



Masonry dam (PIPRO-DB)

Small-scale dams (马里)

Micro-barrages (French)

描述

Small-scale dams are moderately-sized barriers built across valley bottoms to retain water from permanent watercourses or seasonal flows.

They can range in length from 100 to 200 m, and the dam wall is usually between 2 and 4 m high. Small-scale dams impound permanent or seasonal water behind them, covering areas from 5 to 15 hectares. They are built with buttresses and a stilling basin. Depending on local conditions, the dam wall can be made of quarry stone joined with mortar or concrete. The dikes are made of earth and can be reinforced with stones. Some such structures are built as bridge dams, providing a means of crossing the valley. The effect on the water table depends on the depth at which the dam is anchored. The deeper the foundation, the more groundwater is retained. Sometimes, they are fitted with geomembranes which extend down deeper to retain more groundwater.

In the rainy season, water gradually accumulates behind the dike, increasing the availability of surface water during the rainy season and groundwater in the dry season. The land is farmed upstream and downstream both in the rainy season and the dry season. During the rainy season, rice is grown, and the areas around the body of water are used for other crops (flood-recession cropping). Dams increase the area of farmable land, yields and production. The water is also used for livestock, for fish farming and sometimes for household needs. The recharged water table feeds market garden wells, enabling farmers to grow vegetables in the dry season and permitting two or three crop harvests a year which increases the availability of food, providing income for farmers and guaranteeing work all year round. This improves the stability of local communities, increases their income and raises their standard of living.

Sustainable operation and management depend directly on the participatory approach. At the planning stage, the condition of the valley upstream and downstream and all user groups must be taken into account. The question of land tenure, in particular, must be settled before construction begins. It must be determined who the owner of the bottomlands is, who will be entitled to use them once the dam has been constructed, what uses will be permitted and under what conditions. The question of project ownership and upkeep must also be clarified. Today, the role of project owner is normally assigned to the commune authorities, although management of the dam is often delegated to a management committee. In order to avoid conflicts, it is essential to take into account all the user groups, livestock keepers in particular. Watering corridors must be established to prevent animals from damaging the crops. In order to maximise the value of the investment, well-organised management committees must be set up to ensure efficient crop production and oversee maintenance work. A management committee controls the opening and closing of the gates. It organises the maintenance of the structure and the implementation of any additional measures necessary to protect the gabion structures and stone bunds. It also collects and manages funds for the maintenance of the dam and organises meetings of farmers. In dry periods, it is important to manage water resources in such a way that downstream areas have enough water. When a series of dams are built on the same watercourse, an inter-dam committee may be required to manage the distribution of water and avoid conflicts between the users of the different dams.

Well-constructed small-scale dams last at least 50 years with a certain amount of upkeep. A high standard of technical planning and construction is required for small-scale dams to avoid subsequent damage. Depending on the natural characteristics of the watershed, small-scale dams may require additional SWC/SPR measures upstream to protect them from siltation.

These small-scale dams are suitable for use in narrower valleys, as a considerable volume of water can be impounded with a relatively short structure. They are not as well suited to wide, gently sloping valleys, as very long dikes are required and this increases the cost.

地点

地点: Mali, 马里

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: 均匀地分布在一个区域 (approx. 0.1-1 平方公里)

在永久保护区? :

实施日期: 10-50年前

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)
- 在实验/研究期间
- 通过项目/外部干预



Masonry dam (PIPRO-DB)

技术分类

主要目的

- 改良生产
- 减少、预防、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/提高生物多样性
- 降低灾害风险
- 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

土地利用



农田

- 一年一作
- 每年的生长季节数: 1



水道、水体、湿地 - 池塘、大坝

供水

- 雨养
- 混合雨水灌溉
- 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
- 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



化学性土壤退化 - Cn : 肥力下降和有机质含量下降 (非侵蚀所致)



生物性退化 - Bc : 植被覆盖的减少



水质恶化 - Ha : 干旱化, Hg : 地下水/含水层水位的变化

SLM组

- 灌溉管理 (包括供水、排水)
- 引水和排水
- 地表水管理 (泉、河、湖、海)

