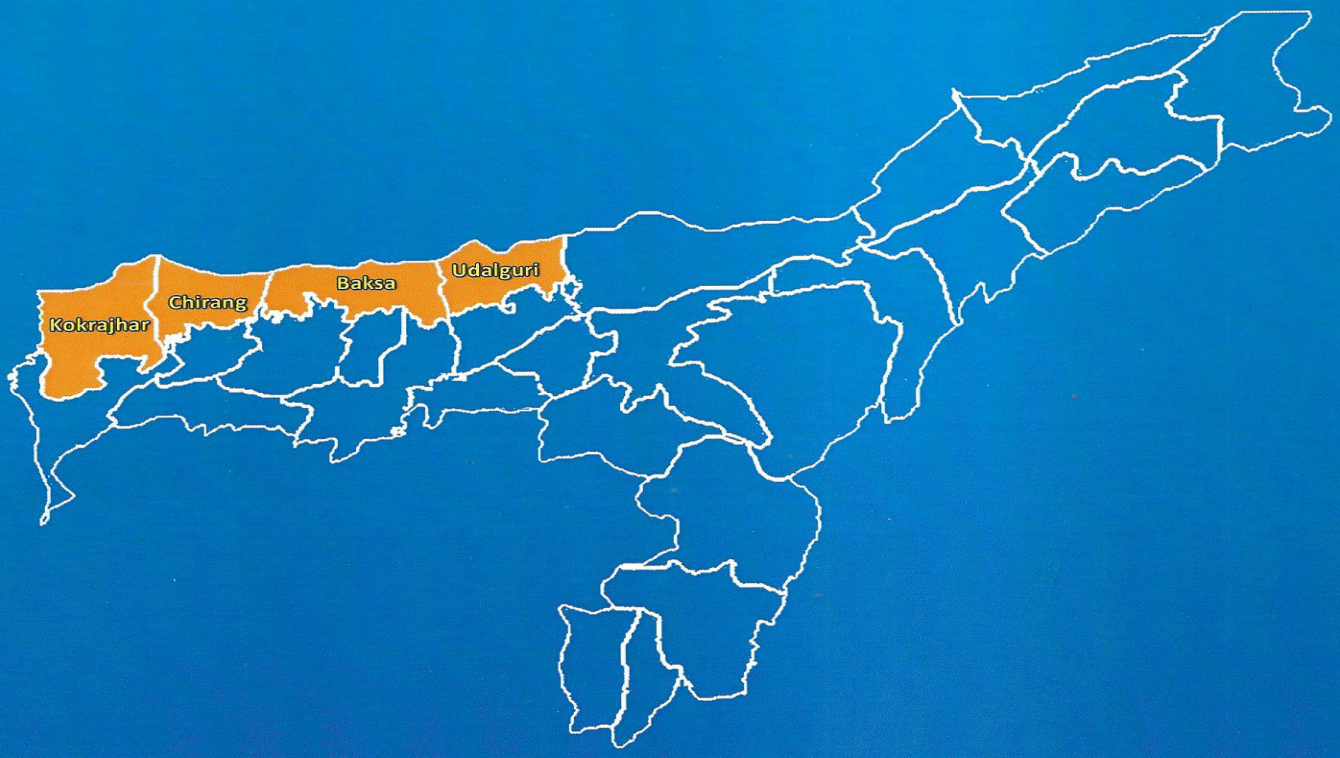
Report on
Feasibility Study for Oil Palm Cultivation in Bodoland Territorial Council Area of Assam, India



भाकृअनुप – भारतीय तेल ताड़ अनुसंधान संस्थान
पेदवेगी – 534 450, पश्चिमी गोदावरी जिला, आंध्र प्रदेश
ICAR - INDIAN INSTITUTE OF OIL PALM RESEARCH
Pedavegi - 534 450, West Godavari Dt., Andhra Pradesh

Report on

Feasibility Study for Oil Palm Cultivation in Bodoland Territorial Council Area of Assam, India

Team of Scientists

Dr. B. Narsimha Rao, Principal Scientist & Team Leader

Dr. G. Ravichandran, Senior Scientist

Dr. S. K. Behera, Senior Scientist

भाकृअनुप – भारतीय तेल ताड़ अनुसंधान संस्थान

पेदवेगी – 534 450, पश्चिम गोदावरी जिला, आन्ध्र प्रदेश

ICAR - INDIAN INSTITUTE OF OIL PALM RESEARCH

Pedavegi - 534 450, West Godavari Dt., Andhra Pradesh

ACKNOWLEDGEMENTS

We, the members of the team would like to thank Dr. R. K. Mathur, Director, ICAR-Indian Institute of Oil Palm Research, Pedavegi, Andhra Pradesh for his constant support, encouragement and giving the opportunity to conduct the feasibility study in four districts of Bodoland Territorial Council Area of Assam.

We express our gratitude to Department of Agriculture Cooperation and Farmer's Welfare (DAC&FW), Ministry of Agriculture & Family Welfare, Govt. of India, New Delhi for the financial support provided to carry out this feasibility study.

We thank Dr. B. Rajender, IAS, Joint Secretary, and Additional Commissioner (Oilseeds), DAC&FW, Ministry of Agriculture & Farmers Welfare, Govt of India, New Delhi for their support to conduct this study.

We thank Sri Biren Ch. Phukan, IAS., Principal Secretary, Bodoland Territorial Council, Assam for his timely response and support extended during the study.

We express gratitude to Sri Karol Narzary, Secretary Agriculture, Bodoland Territorial Council, Assam, for his support during the survey.

We also thank Sri M. M. Swargiary, Director of Agriculture, Bodoland Territorial Council, Assam and his staff for providing logistic support during the course of survey and providing information.

We would like to thank Dr. S. K. Paul, Chief Scientist, Regional Agricultural Research Station, Gossaigaon for sharing his experiences on various aspects of Horticultural crops in the BTC area and providing the meteorological data.

We thank the Programme Coordinators of the Krishi Vigyan Kendras of Kokrajhar, Chirang and Udalguri Districts of BTC for sharing the information on agriculture and related fields in their respective Districts to the team.

The information given by the local farmers of the BTC area regarding their experiences in farming to the team of scientists is worth mentioning.

We would like to thank Mr. Dulu Baruah, Assistant Director, Department of Agriculture, BTC, Kokrajhar for his help in feasibility study in Bodoland Territorial Council, Assam.

B. Narsimha Rao
G. Ravichandran
S. K. Behera

Report on
Feasibility Study for Oil Palm Cultivation in Bodoland Territorial Council Area of Assam

Abstract

Oil palm is the highest vegetable oil yielding perennial crop in the world. A feasibility study was undertaken to examine the possibility of oil palm cultivation in the four districts of Bodoland Territorial Council (BTC) in Assam state situated in the north-eastern part of India. On the request of Department of Agriculture, Cooperation & Farmers Welfare, Ministry of Agriculture and Farmers Welfare, Govt. of India, a team of scientist from ICAR-Indian Institute of Oil Palm Research, Pedavegi, Andhra Pradesh visited the four districts namely Kokrajhar, Baksa, Chirang and Udalguri during November 2016 to assess the feasibility of oil palm cultivation. A macro level survey was carried out to understand the prevailing climatic condition and availability of various resources. After a critical review, the team is in the opinion that there is a wider scope for the cultivation of oil palm in all the four districts of BTC.

