Lowering Emissions, Enhancing Forests in Nagaon

Jurisdictional REDD+ Project in Nagaon

Project Objective

- Lead to Low Emissions from Forests in Nagaon through REDD+.
    - Conserve existing forest and tree cover
    - Raise new plantations
    - Decrease burden of forest dependent people
    - Contribute to climate resilience
- REDD+: Reducing Emissions from Deforestation and Degradation
- REDD intl recognized, part of Paris Agreement
- Will be first district in state to undertake REDD+
- Will contribute to meeting state SDGs (climate Change, Low Emission/Sustainable development)
- Will also contribute to country's NDC targets

1 Reducing Emissions from Deforestation

2 Reducing Emissions from Degradation

3 Conservation of Carbon Stock

4 Sustainable management of forests

5 Enhancement of forest carbon stock

Stakeholder engagement is mandatory and critical to develop a REDD+ project

REDD+ and Sustainable Development Goals

Co-benefits of REDD+ also helps in meeting Assam specific SDGs

SDGs Conjunction with REDD+

- Employment generation (eg: bio-briquettes) (SDG-1)
- Improve the standard of living through cleaner fuels (SDG-3)
- Clean Energy cooking devices (SDG-7 and 13)
- Less indoor pollution in kitchen due to cleaner cooking (SDG-3)
- Sustainable harvesting and use of forest resources (SDG-11)
- Promotion of best climate resilient actions and conservation of natural resources (SDG 15)
- Women have spare time saved from collection of fuelwood (SDG-5)

Nagaon District Level Jurisdictional REDD+

Develop Institutional Framework

Develop REL/RL

Map drivers of forest change

Identify intervention strategies

Develop Carbon + SG Monitoring Strategy

Key Milestones LEEF project

Milestone	Date
Technical Consultant (IORA Ecological Solutions Pvt. Ltd.) hired based on an open EoI, RFP from shortlisted qualified organizations and due diligence.	April 2016
Notification of state REDD+ Task Force under the PCCF (HoFF)	July 2016
Notification of state REDD+ Cell under the CS	September 2016
Finalization of project sites (Nagaon and Majuli)	October 2016
Launch of the projects by the Chief Secretary, GoA	November 2016
Launch of the project at districts at the district development committee meetings in Nagaon	December 2016
Notification of District REDD+ Committee	December 2016
Convergence kick start meetings with line departments at Nagaon	December 2016
RS/GIS analysis: procurement of layers, classification, LULC analysis	January-February 2017
Socio-economic survey and driver idebtification at Nagaon	January-March 2017
Validation of drivers, interventions, LULC at Nagaon	April 2017
Training of 80 foresters at Jalukbari training Institute	June 2017

Key Steps: LEEF Nagaon

Step 1: Institutional Arrangement

- Notification of REDD+ Task Force
- Notification of REDD+ Cell
- District based REDD+ Committee have been formed

Step 2: Project area finalization

- Analysis of all districts of Assam on **10 parameters** to select the pilot site
- Presentation of results to the Hon. Minister and PS for final sanction

Step 3: Awareness creation

- Workshops at district level with line departments
- Development of apt logo for the project, outdoor communication

Step 4: REDD+ Reference Level Development

- **Landsat data for years 2000, 2006, 2010, 2015** procured
- LULC change analysis completed
- Linked to working plan data to compute REDD+ Reference Level

Step 5: Drivers of forest change assessment

- Interview of **567 households in 58 villages, 24 FGDs** in each range, Key Informant Interviews
- Survey data validated on ground and with secondary literature
- Driver-Intervention Matrix developed

Step 6: Intervention Plan

- Driver-Intervention matrix validated at district level
- District based intervention plans developed by line departments

Step 7: Institutionalizing knowledge

- REDD+ - Working Plan convergence document
- Safeguards system, benefit sharing mechanism

Step 8: Plan to Leverage Finance and develop GCF Proposal

- Leverage from convergence of existing programs – CCIP, NAMA (GIZ)
- Convergence of existing schemes through REDD+ Committees.
- Preparation of REDD+ design document to access international finance

Institutional Framework

REDD+ Cell formed at state level under the chair of the CS to oversee and guide REDD+ in the State

REDD+ Cell

REDD+ Task Force formed at the department to manage actual implementation of REDD+ in the landscapes, REDD+ Committees under the chair of DC for deptl. Convergence and deployment of actions

REDD+ Task Force

District REDD+ Committee formed at Nagaon and Majuli

Landscape deployment of actions, monitoring & evaluation after the deployment of interventions

Divisional level nodal officers (Nagaon (T), Golaghat)

Institutionalizing knowledge, training

Includes line departments and autonomous councils as members

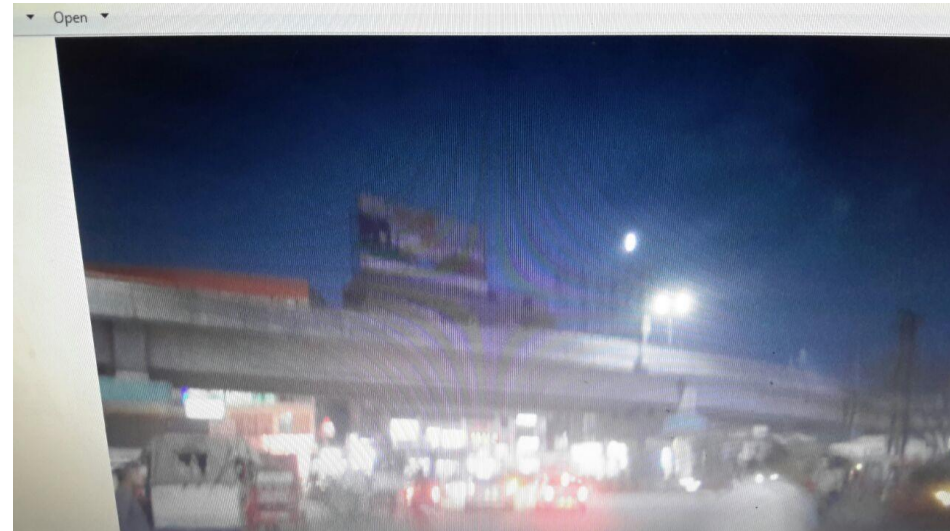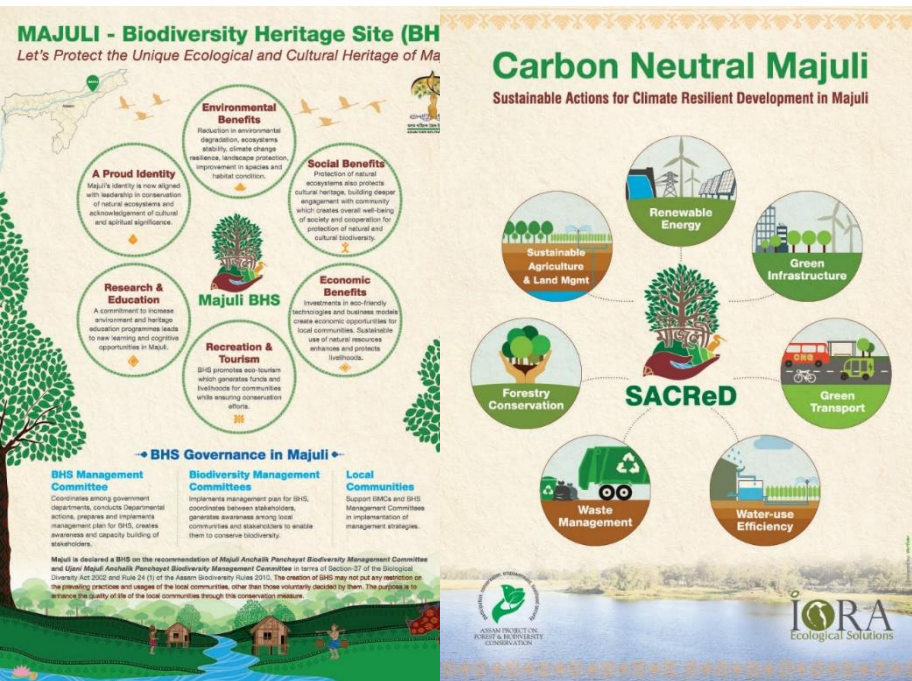# Awareness creation and training

Workshop in Nagaon for officers of territorial and Wildlife divisions, December 2016
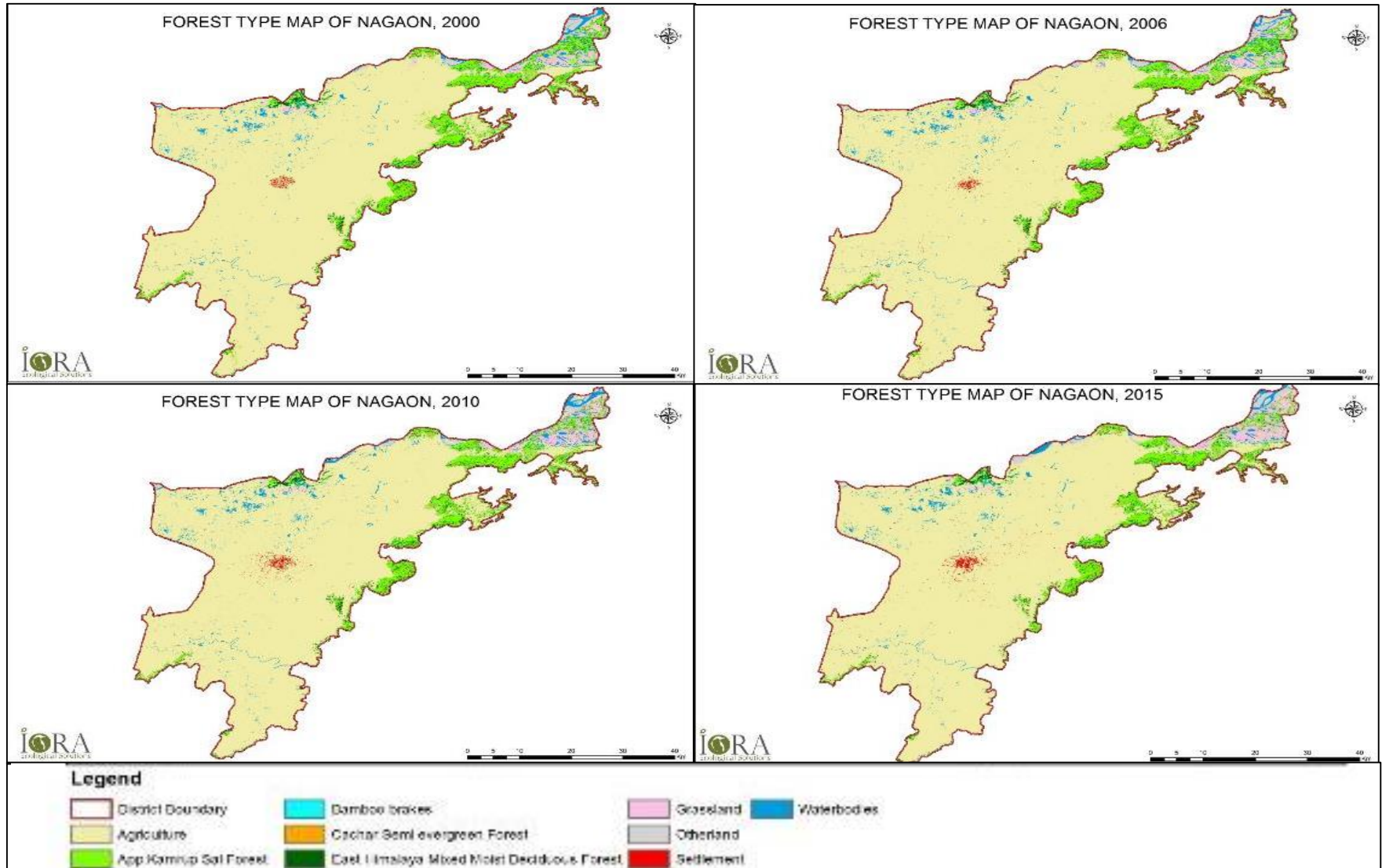

