Proceedings of training on Translation and Harmonization of SRDI Land Use Map Legend into LCCS (v.3)

Land Use Map of Bangladesh, 2004

Bangladesh Forest Department
15-17 February 2016

The Forest Department of Bangladesh leads actions to improve forest management and conservation, adopting forward thinking, innovative approaches in its management of approximately 1.55 million hectares of land across the country.

In 2015, the Forest Department began a process to establish a National Forest Inventory and Satellite Land Monitoring System for improved forest and natural resource management. The process supports national objectives related to climate change mitigation and provides information in support of the UN-REDD programme aimed at Reducing Emissions from Deforestation and Forest Degradation (REDD+). The process also addresses domestic information needs and supports national policy processes related to forests and the multitude of interconnected human and environmental systems that forests support.

The activities implemented under the Bangladesh Forest Inventory process are collaboration between several national and international institutions and stakeholders. National partners from multiple government departments and agencies assist in providing a nationally coordinated approach to land management. International partners, including the United Stated Agency for International Development (USAID) and the Food and Agriculture Organization of the United Nations (FAO) are supporting the development of technical and financial resources that will assist in institutionalizing the process.

The results will allow the Forest Department to provide regular, updated information about the status of trees and forests for a multitude of purposes including for assessment of role of trees for firewood, medicines, timber, and climate change mitigation.

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Executive Summary

From 15 to 17 February 2016, FAO and SRDI conducted a training on 'Translation and Harmonization of SRDI Land Use Map Legend into LCCS (v.3)' toward the integration of forest and other land use mapping activities' with the trainers support from Bangladesh Society of Geoinformatics (BSGI) as a part of capacity building program and technical cooperation at the SRDI premises, Dhaka. The aim of the training was to present and share the knowledge of common practices of land cover and land use mapping in Bangladesh and leading the methodology of land cover classification system (LCCS) developed by FAO and to translate map legend using this system. An overview of the LCCS system has been presented and a hands-on exercise conducted in order to develop and understand the current land use map of SRDI. A three-days training was conducted and a total of six participants (one male and five female) from BFD as well as from SRDI attended the program.

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1. Introduction

In the context of the project "Development of National Land Cover Database and accuracy assessment" Bangladesh Society of Geinformatics (BSGI) aims to introduce Land Cover Classification Systems v.3 (LCCS 3) developed by FAO to the leading land cover and land use map producing organizations. Since there exists no national reference system for land cover/land use mapping in the country, it is important to study different sources of maps to make a common system. Several national organizations (BFD, SRDI, BARC, SPARRSO, SOB, etc.) have been producing Land Cover or related maps for Bangladesh, which integrates the different definitions and legends. Besides, the land cover/land use map produced by different organizations used different raw (type and time) data, classification methods, scale, projection systems etc. Moreover every organization produces land cover or related maps based on the organizational requirements. Therefore, we need a central database that would include common definitions and legends.

The main objective the training was to build capacity to the professionals of SRDI and BFD on land cover and land use mapping using LCCS and exploring harmonization possibilities with land use maps produced at national level as well as to integrate national reference system.

The specific objectives were:

- To introduce Land Cover Classification Systems (LCCS v3) to SRDI that is developed by FAO
- To provide technical assistance to translate existing maps of SRDI and BFD
- To explore harmonization possibilities of SRDI and BFD maps

2. Inauguration Session

The training was inaugurated by Mr. Khandker Moyeenuddin, Director of SRDI, Dhaka. Mr. Moyeenuiddinn emphasized the importance of the up-to-date land cover and land use map for the nation. Mr. Md. Nazmul Hasan, PSO, SRDI briefly discussed the background about the SRDI developed land cover map and necessity of harmonization for their internal and other external maps. Dr. Laskar Muqsudur Rahman from FAO expressed the national concern for a common mapping system. Mr. Mohammad Abdul Hadi of BSGI firstly discussed about the contents of the training and later talked about the common difficulties that a user regularly faces while working with different maps from different organizations.

3. Overview of the training contents:

Day 1: Overview of Common Practices of Land Cover Mapping in Bangladesh and LCCS v3

In the first session of the training, Mr. Hadi presented common practices of land cover mapping in Bangladesh highlighting understanding of Land Cover, *'Land Cover Mapping: Common practices'*, *'Organizations producing Land Cover or related maps for Bangladesh'*, Example Land Cover Map, comparisons of different land cover maps among different organizations, Example of a Land Cover Map, Challenges of land cover representations and finally initiatives that are needed.