1. Background

Oil palm is the highest edible oil yielding perennial crop producing two types of oil *i.e.,* crude palm oil and palm kernel oil, which are used for domestic and industrial purposes. It produces about 4 to 6 tonnes of crude palm oil and 0.4 to 0.6 tonnes of palm kernel oil per hectare per year during its productive life span from 4 to 30 years. Visualizing its potential, Government of India has given emphasis to expand the area under oil palm cultivation to meet the ever increasing vegetable oil demand of the country and reduce the expenditure on import of vegetable oils. The Department of Agriculture, Cooperation & Farmers Welfare, Ministry of Agriculture and Farmers Welfare, Govt. of India, Shastri Bhawan, New Delhi requested the Director, ICAR-Indian Institute of Oil Palm Research, Pedavegi, Andhra Pradesh to conduct feasibility study for oil palm cultivation in four Districts of Bodoland Territorial council (BTC) of Assam vide letter No.3-07/2015 OP SB dated 6th Oct., 2015 (Annexure I). Accordingly, the Director, ICAR-Indian Institute of Oil Palm Research, Pedavegi constituted a committee consisting of Dr. B. Narsimha Rao, Principal Scientist (Horticulture), Dr. G. Ravichandran, Senior Scientist (Seed Technology) and Dr. S. K. Behera, Senior Scientist (Soil Science) to examine the possibility for oil palm cultivation in four districts of BTC, Assam (Annexure II).

2. Methodology

The team of scientists visited all four districts of BTC during Nov., 2016, surveyed the areas and interacted with the officials of State Department of Agriculture; scientists, Regional Agricultural Research Station, Assam Agricultural University, Gossaigaon and Krishi Vigyan Kendras (KVKs) (Annexure III) and farmers (Annexure IV) of these areas. While interaction, the team obtained information about the geography, climate, land use pattern, soils, climates and cropping pattern of the farmers of the area. Soil and water samples were collected from different places in the BTC areas and analyzed for different parameters at ICAR-IIOPR, Pedavegi to get detailed information of the areas surveyed. A comprehensive report on the geography of the area, land use pattern, rainfall, irrigation resources and cropping pattern has been prepared for arriving at the feasibility of oil palm cultivation in the four districts of BTC area of Assam.

3. Findings

3.1 Geographical setting of the area

The Bodoland Territorial Council is a territorial council established in Assam state by carving out some areas of eight districts of Assam namely Kokrajhar, Dhubri, Bongaigaon, Barpeta, Nalbari, Kamrup, Darang and Sonitpur within the state of Assam. The area under the BTC jurisdiction is called the Bodoland Territorial Area District (BTAD). It is an autonomous Administrative unit constituted under the Sixth Schedule of the Constitution of India covering an area of 8795 Sq. Km (Provisional). The BTAD consist of four contiguous districts namely Kokrajhar, Chirang, Baksa and Udalguri. The geographical boundary of BTC lies between 26^0 7'12'' N to 26^0 47' 50'' N latitude and 89^0 47' 40'' E to 92^0 18' 30'' E longitude and is in the north-western part of Assam. Kokrajhar town the administrative head quarter lies between 26^0 25' N longitude and 99^0 16' 38'' E latitude. BTC is blessed with natural beauty with rivers and vast forests covers and abundant flora and fauna. Located in the foothills of Bhutan and bordering North Bengal, BTAD has more than one-third of its land covered by pristine forests. The district wise details are given below.

Kokrajhar: Kokrajhar district serves as the gateway to the north-eastern region of India. Roads and rails to seven sister states pass through this district on their way to other northeast states. The district is bounded on the north by the Himalayan kingdom of Bhutan, by Dhubri district on the south, Chirang district on the east and the Indian state of West Bengal on the west. The district lies between 89.46' E to 90.38' E longitudes and 26.19" N to 26.54" N latitudes.

Chirang: It falls under lower Brahmaputra valley Agro-climatic zone. The Chirang district possesses a plain topography. It also has undulating areas and the northern parts of the

district lie on the foothills of Bhutan that has slightly higher elevation, which decreases towards the southern parts of the district. The district is surrounded by International boundary of Bhutan in north, Bongaigaon District and a little portion of Kokrajhar district in south, Baksa district in the east and Kokrajhar district in west. The district is located between 26°28' N to 26°54' N longitudes and 89°42' E to 90°06' E latitudes.

Baksa: The district shares the privilege of being the International Boundary with Bhutan in the North with a mixed topography of plains and foot hills. The gentle and gradual slopes can be seen stretching from the foot hill of Bhutan and reaching out to the southern tips of Barpeta, Nalbari and Kamrup district. The east and western boundaries of the district respectively shares with the neighbouring district of Udalguri and Chirang. The district forms a part of the vast alluvial plains of Brahmaputra River system and sub basin of River Manas. Physiographically, it is characterized by the different land forms resulting from a) denudation structural hill and b) alluvial plain. The low mounds/hillocks are covered by a thick lateritic mantle and these are occupied by evergreen mixed forests. It is located at 23°11' N latitude and 88°55'E longitude and at an altitude about 54 to 46 m above the mean sea level.

Udalguri : The Udalguri district is having mostly plain topography. It also has undulating areas and the northern parts of the district lie on the foothills of Bhutan that has slightly higher elevation, which decreases towards the southern parts of the district. This district is bounded by Bhutan and Arunachal Pradesh in the north, Sonitpur district in the east, Darrang district in the south and Baksa district in the west. The district of Udalguri lies between 26°462 and 26°77' N latitude and 92°082 and 95°15' E longitude and at an altitude of about 103 to 180m above the mean sea level.

3.2 Climate

The climate of BTC area is sub-tropical in nature with warm and humid summer followed by cool and dry winter. The maximum and minimum temperature of different months of the year ranged from 20 to 45 °C and 4.4 to 29 °C respectively in different districts of BTC (Annexure V). However, low temperature of less than 10 °C prevails in some days in the months from December to February particularly in Chirang and Baksa districts. The relative humidity in different months varied from 50 to 91%, 72 to 98%, 60 to 94% and 79 to 96% in Kokrajhar, Chirang, Baksa and Udalguri districts respectively (Annexure VI). Higher values of relative humidity prevailed during June to September. The BTC is a high rainfall area. The average (for the period 2011 to 2015) annual rainfall is 3311, 2969, 2065 and 1785 mm for Kokrajhar, Chirang, Baksa and Udalguri district, respectively (Annexure VII). It indicates reduction in annual average rainfall as we move from west to east in BTC area. The area normally receives 2 per cent of rainfall in winter season (January to February), 25 per cent in summer season (March to May), 65 percent in monsoon season (June to September) and 8 percent in post-monsoon season (October to December). The values of

pan evaporation, as obtained from RARS, AAU, Gossaingaon, Kokrajhar, for the months of February to November, 2015 varied from 2.16 to 4.67 mm with higher values recorded in the month of June and September. Overall climatic condition of the area is suitable for oil palm cultivation.

