Calliandra incorporated into a vegetative cross-slope barrier (William Akwanyi)

Vegetative cross-slope barriers (肯尼亚)

描

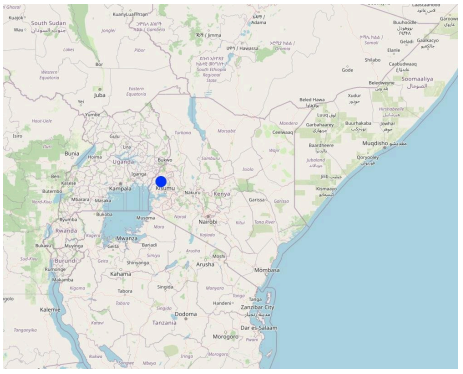
Cross-slope barriers in the form of vegetative strips are established on sloping lands to reduce runoff velocity and prevent soil loss, thereby contributing to the conservation of soil, water, and plant nutrients.

Vegetative cross-slope barriers are strips of perennial plants that are established along the contours of sloping lands. They act as soil and water conservation measures to reduce runoff velocity and consequently prevent soil loss. The strips are mostly between 0.3 m and 1.5 m wide and consist initially of one or two rows of plants. They slow down the speed of runoff during heavy rainfall. This facilitates infiltration, and eroded sediment in the runoff is trapped on the upslope side of the barriers. Hence, they contribute to the conservation of soil, water, and plant nutrients. The most used plants/ crops used in establishing vegetative cross-slope barriers are perennial erect grasses, including Brachiaria sp., napier grass (Pennisetum purpureum), and vetiver grass (Vetiver zizanioides). Depending on species (vetiver being an exception), vegetative cross-slope barriers can serve as important sources of fodder for livestock. Some farmers prefer to establish crops (e.g., bananas and pineapples) or trees and shrubs (e.g., (e.g., Calliandra calothyrus, Grevillea robusta or Sesbania sesban) as cross-slope barriers at appropriate spacing (depending on the tree/ shrub) to serve as windbreakers as well as providing additional measures to control soil erosion. Alternatively, these may be combined with grasses. These can also serve as important sources of food, fodder, fuel, and timber.

In establishing vegetative cross-slope barriers, the distance between the barriers is dictated by the slope of the land. The ProSoil project through Welthungerhilfe trained Community Resource Persons (CRPs) on how to survey contours using a line level. The CRPs by extension train farmers on how to measure slope for their fields and how to determine the distance between the barriers using a predetermined scale. Once established, minimal labour is required for maintenance. The main vegetation (grasses) must be harvested or cut back to a height of less than 0.5 m before planting a crop in the main field to prevent them from suppressing the crops through shading. The trees, and shrubs may need to be trimmed (coppiced) during the cropping period to allow adequate sunlight to reach the crops. The cut material can be collected and used as fodder or firewood as appropriate or be incorporated during land preparation, or during weeding as mulch.

Farmers like the technology because it contributes to soil, water, and nutrient conservation and it reduces the steepness of the slope as soil eroded from the upper part of the slope accumulates on the upslope side of the barrier resulting, eventually, in distinct terrace-like benches. As a result, farmers find it easier to cultivate on these terraces. Vegetative cross-slope barriers can be associated with retention ditches, especially where farmers find it important to harvest the water. They can also provide firewood and fodder, especially where palatable cut and carry varieties of grass are used.

地点



地点: Khalaba Ward, Matungu Sub-county in Kakamega County, Kakamega County in western Kenya, 肯尼亚

分析的技术场所数量: 单一场所

选定地点的地理参考
- 34.54194, 0.41211

技术传播: 均匀地分布在一个区域 (0.003804 km²)

在永久保护区？: 否

实施日期: 2019

介绍类型
- ☐ 土地使用者的创新
- ☑ 作为传统系统的一 分 50 年
- ☐ 在实 /研究期
- ☑ 外 目 干

A vegetative cross-slope barrier (George Onyango)

技术分类

主要目的

- [x] 改 生产
- [x] 减少、 、恢复土地 化
- [ ] 保护生态系统
- [x] 结合其他技术保护流域/下游区域
- [x] 保持/提 生物多样性
- [ ] 低灾害
- [x] 应气候变化/极端天气及其影响
- [ ] 减缓气候变化及其影响
- [ ] 创 有益的经济影响
- [ ] 创 有益的社会影响

土地利用

同一土地单元内混合使用的土地 是 - 农林业

农田

- 一年一作: 料作物其他, 料作物 , 料作物三叶 , 油料作物 - 生 物类玉米, 科牧 和- 类予 科牧 和 类大 , 根/块 作物木 . Cropping system: 玉米/ 粱/ 子与 类 作
- 多年一作 木材
- 乔木与灌木的种植: 料树木 朱缨 属、 合欢、前庭 梨水果、其他, 果、山竹果、番石榴

