



Diversion Dam upstream (Abdalla Osman Eisa (Soil Conservation and Land Use Admin. Port Sudan.))

## Water Spreading (typical example from Hashatribab) (Sudán)

Sidud (Local Arabic) - Tarrit (Beja dialect) for earth dams

### DESCRIPCIÓN

**Water Spreading (or Spate Irrigation system) conducted through the construction of earth dam structures at the khor cross section.**

Water Spreading (or Spate Irrigation) can be done through the construction of an angled bank or weir – with a spillway in case of excess flow – to divert a “khor” (ephemeral stream) and spread it (using spaced contour bunds) for crop production.

Water Spreading from khors or wadis where channelized runoff/ floodwater is diverted onto plains which are then cultivated on residual moisture. An example of a scheme which was constructed in 1999 is located at Hashatribab, some 7 km from Sinkat on the road towards Kassala. This scheme, comprising a stone-pitched earth diversion barrier across a khor (an ephemeral water course), is documented by using among others the WOCAT Questionnaire and WOCAT’s QA. While the diversion is still intact and provides water to the fields about one kilometre downstream (there were young sorghum plants growing at the time of the visit in November 2011) maintenance will be needed. There was only a very small input of voluntary labour in its original construction (comprising a contribution in terms of stone pitching).

Construction by the Government, using machinery, with little local contribution might explain why voluntary maintenance of the structures has been negligible. Water spreading schemes have gradually expanded in number over the last 20 years in Red Sea State (according to Sayed Dabloub’s personal comment). Currently it was confirmed that there are new sites under planning and construction.

The purposes of diversion dam construction was to divert the main water course to take its way in the crop growing area replacing the old one and being controlled by small diversion dams (terraces to spread water for even water distribution through the original land. These terraces remarkably reduce gully formation.

Most important purpose is to provide water to growing crops in an area which is too dry for rain fed production and where no source for irrigation is available. It secures moisture during the growing season, by allowing more water to penetrate soil and to preserve moisture for a longer period at plant root zone.

The decrease of flood water velocity leads to silt accumulation and other debris materials which increase soil capability in providing moisture, nutrients and maintain soil structure and conservation.

For the earthen/stone-pitched diversion structure with spillway and small haffir alongside machines have been used (mainly loaders provided by the government) which excavated and built the bund. In addition local communities were involved in some aspects of the establishment (mainly stone pitching) supported/subsidized with incentives. The structure/scheme at Hashatribab (close to Sinkat) was built in 1999 (and no maintenance has been done since that time). It helps in watering about 500 feddan (c. 200 hectares) of agricultural area where water is spread by the use of small contour bunds: these were also constructed using subsidies and machines.

Terraces are usually used to control water spreading along the cropped area. Those terraces usually receive the water at low speed velocity. For that reason they are very small in size and volume. Usually they are located in very gentle and uniformed areas. The terraces can be constructed by simple hand tool and tractors accessories. But the prolonged drought makes the maintenance difficult as the dry soil is more susceptible to wind erosion and sand accumulation on both sides of the dam and the bottom of the bund is one of several desertification phenomenon in the region. But the wind-blown sand is one of the most serious one especially in the dry lands of the Red Sea State. Contour survey for land leveling slope identification and location is an important step before implementation.

The study site is located in the arid region of Red Sea State where steep hills from north-south inland mountains are interrupted by arid plains. The population density is low and the population depends on both cropping and livestock with high incidence of poverty. For this

