Mixed plantation site with slow growing indigenous species (Md. Fazlay Arafat)

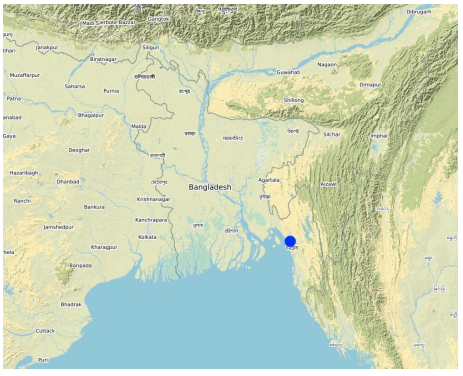
Mixed plantation with slow growing indigenous species to protect land degradation (孟加拉国)

Desi Projatir Misro Bagan

Mixed plantation technique with slow growing indigenous plant species in hill slope, that plays an important role to protect land degradation.

Mixed-species plantations can play an important role in regulating land degradation and sustainable management of degraded forest areas. Among the various forestry practices, planting fast-growing species (used in mono-culture plantation) with slow-growing and indigenous species has a positive long-term impact on forest land management. Mixed species tree plantations have the potential to improve forest soils, forest cover and biological diversity, and facilitate forest succession in degraded ecosystems. In addition to carbon accumulation, mixed plantations also increase understory plant regeneration, and in some cases, reduce diseases and pests infestation in plantation. This technology is applied in hill-forest areas in Bangladesh for preventing erosion and risk of landslides, and to provide a sustainable supply of timber and fuel wood.
The plantation site located in Hathazari area of Chittagong division and inside the periphery of University of Chittagong. The landform is hill slope with 16-30% slopes on average. The annual rainfall is around 2500 mm and the soil texture is loamy to silty. The species used at the Hathazari plantation site were: Garjan (Dipterocarpus turbinatus), Telsur (Hopea odorata), Chapalish (Artocarpus chaplasha), Pithraj (Aphanamixis polystachya), and Minjiri (Senna siamea). All are deep-rooted, slow growing indigenous plant species with a felling rotation of 25-30 years. The Dipterocarpus species grows well on top of hill whereas Artocarpus chaplasha and Hopea odorata grows well in mid slope. Aphanamixis polystachya and Senna siamea perform well in bottom layer of hill. The sequence has positive mutual effects on tree growing. The plantation was established and managed by the authority of University of Chittagong (owner of the land) in 1990 with 2500 trees planted per hectare area (spacing interval 2m x 2m). The average slope of the site is around 30%. Before reforestation, the land was degraded and unproductive. As only a few scattered trees grow due to a huge demand of fuel wood the resulting insufficient coverage by tree crowns frequently led to landslides in the area. The local communities are only allowed to collect the dead branches as fuel and other non-wood forest products like honey, mushrooms, fruits and fodders from the plantation site.
The major activities required to establish the plantation are: seed collection, nursery preparation, site preparation, pit preparation, planting, tying of plants to stick for support, application of fertilizer, compost and biocide. After first establishment, the plantation needs ongoing maintenance activities such as weeding, refilling of vacancies, thinning, pruning, application of fertilizers and biocides (if necessary) and cutting of climbers. The timber species undergo a variety of thinning practices before the entire stand reaches maturity. These trees are progressively thinned out to provide fuel wood and timber, while allowing room for the natural regeneration of native species. The university authority carried out the maintenance activities and such a practice is advantageous to adjacent local communities since it meets their fuel wood demand.
Prior to establishment of the plantation, the area was barren and unproductive, and was hardly a suitable habitat for wildlife. More critically, during the annual monsoons, landslides were a regular phenomenon. The natural regeneration of the deforested area was additionally hampered by incendiary fires set by local communities for agricultural purpose. After the establishment of the plantation and the subsequent improvement of forest/land cover, it is now a habit for various species of bird, monkeys, deer, wild pigs, and rabbits. Furthermore, in humid tropical regions like Bangladesh, the frequent litterfall from indigenous plant species in mixed plantations constitutes the bulk of soil organic matter, and improved nutrient availability and soil fertility.
Though the mixed plantation required intensive management in the early stage, the example of this plantation shows that the mixed plantation with indigenous species is worthwhile and a degraded area can fully recover after 20 years. However, illicit felling of timber trees and