3.3 Land use pattern

The details of land use data of BTC area are given in Annexure VIII. The total geographical area of Kokrajhar, Chirang, Baksa and Udalguri district is 312900, 109985, 196108 and 167393 ha respectively. The kokrajhar district is having highest forest area followed by Baksa, Chirang and Udalguri. But the total cropped area is highest in Kokrajhar (179533 ha) district followed by Udalguri (159311 ha), Baksa (137955 ha)and Chirang (89679 ha) district. Besides these, the districts of the BTC area are having barren and uncultivated land, permanent pastures and other grazing land, land under miscellaneous tree, cultivable waste land and fallow land, which can also be explored for oil palm cultivation.

3.4 Soils

The soils of the surveyed districts of BTC area are mainly older and younger alluvial soils with sandy loam, silty loam, sandy clay loam and loamy sand textures. In most of the places, the depth of soil is more than 2 m. During the survey, soil and water samples were collected for analysis of different parameters (Annexure IX). Analysis of soil samples reveal that the values of soil pH, electrical conductivity, organic carbon content in collected samples are from 4.56 to 6.32, 0.08 to 0.25 dS/m and 0.55 to 3.86 %, respectively (Annexure X). Soils are acidic in reaction with medium to high level of organic carbon content. Available phosphorus and potassium contents varied from low to high. These soils are suitable for oil palm cultivation. Water sample collected from rivers/streams, dug well and bore well during the survey were found to be acid to neutral in reaction and having low salinity hazard (Annexure XI). The water quality indicates that in general it is suitable for irrigation purpose.

3.5 Irrigation sources

The sources of irrigation in the BTC area are rainwater, rivers, canals and bore wells. Irrigation through rivers like Champamati, Gaurang, Tipkai, Sonkosh from Bhutan hills, Saral Banga Gongia, Laroni, Saumukum and Lonia which are passing through this district are the major source in Kokrajar disrtict. Whereas in Chirang, revivers like Champamati, Aie and Manas flow through the district and join the Brahmaputra river. Many other tributaries, small rivulets and streams flow through this district. The entire area of Udalguri District depends on Tangla minor irrigation project and shallow tube wells for irrigation. It is reported that the average ground water table in the district can be reached at a depth of about 3 to 8 m from ground level/surface depending upon location. Major tributaries of the river

Brahmaputra viz. Pachnoi, Dhansiri, Jiya Dhansiri, Mora Dhansiri, Noa, Kulsi, Dipila and Bornoi which originate from the foothills of the Himalayan range flow through the district and they are the main source of irrigation in the district. For Baksa district, the source of irrigation is through low lift pumps, shallow tube well, deep tube wells, electric lift irrigation and flow irrigation system.

3.6 Cropping pattern

The soil, topography, rainfall and climate in general are conducive for an agricultural activity in the BTC area. The team observed that mono cropping of paddy, tea and rubber plantation is a predominat practice in this area. Besides that, crops like wheat, rape seed & mustard, jute, black gram, green gram, sesame, vegetables, ginger, turmeric, coconut, areca nut, pineapple, banana, citrus jute, mesta, lentil, arhar, are grown in the area. However, during the discussion with the officials, the team could understand the prevalence of (a) paddy-jute/mesta/oilseeds/pulses/vegetables/ summer paddy, (b) autumn paddy-vegetables/ pulses/oilseeds, (c) paddy-mustard/Potato/Lentil/ vegetables, (d) paddy- jute/summer Paddy/mustard/pulses/maize/ Vegetables cropping system in the districts of BTC area.

4. Potentiality for Oil palm cultivation in BTC

Assam state as a whole is one among the 14 global bio-diversity hotspots having enough options for farming. Assam is traditionally rich in horticultural production due to its diverse agro-climatic condition combined with rich resources is conducive for growing wide range of horticultural crops like fruits, vegetables, flowers, spices, nuts, tuber crops, medicinal and aromatic plants. Wide range of soil, various source of irrigation, continuous rainfall thought out the year and less evoptranspiration rate are the added advantages.

In oil palm, the fresh fruit bunch (FFB) is the economical part, formed from the female inflorescence. Very few male inflorescences are needed, which produces pollen and the pollen reach to the female flower through wind or pollinating weevil. Oil palm is water loving crop and any water stress alters the flower sex ratio ultimately leads to the production of more male inflorescence. The available rainfall data of BTC shows that it is a high rainfall area and distributed over a period of six to seven months from April to October, which can support the oil palm crop. However, winter months receive a little or no rainfall. In order to avoid water stress during winter, the crop should be supported with irrigation. As BTC is having a lot many of rivers, tributaries and various irrigation systems for already existing cropping pattern, oil palm could also be accommodated. The temperature data shows a mild weather throughout the year, provides a congenial environment for the survival of the pollinating weevil, which facilitates the fruit formation through pollination. The less evapotranspiration rate throughout the year in Kokrajar district indicates the need of less water during the growth period. However to avoid the water stress, palms need to be irrigated based on

evapotranspiration too. The soils of the four districts of Bodoland Territorial Council are predominantly alluvial soils with sandy clay loam to sandy loam texture. In most of the places, the depth of soil is more than 2 m. In general, climate and soils of the area are suitable for oil palm cultivation and available water quality is good for irrigation.

5. Summary and Recommendations

The team consist of Dr. B. Narsimha Rao, Dr. G. Ravichandran and Dr. S. K. Behera constituted by the Director, ICAR-Indian Institute of Oil Palm Research, Pedavegi has carried out a macro level survey of four districts namely Kokrajhar, Chirang, Baksa and Udalguri of Bodoland Territorial Council (BTC) of Assam to find out the feasibility of oil palm cultivation. The team has examined the climate, soil types, water resources, cropping systems and ground water table availability in the four districts. The team had interactions with BTC officials, scientists of RARS, AAU, Gossaingaon, Kokrajhar, KVKs of the area and farmers regarding the scope and prospects for oil palm cultivation in these districts to get the first hand information.

The team also examined pests and diseases, yield pattern and cost benefit ratio of existing cropping patterns. The climatic conditions in these districts are not showing any extremities except low temperature for a short period during winter months and they are well within the tolerable limits for successful cultivation of oil palm. Soil types, distribution of rainfall for six to seven months, optimum temperatures and humidity are the strong points considered for recommending the feasibility of oil palm cultivation in BTC.

- ✔ The team recommends the feasibility of oil palm cultivation in all the four districts of Bodoland Territorial Council of Assam namely Kokrajhar, Chirang , Baksa and Udalguri.

(Dr. S.K.Behera) **(Dr. G.Ravichandran)** **(Dr. B. Narsimha Rao)**

5830
Date 16/10/15

F. No. 3-07/2015 OP (SB)
Government of India
Ministry of Agriculture and Farmers Welfare
Department of Agriculture, Cooperation and Farmers Welfare

Shastri Bhawan, New Delhi
Dated the 06th October, 2015

To

The Director,
Indian Institute of Oil Palm Research (IIOPR),
ICAR, Pedavegi, Andhra Pradesh.

Sub: To explore the possibilities for oil palm cultivation in four districts of Bodoland Territorial Council-reg.

Sir,

Government of India has been implementing a Mini Mission-II for oil palm development under National Mission on Oilseeds and Oil Palm (NMOOP) in the State of Assam w.e.f. 01.04.2014. Four districts viz; Chirang, Baksa, Udalguri and Kokrajhar of Bodoland Territorial Council (BTC) having huge potential for oil palm cultivation which are not covered under NMOOP for oil palm cultivation due to lack of survey/study by any research institute including IIOPR.

