Greenbelt plantation with Jhau (Casuarina equisetifolia) (Md. Fazlay Arafat)

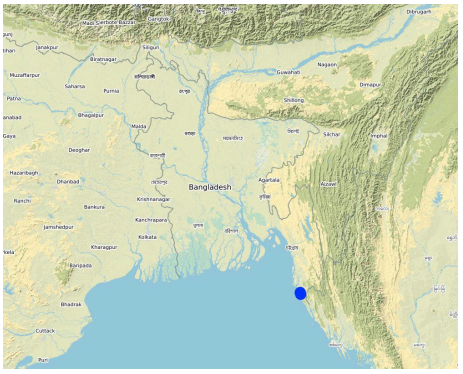
Creating green shelter-belt through Jhau (Casuarina equisetifolia) plantation in coastal area (孟加拉国)

Coastal Greenbelt

Creation of green shelter-belt along the coast line through plantation of Jhau (Casuarina equisetifolia) to reduce vulnerabilities and hazards of extreme weather events like cyclones.

The coastal zone of Bangladesh is extremely vulnerable to the impact of climate change. The coastal populations are mostly poor and some of them are landless with livelihoods connected to agriculture, fishing, shrimp farming, salt farming etc. Past devastating cyclones have killed thousands of people and destroyed homes and infrastructure. Creation of green shelter-belts, including mangrove and non-mangrove plantations, reduces the vulnerabilities and hazards related to extreme weather events like cyclones and storm surges. Afforestation along coastal areas is usually cheaper and ecologically more beneficial than other measures and serves to conserve biodiversity and stabilize newly accreted land. As a general guideline, a shelter-belt protects an area over a distance up to its own height on the windward side and up to 10 times its height on the leeward side, depending on the strength of the wind.
The current sustainable land management practice takes particular account of the Jhau plantation along the coastline of Himchari National Park of Cox's Bazar. Jhau (Casuarina equisetifolia) is one of the most promising non-mangrove species for creating shelter-belts and the Bangladesh Forest Department has been planting them in raised coastal lands and embankments since the 1990s. Casuarina equisetifolia is an evergreen tree with a finely branched, feathery crown and usually growing around 35 meters tall. It is fast growing, salt tolerant, grows in sand and can also tolerate occasional inundation by sea water at extremely high tides. Many areas where the species naturally occurs are susceptible to tropical cyclones, and its general tolerance to strong winds has encouraged its use in protective planting. The most common uses of C. equisetifolia are for coastal sand dune stabilization, shelter-belts, land reclamation and erosion control. The wood is hard and used for house posts, rafters, electric poles, tool handles, etc. It has been called 'the best firewood in the world' and also produces high-quality charcoal.
Coastal plantation with Jhau is a soft adaptation measure that has significantly contributed to reduce the loss of lives and properties against tropical cyclones and storm surges in the coastal areas. This species can be planted in coastline, roadside, embankment and marginal lands for creating dense vegetation, which can function as windbreak and combat tidal surges. The spacing used in this shelter-belt plantation along the coastline of Himchari National Park is 2m x 2m and 2500 trees are planted per hectare area. The examined shelter-belt plantations are approximately 1.5km long and 150m wide. The major activities required to establish the plantation were: nursery development (seed collection, site clearing, leveling and fencing, drainage arrangement, bed preparation, making overhead shed, poly-bag preparation, potting seeds, manuring, irrigation, weed control), site preparation (prepare plantation site map with GPS, weeding, marking pit location with sticks, carrying of seedlings to the site) and tree planting (digging of planting holes, tying up of plants with stick for support, application of fertilizers and compost). Weeding and vacancy filling were the maintenance activities which required up to three years after plantation establishment. All those activities carried out by the forest department with the financial help from world bank project fund. The local communities were involved as paid labour for nursery development, plantation and maintenance activities. Local people can only collect fuel wood from the plantation as its soul purpose is to act as shelter-belt from cyclones and tidal surge.
As the plantation site is on the coastline and beside the Himchari National Park, it turns to a tourist spot now for its scenic beauty. Local people involved with various sorts of tourist oriented small-scale business here e.g. parasailing, boating, restaurant, cottage industries, shops, etc. Though the initial establishment of Jhau stand need intensive care, it is functioning as a good wind breaker and combating with tidal surge along with creating alternate livelihood opportunities for local people.