地



地点: Hathazari, Chittagong division, 孟加拉国

分析的技术场所数量: 单一场所

选定地点的地理参考
- 91.79248, 22.47003

技术传播: 均匀地分布在一个区域 (approx. 0.1-1 平 千)

在永久保护区？: 否

实施日期: 1990

介绍类型
- 土地使 创
- 作为传 >50 年分
- [x] 在实 /
- 外 干

illegal removal of litters from the ground for fuel by the local communities are still remains as a management challenge. The practice retains ecological integrity and enhances human well-being (through 'cultural' ecosystem services such as aesthetic beauty, ecotourism etc.) and livelihood (timber, fuelwood, non-timber forest products) as well.

Mixed plantation site (Md. Fazlay Arafat)

Mixed plantation site (Md. Fazlay Arafat)

技 分

主要目的

- [x] 产
- [x] 减少、 、恢复土地 化
- [x] 保护 态
- [ ] 合其他技 保护/下 域 区域
- [ ] 保 / 多 性
- [x] 低 害
- [ ] 应 候变化 天 及其影响
- [ ] 减 候变化及其影响
- [ ] 创 影响
- [x] 创 会影响

土地利用

同一土地单元内 合使 土地

森林/林地

- 带 人品 : 交品

Tree types (合 叶或常不
产品和 务 保护, 娱乐/ 害

供水

- [x] 养
- [ ] 合
- [ ] 充分

土地退化相关的目的

- [ ] 土地 化
- [x] 减少土地 化
- [ ] 修复/恢复严 化 土地
- [ ] 应土地 化
- [ ] 不

解决的退化问题

土壤水蚀 - Wt 土/地 失 侵, Wg 冲 侵 , Wm 块体 动 坡

SLM组

-
- /地
- 减少基于 态 害

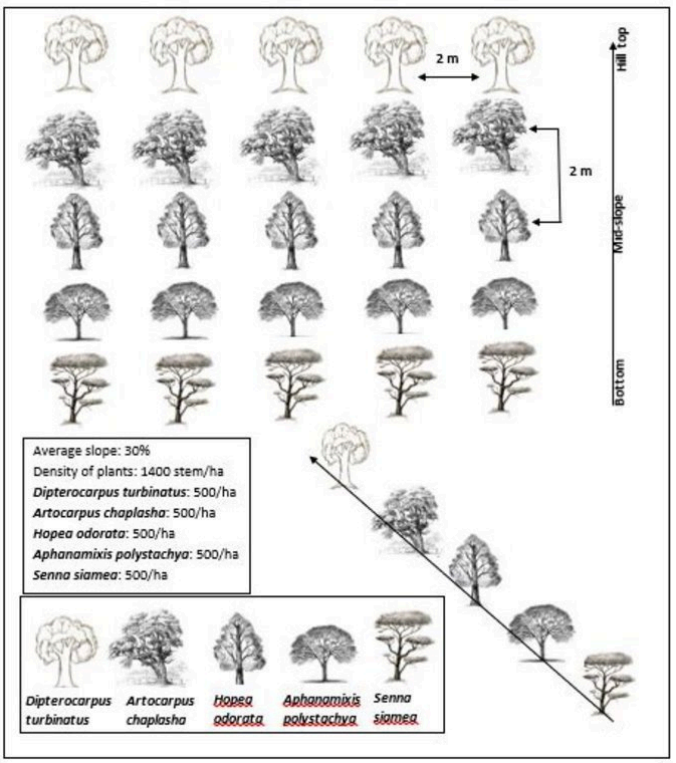
SLM措施

植物措施 - V1 乔 和 层

技 图

技术规范

The dimensions of structures are explained in the description part.