2. You are, therefore, requested to kindly depute a team of scientists from your institute to conduct a brief survey/study in consultation with officials of BTC for feasibility of taking up oil palm cultivation so that an area of at least 5000-10000 hectare could be brought under oil palm cultivation. A study report in this regard may please be sent to this department as soon as possible.

Yours faithfully,

(Dr. Anupam Barik)
Additional Commissioner (Oilseeds)

Copy to: The Principal Secretary, Bodoland Territorial Council, Kokrajhar, with request to extend all possible support to the team of IIOPR, ICAR for conducting the above study.

The constitution of committee is
1. डॉ. वी.एन. राव (Chairman)
2. डॉ. जी. रविचन्द्रन
3. डॉ. एस.के. वेहेरा

Phone: 08812 259409/532/524 Fax: 08812 259531 E-mail: director.iiopr@icar.gov.in

भाकृअनुप - भारतीय तेल ताड़ अनुसन्धान संस्थान
ICAR – INDIAN INSTITUTE OF OIL PALM RESEARCH
पेदवेगी-534 450, पश्चिमी गोदावरी जिला, आंध्र प्रदेश
Pedavegi–534 450, West Godavari District, Andhra Pradesh

F.No. PME/12(L)/2001

October 15, 2016

Note

Director, ICAR-IIOPR is pleased to constitute a committee with the following scientists to submit a proposal on the feasibility of oil palm cultivation in four districts viz., Chirang, Baksa, Udalgiri and Kokrajhar of the Bodo Territorial Council (BTC):

1. Dr. B. Narsimha Rao, Principal Scientist (Horticulture) - Team Leader
2. Dr. G. Ravichandran, Senior Scientist (Seed Technology) - Member
3. Dr. Sanjib Kumar Behera, Senior Scientist (Soil Science) - Member

Dr. K. Suresh
Principal Scientist &
Scientist-In-Charge (PME)

Copy to:

1. Dr. B. Narsimha Rao, Principal Scientist (Horticulture)
2. Dr. G. Ravichandran, Senior Scientist (Seed Technology)
3. Dr. Sanjib Kumar Behera, Senior Scientist (Soil Science)

Annexure III

Name of Officers and staff of Department of Agriculture, scientists of RARS, A.A.U., Gossaigaon and KVK's of Bodoland Territorial Council, Assam met during the survey

S. No.	Name of the Officer	Designation and Address	Mobile No.
1.	Sri Biren Ch.Phukan, IAS	Principal Secretary, BTC	-
2.	Sri Karol Narzary	Secretary, BTC	-
3.	Sri M. M. Swargiary	Director of Agriculture, BTC and DAO, Kokrajhar	9678776708
4.	Sri Dulu Baruah	Asst. Director of Agriculture (Zonal), BTC	7086046365
5.	Dr. A. K. Paul	Chief Scientist, RARS, AAU, Gossaigaon, Assam	-
6.	Dr. M. K. Bhuyan	Programme Coordinator, KVK, Kokrajhar	9435084843
7.	Dr. Kameswar Das	Programme Coordinator, KVK, Chirang	9854071472
8.	Dr. Debasis Borah	Programme Coordinator, KVK, Udalguri	-
9.	Mr. Ashok Kumar Das	AD (Agri), Kokrajhar	9435510831
10.	Mr. Bitupon Hazarika	DAO, Chirang	9435384126
11.	Mr. B. D. Barman	SDAO, Bijni, Chirang	9435026027
12.	Dr. Amarjeet Singh	Scientist-in-Charge, RAMIE Research Station, Kamargaon, Sorbhog, Chirang	-
13.	Mr. Kailash Chandra Deka	DAO, Baksa	9435481539
14.	Mr. Udahal Regmi	Department of Agriculture, BTC	9613117962
15.	Mr. N. K. Deka	DAO, Udalguri	9435185702
16.	Mr. Abdul Baten	SDAO, Dimakhushi	9859116654
17.	Mr. Mukul Sharma	SDAO, Udalguri	7086842120
18.	Mr. Kumud Chaudhury	ADO, Bhergaon, Udalguri	-

List of farmers interacted in the surveyed districts of Bodoland Territorial Council, Assam

S. No.	Name of the farmer	Village	Mobile No
1.	Mr. Bilamba Brahma	Pakriguri Part 2	9854131235
2.	Mr. Chabin Muchahary	Chota Anguri	9954852079
3.	Mr. Satyam Ch Basmurty	Dimakmari	9954127355
4.	Mr. Mali Basmatary	Gossaigaon	9954782175
5.	Mr. Sukleswar Basumatary	Ronehaidham	9957446509
6.	Mr. Chahin Brahma	Pakriguri Part 2	8256020905
7.	Mr. Tharani Kanta Gayary	Dahalapara	8812895926
8.	Mr. Prional Narsary	Dabdong Para	9864194771
9.	Mr. Benarji Muchehary	Salguri	9954394084
10.	Mr. Tukaram Boro	Shamtharibary	9613174795
11.	Mr. Aastine Basumatary	Salguri	9678924251
12.	Mr. Pabinath Brahma	Pakriguri Part 2	8071865063
13.	Mr. Amsuamui Narzary	Gossaigaon	9707057077
14.	Mr. Birwajet Basumatary	Pakriguri	9859462395
15.	Mr. Rajib Muchahary	Bangaldoba	9613613076
16.	Mr. Dhanraj Basumatary	Gnabasi (A.E.A)	9707712214
17.	Mr. Harimohan Basumatary	Pakriguri Part 2	8472883689
18.	Mr. Amsumui Narzary	Gossaigaon	9707057077
19.	Mr. Biswajet Basumatray	Pakriguri	9859962395
20.	Mr. Pabinath Brahma	Pakriguri Part 2	804865063
21.	Mr. Surath Narzary	Gossaigaon	9954257759
22.	Mr. Debaru Wary	Gossaigaon	9864427321
23.	Mr. Haliram Narzary	Chota Anguri	7851054872
24.	Mr. Bireswar Brahma	Gossaigaon	8135084271
25.	Mr. Dambaru Basumatary	Gossaigaon	9957161568
26.	Mr. Hemanta Basumatary	North kajalgaon	9406815509
27.	Mr. Purisumuri Narzary	Ghoromsa	9957921216
28.	Mr. Lankeswar Basumatary	Pakriguri Part 2	9957637030
29.	Mr. Promod Basumatary	Gossaigaon	99594247520
30.	Mr. Narendra Brahma	Pakriguri Part 2	9706828652
31.	Mr. Nareswar Brahma	Pakriguri Part 2	-
32.	Mr. Bilamba Brahma	Pakriguri Part 2	9854131235
33.	Mr.Sumit Basumatary	Basbari Part 1	8135894037
34.	Mr. Plabun Marak	Unujuli - Kumarighat	9957703157
35.	Mr. Lubhash Sukradhar	Bangoldoba	7896938003
36.	Mr. Panidhar Brahma	Panijani Part 2	9854242933
37.	Mr. Vijay Kumar Brahma (Senior Headman)	Panijani Part 2	9859818063
38.	Mr. Sarveswar Basumatary	Panbari	9954527149
39.	Mr. Bironjoy Basumatary (General Secretary, DuBAA,)	Patashala	8473005709
40.	Mr. Jadav Brahma (Training Organizer, DuBAA)	Patashala	8133893482
41.	Mr. Dilip Kr Ray	PanBari	9678860216
42.	Mr. Purna kamto Baro	PanBari	9954206789
43.	Mr. Surgum Brahma	PanBari	8473839088
44.	Mr. Jaydev Ray	PanBari	9678583413
45.	Mr. Aklung K. Ray	PanBari	-
46.	Mr. Buddhiram Basumatary	PanBari	-
47.	Mr. Upendra Brahma	PanBari	7896758211
48.	Mr. Bhabanonada Ray	PanBari	9678341307
49.	Mr. Dhanjay Basamatary	PanBari	7086449314