Second sessions of the training covered
- LCCS3 software installation
- Step by step procedures for creating legends in LCCS3 with demo data

Day 2: Development land covers land use definition and legends from existing maps

The first session of the covered to create existing map legend from SRDI Land Use 2004 and NFA 2005 map and update attribute. Later on the trainers and the participants had an open discussion regarding the properties of a legend that can be identified and the scope to change and update.

In the second session, the participants from SRDI has started to create legends (lccs files) for 'Land Use Map 2004' by one group and 'Land Use Map 1997' by another group. The participants from BFD involved in preparing lccs file for NFA 2005 map.

Day 3: Review and update

In the first session the participants continued to prepare legend files.

In the second session, the resource persons discussed on the difficulties faced by the participants while preparing the lccs file. The sessions also discussed on how to integrate harmonization of the legends that are prepared by the participants from different organization.

4. Different land cover and land use legends integration

Two separate sessions were dedicated for this topic and are moderated by the resource persons from BSGI. After the translation of the map legends, the technicalities of the legend integration between the existing SRDI land use maps and BFD National Forest Assessment 2005 maps can be shown in the following way:

Legend example 1: Sal Forest

LCCS Diagram of SRDI Land Use 2004 Map (Code: 19c)
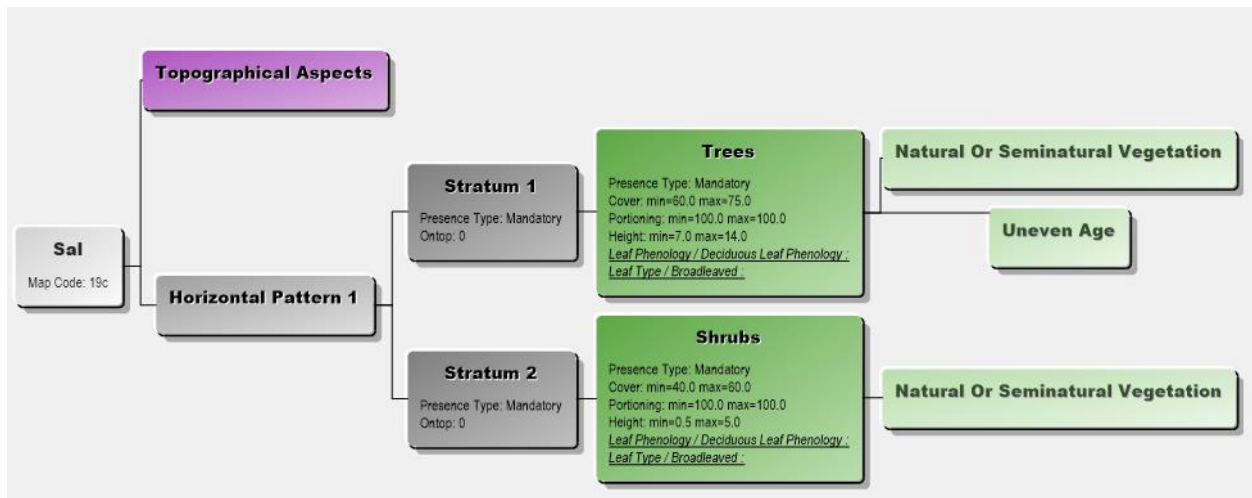
LCCS Diagram of NFA 2005 Map (Code: FSa)
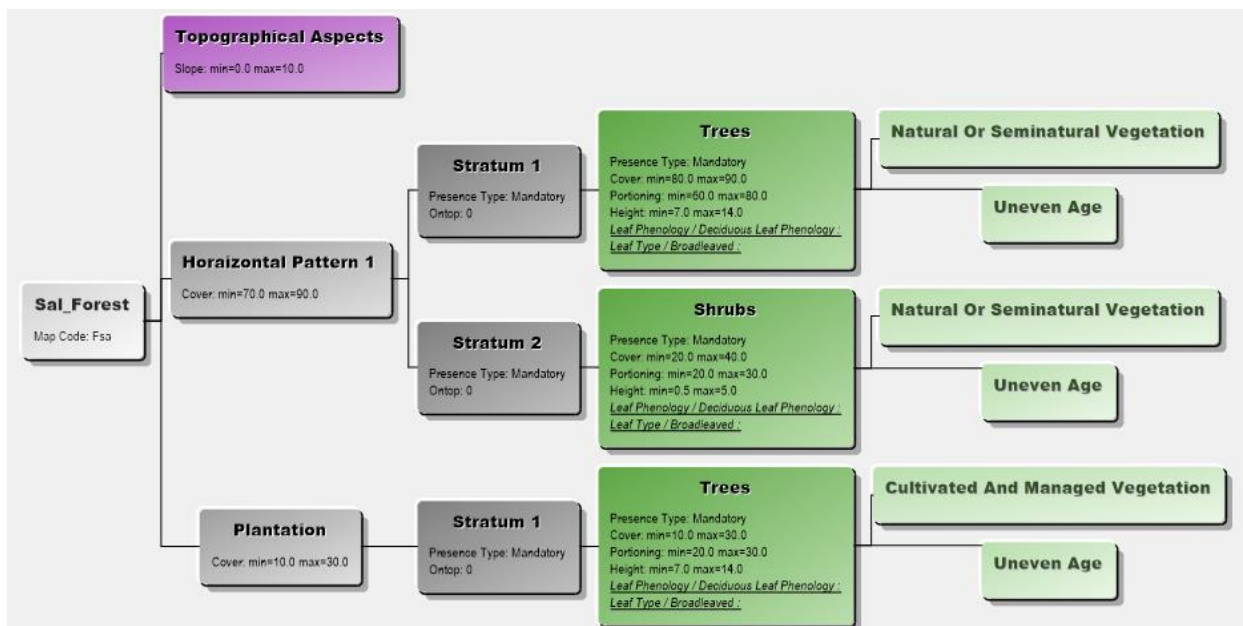
Legend example 2: Triple Cropland/Agriculture land