Author: Md. Fazlay Arafat

技 建 与 护 动、投入和

投入和成本的计算

- 成 为 个技 寸和区域 Hectare 为Labor cost 公 1 公顷 = 2.47 acres
- 成 使 BDT 币
- 为 元83.0 BDT
- 劳工 平均500 成

影响成本的最重要因素

技术建立活动

1. Nursery preparation (seed collection, site clearing, leveling and fencing, drainage arrangement, bed preparation, making overhead shed, poly-bag preparation, potting seeds, manuring, irrigation, weed control) (October)
2. Site preparation (prepare plantation site map with GPS, jungle cutting, debris collection and staging, preparation of inspection paths and fire lines) (May)
3. Plantation (pit preparation, tying up of plants, application of fertilizers, compost and biocide, stick for support) (June-July)

技术建立的投入和成本 (per hectare)

对投入进行具体说明	单位	数量	单位成本 (BDT)	每项投入的总成本 (BDT)	土地使用者承担的成本%
劳动力					
Nursery work	Person day	32.0	500.0	16000.0	100.0
Site preparation	Person day	20.0	500.0	10000.0	100.0
Plantation	Person day	40.0	500.0	20000.0	100.0
设备					
Polybags	Pieces	3000.0	1.0	3000.0	100.0
Loamy soil	Cubic meter	6.0	400.0	2400.0	100.0
Bamboo	Pieces	7.0	600.0	4200.0	100.0
Stick	Pieces	2600.0	2.0	5200.0	100.0
Rope	Lump sum	1.0	200.0	200.0	100.0
Bucket, Spade, Knife	Lump sum	1.0	1000.0	1000.0	100.0
植物材料					
Seeds	Kg	2.0	500.0	1000.0	100.0
肥料和杀菌剂					
Urea	Kg	12.0	35.0	420.0	100.0
TSP	Kg	12.0	40.0	480.0	100.0
MoP	Kg	12.0	30.0	360.0	100.0
Compost	Kg	3200.0	4.0	12800.0	100.0
Biocide	Lump Sum	1.0	200.0	200.0	100.0
施工材料					
Signboard (to demarcate plantation area, number of species planted and year of plantation)	Pieces	1.0	1000.0	1000.0	100.0

技术建立所需总成本	78'260.0	
技 建 总成 元	*942.89*	

技术维护活动

1. 1st year weeding and climber cutting (3 times in a year)
2. 2nd year weeding, climber cutting and thinning (3 times in a year)
3. 3rd year weeding, climber cutting, thinning and pruning (3 times in a year)
4. 1st year Vacancy filling, fertilizer and compost application (June-July)
5. 2nd year Vacancy filling, fertilizer and compost application (June-July)

技术维护的投入和成本 (per hectare)

对投入进行具体说明	单位	数量	单位成本 (BDT)	每项投入的总成本 (BDT)	土地使用者承担的成本%
劳动力					
1st year weeding and climber cutting	person-day	21.0	500.0	10500.0	100.0
2nd year weeding, climber cutting and thinning	person-day	21.0	500.0	10500.0	100.0
3rd year weeding, climber cutting, thinning and pruning	person-day	12.0	500.0	6000.0	100.0
Vacancy filling, fertilizer and compost application 2 times	person-day	30.0	500.0	15000.0	100.0
植物材料					
Seedlings	pieces	500.0	10.0	5000.0	100.0
肥料和杀菌剂					
Urea, TSP, MoP, Compost	Lump sum	1.0	1000.0	1000.0	100.0
技术维护所需总成本				**48'000.0**	
技 护总成 元				*578.31*	

境

年平均降雨量

- [ ] < 250
- [ ] 251-500
- [ ] 501-750
- [ ] 751-1,000
- [ ] 1,001-1,500
- [ ] 1,501-2,000
- [x] 2,001-3,000
- [ ] 3,001-4,000
- [ ] > 4,000