Annexure V

Month-wise maximum and minimum temperature (°C) of the districts of Bodoland Territorial Council, Assam

Year	Jan.		Feb.		Mar.		Apr.		May		June		July		Aug.		Sep.		Oct.		Nov.		Dec.	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
Kokrajhar																								
2011	21.0	12.7	26.0	21.5	28.6	24.4	30.1	26.6	32.5	27.4	33.0	29.0	32.3	29.0	32.5	28.4	33.6	28.8	32.4	27.6	26.3	22.8	31.6	17.4
2012	20.2	12.4	25.1	19.1	30.1	26.0	32.8	23.6	34.4	31.4	31.3	27.7	33.9	28.3	33.8	25.5	33.7	28.9	33.1	29.2	32.0	24.4	30.6	18.6
2013	21.9	13.3	25.6	19.5	30.5	23.1	29.4	23.0	30.8	23.7	31.8	23.1	33.6	26.6	33.8	25.8	34.0	27.6	32.6	26.5	34.7	19.4	23.6	13.6
2014	21.2	10.2	21.1	11.3	27.2	17.1	33.4	23.6	33.3	24.9	34.1	24.7	35.2	20.9	33.2	20.0	34.2	24.5	31.3	21.3	30.2	16.3	23.3	10.6
2015	28.3	8.5	26.3	13.8	36.4	22.5	35.5	24.3	34.2	26.2	35.2	26.5	36.4	28.0	36.5	26.3	33.0	22.9	31.0	19.3	29.4	17.8	24.4	13.9
Chirang																								
2011	24.6	8.6	26.2	11.1	32.0	10.5	32.5	16.7	33.7	20.4	34.4	23.2	34.8	23.0	34.1	24.4	34.7	23.8	33.3	17.4	28.2	11.8	27.7	8.4
2012	23.9	6.9	28.3	7.4	27.5	9.6	39.1	6.3	40.4	17.2	39.4	20.0	40.5	29.0	41.1	22.3	40.3	20.5	38.5	14.3	35.1	10.8	31.9	5.6
2013	30.8	4.4	36.9	6.8	36.7	12.4	35.1	15.3	36.0	19.9	37.5	23.0	35.7	23.8	36.4	23.9	35.8	22.9	33.7	17.9	29.5	9.0	28.6	6.0
2014	28.2	6.6	28.6	6.6	33.5	10.0	38.6	14.6	35.2	19.8	36.8	22.7	36.2	24.2	36.7	22.9	37.0	22.3	34.4	15.7	32.4	13.0	28.3	6.2
2015	29.0	6.8	31.2	5.2	33.9	12.1	34.5	18.1	45.4	21.2	36.1	21.3	36.1	22.8	41.1	23.6	39.0	24.1	37.5	17.8	31.1	12.7	29.4	7.4
Baksa																								
2011	24.6	8.6	26.2	11.1	32.0	10.5	32.5	16.7	33.7	20.4	34.4	23.2	34.8	23.0	34.1	24.4	34.7	23.8	33.3	17.4	28.2	11.8	27.7	8.4
2012	23.9	6.9	28.3	7.4	27.5	9.6	39.1	6.3	40.4	17.2	39.4	20.0	40.5	29.0	41.1	22.3	40.3	20.5	38.5	14.3	35.1	10.8	31.9	5.6
2013	30.8	4.4	36.9	6.8	36.7	12.4	35.1	15.3	36.0	19.9	37.5	23.0	35.7	23.8	36.4	23.9	35.8	22.9	33.7	17.9	29.5	9.0	28.6	6.0
2014	28.2	6.6	28.6	6.6	33.5	10.0	38.6	14.6	35.2	19.8	36.8	22.7	36.2	24.2	36.7	22.9	37.0	22.3	34.4	15.7	32.4	13.0	28.3	6.2
2015	29.0	6.8	31.2	5.2	33.9	12.1	34.5	18.1	45.4	21.2	36.1	21.3	36.1	22.8	41.1	23.6	39.0	24.1	37.5	17.8	31.1	12.7	29.4	7.4
Udalguri*																								
2013	NA	NA	NA	NA	NA	NA	35.8	16.4	37.6	18.7	37.9	23.9	36.9	24.6	36.6	23.4	37.4	22.6	34.4	17.8	30.6	11	30	7.3
2014	29.4	8.2	29.9	7.0	35.1	10.7	35.8	16.4	37.6	18.7	37.9	23.9	36.9	24.6	36.6	23.4	37.4	22.6	34.4	17.8	30.6	11	30	7.3

Source: Director of Agriculture, BTC, Kokrajhar, Assam * KVK, Udalguri

Month-wise relative humidity (%) of the districts of Bodoland Territorial Council, Assam

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Kokrajhar												
2011	64	60	60	60	68	76	77	80	64	59	63	65
2012	65	64	67	68	70	66	86	78	86	60	55	56
2013	66	66	57	60	66	82	91	83	76	59	52	52
2014	56	59	65	62	59	78	85	78	78	56	52	66
2015	51	56	59	64	75	78	79	87	83	62	55	50
Chirang												
2011	77	68	86	95	98	98	98	95	94	91	86	76
2012	73	73	68	80	83	91	90	88	89	86	83	88
2013	84	77	69	87	87	89	94	91	90	91	85	89
2014	89	83	80	95	95	97	98	99	93	94	92	85
2015	82	77	72	86	86	86	84	91	79	76	77	80
Baksa												
2011	60	64	64	66	68	80	85	78	72	70	63	60
2012	62	63	66	65	70	92	90	80	74	68	63	62
2013	64	65	64	67	71	88	94	82	70	66	64	60
2014	63	62	63	65	69	90	91	85	72	69	62	62
2015	62	63	64	66	70	86	92	78	71	65	62	60
Udalguri *												
2013	NA	NA	NA	83	95	95	96	94	93	90	87	88
2014	89	86	79	83	95	95	96	94	93	90	87	88

Source: Director of Agriculture, BTC, Kokrajhar, Assam * KVK, Udalguri

Annexure VII

Month-wise and district-wise rainfall (mm) distribution of the districts of Bodoland Territorial Council, Assam for the year 2011-2015

District	2011	2012	2013	2014	2015	Average	Average No. of Rainy days
Kokrajhar	2500	3606	4346	3019	3083	3311	98
Chirang	2018	3737	2397	3337	3355	2969	112
Baksa	2018	2000	2175	2083	2065	2065	210
Udalguri	1442	2302	1345	1678	2149	1785	118