每年的生 季 : 2数
用 作制度了吗是
用 作制度了吗是

牧场

- 收割和携带/ 放牧
- 改 牧场

动物类型: cattle - dairy and beef (e.g. zebu), 家禽
是否实 作物与牲畜的综合管理 是
产品和服务: economic security, investment prestige, 奶类, manure as fertilizer/ energy production, 类肉类

品种	计数
cattle - dairy and beef (e.g. zebu)	3
家禽	10

供水

- [x] 养
- [ ] 混合 水灌溉
- [ ] 充分灌溉

土地退化相关的目的

- [x] 止土地 化
- [x] 减少土地 化
- [ ] 修复/恢复严 化的土地
- [ ] 应土地 化
- [ ] 不 用

解决的退化问题

土壤水蚀 - Wt 土流失 侵, Wg 冲沟侵/沟

SLM组

- 农业林学
- 农畜综合管理
- 横坡措施

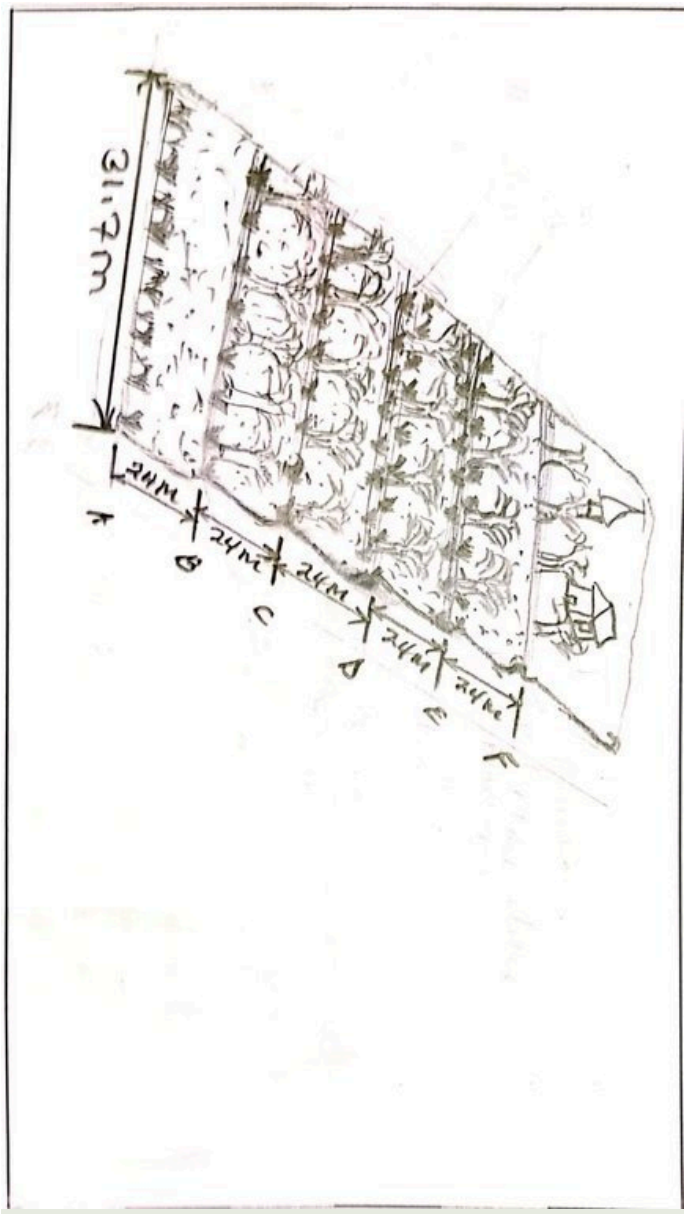
SLM措施

植物措施 - V1 乔木和灌木 盖/层 和多年生 本植物

技术图纸

技术规范

Length of the farm (down the slope): 120 m
Width of the farm (along the contour): 31.7 m
Number of vegetative cross-slop barriers established: 6
Width of barriers: ranges between 0.3 m and 0.5 m
Slope: 4%
Width of the established terraces/ distance between any two barriers: 24 m
Plants used: brachiaria and napier grass (grasses), grevillea and calliandra (trees and shrub), bananas (crops)
1st barrier on the upper side (F) is on a retention ditch
Last barrier (A) is on the upper side of a channel that collects excess runoff and prevents damage to neighbours' farms on the lower side of the farm



Author: William Akwanyi

技术建立与维护 活动、投入和 用

投入和成本的计算

- 算的成本为 每个技术区域 尺寸和 积单位 **0.00761 ha** 换算为1公 的换算系数 **1 公顷 = 1 ha = 2.47 acres**
- 成本 算使用的 **KES**
- 汇率 换算为美元 1 美元 = 124.21352 KES
- 用劳工的每日平均工 成本 **250**

影响成本的最重要因素

Rate of man-days vary from one place to another and also depend on the kind of work. Exchange rate for January 2023, source: European Commission/ InfoEuro online at https://commission.europa.eu/funding-tenders/procedures-guidelines-tenders/information-contractors-and-beneficiaries/exchange-rate-inforeuro_en The stated costs are estimates.

