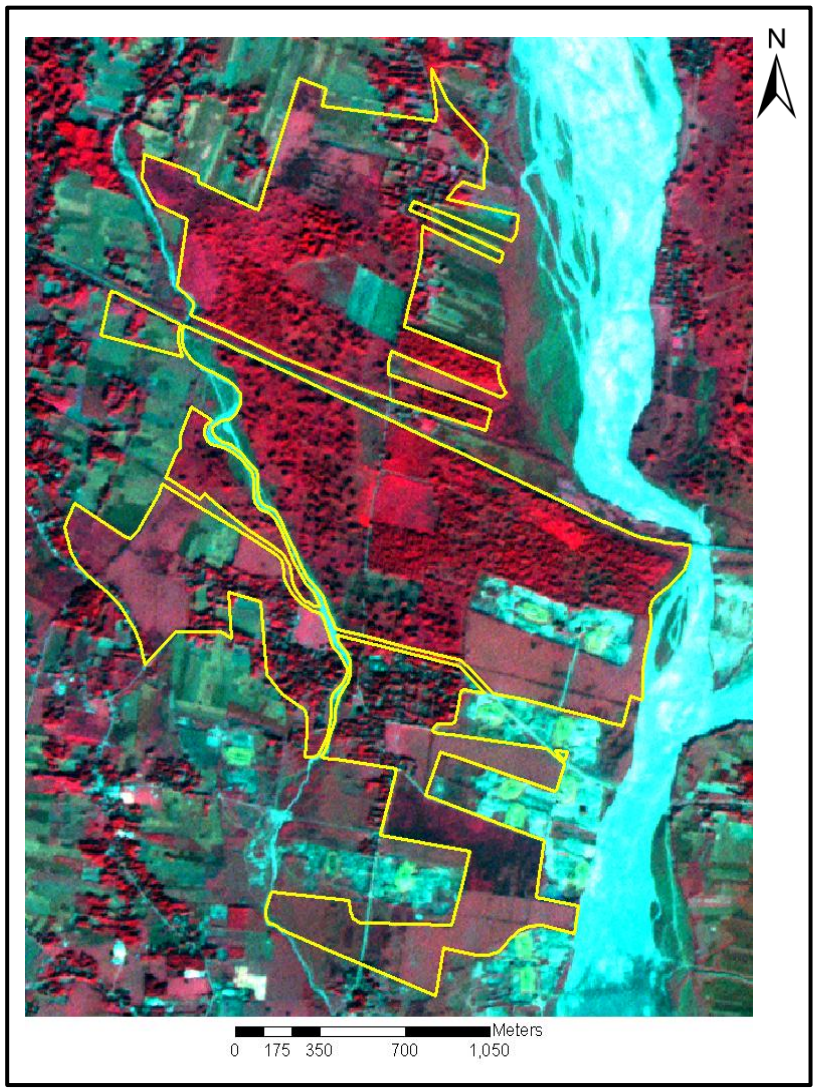
b. Tea Estate Landuse



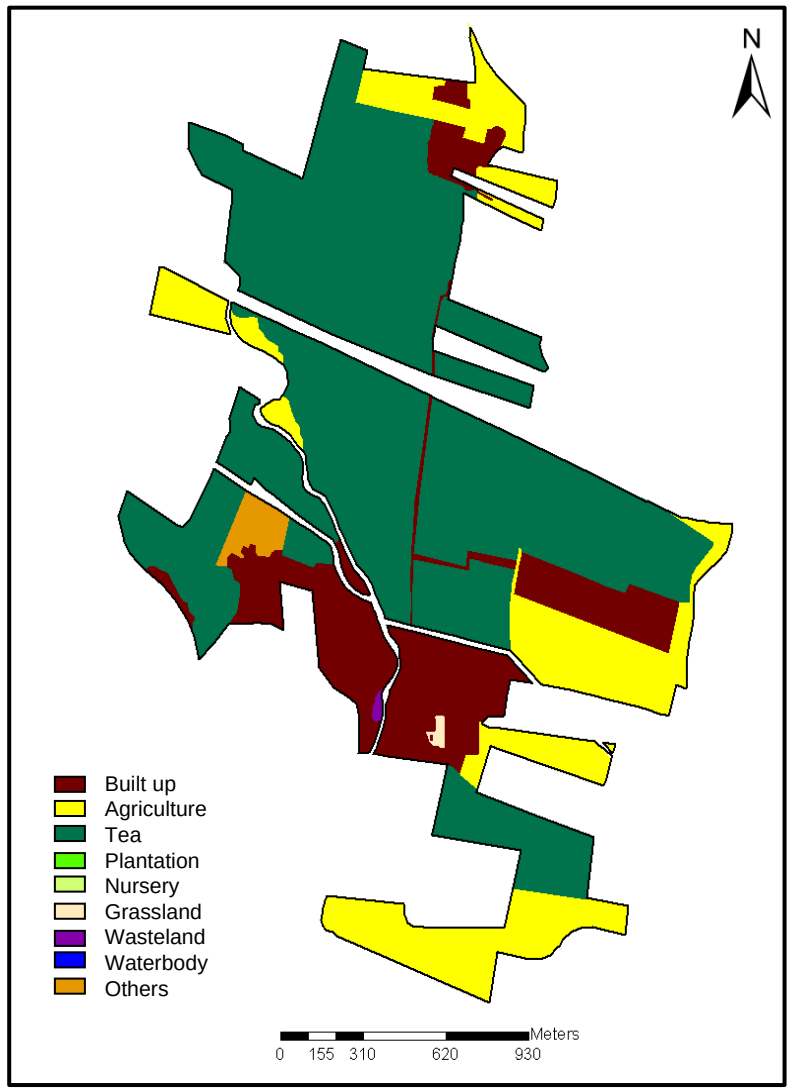
c. Section Boundaries of the Estate



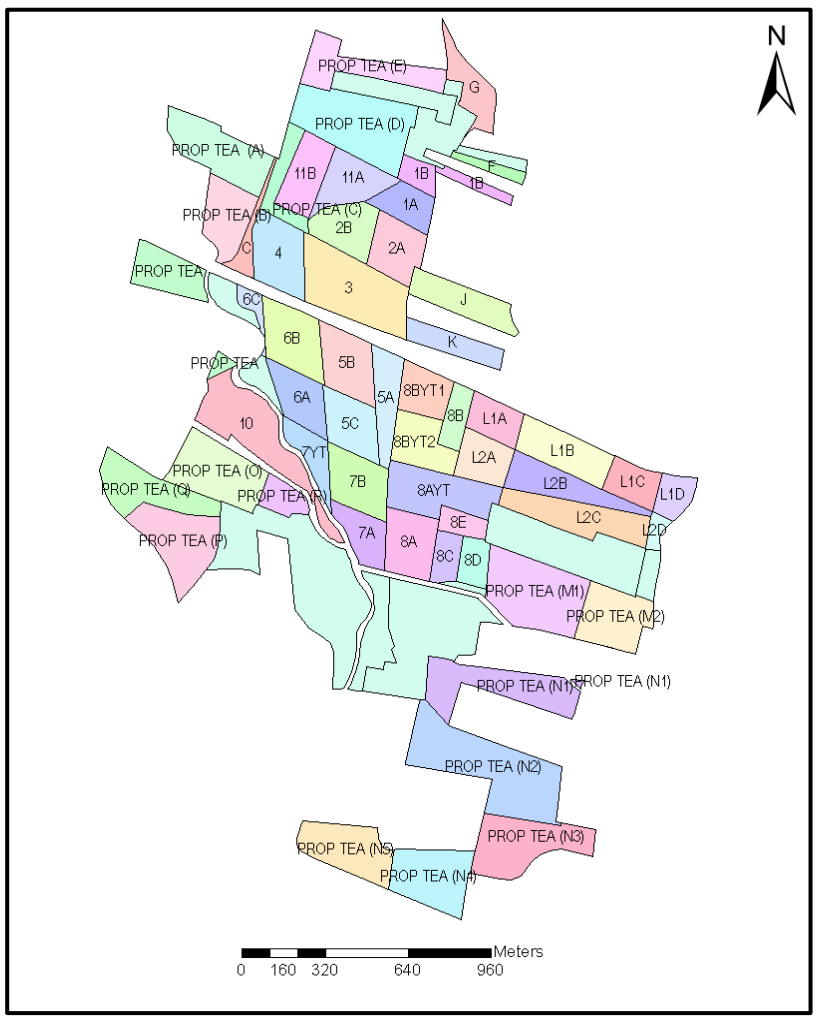
d. Shade Tree Density in Sections



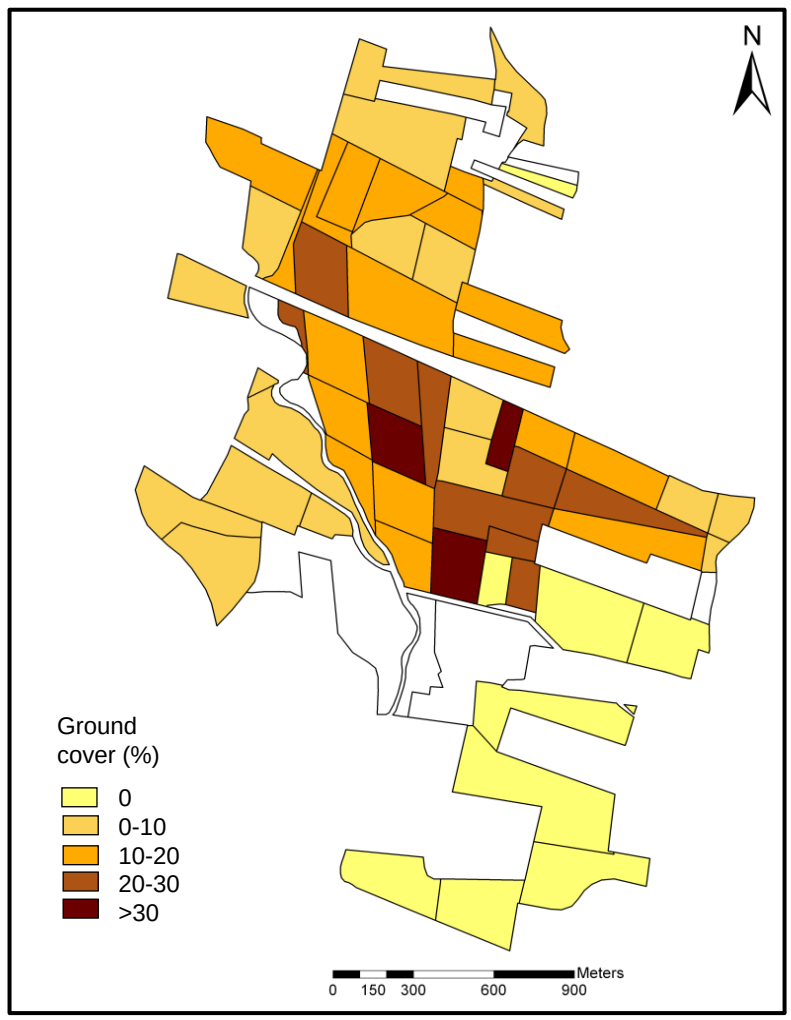
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

e. General Information

1. General	
Contact address	PO: Birpara, Dist: Jalpaiguri
Contact phone	9475477043
Name of the company	Rahimpur Tea Co. Ltd.
Name of the village where it falls	Rahimpur
Leased area of the estate (ha)	315.63
Tea grown area of the estate (ha)	145.39
No. of divisions / sections	1 div/44 sec
Year of establishment	1928
Type of tea produced	Green tea, orthodox

2. Infrastructure	
Availability of processing factory	Yes
Availability of workers colony	Yes
Availability of internet facility / e-mail id	No
Meteorological observations taken	Rainfall

3. Amenities	
Availability of health care / dispensary	Yes
Availability of school	Yes

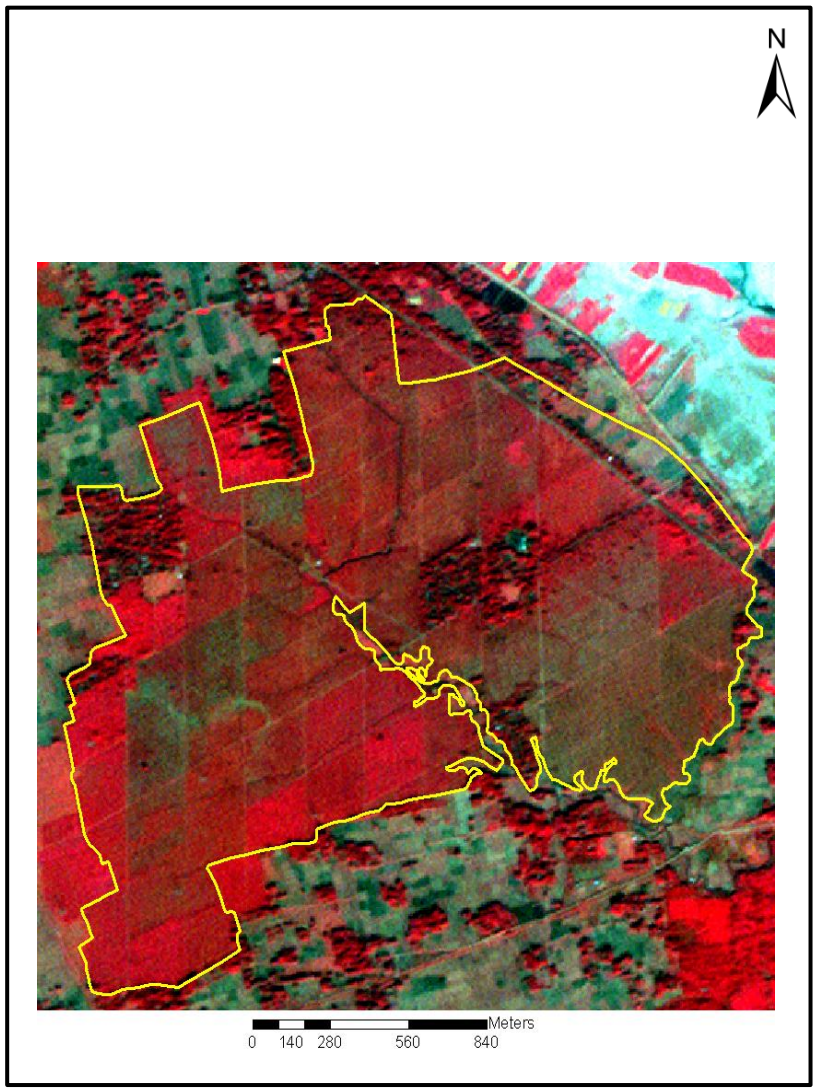
4. Shade trees	
Shade tree density (garden level)	Optimum
Plant to plant spacing (m)	6.66 x 6.66
Row to row spacing (m)	6.66 x 6.66

5. Natural resources constraints	
Drainage congestion and water logging	Yes
Scarcity of water during summer	Yes
River bank erosion	Yes
Major diseases and duration	--
Major pests and duration	*Helopeltis*, looper (15 days)
Damage due to wildlife	Yes

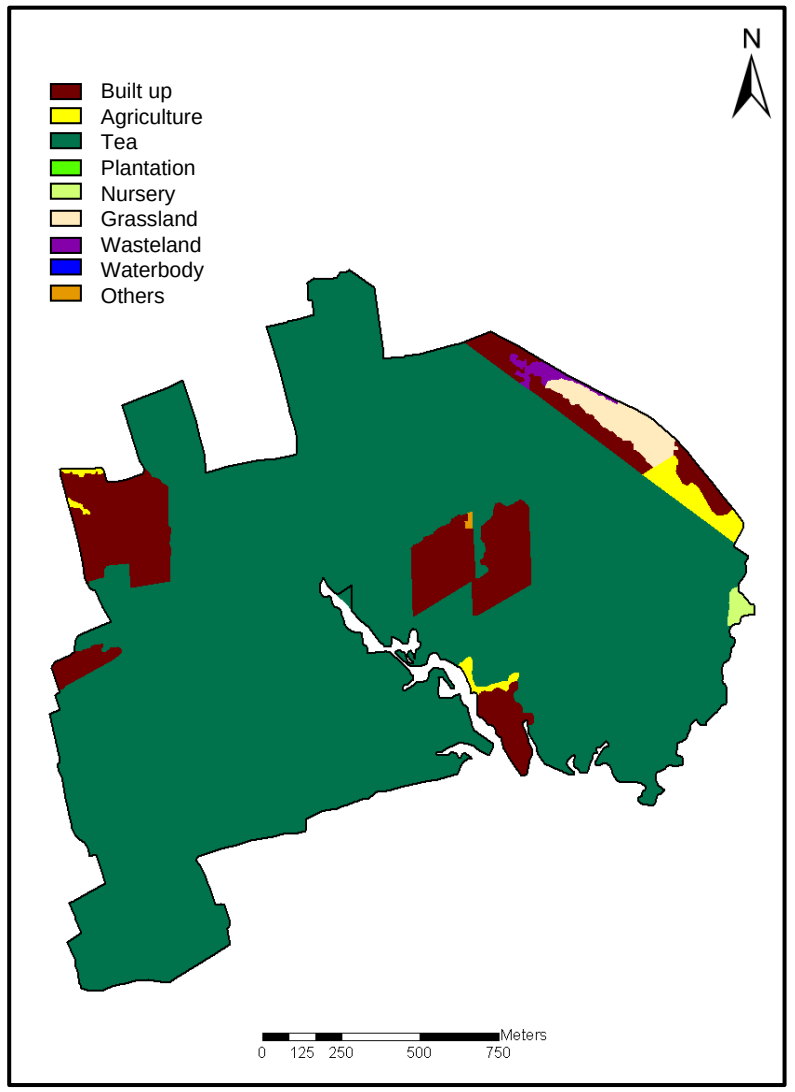
6. Yield / production	
Peak plucking periods	Jun-Oct
Annual green leaf yield	3472.3 kg/ha
Annual production of processed tea	120528 kg

7. Pruning	
Time of pruning	Dec - Jan
Pruning cycle	4 yrs
Types of pruning	--

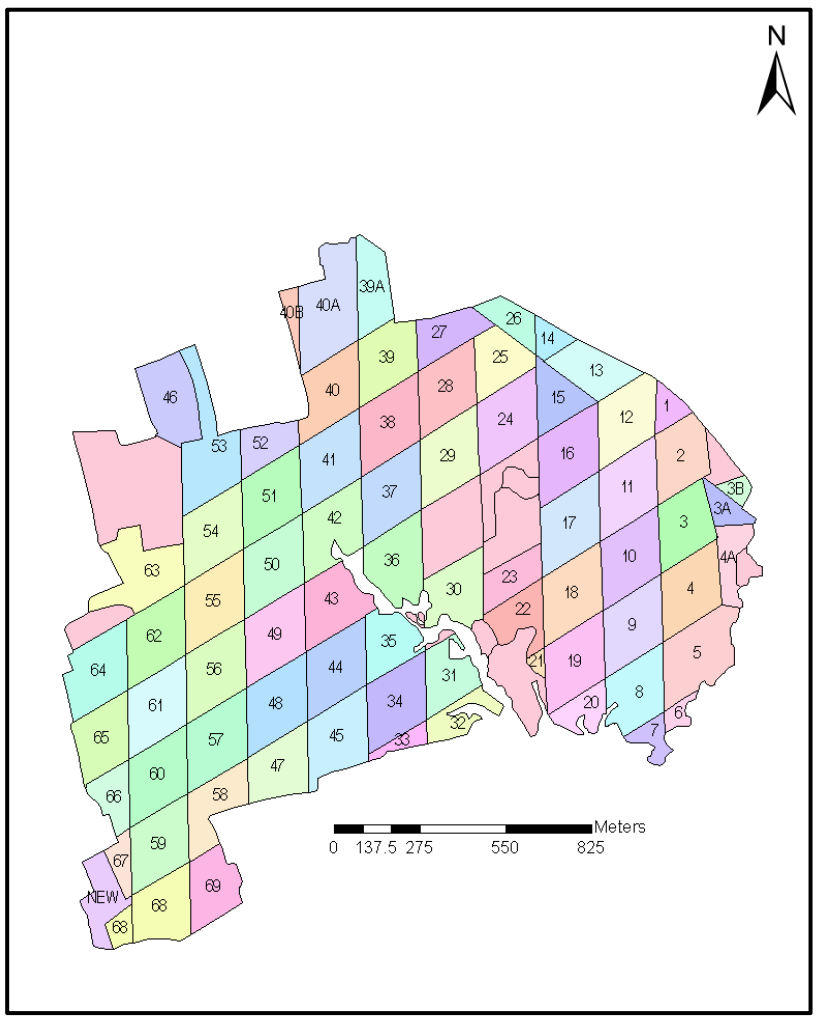
8. Fertilizer use	
Types of N, P, K fertilizers used	Urea/SOA, RP, SSP, MOP
Dose of Nitrogen (kg/ha)	90
Dose of Phosphorous (kg/ha)	30
Dose of Potash (kg/ha)	90
Whether lime is applied, if yes dose	--



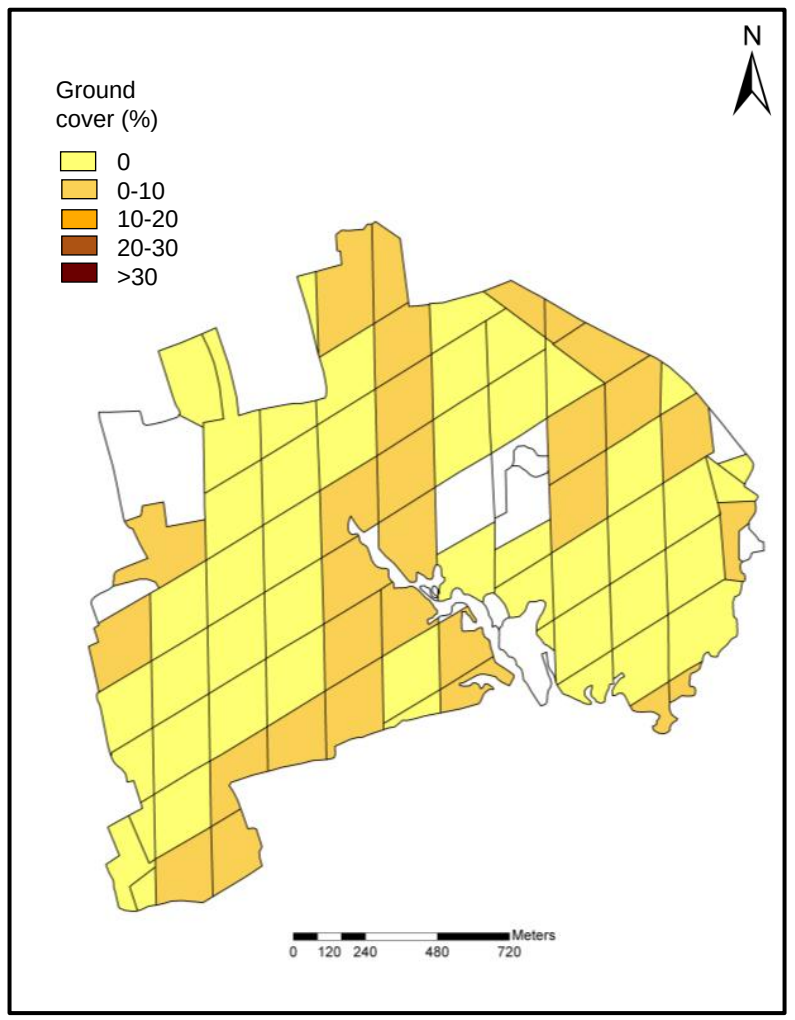
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

e. General Information

1. General	
Contact address	PO: Randhamali, Dist: Jalpaiguri
Contact phone	0353-2503808, 09434045064
Name of the company	Amritapur Tea Company Ltd.
Name of the village where it falls	Randhamali
Leased area of the estate (ha)	341.59
Tea grown area of the estate (ha)	240.80
No. of divisions / sections	0 div/77 sec
Year of establishment	1913
Type of tea produced	Not yet started. Green leaf sale to bought leaf factory

2. Infrastructure	
Availability of processing factory	No
Availability of workers colony	Yes
Availability of internet facility / e-mail id	No
Meteorological observations taken	No

3. Amenities	
Availability of health care / dispensary	Yes
Availability of school	Yes (primary)

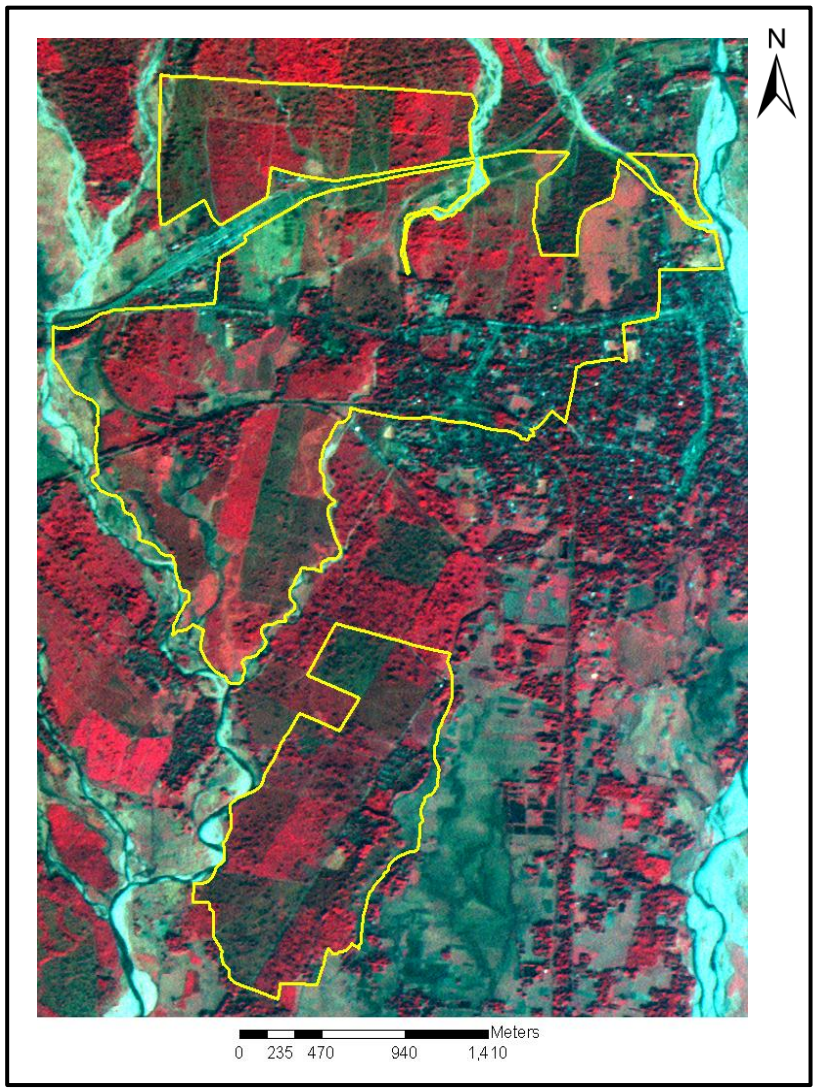
4. Shade trees	
Shade tree density (garden level)	Low
Plant to plant spacing (m)	10 x 10
Row to row spacing	3' x 2' (new), 4' x 4' (old)

5. Natural resources constraints	
Drainage congestion and water logging	No
Scarcity of water during summer	Yes
River bank erosion	No
Major diseases and duration	Black rot, red rust, blight
Major pests and duration	Red spider mite, thrips, caterpillar
Damage due to wildlife	No

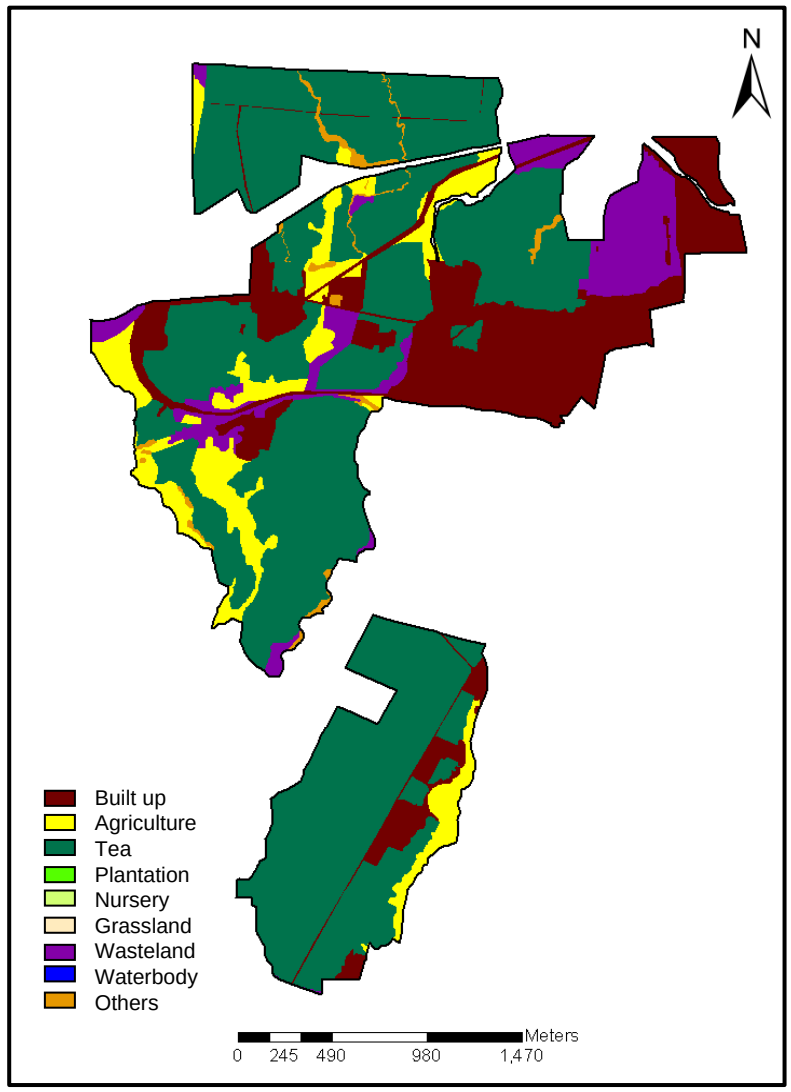
6. Yield / production	
Peak plucking periods	Jun-mid Dec
Annual green leaf yield	--
Annual production of processed tea	--

7. Pruning	
Time of pruning	Last week of Dec-1st week of Jan
Pruning cycle	4 yr
Types of pruning	--

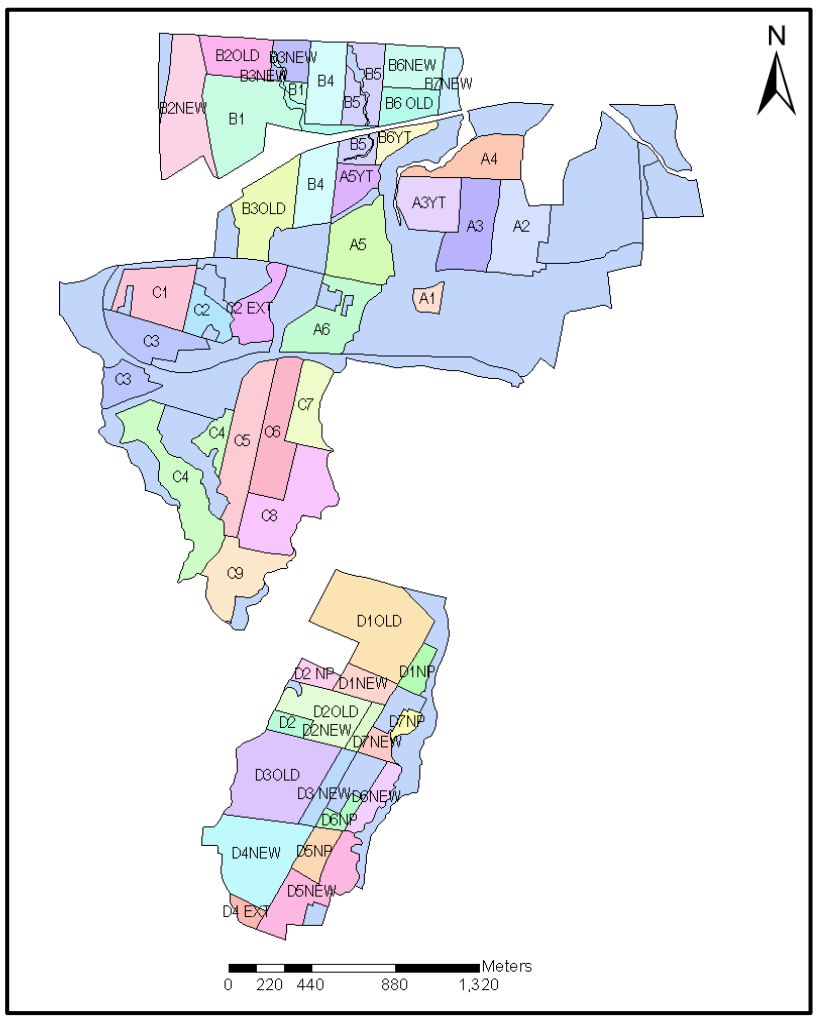
8. Fertilizer use	
Types of N, P, K fertilizers used	Agromin plus (15 kg/ha) and Macrofert (12 kg/ha)
Dose of Nitrogen (kg/ha)	--
Dose of Phosphorous (kg/ha)	--
Dose of Potash (kg/ha)	--
Whether lime is applied, if yes dose	No



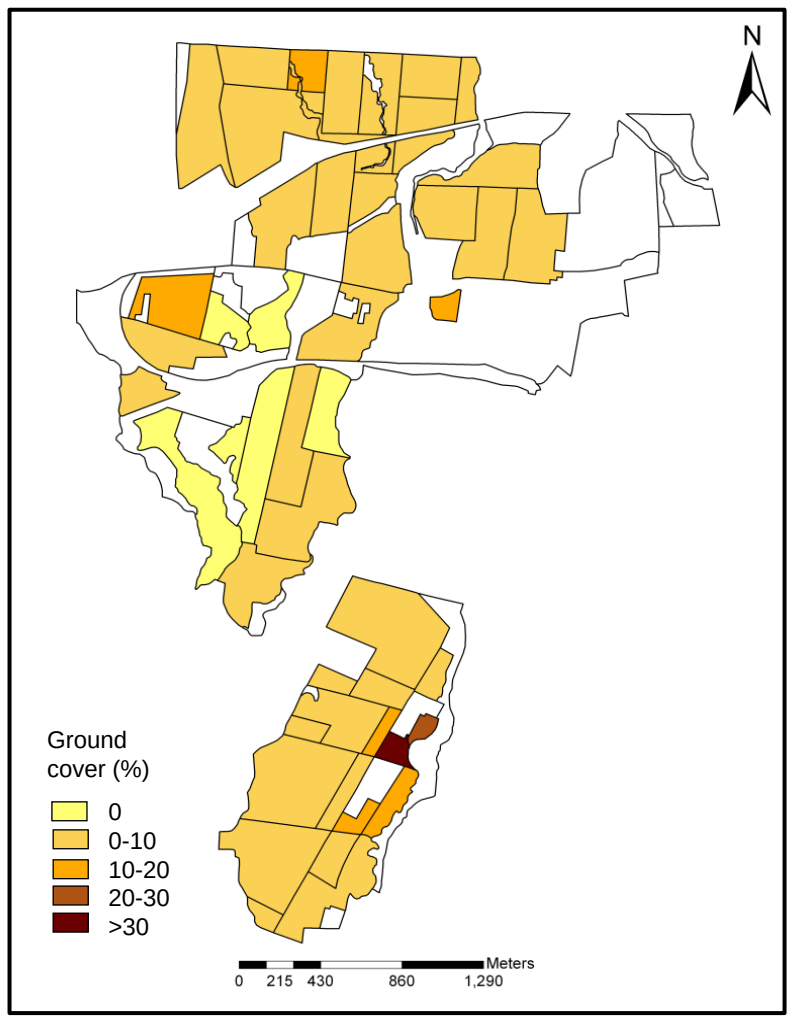
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse

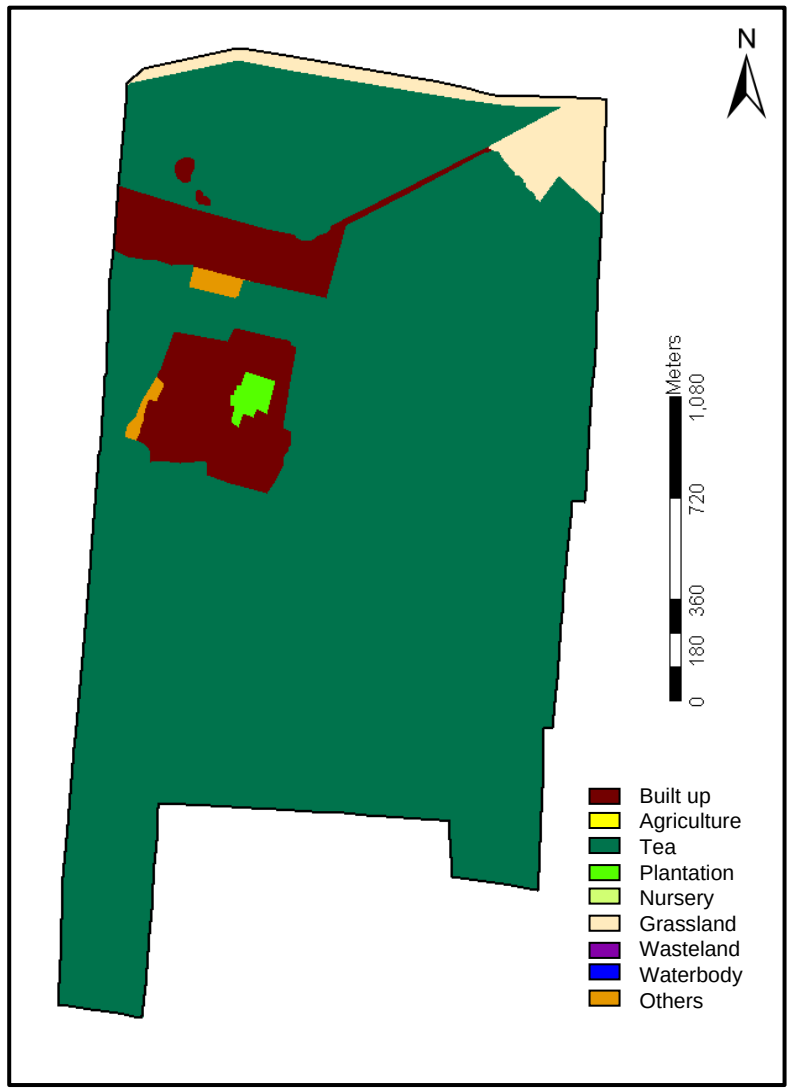


c. Section Boundaries of the Estate

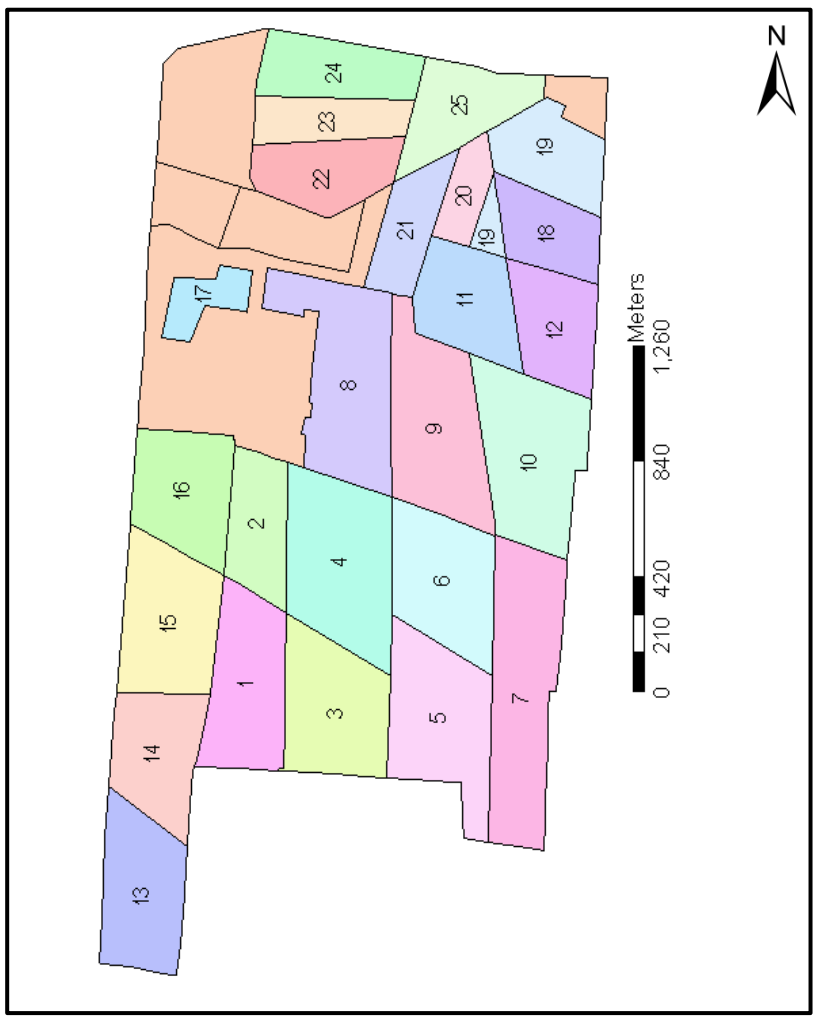


d. Shade Tree Density in Sections

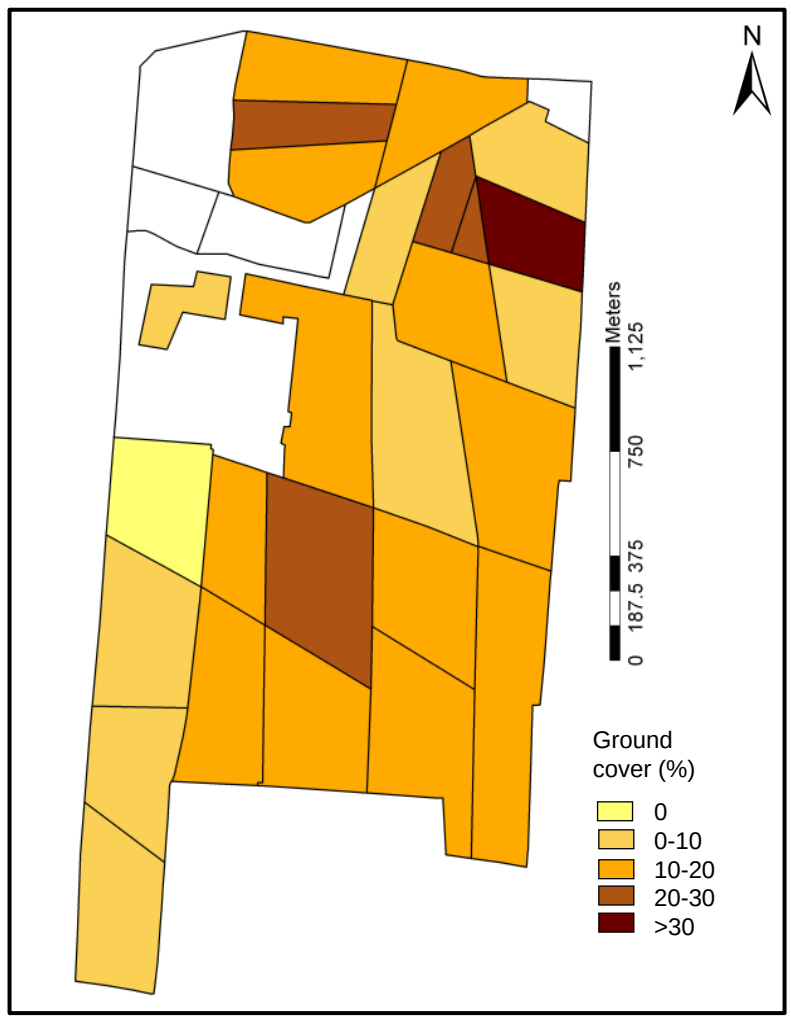
a. False Colour Composite of IRS LISS IV



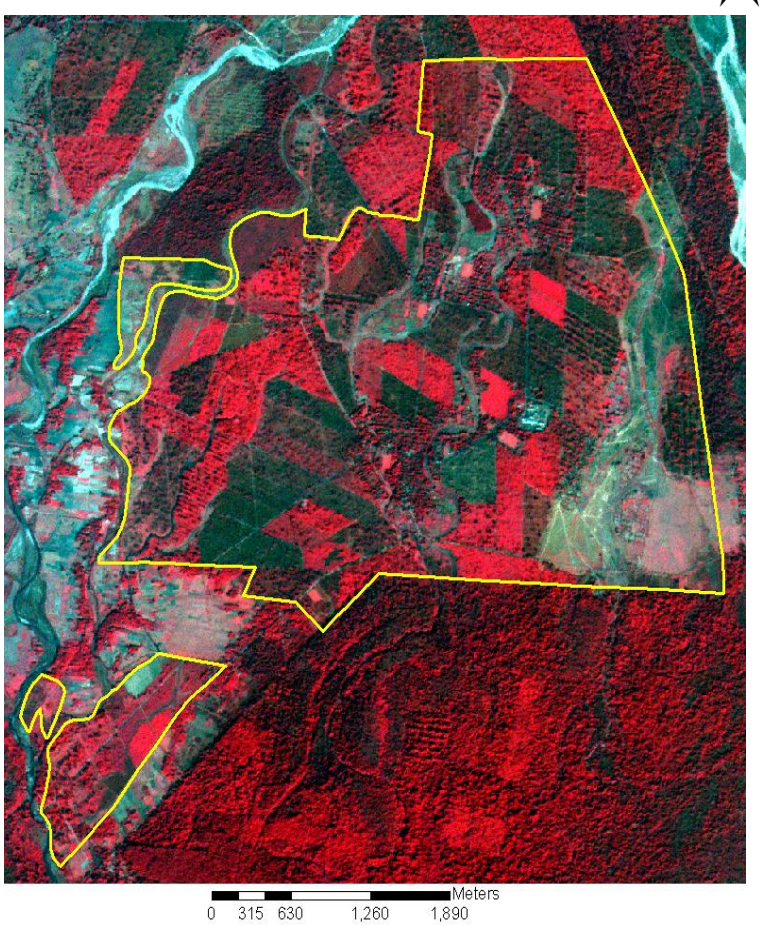
b. Tea Estate Landuse



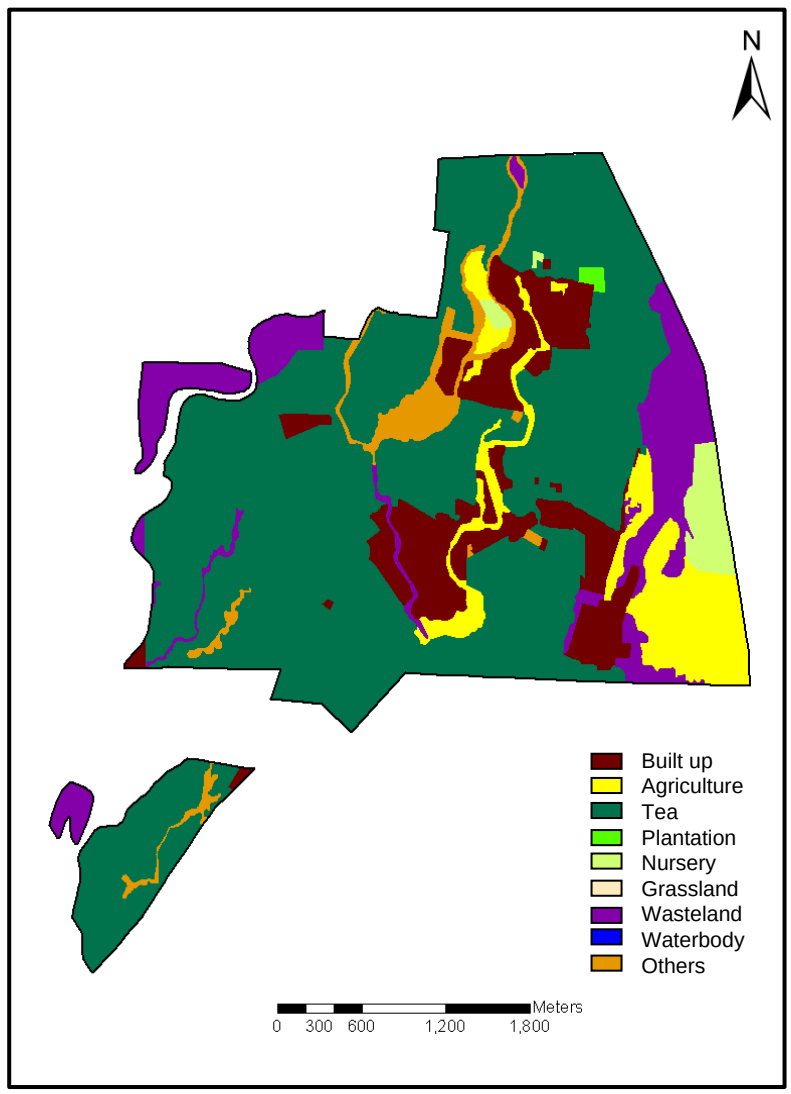
c. Section Boundaries of the Estate



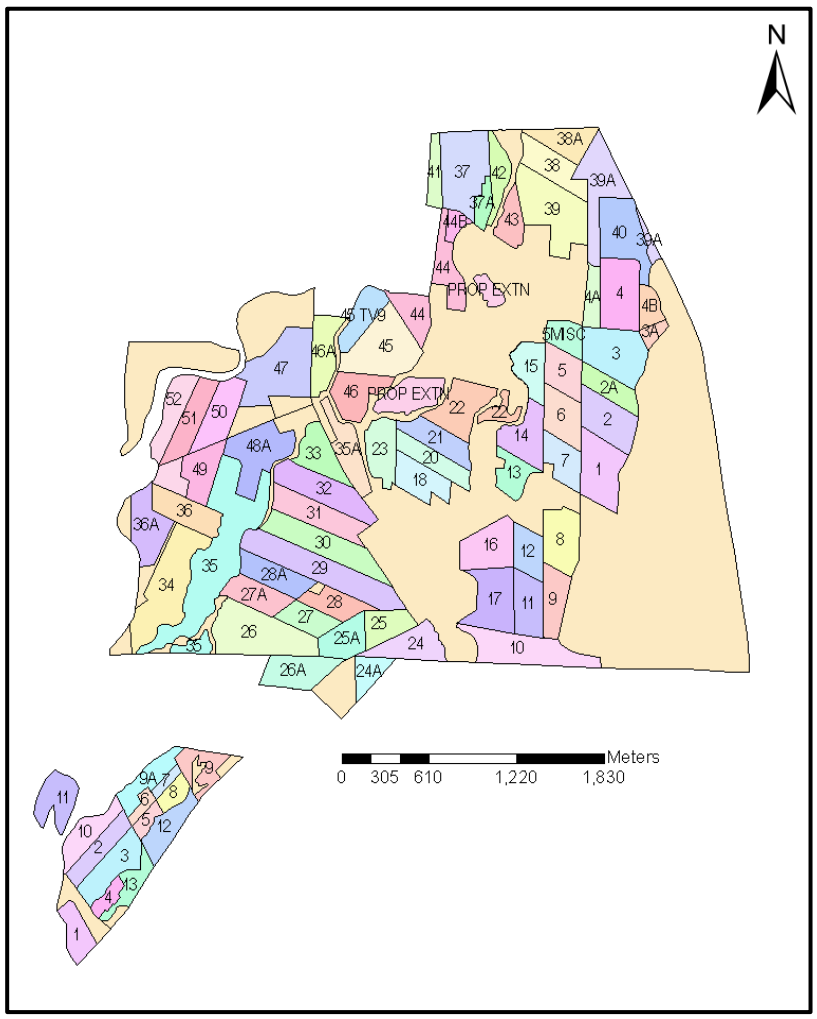
d. Shade Tree Density in Sections



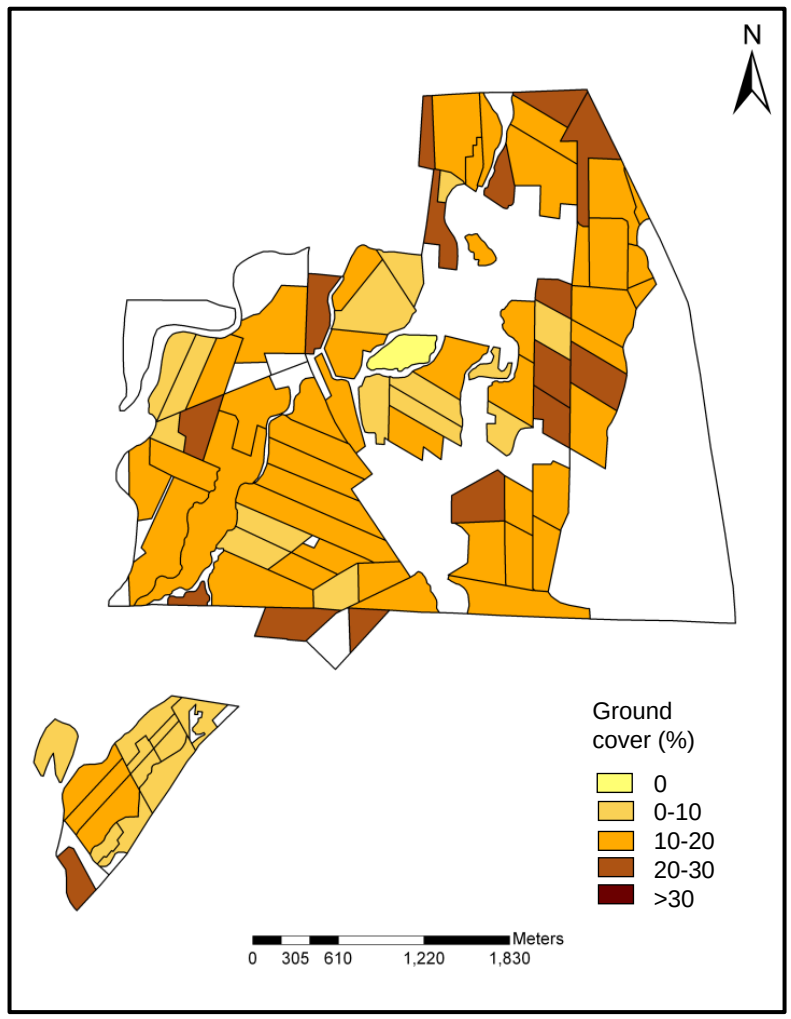
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

e. General Information

1. General	
Contact address	PO: Raidak, Dist: Jalpaiguri PIN: 736201
Contact phone	03564-200012
Name of the company	Rydak Sindicate Limited
Name of the village where it falls	Rydak
Leased area of the estate (ha)	1414.89
Tea grown area of the estate (ha)	723.66
No. of divisions / sections	2 div/88 sec
Year of establishment	1997
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

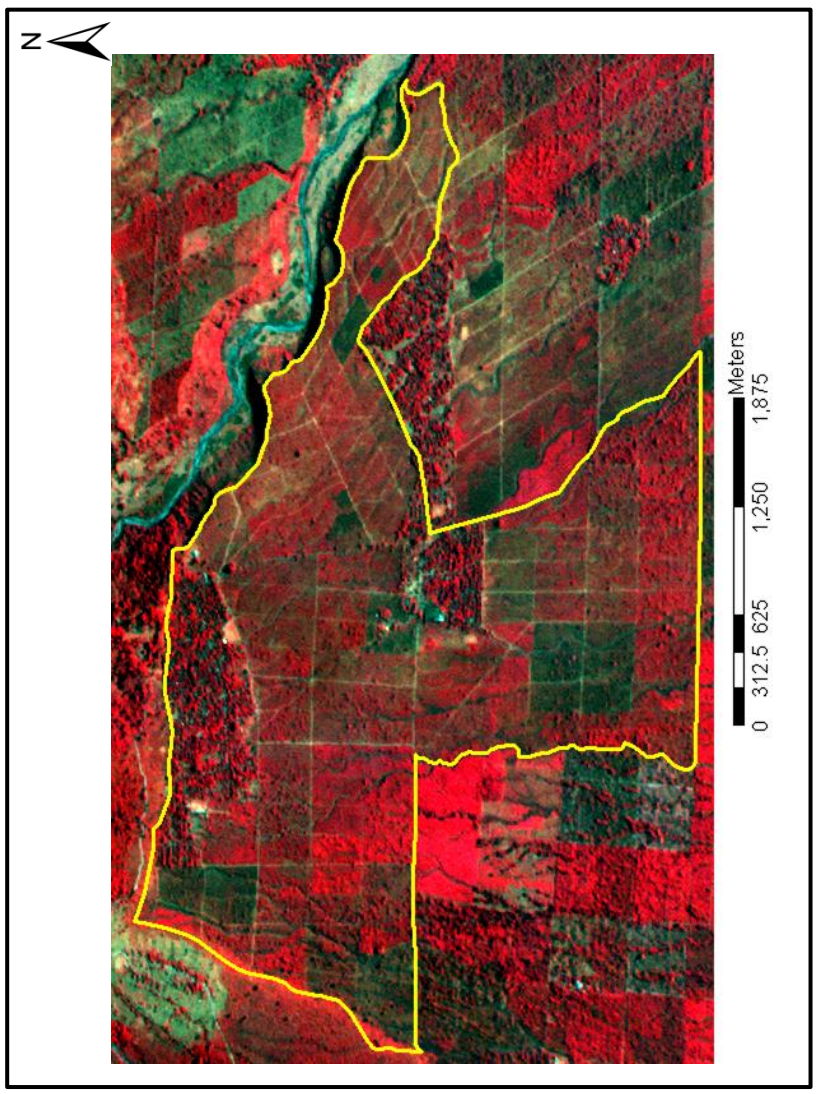
4. Shade trees	
Shade tree density (garden level)	Medium
Plant to plant spacing	60 cm x 60 cm
Row to row spacing	100 cm x 100 cm

5. Natural resources constraints	
Drainage congestion and water logging	Yes
Scarcity of water during summer	No
River bank erosion	Yes
Major diseases and duration	Blight
Major pests and duration	Looper, *Helopeltis*, RSM
Damage due to wildlife	Yes

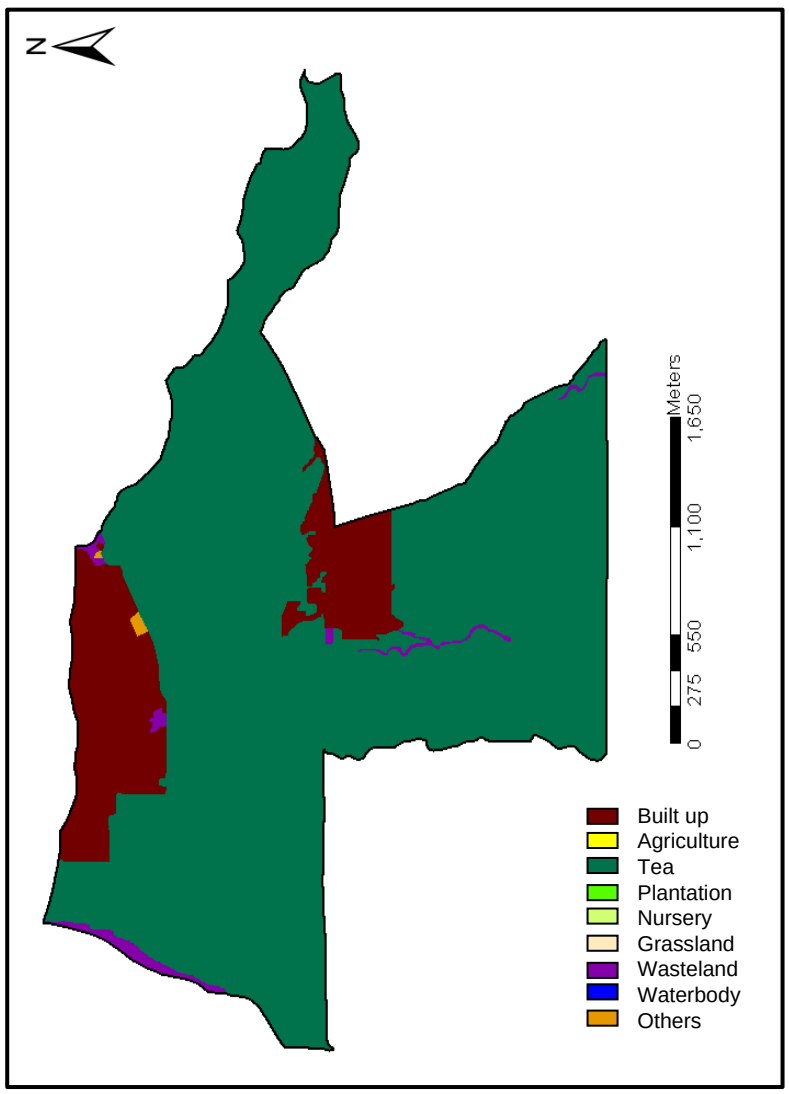
6. Yield / production	
Peak plucking periods	Jun-Sep
Annual green leaf yield	7406.46 kg/ha
Annual production of processed tea	1172483 kg

7. Pruning	
Time of pruning	End of Nov-Feb
Pruning cycle	4 yr
Types of pruning	--

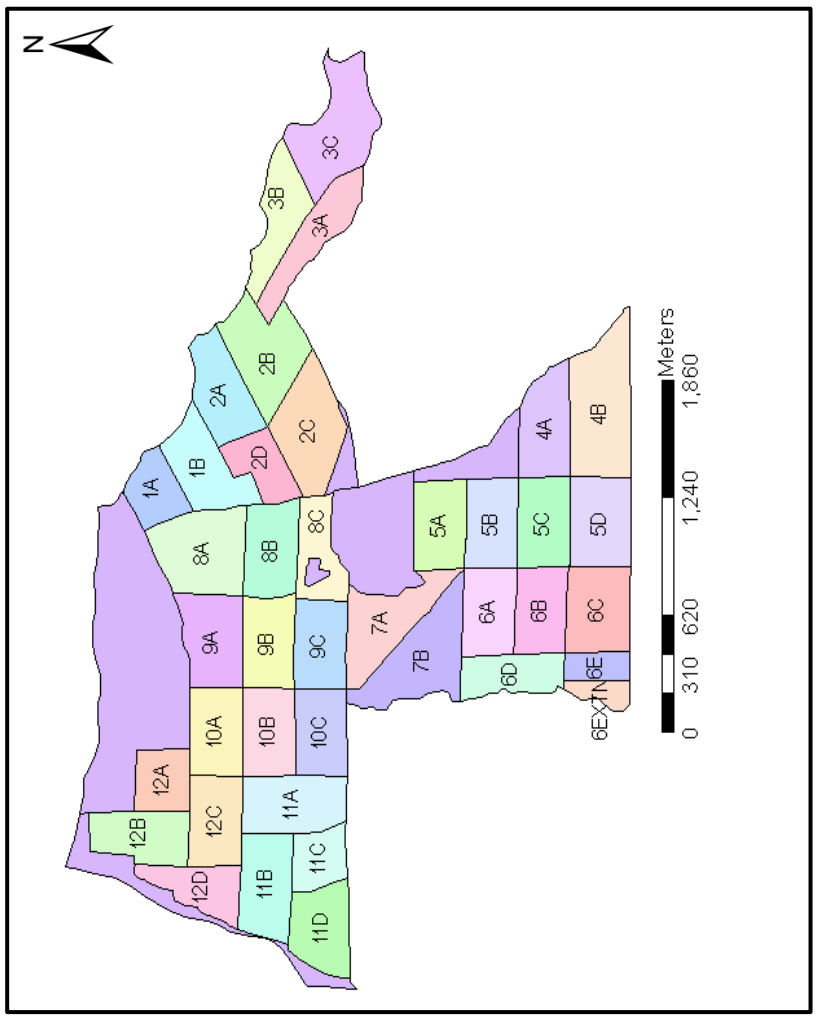
8. Fertilizer use	
Types of N, P, K fertilizers used	Urea, MOP, SSP, RP
Dose of Nitrogen (kg/ha)	120
Dose of Phosphorous (kg/ha)	35
Dose of Potash (kg/ha)	120
Whether lime is applied, if yes dose	Yes



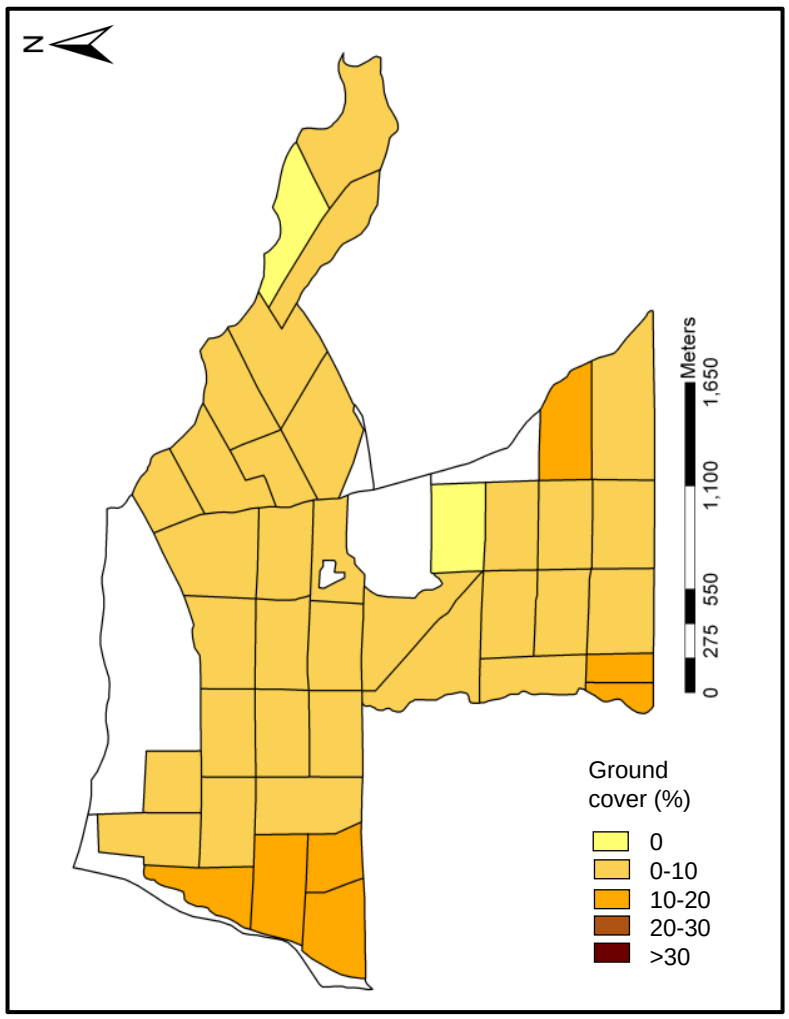
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

e. General Information

1. General	
Contact address	PO: Metalli, Dist: Jalpaiguri PIN: 735223
Contact phone	09434381072
Name of the company	Samsing Organic Tea Pvt. Ltd.
Name of the village where it falls	Samaing
Leased area of the estate (ha)	1256.61
Tea grown area of the estate (ha)	915.17
No. of divisions / sections	3 div/69 sec
Age	More than 70 years
Type of tea produced	Orthodox, CTC

2. Infrastructure	
Availability of processing factory	Yes
Availability of workers colony	Yes
Availability of internet facility / e-mail id	No
Meteorological observations taken	Tmax, Tmin, Rainfall

3. Amenities	
Availability of health care / dispensary	Yes
Availability of school	Yes (primary)

4. Shade trees	
Shade tree density (garden level)	Low
Plant to plant spacing (m)	6 x 6-9 x 9
Row to row spacing (m)	6 x 6-9 x 9

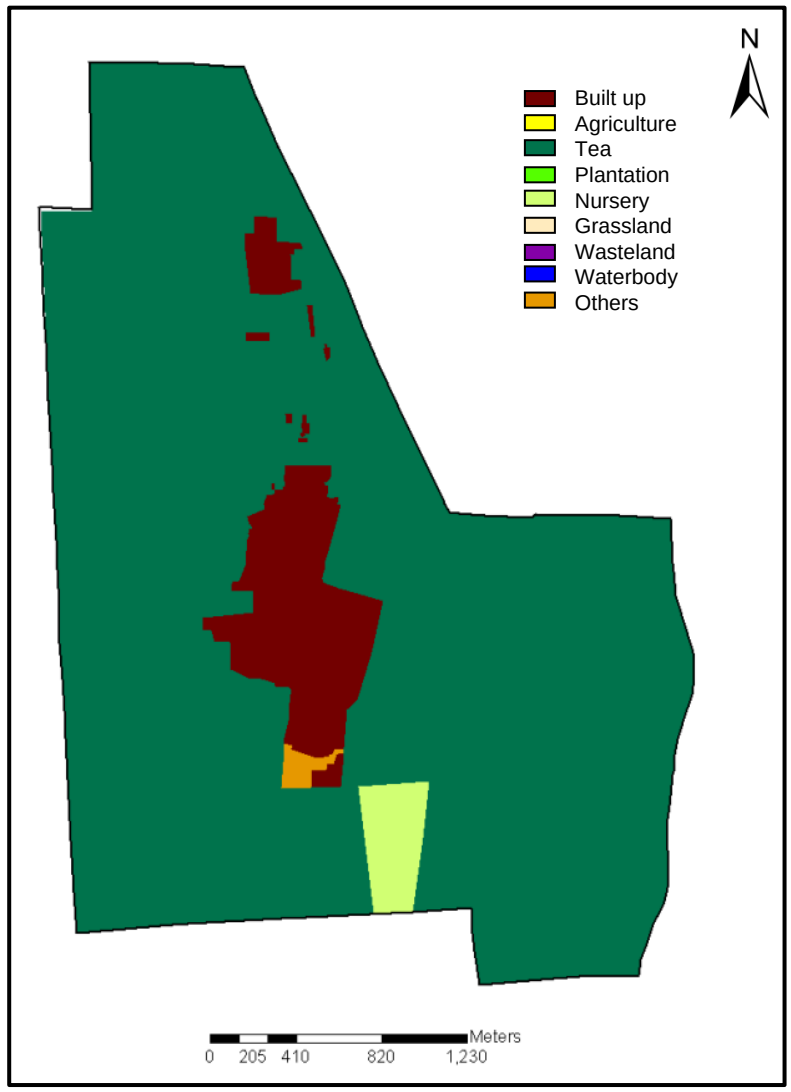
5. Natural resources constraints	
Drainage congestion and water logging	No
Scarcity of water during summer	No
River bank erosion	Yes
Major diseases and duration	Black rot, red rust, blister blight
Major pests and duration	RSM, *Helopeltis*, caterpillar, thrips
Damage due to wildlife	No

6. Yield / production	
Peak plucking periods	Mar-Nov
Annual green leaf yield	--
Annual production of processed tea	--

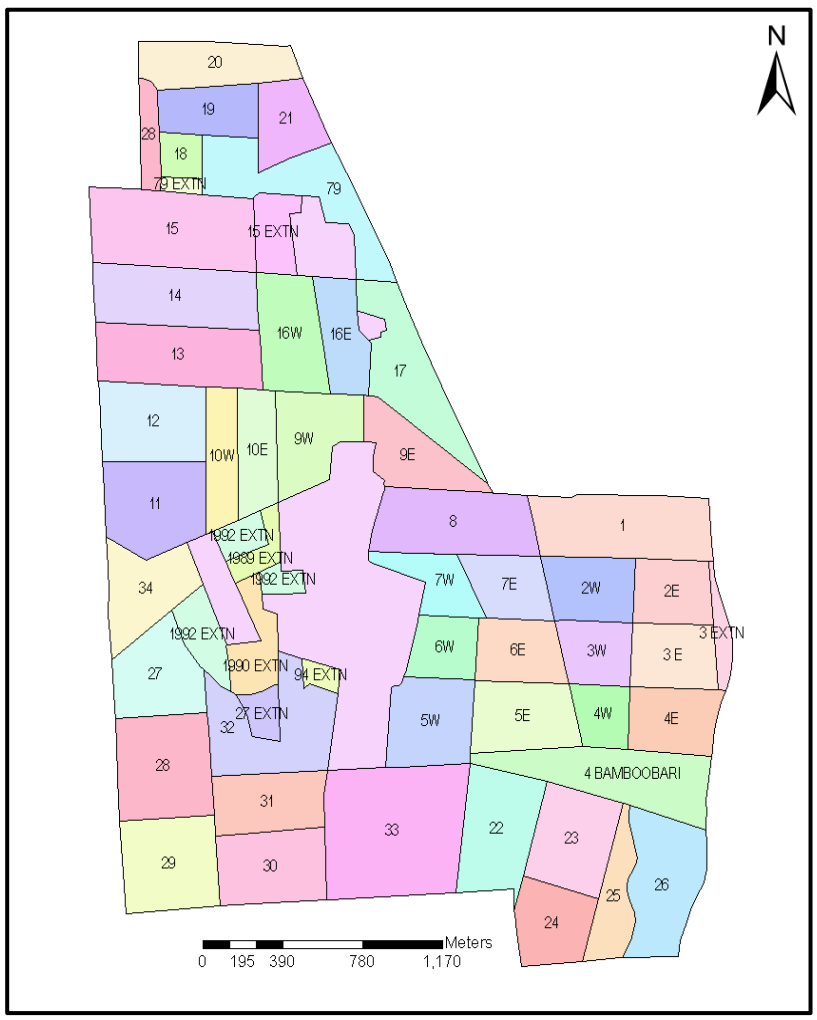
7. Pruning	
Time of pruning	Dec
Pruning cycle	4 yrs
Types of pruning	LP-UP-DS-LP

8. Fertilizer use	
Types of N, P, K fertilizers used	--
Dose of Nitrogen (kg/ha)	--
Dose of Phosphorous (kg/ha)	--
Dose of Potash (kg/ha)	--
Whether lime is applied, if yes dose	--

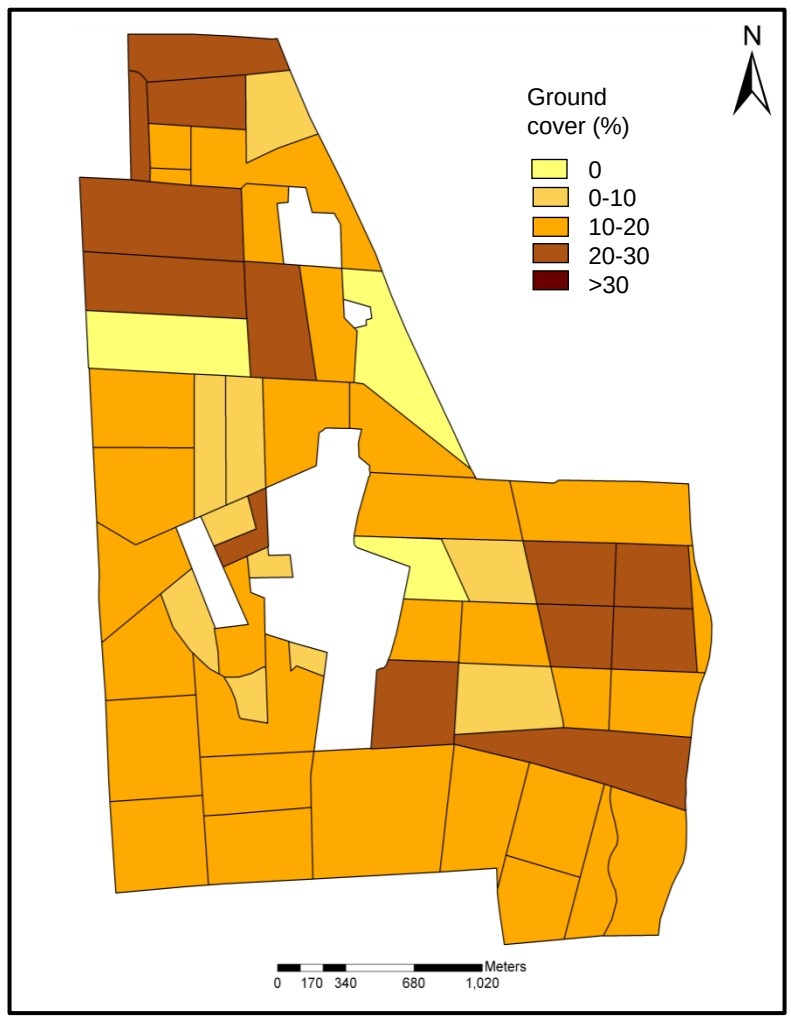
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse

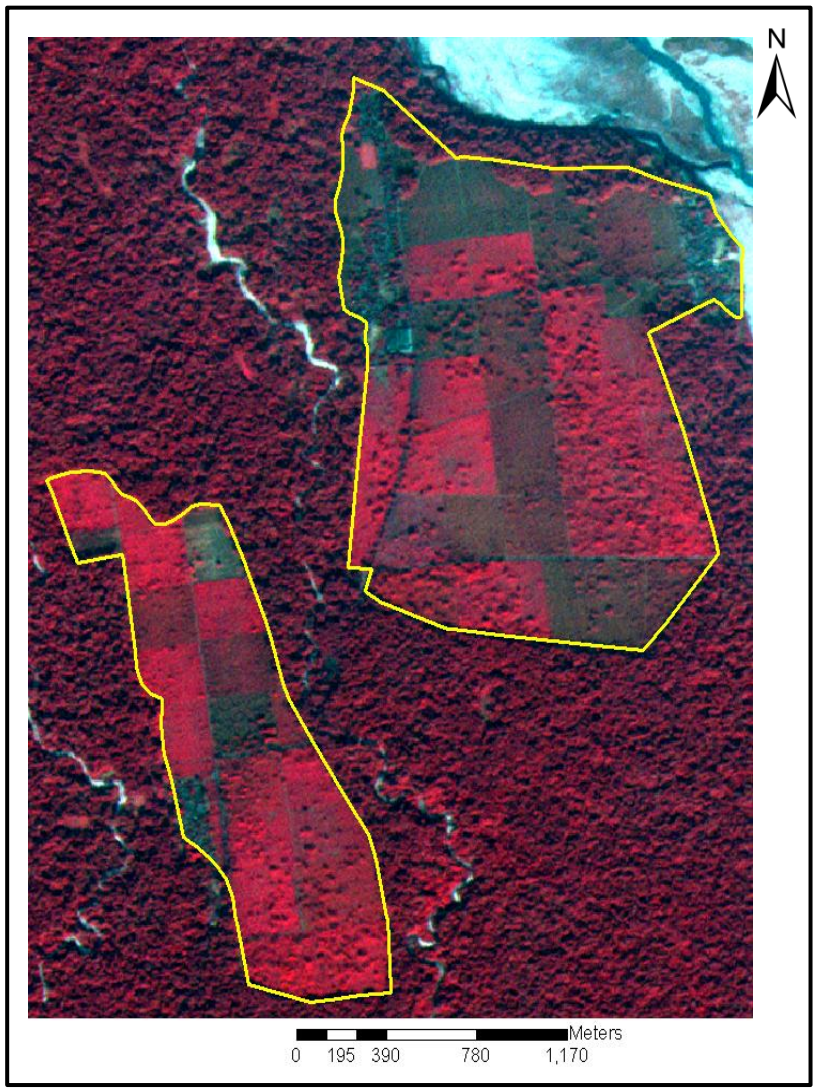


c. Section Boundaries of the Estate

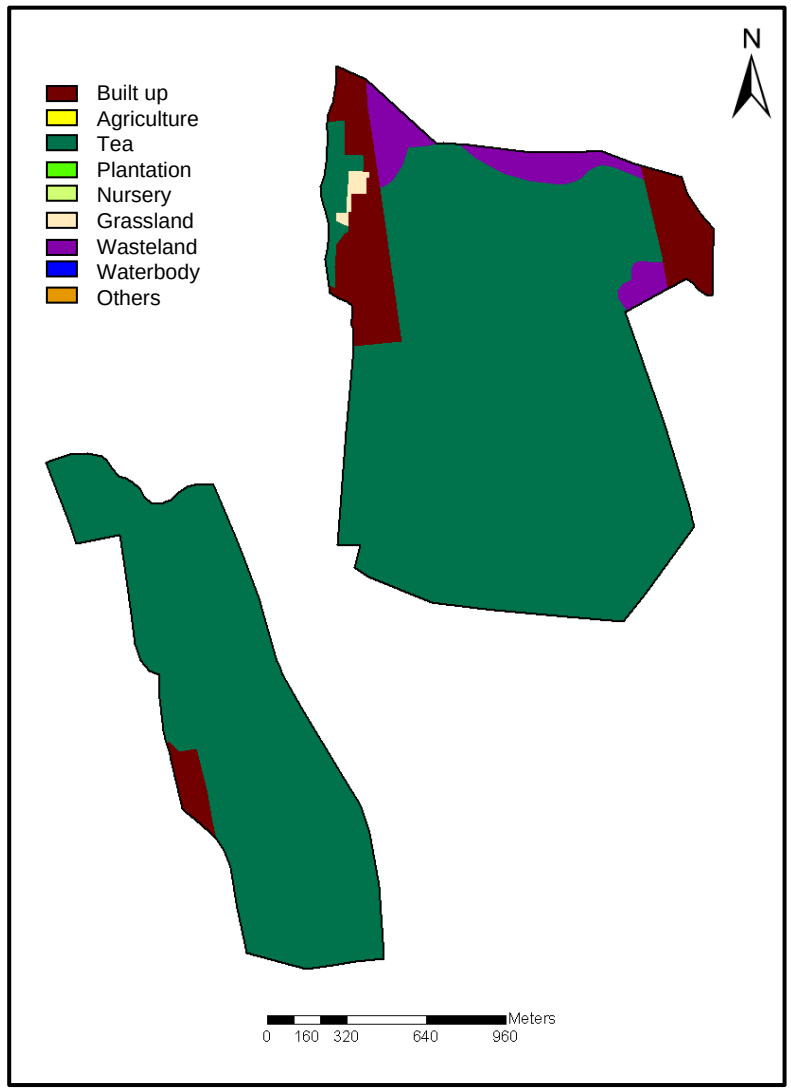


d. Shade Tree Density in Sections

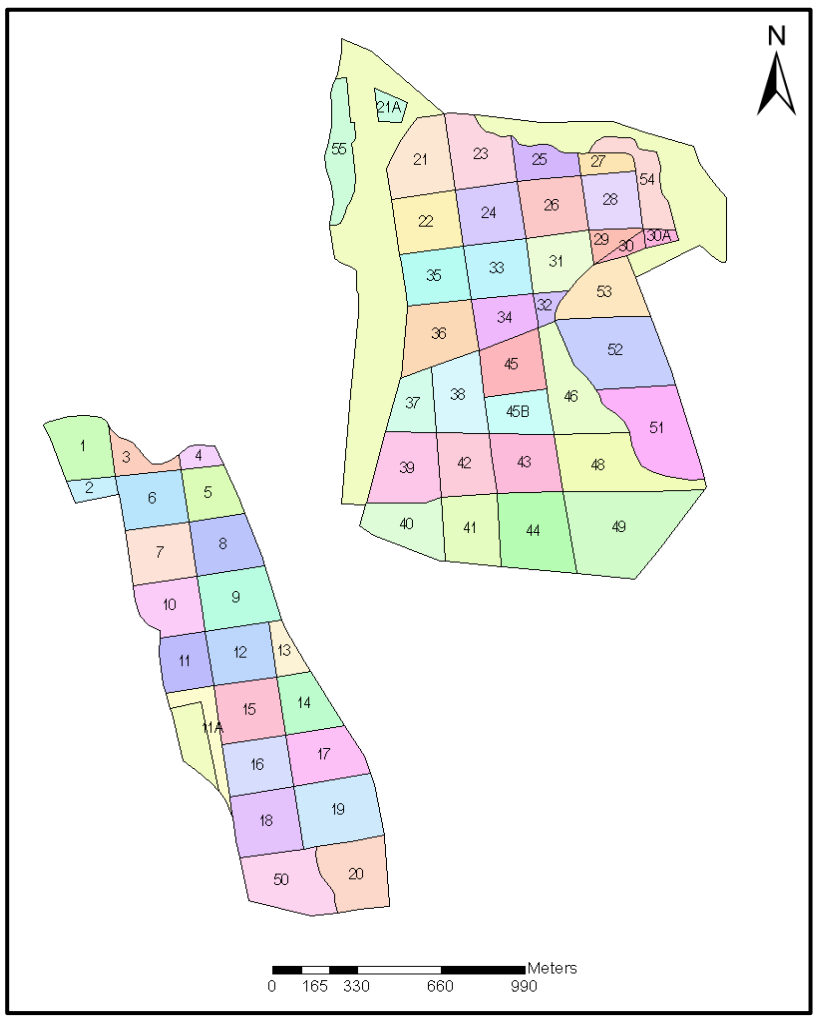
P112: SARASWATIPUR TE



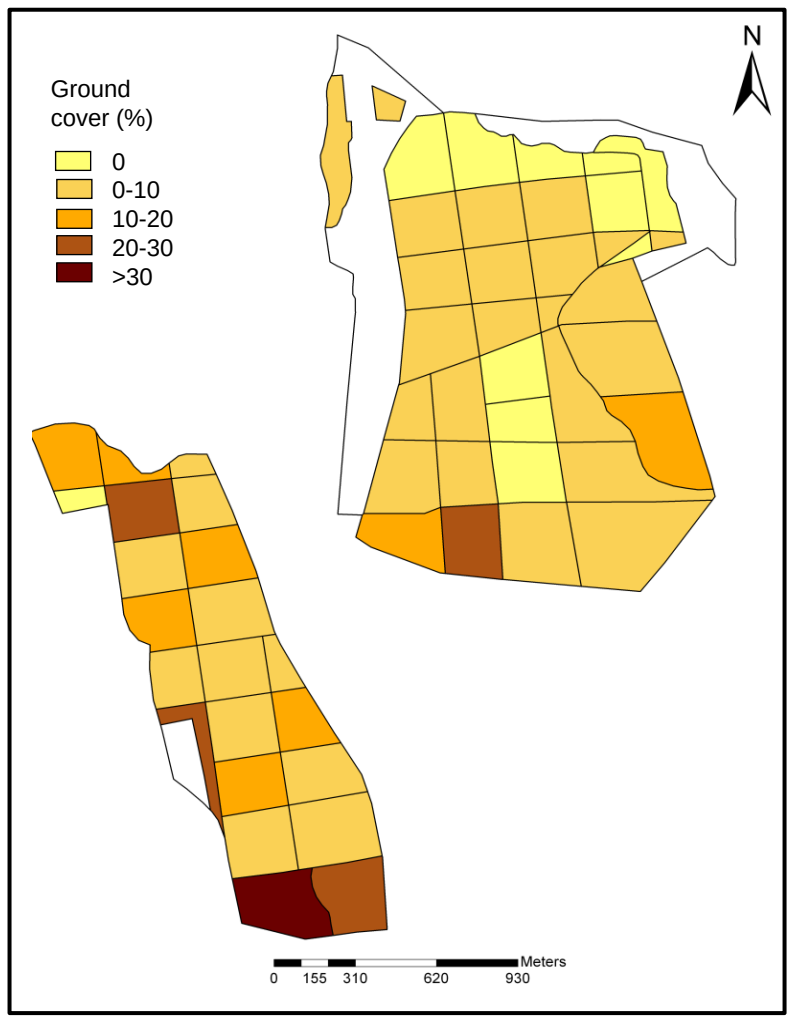
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse

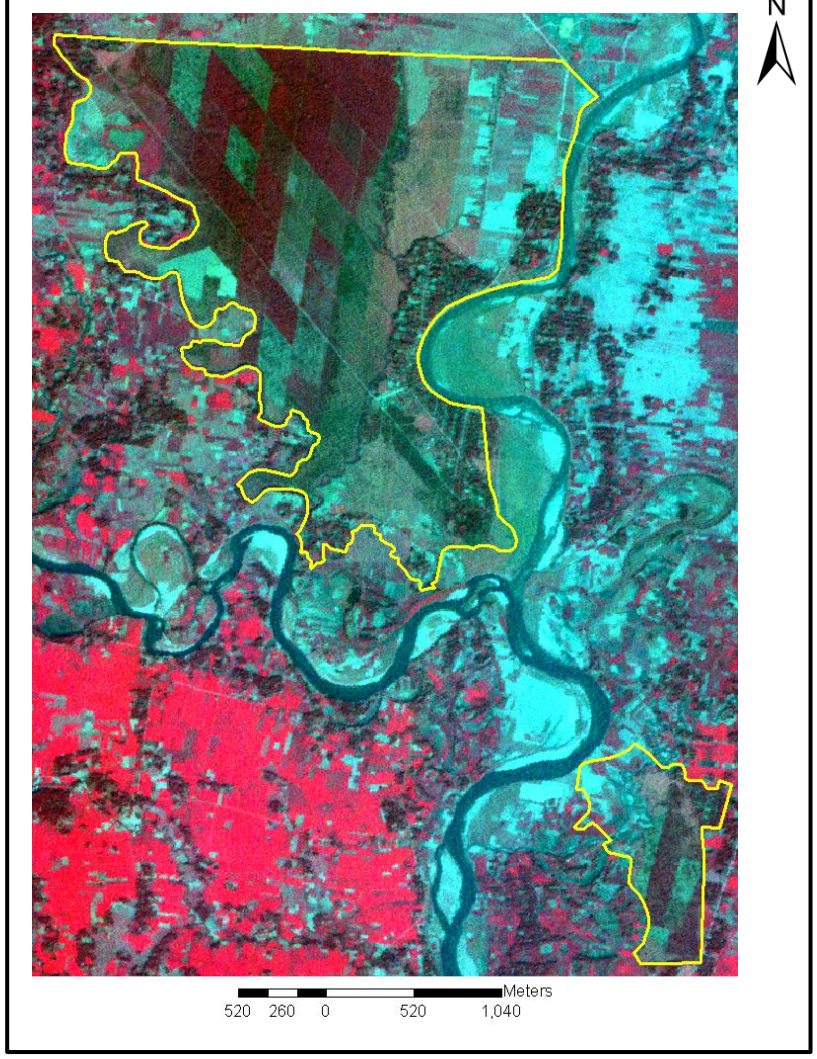


c. Section Boundaries of the Estate

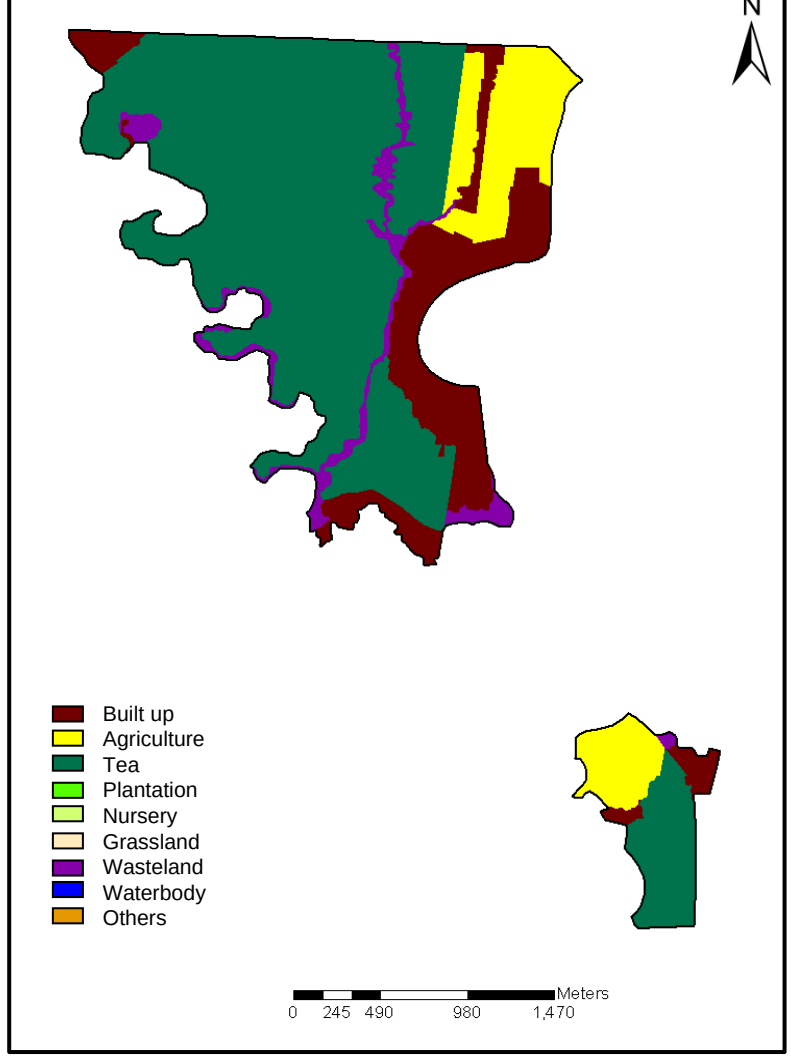


d. Shade Tree Density in Sections

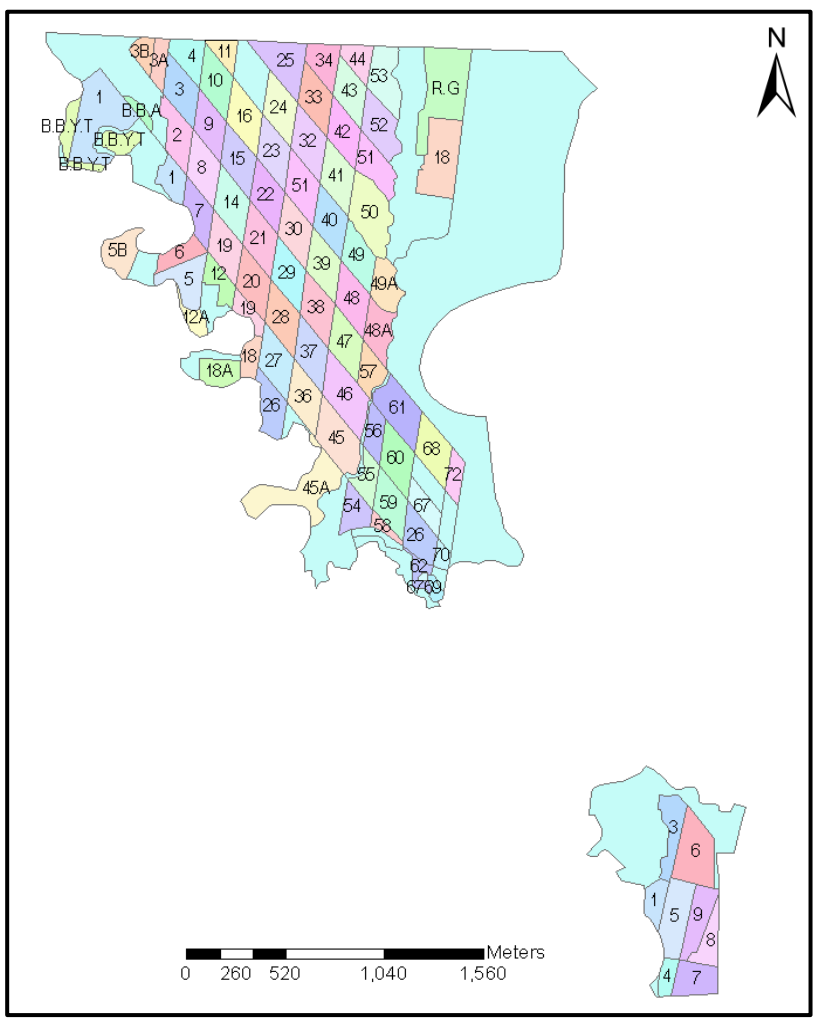
P113: SARUGAON TE



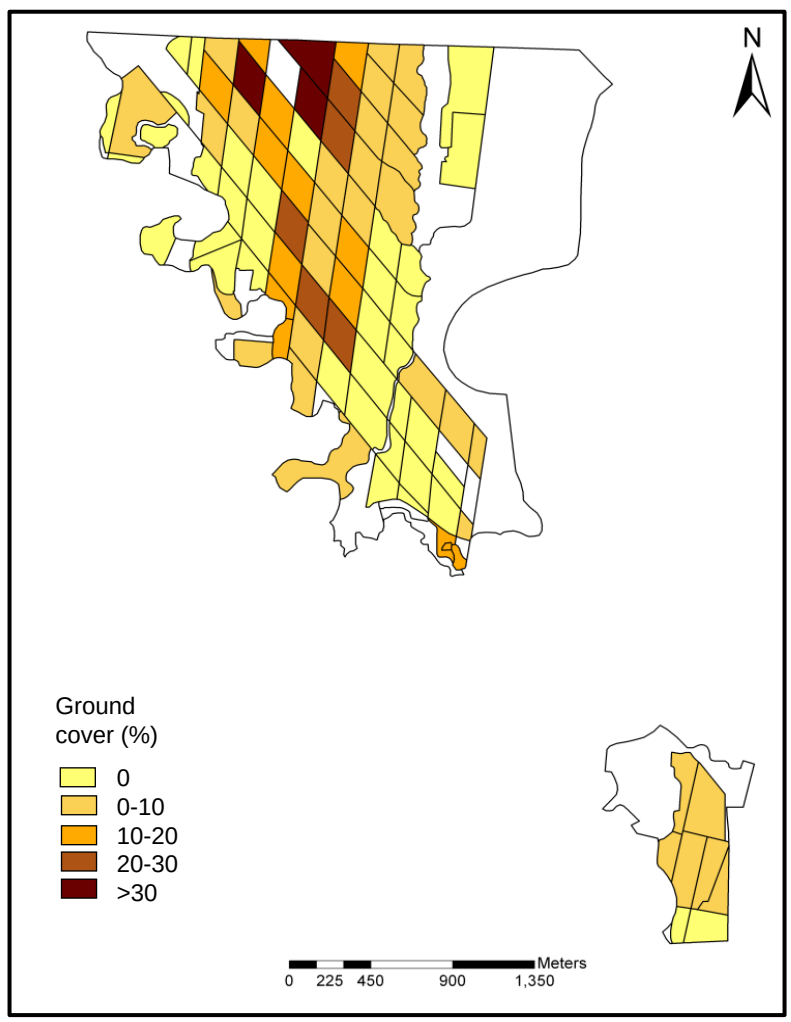
a. False Colour Composite of IRS LISS IV



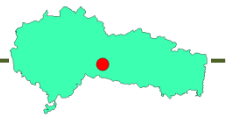
b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections



e. General Information

1. General	
Contact address	PO: Birpara, Dist: Jalpaiguri PIN: 735204
Contact phone	03561-284739
Name of the company	The Ethelbari Tea Company Ltd.
Name of the village where it falls	Sarugaon
Leased area of the estate (ha)	629.27
Tea grown area of the estate (ha)	319.03
No. of divisions / sections	2 div/61 sec
Year of establishment / age	--
Type of tea produced	CTC

2. Infrastructure	
Availability of processing factory	No
Availability of workers colony	Yes
Availability of internet facility / e-mail id	No
Meteorological observations taken	Tmax, Tmin, Rainfall

3. Amenities	
Availability of health care / dispensary	Yes
Availability of school	Yes (primary)

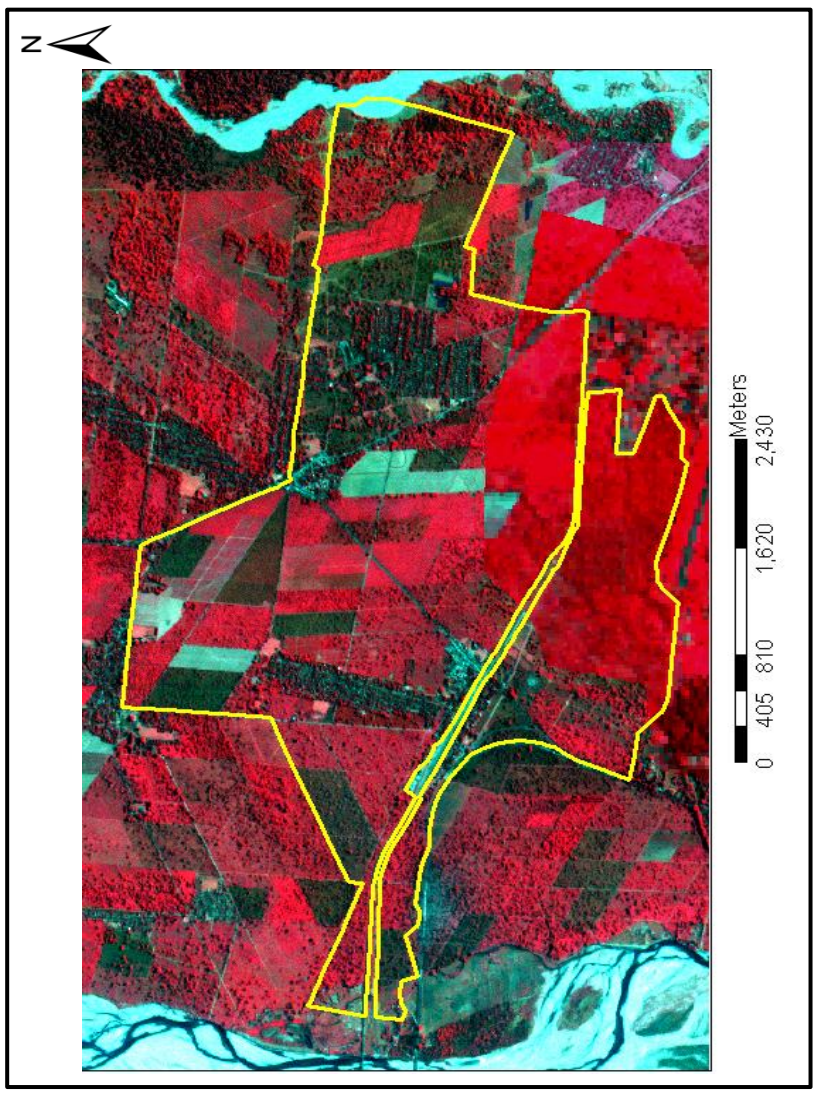
4. Shade trees	
Shade tree density (garden level)	Medium
Plant to plant spacing (m)	6.66 x 6.66
Row to row spacing (m)	6.66 x 6.66, 13.33 x 13.33

5. Natural resources constraints	
Drainage congestion and water logging	Yes
Scarcity of water during summer	Yes
River bank erosion	Yes
Major diseases and duration	Red rust (4 months)
Major pests and duration	Looper (whole season), RSM (10 months), *Helopeltis* (7-8 months)
Damage due to wildlife	No

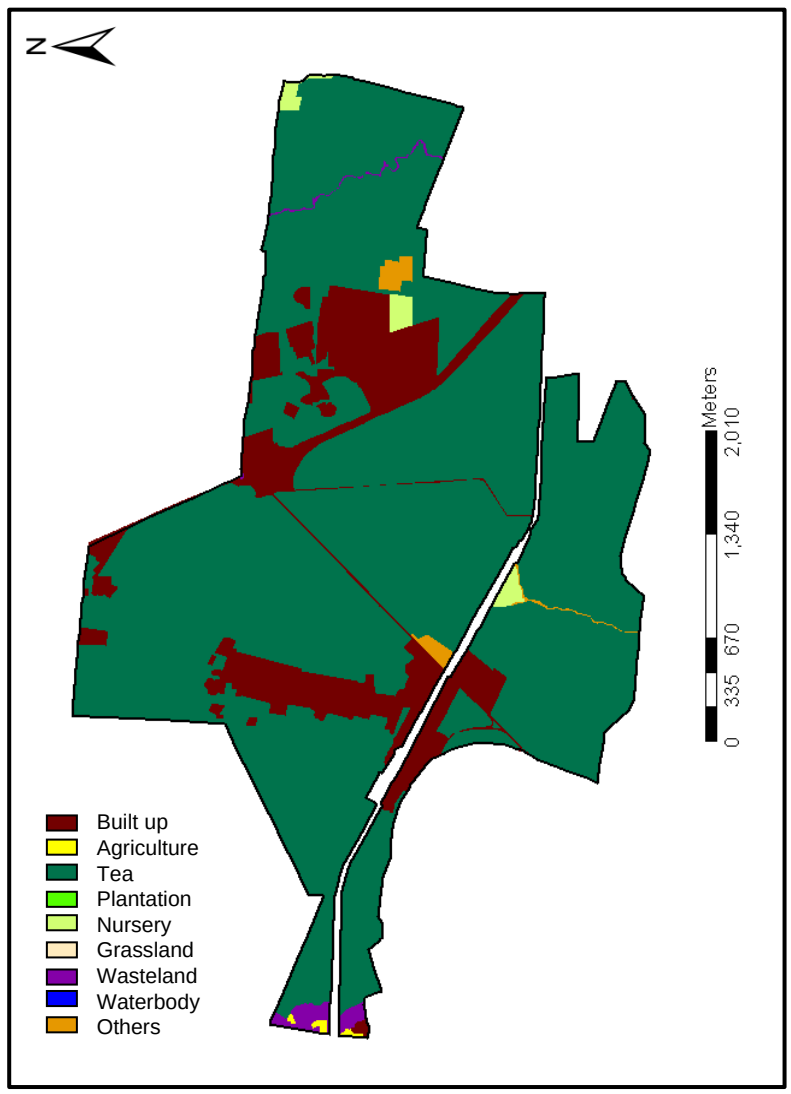
6. Yield / production	
Peak plucking periods	Mid Jun-mid Nov
Annual green leaf yield	4234 kg/ha
Annual production of processed tea	258500 kg

7. Pruning	
Time of pruning	Dec (mid)-Feb (last week)
Pruning cycle	4 yrs
Types of pruning	--

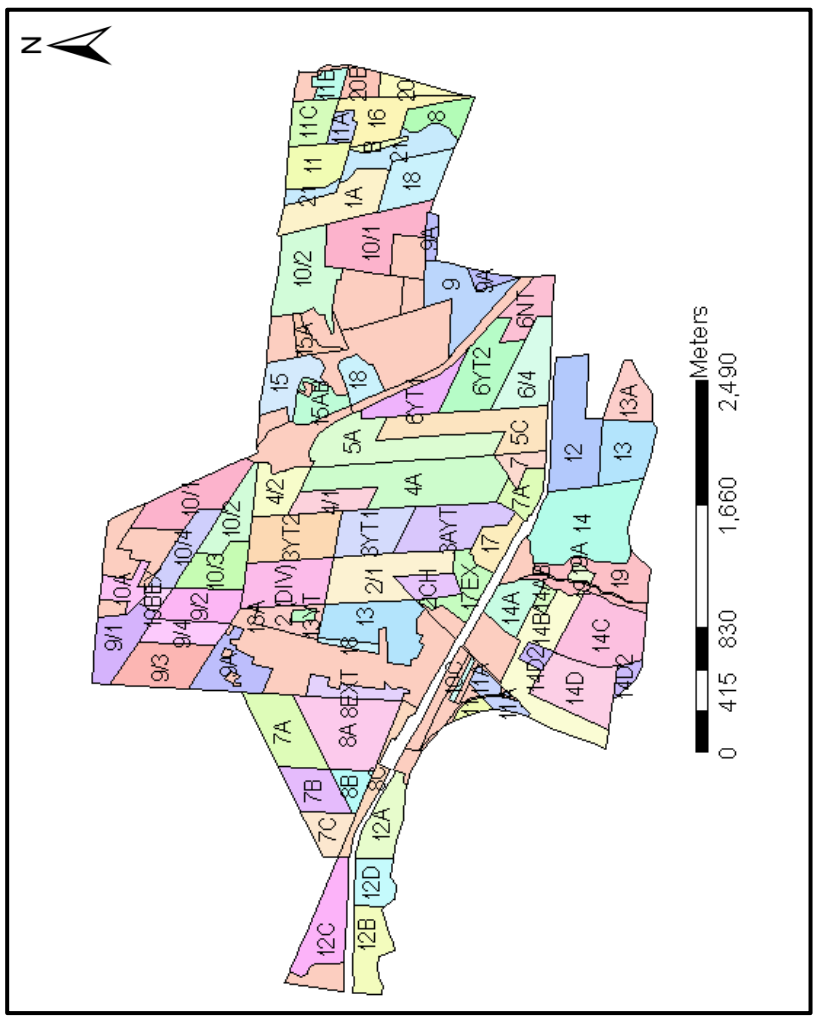
8. Fertilizer use	
Types of N, P, K fertilizers used	Urea, MOP, RP, SSP
Dose of Nitrogen (kg/ha)	120
Dose of Phosphorous (kg/ha)	45
Dose of Potash (kg/ha)	109
Whether lime is applied, if yes dose	No



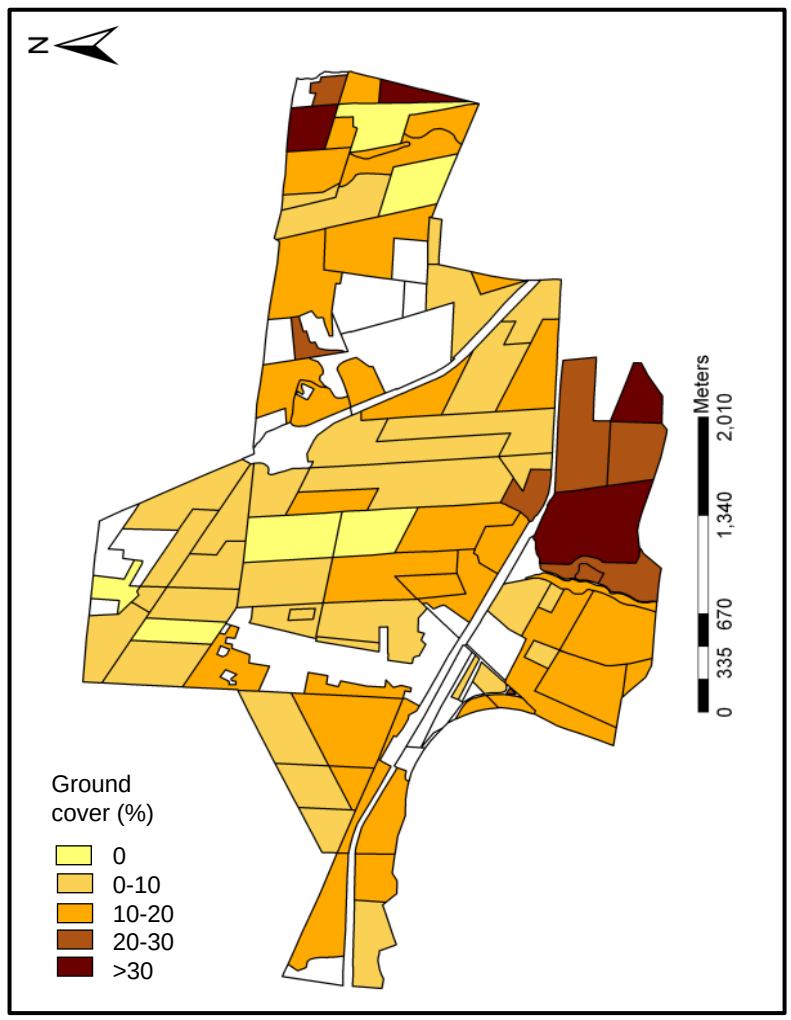
a. False Colour Composite of IRS LISS IV