SLM措施



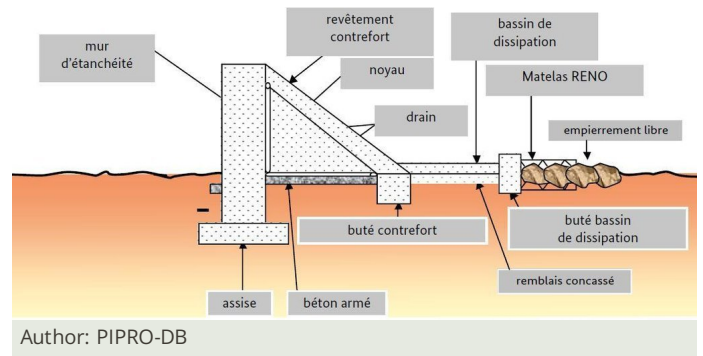
结构措施 - S5 : 大坝、集水斗、水池

技术图纸

技术规范

They can range in length from 100 to 200 m, and the dam wall is usually between 2 and 4 m high.

Technical knowledge required for field staff / advisors: high
 Technical knowledge required for land users: low
 Main technical functions: control of dispersed runoff: retain / trap, control of concentrated runoff: retain / trap, increase of infiltration, increase / maintain water stored in soil, increase of groundwater level / recharge of groundwater, water harvesting / increase water supply
 Secondary technical functions: increase in organic matter, increase in nutrient availability (supply, recycling,...), sediment retention / trapping, sediment harvesting, increase of biomass (quantity), promotion of vegetation species and varieties (quality, eg palatable fodder)



Dam/ pan/ pond
 Depth of ditches/pits/dams (m): 2-4
 Length of ditches/pits/dams (m): 100-200

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：不适用
- 汇率（换算为美元）：1 美元 = 不适用
- 雇用劳工的每日平均工资成本：不适用

影响成本的最重要因素

The cost of small-scale dams varies greatly depending on the physical characteristics of the site, the size of the structure and the local availability of materials. In Dogon country, in Mali, the PDRT project constructed dams with cyclopean concrete costing an average of around 20 million CFA francs and between 3 and 5 million CFA francs per hectare. The internal rate of return of the dams built averaged 17% (Nill & Kobilke, 2002). Larger dams built in the Beledougou area cost 100-140 million CFA francs. Helvetas Swiss Intercooperation reports costs of around 20 million CFA francs for areas of 10-80 hectares (PASSIP, 2012).

技术建立活动

1. At the planning stage, the condition of the valley upstream and downstream and all user groups must be taken into account. The question of land tenure must be settled before construction begins. The question of project ownership and upkeep must also be clarified. (时间/频率: None)
2. In order to avoid conflicts, it is essential to take into account all the user groups, livestock keepers in particular (时间/频率: None)
3. Construction of dam (时间/频率: None)
4. Watering corridors must be established to prevent animals from damaging the crops (时间/频率: None)
5. well-organised management committees must be set up to ensure efficient crop production and oversee maintenance work (时间/频率: None)

技术维护活动

1. A management committee controls the opening and closing of the gates. It organises the maintenance of the structure and the implementation of any additional measures necessary to protect the gabion structures and stone bunds. It also collects and manages funds for the maintenance of the dam and organises meetings of farmers (时间/频率: None)
2. Depending on the natural characteristics of the watershed, small-scale dams may require additional SWC/SPR measures upstream to protect them from siltation. (时间/频率: None)

自然环境

年平均降雨量

- < 250毫米
- 251-500毫米
- 501-750毫米
- 751-1,000毫米
- 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: subtropics

斜坡

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

地形

- 高原/平原
- 山脊
- 山坡
- 山地斜坡
- 麓坡
- 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.
- 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
- 凹陷情况
- 不相关

土壤深度

- 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)

土壤质地 (表土)

- 粗粒/轻 (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 (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%)
- 低 (<1%)

非常深 (> 120厘米)

地下水水位

- 表面上
- < 5米
- 5-50米
- > 50米

地表水的可用性

- 过量
- 好
- 中等
- 匮乏/没有

水质 (未处理)

- 良好饮用水
 - 不良饮用水 (需要处理)
 - 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
- 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)
- 混合 (生计/商业)
- 商业/市场

