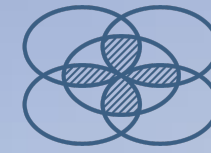




**META**  
**META** Research



Flood-Based Livelihoods  
Network Foundation

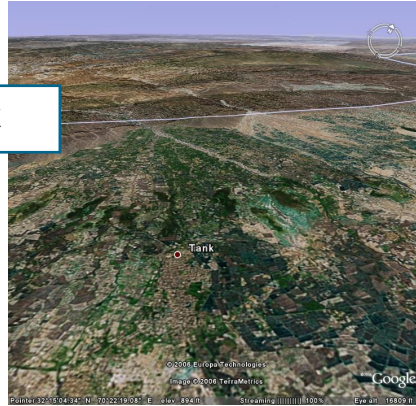
# Management of Hill Torrents: Opportunities and Challenges – Untapped Potential of Spate Irrigation in Pakistan

Frank van Steenberg

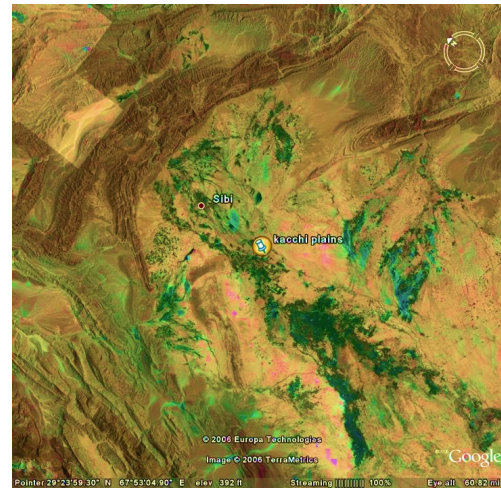




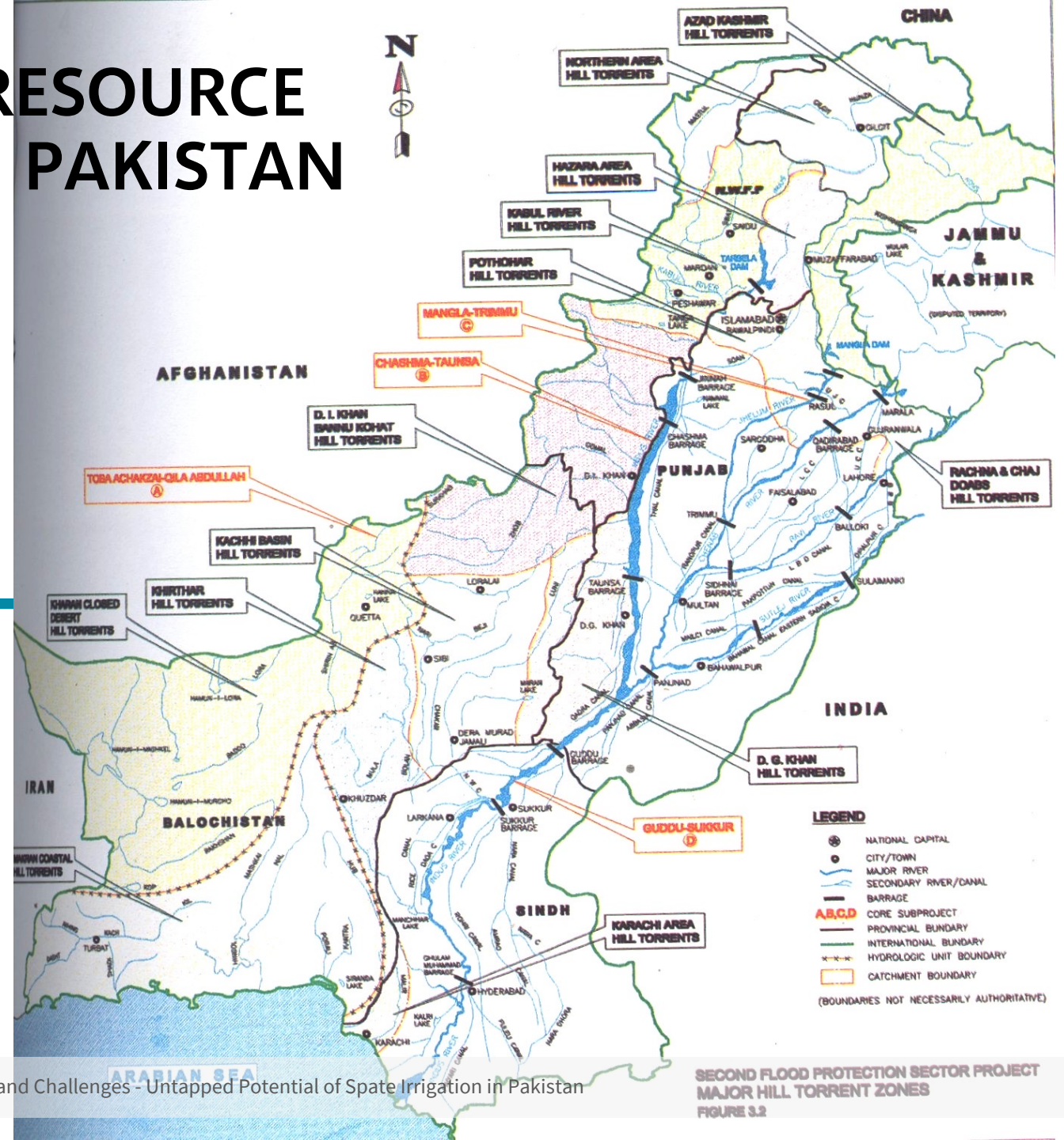
## Tank



## DI Khan



## Kacchi system





# A long history...

## AGE

Some spate diversion bunds in Pakistan are more than 5000 years old

## IMPACT

The construction of spurs and bunds in the Bolan river (Balochistan) during dry period was one of first opportunities to control surface flows and resulted in strong population increase in 2600 BC

## DESIGN



Source: French Archeological Mission

# IRRIGATION OF FIELDS WITH FLOOD WATER

- Managing flood water and sedimentation – unique system
- Soil moisture conservation crucial for successful harvests





(1) Large systems along the Kohi Suleiman, Kirthar Range and in Kacchi Plains (>10,000ha)



(2) Medium-sized systems (100-11000 ha): Las Bela, interior Balochistan, smaller rivers from Koh-i-Sulaiman and Kirthar Range



(3) Smaller systems – increasing – in mountain areas and elsewhere

	MAJOR AREA
<b>KP</b>	DI Khan, Tank, Laki Marwat, Bannu, Karak
<b>Punjab</b>	DG Khan, Rajanpur, Mianwali
<b>Sindh</b>	Dadu, Larkana, Jamshoro, Thatta, Karachi
<b>Balochistan</b>	Kacchi, Sibi, Jal Magsi, Kharan, Qila Saifullah, Musakhel, Barkhan, Lorelai, Las Bela





# SPATE IRRIGATION IN PAKISTAN

## USING SHORT DURATION FLASH FLOODS TO IRRIGATE LAND

- Over 1 million ha command area through spate flows
- Significant potential to expand the area with low investment (if proper approach used)
- Increase already happening
- Also for filling of drinking water ponds, recharging groundwater in some areas and reviving rangeland
- Common crops: Sorghum, Sesame, Mungbean, Chickpea, Guar, Aragula/Mustard, Wheat and Fodder
- Key to livestock industry and pastoral economy



Potential is large:

## Climate change

- Attenuates floods
- Stabilizes the area, avoid desertification