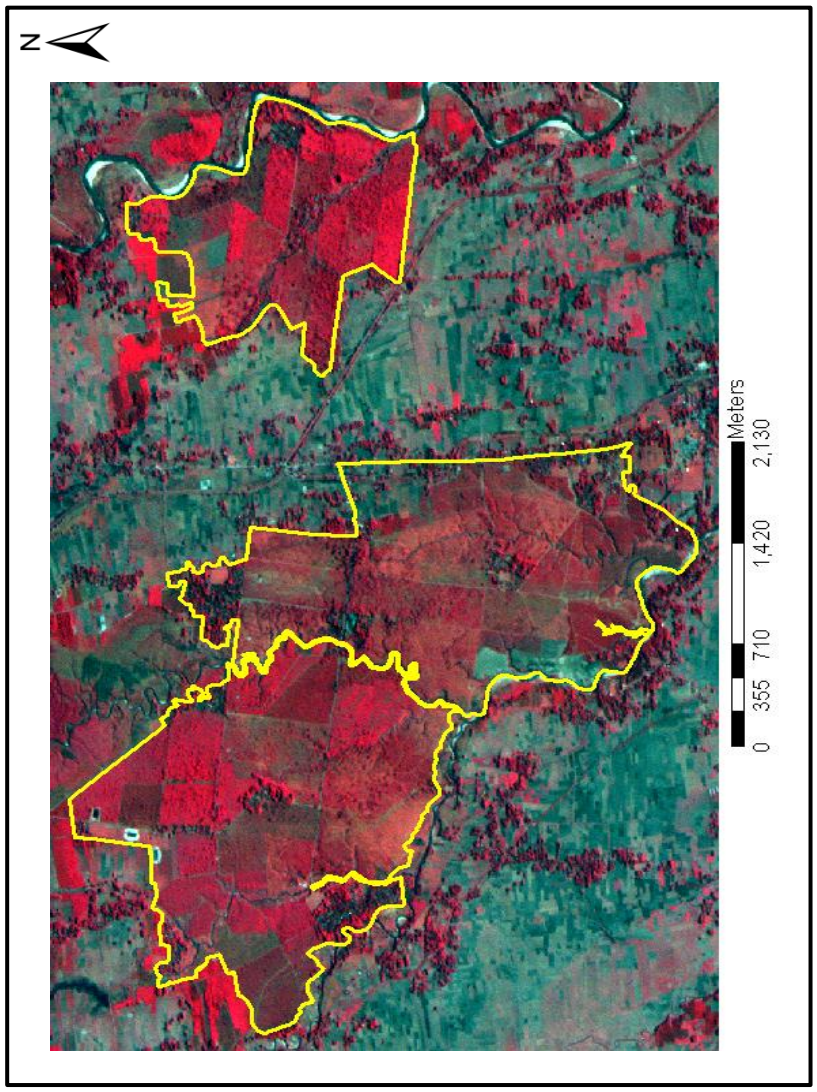
b. Tea Estate Landuse



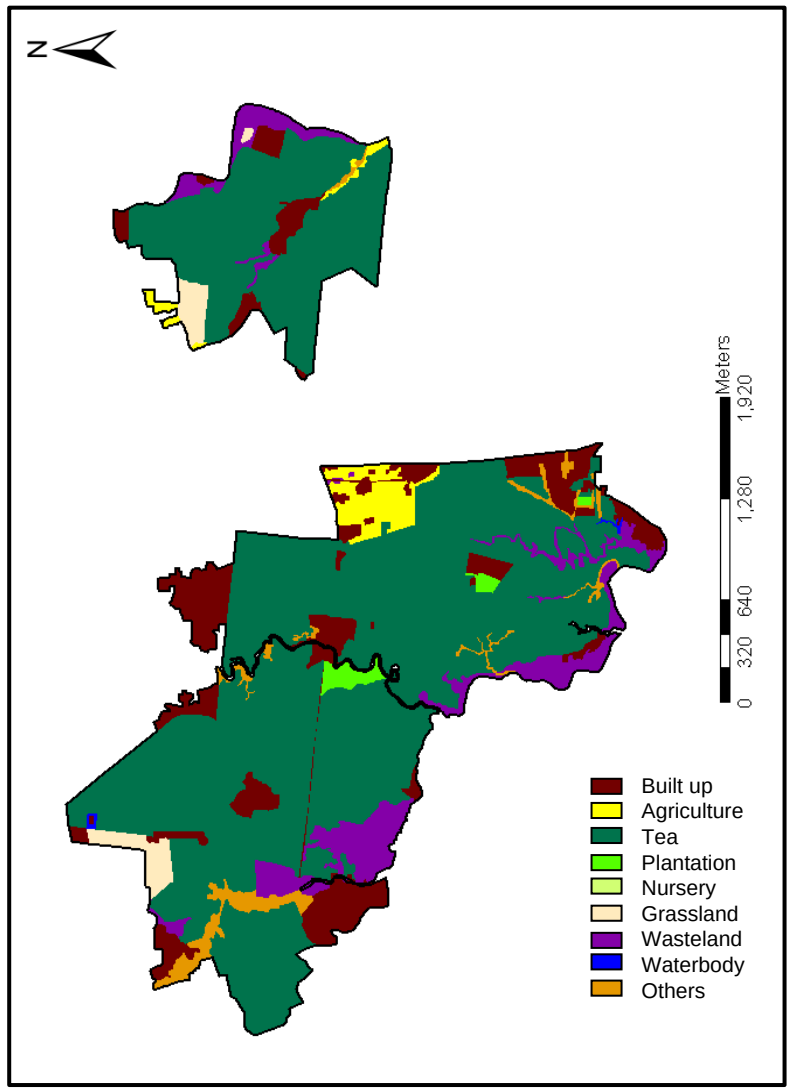
c. Section Boundaries of the Estate



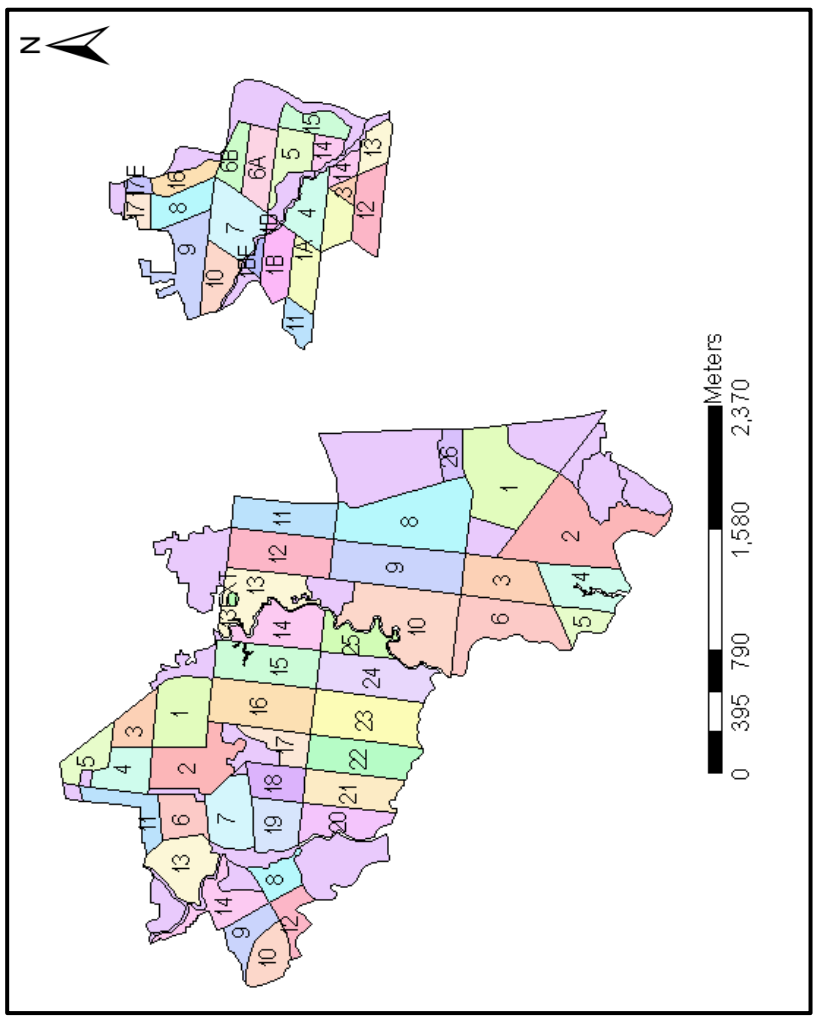
d. Shade Tree Density in Sections



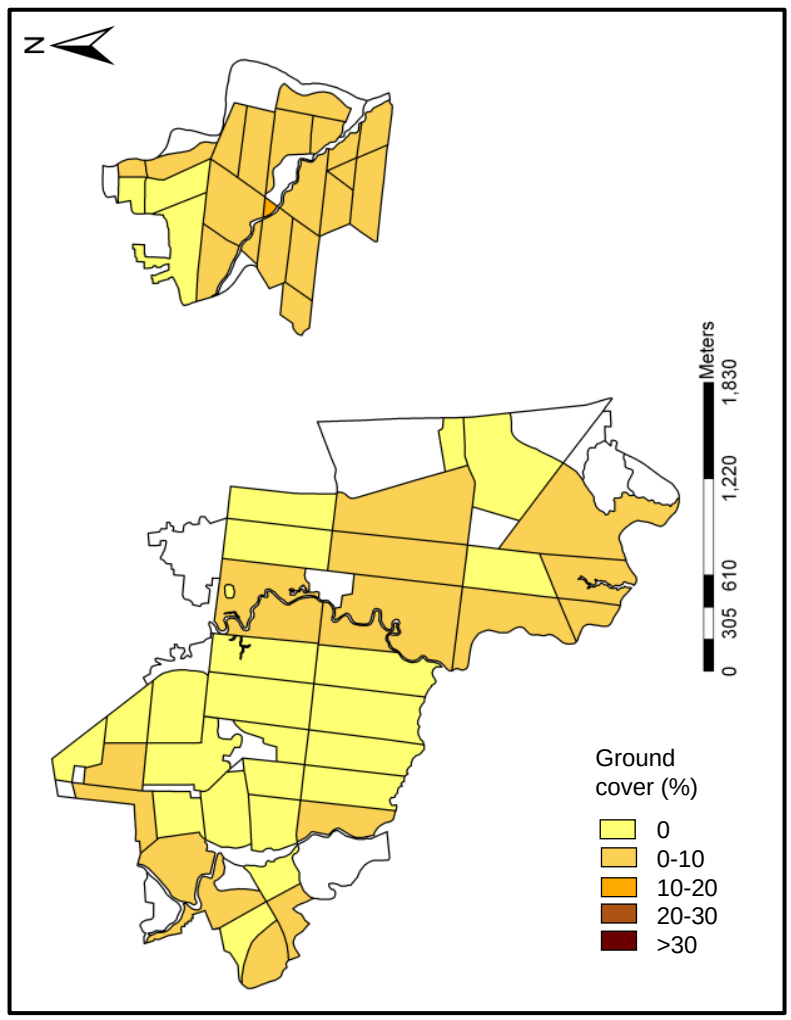
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate

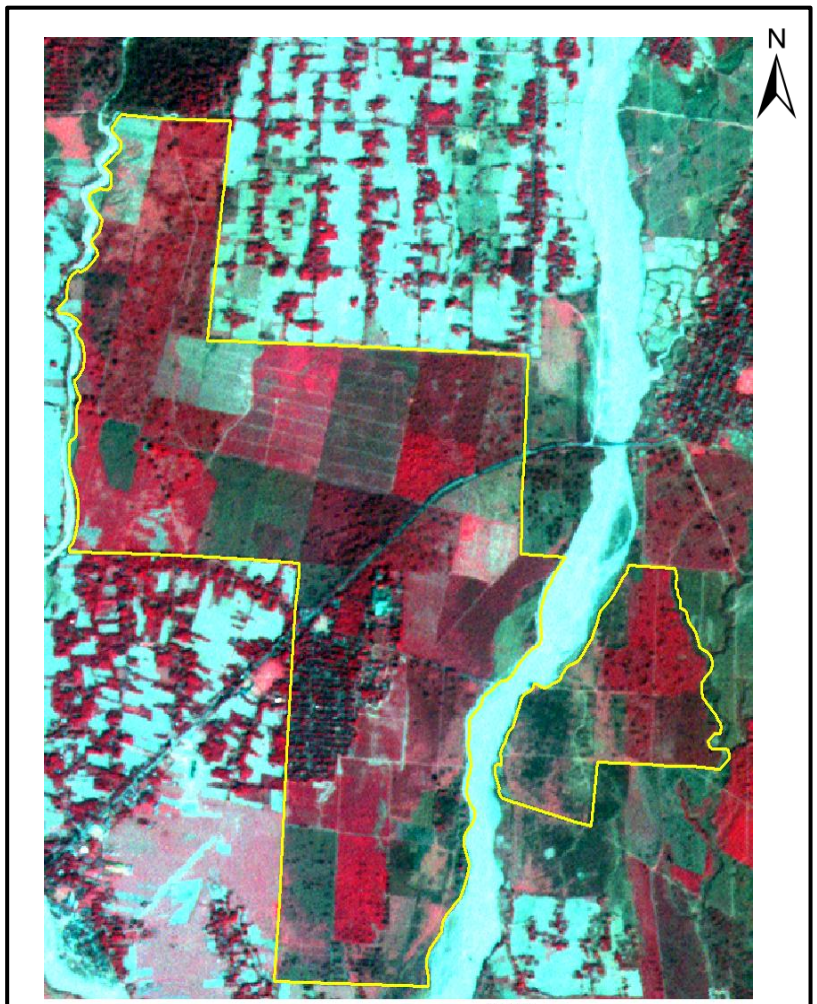


d. Shade Tree Density in Sections

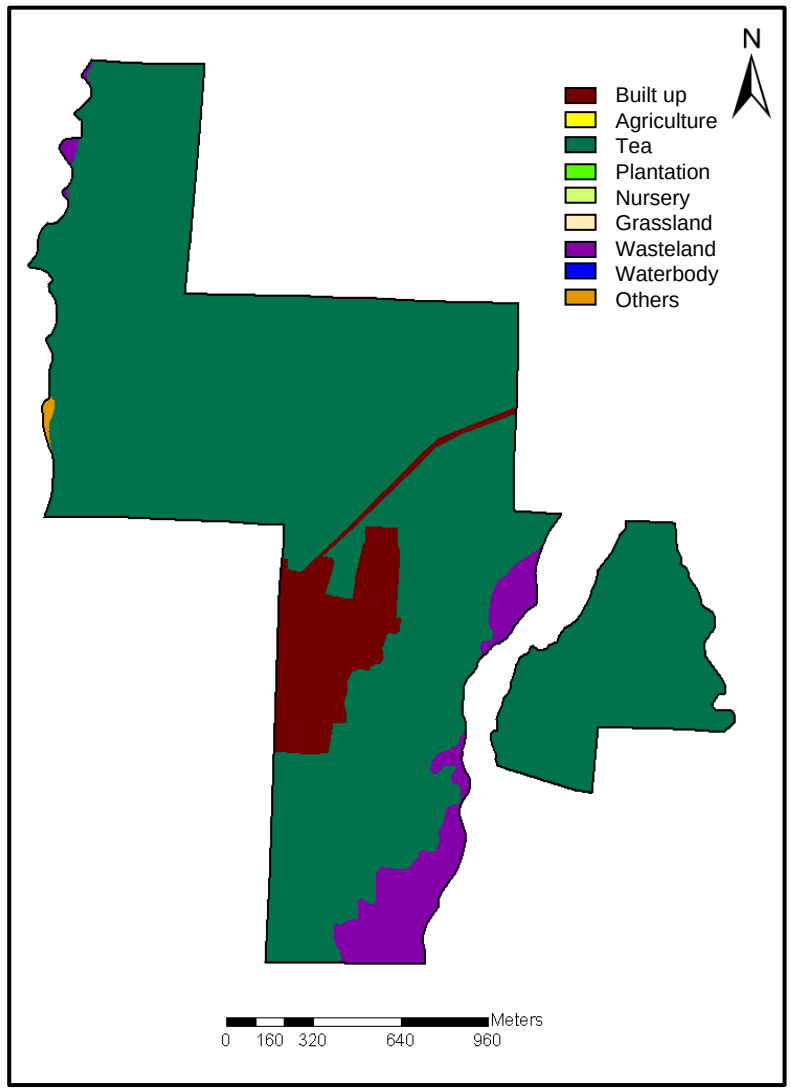
e. General Information

1. General	
Contact address	PO: Shikarpur, Dist: Jalpaiguri PIN: 735133
Contact phone	--
Name of the company	--
Name of the village where it falls	Shikarpur
Leased area of the estate (ha)	904.90
Tea grown area of the estate (ha)	612.02
No. of divisions / sections	2 div/62 sec
Year of establishment	1920
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, Wind, SSH
3. Amenities	
Availability of health care / dispensary	Yes
Availability of school	Yes (primary)
4. Shade trees	
Shade tree density (garden level)	Low
Plant to plant spacing (m)	6.66 x 6.66
Row to row spacing (m)	13.33 x 13.33

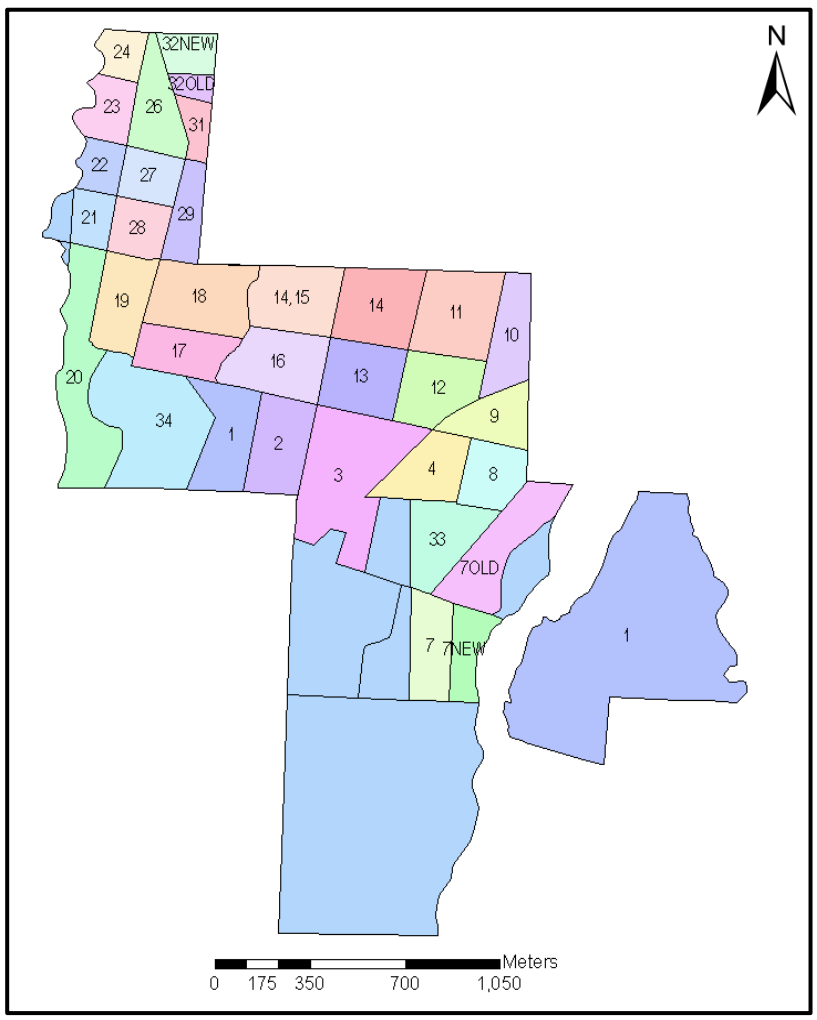
5. Natural resources constraints	
Drainage congestion and water logging	Yes
Scarcity of water during summer	Yes
River bank erosion	No
Major diseases and duration	Red rust, black rot
Major pests and duration	Looper, thrips, RSM
Damage due to wildlife	No
6. Yield / production	
Peak plucking periods	Jul-Sep
Annual green leaf yield	4030 kg/ha
Annual production of processed tea	515276 kg
7. Pruning	
Time of pruning	End Nov-Feb
Pruning cycle	4 yrs
Types of pruning	LP-UP-DS/MS-UP
8. Fertilizer use	
Types of N, P, K fertilizers used	Urea, MOP, RP, SSP
Dose of Nitrogen (kg/ha)	200
Dose of Phosphorous (kg/ha)	50
Dose of Potash (kg/ha)	180
Whether lime is applied, if yes dose	No



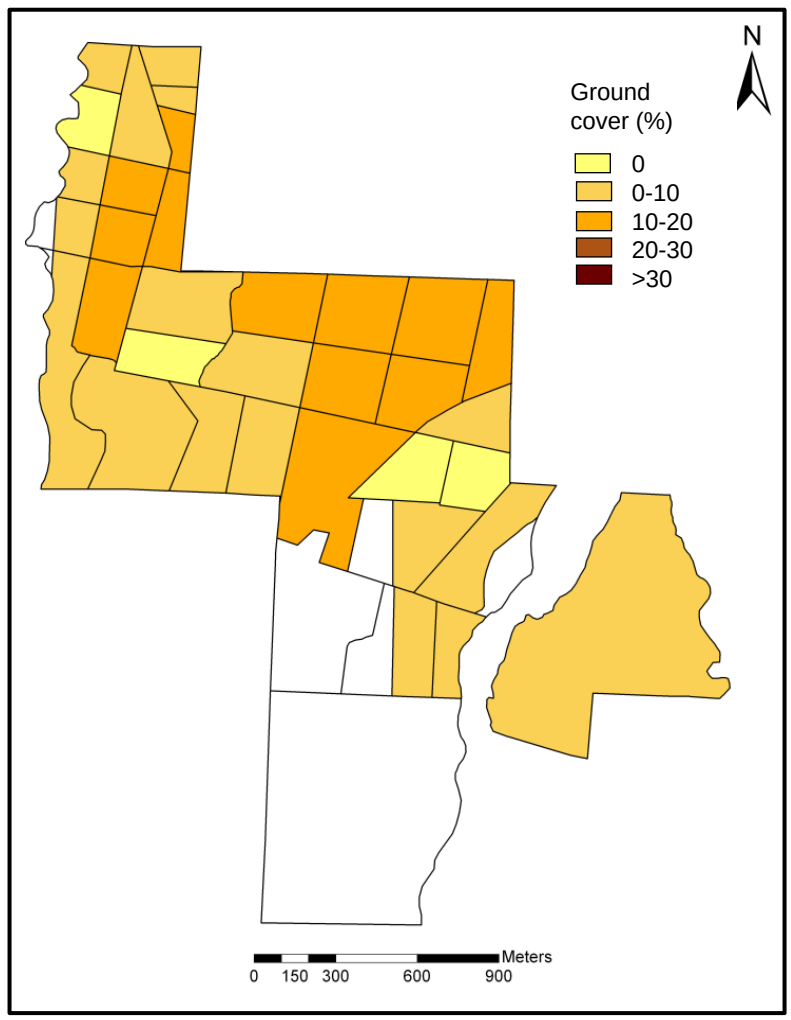
a. False Colour Composite of IRS LISS IV



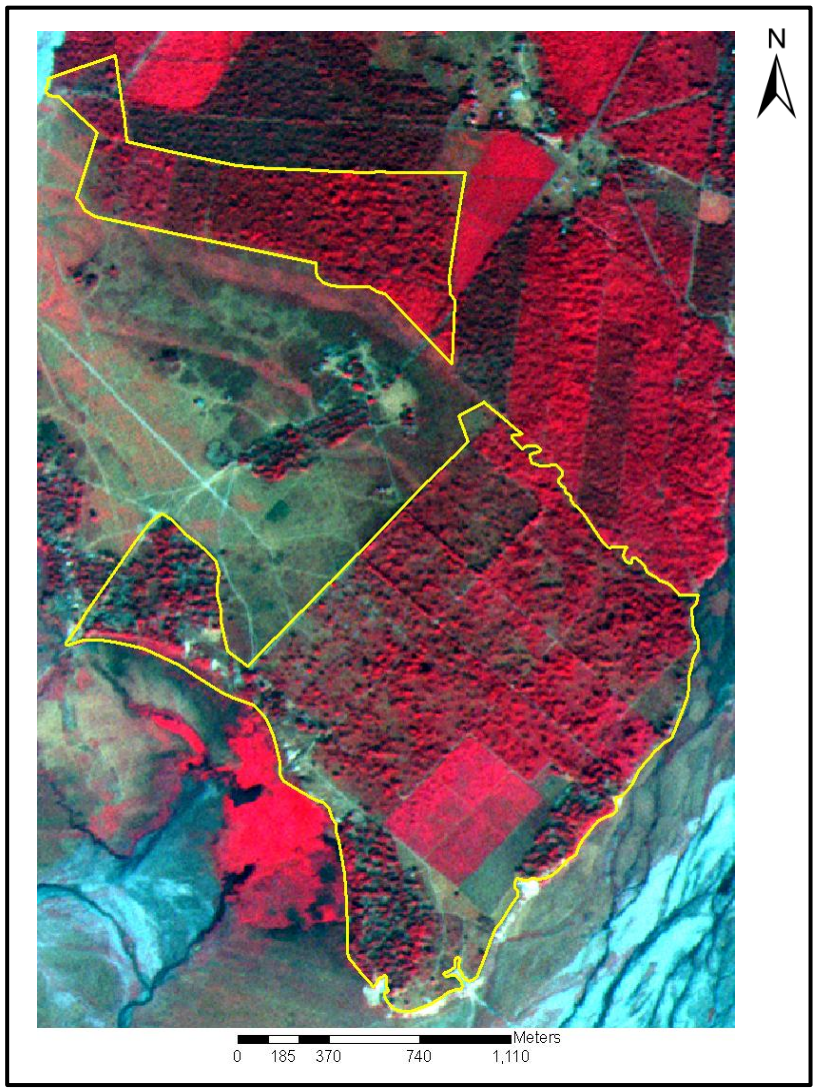
b. Tea Estate Landuse



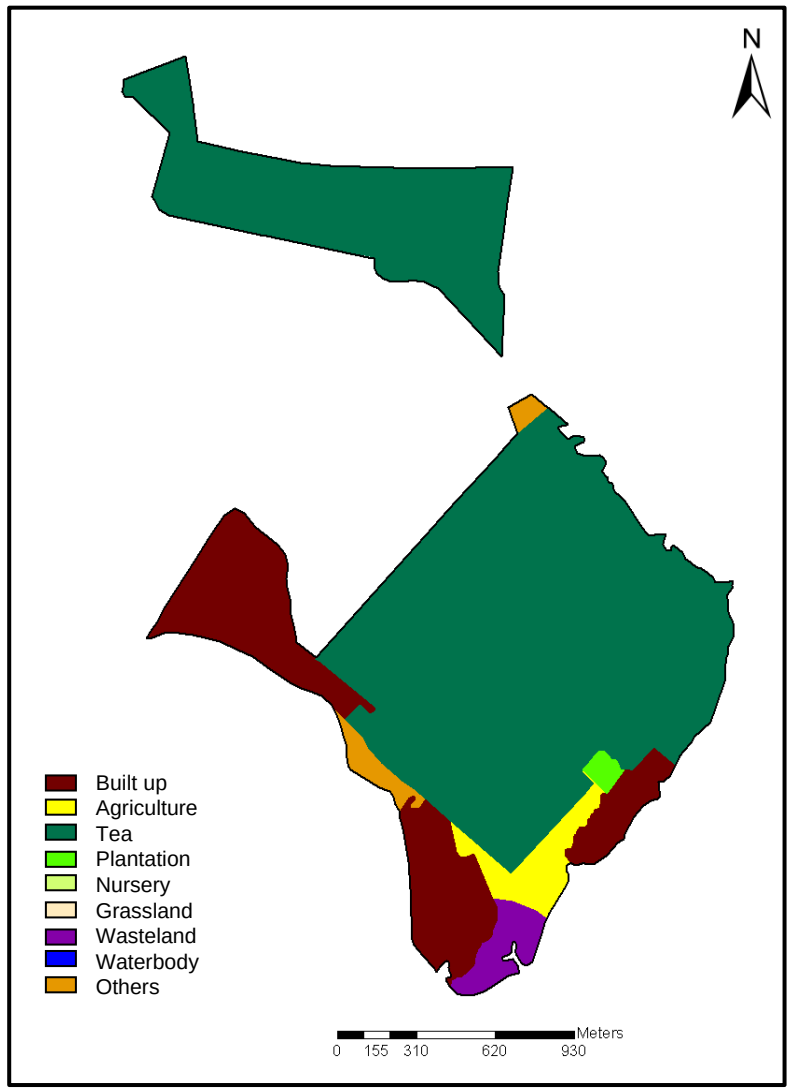
c. Section Boundaries of the Estate



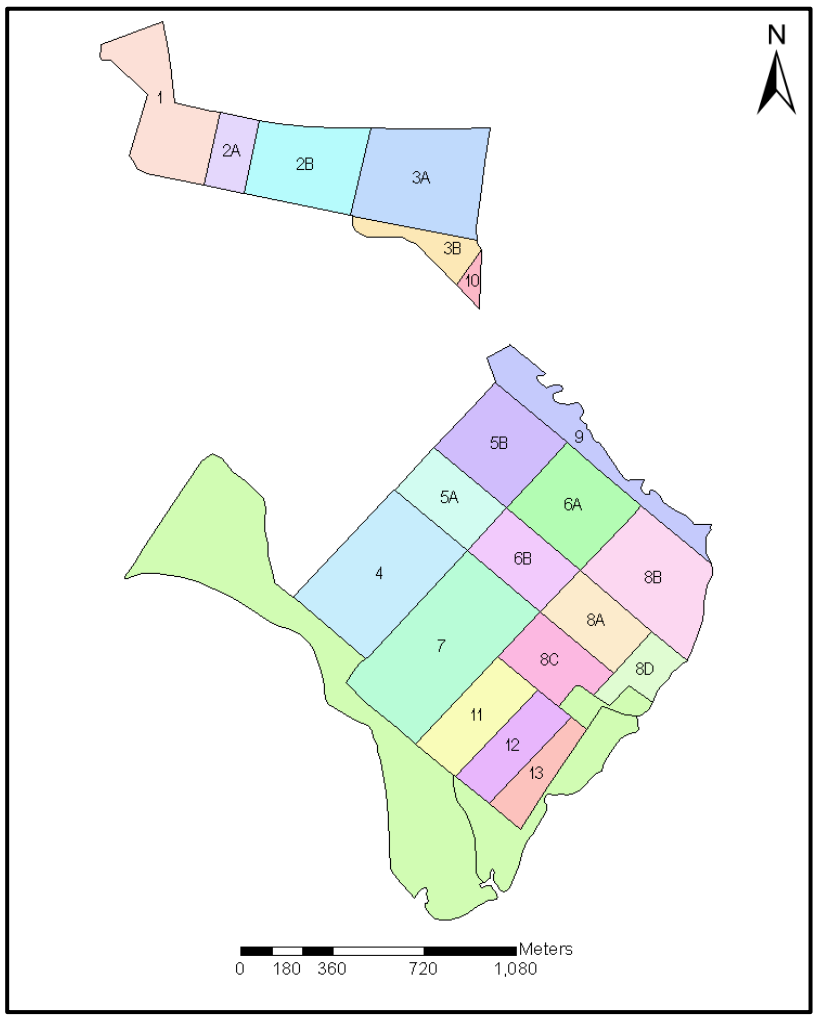
d. Shade Tree Density in Sections



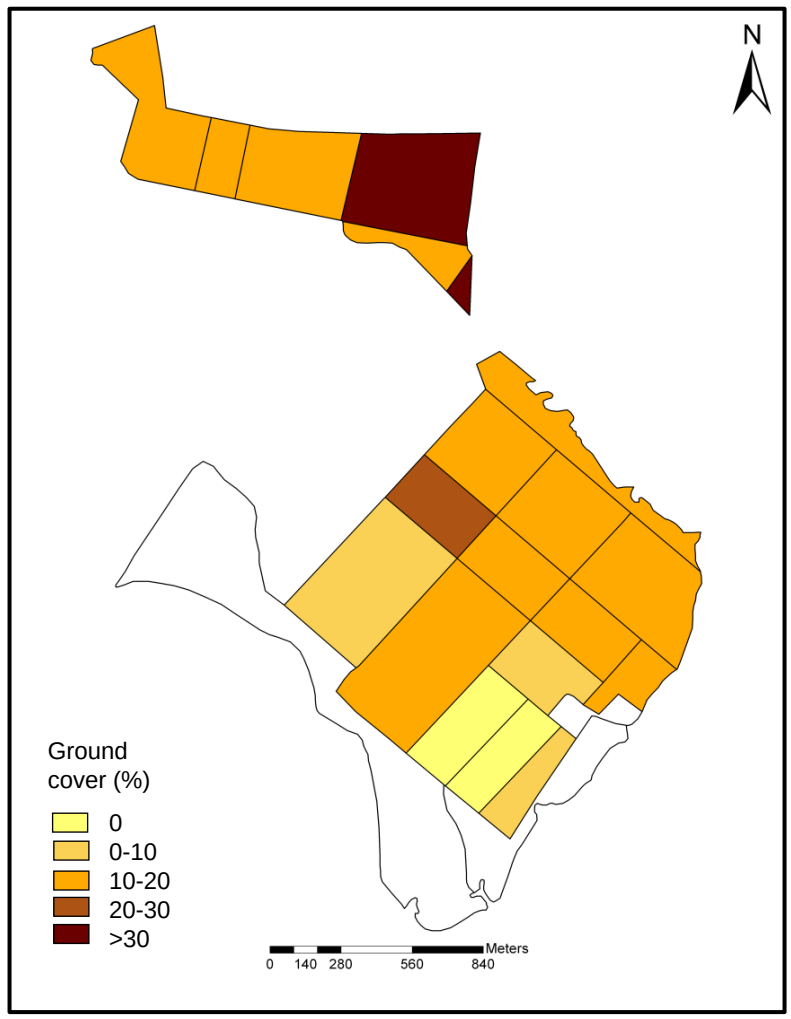
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse

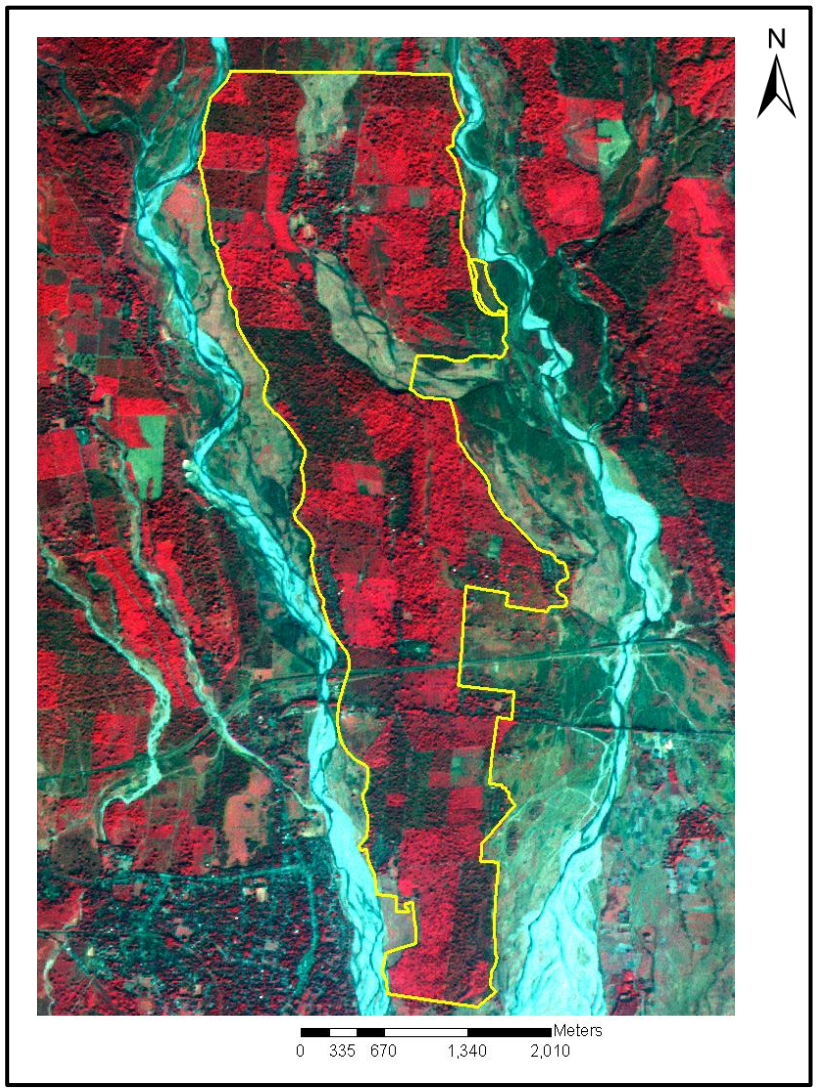


c. Section Boundaries of the Estate

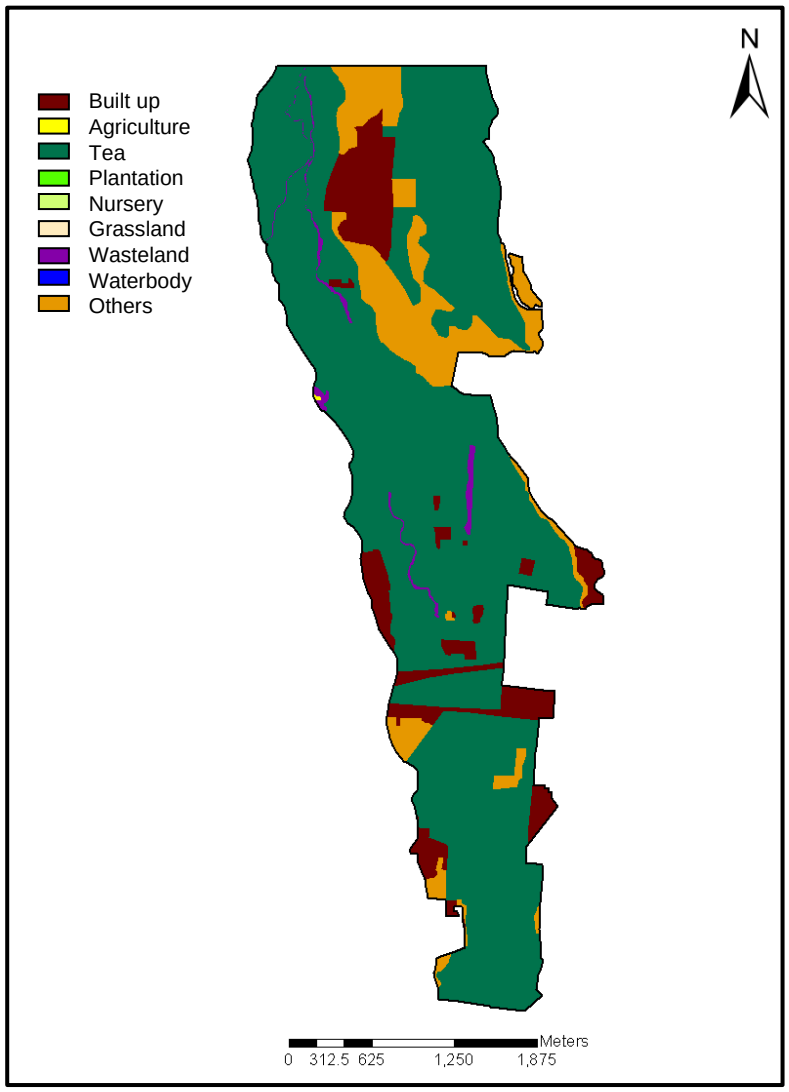


d. Shade Tree Density in Sections

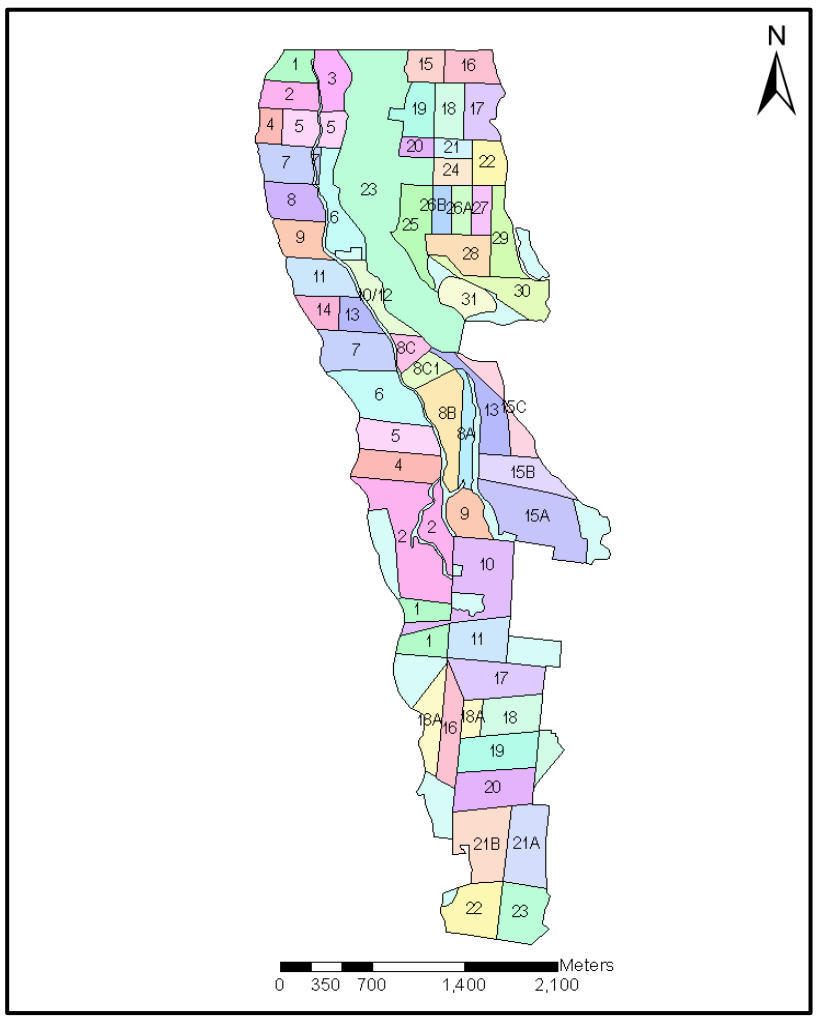
P118: SOONGACHI TE



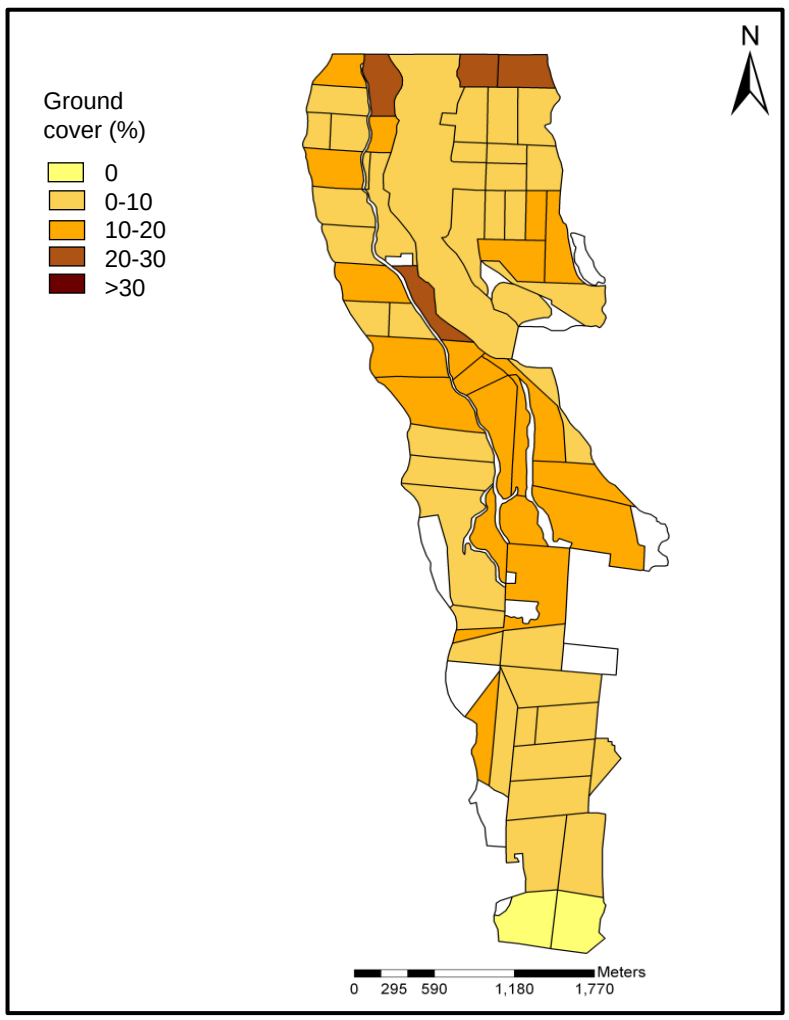
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

e. General Information

1. General	
Contact address	PO: Mal, Dist: Jalpaiguri
Contact phone	9475834236 / 9434050033
Name of the company	Soongachi Tea Ind (P) Ltd.
Name of the village where it falls	Malbazar
Leased area of the estate (ha)	1052.10
Tea grown area of the estate (ha)	639.42
No. of divisions / sections	3 div/61 sec
Year of establishment	1923
Type of tea produced	CTC