地



地点: Hiimchari, Cox's Bazar, Chittagong, 孟加拉国

分析的技术场所数量: 2-10个场所

选定地点的地理参考
- 92.03183, 21.33515
- 92.03458, 21.32175
- 92.04474, 21.29526

技术传播: 均匀地分布在一个区域 (approx. 0.1-1 平

在永久保护区？: 否

实施日期: 10-50年前

介绍类型
- 土地使 创
- 作为传 ≥50 年份
- 在实 /
- ☑ 外 干

Plantation of Jhau along the coast (Md. Fazlay Arafat)

Jhau plantation at young stage (Md. Fazlay Arafat)

技 分

主要目的

- [ ] 产
- [x] 减少、 、恢复土地 化
- [ ] 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
- [x] 减 候变化及其影响
- [x] 创 影响
- [ ] 创 会影响

土地利用

同一土地单元内 合使 土地

森林/林地

- 带 人工 . 品属 : 单一 培 外 品

Tree types (常):

产品和 务 保护, 娱乐/ 害 护

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 - Wc 岸侵

土壤风蚀 - Et 土 失

SLM组

- / 护 带
- 减少基于 态 害

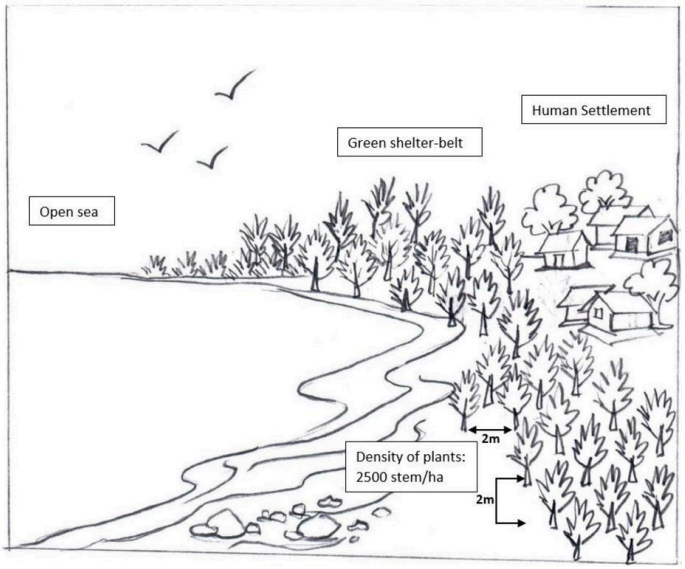
SLM措施

植物措施 - V1 乔 和 层

技 图

技术规范

Plant spacing between the Jhau trees is 2mx2m.



技 建 与 护 动、投入和

投入和成本的计算

- 成 为 个技 寸和区域 单位 hectare 为
  1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

labor

技术建立活动

1. Nursery development (seed collection, site clearing, leveling and fencing, drainage arrangement, bed preparation, making overhead shed, poly-bag preparation, potting seeds, manuring, irrigation, weed control) (September-October)
2. Site preparation (prepare plantation site map with GPS, weeding, marking pit location with sticks, carrying of seedlings to the site) (April-May)
3. Tree planting (digging of planting holes, tying up of plants with stick for support, application of fertilizers and compost) (June-July)

技术建立的投入和成本 (per 1 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 preparation	person-days	17.0	500.0	8500.0	
Site preparation	person-days	7.0	500.0	3500.0	
Planting activities	person-days	22.0	500.0	11000.0	
设备					
Bucket	pieces	10.0	150.0	1500.0	
Spade	pieces	8.0	300.0	2400.0	
Scissor	pieces	2.0	150.0	300.0	
Knife	pieces	2.0	200.0	400.0	
肥料和杀菌剂					
Cow dung	cubic meter	1.0	1200.0	1200.0	
Urea	kg	6.0	35.0	210.0	
MoP	kg	6.0	30.0	180.0	
TSP	kg	6.0	40.0	240.0	
Compost	kg	1250.0	4.0	5000.0	
施工材料					
Poly bag	pieces	3000.0	0.8	2400.0	
Bamboo stick	pieces	2600.0	2.0	5200.0	
Signboard	Lump sum	1.0	1000.0	1000.0	
技术建立所需总成本				**43'030.0**	
技 建 总成 元				*518.43*	

技术维护活动

1. weeding (3 times in a year)
2. vacancy filling (June-July)

技术维护的投入和成本 (per 1 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 (6 labor/weeding/Ha.) 3 times	person-days	18.0	500.0	9000.0	

2nd year Weeding (5 labor/weeding/Ha.) 3 times	person-days	15.0	500.0	7500.0	
3rd year Weeding (5 labor/weeding/Ha.) 2 times ng and cleaning (5 labor/weeding/Ha.) 1 time	person-days	10.0	500.0	5000.0	
Vacancy filling	person-days	5.0	500.0	2500.0	
设备					
Bamboo stick	pieces	1000.0	2.0	2000.0	
技术维护所需总成本				**26'000.0**	
技 护总成 元				*313.25*	

境

年平均降雨量
- [ ] < 250
- [ ] 251-500
- [ ] 501-750
- [ ] 751-1,000
- [ ] 1,001-1,500
- [ ] 1,501-2,000
- [ ] 2,001-3,000
- [x] 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
- [x] 平0-2%
- [ ] 3-5%
- [ ] 6-10%
- [ ] 11-15%
- [ ] 16-30%
- [ ] 31-60%
- [ ] 60%

地形
- [ ] 平原
- [ ] 山
- [ ] 山坡
- [ ] 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
- [x] 常 0-20厘
- [ ] 21-50厘
- [ ] 中 厚 30-80厘
- [ ] 81-120厘
- [ ] 常 > 120厘