Training of 80 foresters at Jalukbari Training Institute, June 2017
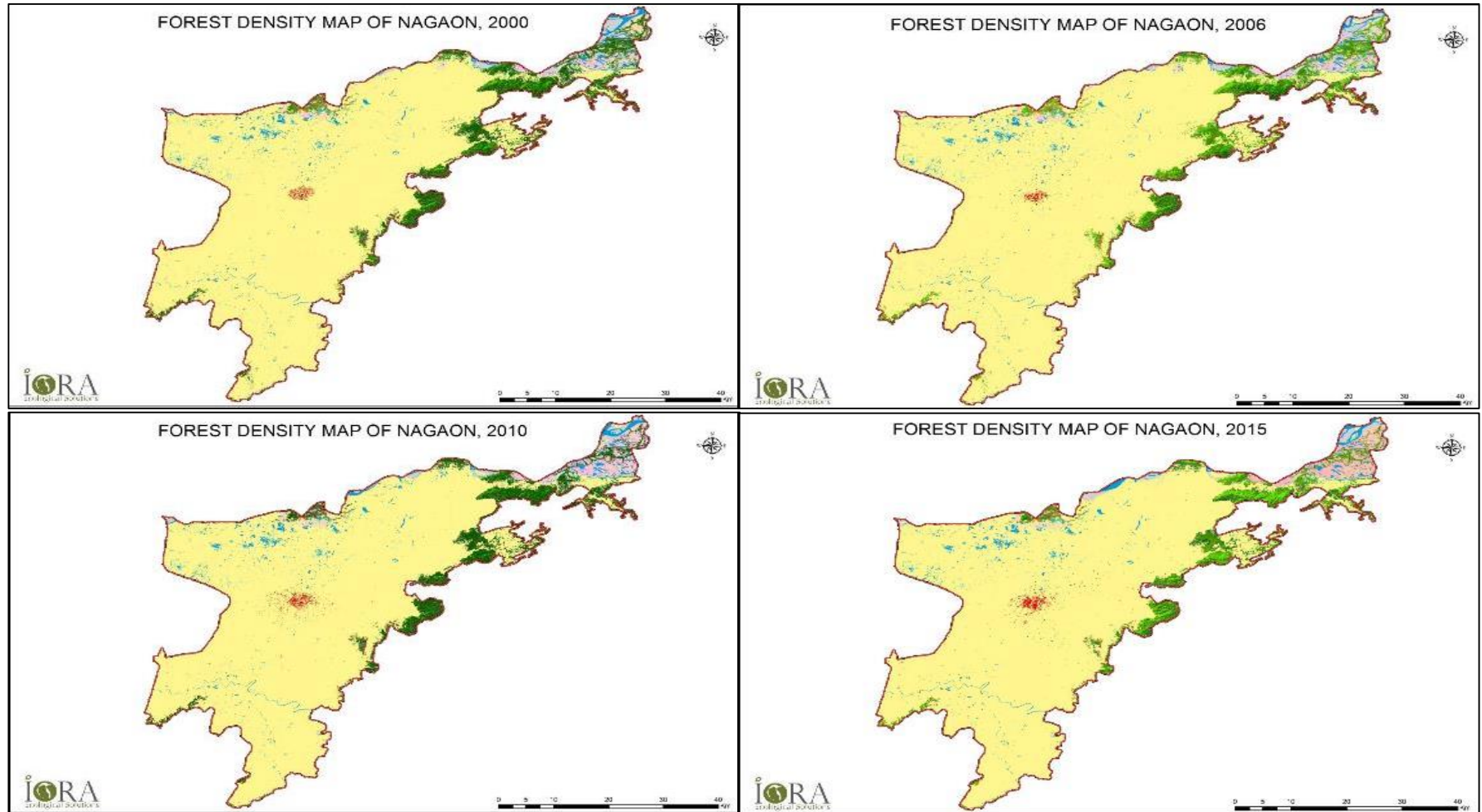
Awareness Creation

- Posters for mass communication

- Outdoor campaign – hoardings gateways

Forest Type Map of Nagaon (2000, 2006, 2010, 2015)

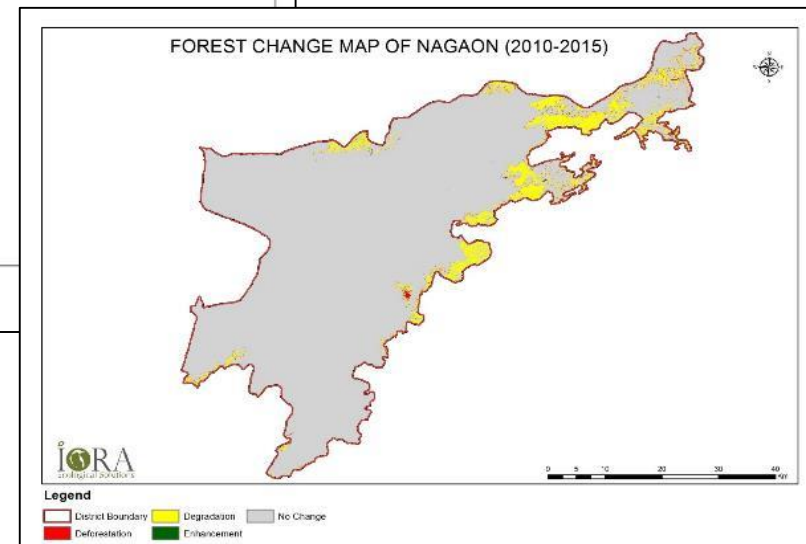# Forest Density Map of Nagaon (2000, 2006, 2010, 2015)

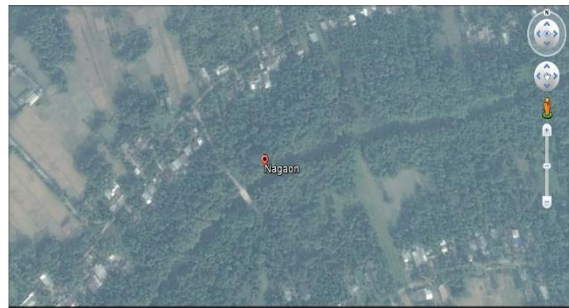# Forest Change Map of Nagaon (2000-06, 2006-10, 2010-15)
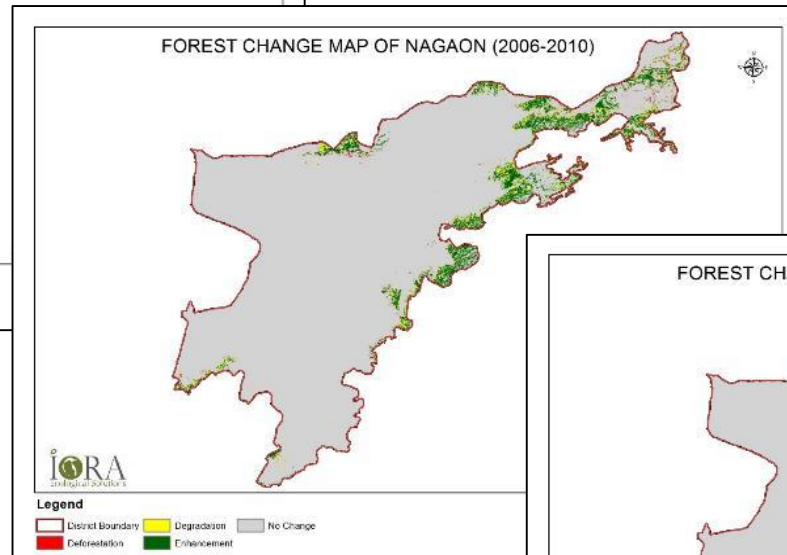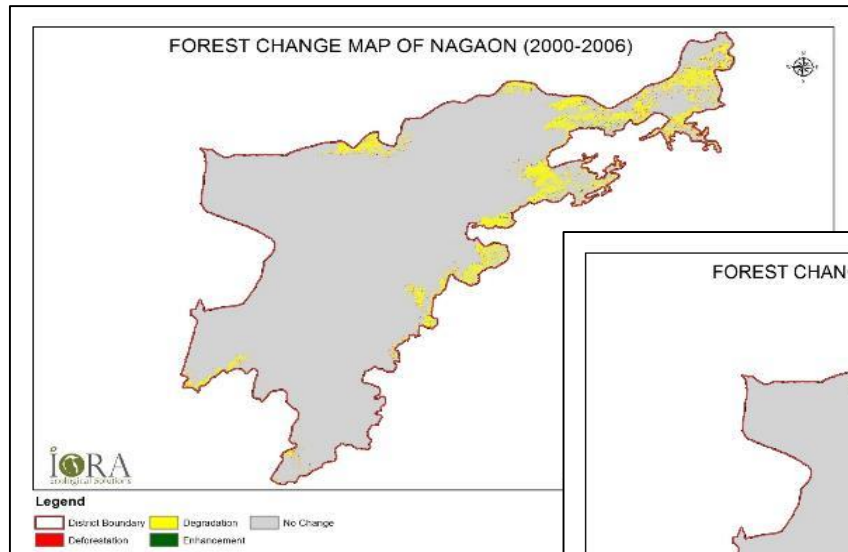
Field Validation of Classification