2. Infrastructure	
Availability of processing factory	Yes
Availability of workers colony	Yes
Availability of internet facility / e-mail id	No
Meteorological observations taken	No

3. Amenities	
Availability of health care / dispensary	Yes
Availability of school	Yes

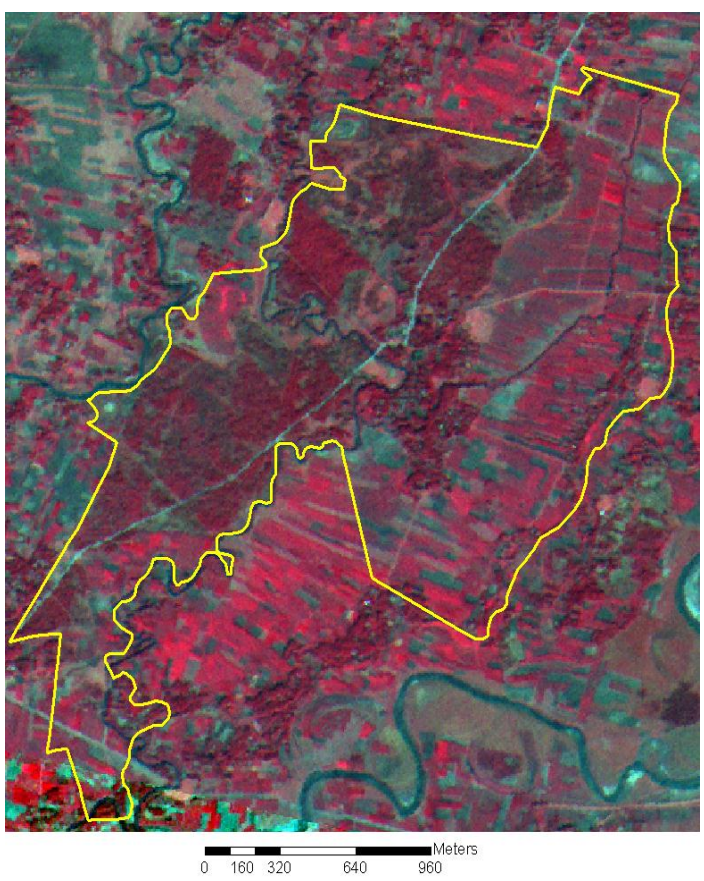
4. Shade trees	
Shade tree density (garden level)	Low
Plant to plant spacing	12’ x 12’
Row to row spacing	12’ x 12’

5. Natural resources constraints	
Drainage congestion and water logging	No
Scarcity of water during summer	Yes
River bank erosion	Yes
Major diseases and duration	--
Major pests and duration	--
Damage due to wildlife	No

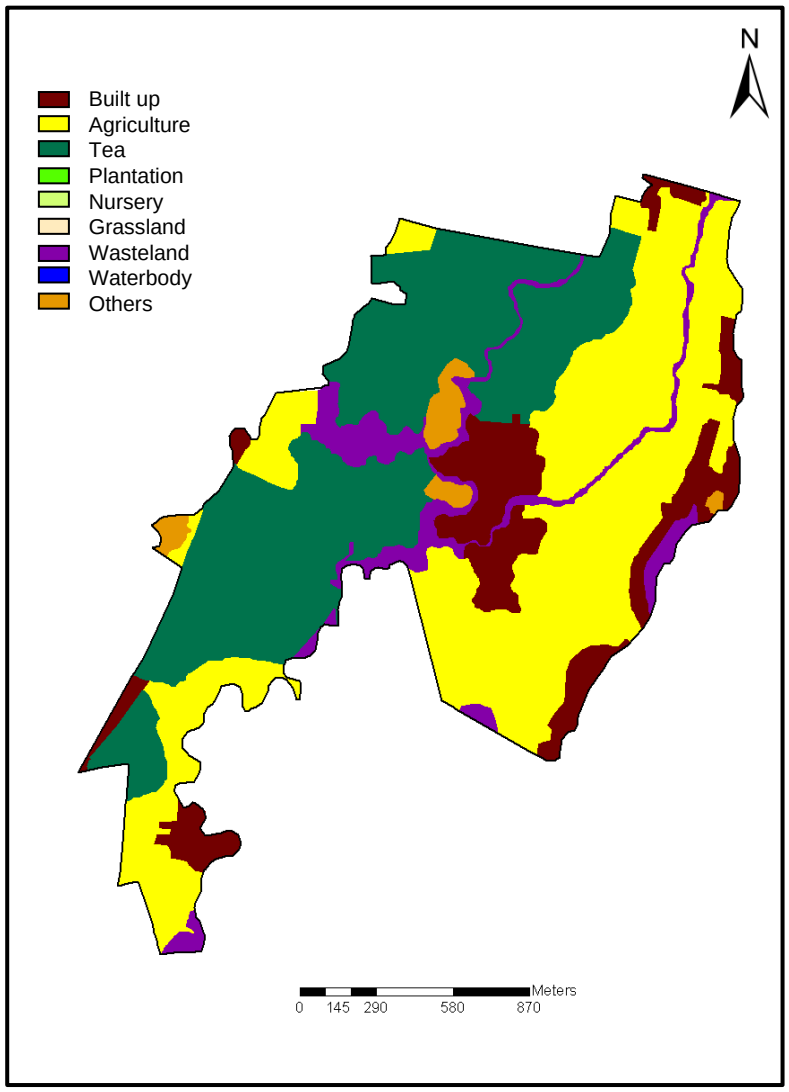
6. Yield / production	
Peak plucking periods	Jun-Oct
Annual green leaf yield	9170 kg/ha
Annual production of processed tea	1319123 kg

7. Pruning	
Time of pruning	Dec-Jan
Pruning cycle	4 yrs / 3 yrs
Types of pruning	LP-DS

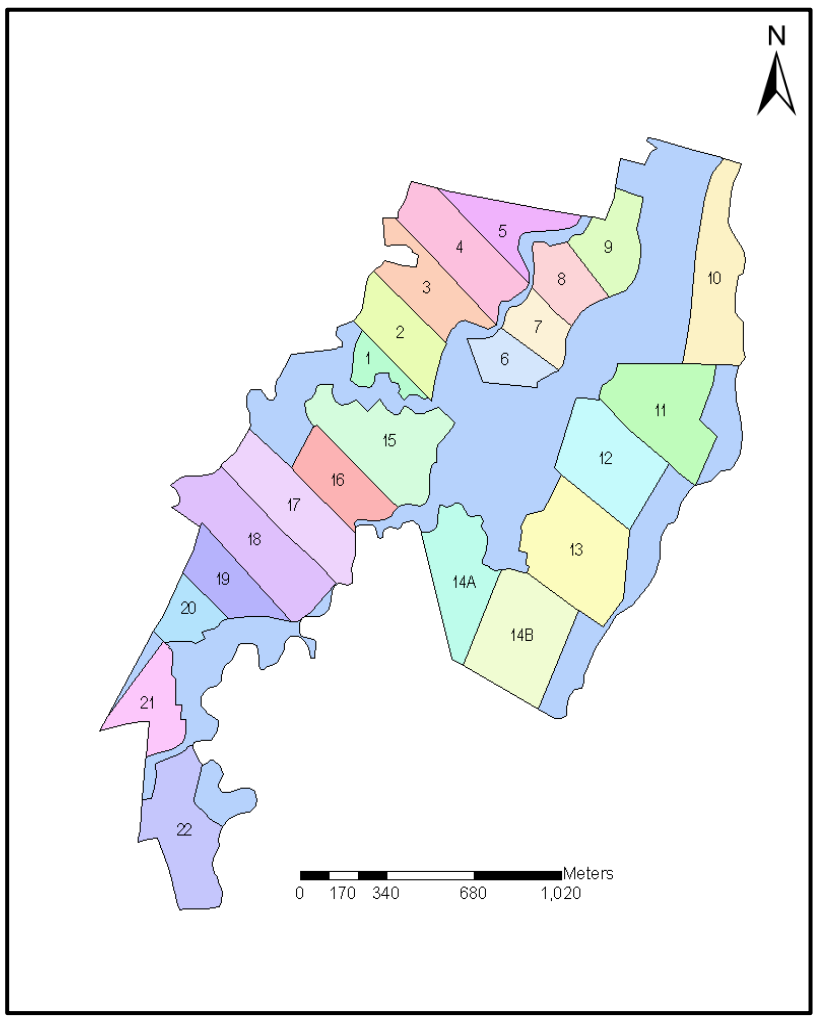
8. Fertilizer use	
Types of N, P, K fertilizers used	Urea, MOP, RP
Dose of Nitrogen (kg/ha)	100 - 160
Dose of Phosphorous (kg/ha)	30
Dose of Potash (kg/ha)	20
Whether lime is applied, if yes dose	--



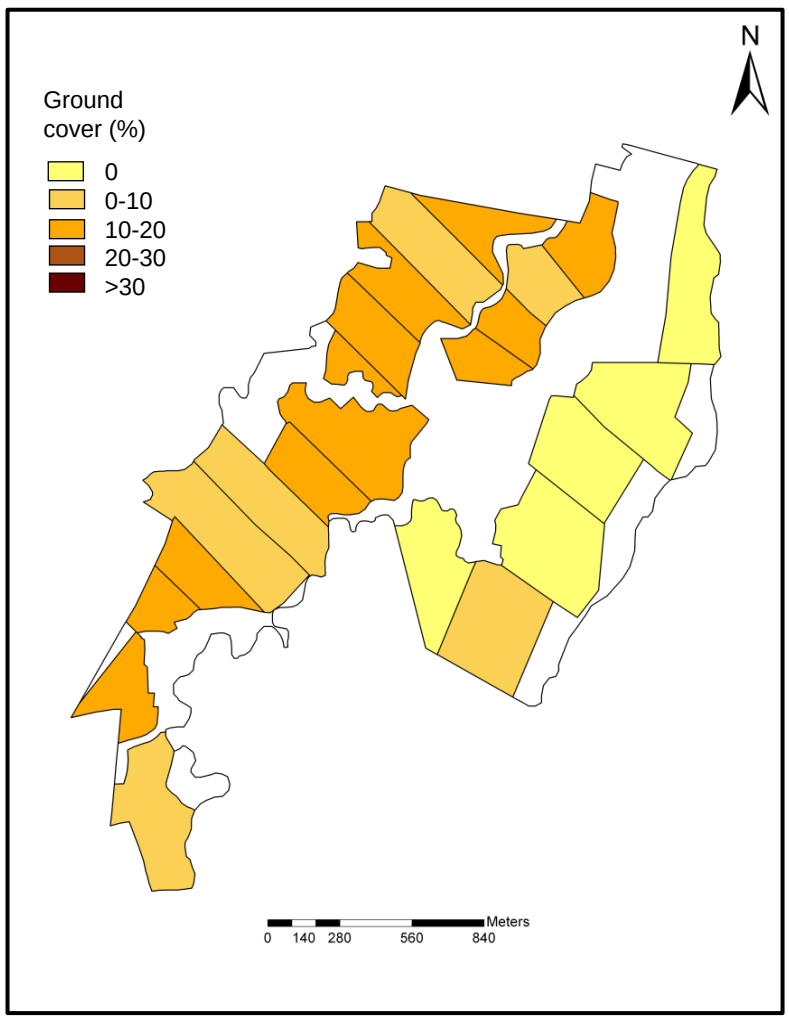
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse

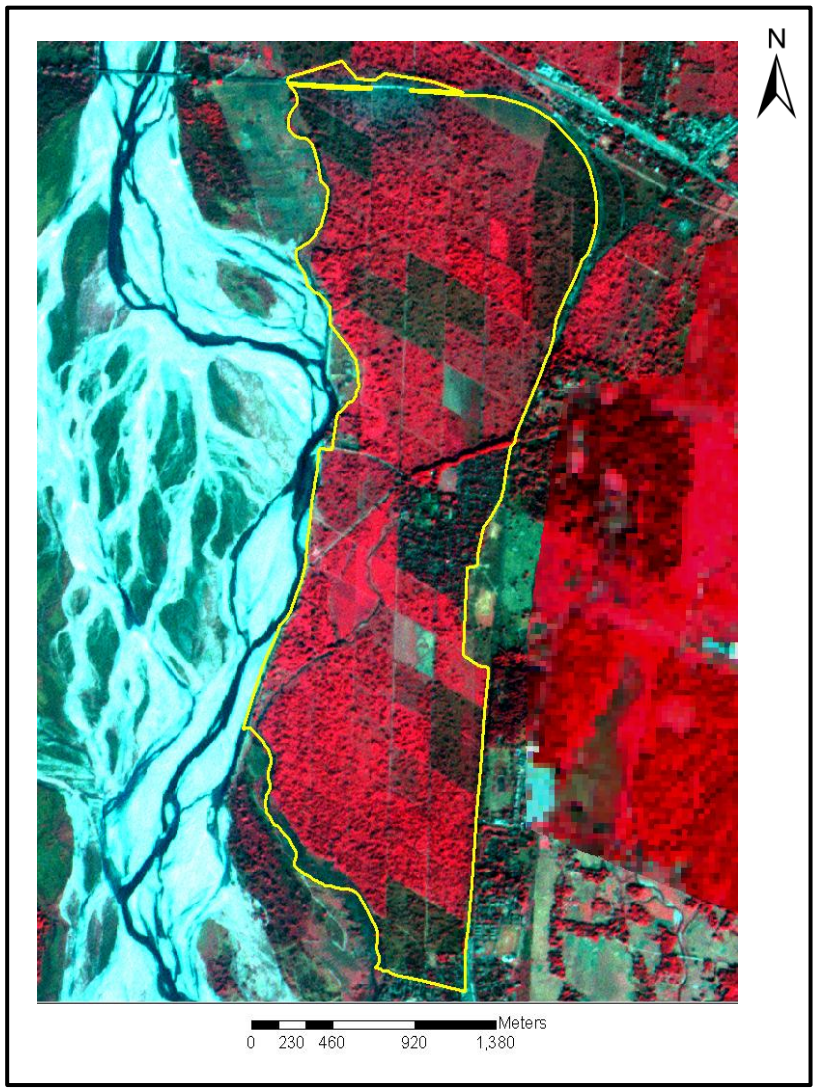


c. Section Boundaries of the Estate

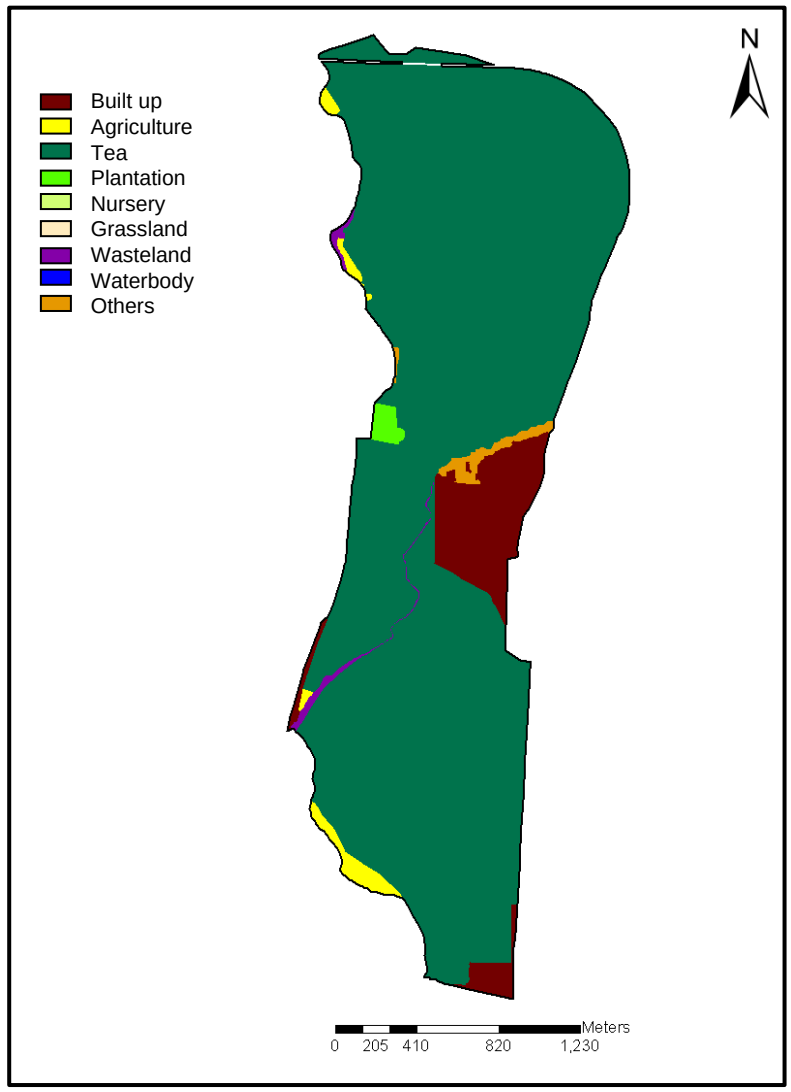


d. Shade Tree Density in Sections

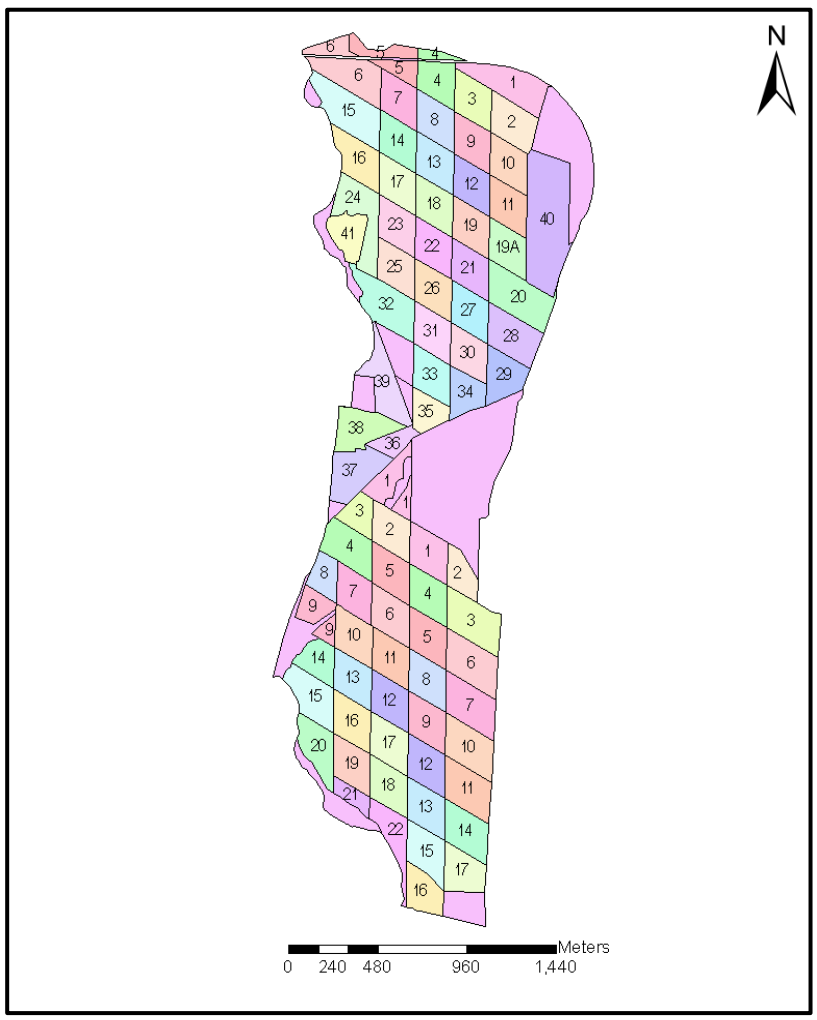
P120: SUBHASINI TE



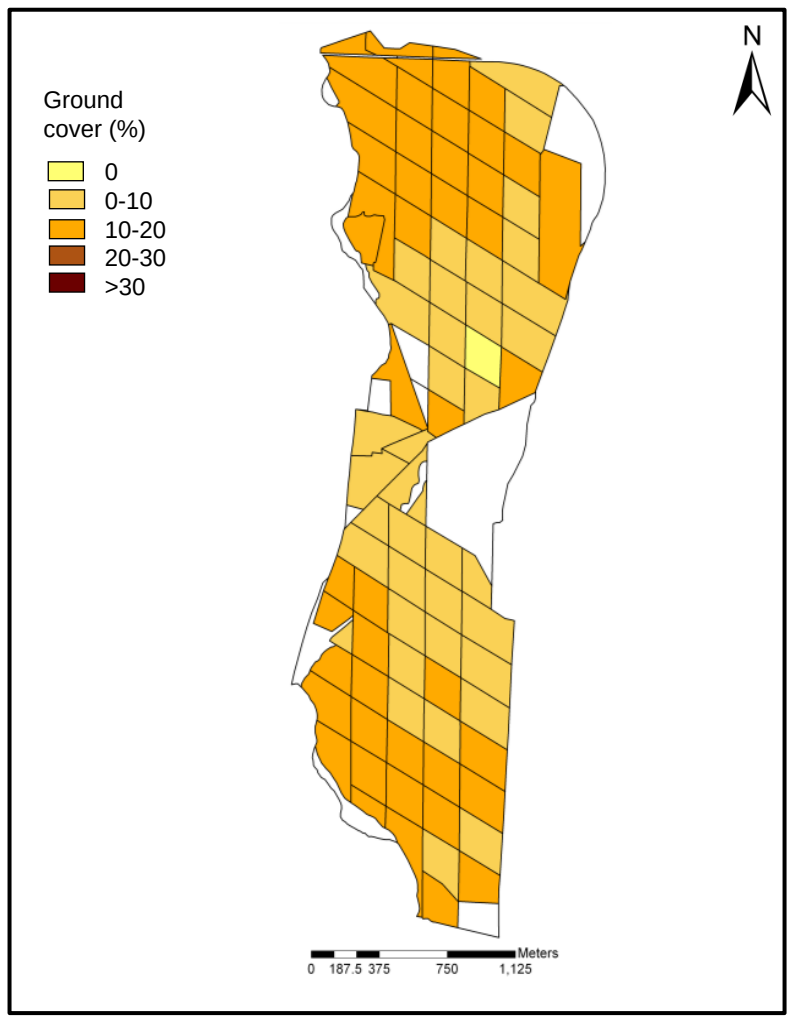
a. False Colour Composite of IRS LISS IV



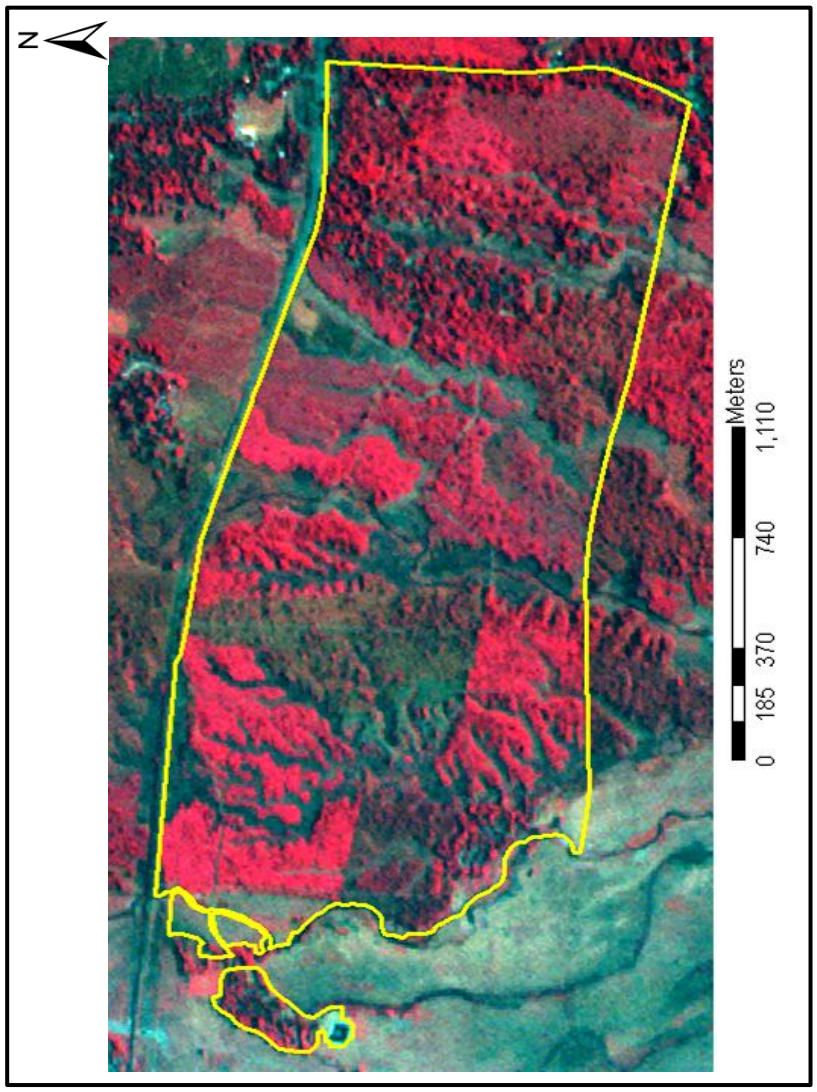
b. Tea Estate Landuse



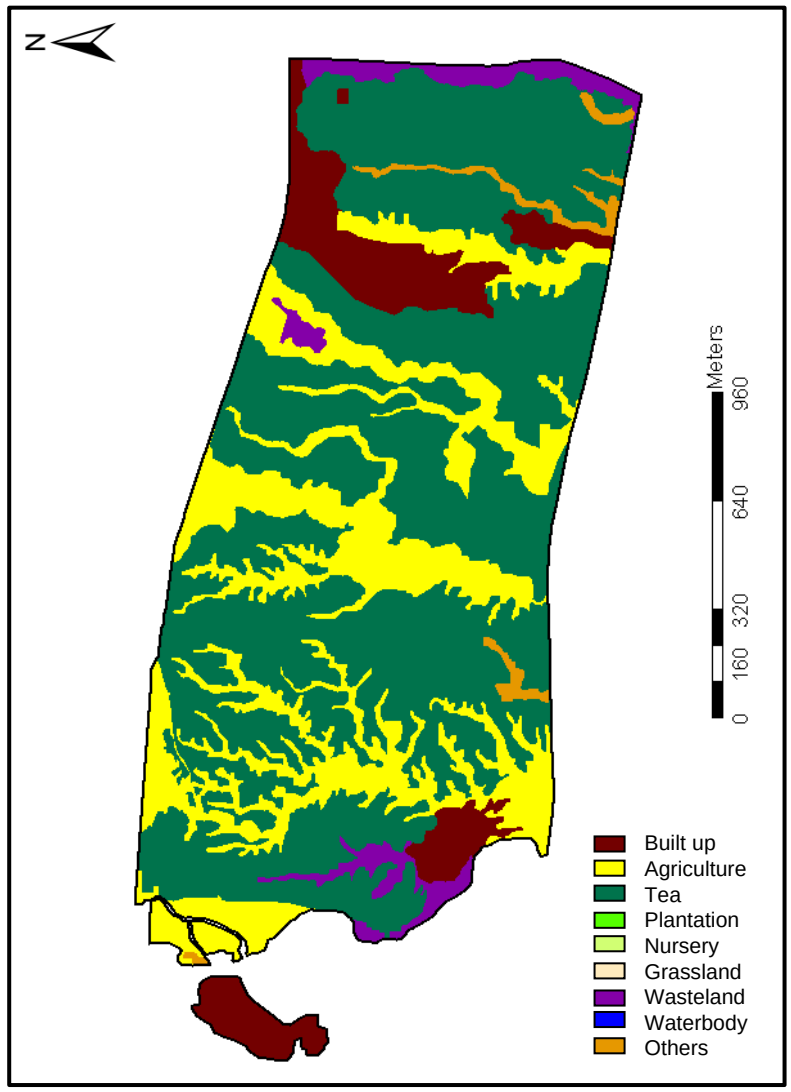
c. Section Boundaries of the Estate



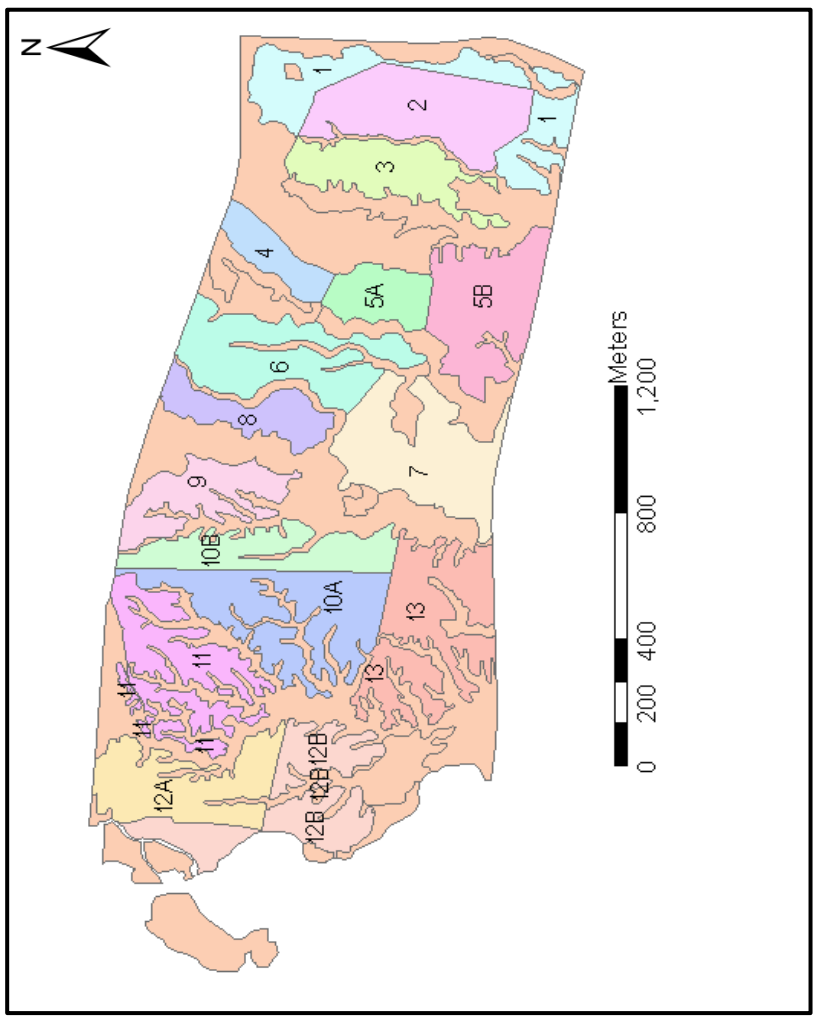
d. Shade Tree Density in Sections



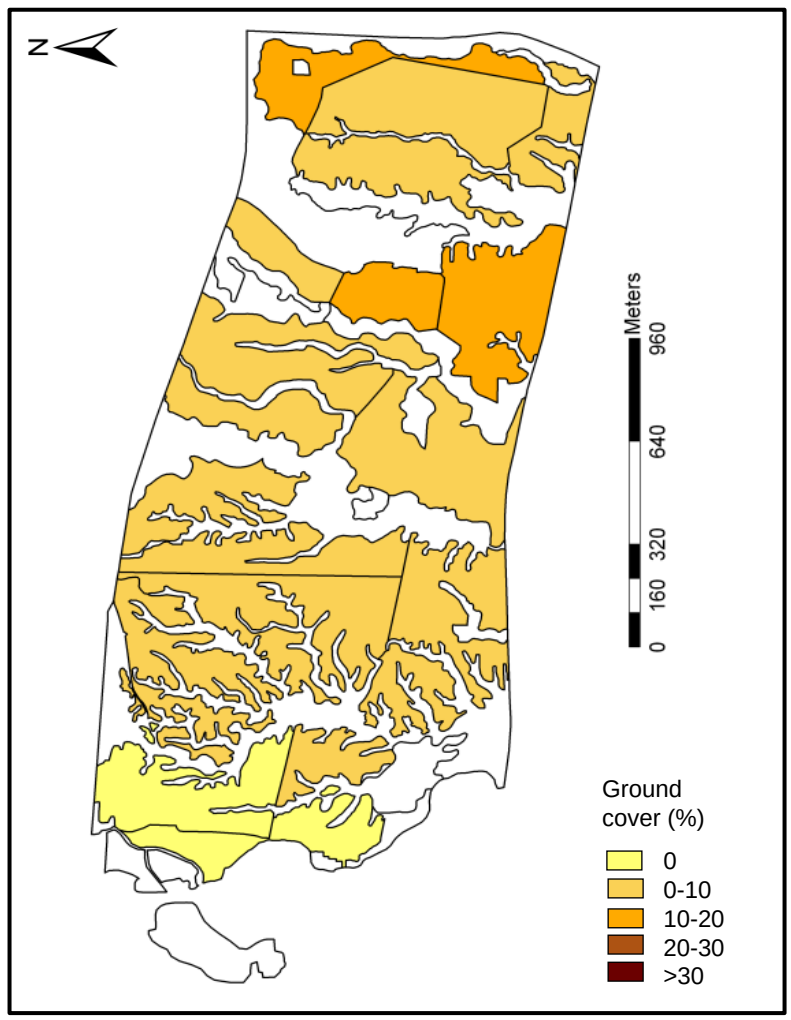
a. False Colour Composite of IRS LISS IV



