Kanda construction in progress in Sourakhak watershed (Helvetas Swiss Intercooperatio (Kabul Afghanistan))

Kanda (阿富汗)

Kanda

描述

A traditional underground water tank carved out of rocks to collect rainfall and snow water and reduce evaporation losses.

Kanda is an indigenous technology for collecting rain and snow melt. The technology comprises an underground tank carved out of rock (limestone), channels to convey the runoff into the underground tank or kanda and a rocky catchment from where runoff is collected. Kanda technology is applied in Afghanistan in many places, particularly in areas which experience scarcity of water for human beings, livestock and irrigation.

Purpose of the Technology: Due to high evaporation rates and low precipitation, harvesting runoff in open tanks is not an efficient way of water harvesting. HELVETAS Swiss Intercooperation is implementing community based watershed management projects in Kahmard district of Bamyan province (Afghanistan) since 2008 with financial support from the International Swiss Re Award for sustainable watershed management (2009) and the Swiss Agency for Development and Cooperation (SDC). One of the activities for sustainable watershed management is plantation of fruit and non-fruit trees in the selected watersheds (upland areas) which were used for grazing and extraction of vegetation for domestic use. Due to water scarcity in the upland areas, irrigation of the planted saplings becomes very difficult and water has to be transported on donkey from far locations. To overcome this constraint, Kanda was identified as the most potent technology for harvesting runoff and snow melt.

Establishment / maintenance activities and inputs: For constructing Kandas, Kanda makers from Dara-e Suf district in Samangan province had to employed as there are no experts in Kahmard. Based on feasibility studies, eight kandas have been constructed including 4 kandas in Sourakhak wa-tershed and 4 in Baqa Kushta watershed. The size of each kanda is 6 m length, 6 m in width and 3 m in height. To convey the runoff into the tank, 10-20 m long graded channels were carved out of the rocks. The establishment cost of one Kan-da was approximately US$ 7163. Kanda making requires special skills, especially when it is carved out of rocks. A kanda maker has sound understanding of the area's geology, and this wisdom is gained through learning by doing and ances-tors.. In Kahmard, 2-3 experts worked for 4-5 months for one Kanda.

Natural / human environment: In 2012, due to sufficient rains, 2 Kandas which did not have leakage problems in Sourakhak watershed got full with runoff water, which was then used for irrigating 6500 saplings seven times during the year. Kahmard district has a semi-arid cli-mate. Some years are dry with rainfall of about 190 mm. Considering this context, it becomes very necessary to tap rainwater, especially in the rainfed uplands, and use it for irrigating saplings or for livestock.

地点

地点: Kahmard, Bamyan, 阿富汗

分析的技术场所数量:

选定地点的地理参考

- 不适用

技术传播: 适用于特定场所/ 中在较小区域

在永久保护区？:

实施日期: 50多年前 传统

介绍类型

- [ ] 通过土地使用者的创新
- [ ] 作为传统系统的一部分 > 50 年
- [ ] 在实 /研究期间
- [x] 通过 另外部干

A view of the Kanda ungerground tank,conveyance channel, sedement pit(being cleaned) and the rocky catchment. (Helvetas Swiss Intercooperatio (Kabul Afghanistan))

技术分类

主要目的

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

土地利用

牧场

- 半游牧畜牧业
- 改良牧场

动物类型: 山羊, 绵羊

供水

- [x] 养
- [ ] 混合 水灌溉
- [ ] 充分灌溉

土地退化相关的目的

- [ ] 防止土地退化
- [ ] 减少土地退化
- [x] 修复/恢复严重退化的土地
- [ ] 适应土地退化
- [ ] 不适用

解决的退化问题

土壤水蚀 - Wt 表土流失地表侵蚀

生物性退化 - Bc 植被覆盖的减少

SLM组

- 水

SLM措施

结构措施 - S11 其它

技术图纸

技术规范

Technical drawing of a Kanda constructed at Baqa Kushta watershed in Kahmard district (Bamyan province).
Size of one Kanda tank:
Length:6m
Width :6m
Height:3m
108 cu.m water can be stored in one Kanda.