Source: Director of Agriculture, BTC, Kokrajhar, Assam

District	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Total
Kokrajhar	1.2	21.4	62.0	126.6	476.2	1118.6	516.5	539.4	348.0	99.2	1.2	1.1	3311
Chirang	4.92	28.3	155.4	138.4	346.0	739.4	459.5	564.3	417.5	102.0	8.6	4.5	2969
Baksa	34.8	42.8	109.1	172.6	195.6	576.6	548.7	212.9	99.8	31.2	15.4	25.9	2065
Udalguri	6.4	14.5	44.2	139.1	314.1	498.1	199.6	274.8	203.4	48.3	18.5	3.6	1785

Source: Director of Agriculture, BTC, Kokrajhar, Assam

Annexure VIII

Land use pattern of the districts of Bodoland Territorial Council, Assam for the year 2011-2015

District	Total geographical area	Forest area	Total cropped area	Barren and uncultivable land	Permanent pastures and other grazing land	Land under misc. trees	Cultivable waste land	Fallow land
Kokrajhar	312900	161195	179533	19810	15031	2352	2065	2243
Chirang	109985	41037	89679	1235	1371	995	1133	121
Baksa	196108	83019	137955	17581	8931	824	420	3
Udalguri	167393	22400	159311	6945	3862	7061	3579	112

Source: Statistical Handbook, Govt. of Assam, Guwahati; Council Head of the Department of Irrigation, BTC, Kokrajhar, Assam.

Annexure IX

Details of soil and water samples collected during survey of the districts of Bodoland Territorial Council, Assam

S.No.	District	Village	Latitude (N)	Longitude (E)	MSL (ft)	Soil	Water
1	Kokrajhar	Jiagurh	26°19.305'	90°15.582'	170	√	
2	Kokrajhar	Bashbari Part II	26°18.682'	90°17.224'	160	√	
3	Kokrajhar	Bashbari Part I	26°17.869'	90°17.532'	153	√	
4	Kokrajhar	Chakrashila Part II	26°17.596'	90°21.771'	138		√
5	Kokrajhar	Unnujuli	26°19.200'	90°22.357'	129		√
6	Kokrajhar	Unnujuli	26°19.199'	90°22.302'	130		√
7	Kokrajhar	Unnujuli	26°19.083'	90°21.867'	213	√	
8	Kokrajhar	Bangaldaba Part I	26°19.851'	90°23.569'	97		√
9	Kokrajhar	Bangaldaba Part I	26°20.022'	90°23.760'	114	√	
10	Kokrajhar	Balapara	26°20.476'	90°04.606'	130	√	
11	Kokrajhar	Panijani Part II	26°22.165'	90°03.086'	132		√
12	Chirang	Pakrigurhi Part II	26°30.281'	90°27.800'	249	√	√
13	Chirang	Kashikotra	26°32.700'	90°25.987'	220	√	
14	Chirang	Panibari	26°36.107'	90°51.029'	140	√	√
15	Baksa	Kakilabari	26°45.512'	91°11.827'	202	√	√
16	Baksa	Nikashi	26°43.230'	91°22.385'	300	√	√
17	Baksa	Kharua	26°33.724'	91°20.620'	159	√	√
18	Udalgiri	Nowbandha	26°42.428'	91°45.591'	298	√	√
19	Udalgiri	Merabil	26°44.282'	92°14.701'	286	√	√

Annexure X

Analysis Report of soil samples collected during survey of the districts of Bodoland Territorial Council, Assam

Sample No.	pH	EC (dS/m)	Organic carbon (%)	Available Phosphorous (kg/ha)	Available Potassium(kg/ha)
1	4.56	0.108	1.44	20.5	56.8
2	4.92	0.099	1.83	12.9	102.7
3	4.68	0.107	1.25	8.8	113.2
4	4.82	0.119	2.26	12.3	97.6
5	4.70	0.131	1.83	17.0	146.9
6	4.75	0.082	2.22	10.8	83.4
7	5.21	0.115	2.38	31.3	182.3
8	4.62	0.228	3.86	37.1	207.9
9	6.32	0.163	1.17	101.2	123.4
10	6.24	0.147	1.40	47.1	80.1
11	5.10	0.117	1.33	36.8	103.4
12	4.85	0.253	1.68	107.0	253.0
13	5.35	0.108	0.62	18.1	78.3
14	5.68	0.127	0.55	19.6	171.5

Critical limits

- pH - < 6.5 acidic, 6.5-7.5 neutral, > 7.5 alkaline
- EC (dS/m) - <2.0 normal
- Organic carbon (%) - <0.5 low, 05.-0.75 medium, >0.75 high
- Available phosphorous (kg/ha)- <22 low, 22-56 medium, > 56 high
- Available potassium (kg/ha)-<141 low, 141-336 medium, >336 high

Remarks

Sample 1: Acidic in pH, normal in EC, high in organic carbon, low in available phosphorous and potassium
Sample 2: Acidic in pH, normal in EC, high in organic carbon, low in available phosphorous and potassium
Sample 3: Acidic in pH, normal in EC, high in organic carbon, low in available phosphorous and potassium
Sample 4: Acidic in pH, normal in EC, high in organic carbon, low in available phosphorous and potassium
Sample 5: Acidic in pH, normal in EC, high in organic carbon, low in available phosphorous and medium in available potassium
Sample 6: Acidic in pH, normal in EC, high in organic carbon, low in available phosphorous and potassium
Sample 7: Acidic in pH, normal in EC, high in organic carbon, medium in available phosphorous and potassium
Sample 8: Acidic in pH, normal in EC, high in organic carbon, medium in available phosphorous and potassium
Sample 9: Acidic in pH, normal in EC, high in organic carbon, high in available phosphorous and low in available potassium
Sample 10: Acidic in pH, normal in EC, high in organic carbon, medium in available phosphorous and low in available potassium
Sample 11: Acidic in pH, normal in EC, high in organic carbon, medium in available phosphorous and low in available potassium
Sample 12: Acidic in pH, normal in EC, high in organic carbon, high in available phosphorous and medium in available potassium
Sample 13: Acidic in pH, normal in EC, medium in organic carbon, low in available phosphorous and potassium
Sample 14: Acidic in pH, normal in EC, medium in organic carbon, low in available phosphorous and medium in available potassium

Analysis Report of water samples collected during survey of the districts of Bodoland Territorial Council, Assam

Sample No.	pH	EC(dS/m)
1	6.03	0.05
2	6.36	0.05
3	6.26	0.14
4	5.64	0.05
5	6.45	0.10
6	5.44	0.06
7	7.50	0.37
8	6.68	0.48
9	6.60	0.26
10	6.42	0.21
11	6.35	0.13
12	5.80	0.14
13	6.54	0.09

Critical limits

- pH - < 6.5 acidic, 6.5-7.5 neutral, > 7.5 alkaline
- EC (dS/m) - <0.7 low salinity hazard, 0.7 to 1.6 medium salinity hazard, 1.6 to 3.0 high salinity hazard, >3.0 very high salinity hazard

Remarks

All the water samples are having acidic to neutral pH and having low salinity hazard