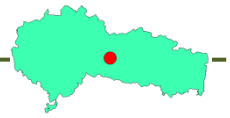
b. Tea Estate Landuse

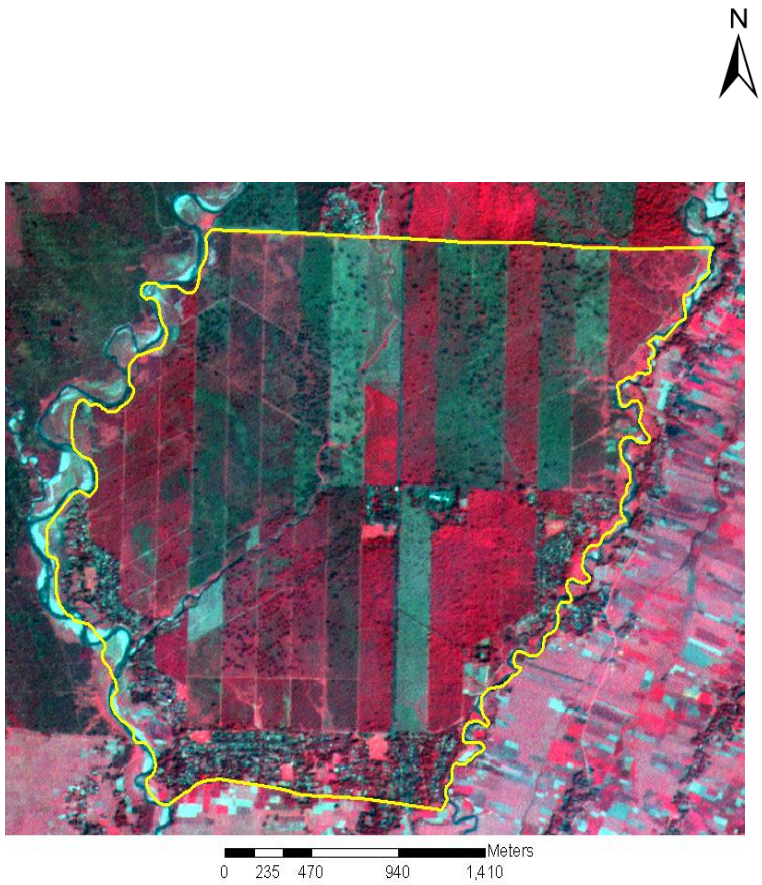


c. Section Boundaries of the Estate

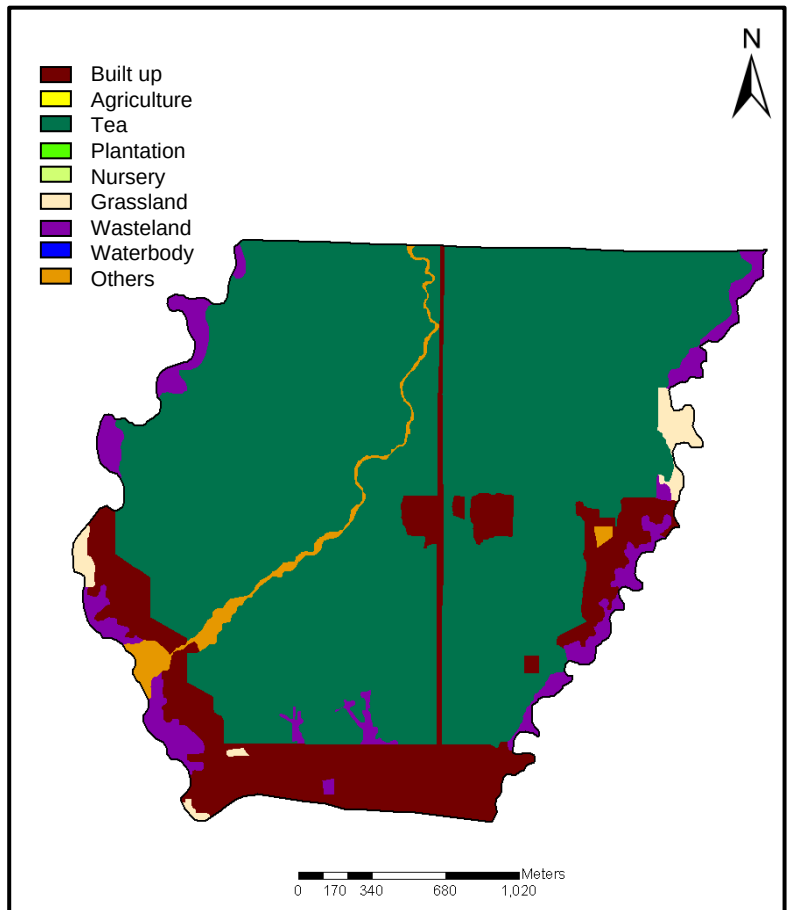


d. Shade Tree Density in Sections

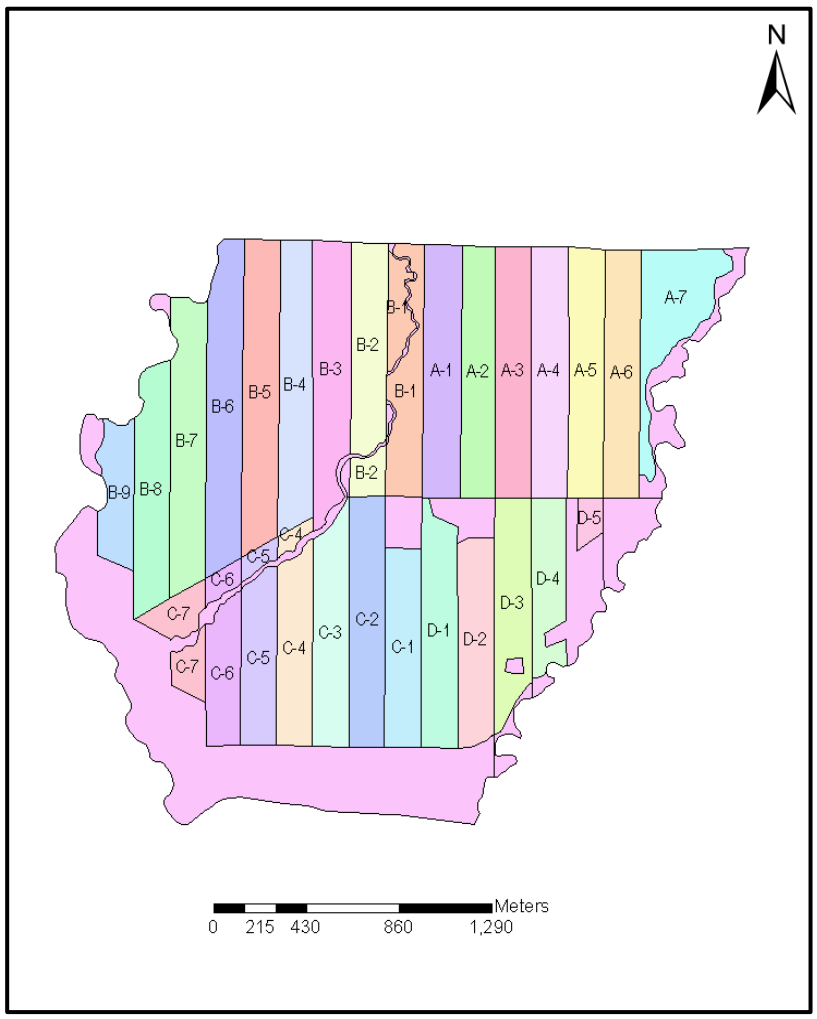




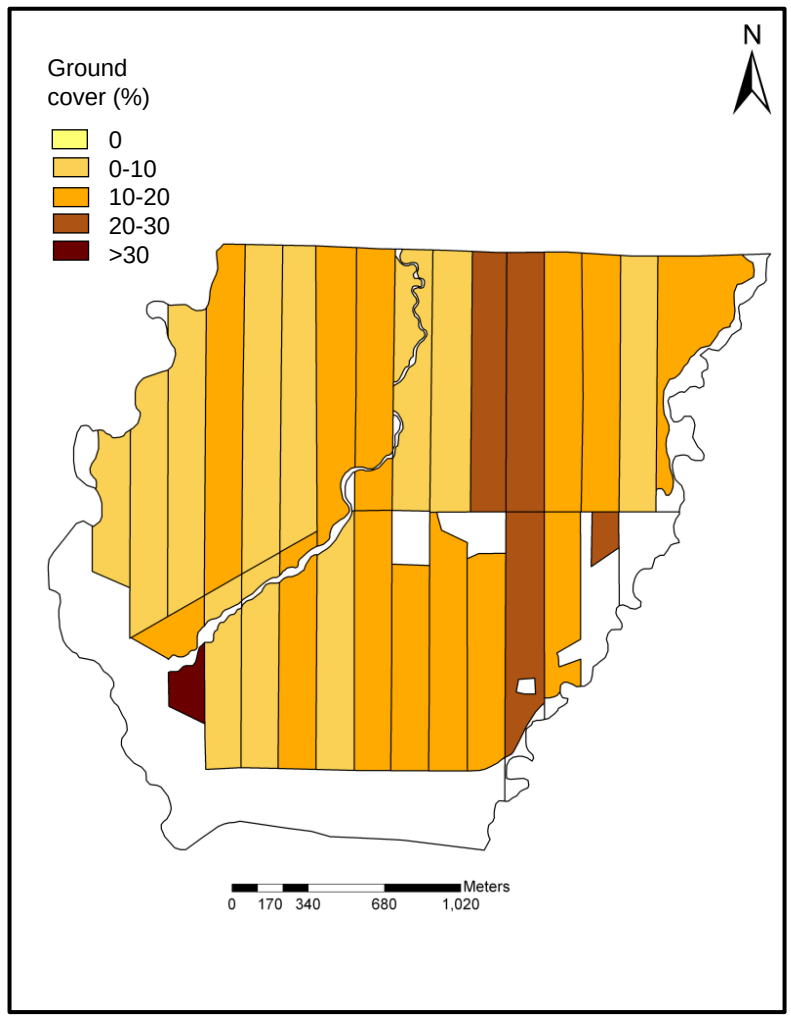
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse

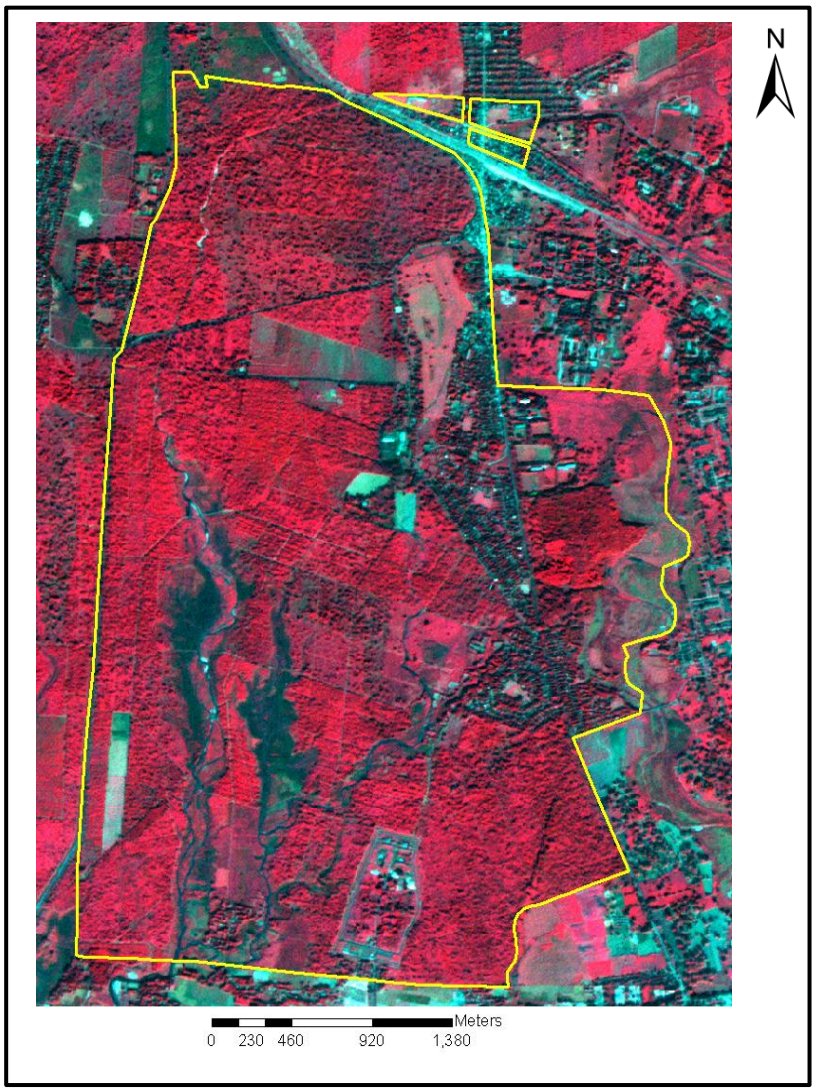


c. Section Boundaries of the Estate

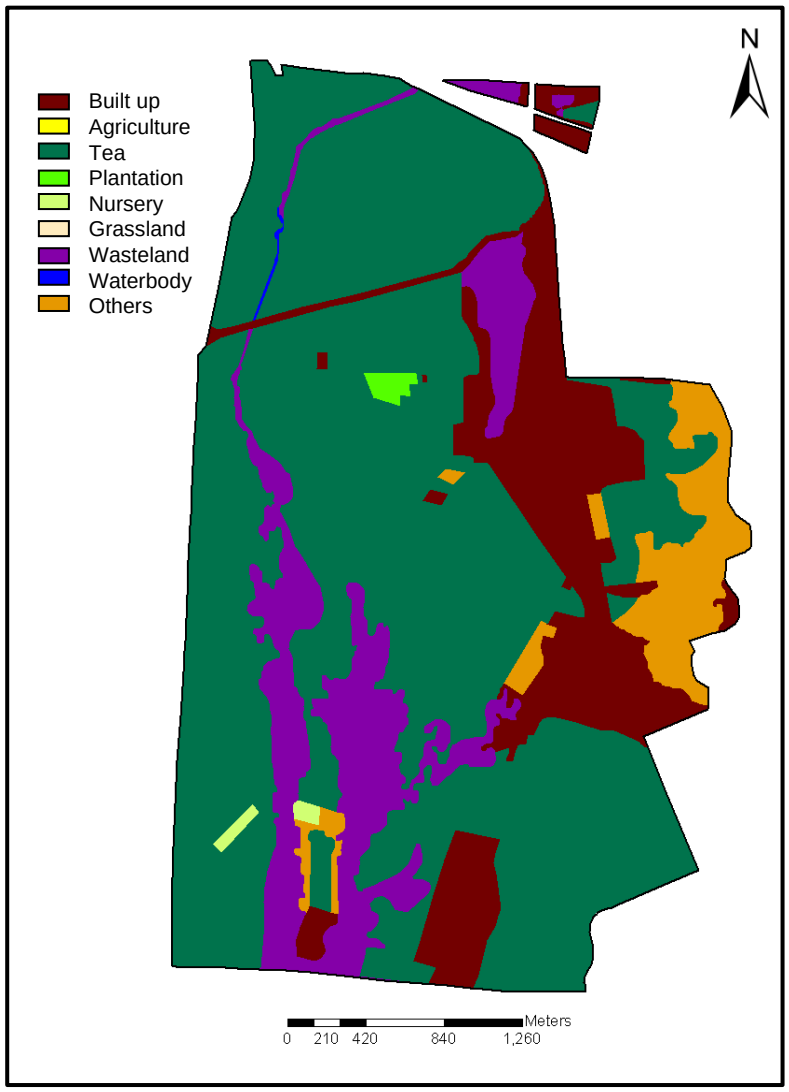


d. Shade Tree Density in Sections

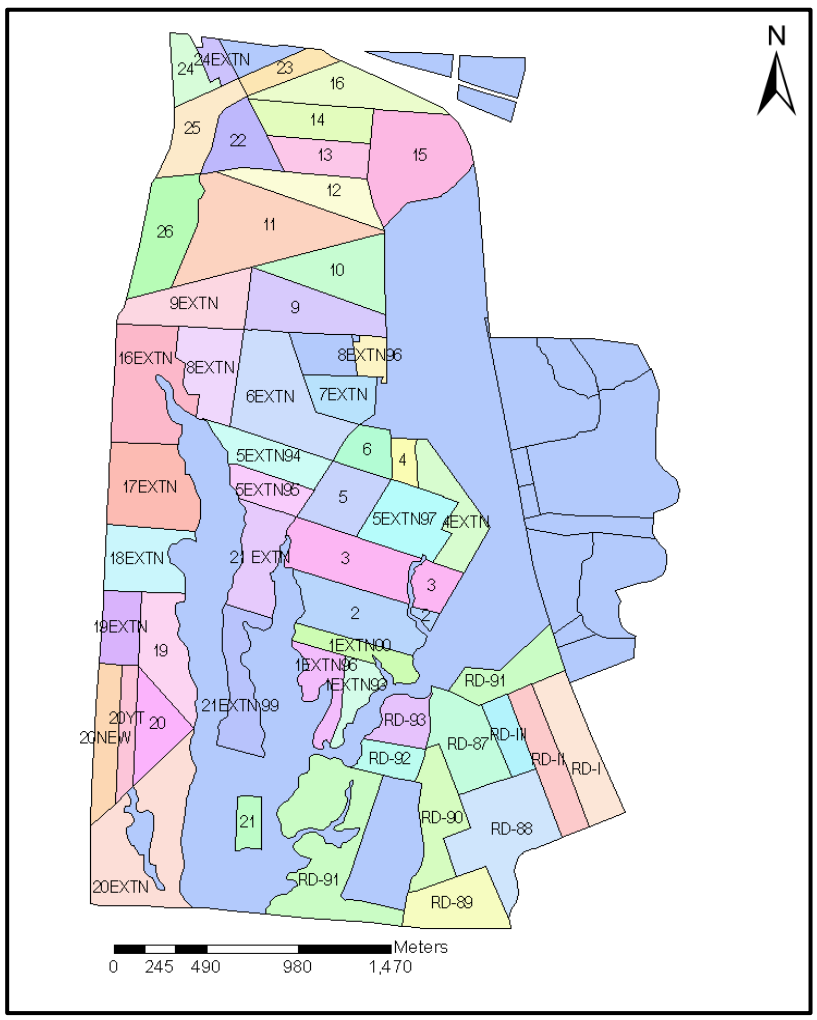
P123: TELEPARA TE



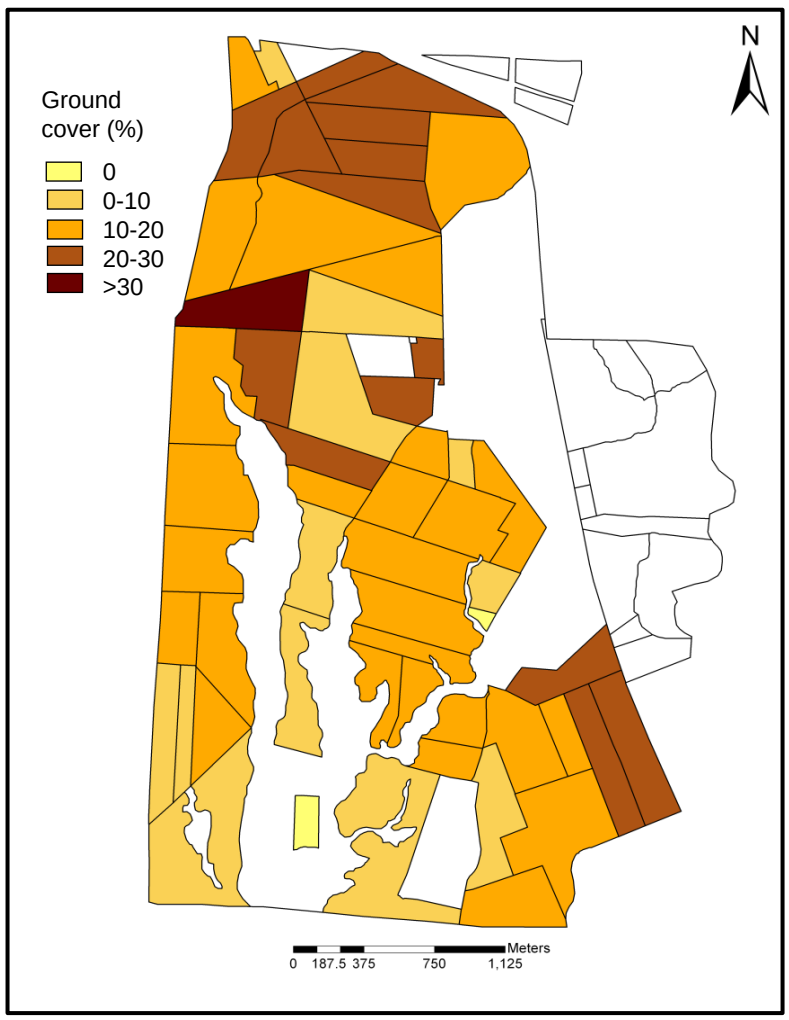
a. False Colour Composite of IRS LISS IV



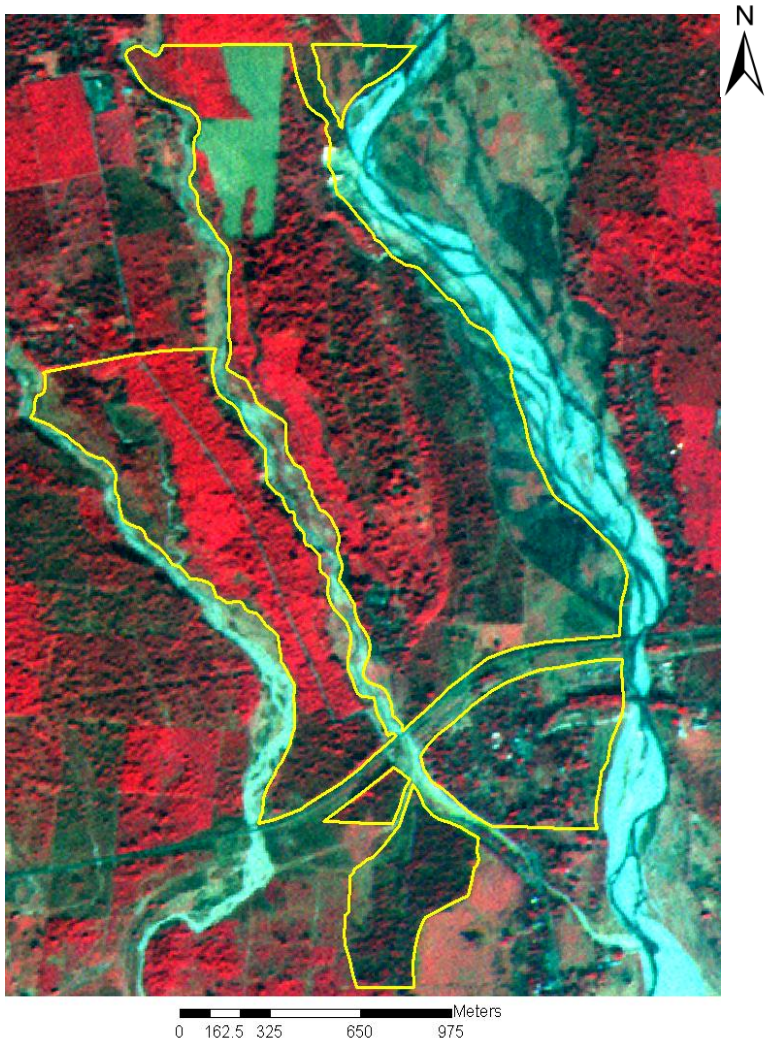
b. Tea Estate Landuse



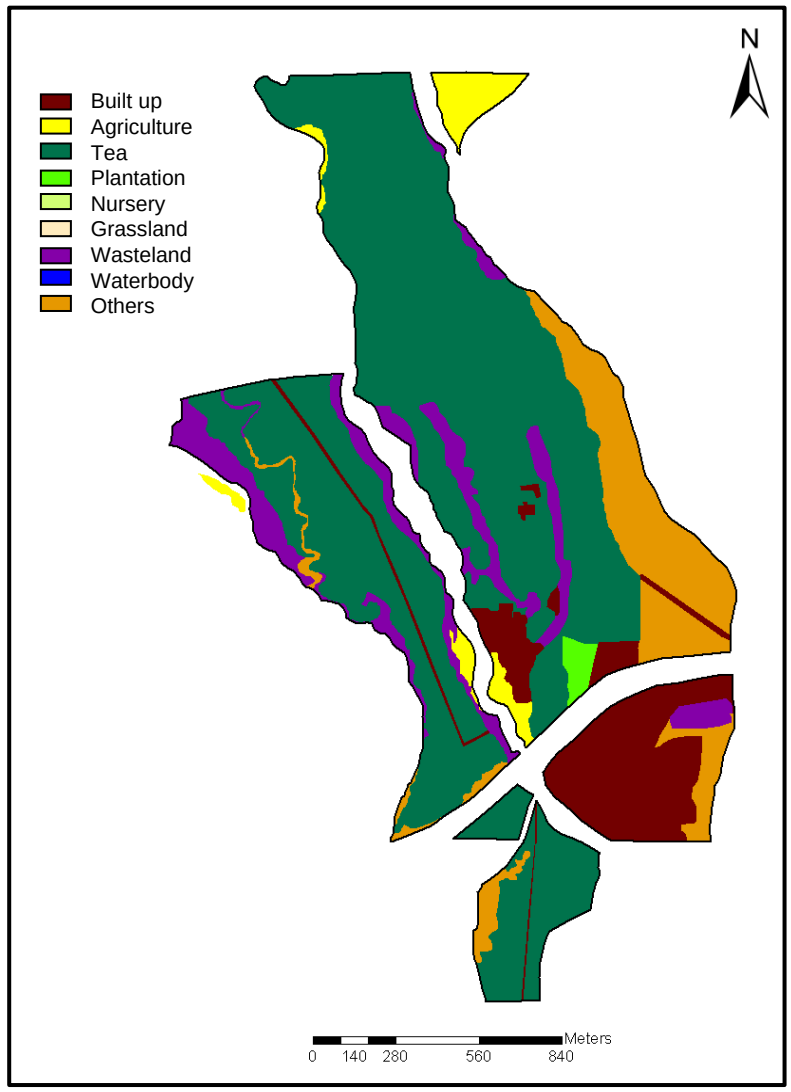
c. Section Boundaries of the Estate



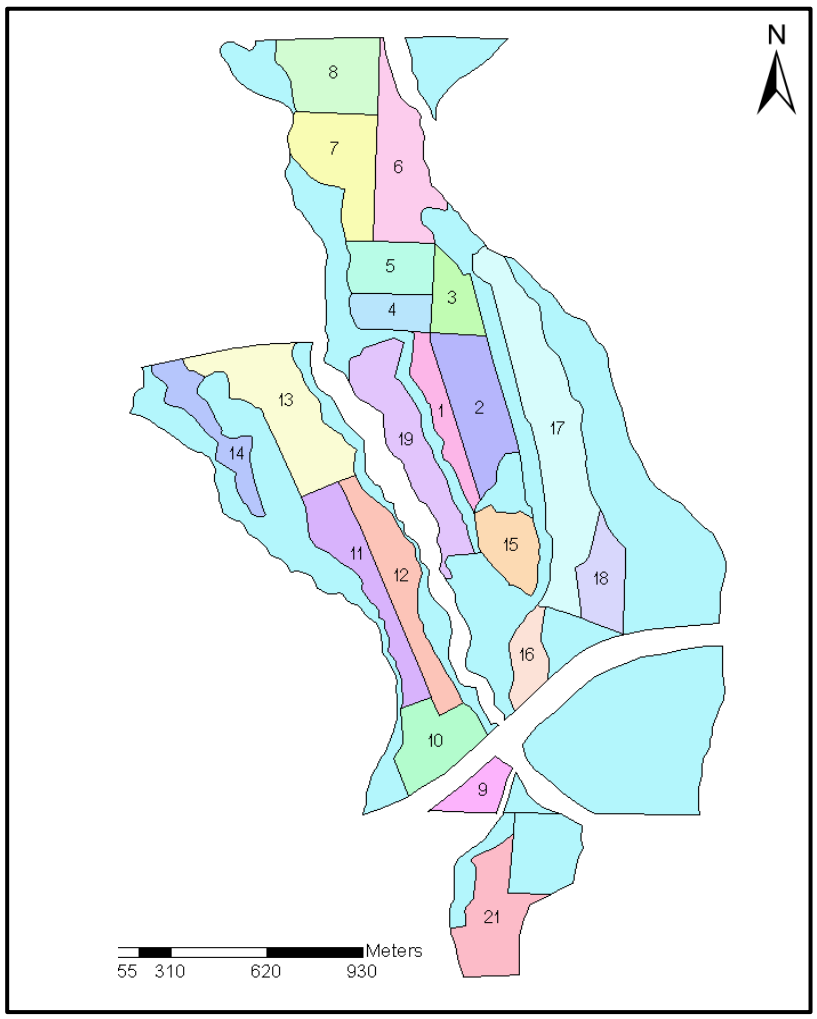
d. Shade Tree Density in Sections



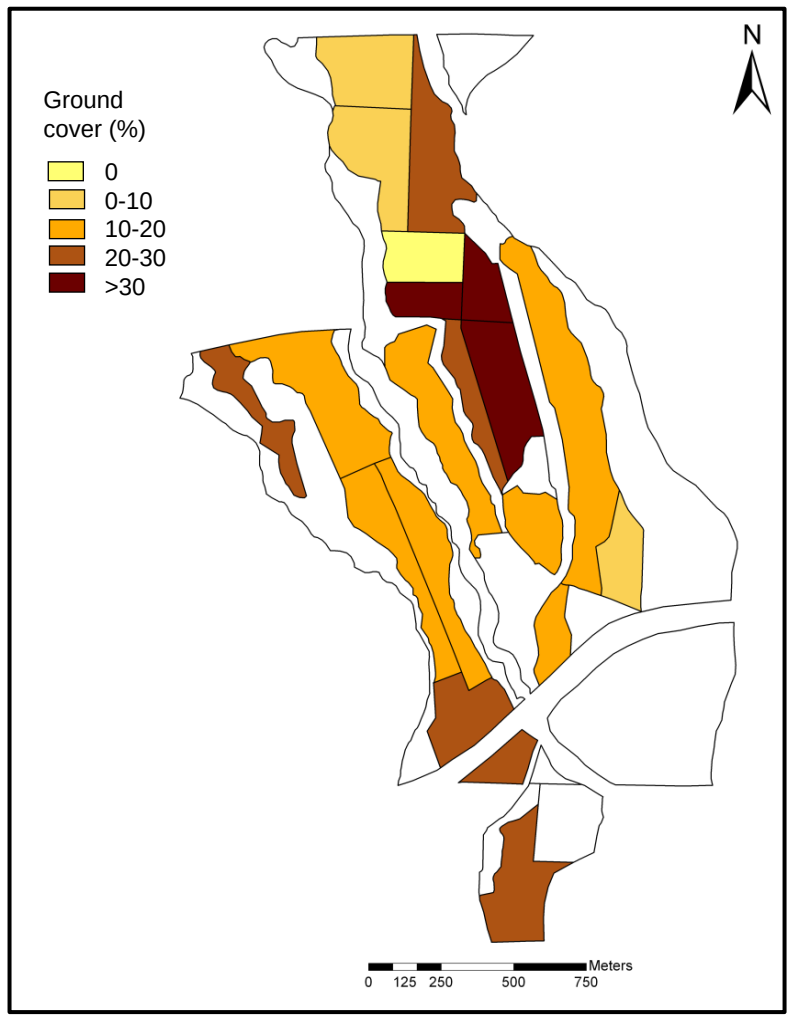
a. False Colour Composite of IRS LISS IV



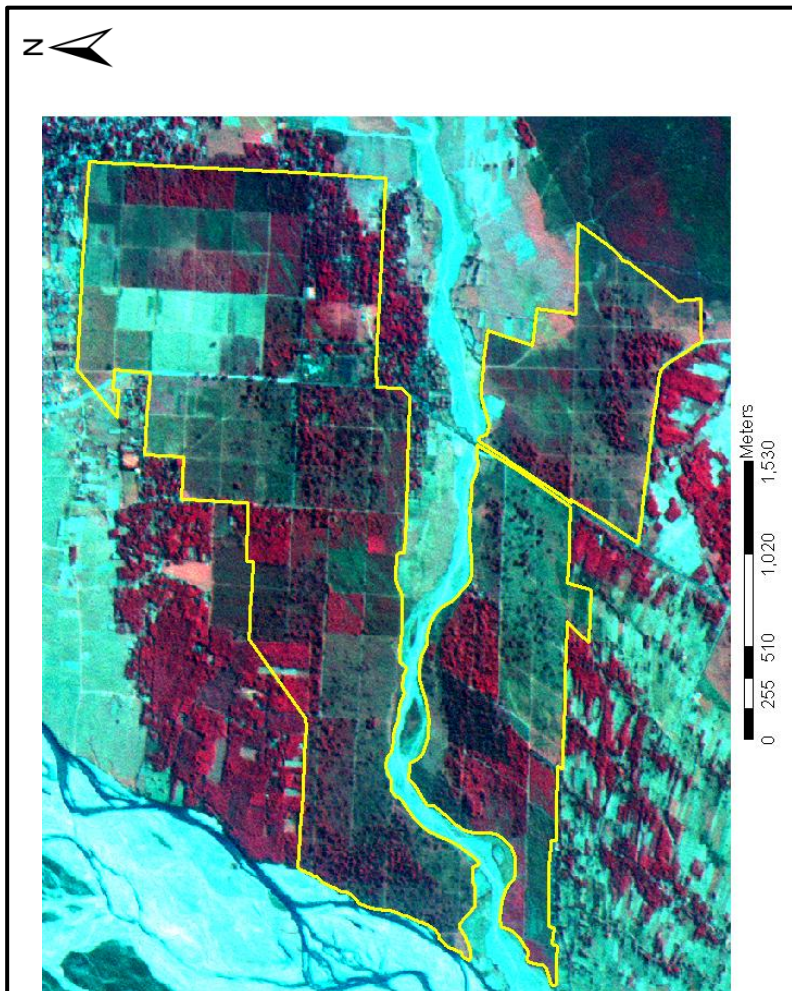
b. Tea Estate Landuse



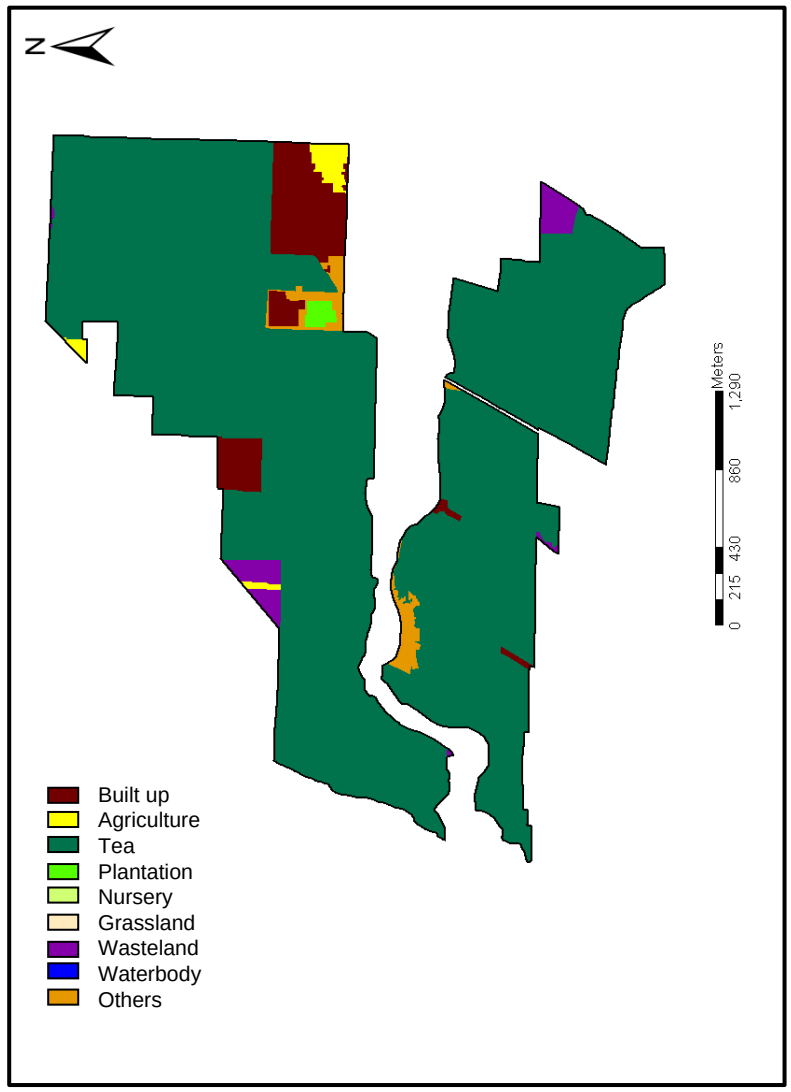
c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