- Random points selected from each class.
- Validated from field visits, photographs, hi-res images and Google Earth

Corrections made based on the results

Confusion Matrix

Classified Data	App.Kamrup Sal	East Himalaya Moist Deciduous	Cachar Semi evergreen	Bamboo brakes	Agriculture	Settlement	Waterbodies	Grassland	Otherland	Row Total
App.Kamrup Sal	9	0	0	0	2	0	0	2	0	13
East Himalaya Moist Deciduous	0	10	0	0	2	0	0	1	0	13
Cachar Semi evergreen	0	0	10	0	1	0	0	2	0	13
Bamboo brakes	0	0	0	7	3	0	0	3	0	13
Agriculture	2	0	0	0	9	0	1	1	0	13
Settlement	0	0	0	0	2	11	0	0	0	13
Waterbodies	0	0	0	0	5	0	8	0	0	13
Grassland	0	0	0	0	0	0	2	11	0	13
Otherland	0	0	0	0	1	0	1	0	11	13
Column Total	11	10	10	7	25	11	12	20	11	117

Overall Classification Accuracy = 80.50%
Overall Kappa Statistics = 0.7019

Class Name	Kappa
App.Kamrup Sal	0.6604
East Himalaya Mixed Moist Deci	0.7477
Cachar Semi evergreen Forest	0.7477
Bamboo brakes	0.5091
Agriculture	0.6087
Settlement	0.8302
Waterbodies	0.5714
Grassland	0.8144
Otherland	0.8302

Class Name	Reference Totals	Classified Totals	Number Correct	Producers Accuracy	Users Accuracy
App.Kamrup Sal	11	13	9	81.82%	69.23%
East Himalaya Moist Deciduous	1	13	10	100.00%	76.92%
Cachar Semi evergreen	10	13	10	100.00%	76.92%
Bamboo brakes	7	13	7	100.00%	53.85%
Agriculture	25	13	9	36.00%	69.23%
Settlement	11	13	11	100.00%	84.62%
Waterbodies	12	13	8	66.67%	61.54%
Grassland	20	13	11	55.00%	84.62%
Otherland	11	13	11	100.00%	84.62%
Totals	117	117	86		

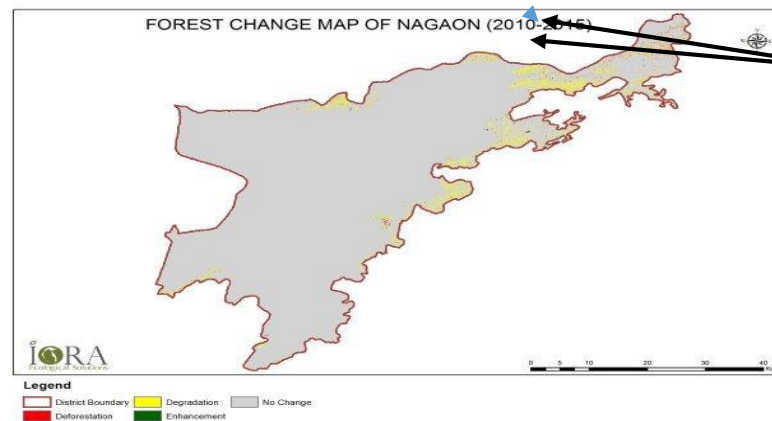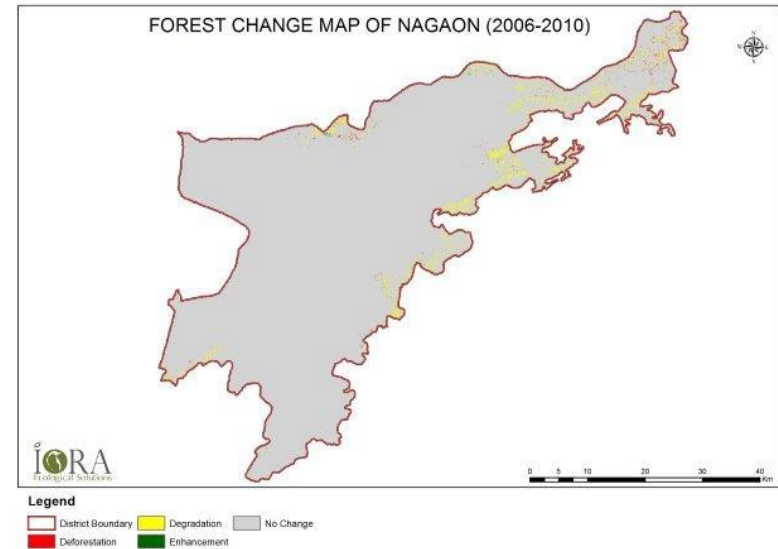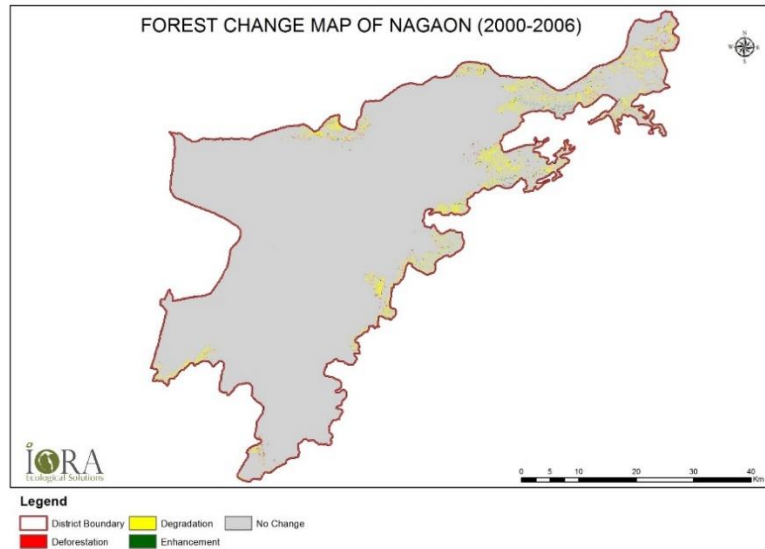Accuracy of classification is **80.5%**, within the allowed range of accuracy as per national standards

Forest Change Maps

Hotspots of deforestation and degradation identified for developing spatially relevant interventions

LULC Change Matrix for 3 Timepoints

2006 → 2006

2006	AKS 10-30	AKS 30-50	AKS 50-70	AKS Above 70	EMMD 10-30	EMMD 30-50	EMMD 50-70	EMMD Above 70	CSE 10-30	CSE 30-50	CSE 50-70	CSE Above 70	BAMBOO BRAKES	AGRICULTURE	SETTLEMENT	WATERBODIES	GRASSLAND	OTHERLAND	Grand Total
AKS 10-30	1424.40	27.20	2.92	0.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.05	0.05	0.00	0.00	0.24	1464.47073
AKS 30-50	59.51	7665.13	36.40	3.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	34.57	0.38	0.00	0.00	0.54	7800.35841
AKS 50-70	79.58	94.55	8162.33	36.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.70	0.00	0.00	0.00	8373.32017
AKS Above 70	81.35	64.21	47.47	1581.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.08	1774.88067
EMMD 10-3	0.00	0.00	0.00	0.00	15.93	1.79	0.50	0.10	0.00	0.00	0.00	0.00	0.51	0.99	0.00	0.00	0.00	0.00	19.8150573
EMMD 30-5	0.00	0.00	0.00	0.00	21.72	2179.93	5.89	0.25	0.00	0.00	0.00	0.00	6.56	10.47	0.00	0.00	0.00	0.00	2224.82851
EMMD 50-7	0.00	0.00	0.00	0.00	54.52	9.86	3076.31	6.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	3146.92371
EMMD Above 70	0.00	0.00	0.00	0.00	36.14	13.26	24.89	636.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.47	711.459645
CSE 10-30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.38	0.25	0.07	0.15	0.00	0.00	0.00	0.00	0.98979154
CSE 30-50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	3.70	2.29	4.89	0.00	4.04	0.00	0.00	0.00	0.26	15.3229623
CSE 50-70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.62	2.99	161.65	7.18	0.00	0.00	0.00	0.00	0.00	0.03	172.47847
CSE Above 70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.51	4.57	10.09	1070.82	0.00	0.00	0.00	0.00	1.69	0.00	1087.6838
BAMBOO BRAKES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1132.15	0.00	0.03	0.00	14.98	0.04	1147.20933
AGRICULTURE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	211891.83	59.36	0.00	0.00	12.80	211963.984
SETTLEMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.93	402.21	0.00	0.00	0.00	414.144323
WATERBODIES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5359.13	0.00	499.84	5858.96085
GRASSLAND	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4414.27	4.05	4418.32059
OTHERLAND	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.45	0.00	146.50	0.00	1594.74	1750.68086
Grand Total	1644.841	7851.089	8249.125	1622.302	128.3086	2204.837	3107.594	643.1503	1.425221	11.2626	174.4118	1083.138	1139.291	211972.5	462.797	5505.622	4431.204	2112.955	252345.832