Location: Baqa Koshta watershed. Kahmard

Date: 24/03/2013

Technical knowledge required for field staff / advisors: high

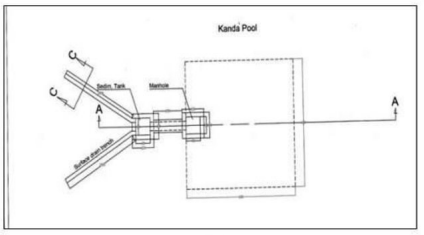
Technical knowledge required for land users: high

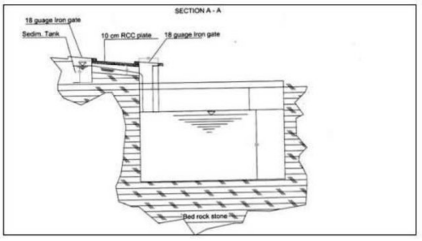
Main technical functions: control of concentrated runoff: retain / trap, water harvesting / increase water supply, Reduction in evaporation and seepage losses

Secondary technical functions: improvement of ground cover

Structural measure: cistern(from rock)
Depth of ditches/pits/dams (m): 3
Width of ditches/pits/dams (m): 6
Length of ditches/pits/dams (m): 6

Construction material (other): Constructed from rock





Author: Helvetas Swiss Intercooperatio, Kabul Afghanistan

技术建立与维护 活动、投入和费用

投入和成本的计算
- 计算的成本为
- 成本计算使用的货币 **美元**
- 汇率 换算为美元 1 美元 = 不适用
- 用劳工的每日平均工资成本5

影响成本的最重要因素
不适用

技术建立活动
n.a.

技术建立的投入和成本

对投入进行具体说明	单位	数量	单位成本 (美元)	每项投入的总成本 (美元)	土地使用者承担的成本%
劳动力					
Labour	kanda	1.0	5640.0	5640.0	15.0
设备					
Equipement	kanda	1.0	458.0	458.0	
施工材料					
Materials	kanda	1.0	1065.0	1065.0	8.0
技术建立所需总成本				**7'163.0**	
技术建立总成本 美元				*7'163.0*	

技术维护活动
1. Cleaning of the canals and Kanda (时间/ 率once/year)

技术维护的投入和成本

对投入进行具体说明	单位	数量	单位成本 (美元)	每项投入的总成本 (美元)	土地使用者承担的成本%
劳动力					
Cleaning of the canals and Kanda	persons/day/kanda	2.0	5.0	10.0	100.0
技术维护所需总成本				**10.0**	
技术维护总成本 美元				*10.0*	

自然环境

年平均降雨量
- [ ] < 250毫米
- [x] 251-500毫米
- [ ] 501-750毫米
- [ ] 751-1,000毫米
- [ ] 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
- [ ] 潮湿的
- [ ] 半湿润
- [ ] 半干旱
- [ ] 干旱

关于气候的规范
Thermal climate class: temperate

斜坡
- [ ] 水平（0-2%）
- [ ] 缓（3-5%）
- [ ] 平缓（6-10%）
- [ ] 滚坡（11-15%）
- [x] 崎岖（16-30%）
- [x] 陡峭（31-60%）
- [ ] 非常陡峭（>60%）

地形
- [ ] 高原
- [ ] 山脊
- [ ] 山坡
- [x] 山地斜坡
- [ ] 山坡
- [ ] 谷底

海拔
- [ ] 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.
- [x] 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
- [ ] 凹形情况
- [ ] 不相关