技术建立活动

1. Contour surveying to establish locations for the vegetative cross slope barriers (时 / 率Before planting)
2. Planting (时 / 率After rains)

总技术建立成本（估算）

8000.0

技术维护活动

1. Weeding (时 / 率After every harvest)
2. Adding manure/ compost (时 / 率After every harvest)
3. Regular inspection to fill large gaps in the barriers that are 30 Cm or more by replanting (时 / 率Monthly during the rainy season)

技术维护的投入和成本 (per 0.00761 ha)

对投入进行具体说明	单位	数量	单位成本 (KES)	每项投入的总成本 (KES)	土地使用者承担的成本%
劳动力					
Weeding	Man-days	3.0	250.0	750.0	100.0
Adding manure/ compost	Man-days	2.0	250.0	500.0	100.0

设备					
Hoe (jembe) for weeding	No.	1.0	90.0	90.0	100.0
Wheelbarrow for carrying manure/ compost	No.	1.0	500.0	500.0	100.0
Spade for scooping manure/ wheelbarrow	No.	1.0	100.0	100.0	100.0
肥料和杀菌剂					
Manure/ compost	Wheelbarrows	20.0	50.0	1000.0	100.0
技术维护所需总成本				**2'940.0**	
技术维护总成本 美元				*23.67*	

然环境

年平均降雨量
- < 250毫米
- 251-500毫米
- 501-750毫米
- 751-1,000毫米
- [x] 1,001-1,500毫米
- 1,501-2,000毫米
- 2,001-3,000毫米
- 3,001-4,000毫米
- > 4,000毫米

农业气候带
- [x] 潮湿的
- 半湿润
- 半干旱
- 干旱

关于气候的规范
以毫米为单位 算的年平均 1200.0
Rainfall pattern is bimodal. Monthly rainfall variability is high with some months such as January recording less than 5 mm of total rainfall.
气 站名称Kakamega Meteorological Station

斜坡
- 水平 0-2%
- [x] 缓 3-5%
- [x] 平缓 6-10%
- 滚坡 11-15%
- 崎岖 16-30%
- 峭 31-60%
- 常 峭 >60%

地形
- [x] 原/平原
- 山
- 山坡
- 山地斜坡
- 坡
- 底

海拔
- 0-100 m a.s.l.
- 101-500 m a.s.l.
- 501-1,000 m a.s.l.
- [x] 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] 不相关