LCCS Diagram of SRDI Land Use 2004 Map (Code: 14a)

LCCS Diagram of NFA 2005 Map

Legend example 3: Orchard or Perianal Crops (like sugarcane)

LCCS Diagram of SRDI Land Use 2004 Map (Code: 16a/16b)

LCCS Diagram of NFA 2005 Map (Mango or other orchards)

5. Definition problem/gaps in legend harmonizing from existing maps

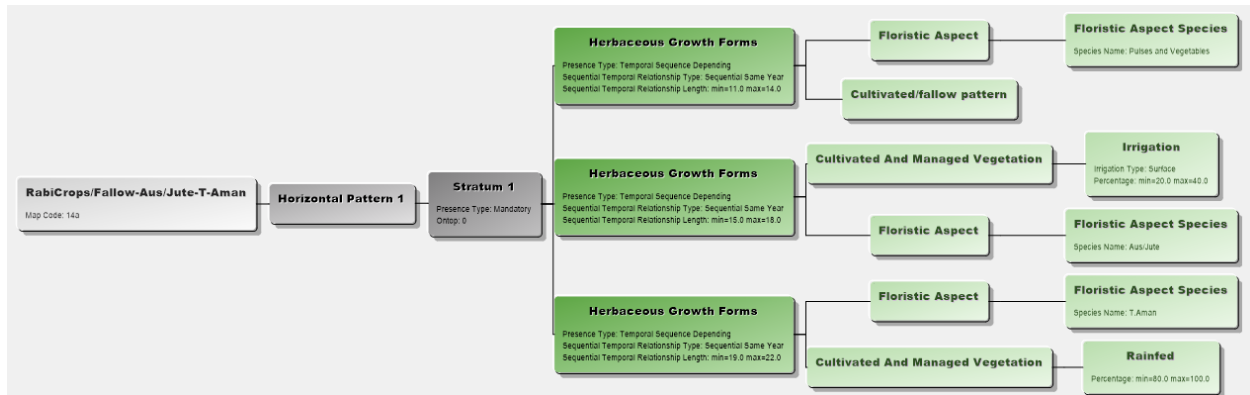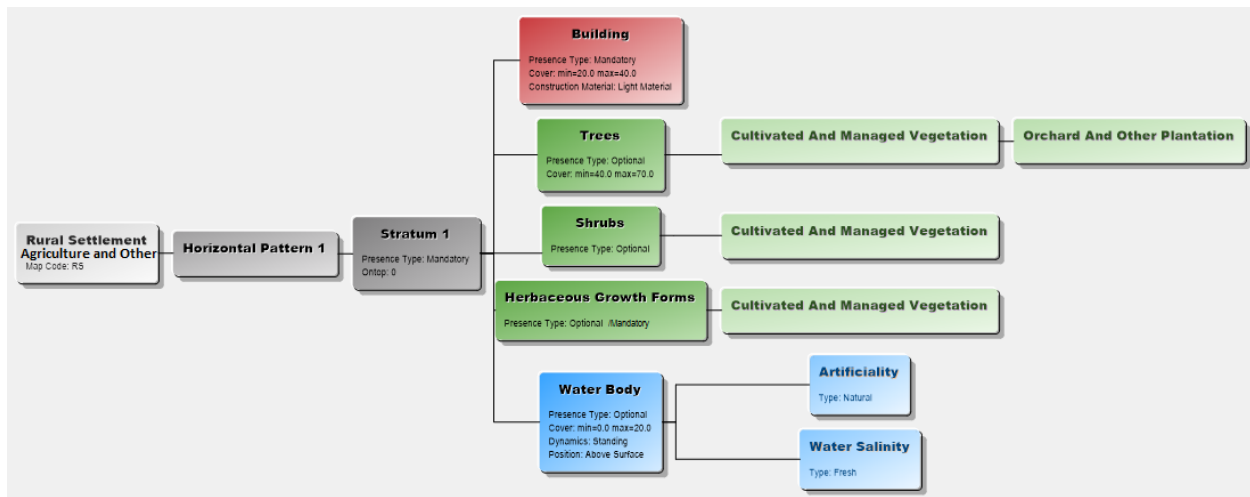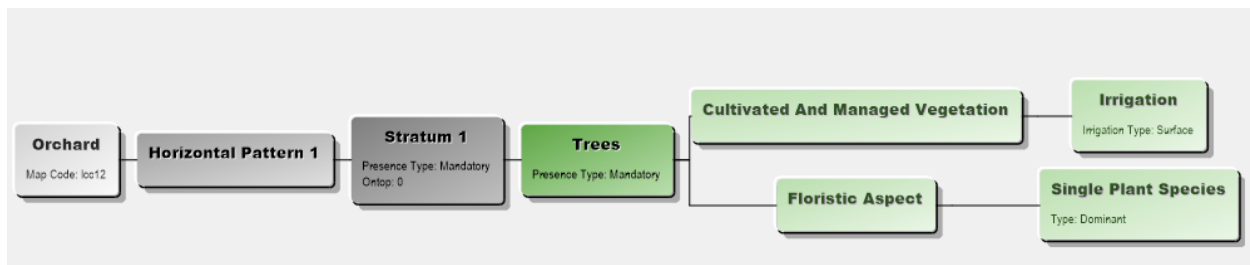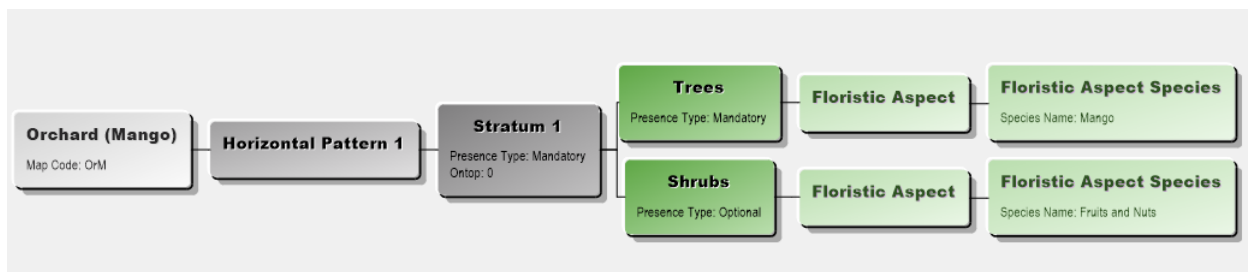- The main challenge in developing land cover definition and legend has been identified in agricultural land cover (due to variation in crop rotation, etc.)
- Some land cover definition should be changed in existing SRDI land cover map, for example water definition by SRDI '12 months of water presence in the land' whereas, in haor or baor area where water presence is more than 7 months some cases 9 months and the made legend as Rice-fallow which could be Rice-water-water (Paddy rice)
- As per the legend of SRDI (e.g. Rabi crops/Fallow-Aus/Jute-T.Aman) cropping pattern overlap with many other legends, which is the critical issue for translation. The pattern that dominates in each category could be defined a class to resolve however it might also be a problem in many cases.

6. Conclusion:

As per the organizational needs, the land use maps are prepared by different organizations. Definition of the legends of the map depicts particular interest only and in many cases that does not reflect the national requirements. The classes of forest map represented many different forest classes whereas agriculture classes are merged with rural settlement and other classes. Moreover, SRDI maps presented plenty of agricultural rotation pattern. Such variations are the main difficulties to harmonize the translated legends. The consensus that is evolved from the training is to prepare a national reference system and only after that the harmonization can be performed.