土壤质地（表土）
- [x] 中 壤土、 土
- [ ] 壤土、 土

土壤质地（地表以下>20厘米）
- [x] 中 壤土、 土
- [ ] 壤土、 土

表土有机质含量
- [ ] 3%
- [ ] 中 1-3%
- [x] 低 <1%

地下水位
- [ ] 上
- [ ] < 5
- [x] 5-50
- [ ] > 50

地表水的可用性
- [x]
- [ ] 好
- [ ] 中
- [ ] 匮乏/

水质（未处理）
- [ ] 好
- [ ] 不 处
- [ ] 仅供农业使
- [x] 不可
貌下 和地

盐度是个问题吗？
- [x]
- [ ] 否

洪水发生
- [x]
- [ ] 否

物种多样性
- [ ]
- [ ] 中
- [x] 低

栖息地多样性
- [ ]
- [ ] 中
- [x] 低

应 技 土地使 征

市场定位
- [x] 合 商业
- [ ] 商业/市场

非农收入
- [ ] 低于全 0%
- [x] 入10-50%
- [ ] > 入50%

相对财富水平
- [ ] 常
- [x]
- [x] 平均 平
- [ ] 丰富
- [ ] 常丰富

机械化水平
- [x] 手工作业
- [ ] 力 引
- [ ] / 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
- [x] 年人

每户使用面积
- [ ] < 0.5 公
- [ ] 0.5-1 公
- [ ] 1-2 公
- [ ] 2-5公
- [ ] 5-15公
- [x] 15-50公

规模
- [x] 小
- [ ] 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
- [x] 入
- [ ] 区
- [ ] 个人

用水权
- [x] 入

- 50-100公□
- 100-500公□
- 500-1,000公□
- 1,000-10,000公□
- > 10,000公□

- □ 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	□ 低						✓		增加	
□ □ □ □ 业□ 产	□ 低					✓			增加	leaves and fruits are used for ornamental purposes
□ 产□ □ □ □	增加					✓			□ 低	Jhau tree performs better than other trees for stabilization of coastal sand dune
产品多□ 性	□ 低					✓			增加	the plantation site now become a picnic spot for its scenic beauty (tourism has been attracted because of the coastal plantation)
□ 产区域□ /使□ □ 中□ □ 土地□	□ 低						✓		增加	
土地□ □	妨□						✓		□ 化	
□ 入□ □ □ 多□ 性	□ 低						✓		增加	The area attract more tourists now and local people involved in various type of small scale business here
工作□	增加						✓		□ 低	The workload reduced due to diversified income source of local community

社会文化影响

□ 化□ 会□ 如□ □ 、审□ 以及其他□	减少						✓		□ □	New year celebration program now organized here every year
娱乐□ 会	减少						✓		□ □	This area now become a tourist hotspot
SLM/土地□ 化□ □	减少						✓		□ □	Learn about the stabilization of sand dunes

生态影响

土壤□ □ 层	减少					✓			□ □	
土壤□ 失	增加						✓		□ 低	
土壤堆□	□ 低						✓		增加	
土壤□ □ /地下C	□ 低					✓			增加	
□ □ □ □ 层	□ 低						✓		增加	
□ □ /地上C	□ 低					✓			增加	
□ □ □ □ □ □ □ □ 、□ □ 、传□ □ □	□ 低					✓			增加	The green belt support home for native birds
□ 息地多□ 性	□ 低					✓			增加	
□ □ 影响	增加					✓			□ 低	
□ □ 、□ □ □ 影响	增加						✓		□ 低	
□ 和□ 室□ 体□ □ □	增加					✓			□ 低	
□ □	增加							✓	□ 低	

场外影响

□ 力□ □ □ □ □	增加					✓			减少	protection of agricultural land on back side of shelter-belt
□ 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

气候有关的极端情况（灾害）

带 常不好 常好

局地 常不好 常好

局地 常不好 常好

/ 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

- Function as wind break and combat tidal surges
- Increases the soil fertility of the degraded land through nutrient cycle

长处: 编制者或其他关键资源人员的观点

- Biodiversity conservation through habitat improvement
- Increase carbon sequestration

弱点/缺点/风险: 土地使用者的观点如何克服

- Initial establishment of stand need intensive care and risk of failure is high Increase technical capabilities of forest officials

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

- Jhau tree is not a natural vegetation for the sand dunes Introduce other indigenous salinity tolerant plant species in the green shelter belt

参

编制者

Fazlay Arafat

Editors

审查者

Nicole Harari
Rima Mekdaschi Studer
Ursula Gaemperli

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资源人

Hoq Mahabub Morshed - 土地使
Dhiman Mondol - 土地使
Md. Sobur Ali - 土地使

WOCAT数据库中的完整描述

https://qcat.wocat.net/zh/wocat/technologies/view/technologies_4333/

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)

主要参考文献

- Islam, S. A. & Rahman, M. M. (2015). Coastal afforestation in Bangladesh to combat climate change induced hazards. Journal of Science, Technology & Environment Informatics, 02(01), 13–25, 2015: 2015, Journal BiNET. This is an open access article distributed under terms of the Creative Common Attribution 4.0 International License.