2010 → 2006

2006	AKS 10-30	AKS 30-50	AKS 50-70	AKS Above 70	EMMD 10-30	EMMD 30-50	EMMD 50-70	EMMD Above 70	CSE 10-30	CSE 30-50	CSE 50-70	CSE Above 70	BAMBOO BRAKES	AGRICULTURE	SETTLEMENT	WATERBODIES	GRASSLAND	OTHERLAND	Grand Total
AKS 10-30	1509.51	19.49	16.63	11.76	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.77	85.65	0.07	0.00	0.00	0.22	1644.09
AKS 30-50	32.04	7644.71	93.17	26.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	56.18	0.01	0.00	0.00	0.07	7852.57
AKS 50-70	59.14	29.66	8090.01	47.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	22.45	0.00	0.00	0.00	0.00	8248.40
AKS Above 70	0.42	1.26	6.61	1599.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.39	0.00	0.00	0.00	0.00	1621.52
EMMD 10-30	0.00	0.00	0.00	0.00	70.41	0.71	7.91	22.64	0.00	0.00	0.00	0.00	0.35	26.57	0.00	0.00	0.00	0.00	128.59
EMMD 30-50	0.00	0.00	0.00	0.00	4.23	2033.60	39.36	92.01	0.00	0.00	0.00	0.00	3.76	46.56	0.00	0.00	0.00	0.00	2219.51
EMMD 50-70	0.00	0.00	0.00	0.00	0.10	3.92	3051.45	41.36	0.00	0.00	0.00	0.00	3.65	0.00	0.00	0.66	5.50	0.00	3106.63
EMMD Above 70	0.00	0.00	0.00	0.00	0.00	0.00	0.15	639.76	0.00	0.00	0.00	0.00	0.00	2.76	0.00	0.00	1.03	0.00	643.71
CSE 10-30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.49	0.66	0.00	0.13	0.00	0.00	0.00	0.00	1.43
CSE 30-50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.27	1.64	7.18	0.00	1.16	0.00	0.00	0.00	0.00	11.26
CSE 50-70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	170.37	25.95	0.00	7.82	0.00	0.00	0.19	0.00	204.41
CSE Above 70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.08	1061.43	0.34	14.05	0.00	0.02	0.00	1083.92
BAMBOO BRAKES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1104.00	29.87	0.00	0.00	15.96	0.00	1149.82
AGRICULTURE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.35	211477.75	37.99	261.53	4.86	176.53	211970.01
SETTLEMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	428.21	0.00	0.00	0.00	428.21
WATERBODIES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5308.14	0.00	201.09	5509.23
GRASSLAND	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4405.88	24.34	4430.22
OTHERLAND	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	193.82	0.00	621.02	3.59	1274.05	2092.48
Grand Total	1601.11	7695.13	8206.42	1685.13	74.73	2038.23	3098.88	795.77	0.14	1.36	180.58	1095.23	1120.57	211981.80	466.28	6191.38	4437.00	1676.29	252346.0

2015 → 2010

2010	AKS 10-30	AKS 30-50	AKS 50-70	AKS Above	EMMD 10-3	EMMD 30-5	EMMD 50-7	EMMD Abo	CSE 10-30	CSE 30-50	CSE 50-70	CSE Above	BAMBOO B	AGRICULTURE	SETTLEMEN	WATERBOD	GRASSLAND	OTHERLAN	Grand Total
AKS 10-30	1528.86	25.95	9.24	8.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	28.43	0.00	0.00	0.00	0.00	1601.11
AKS 30-50	31.89	7579.06	36.02	14.66	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.70	32.41	4.01	0.00	0.00	0.10	7698.84
AKS 50-70	83.47	68.29	8011.03	37.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.03	0.00	0.00	0.00	0.15	8205.97
AKS Above 70	51.44	43.67	45.30	1534.96	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.88	0.02	0.00	0.00	0.13	1685.40
EMMD 10-3	0.00	0.00	0.00	0.00	170.25	0.05	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	4.05	0.00	174.63
EMMD 30-5	0.00	0.00	0.00	0.00	0.50	2031.40	4.43	0.10	0.00	0.00	0.00	0.00	0.00	0.87	0.00	0.00	0.00	0.00	2037.30
EMMD 50-7	0.00	0.00	0.00	0.00	0.00	6.25	14.12	3066.64	0.79	0.00	0.00	0.00	0.00	3.54	7.39	0.00	0.00	0.25	3098.94
EMMD Above 70	0.00	0.00	0.00	0.00	14.47	11.85	39.95	721.32	0.00	0.00	0.00	0.00	0.00	8.35	0.00	0.00	0.01	0.00	795.94
CSE 10-30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14
CSE 30-50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.11	0.10	0.00	0.00	0.15	0.00	0.00	0.00	0.00	1.36
CSE 50-70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.54	1.92	114.43	7.16	0.00	6.52	0.00	0.00	0.00	130.58
CSE Above 70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.70	8.52	30.72	1041.48	0.00	13.72	0.00	0.00	0.00	1095.13
BAMBOO BRAKES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1085.19	35.47	0.00	0.00	0.00	0.00	1120.66
AGRICULTURE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	211722.18	5.46	136.80	0.00	107.42	211971.85
SETTLEMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	37.66	428.66	0.00	0.00	0.00	466.33
WATERBODIES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	68.31	0.00	5440.47	0.00	622.71	6131.49
GRASSLAND	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4432.07	3.70	4435.78
OTHERLAND	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	60.43	0.00	319.92	0.00	1314.19	1694.54
Grand Total	1695.65	7716.97	8101.59	1595.24	191.47	2057.42	3111.19	722.22	1.38	11.54	145.25	1048.64	1097.78	212029.54	438.17	5897.19	4436.38	2048.39	252346.017

LULC Matrices for Three Time Points

Classes	Area in 2000 (ha)	Area in 2006 (ha)	Area in 2010 (ha)	Area in 2015 (ha)
App. Kamrup Sal Forest	19413.03	19366.59	19191.32	19109.46
East Himalayan Mixed Moist Deciduous Forest	6103.027	6098.45	6006.858	5982.294
Cachar Semi-Evergreen Forest	1326	1301.019	1227.201	1206.812
Bamboo Brakes	1147.209	1149.824	1220.659	1097.778
Agriculture	211963	211970	211971.9	212029.5
Settlement	421.1443	428.2081	466.3284	478.1714
Waterbodies	5808.961	5509.23	6131.485	5997.192
Grassland	4418.321	4430.215	4435.776	4436.379
Otherland	1744.681	2092.475	1694.536	2008.391
Total	252345.4	252346	252346	252346

Drivers and Interventions: Survey Process

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┌──────────────────┐     ┌──────────────────┐     ┌──────────────────┐     ┌──────────────────┐
│ Selection of     │     │ Primary          │     │ Guidance from    │     │ Selection of the │
│ appropriate      │ ──> │ stakeholder      │ ──> │ forest           │ ──> │ samples from the │
│ methodology for  │     │ mapping,         │     │ department,      │     │ population       │
│ the survey       │     │ secondary        │     │ final            │     │                  │
│                  │     │ literature study │     │ stakeholder map  │     │                  │
└──────────────────┘     └──────────────────┘     └──────────────────┘     └──────────────────┘

┌──────────────────┐     ┌──────────────────┐     ┌──────────────────┐     ┌──────────────────┐
│ Preparation and  │     │                  │     │ Key informant    │     │ Data             │
│ field test of    │ ──> │ HH Survey and    │ ──> │ interviews and   │ ──> │ digitization,    │
│ the              │     │ FGD              │     │ meeting other    │     │ analysis and     │
│ questionnaires   │     │                  │     │ stakeholders     │     │ interpretation   │
└──────────────────┘     └──────────────────┘     └──────────────────┘     └──────────────────┘

┌──────────────────┐     ┌──────────────────┐     ┌──────────────────┐     ┌──────────────────┐
│ Validation of    │     │ Develop          │     │ Present the plan │     │ Finalise the     │
│ drivers by the   │ ──> │ convergence plan │ ──> │ to the district  │ ──> │ implementation   │
│ forest           │     │ for the          │     │ collector        │     │ plan             │
│ department       │     │ interventions    │     │                  │     │                  │
└──────────────────┘     └──────────────────┘     └──────────────────┘     └──────────────────┘
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Methodology for the Survey

Nagaon District

Territorial Ranges (5 ranges)

Wildlife Ranges (2 ranges)

Randomly select the villages based on distance from Forest in each range

- Households within the forest
- Households within 1 KM from forest
- Households within 5 KM from forest
- Households beyond 5 KM from forest
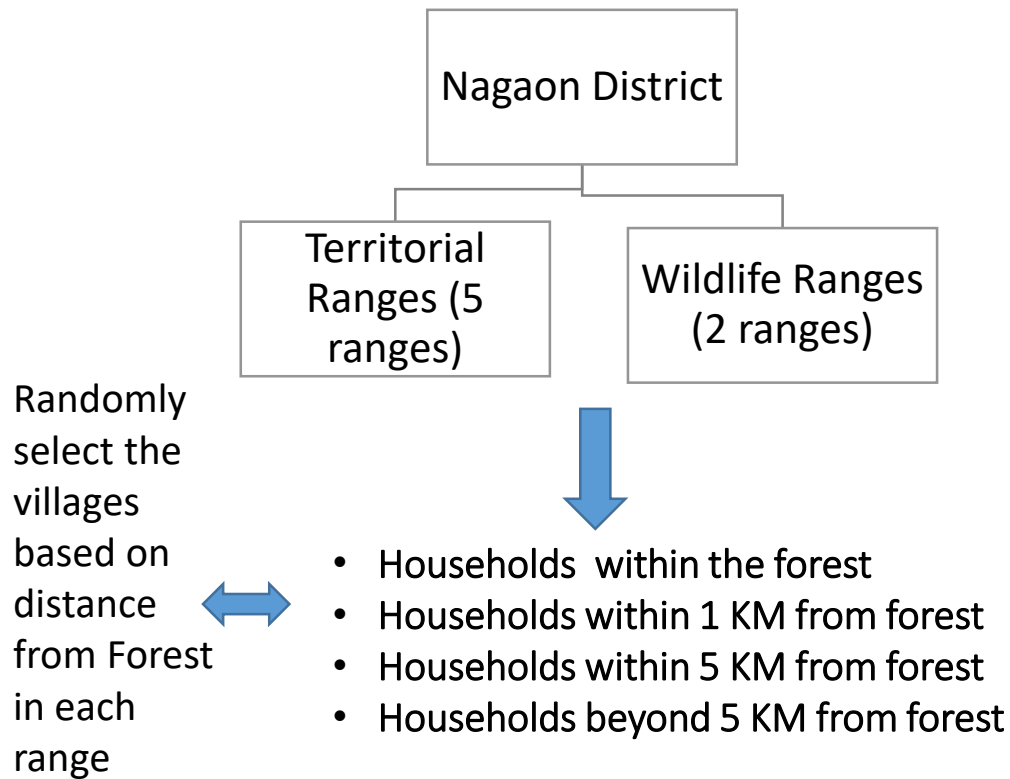
Households are selected in each Village based on Land holding Criteria

- Based on REDD+ methodology VM0006 version 2.1.
- Guidance from Climate, Community and Biodiversity standard, the Gold Standard.
- Templates of JFMC PRAs adapted for REDD+ data collection.
- Follows strictures and guidance of internationally recognized approaches.