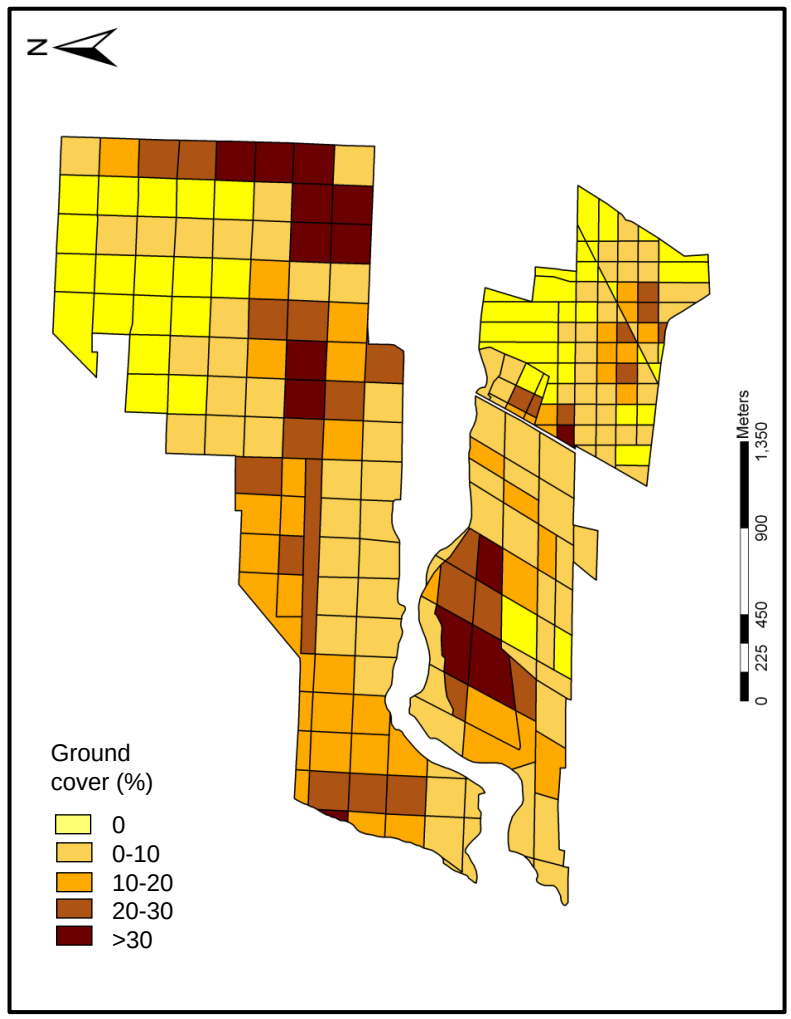


a. False Colour Composite of IRS LISS IV



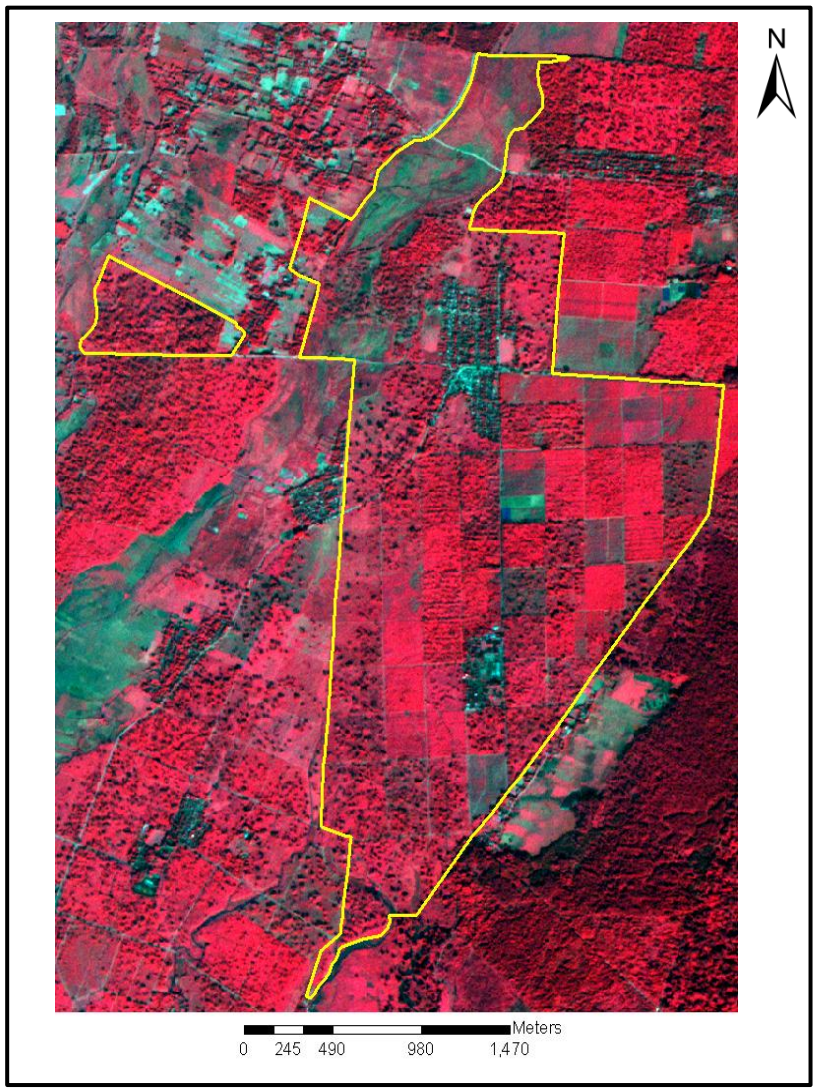
b. Tea Estate Landuse

c. Section Boundaries of the Estate

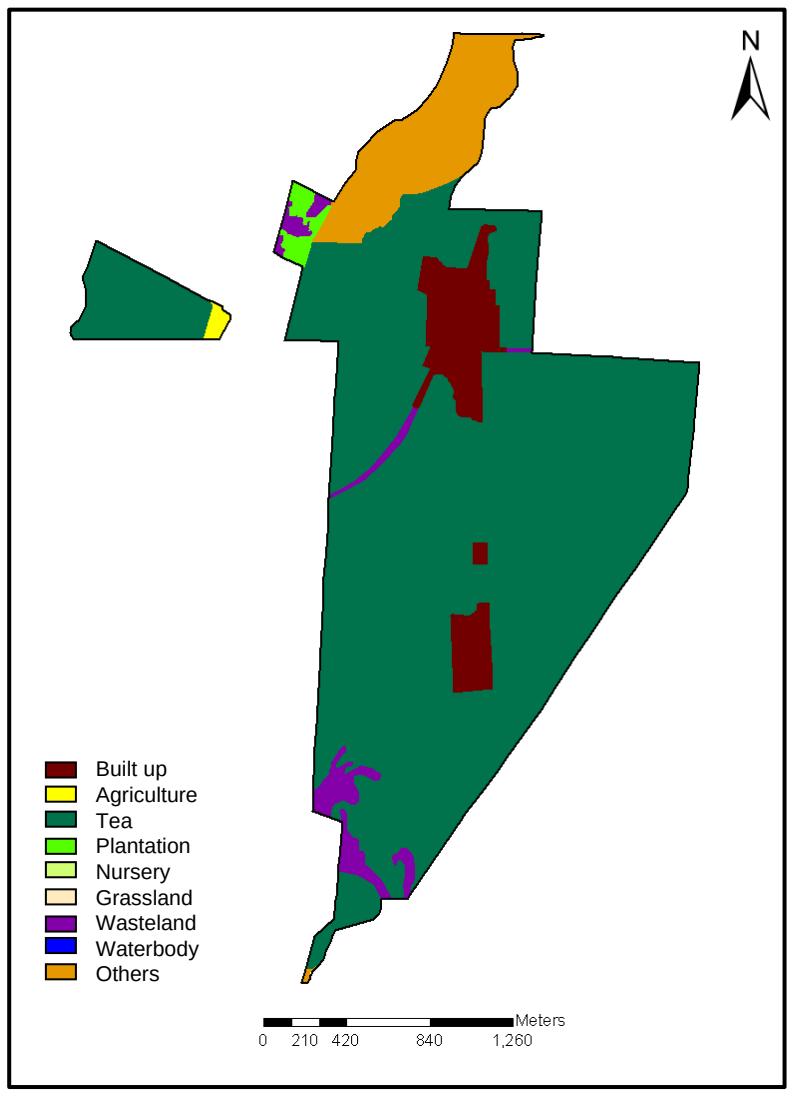


d. Shade Tree Density in Sections

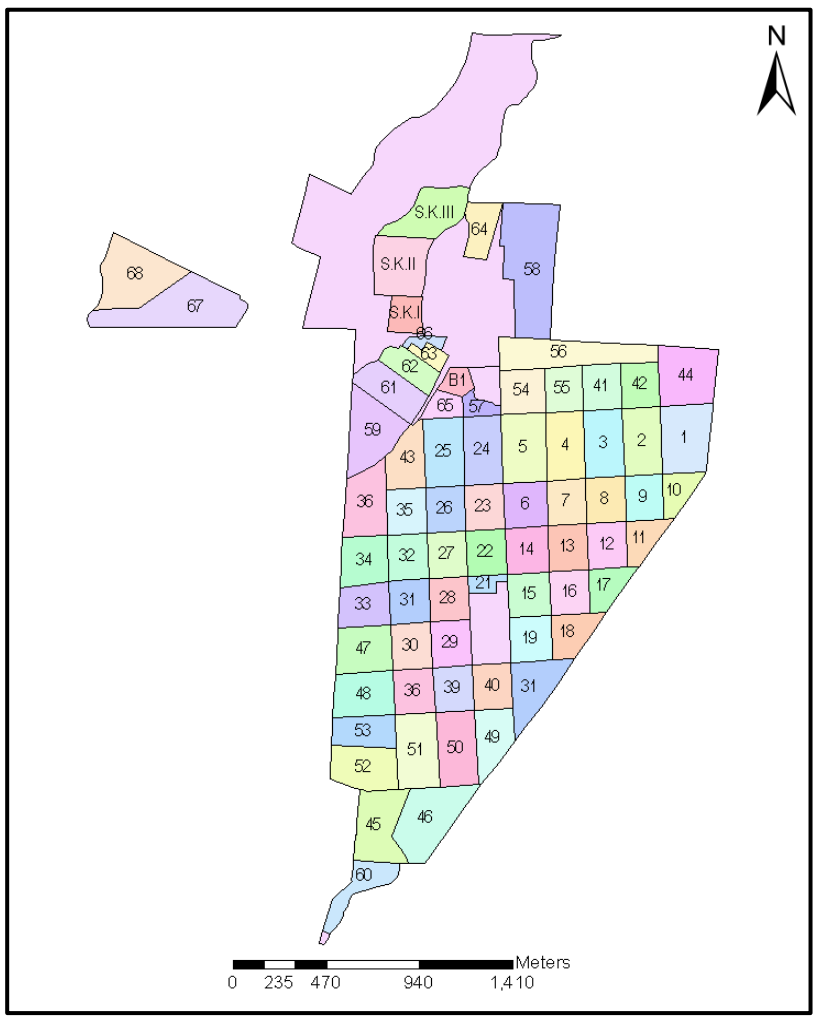
P126: TOTAPARA TE



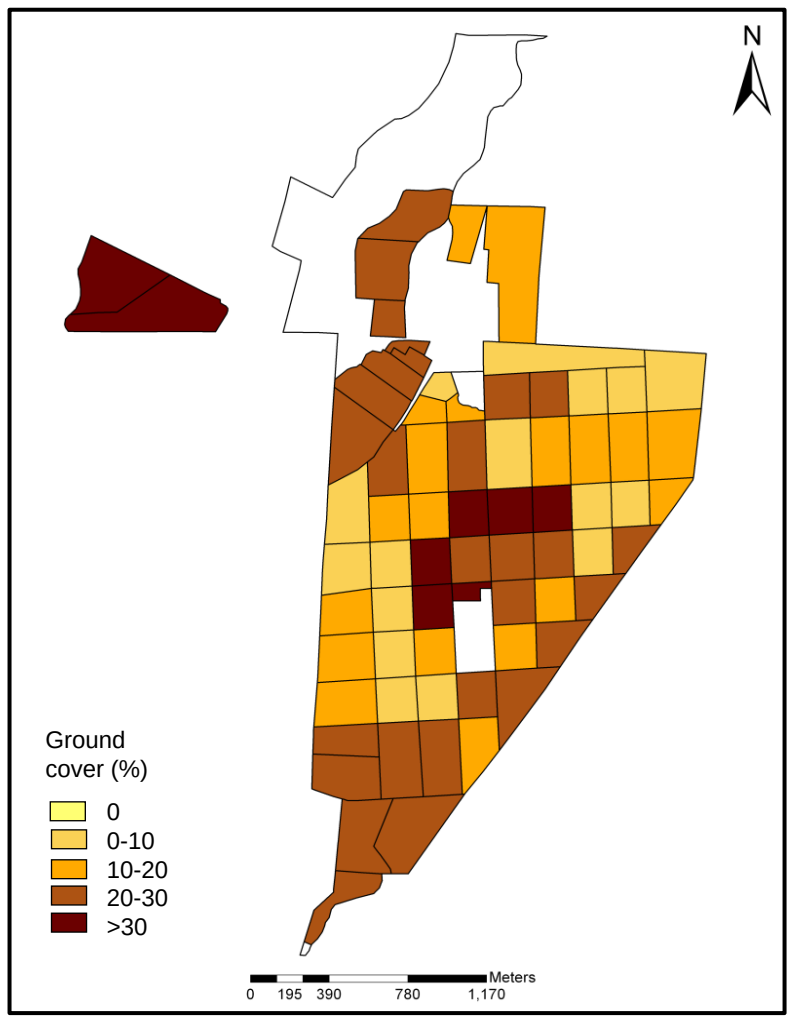
a. False Colour Composite of IRS LISS IV



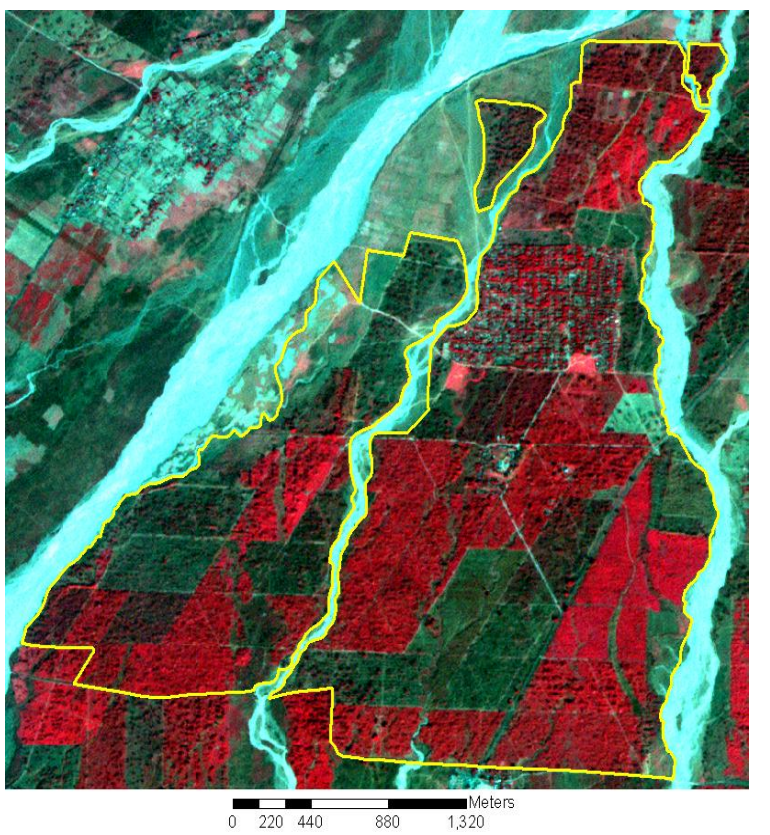
b. Tea Estate Landuse



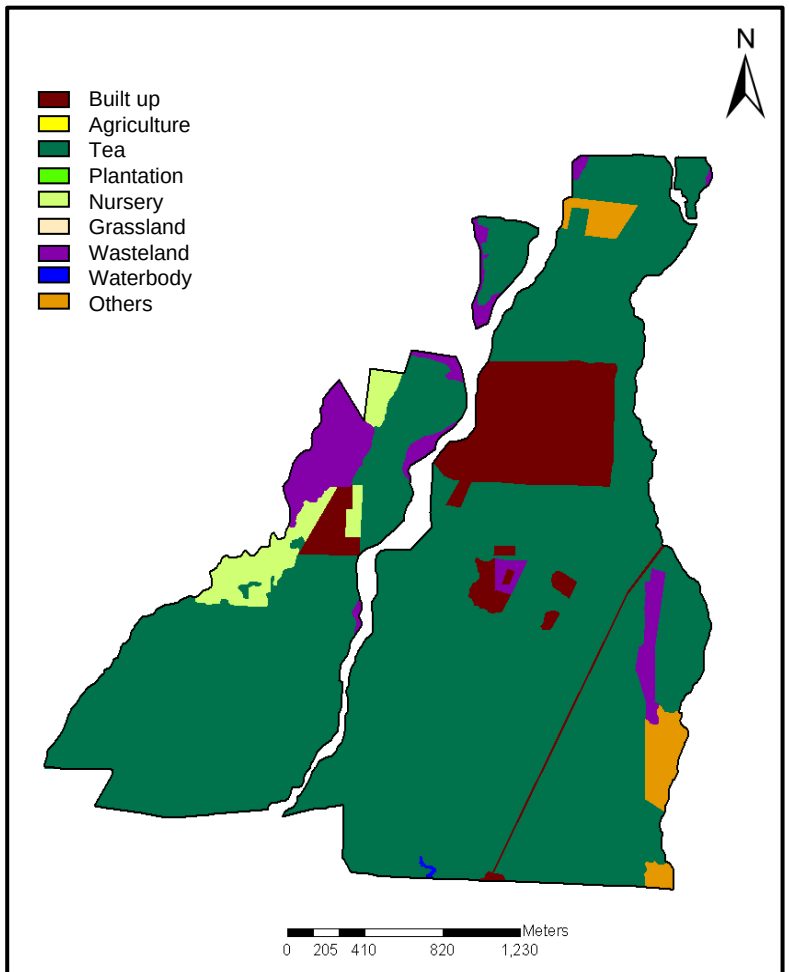
c. Section Boundaries of the Estate



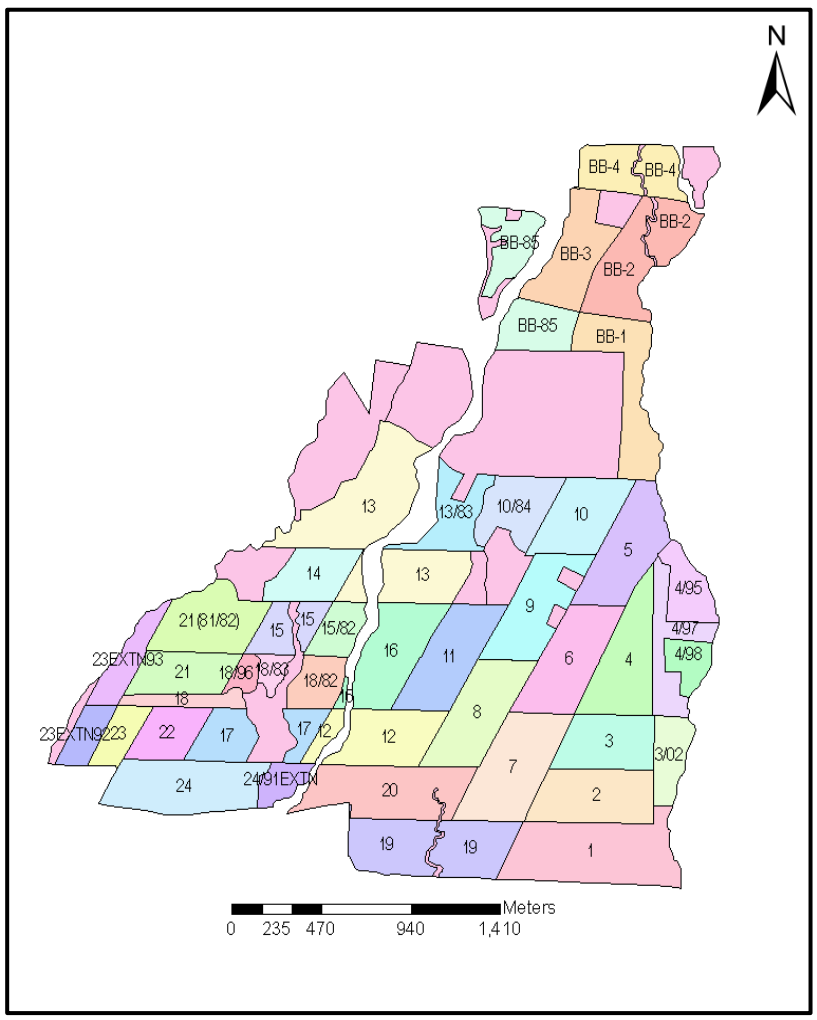
d. Shade Tree Density in Sections



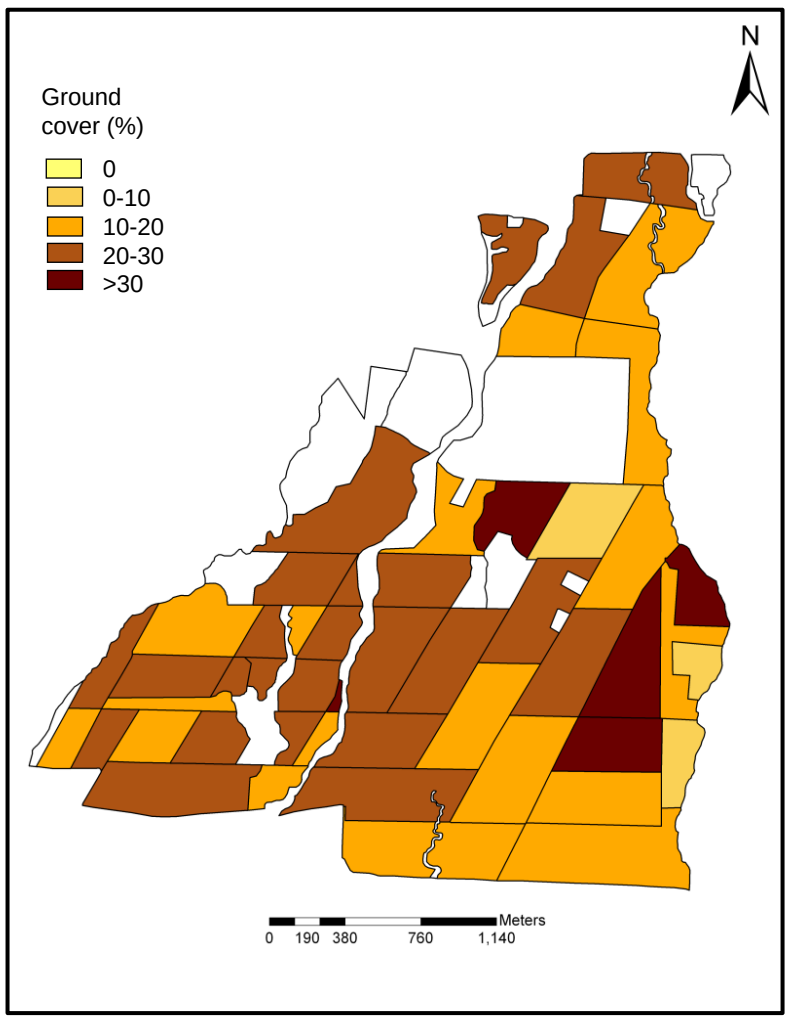
a. False Colour Composite of IRS LISS IV



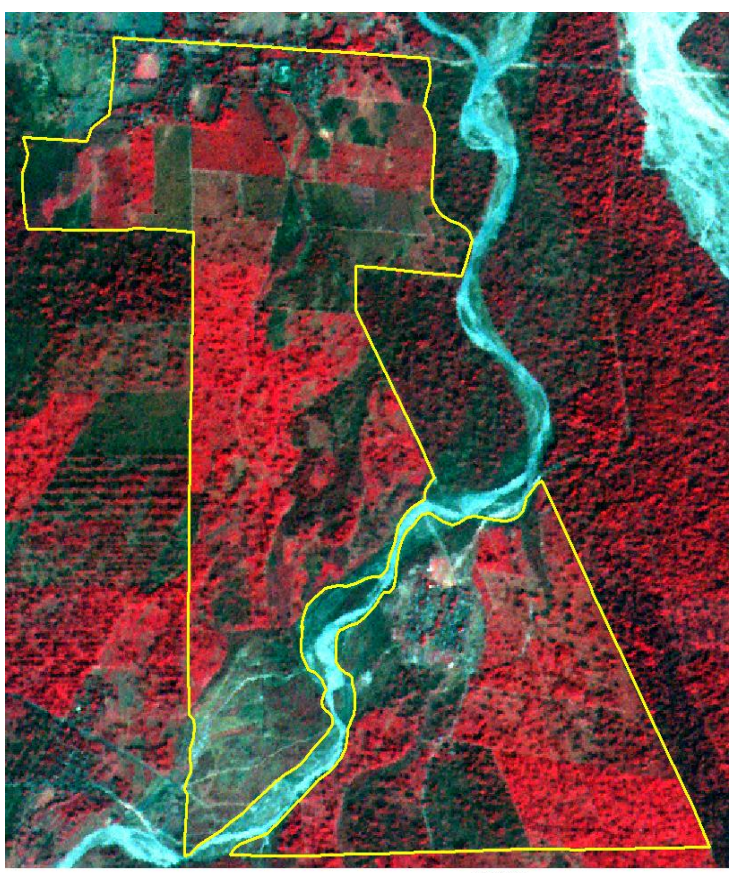
b. Tea Estate Landuse



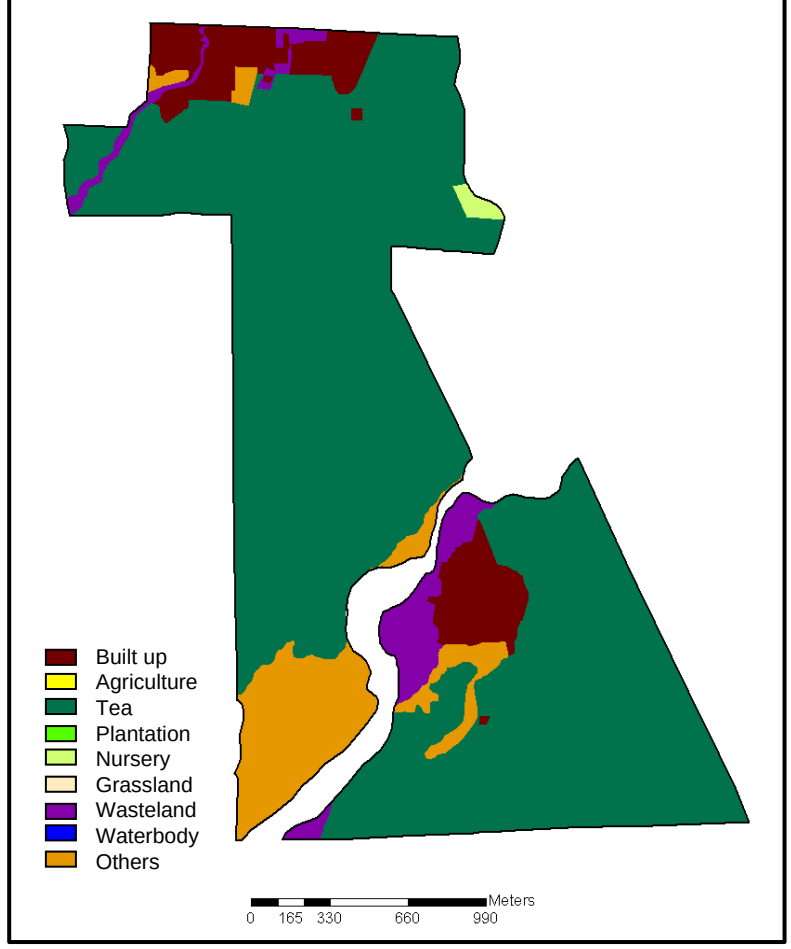
c. Section Boundaries of the Estate



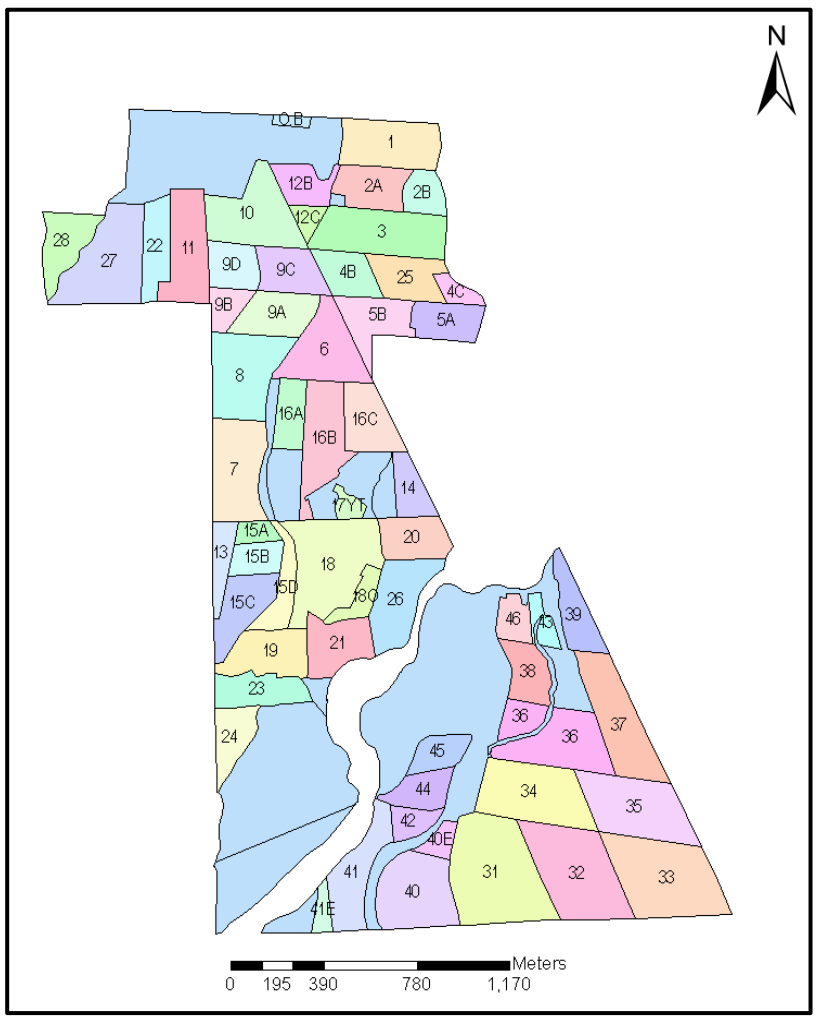
d. Shade Tree Density in Sections



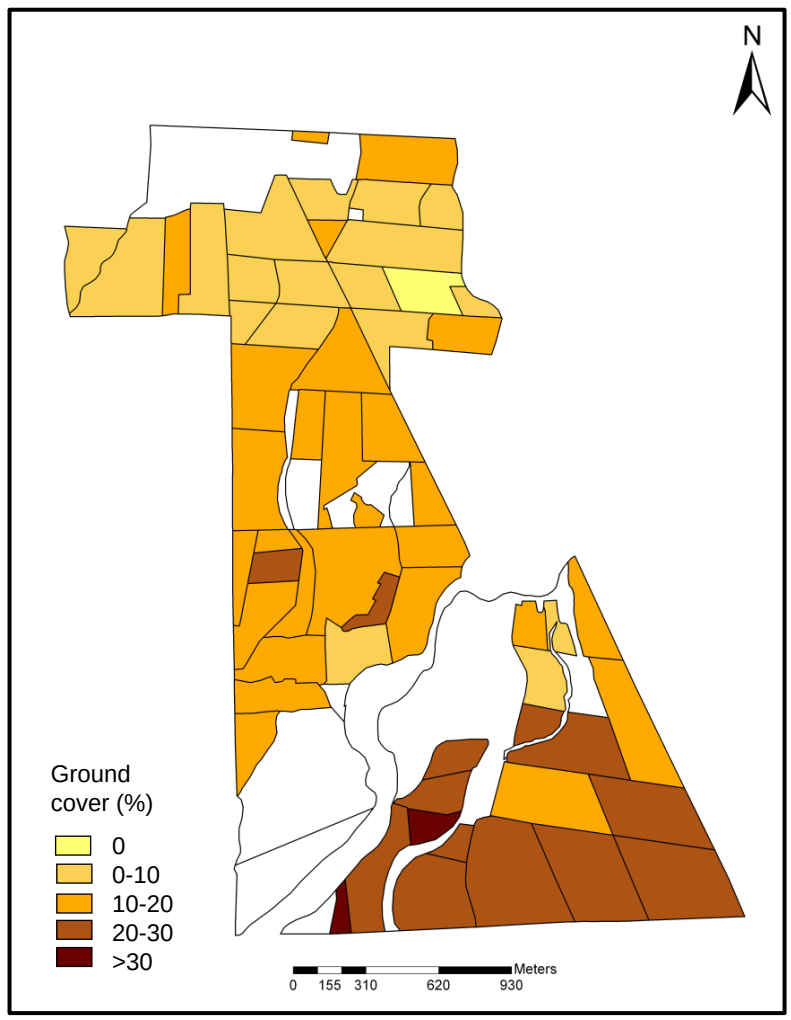
a. False Colour Composite of IRS LISS IV



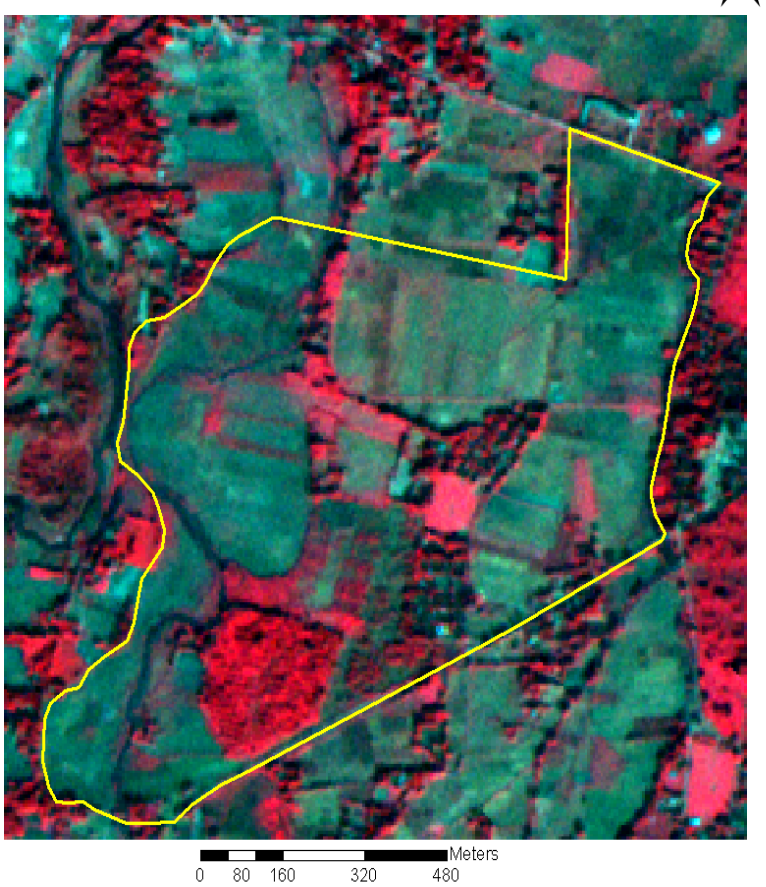
b. Tea Estate Landuse



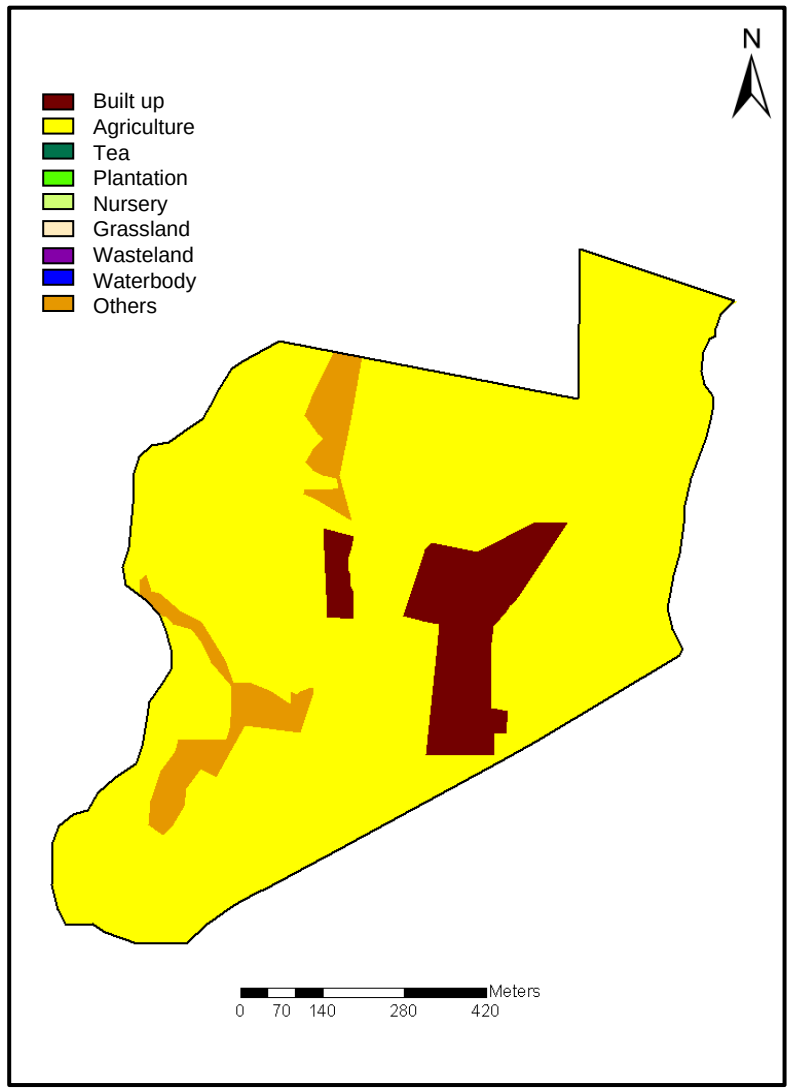
c. Section Boundaries of the Estate



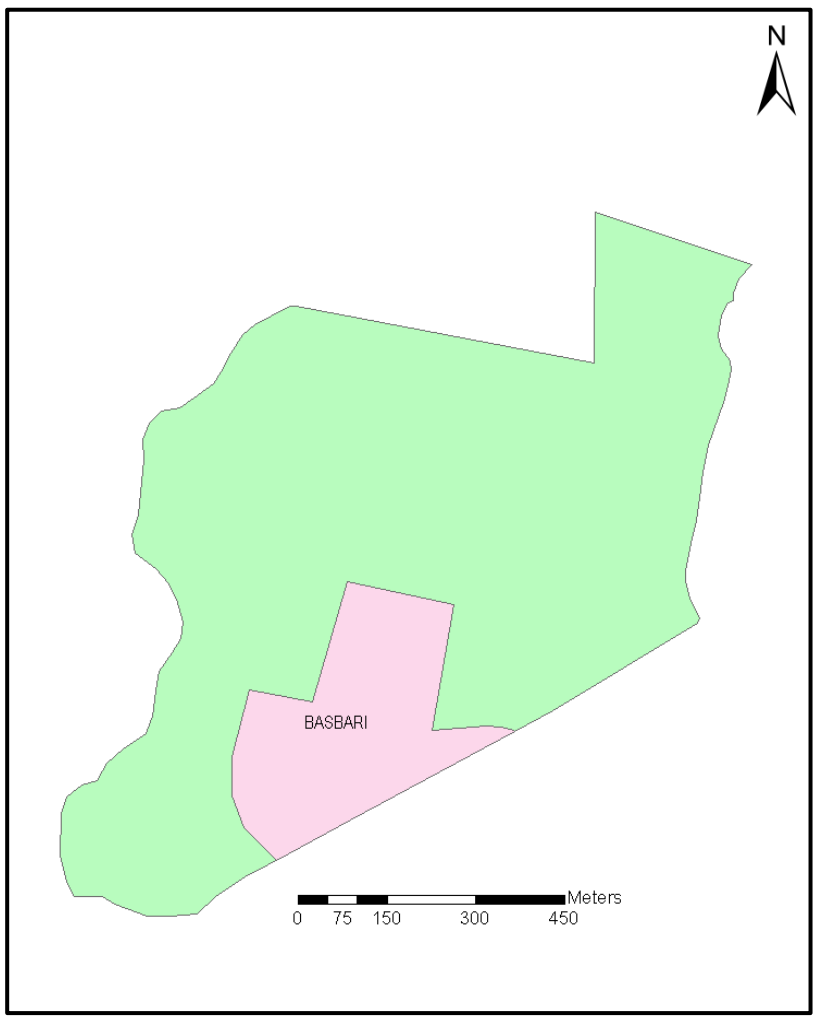
d. Shade Tree Density in Sections



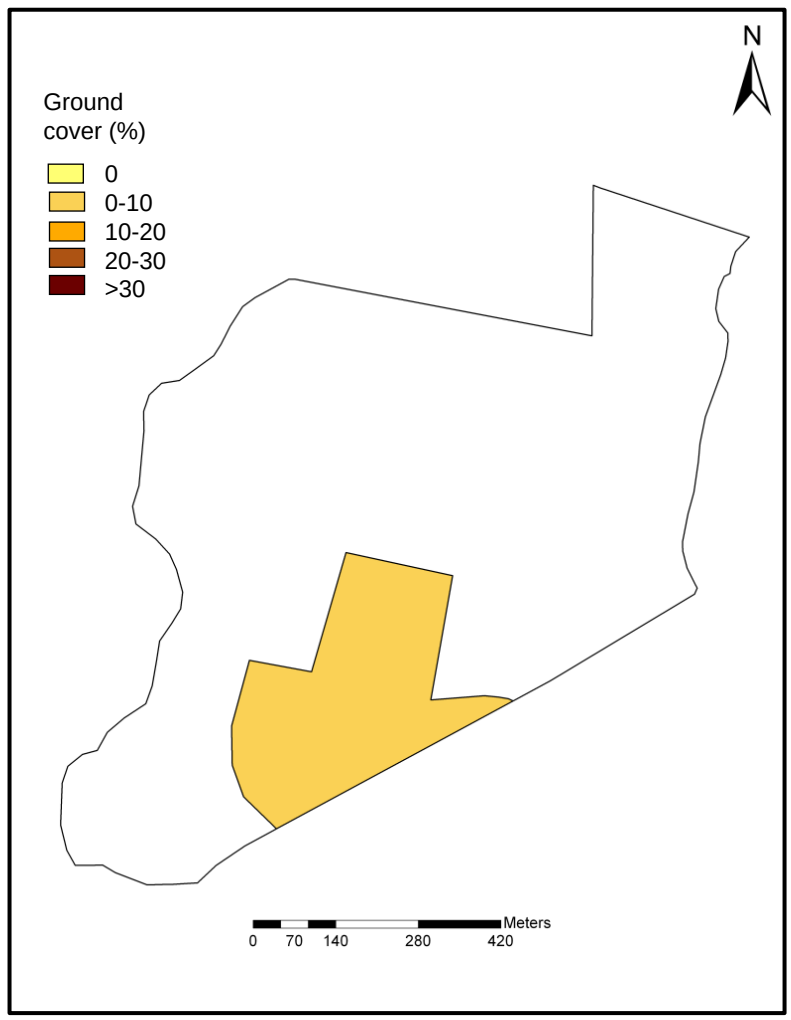
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