Appendix 1:

List of participants

| Sl. No	Name	Gender	Designation	Organization	Email
1	Dilruba Karim	F	Senior Scientific Officer	SRDI	d_karim99@yahoo.com
2	Neelima Akter Kohinoor	F	Senior Scientific Officer	SRDI	neel_srdi@yahoo.com
3	Farzana Shahrin	F	Senior Scientific Officer	SRDI	shahrin_srdi@yahoo.com
4	Mohammed Ruhul Islam	M	Senior Scientific Officer	SRDI	ruhul_islamb@yahoo.com
5	Afroza Begum	F	Research Officer	BFD	b.afroza@yahoo.com
6	Shamima Begum Shewly	F	Research Officer	BFD	To.shewli99@gmail.com

Annex -2: SRDI Land Use Map 2004 Legends

Mapping unit	Area (ha) & (Percentage)	Main Landuse	Secondary Landuse	Area(ha)	Percentage
1		**VEGETABLES ROTATION**			
1a	72,100 (0.49 %)	**R.vegetables-K.vegetables**		**33740**	**0.23**
			Rc-B.Aus/Jute-T.aman/F	14750	0.10
			Rc-Boro-T.aman	13280	0.09
			Sugarcane;Orchard	10330	0.07
1b	3,500 (0.02 %)	**R.vegetables-K.vegetables**		**2900**	**0.02**
			Rc-B.aus/Jute-T.aman/F; Sugarcane;Orchard	600	minor
2		**RABI CROPS ROTATION**			
2a	1,49,800 (1.02%)	**Rabi crops-B.aus/Jute-Fallow**		**88,240**	**0.60**
			Boro-T.aman;Rc-B.aus/F-T.aman; Sugarcane;R.veg-K.veg	35,110	0.24
			Boro-B.aman;F-mixed Aus/Jute/ Seasame & B.Aman;Boro-F	17,600	0.12
			Betelvine;Orchard	8,850	0.06
2b	3,26,200 (2.22%)	**Rabi crops-B.aus/Jute/Fallow**		**1,95,270**	**1.33**
			Boro-T.aman; Rc-Aus/Jute-F-T. Aman	58,620	0.40
			Rc-Aus/Maize/K.veg-F	48,700	0.33
			Rc-Boro-B.aman;Rc-B.aman/DTA	23,610	0.16
3	1,62,100 (1.10%)	**Rabi crops-Fallow-Fallow**		**61,880**	**0.42**
			Groundnut-F	41,220	0.28
			R.veg-Jute/F-F;Rc/Boro-DTA/B.aman	19,153	0.13
			Rc/F-Boro-T.aman	14,757	0.10
			Rc-UBA;Boro-F	14,760	0.10
			Sugarcane;Reed(Kashban);Fallow	10,330	0.07
4		**TRANSPLANTED AMAN ROTATION**			
4a	11,90,100 (8.06%)	**Rabi crops/Fallow-Aus/Jute-T.aman**		**67,3130**	**4.56**
			Boro-T.aman	3,20,720	2.17
			R-veg-K.veg; Sugarcane;Groundnut-F; Rc-Sesame-T.aman	1,26,910	0.86
			Belelvine;Perennial crop; Ginger;Turmeric;Orchard	48,690	0.33
			Boro-B.aman/DTA; F-B.aman/UBA	20,650	0.14
4b	2,33,00 (0.16%)	**Rabi crops/Fallow-Aus/Jute-T.aman**		**10,030**	**0.07**
			Boro-T.aman; Rc/Boro-UBA	4,420	0.03
			Shrimp-T.aman;F-T.aman	2,950	0.02
			R.veg-K.veg; Rc/F-T.aus-T.aman	2,950	0.02
			Sugarcane;Orchard	2,950	0.02
4c	1,06,600 (0.73%)	**Rabi crops-Di.aus-T.aman**		**72,790**	**0.50**
			F/Rc-F-T.aman	20,530	0.14
			Boro-T.aman;Rc-T.aus-Taman	13,280	0.09
4d	33,300 (0.23%)	**Fallow-T.aus-T.aman**		**17,100**	**0.12**
			Rc/T.aus-T.aman;Boro-T.aman	8,800	0.06
			Sugarcane;Orchard;Forest	4,400	0.03
			Boro-F	3,000	0.02
5		**RABI CROPS/FALLOW-JUTE/FALLOW-T.AMAN**			
5a	20,200 (0.14%)	**Rabi crops/Fallow-Jute/ Fallow-T.aman**		**10,030**	**0.07**
			Boro-T.aman;F-T.aman	5,800	0.04
			Sugarcane;Orchard;Tea;Stone collection	4,370	0.03
5b	2,34,700 (1.59%)	**Rabi crops/Fallow-Jute/ Fallow-T.aman**		**1,10,670**	**0.75**
			Boro-T.aman; Rc/Tobacco-F-T.aman	51,650	0.35
			Rc/F-T.aus-T.aman	26,560	0.18
			Sugarcane;Orchard;	23,690	0.16
			R.veg-K.veg	22,130	0.15
5c	1,40,800 (0.95%)	**Rabi crops/Fallow-Fallow-T.aman**		**70,830**	**0.48**
			Rc/F-T.aman/Di-aus-T.aman	47,720	0.32
			Boro-T.aman;F-T.aman	17,730	0.12
			Coconut;Betelnut;Orchard; Mulbery;R.veg-K.veg	4,520	0.03
6	7,53,00 (0.51%)	**Potato-Boro-T.aman**		**50,170**	**0.34**
			Boro-T.aman;Rc-T.aus-T.aman; Rc-F-T.aman	20,660	0.14
			R.veg-K.veg; Maize-F; Orchard	4,470	0.03