Source: Planning for Forest Resources and Biodiversity Management: by Kailash Chandra Bebartha, IFS and FRI

Conducting the Socio-Economic Survey


```
Training of surveyors (hired from the landscape)  →  Household surveys
                                                          ↓
Focal Group Discussions  →  Interview traders of forest resources
                                         ↓
Key Informant Interviews  →  Analysis and validation
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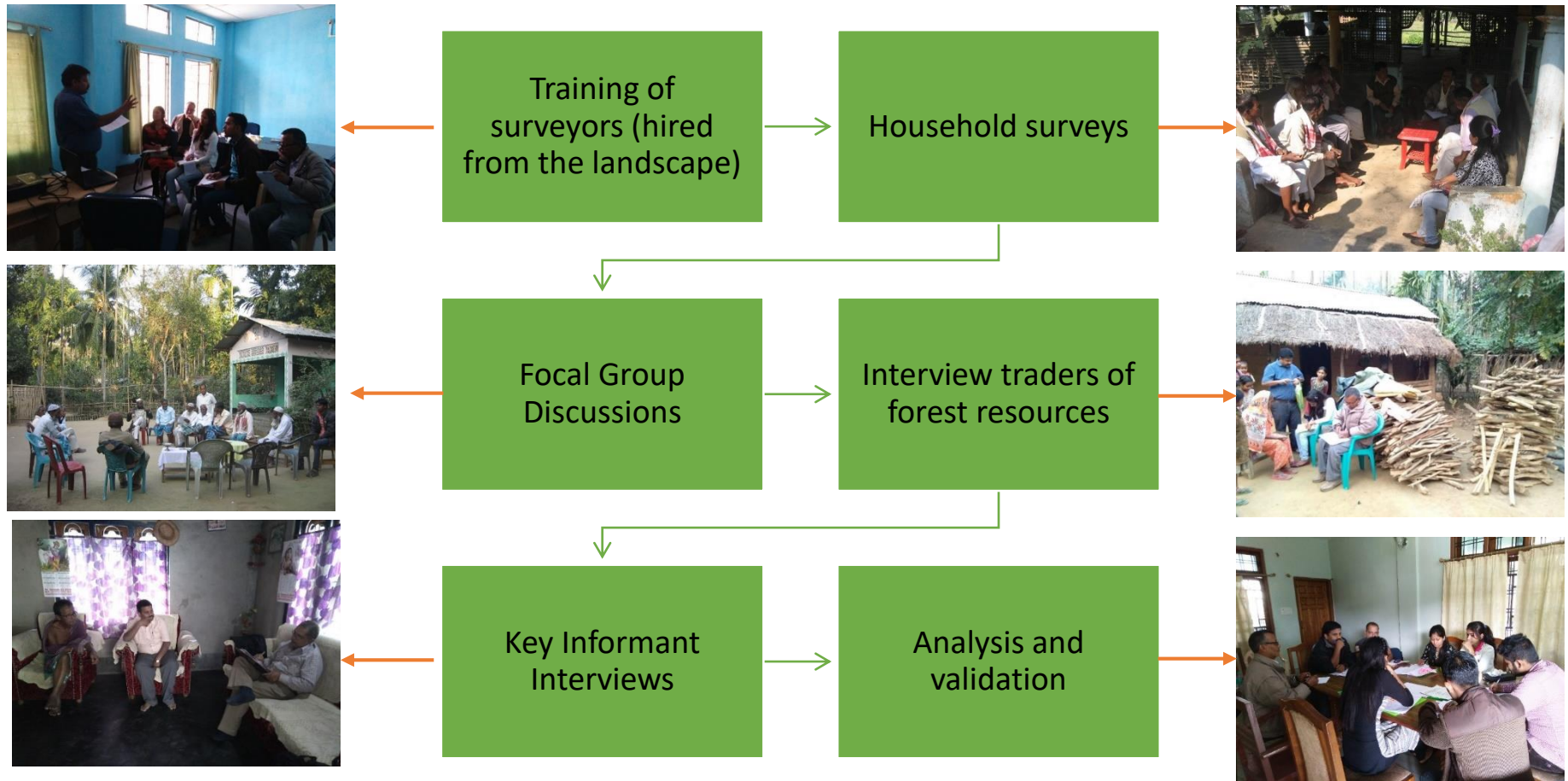
Development of Driver-Intervention Matrix

Drivers identified
Fuelwood for domestic energy needs
Fuelwood for commercial sale
Conversion to settlements
Conversion to cropland
Conversion to other infrastructure
Cattle grazing in forests
Commercial extraction of Fuelwood
Timber for local enterprises and domestic use
Extraction of understory vegetation

Potential Interventions

Fuelwood:
LPG in households and commercial use, Improved Cookstoves, Biogas in institutions, improved driers for arecanut processing (support from AEDA)
Fuelwood/Energy plantations, bio-briquette

Fodder Management:
Agroforestry, fodder plantations, silages, promotion of stall feeding, hydroponics and azolla cultivation as nutritional supplements (support from AH&VS)

Timber:
Agroforestry schemes, easing of doing plantation/forestry in private lands

Encroachment:
CPT, EPT as boundary markers, smart patrolling

List of Interventions

S. No.	Name of Intervention	Drivers Addressed
1	Alternative energy cooking system in households (ICS, LPG, biogas)	Unsustainable fuelwood extraction from forests for cooking and heating purposes
2	Efficient fuelwood-based driers for arecanut processing in arecanut industries in Nagaon	
3	Efficient fuelwood-based boilers for Arecanut boiling in Arecanut industries in Nagaon	
4	Retrofitting existing brick kilns / Introducing new brick manufacturing technologies, for fuel efficient brickmaking	
5	Smokeless Biomass briquettes as a fuelwood substitute	
6	Smart patrolling to check unplanned extraction of forest resources and unplanned mining within forest land	Encroachment, unplanned felling
7	Construction of CPTs and EPTs for better defined boundaries to reduce encroachments	Grazing, illegal transport of forest produce, encroachment
8	Bio-fencing to reduce encroachment, illegal felling and man-animal conflicts	Encroachment, unsustainable fuelwood and NTFP extraction, man-animal conflicts
9	Plantation activities: 1) Afforestation and Reforestation in non-forest lands for tree cover. 2) Assisted Natural Regeneration in forests to stop degradation	Unsustainable extraction of fuelwood
10	Promoting agro-forestry in large scale in non-forest lands	Unsustainable extraction of fuelwood and timber
11	Cultivation of medicinal plants as a measure of alternative livelihood and income enhancement	Over-dependence on forest resources
12	Sustainable grazing and livestock management 1) Silvi-pastoral and Horti-pastoral models, 2) Fodder densification and stall feeding, 3) Vaccination of livestock	Unsustainable fuelwood extraction from forests and overgrazing in forest lands

Interdepartmental Convergence Activities Under LEEF

For first phase of deployment:
94 villages in forest fringes identified.
Total beneficiaries: **83,906**

Key convergences: Consumer Affairs and AEDA

- LPG connections by prioritizing beneficiaries from forest fringe villages – Forest dept. to provide names of BPL families eligible to DD, Supplies.
  - 9 JFMCs and EDCs in WL area to be first target; followed by other forest fringe villages.
  - Directive from the HO to immediately start deploying LPG connections among the identified beneficiaries of the fringe villages.
  - An event may be organized to mark the distribution of the devices amongst the identified villages.
- Alt. Energy
  - AEDA in principle will support ICS deployment.
  - In phase I an AFDSS being deployed for ICS.
  - Directive to saturate identified villages with ICS.

Low carbon cooking technology

IMPROVED COOKSTOVE FOR HOUSEHOLDS

Assam Energy Development Agency
(Procure bio-briquettes and supply to markets)

P&RD
(Training and Capacity Building)

Agriculture Department
(Data collection and pilot scale deployment)
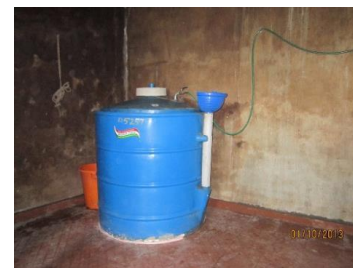
NABARD/Other financial institutions
(Financial assistance)

Consumer Affairs dept.
(Provide, deploy, conduct trainings for clean technology)

Science and Technology Department
(Study, assess, develop clean technology)

BIOTECH BIOGAS MODEL FOR HOUSEHOLDS

Department Name	Intervention			Potential Convergence
• Ministry of Renewable Energy, Govt. of India, Assam Energy Development Agency (AEDA) • Consumer Affairs dept.	Activity	Target	Total Cost (INR)	Priority to be given to those villages where fuelwood consumption is more especially forest fringe villages. • LPG: Pradhan Mantri Ujjwala Yojana • ICS: Unnat Chulha Yojana • Biogas: National Biogas and Manure Management Programme (NBMMP) • AEDA schemes.
	ICS installation	2,88,192 HHs	20,00,00,000	
	LPG installation (with 4 refills in 1st year and 2 refills in 2nd year)	15,203 HHs	12,59,26,449	
	Biogas units (2m3 Sintex type Model)	200 HHs	25,00,000	
	Smokeless Biomass briquettes	400 nos.	15,60,000	

Key convergences: AH&VS

- AH&VS-
  - Prepared a plan to integrate with LEEF program; Awareness creation on stall feeding and fodder plantation
  - Purbimitra and cooperatives through Dist. Dairy Devpt. officer
  - Vaccination camps with support of forest dept.; esp through dispensary at Laokhowa
  - Oat grass as fodder as pilot in 2-3 JFMC villages.
  - Silages to store fodder and feed mill in fringe villages.
  - Directive to the AH&VS department to start the campaigns in the villages identified in the WL area.

Fodder Management

Animal Husbandry and Veterinary Service Department
(Fodder development, pilot deployment)

Horticulture Department
(Seeds for fodder development)

P&RD
(Land)

Agriculture Department
(Land)

NABARD/Other financial institutions
(Financial assistance)

Department Name	Intervention			Potential Convergence
Horticulture and Animal Husbandry Department, Govt. of Assam	Activity	Target	Total Cost (INR)	To reduce open grazing, priority to be given to stall feeding. Farmers should be provided with fodder seeds and shall be encouraged to take up this activity at large scale.
	Area under silvi-pastoral and horti-pastoral plantations	192 ha	36,94,080	• Sub-Mission on Fodder and Feed Development, National Livestock Mission (Government of India)
	No. of straw-based block making machine (15 MT per day) [on pilot basis]	3	1,05,00,000	• Accelerated Fodder Development Programme, Department of Agriculture (Government of India)
	No. of livestock for CBPP and Rinderpest eradication programmes	20,87,631	4,10,84,578	• Pashu Dhan Bima Yojana

Key convergences: Horticulture under Agri.

- Arecanut driers
  - Exposure of efficient driers to industry – facilitate visit to operational driers in Karnataka.
    - President of the association planned a visit in August, however put off due to some reasons.
  - Directive to horticulture (Agriculture Dept.) to explore subsidies for decentralized driers to be operated at HH level.
  - Directive to industries dept. (SME) to explore subsidies to operate large scale driers modelled after the ones that are operational in Karnataka.

Department Name	Intervention			Potential Convergence
• Agriculture dept. • AEDA	Activity	Target	Total Cost (INR)	• Provide the dryers and boilers to big Arecanut processing industries at subsidized price. • People are willing to deploy the technology if government can provide Subsidy
	Arecanut Dryer	10 nos.	37,04,800	
	Arecanut boiler:	20 nos.	5,00,000	

Key convergences: Agriculture dept.

- Medicinal garden