农业气候带

- [x]
- [ ] 半
- [ ] 半干
- [ ] 干

关于气候的规范

不

斜坡

- [ ] 平 0-2%
- [ ] 3-5%
- [ ] 平 6-10%
- [ ] 坡 11-15%
- [x] 崎岖 16-30%
- [ ] 峭 31-60%
- [ ] 常 峭 >60%

地形

- [ ] 平原
- [ ] 山
- [ ] 山坡
- [x] 山地 坡
- [ ] 坡
- [ ] 底

海拔

- [x] 0-100 m a.s.l.
- [ ] 101-500 m a.s.l.
- [ ] 501-1,000 m a.s.l.
- [ ] 1,001-1,500 m a.s.l.
- [ ] 1,501-2,000 m a.s.l.
- [ ] 2,001-2,500 m a.s.l.
- [ ] 2,501-3,000 m a.s.l.
- [ ] 3,001-4,000 m a.s.l.
- [ ] > 4,000 m a.s.l.

.....应用的技术

- [ ] 凸形情况
- [ ] 凹 情况
- [x] 不 关

土壤深度

- [ ] 常 0-20厘
- [ ] 21-50厘
- [x] 中 厚 51-80厘
- [ ] 81-120厘
- [ ] 常 > 120厘

土壤质地（表土）

- [ ]
- [x] 中 壤土、 土
- [ ] 土

土壤质地（地表以下>20厘米）

- [ ]
- [x] 中 壤土、 土
- [ ] 土

表土有机质含量

- [ ] >3%
- [x] 中 1-3%
- [ ] 低 <1%

地下水位

- [ ] 上
- [ ] < 5
- [x] 5-50
- [ ] > 50

地表水的可用性

- [ ]
- [ ] 好
- [x] 中
- [ ] 匮乏/

水质（未处理）

- [ ] 好
- [x] 不 处
- [ ] 仅供农业使
- [ ] 不可

参

盐度是个问题吗？

- [ ]
- [x] 否

洪水发生

- [ ]
- [x] 否

物种多样性

- [ ]
- [x] 中
- [ ] 低

栖息地多样性

- [ ]
- [ ] 中
- [x] 低

应 技 土地使 征

市场定位

- [ ]
- [x] 合 商业

非农收入

- [x] 低于全 10%
- [ ] 入 10-50%

相对财富水平

- [ ] 常
- [ ]

机械化水平

- [x] 手工作业
- [ ] 力 引

- [ ] 商业/市场

- [ ] > 入50%

- [x] 平均 平
- [ ] 丰富
- [ ] 常丰富

- [ ] /化 动

定栖或游牧
- [x] 定
- [ ] 半
- [ ]

个人或集体
- [ ] 个人/家庭
- [ ] 团体/ 区
- [ ] 合作
- [x] 员工 公司、 府

性别
- [x] 女人
- [x] 人

年龄
- [ ] 儿
- [x] 年人
- [x] 中年人
- [ ] 年人

每户使用面积
- [ ] < 0.5 公
- [ ] 0.5-1 公
- [ ] 1-2 公
- [ ] 2-5公
- [x] 5-15公
- [ ] 15-50公
- [ ] 50-100公
- [ ] 100-500公
- [ ] 500-1,000公
- [ ] 1,000-10,000公
- [ ] > 10,000公

规模
- [ ] 小
- [x] 中
- [ ] 大

土地所有权
- [x] 州
- [ ] 公司
- [ ] 区 庄
- [ ] 团体
- [ ] 个人 命名
- [ ] 个人 命名

土地使用权
- [ ] 入
- [ ] 区
- [ ]
- [x] 个人

用水权
- [x] 入
- [ ] 区
- [ ]
- [ ] 个人

进入服务和基础设施的通道

健康	好
	好
技 助	好
就业 例如 农	好
市场	好
	好
和交	好
和卫	好
务	好

影响

社会经济影响

产	增加	
地	增加	
业 产	增加	honey, mushrooms and fruits for wildlife
产	增加 低	mixed plantation is more pest resistant
产品多 性	增加	Along with timber these mixed plantation yields oil, fruits, fodder, fuel and herbal medicines
产区域 使 中 土地 土地	增加	
	妨 化	The degraded land which was vulnerable for landslides now convert to a native plantation area
可 性	增加	Increase of the stream flow that used for irrigation in adjacent crop lands
入 多 性	增加	
	增加	tourism promoted in the area
工作	增加 低	The workload increased at the initial stage but in the long run it will protect from the hassle of landslides