7	75,100 (0.50%)	**Boro-T.aus-T.aman**		**4,52,70**	**0.30**
			Rc.-T.aus/Jute-F;Pisiculture Boro-T.aman;Rc-F-T.aman	17,930 11,900	0.12 0.08
8		**FALLOW-AUS-T.AMAN**			
8a	5,18,200 (3.51%)	**Fallow-T.aus-T.aman**		**2,96,860**	**2.01**
			Rc-T.aus/F-T.aman;F-B.aus/B.aman Boro-T.aman;Boro-F R,veg-K.veg;Orchard;Forest	1.35.760 7,96,80 5,900	0.92 0.54 0.04
8b	3,69,000 (2.50%)	**Fallow-T.aus-T.aman**		**1,91,930**	**1.30**
			Rc-F-T.aman Boro-T.aman;F-T.aman;Rc-T.aus-T.aman F-B.aus/Jute-T.aman;Orchard; Sugarcane;Betelvine	88,540 59,020 29,510	0.60 0.40 0.20
8c	37,200 (0.25%)	**Fallow-Di.aus-T.aman**		**19,390**	**0.13**
			Boro-T.aman;Rc-T.aus-T.aman; Rc-UBA/B.aman F-T.aman;F-T.aus-T.aman	11,910 5,900	0.08 0.04
9		**BORO-T.AMAN**			
9a	5,84,000 (3.96%)	**Boro-T.aman**		**3,68,560**	**2.50**
			Rc-Jute/Sesame/Chilli-T.aman Rc-Boro-T.aman;F-T.aman R.veg-K.veg Sugarcane;Orchard;	1,03,300 88,540 17,700 5,900	0.70 0.60 0.12 0.04
9b	19,64,200 (13.31%)	**Boro-T.aman**		**12,97,140**	**8.79**
			Rc-Boro-T.aman Orchard;Sugarcane;R.veg-K.veg;Betelvine Rc-Jute-F.T.aman Rc-Boro-DTA;Boro-F Rc-T.aus-T.aman;Rc-F-T.aman	2,80,380 1,34,280 1,32.810 90,010 29,580	1.90 0.91 0.90 0.61 0.20
9c	12,20,700 (8.27%)	**Boro-T.aman**		**6,64,060**	**4.50**
			RC-T.aus-/Jute-T.aman;F-T.aman Boro-F;Rc-UBA;Rc/F-B.aman R.veg-K.veg Orchard;Sugarcane;Turmeric;Betelnut;Betelvine	4,89,930 50,480 13,280 2,950	3.32 0.34 0.09 0.02
9d	30,200 (0.21%)	**Boro-T.aman**	Boro-F Rc/F-F/Jute-T.aman Shrimp-T.aman; Boro-Shrimp-F-T.aman	**15,730** 6,070 4,020 4,380	**0.11** 0.04 0.03 0.03
9e	34,400 (0.23%)	**Boro-T.aman**		**17,970**	**0.12**
			Rc-T.aus-T.aman;Boro-T.aus-T.aman;F-T.aman R.veg-K.veg;Orchard Shrimp-F;Saltbed	10,530 2,950 2,950	0.07 0.02 0.02
10		**FALLOW-FALLOW-T.AMAN**			
10a	1,05,700 (0.72%)	**Fallow-Fallow-T.aman**	Boro-T.aman;Rc-F-T.aman;Rc-T.aus-T.aman; R.veg-K.veg Sugarcane;Orchard; Betelvine	**67,380** 29,470 8,850	**0.46** 0.20 0.06
10b	1,78,400 (1.20%)	**Fallow-Fallow-T.aman**		**1,03,800**	**0.70**
			Boro-T.aman;Rc-F-T.aman Orchard F-T.aus-T.aman	59,520 10,660 4,420	0.40 0.07 0.03
10c	2,70,100 (1.83%)	**Fallow-Fallow-T.aman**		**1,66,750**	**1.13**
			Srimp-T.aman; Boro-T.aman Rc-T.aman;F-Sesame-T.aman;Betelvine	73,780 29,570	0.50 0.20
10d	4,77,700 (3.23%)	**Fallow-Fallow-T.aman**	F-T.aus-T.aman Rc-F-T.aman;R.veg-K.veg Rc-Di.aus-T.aman;Boro-T.aman;Boro-F Planted Mangrove forest	**3,24,650** 63,950 56,640 29,510 2,950	**2.20** 0.43 0.38 0.20 0.02