Meeting with officials of BTC

Interaction with Principal Secretary, BTC

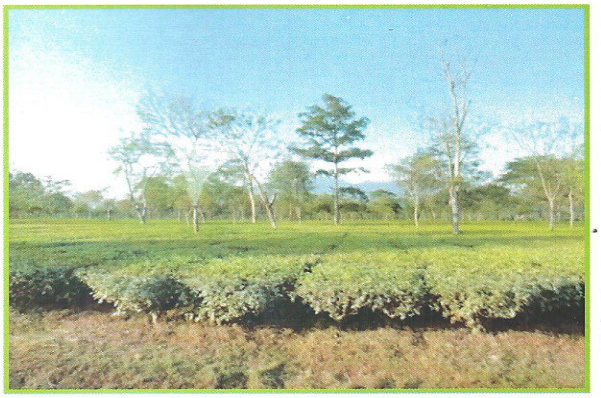
Interaction with Secretary (Agriculture), BTC

Interaction with MLC, BTC

Interaction with MLA, Baksa

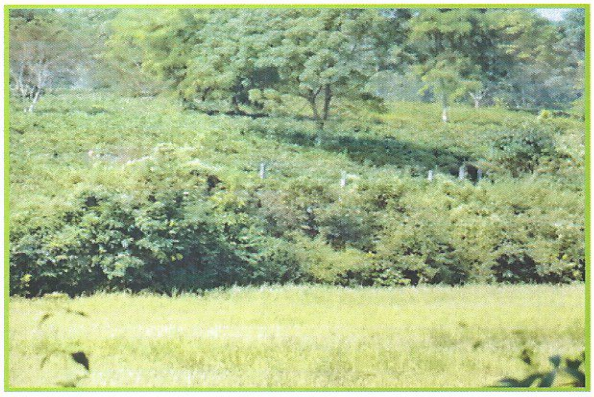
Existing cropping pattern in BTC

Paddy



Tea

Tapioca

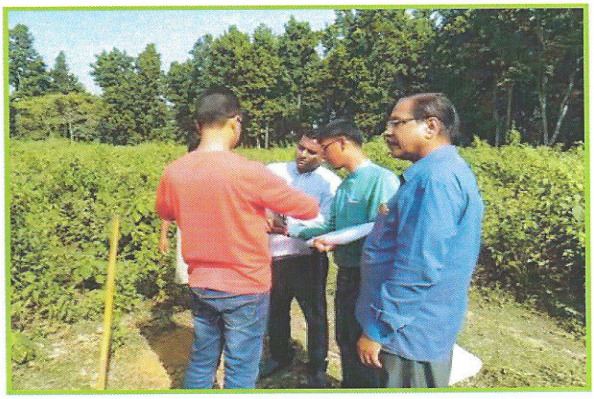


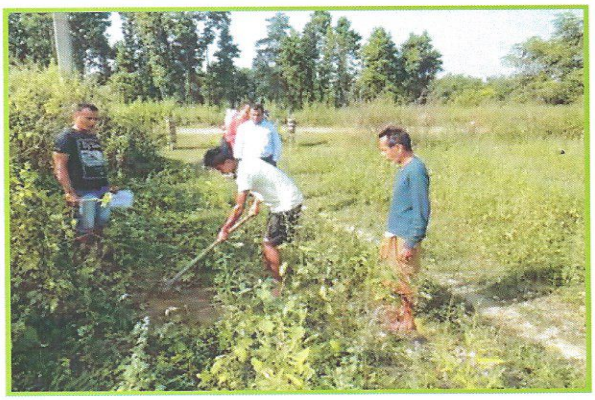
Paddy and Tea

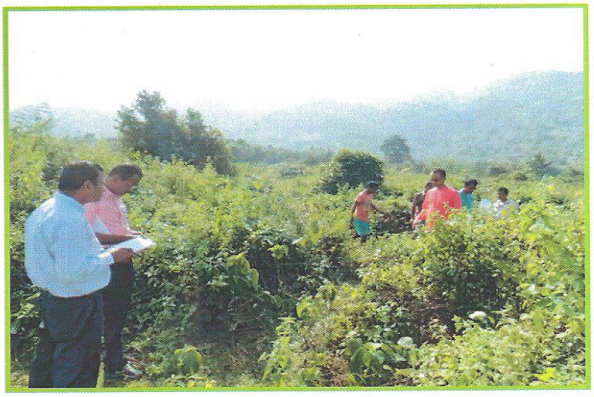
Banana and Arecanut

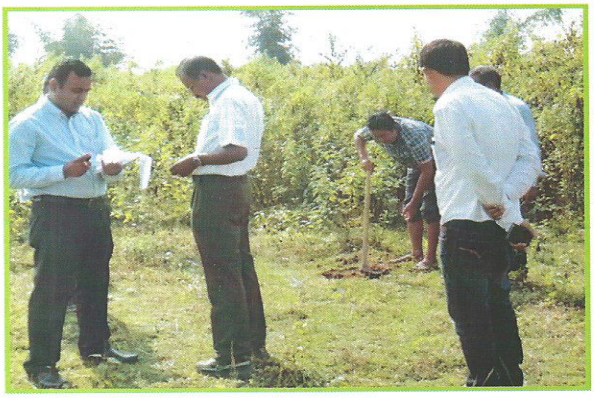
Paddy, Arecanut and Coconut

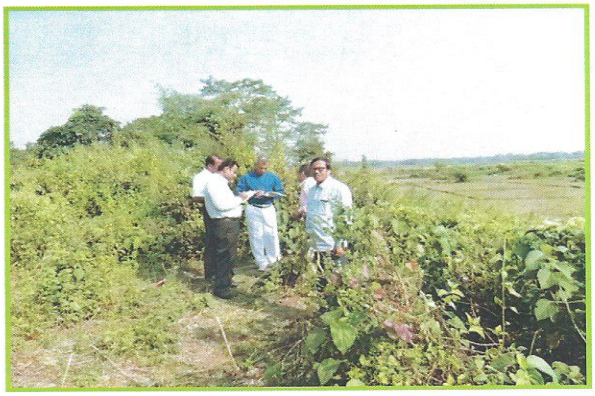
Soil and water sample collection during the survey in BTC