  - Horticulture mission through AYUSH – planned to be started as alternative livelihood program in JFMCs under AFD.
  - Honey promotion in EDCs
  - Fruit trees in private lands
  - Directive to AYUSH to provide training for interested people at the identified JFMCs.
- Dissemination of CSA initiatives for enhanced resilience

Medicinal Gardens

Panchayat and Rural Development
(Land and inputs for plantation and maintenance)

Horticulture Department
(Provide seeds and saplings)

Forest Department
(Support through NTFP Cell)

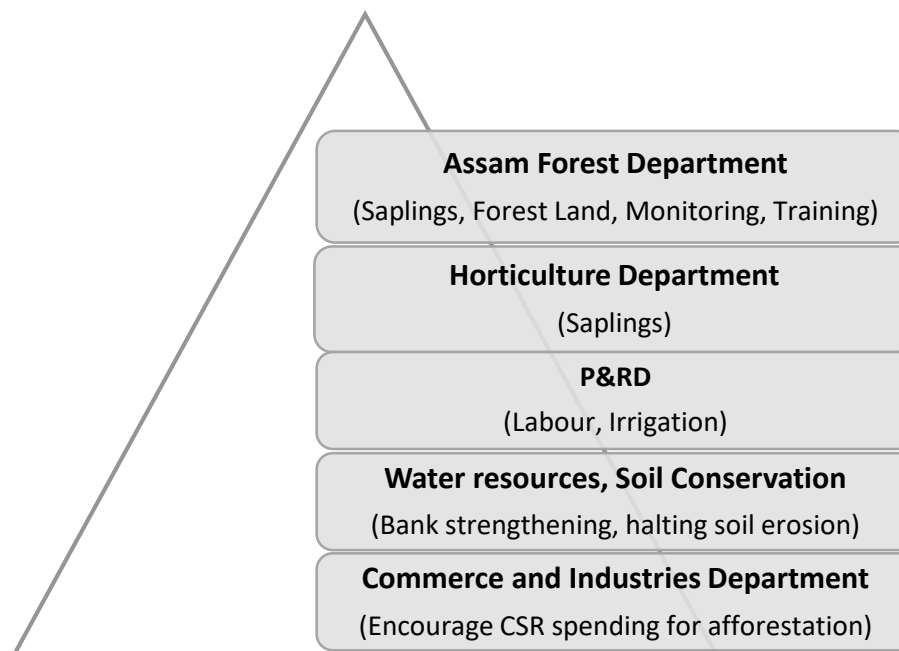**Science and Technology Department**
(Study, assess, develop clean technology)

WPTBC (Community and traditional knowledge national state schemes),

Department Name	Intervention			Potential Convergence
• Agriculture Department • Horticulture Department • Department of AYUSH (Govt. of India)	Cultivation of Medicinal Plants at large scale on farmer lands			Seeking subsidies from Government on seeds, equipment required for the activities and provide loans at reduced interest rates.
	Activity	Target	Total Cost (INR)	• Horticulture Mission • Agriculture Department (Ayush Programme for cultivation of medicinal plants)
	Area under Aloe Vera cultivation	50 ha	11,85,18,750	
	Area under Ashwagandha cultivation	50 ha		

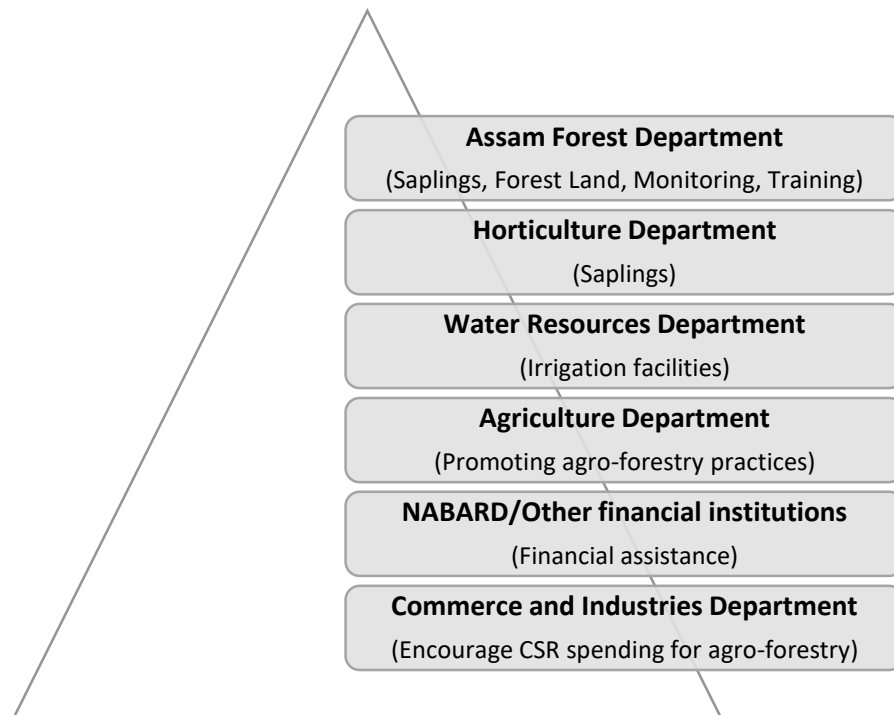# Key convergences: Brick industries

- Brick kilns-
  - Proposal to be made to BEE/DST on retrofitting/technology overhaul; district administration to give LoS.
  - Administration also to support with baseline information.
  - Approximately 100 brick kilns to be targeted.
  - Directive to also bring the kilns in Nagaon and Moregaon under this; brick kilns in Moregaon also can be targeted at the same time.

Afforestation

Assam Forest Department
(Saplings, Forest Land, Monitoring, Training)

Horticulture Department
(Saplings)

P&RD
(Labour, Irrigation)

Water resources, Soil Conservation
(Bank strengthening, halting soil erosion)

Commerce and Industries Department
(Encourage CSR spending for afforestation)

Department Name	Intervention			Potential Convergence
	Activity	Target	Total Cost (INR)	Under MGNREGA:
• Agriculture Department, Govt. of Assam	Area under block plantation	2000 ha	7,44,56,000	1. Wages for plantation activities
	Area under gap plantation	3800 ha	14,14,66,400	2. Bio Fencing of forest lands

Agro-Forestry

| Assam Forest Department |
| (Saplings, Forest Land, Monitoring, Training) |
| **Horticulture Department** |
| (Saplings) |
| **Water Resources Department** |
| (Irrigation facilities) |
| **Agriculture Department** |
| (Promoting agro-forestry practices) |
| **NABARD/Other financial institutions** |
| (Financial assistance) |
| **Commerce and Industries Department** |
| (Encourage CSR spending for agro-forestry) |

Department Name	Intervention			Potential Convergence
• Agriculture Department, Govt. of Assam	Activity	Target	Total Cost (INR)	Under MGNREGA: 1. Wages for plantation activities 2. Bio Fencing of forest lands 3. Wages involved in Agro forestry activities
	Total area under agro-forestry (100,00 HHs)	5000 ha	6,25,00,000	

Alternate Economic Opportunities

Bio-briquette moulds

Animal Husbandry and Veterinary Service Department
(Fodder development)

Horticulture Department
(Agro-forestry)

P&RD
(Bio-briquetting, biogas, sericulture, plantation management)

Forest Department
(Sustainable NTFP harvesting, plantation management, Eco-tourism)

NABARD/Other financial institutions
(Financial assistance for farmers)

Department of Tourism (Eco-tourism)

Department of Sports and Youth Affairs
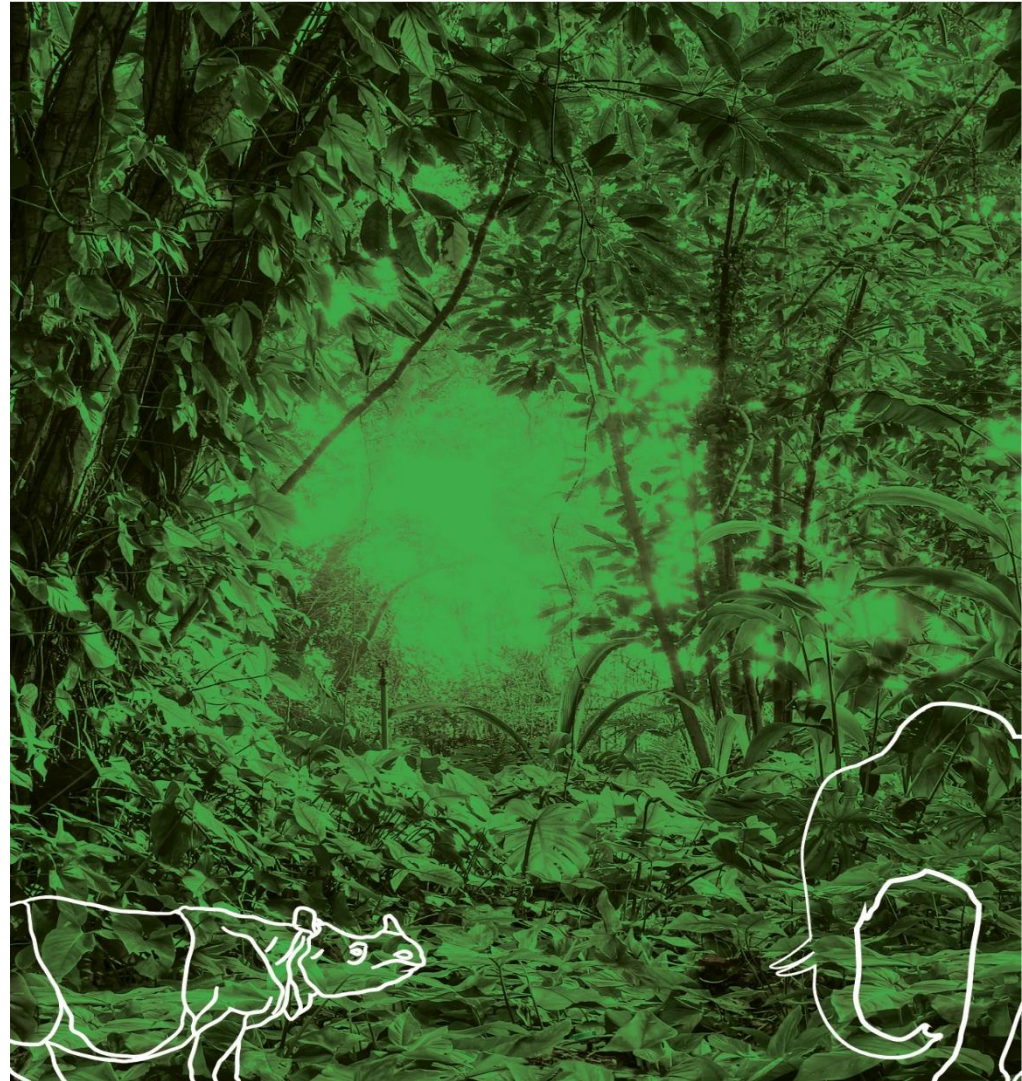(Trainings for enterprise development, eco-tourism, sericulture, plantation management)

SMART Patrolling

Department Name	Intervention			Potential Convergence
Ministry of Electronics and Information Technology, Government of India	**Spatial Monitoring and Reporting Tool (SMART)** is a combination of software, training materials and equipments			Under **Digital India Programme**, procure the materials required for monitoring and conduct trainings for the personal
	Activity	Target	Total Cost (INR)	
	No. of motorcycles for rangers (1 per range)	7	5,60,000	
	No. of night vision goggles (2 per range)	14	8,40,000	
	No. of smartphones (5 per range)	35	3,50,000	
	No. of trainings	25	6,25,000	

Thank You

Intervention 1

| Objective	Alternative cooking systems for households (ICS, LPG, biogas, solar based community cooking systems)
Description	• 96% households use fuelwood for cooking and domestic thermal energy needs. • Average of 3.22 tons of fuelwood is required per family per year. • Introducing improved cookstoves, LPG, solar based cooking systems and biogas can ease pressures on forests.
Implementation Plan	1. Deploy at least 1.5 lakh LPG connections 2. Identifying potential for solar power, ICS, and biogas where LPG penetration is low 3. Using a scientific and objective decision support system to identify locations of maximum benefit for rollout of these activities through funding from other projects such as the NAMA. 4. Development of an Action Plan for interventions, together with the identified institutional partners and the DoEF. 5. Facilitating distribution of LPG, ICS and solar cookers through existing schemes and co-financing.
Potential convergence	Pradhan Mantri Ujjwala Yojana, Unnat Chulha Yojana, NBMMP, AEDA schemes.

IMPROVED COOKSTOVE FOR HOUSEHOLDS

Intervention Activity	Number
Number of ICS installation	2,88,192
Number of LPG installation (with 4 refills in 1st year and 2 refills in 2nd year)	15,203
Biogas Dhenabandhu	100
Biogas Sintext	100

BIOTECH BIOGAS MODEL FOR HOUSEHOLDS

Intervention 2

Objective	**Efficient fuelwood-based dryers for arecanut processing in arecanut processing industries in Nagaon**
Description	• Over 80,000 tons of fuelwood being consumed by the arecanut industry in Nagaon every year. • Fuelwood efficient driers for arecanut to bring down considerable fuelwood demand and provide environmental and social benefits to supari industries.
Institutional Partners	1. Agriculture Department 2. AEDA 3. Centre for Sustainable Technologies, Indian Institute of Science (Bangalore).
Implementation Plan	1. Selection of beneficiaries in Nagaon based on objective criteria 2. Exposure visit of Arecanut manufactures or processors to the Arecanut dryer sites. 3. Target number of driers (50 kg and 100 kg) = 10 each 4. Facilitating distribution and sale of efficient driers in coordination with the Arecanut Manufacturing Association. 5. Action Plan for driers, in coordination with DoEF and other Departments.
Potential convergence	Schemes under horticulture and agriculture departments, AEDA to promote energy efficient driers.
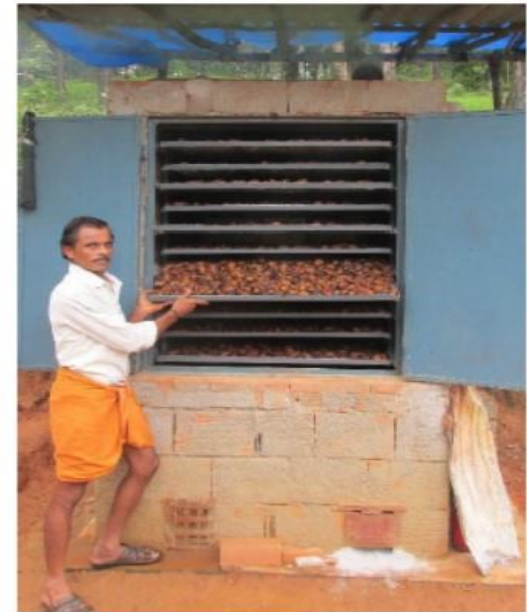
ARECANUT DRYER

Intervention 3

Name of the Intervention	Efficient FW based boilers for arecanut boiling in arecanut industries in Nagaon
Description of the problem	• Traditional fuelwood based stoves with huge tumblers are used for boiling raw arecanut; which consumes lots of fuelwood. • Fuelwood efficient boilers for arecanut can bring down fuelwood consumption in arecanut processing units.
Institutional Partners	1. Agriculture Department 2. AEDA 3. Centre for Sustainable Technologies, Indian Institute of Science (Bangalore). 4. TIDE technologies.
Implementation Plan	1. Selection of beneficiaries in Nagaon to set up 20 arecanut boilers across the district. 2. Facilitating distribution and sale of efficient boilers in coordination with the VFCs and CST. 3. Calculation of benefits (in CO_2 eq.) and costs (in INR) 4. Action Plan for boilers, in coordination with DoEF and other Departments
Potential convergence	Schemes under horticulture and agriculture departments to promote energy efficient boilers