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

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

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

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

地下水位
- [ ] 表面上
- [ ] < 5米
- [ ] 5-50米
- [x] > 50米

地表水的可用性
- [ ] 过量
- [ ] 好
- [ ] 中等
- [x] 匮乏/没有

水质（未处理）
- [ ] 良好（用水）
- [ ] 不良（用水/要处理）
- [x] 仅供农业使用（灌溉）
- [ ] 不可用

水质请参考。

盐度是个问题吗？
- [ ] 是
- [ ] 否

洪水发生
- [ ] 是
- [ ] 否

物种多样性
- [ ] 高
- [ ] 中等
- [x] 低

栖息地多样性
- [ ] 高
- [ ] 中等
- [ ] 低

应用该技术的土地使用者的特征

市场定位
- [ ] 生计（自给）
- [x] 混合（生计/商业）
- [ ] 商业/市场

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

相对财富水平
- [ ] 非常贫瘠
- [x] 贫瘠
- [x] 平均水平
- [ ] 丰富
- [ ] 非常丰富

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
- [ ] 半游牧的
- [ ] 游牧的

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

性别
- [ ] 女人
- [x] 男人

年龄
- [ ] 儿童
- [ ] 年轻人
- [ ] 中年人
- [ ] 老年人

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

规模
- [x] 小规模的
- [ ] 中等规模的
- [ ] 大规模的

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

土地使用权
- [ ] 自由进入（无组织）
- [x] 社区（有组织）
- [ ] 租赁
- [ ] 个人

用水权
- [ ] 自由进入（无组织）
- [x] 社区（有组织）
- [ ] 租赁
- [ ] 个人

进入服务和基础设施的通道

健康	贫瘠	好
教育	贫瘠	好
技术援助	贫瘠	好
就业（例如：农）	贫瘠	好
市场	贫瘠	好
能源	贫瘠	好
道路和交通	贫瘠	好

追路和交通 贫瘠 好
用水和卫生设施 贫瘠 好
金融服务 贫瘠 好

影响

社会经济影响

生产故 增加 低
用水的可用性 增加
用水的质量 增加
工作量 增加 低
expense for construction decreased increased

社会文化影响

SLM/土地退化知识 减少 改良
livelihood and human well-being reduced improved

Increased availability of water for small scale irrigation such as trees, sapling and livestock and increase successful afforestation in dry land areas which in the longer term will lead to increased income, fuel wood and timber for land user and greener watersheds

aesthetic value due to greener watershed decreased increased

生态影响

水的回收/收 径流、 水、 等 减少 改良
地表径流 增加 低

due to water harvesting

sediments due to excavation of rocks decreased increased

场外影响

下游洪水 不希望 增加 减少
对公共/私人基础设施的破坏 增加 减少
Contributes to flash flood risk reduction by supporting regreening effort improved reduced

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
长期回报 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
长期回报 常消极 常积极

This technology is very positive and useful for land users and collected the water for irrigation and livestock.

气候变化

渐变气候

年温度 增加 常不好 常好

气候有关的极端情况（灾害）

局地暴 常不好 常好
局地 暴 常不好 常好
干旱 常不好 常好
比较和缓的 河道 洪水 常不好 常好

其他气候相关的后果

缩短生长期 常不好 常好

采用和适应

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 由于迁移

结论和吸取的教训

长处: 土地使用者的观点

- The technology supports plantation activities in sites which are far from perennial water sources

  How can they be sustained / enhanced? The collected water should be used efficiently during irrigation by combining with conservation measures like mulching, drip or pitcher irrigation
- As the kanda catchment is rocky, infiltration losses are minimized and most of the surface runoff is harvested

  How can they be sustained / enhanced? The channel must be constructed properly so that all runoff is trapped and conveyed to the Kanda.

长处: 编制者或其他关键资源人员的观点

- An indigenous multipurpose technology

  How can they be sustained / enhanced? Kanda size can be improved if the catchment area and precipitation amount are considered. This also depends on availability of long-term rainfall data.
- Requires minimum maintenance when constructed properly

  How can they be sustained / enhanced? Kanda, conveyance canals, sediment pits and catchment areas should be cleaned. If any leakages occur in the tank, they should be sealed.

弱点/缺点/风险: 土地使用者的观点如何克服

- Due to a lack of geological and hydro-meteorological information, it is not possible to prepare precise and cost-effective kanda proposals Make best use of traditional wisdom, install hydro-met stations if possible and make adjustments based on regular monitoring.
- If the kanda and sediment trap tanks are not cleaned regularly and the kanda opening is not covered, sedimentation can be problem leading to reduced Kanda capacity and also animals could fall Cleaning and maintenance works must be carried out by the local people every year before spring rains. The openings must be covered.
- Due to availability of water, there can be grazing pressure near the Kanda Watershed committee members and guards should ensure that the site is protected from over grazing. Construct Kandas outside the selected watershed for livestock purposes.

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

- Establishment cost is high if the catchment is rocky Needs external support during the establishment phase
- Lack of kanda makers in some districts like Kahmard Get kanda makers from other districts and build capacities of interested local people.

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_1659/

链接的SLM数据
不适用

文件编制者

机构
- HELVETAS (Swiss Intercooperation)

目
- 不适用

链接到网络上可用的相关信息
- None: www.wocat.net(Online Technology Database)