### LUGAR



**Lugar:** Sinkat Locality, Red Sea, Sudán

**No. de sitios de Tecnología analizados:**

**Georreferencia de sitios seleccionados**

- 36.7805, 18.8765

**Difusión de la Tecnología:** distribuida parejamente sobre un área (approx. 1-10 km<sup>2</sup>)

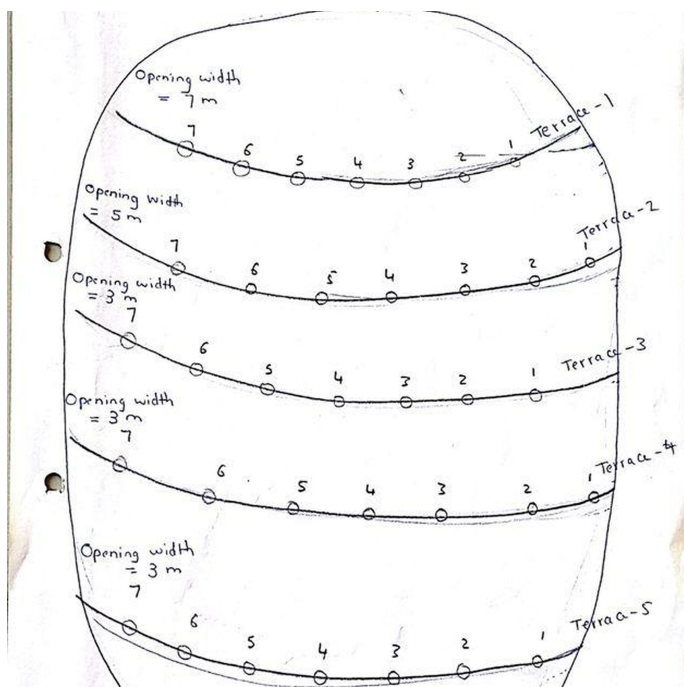
**¿En un área de protección permanente?:**

**Fecha de la implementación:** 10-50 años atrás

**Tipo de introducción**

- mediante la innovación de usuarios de tierras
- como parte de un sistema tradicional (> 50 años)
- durante experimentos/ investigación
- mediante proyectos/ intervenciones externas

reason there should be a clear plan for construction and community extension approach to care about the maintenance of the technology. About 120 families live in Hashtribab area. All the year round they secure their provision by storing food crops in particular sorghum.



Contour Terraces System (Dr. Adil Khidir, Consultant (Khartoum))



Diversion dam and channal (Abdalla Osman Eisa (Soil Conservaton and Land Use Admin. Port sudan, Sudan.))

## CLASIFICACIÓN DE LA TECNOLOGÍA

### Propósito principal

- mejorar la producción
- reducir, prevenir, restaurar la degradación del suelo
- conservar el ecosistema
- proteger una cuenca hidrográfica/ áreas corriente abajo – en combinación con otras Tecnologías
- preservar/ mejorar biodiversidad
- reducir el riesgo de desastres naturales
- adaptarse al cambio climático/ extremos climáticos y sus impactos
- mitigar cambio climático y sus impactos
- crear impacto económico benéfico
- crear impacto social benéfico

### Uso de tierra



#### Tierras cultivadas

- Cosecha anual: cereales - sorgo
- Número de temporadas de cultivo por año: 1

### Provisión de agua

- de secano
- mixta de secano – irrigada
- totalmente irrigada
- post-flooding

### Propósito relacionado a la degradación de las tierras

- prevenir la degradación del suelo
- reducir la degradación del suelo
- restaurar/ rehabilitar tierra severamente degradada
- adaptarse a la degradación del suelo
- no aplica

### La degradación considerada



**erosión de suelos por agua** - Wt: pérdida de capa arable/ erosión de la superficie, Wg: erosión en cárcavas, Wo: efectos de degradación fuera del sitio

### Grupo MST

- medida de pendiente transversal
- diversión y drenaje de agua

### Medidas MST

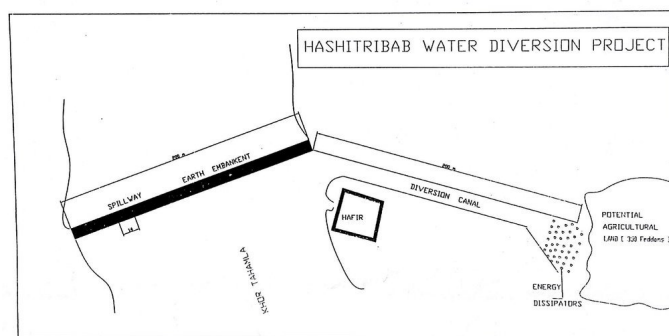


**medidas estructurales** - S2: Taludes, bancos

## DIBUJO TÉCNICO

### Especificaciones técnicas

None



Author: Dr. Adil Khidir, Faculty of Engineering, Kartoum University

## ESTABLECIMIENTO/ MANTENIMIENTO: ACTIVIDADES, INSUMOS Y COSTOS

### Cálculo de insumos y costos

- Los costos se calculan:
- Moneda usada para calcular costos: **n.d.**
- Tasa de cambio (a USD): 1 USD = n.d.
- Costo promedio por día del sueldo de la mano de obra contratada: n.d.