		BROADCAST AMAN ROTATION			
11	5,03,400 (3.41%)	**Rabi crops-B.aman**		**2,80,580**	**1.90**
			Boro-B.aman/DTA;Boro-F	1,49,040	1.01
			Rc-aus/Jute/Sesame-T.aman;Rc-Dhaincha-F	61,980	0.42
			Rc-Mixed Aus/Sesame and B.aman;	11,800	0.08
			Sugarcane		
12		**BORO-B.AMAN**			
12a	55,100 (0.38%)	**Boro-B.aman/DTA**		**2,90,00**	**0.20**
			Boro-F;Boro-T.aman;F/Rc-Boro-B.aman/DTA	17,300	0.12
			Rc-B.aman;Rc-UBA	4,400	0.03
			Sugarcane;Rc-Jute-Aman	4,400	0.03
12b	64,800 (0.44%)	**Boro-B.aman**		**29,400**	**0.20**
			F/Rc-B.aman;F/Rc-UBA	20640	0.14
			Boro-F;Boro-DTA;Boro-T.aman	14,760	0.10
12c	93,400 (0.63%)	**Boro-B.aman**		**48,900**	**0.33**
			Boro-Shrimp;Shrimp-F;F-B.aman;F-UBA	29,700	0.20
			F(Water logged)	14,800	0.10
13	22,400 (0.15%)	**Fallow-B.aman**		**12,000**	**0.08**
			F-UBA;Boro-F	5,940	0.04
			Rc-F;T.aman;Nursery	4,460	0.03
14		**BORO-ROTATION**			
14a	3,32,700 (2.25%)	**Boro-Falllow**		**1,84,700**	**1.25**
			Rc/F-DTA;Rc-B.aus/Jute/Sesame-F	1,18,400	0.80
			Rc/F/UBA;Boro-T.aman;Rc-Boro-F	29,600	0.20
14b	3,66,900 (2.49%)	**Boro-Falllow**		**2,19,870**	**1.49**
			Rc/F-B.aman;Boro-T.aman	1,18,030	0.80
			Rc-Boro-F	29,000	0.20
14c	9,00900 (6.11%)	**Boro-Falllow**		**6,05,760**	**4.11**
			Boro-B.aman/DTA	1,47,570	1.00
			Boro-T.aman	1,03,300	0.70
			Boro-UBA;Rc/F-B.aus-T.aman	44,270	0.30
14d	2,20,300 (1.50%)	**Boro-Falllow**		**1,47,020**	**1.00**
			Grazing grass;water bodies	73,280	0.50
14e	16,900 (0.11%)	**Boro-Falllow**		**6,200**	**0.04**
			F-B.aman	6,200	0.04
			Boro-Shrimp;F-T.aman;Boro-Aus/B.aman	4,500	0.03
15		**ANNUAL CROPS**			
15a	9,400 (0.06%)	**Pineapple**		**3,140**	**0.02**
			Turmeric;Banana;Papya etc.	3,130	0.02
			Rc-B.aus/Jute-F-Boro-T.aman	3,130	0.02
			Forest		
15b	2,21,200 (1.50%)	**Sugarcane**		**88,500**	**0.60**
			Rc-B.aus/Jute/Sesame-T.aman;Boro-B.aman	73,700	0.50
			Boro-T.aman	44,250	0.30
			R.veg-K.veg;Orchard	14,750	0.10
16		**PERENNIAL CROPS**			
16a	24,900 (0.17%)	**Orchard**		**10,200**	**0.07**
			Mixed thickets &Forest;Jhum;Rubber	5,900	0.04
			Boro-T.aman;Rc-F/T.aus-T.aman	4400	0.03
			Mixed evergreen & deciduous Forest	4400	0.03
16b	1,73,300 (1.17%)	**Orchard**		**88,900**	**0.60**
			Rc/F-Aus/Jute/Sesame-T.aman;Boro-T.aman	59,200	0.40
			Sugarcane;R.veg-K.veg;Mulbery	25,200	0.17
16c	95,600 (0.65%)	**Tea**		**51,450**	**0.35**
			Mixed thickets &Forest;Pineapple;Ginger;	29,400	0.20
			Turmeric;Banana;Betelnut		
			F-T.aus-T.aman;F-T.aman;R.veg-K.veg	14,750	0.10