FUEL-EFFICIENT ARECANUT BOILER
(TIDE Technologies)

Intervention 4

Objective	**Retrofitting existing brick kilns / Introducing new brick manufacturing technologies, for fuel efficient brickmaking**
Description	There are around 300 brick kilns in Nagaon district (Sentinel Assam, May 2017), consuming more than 3,000 tons of fuelwood in a year. [10 tons fuelwood used per kiln (FAO, 1988)] Solutions proposed: • Introduction of alternate household fuels like efficient burners and driers. • Retrofitting existing brick factories to make them more fuel-efficient.
Institutional partners	TARA, Development Alternatives, Shakti Foundation, Core Support Programme (Dept. of Science and Technology)
Implementation plan	• Identification of target small and medium brick kilns across Nagaon district. • Extensive Capacity Building Programs including training workshops for brick kiln owners and workers. • Adoption of improved feeding, firing and operating practices in existing Fixed Chimney Bull's Trench Kilns (FCBTKs) • Retrofitting of kiln and converting into one of the following technologies: Zig-zag kiln, fly-ash brick kiln, tunnel kiln, and vertical shaft brick kiln (VSBK) • Effective policies and regulations for implementing the mentioned energy efficient technologies. • Establishing demand/market for resource efficient products like hollow and perforated bricks, and limiting the production of solid bricks in phases.
Potential convergence	Initiatives by the Pollution Control Board of Assam (PCBA) Assam Brick Association

Intervention 5

Objective	Smokeless Biomass briquettes as a fuelwood substitute
Description	Introduction of smokeless bio-briquettes using waste biomass and invasive species will help reduce fuelwood consumption.. In addition, they will lead to the following benefits: - Check the breakout of invasive species causing deterioration of forest health - Provide an outlet for disposal of agricultural and animal feed wastes - Make available organic fertilizer and opportunities for non-farm based livelihoods - Reduce health hazards from smoke and high emissions from burning fuelwood and biomass
Implementation plan	1. Training and awareness campaigns on bio-briquettes all the districts in such a way that at least 4 representatives from each village attend the training program. 2. One mould will be given to each village, the SHGs/JFMCs in each village can procure more moulds from wherever they prefer. 3. This will be tested in 10 JFMCs being developed under the APFBC project as a pilot. This can be scaled up after the success of the smokeless biomass briquettes in these 10 villages. 4. A market chain will be established to market the bio-briquettes.
Potential convergence	Pradhan Mantri Ujjwala Yojana, Unnat Chulha Abhiyan

DIFFERENT TYPES OF BIO-BRIQUETTE MOULDS

No of JFMCs	10
No of villages per JFMC	2
No of Moulds per village	2
No of ICS (10 HHs per mould)	400

Intervention 6

Objective	SMART patrolling to check unplanned extraction of forest resources and unplanned mining within forest land
Description	• Spatial Monitoring and Reporting Tool (SMART) is a combination of software, training materials and patrolling standards • Regular patrolling by forest personnel will discourage encroachers to illegally retrieve rocks from forests • This will include: GPS trackers in vehicles, night vision goggles, watch towers in certain RFs, tents, smart phones and apps
Institutional partners	Forest Department , JFMCs
Implementation plan	1) Identification of target JFMCs and training them on SMART patrolling approach. 2) Capacity building across all ranges of forest personnel on: - Define and manage patrolling schedules - Inform Personnel about their Rota and send reminder through mobile app. - Track and record adherence to patrolling schedule - Maintain historical records of adherence through images/videos - Generate analytics for planning and reporting
Potential Convergence	Digital India Programme, Ministry of Electronics and Information Technology, Government of India

No. of ranges	7
No. of night vision goggles per range	2
No. of smartphones per range	5

Intervention 7

Objective	**Construction of Cattle Proof Trenches (CPT) and Elephant Proof Trenches (EPT) for better defined boundaries to reduce encroachments**
Description of the problem	• CPTs and EPTs are constructed to ensure cattle do not cross into forests and elephants do not cross out of forests. • CPTs and EPTs also cost less in terms of maintenance. These can be constructed under MGNREGA, and can be maintained with the assistance of local watchers.
Institutional partners	Department of Environment and Forests (DoEF), JFMCs
Implementation plan	1) Proper demarcation of reserve forests with help of the Forest Dept. 2) Creating awareness among JFMCs and concerned forest communities regarding management of reserve forests. 3) Identification of elephant depredation hotspots. 4) Identification of vulnerable areas with need for fencing based on objective criteria 5) Exploring various models of trench construction
Potential Convergence	MGNREGA

AN ELEPHANT PROOF TRENCH BEING DUG

Intervention 8

Objective	**Bio-fencing to reduce encroachment, unplanned extraction felling and man-animal conflicts**
Description	• Development of biological barriers such as agave plantation can stop the felling and transport of local timber, while also acting as a barricade against animal incursion. • These natural barriers would supplement existing efforts undertaken by the DoEF, like surveillance through watchtowers and procurement of night-vision glasses, to check these illegal activities. • In addition, such vegetative barriers restrict animals from foraging on agricultural produce and causing crop damages.
Implementation plan	1. Training of DoEF personnel, JFMCs and local communities on the construction and maintenance of live fences 2. Identification of areas for agave plantation, geo-tagging them. 3. Biofencing of a total distance of approximately 100 km. 4. Ground reconnaissance, raising agave, planting them in the prescribed manner. 5. Development of strategies to converge the objectives of this intervention with other DoEF initiatives to check illegal felling and transport.
Potential schemes	Existing DoEF schemes

By RK Holla - image.shramajeevi.com

AGAVE BIOFENCING

Intervention 9

Plantation Plan

Objective	Plantation activities: 1. **Afforestation and Reforestation in non-forest lands for tree cover.** 2. **Assisted Natural Regeneration in forests to stop degradation**
Description	Conservation of tree belt and forests is one of the most cost effective ways of sequestering carbon. Plantation activities in identified degraded pockets through Assisted Natural Regeneration (ANR) and gap plantation and identified non-forest pockets prone to deforestation (afforestation and reforestation) will help in enhancement of forest stock and increase forest and tree cover.
Institutional partner	JFMCs/EDCs
Implementation plan	1. Identification and demarcation of degraded forest and non-forest land, its extent of degradation and suitability for A/R and ANR activities. 2. Selection of suitable native species to be used for regeneration 3. Expert consultations to identify, and attempt to overcome, expected challenges (environmental, ecological, and financial) for carrying out the regeneration 4. Year 3 onwards, further ANR to increase the forest stocks in a phased manner.
Potential schemes	• National Afforestation Policy (NAP), NAEB (MoEFCC) [Implementing Agency: Forest Development Agency, Assam] • State Compensatory Afforestation Fund Management and Planning Authority (CAMPA) • MGNREGA [State Implementing Agency: Panchayat and Rural Development Department]

Type of plantation	Total area (Ha)
Block Plantation	2000
Gap plantation	3800