社会文化影响

土地使	恶化	
娱乐 会	减少	tourism increased in the area
SLM/土地 化	减少	

生态影响

	增加	water holding capacity of soil increased due to the increase organic matter in the soil and canopy coverage
	增加	
地 径	增加 低	

多余 减少
地下 层
下 aquifer recharge positively influenced due to the canopy coverage and reduction of surface runoff
土壤 分 增加
土壤 层 减少
土壤 失 增加 低
土壤堆 增加
养分循 / 增加
土壤 /地下C 增加
层 增加
/地上C 增加
多 性 增加
外 入侵 as the plantation established and maintained with native plant species, the alien invasive plant species are not able to spread much here
增加 减少
动 多 性 增加
、 、传 增加
息地多 性
增加 The before bare, unproductive and degraded land now supports habitat for various wildlife
害 / 制 增加
坡 增加 低
、 影响 增加 低
和 室 体 增加 低
增加 低

场外影响

可 性 地下 、 增加
季 定可 包 低 减少 增加
下
增加 低 downstream siltation decreased due to reduction of surface runoff
室 体 影响 增加 减少

成 分

与技术建立成本相比的效益

回报 常 常
回报 常 常

与技术维护成本相比的效益

回报 常 常
回报 常 常

候变化

渐变气候

年 增加 常不好 常好
年 减少 常不好 常好
季 增加 常不好 常好 季 季 季

气候有关的极端情况（灾害）

/ 侵扰 常不好 常好

和 应

采用该技术的地区内土地使用者的百分比

- 单例/实
- [x] 1-10%
- 11-50%
- > 50%

在所有采用这种技术的人当中，有多少人在没有获得物质奖励的情况下采用了这种技术?

- 0-10%
- 11-50%
- 51-90%
- [x] 91-100%

最近是否对该技术进行了修改以适应不断变化的条件？

-
- [x] 否

什么样的变化条件？

- 候变化 候
- 不 变化 市场
- 劳动力可 性 例如 于

和吸取

长处: 土地使用者的观点

- This practice reduces 80% of landslides in this area.
- Increases the soil fertility of the degraded land through improved nutrient cycling.
- Enhances biodiversity conservation through habitat improvement.

长处: 编制者或其他关键资源人员的观点

- Increase carbon sequestration
- Provide a sustainable source of fuel wood and timber to the land user

弱点/缺点/风险: 土地使用者的观点如何克服

- Protecting mixed-species plantations from illicit felling is difficult Regular patrolling need to be introduced
- Silvicultural practices like thinning and pruning are not systematically practiced as local community collect dead branches for fuel
- Local community collect litter from the ground to meet their fuel demand and this reduces the soil fertility Collecting litter from ground should be banned to protect soil fertility

弱点/缺点/风险: 编制者或其他关键资源人员的观点如何克服

- Due to the slow-growing nature of indigenous plant species, there is a long lag period before harvest gets possible (which has impacts on income). Alternate income generation activity need to be introduced

参

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实施日期: Feb. 5, 2019

上次更新: April 7, 2020

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WOCAT数据库中的完整描述
https://qcat.wocat.net/zh/wocat/technologies/view/technologies_4329/

链接的SLM数据
不

文件编制者

- Bangladesh Forest Department (Bangladesh Forest Department) - 孟加拉国
- Decision Support for Mainstreaming and Scaling out Sustainable Land Management (GEF-FAO / DS-SLM)