### Factores más determinantes que afectan los costos

The slope and depth of the wadi/ khor to be diverted

### Actividades de establecimiento

- Excavation of foundation trenches. (Momento/ frecuencia: 1 week)
- Backfilling with heavy soil (Momento/ frecuencia: 1 day)
- Establishment diversion structure (Momento/ frecuencia: 8 weeks)
- Stonepitching by hand (Momento/ frecuencia: 3 weeks)
- Construction of spillway (Momento/ frecuencia: 2 weeks)

### Insumos y costos para establecimiento

Especifique insumo	Unidad	Cantidad	Costos por unidad (n.d.)	Costos totales por insumo (n.d.)	% de los costos cubiertos por los usuarios de las tierras
<b>Mano de obra</b>					
labour	ha	1,0	57,0	57,0	
<b>Equipo</b>					
machine use	ha	1,0	355,0	355,0	
<b>Costos totales para establecer la Tecnología</b>				<b>412,0</b>	
<i>Costos totales para establecer la Tecnología en USD</i>				<i>412,0</i>	

### Actividades de mantenimiento

- Tillage (Momento/ frecuencia: before fluding period)

## ENTORNO NATURAL

### Promedio anual de lluvia

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

### Zona agroclimática

- húmeda
- Sub-húmeda
- semi-árida
- árida

### Especificaciones sobre el clima

Thermal climate class: tropics

### Pendiente

- plana (0-2 %)
- ligera (3-5%)
- moderada (6-10%)
- ondulada (11-15%)
- accidentada (16-30%)
- empinada (31-60%)
- muy empinada (>60%)

### Formaciones telúricas

- meseta/ planicies
- cordilleras
- laderas montañosas
- laderas de cerro
- pies de monte
- fondo del valle

### Altura

- 0-100 m s.n.m.
- 101-500 m s.n.m.
- 501-1,000 m s.n.m.
- 1,001-1,500 m s.n.m.
- 1,501-2,000 m s.n.m.
- 2,001-2,500 m s.n.m.
- 2,501-3,000 m s.n.m.
- 3,001-4,000 m s.n.m.
- > 4,000 m s.n.m.

### La Tecnología se aplica en

- situaciones convexas
- situaciones cóncavas
- no relevante

### Profundidad promedio del suelo

- muy superficial (0-20 cm)
- superficial (21-50 cm)
- moderadamente profunda (51-80 cm)
- profunda (81-120 cm)
- muy profunda (>120 cm)

### Textura del suelo (capa arable)

- áspera/ ligera (arenosa)
- mediana (limosa)
- fina/ pesada (arcilla)

### Textura del suelo (> 20 cm debajo de la superficie)

- áspera/ ligera (arenosa)
- mediana (limosa)
- fina/ pesada (arcilla)

### Materia orgánica de capa arable

- elevada (>3%)
- media (1-3%)
- baja (<1%)

### Agua subterránea

- en superficie
- < 5 m
- 5-50 m
- > 50 m

### Disponibilidad de aguas superficiales

- excesiva
- bueno
- mediana
- pobre/ ninguna

### Calidad de agua (sin tratar)

- agua potable de buena calidad
  - agua potable de mala calidad (requiere tratamiento)
  - solo para uso agrícola (irrigación)
  - inutilizable
- La calidad de agua se refiere a:*

### ¿La salinidad del agua es un problema?

- Sí
- No

### Incidencia de inundaciones

- Sí
- No

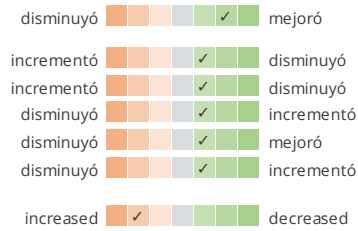
Diversidad de especies

Diversidad de hábitats





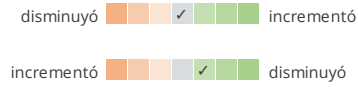
cosecha/recolección de agua (escurrimiento, rocío, nieve, etc.)  
 escurrimiento superficial  
 evaporación  
 humedad del suelo  
 cubierta del suelo  
 materia orgánica debajo del suelo C  
 competition with natural ecosystem