Block plantation	
Year 1	100
Year 2	200
Year 3	300
Year 4	200
Year 5	200
Year 6	200
Year 7	200
Year 8	200
Year 9	200
Year 10	200
Gap plantation	
Year 1	200
Year 2	400
Year 3	400
Year 4	400
Year 5	400
Year 6	400
Year 7	400
Year 8	400
Year 9	400
Year 10	400

Intervention 10

Objective	**Promoting agro-forestry in large scale in non-forest lands**
Description	Through LULC change mapping, it is observed that there are pockets of degradation and deforestation in Nagaon. Agro-forestry will be promoted with a mix of fuelwood and other native fodder, fruit trees to address fuel, fodder and other livelihood needs of the communities.
Implementation plan	1. Identification and demarcation of non-forest land which belongs to local farmer 2. Households will take up plantation of any tree species of their choice. They will be allowed to plant not more than 5 seedlings in homestead, and not more than 400 saplings in not more than 5 ha in their cropland. 3. Plantation of amla and Jamun in cropland apart from avenue plantation as may be commercially viable considering Patanjali Herbal Park planned to come up in Tezpur. 4. Plantation of suitable crops on paddy fields, e.g., Dalbergia sissoo (Sissoo), Albizia procera (Koroi), Azadirachta indica (Mahaneem), etc. 5. A group of NGOs/CBOs will be designated as 'vrikshamitras' to help in plantation work and in monitoring the plantation. 6. Each family participating in agroforestry will be asked to plant at least 5 saplings per day. Vrikshamitras will be paid a remuneration of ₹50 per household if 100% of saplings are successfully completed in each household. Further for the first year, the vrikshamitras will be paid another ₹50 per household if all the saplings are surviving after 1 year. 7. Physical evidences such as photographs will be required to be taken of the plantation to be eligible for the incentive. 8. Around 100,000 households will be brought under the agroforestry scheme. 9. Promotion of establishment of nurseries by Mahila Self Help Groups in every beat office jurisdiction with total quality management to ensure timely and regular availability of high quality planting stock to the people.
Potential schemes	• Sub-Mission on Agroforestry (SMAF), National Mission for Sustainable Agriculture (NMSA), Govt. of India • MGNREGA (Implementing Agency: Panchayat and Rural Development Department) • Green India Mission

Intervention 11

Name of the intervention:	**Cultivation of medicinal plants as a measure of alternative livelihood and income enhancement, decreased extraction of NTFPs from forests**
Description of the problem	• Around 24% households collect NTFPs, including herbs • Most collect these NTFPs for personal consumption, implying no monetary gains through NTFPs for the households • Plantation and collection of medicinal plants and linking it with herbal markets will help the farmers in finding alternative sources of income and also reduce the need to go into forests to collect medicinal plants.
Partner institutions	1. DoEF 2. JFMCs/EDCs/SHGs and Gram Panchayats 3. Patanjali Ayurved Ltd. 4. Horticulture Mission, Agriculture Department (Ayush Programme for cultivation of medicinal plants)
Implementation plan	1. Identification of interested farmers and selection of suitable lands for plantation activities. 2. Training, capacity-building and promotion of medicinal plantations. 3. Facilitating distribution of seeds of ecologically adaptive and agro-climatically suitable species 4. Convergence of public funds and schemes for promoting and implementing medicinal plantations 5. Area to come under cultivation of Aloe Vera and Ashwagandha : 50 ha each
Potential convergence	Horticulture Mission, Agriculture Department (Ayush Programme for cultivation of medicinal plants)

Intervention 12.1

Objective	**Silvi-pastoral and Horti-pastoral practices for sustainable grazing**
Description	• Around 68% of surveyed households have cattle in their houses which require a constant supply of fodder and pasturelands. • 83% of the cattle goes for open grazing. 22% households collect fodder from forests. • Development of silvi-pastoral models to meet the pasture demands of local livestock and to provide for the cultivation of trees for fuelwood purposes.
Partner institutions	1. DoEF/JFMCs/EDCs/SHGs and Gram Panchayats 2. Horticulture Mission, Agriculture Department
Implementation plan	1. Identification and selection of suitable lands for adoption of silvi-pastoral activities 2. Designing of silvi-pastoral and horti-pastoral activities in consultation with experts and institutions and agencies like local NGOs, SHGs and others. 3. Training, capacity-building and promotion of silvi-pastoral and horti-pastoral activities 4. Facilitating distribution of seeds of ecologically adaptive and agro-climatically suitable species 5. Total area to bring under plantation: 192 ha 6. Convergence of public funds and schemes for promoting and implementing silvi-pastoral and horti-pastoral practices
Potential schemes	• Sub-Mission on Fodder and Feed Development, National Livestock Mission (Government of India) • Accelerated Fodder Development Programme, Department of Agriculture (Government of India)

Intervention 12.2

Objective	Fodder densification and stall feeding
Description	• Present requirement of green fodder for cross-bred animals is 2.3 million MT but what's available is a mere 85,633 MT. Densification of roughages and waste crop residues in compact blocks is an effective solution for livestock feed management. • This technology will enhance income of farmers, decrease environmental pollution and help alleviate shortage of good quality seeds in tropical countries. • Blocks or pellets could also provide complete feed to livestock in emergency situations. • Enable efficient and cost-effective transport of fodder upon its densification into fodder blocks where up to 10 tons of feed block can be easily transported in a truck as against 4 ton loose fodder. (DAH&VD, Nagaon)
Partner institutes	DoEF, FAO, District Animal Husbandry and Veterinary Department, Nagaon (Assam)
Implementation plan	• Fodder densification through establishing of fodder banks and promotion of fodder grasses and legumes. • Establishment of Fodder Banks for storing and distribution of dry fodder. • The existing Gaushalas in the region should be made use of for storing and distribution of dry fodder/ feed blocks. • Fodder grasses and legumes of Cenchrus ciliaris, Chloris gayana, Dichanthium, Stylosanthes, Clitori needs to be propagated especially in the common grazing lands
Potential convergence	• Sub-Mission on Fodder and Feed Development, National Livestock Mission (Government of India) • Accelerated Fodder Development Programme, Department of Agriculture (Government of India)

Intervention 12.3

Name of the intervention:	Vaccination camps for disease-free livestock in forest villages
Description of the problem	• The livestock is prone to diseases like rinderpest and Contagious Bovine Pleuropneumonia (CBPP), especially around the monsoon season. • Vaccination camps can be arranged in the forest villages with support from the Veterinary Department along with Awareness camp on Dairy Development.
Partner institutions	1. Veterinary and Animal Husbandry Department 2. JFMCs/EDCs/SHGs and Gram Panchayats
Implementation plan	1. Convergence of public funds and schemes for promoting and implementing livestock vaccination 2. Development of an Action Plan for administration and monitoring of the intervention with Gram Panchayats, JFMCs, and DoEF.
Potential convergence	• Sub-Mission on Fodder and Feed Development, National Livestock Mission (Government of India) • Accelerated Fodder Development Programme, Department of Agriculture (Government of India) • Pashu Dhan Bima Yojana