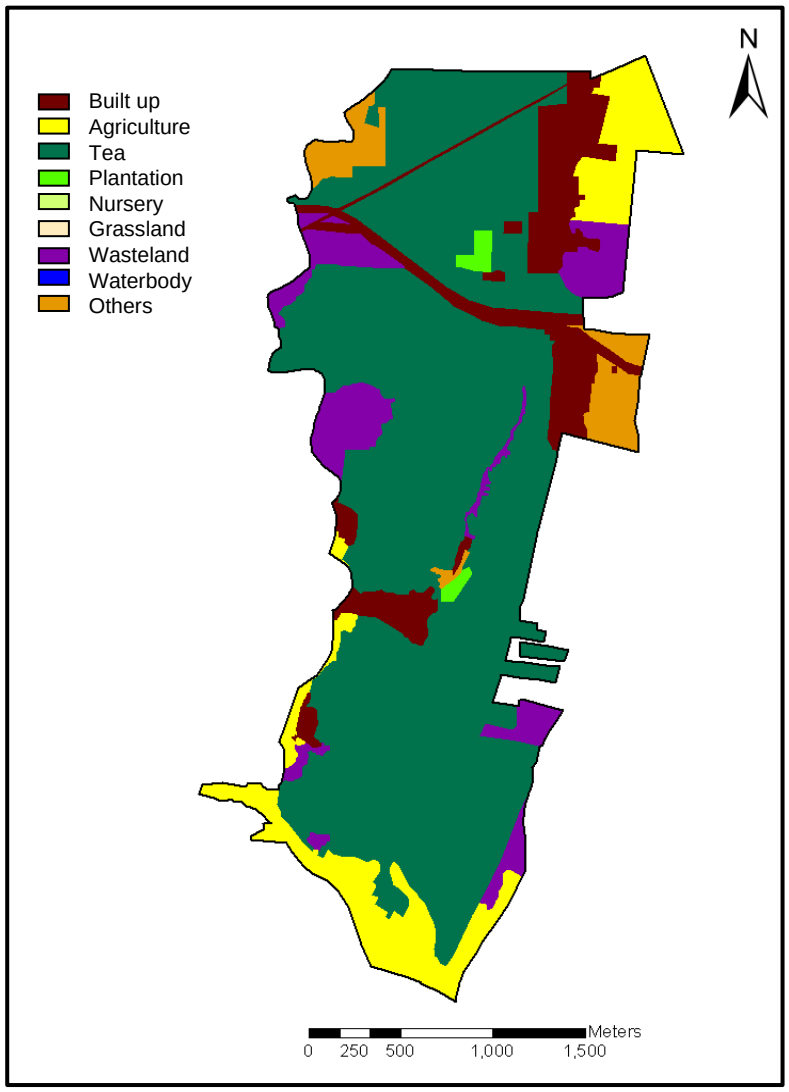
c. Section Boundaries of the Estate



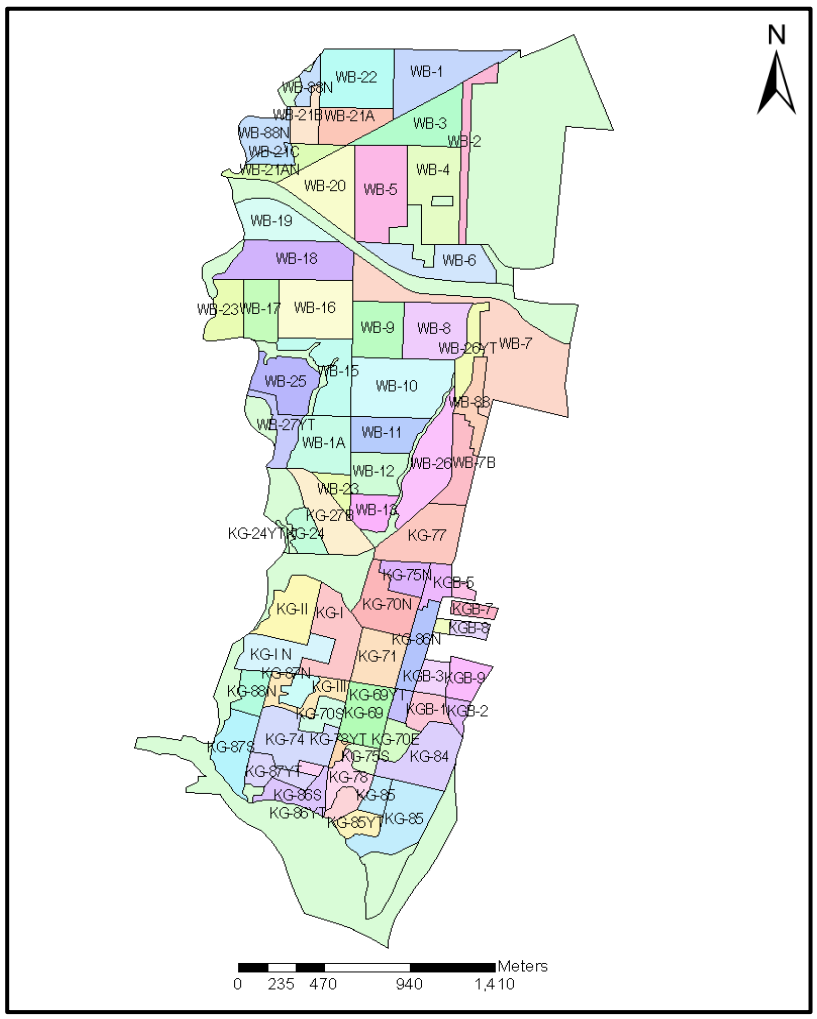
d. Shade Tree Density in Sections

P130: WASHBARI TE

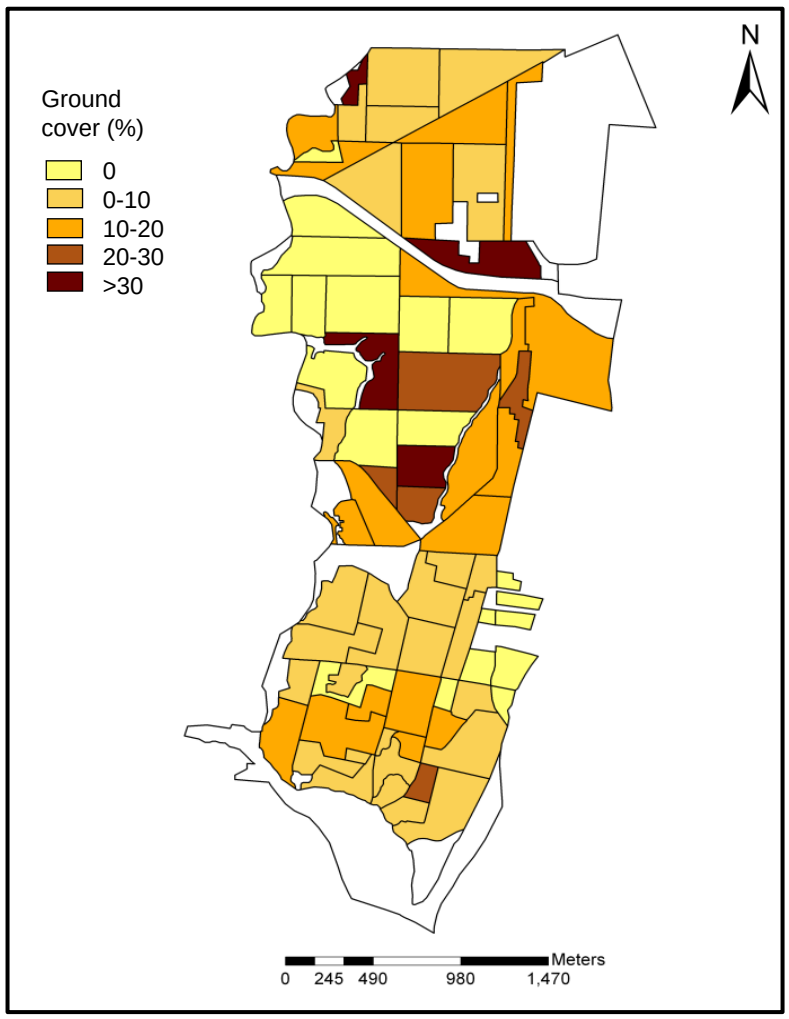
a. False Colour Composite of IRS LISS IV



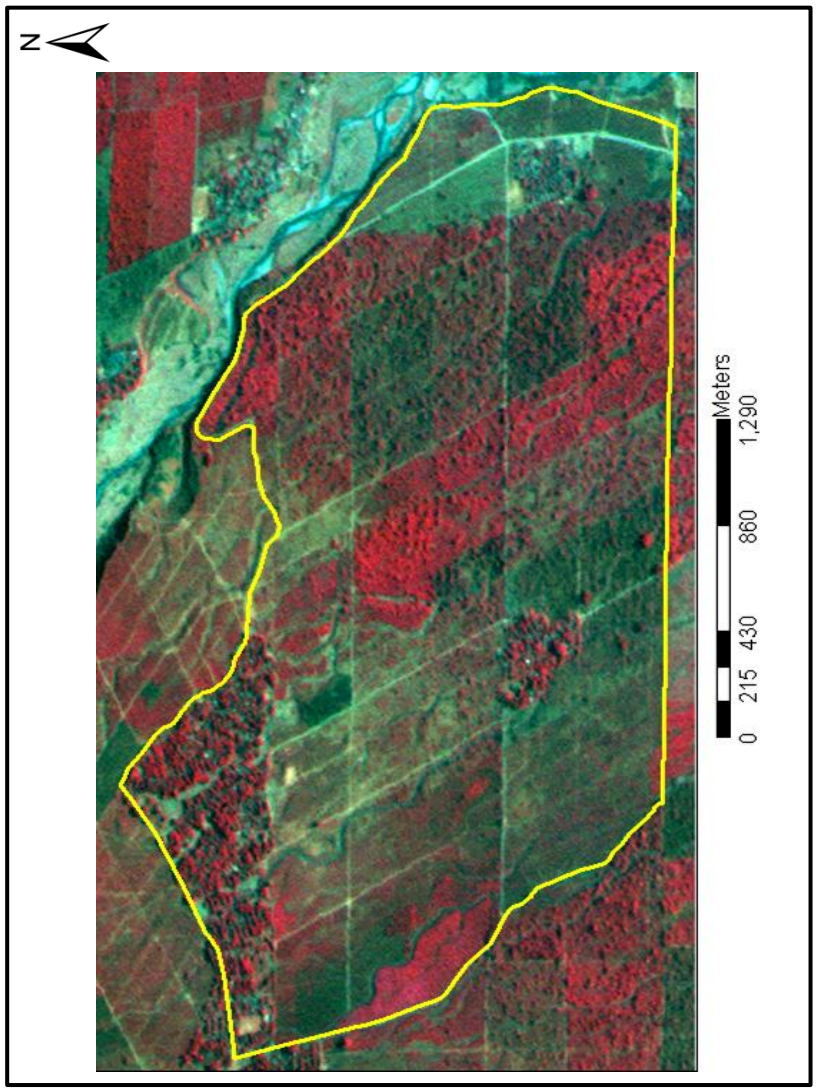
b. Tea Estate Landuse



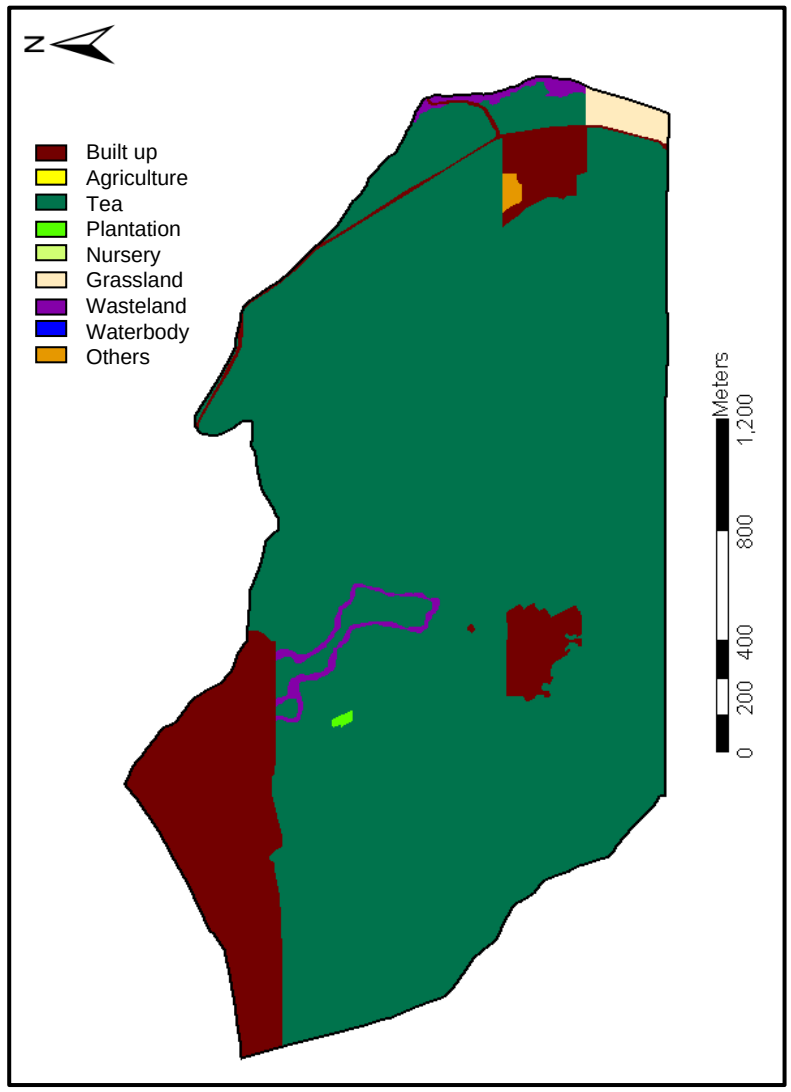
c. Section Boundaries of the Estate



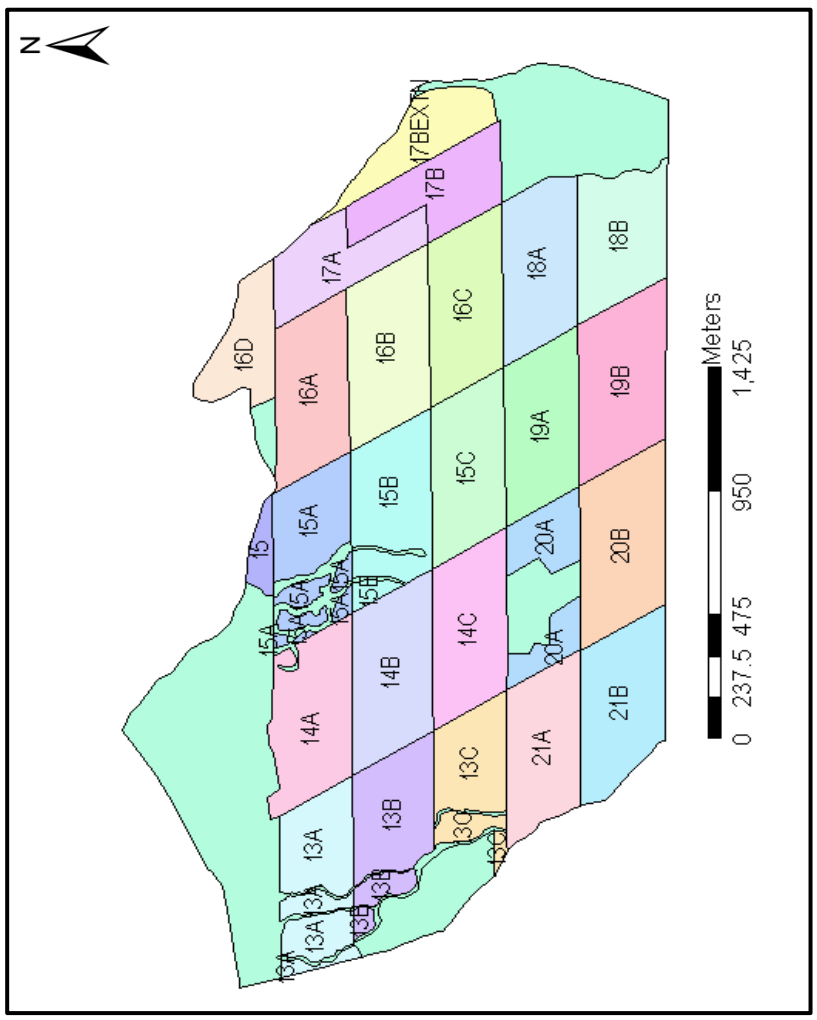
d. Shade Tree Density in Sections



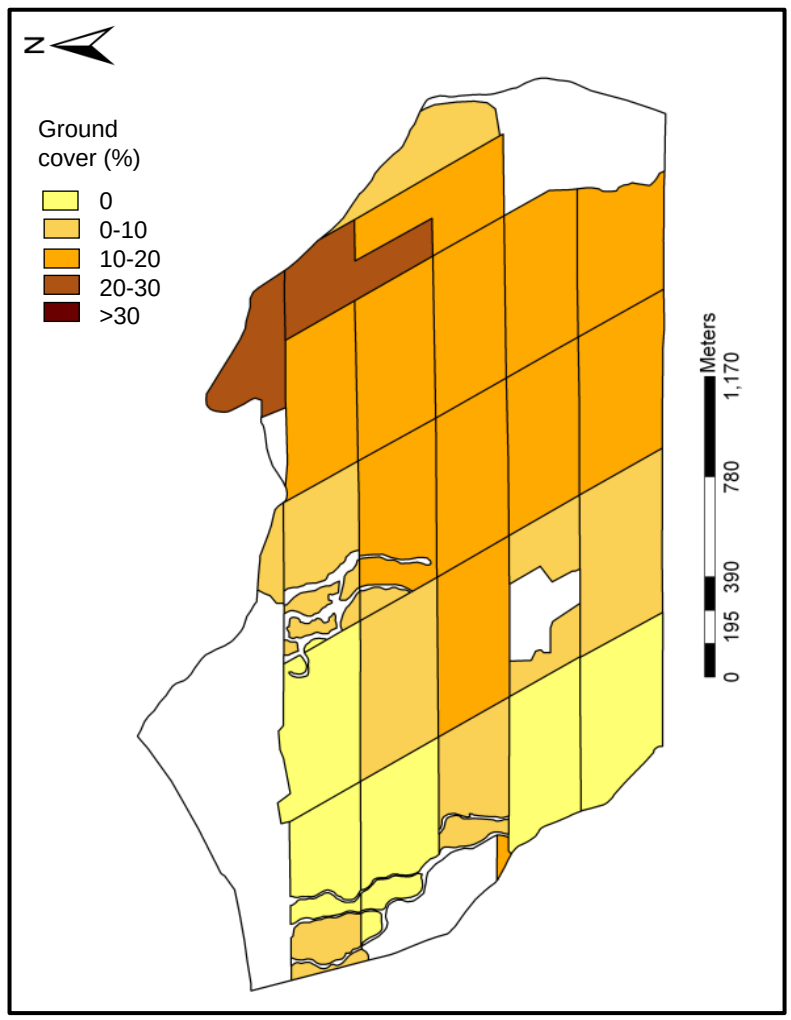
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



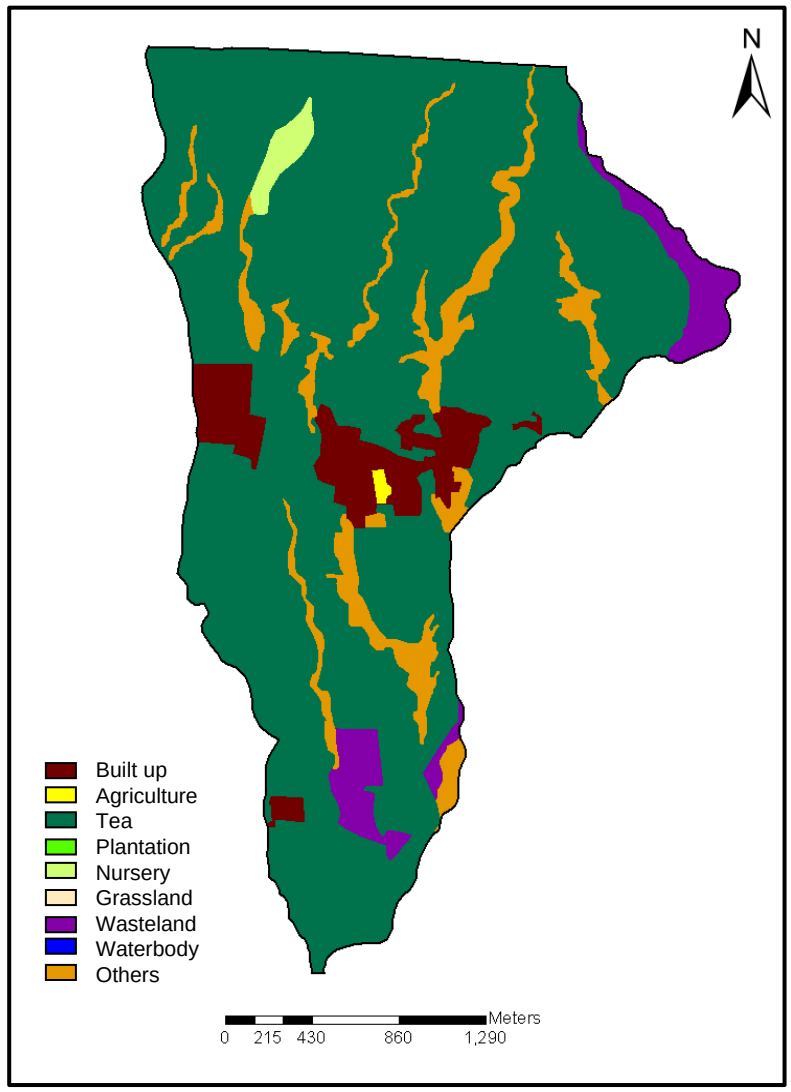
c. Section Boundaries of the Estate



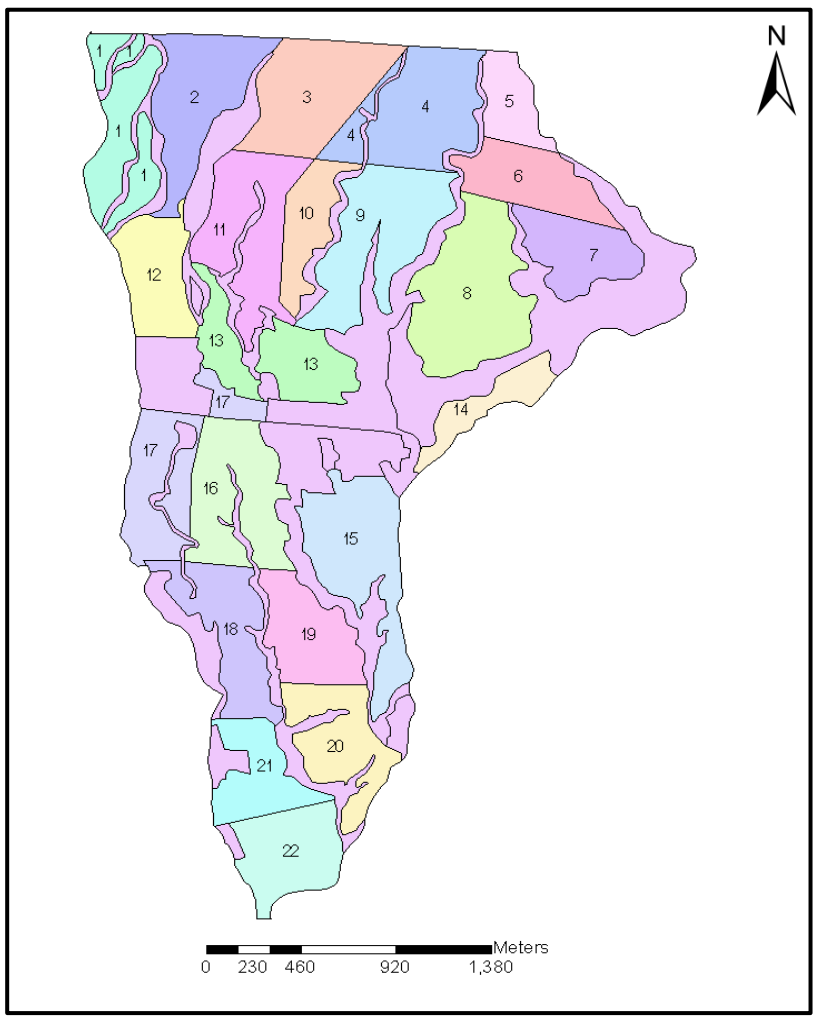
d. Shade Tree Density in Sections

P132: ZURANTEE TE

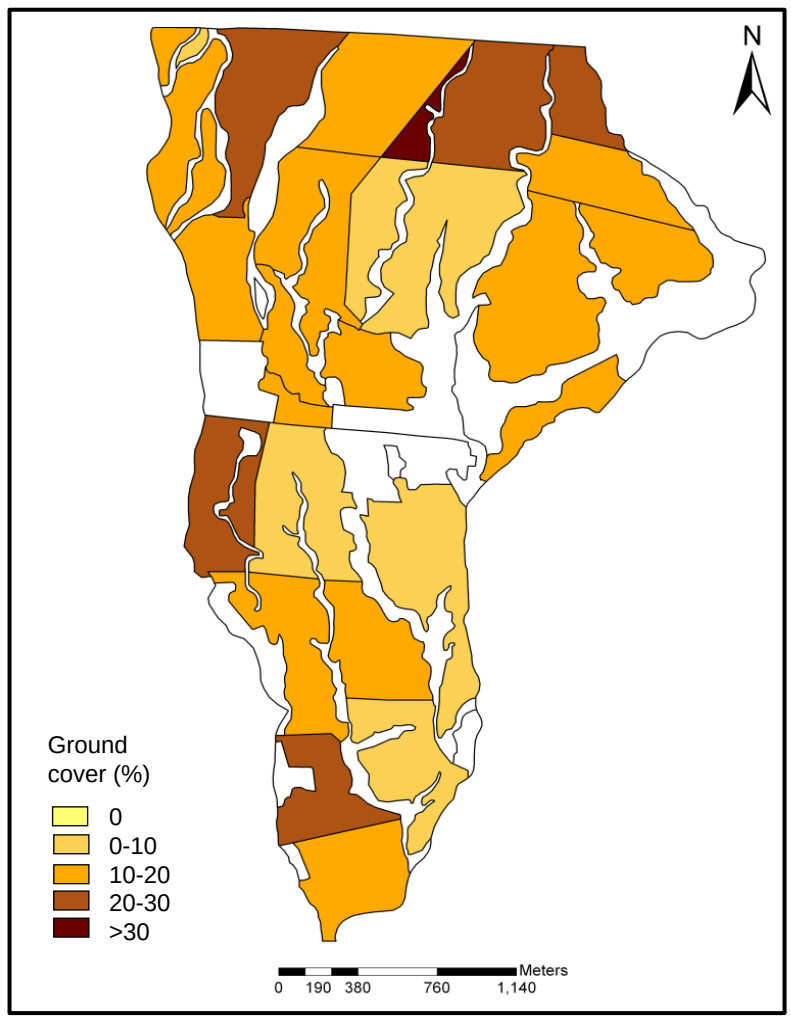
a. False Colour Composite of IRS LISS IV



b. Tea Estate Landuse



c. Section Boundaries of the Estate



d. Shade Tree Density in Sections

Annexure 1: Jalpaiguri District at a Glance

1. Administrative Set-up (2004)	Jalpaiguri	**4. Workers (2001)**		**8. Educational Institutes (2004)**	
District Headquarter	3	Main Workers	1025433	Primary School	1968
No. of Sub Divisions	17	Marginal Workers	277703	Middle School	74
No. of Police Stations	13	Non-Workers	2098037	High School	176
No. of Blocks	4	**5. Agriculture and Forest**		Higher Secondary School	96
No. of Municipalities	146	Crop Area (ha), 2004	291000	General College, University	12
No. of Gram Panchyats	346	Irrigated Area (ha), 2004	94280	Professional and Technical	26
No. of Post Offices	756	Forest Area (ha)	64393	College / University	More than 14
No. of Mouzas					
2. Area and Population		**6. Transport Network (2004)**		**9. Tea Industry (as on 2012)** (Includes Dooars and Terai)	
District Area	6245 sq km				
Total Population	38,69,675				
Male Population	19,80,068	Total Road Length (km)	5492	Area of Big growers	86950
Female Population	18,89,607	National Highways (km)	321.70	(>10.12 ha) in ha	
SC Population (2001)	12,48,577	State Highways (km)	63.01	Area of Small growers	35553
ST Population (2001)	6,41,688	District Roads (km)	36.17	(<10.12 ha) in ha	240
Sex Ratio	954:1000	Village and Other Roads	5071	No. of Big growers	20607
Population Density	621/km^2	(km)		No. of Small growers	201
Decadal growth rate	13.77%			No. of estate factories	100
Literacy rate (2001)	62.9%			No. of bought leaf factories	267
				Production ('000 kg), 1999	133803
3. Climate		**7. Major Rivers**	Teesta,	**10. Medical Facilities (2003)**	10
Total rainfall (mm)	3653		Torsa,	Govt. Hospitals	100
Maximum Temperature	12		Jaldhaka,	Tea Garden Hospitals	52
(ºC)	37		Raidak,	Health Centres	56
Minimum Temperature			Sankosh	Clinics	56
(ºC)					

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	Aibheel	101_56_07jan08	587_273_26dec05
2	Amarpur	101_58_07jan08	586_275_18apr08
3	Ambari	101_58_23nov09	588_274_27nov07
4	Anandapur	101_57_07jan08	586_274_18apr08
5	Bagrakote	101_56_07jan08	586_274_18apr08
6	Baintgoorie	102_50_23mar09	586_274_18apr08
7	Bamandanga Tondoo	102_50_23mar09	587_274_08jan07
8	Banarhat	101_58_23nov09	588_274_27nov07
9	Baradighi	102_50_23mar09	587_274_08jan07
10	Batabari	102_50_23mar09	586_274_18apr08
11	Beech	101_65_26jan07	590_274_06dec06
12	Bhandiguri	101_57_07jan08	586_275_19jan07
13	Bharnobari	101_65_26jan07	590_274_06dec06
14	Bhatkowa	102_47_19nov07	590_274_06dec06
15	Bhatpara	101_65_26jan07	590_274_06dec06
16	Bhogotpore	102_50_23mar09	587_273_26dec05
17	Binaguri	101_58_23nov09	588_274_27nov07
18	Birpara	102_39_24feb05	589_274_14may07
19	Carron	101_57_23nov09	588_274_27nov07
20	Central Dooars	101_65_26jan07	590_274_06dec06
21	Chalouni	102_49_23mar09	587_273_26dec05
22	Chinchula	102_45_19feb07	591_275_31mar07
23	Choonabhuti	101_58_23nov09	588_274_27nov07
24	Chuapara	101_65_26jan07	590_274_06dec06
25	Chuniajhora	102_06_21apr08	592_275_14nov06
26	Dalgaon	102_39_24feb05	589_274_14may07
27	Damdim	101_57_07jan08	586_274_18apr08
28	Debipur	102_50_23mar09	586_274_18apr08
29	Debpara	101_58_23nov09	588_274_17nov07
30	Demdima	102_39_24feb05	588_275_16nov07
31	Denguajhar	101_58_07jan08	586_275_18apr08
32	Dharanipur	101_57_23nov09	588_274_27nov07
33	Dhowlajhora	102_40_26jan06	592_275_14nov06
34	Dima	101_66_26jan07	591_275_31mar07
35	Dumchipara	102_39_24feb05	589_274_06dec06
36	Ellenbarie	Not available	586_274_19jan07
37	Engo	102_49_23mar09	587_273_26dec05
38	Ethelbarie	101_60_14feb08	589_275_14may07

Sl no.	Estate name	IRS LISS IV (Path_Row_date of overpass)	Cartosat-1 (Path_Row_date of overpass)
39	Gairkhata	101_58_23nov09	588_274_27nov07
40	Gandrapara	101_58_23nov09	588_274_27nov07
41	Garganda	102_39_24feb05	589_274_14may07
42	Goodhope	101_57_07jan08	587_274_08jan07
43	Gopalpur	102_39_24feb05	591_275_31mar07
44	Gopimohan	101_65_26jan07	590_274_06dec06
45	Gurjangjhora	102_50_23mr09	587_273_26dec05
46	Haldibari	101_58_23nov09	588_274_27nov07
47	Hantapara	102_39_24feb05	590_274_06dec06
48	Hope	102_49_23mar09	587_273_27dec05
49	Indong	102_50_23mr09	587_273_27dec05
50	Jadabpur	101_64_05feb05	587_274_08jan07
51	Jainti	102_06_21apr08	592_275_14nov06
52	Jaldacca altadanga	102_50_23mar09	587_274_08jan07
53	Jalpara	101_58_23nov09	588_274_27nov07
54	Jiti	102_49_23mar09	587_273_26dec05
55	Jogesh Chandra	101_57_07jan08	587_274_08jan07
56	Joybirpara	101_58_23nov09	589_274_14may07
57	Kailashpur	101_57_07jan08	587_274_08jan07
58	Kalabari	101_58_23nov09	588_274_16nov07
59	Karala valley	101_58_07jan08	587_275_08jan07
60	Karballa	101_60_14feb08	588_274_27nov07
61	Kartick	102_40_26jan06	592_275_14nov06
62	Kathaldhura	102_50_23mar09	588_274_27nov07
63	Killcott	102_50_23mar09	587_273_26dec05
64	Kohinoor	101_62_30mar04	592_275_07mar06
65	Kumargram	102_40_26jan06	592_275_14nov06
66	Kumlai	101_57_07jan08	587_274_08jan07
67	Kurti	101_57_23nov09	587_273_26dec05
68	Lakhikanta	101_58_23nov09	588_274_27nov07
69	Lakhipara	101_60_14feb08	588_274_27nov07
70	Lankapara	102_39_24feb05	589_274_14may07
71	Lessriver	101_57_07jan08	586_274_19jan07
72	Looksun	101_57_23nov09	588_274_27nov07
73	Madhu	101_65_26jan07	590_274_06dec06
74	Majherdabri	101_62_30mar04	591_275_31mar07
75	Malnuddy	101_56_07jan08	587_273_26dec05
76	Manabarie	101_56_07jan08	586_274_19jan07
77	Matelli	102_49_23mar09	587_273_26dec05
78	Mathura	102_47_19nov07	590_275_06dec06

Sl no.	Estate name	IRS LISS IV (Path_Row_date of overpass)	Cartosat-1 (Path_Row_date of overpass)
79	Mechapara	102_47_19nov07	590_274_06dec06
80	Meenglass	101_56_07jan08	587_273_26dec05
81	Mogalkata	101_60_14feb08	588_274_27nov07
82	Moraghat	101_60_14feb08	588_274_27nov07
83	Mujnai	102_35_02jan08	590_274_06dec06
84	Nagrakata	102_50_23mar09	587_273_26dec05
85	Nangdala	101_58_23nov09	589_274_14may07
86	Nedam	102_50_23mar09	587_273_26dec05
87	Nepuchapur	101_64_05feb05	586_274_18apr08
88	New Dooars	101_58_23nov09	588_274_27nov07
89	New lands	102_40_26jan06	589_274_14mar07
90	Newglenceco	102_50_23mar09	587_274_08jan07
91	Nimtijhora	101_66_26jan07	591_275_31mar07
92	Nowera nuddy	102_50_23mar09	587_274_08jan07
93	Oodlabari	101_56_07jan08	586_274_18apr08
94	Palashbari	101_60_14feb08	588_274_27nov07
95	Patkapara	102_47_19nov07	591_275_31mar07
96	Phaskowa	101_61_30mar04	592_275_07mar06
97	Putharjhora	101_56_07jan08	586_273_06jan06
98	Radharani	101_65_26jan07	590_274_06dec06
99	Raghuutkarsh	102_50_23mar09	587_274_08jan07
100	Rahimabad	102_06_21apr08	592_275_14nov06
101	Rahimpur	101_58_23nov09	589_274_14may07
102	Raipur	101_58_07jan08	586_275_18apr08
103	Raja	102_50_23mar09	587_274_08jan07
104	Rheabari	101_60_14feb08	588_274_27nov07
105	Rydak	102_40_26jan06	592_275_14nov06
106	Samsing	102_49_23mar09	587_273_26dec05
107	Sankos	102_40_26jan06	593_275_10mar08
108	Saraswatipur	101_57_07jan08	586_274_18apr08
109	Sarugaon	102_41_10feb05	589_275_14may07
110	Satali	101_65_26jan07	590_274_06dec06
111	Shikarpur	101_68_01mar08	586_275_18apr08
112	Singhania	102_39_24feb05	589_274_14may07
113	Sonali	101_56_07jan08	586_274_18apr08
114	Soongachi	102_50_23mar09	587_273_26dec05
115	Srinathpur	101_65_26jan07	592_275_07mar06
116	Subhasini	102_35_02jan08	590_274_06dec06
117	Sylee	101_56_07jan08	586_274_18apr08
118	Tasati	102_39_24feb05	589_274_14may07

Sl no.	Estate name	IRS LISS IV (Path_Row_date of overpass)	Cartosat-1 (Path_Row_date of overpass)
119	Telepara	101_60_14feb08	588_274_27nov07
120	Toonbarie	101_64_05feb05	587_274_08jan07
121	Torsa	101_65_26jan07	590_274_06dec06
122	Totapara	101_60_14feb08	588_274_27nov07
123	Tulsipara	102_39_24feb05	589_274_14may07
124	Turturi	102_40_26jan06	592_275_14nov06
125	Uttarsalbari	101_58_23nov09	588_274_16nov07
126	Washabarie	101_64_04dec06	586_274_19jan07
127	Yongtong	101_56_07jan08	587_273_26dec05
128	Zurantee	102_49_23mar09	587_273_26dec05

Annexure 3: List of 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	Geograhic 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
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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