Floodwaters diverted will not reach original destination

### Impactos fuera del sitio

disponibilidad de agua (aguas subterráneas, manantiales)  
 inundaciones río abajo (no deseadas)



## ANÁLISIS COSTO-BENEFICIO

### Beneficios comparados con los costos de establecimiento

Ingresos a corto plazo: muy negativo  muy positivo  
 Ingresos a largo plazo: muy negativo  muy positivo

### Beneficios comparados con costos de mantenimiento

no maintenance carried out so not applicable here

## CAMBIO CLIMÁTICO

### Cambio climático gradual

temperatura anual incrementó nada bien  muy bien

### Extremos (desastres) relacionados al clima

inundación general (río) nada bien  muy bien

## ADOPCIÓN Y ADAPTACIÓN

### Porcentaje de usuarios de la tierra que adoptaron la Tecnología

- casos individuales / experimentales
- 1-10%
- 11-50%
- > 50%

### De todos quienes adoptaron la Tecnología, ¿cuántos lo hicieron sin recibir incentivos/ pagos materiales?

- 0-10%
- 11-50%
- 51-90%
- 91-100%

### ¿La tecnología fue modificada recientemente para adaptarse a las condiciones cambiantes?

- Sí
- No

### ¿A qué condiciones cambiantes?

- cambios climáticos / extremos
- mercados cambiantes
- disponibilidad de mano de obra (ej. debido a migración)

## CONCLUSIONES Y LECCIONES APRENDIDAS

### Fortalezas: perspectiva del usuario de tierras

#### Fortalezas: punto de vista del compilador o de otra persona recurso clave

- Useful and important in the area where floodwater harvesting/ spate irrigation is the only option for crop production. No rain fed irrigation system on the Red Sea State unlike to other Sudan.

### Debilidades/ desventajas/ riesgos: perspectiva del usuario de tierras cómo sobreponerse

- SLM not falls under the community responsibility. They believe SLM is completely Gos role. Land users awareness and involvement
- They don't think that community plays a role in the ongoing soil and vegetation degradation Rotational grazing and seed broadcasting
- They also say no regular concern by the government is given in relation to land reclamation A location of budget and equipment to reclaim land and natural vegetation conservation.
- They confirm that the physical conditions played a great role in land degradation e.g. drought aridity and high temperatures . To ensure water harvesting and without waste.

### Debilidades/ desventajas/ riesgos: punto de vista del compilador o de otra persona recurso clave cómo sobreponerse

- High cost (needs machinery to move earth) More support from Government and outside
- Not enough trained personnel More up-grading skills are required

- Very little data available (apart from construction details) Better system of monitoring and evaluation
- Low technical capacity of the community Capacity building and training

## REFERENCIAS

### Compilador

Abdalla Osman Eisa

### Editors

### Revisado por

Deborah Niggli

Alexandra Gavilano

**Fecha de la implementación:** 22 de abril de 2015

**Últimas actualización:** 14 de agosto de 2019

### Personas de referencia

Abdalla Osman Eisa - Especialista MST

William Critchley - Especialista MST

### Descripción completa en la base de datos de WOCAT

[https://qcat.wocat.net/es/wocat/technologies/view/technologies\\_1292/](https://qcat.wocat.net/es/wocat/technologies/view/technologies_1292/)

### Datos MST vinculados

Approaches: Water Spreading (typical example from Hashatribab) [https://qcat.wocat.net/es/wocat/approaches/view/approaches\\_2543/](https://qcat.wocat.net/es/wocat/approaches/view/approaches_2543/)

### La documentación fue facilitada por

#### Institución

- Soil Conservation, Land Use and Water Administration (Soil Conservation, Land Use and Water Administration) - Sudán

#### Proyecto

- n.d.

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