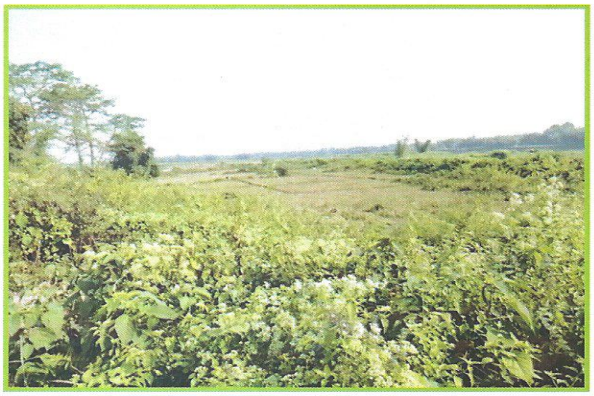


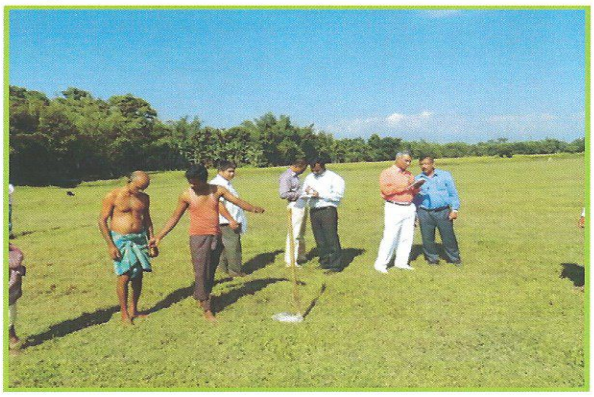




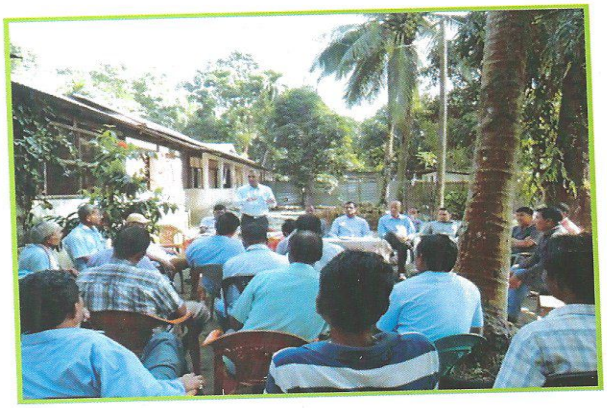


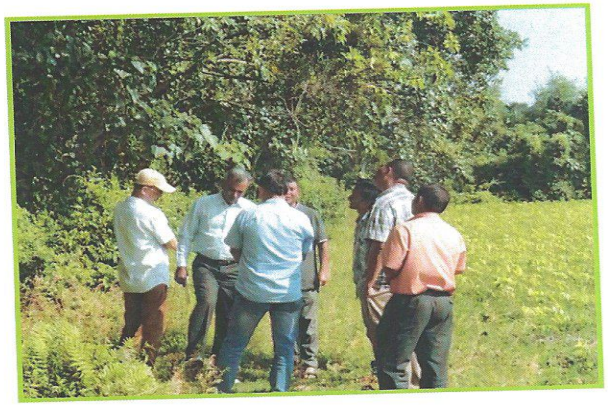
Various barren lands in BTC



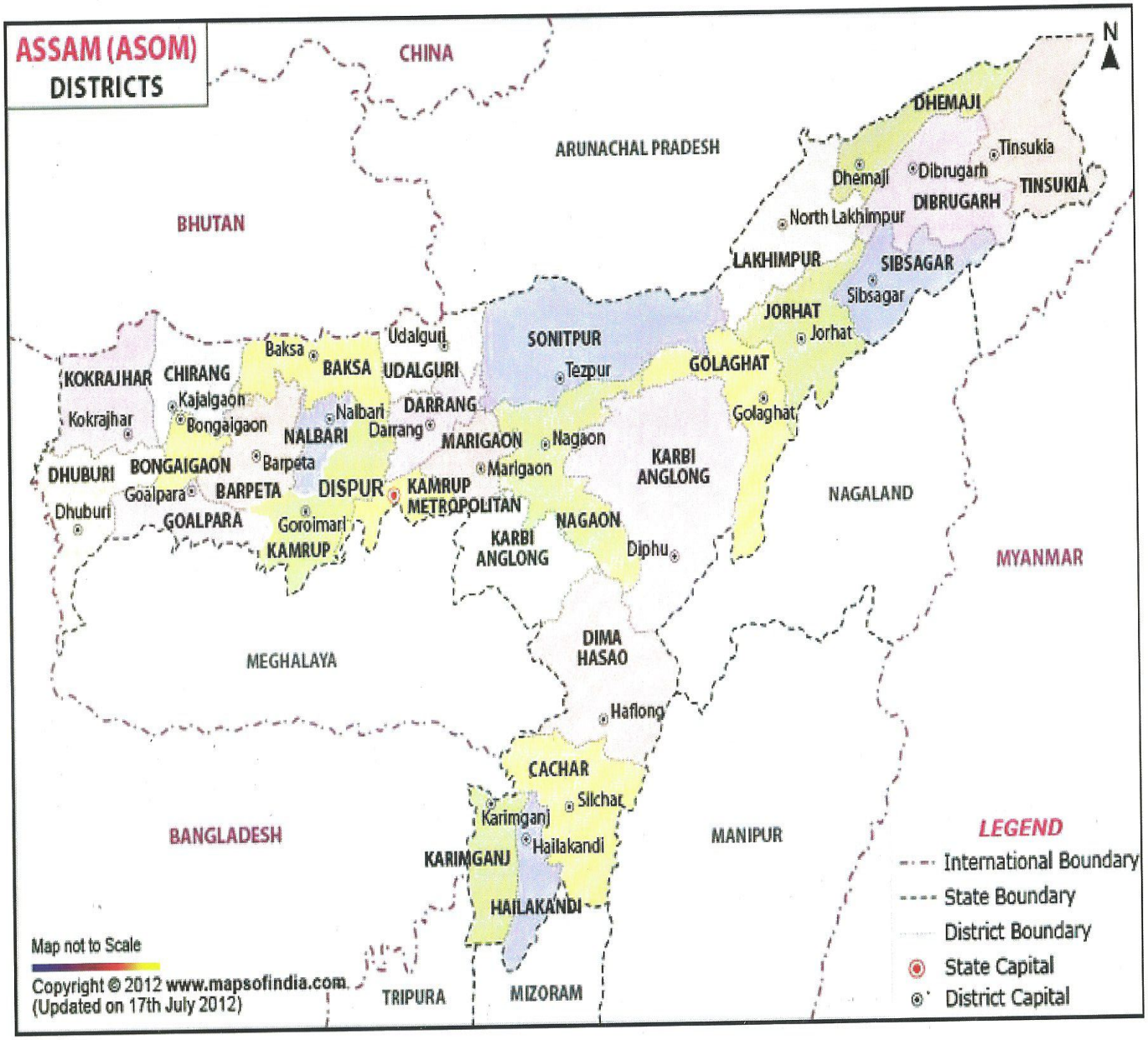


Interaction with farmers





Interaction with RARS and KVK officials


ASSAM (ASOM)
DISTRICTS
N
CHINA
ARUNACHAL PRADESH
BHUTAN
DHEMAJI
Dhemaji
Tinsukia
Dibrugarh
TINSUKIA
DIBRUGARH
North Lakhimpur
LAKHIMPUR
SIBSAGAR
Sibsagar
JORHAT
Jorhat
SONITPUR
Tezpur
GOLAGHAT
Golaghat
Udalguri
Baksa
BAKSA
UDALGURI
KOKRAJHAR
CHIRANG
Kajalgaon
Kokrajhar
Bongaigaon
Nalbari
DARRANG
Darrang
NALBARI
MARIGAON
Nagaon
Marigaon
KARBI ANGLONG
DHUBURI
BONGAIGAON
Barpeta
Goalpara
BARPETA
DISPUR
KAMRUP METROPOLITAN
Dhuburi
GOALPARA
Goroimari
KAMRUP
NAGAON
Diphu
KARBI ANGLONG
NAGALAND
MYANMAR
MEGHALAYA
DIMA HASAO
Haflong
CACHAR
Silchar
Karimganj
Hailakandi
KARIMGANJ
HAILAKANDI
BANGLADESH
MANIPUR
TRIPURA
MIZORAM
LEGEND
International Boundary
State Boundary
District Boundary
State Capital
District Capital
Map not to Scale
Copyright © 2012 www.mapsofindia.com
(Updated on 17th July 2012)