土壤深度
- 常浅 0-20厘米
- 浅 21-50厘米
- [x] 中等深度 51-80厘米
- 深 81-120厘米
- 常深 > 120厘米

土壤质地（表土）
- 粗粒/ 砂
- [x] 中粒 壤土、粉土
- 细粒/ 粘土

土壤质地（地表以下>20厘米）
- 粗粒/ 砂
- [x] 中粒 壤土、粉土
- 细粒/ 粘土

表土有机质含量
- > 3%
- [x] 中 1-3%
- 低 <1%

地下水位
- 上
- < 5米
- [x] 5-50米
- > 50米

地表水的可用性
- 好
- [x] 好
- 中等
- 匮乏/没有

水质（未处理）
- 好 用水
- [x] 不 用水 处理
- 仅供农业使用 灌溉
- 不可用

水 参考地下水和地 水

盐度是个问题吗？
- 是
- [x] 否

洪水发生
- 是
- [x] 否

物种多样性
- [x]
- 中等
- 低

栖息地多样性
-
- [x] 中等
- 低

应用 技术的土地使用者的特征

市场定位
- 生 给
- [x] 混合 生/商业
- 商业/市场

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

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

机械化水平
- [x] 手工作业
- 畜力牵引
- 机械化/电动

定栖或游牧
- 定栖的
- [x] 半游牧的
- 游牧的

个人或集体
- [x] 个人/家庭
- 团体/社区
- 合作社
- 员工 公司、政府

性别
- [x] 女人
- [x] 男人

年龄
- 儿童
- [x] 年人
- [x] 中年人
- 老年人

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

规模
- 小 模的
- [x] 中等 模的
- 大 模的

土地所有权
- 州
- 公司
- 社区/村庄
- 团体
- [x] 个人 未命名
- [x] 个人 有命名

土地使用权
- 由 入 无组织
- 社区 有组织
- 租
- [x] 个人

用水权
- [x] 由 入 无组织

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

社区 有组织
租
✓ 个人

进入服务和基础设施的通道

健康	差	好
教	差	好
技术援助	差	好
就业 例如 农	差	好
市场	差	好
源	差	好
和交	差	好
用水和卫生 施	差	好
服务	差	好

影响

社会经济影响

作物生产

减少 增加

SLM之前的数 ：2
SLM之后的数 ：6
Quantity refers to the number of 90 Kg bags of maize produced per acre. Although vegetative cross-slope barriers reduced the available space for crops, other SLM technologies such as retention ditches and the use of compost contributed to the increase in the production. According to the farmer, the soil at the farm was highly eroded before the SLM technologies were introduced.

作物

减少 增加

Not easy to quantify but according to the farmer, the crops are doing better compared to how they were before the cross-slope barriers were established.

料生产

减少 增加

the farmer estimates that the amount of napier grass harvested from the farm within a year has increased. Farmer not able to quantify.

料

减少 增加

Not easy to quantify but according to the farmer, napier grass is doing better compared to how it was before the cross-slope barriers were established.

畜牧生产

减少 增加

SLM之前的数 ：4
SLM之后的数 ：7
Amount of milk produced by one cow during early lactation period.

土地管理

妨碍 简化

Easy of working on less eroded soils. A farmer's estimate.

农业投入 用

增加 低

SLM之前的数 ：5000
SLM之后的数 ：0
Expenditure on fertilizer in KES. The farmer no longer uses fertilizer.

农业收入

减少 增加

SLM之前的数 ：0
SLM之后的数 ：6000
The farmer earns income from selling napier grass - per year. This is based on the farmer's estimate.

收入来源的多样性

减少 增加

The farmer considers the money earned from selling napier grass as an extra source of income.

社会文化影响

品安全 给

减少 改

SLM之前的数 ：2
SLM之后的数 ：0.5
Number of months in a year when there is total lack of food in the house, and the farmer has to buy all the food required in the house. Based on the farmer's estimate.

SLM/土地 化知

减少 改

Level of knowledge in SLM/ land management. This is a farmer's estimate that she has increased her knowledge in SLM.

生态影响

地 径流

增加 低

The farmer notes that the amount of water leaving the farm and silting other farms in the lower areas. has greatly reduced.

土壤流失

增加 低

the farmer notes that the amount of silt deposited in the lower parts of the farm and in other farms on the lower side of the farm has reduced.

土壤堆积

增加

the farmer notes that the amount of soil trapped by the vegetative cross slope barriers is high and this leads to an increase in soil accummulation at the farm.

场外影响

对 农田的破坏

增加 减少

Amount of runoff leaving the farm with potential to cause soil erosion in neighbouring farms.

成本效益分析

与技术建立成本相比的效益

短期回报 常消极 常积极

期回报 常消极 常积极

与技术维护成本相比的效益

短期回报 常消极 常积极

期回报 常消极 常积极

气候变化

渐变气候

年温度 增加 常不好 常好

季 性温度增加 常不好 常好 季旱季

气候有关的极端情况（灾害）

局地暴 常不好 常好

用和 应

采用该技术的地区内土地使用者的百分比

- 单例/实
- 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%
- 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？

- 是
- ✓ 否

什么样的变化条件？

- 气候变化/极端气候
- 不断变化的市场
- 劳动力可用性 例如 由于 移

结 和吸取的教

长处: 土地使用者的观点

- Soil erosion control.
- increased yields.

长处: 编制者或其他关键资源人员的观点

- More benefits, including firewood and other products from trees planted on the cross slope barriers.

弱点/缺点/风险: 土地使用者的观点如何克服

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

- Reduces area meant for crop production. Ensure optimum use of manure to offset production loss.

参考文献

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WOCAT数据库中的完整描述
https://qcat.wocat.net/zh/wocat/technologies/view/technologies_6705/

链接的SLM数据
Approaches: Promotion of different trees for agroforestry https://qcat.wocat.net/zh/wocat/approaches/view/approaches_6706/

文件编制者

机构
- Alliance Bioversity and International Center for Tropical Agriculture (Alliance Bioversity-CIAT) - 肯尼亚
- Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)

目
- Soil protection and rehabilitation for food security (ProSo(i)l)

链接到网络上可用的相关信息
- Vegetative Barriers for Erosion Control: https://extension.missouri.edu/publications/g1653