17	6,0000 (0.41%)	SALTBED		44,000	0.30
			Shrimp-F; F-T.aman;F/Rc-T.aman; Boro-F Mangrove forest	16000	0.11
18	1,08,800 (0.74%)	SHRIMP		64,630	0.44
			F-T.aman;Shrimp-F F-Sesame-T.aman	36,790 7,380	0.25 0.05
19		FOREST			
19a	5,57,200 (3.78%)	Mixed Evergreen & Deciduous Forest (including Reserved Forest)		4,54,320	3.08
			Jhum;Mixed Thickets & Forest Rubber;Orchard F-T.aus-T.aman;Boro-T.aman;F-Taman;	66,000 29,500 7,380	0.45 0.20 0.05
19b	9,98,300 (6.76%)	Mixed thickets & Forest		72,640	4.92
			Jhum;Rubber;Tea Orchard;R.veg-K.veg F-T.aus-T.aman;F-Taman;Boro-T.aman;	1,12,100 1,15,200 35,700	0.82 0.78 0.24
19c	92,100 (0.62%)	Deciduous Forest(Sal)		44,270	0.30
			Boro-T.aman Orchard;Perennial crop R.veg-K.veg;Boro-F	29,500 11,800 5,900	0.20 0.08 0.04
20		MANGROVE FOREST			
20a	4,59,700 (3.11%)	Mangrove Forest		4,59,700	3.11
20b	73,000 (0.50%)	Planted Mangrove Forest		63,400	0.43
			F-T.aman Shrimp-F	7,300 2,300	0.05 0.02
21		BEACH			
21a	7,800 (0.06%)	Beach		7,500	0.06
			F/Rc-T.aman;Coconut;Casurina	320	minor
21b	34,500 (0.23%)	Fallow (Mud land)		26,560	0.18
			Grassland;Planted Mangrove forest	7,380	0.05
Miscellaneous Land :		Urban River and Water bodies Kaptai Lake		68,100 7,38,400 55,000	
		Total		1,47,57,000	100.00

Annex – 3: BFD National Forest Assessment 2005 Legends
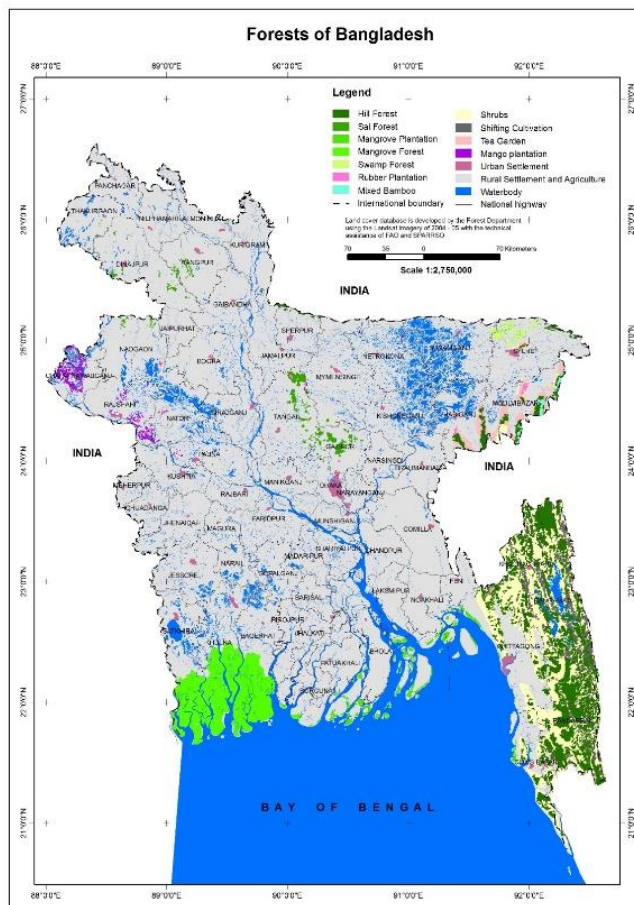
Forests of Bangladesh 2005

LEGEND

- Hill Forest
- Sal Forest
- Mangrove Plantation
- Mangrove Forest
- Swamp Forest
- Rubber Plantation
- Mixed Bamboo
- Shrubs
- Shifting Cultivation

- Tea Garden
- Mango plantation
- Urban Settlement
- Rural Settlement, Agriculture and Others
- River
- Haor and Baor
- Lakes
- Pond
- Highway

Annex – 4: SRDI Land Use 2004 LCCS Diagram

Annex – 5: National Forest Assessment 2005 LCCS Diagram