非农收入

- 低于全部收入的10%
- 收入的10-50%
- > 收入的50%

相对财富水平

- 非常贫瘠
- 贫瘠
- 平均水平
- 丰富
- 非常丰富

机械化水平

- 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
- 团体/社区
- 合作社
- 员工 (公司、政府)

性别

- 女人
- 男人

年龄

- 儿童
- 青年人
- 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
- 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

- 小规模
- 中等规模的
- 大规模的

土地所有权

- 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)
- 社区 (有组织)
- 租赁
- 个人

用水权

- 自由进入 (无组织)
- 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	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	好
教育	贫瘠	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	好
技术援助	贫瘠	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	好
就业 (例如非农)	贫瘠	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	好
市场	贫瘠	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	好
能源	贫瘠	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	好
道路和交通	贫瘠	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	好
饮用水和卫生设施	贫瘠	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	好
金融服务	贫瘠	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	好

影响

社会经济影响

作物生产	降低	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	增加
饲料生产	降低	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	增加
生产故障风险	增加	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	降低
生产区域 (耕种/使用中的新土地)	降低	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	增加
灌溉用水需求	增加	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	降低

社会文化影响

食品安全/自给自足	减少	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	改良
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decreased increased

The water impounded by small-scale dams makes it possible to farm a much larger area in the valley bottoms and ensures better yields in the rainy season and also in the off-season. The production of food staples and market garden output increases significantly. More intense production ensures employment all year round, which improves the stability of local communities, increases their income and raises their standard of living.

生态影响

水量	降低		增加
水的回收/收集 (径流、露水、雪等)	减少		改良
地下水/含水层	下降		补水
土壤水分	降低		增加
土壤覆盖层	减少		改良
土壤流失	增加		降低
养分循环/补给	降低		增加
有益物种 (捕食者、蚯蚓、传粉者)	降低		增加

场外影响

旱季稳定可靠的水流 (包括低流量)	减少		增加
下游洪水 (不希望)	增加		减少
下游淤积	增加		降低

成本效益分析

与技术建立成本相比的效益

短期回报	非常消极		非常积极
长期回报	非常消极		非常积极

与技术维护成本相比的效益

短期回报	非常消极		非常积极
长期回报	非常消极		非常积极

气候变化

渐变气候

年温度 增加	非常不好		非常好
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气候有关的极端情况 (灾害)

局地暴雨	非常不好		非常好
局地风暴	非常不好		非常好
干旱	非常不好		非常好
比较和缓的 (河道) 洪水	非常不好		非常好

其他气候相关的后果

缩短生长期	非常不好		非常好
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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/实验
	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

长处: 编制者或其他关键资源人员的观点

- The small-scale dams create water reserves. When there is not enough rain or during dry spells in the rainy season, the dams retain enough water for crops throughout their growth cycle. If rain-fed crops fail, production in the valley bottoms can mitigate these losses. In wet years, the dams regulate the flow of water, preventing heavy floodwaters from causing damage to land downstream.
- The water impounded by small-scale dams makes it possible to farm a much larger area in the valley bottoms and ensures better yields in the rainy season and also in the off-season. The production of food staples and market garden output increases significantly. More intense production ensures employment all year round, which improves the stability of local communities, increases their income and raises their standard of living.

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

- A high standard of technical planning and construction is required for small-scale dams to avoid subsequent damage. In order to maximise the value of the investment, well-organised management committees must be set up to ensure efficient crop production and oversee maintenance work.

- In the dry season, the recharged water table makes a second and even third crop harvest possible, increasing the availability of food, providing income for farmers and guaranteeing work all year round.
- Replenished water tables not only improve crop output, they also reduce the time and effort that women devote to fetching water and make it easier to water livestock.

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_1623/

链接的SLM数据

不适用

文件编制者

机构

- Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH (GIZ) - 德国

项目

- Manual of Good Practices in Small Scale Irrigation in the Sahel (GIZ)

主要参考文献

- Good Practices in Soil and Water Conservation. A contribution to adaptation and farmers' resilience towards climate change in the Sahel. Published by GIZ in 2012.: http://agriwaterpedia.info/wiki/Main_Page

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