- Recharge of groundwater
- Local wetlands and lakes
- High biodiversity, indigeneous plants
- Low external input (organic) farming
- Organic production

Potential is large:

## Water management

- Revive and resource local management by communities and local government
- Rationalize area under spate irrigation
- Ensure affordable availability of bulldozers in public or private sector
- Stay away from inappropriate civil engineering solutions, such as weirs and flood storage dams. Instead – attenuate and regulate flood patterns
- Appropriate civil engineering solutions are: flow dividers, fixing flood canal inlets, bed stabilizers, improved/ strengthened earthen bunds (gabion sections, abutments), guide bunds, controlled field inlets and overflow structures
- Improve drinking water supply – improved shallow ponds and subsurface dams
- Combine spate irrigation with groundwater use and recharge

Potential is large:

## Food security

- Improved soil moisture conservation (mulching, ploughing, improved equipment)
- Improve yield of major crops such as sorghum by better varieties and better soil moisture conservation –
- Better marketing and processing of promising minor crops (guar, sesame, arugula)
- Improve prospects for local vegetables and medicinal plants
- Spate irrigated forestry (gum arabica)
- Improve local livestock varieties (Bagh Nari)
- Improved fodder for livestock



# HILL TORRENTS AND FLOODS:

- Spate areas absorb minor and medium floods and stabilize areas
- Large outwash areas for beneficial use of occasional mega-flood
- Can be guided





# HARVEST OF MOOTH BEANS FROM AN INTERCROPPED FIELD WITH SORGHUM



# NEWARBI INTRODUCTION

## BACKGROUND



Project Overview and Vision for the NEWARBI 2



**New headworks built in the spate systems/construction of dam**



**Water distribution not aligned with new situation**



**Agricultural and water potential is not used**



**Neglected and underdeveloped areas, with out-migration**



**In 2010 and 2022 floods hard-hit – much devastation**

Funding Agency



Ministerie van Buitenlandse Zaken

Lead Organisation



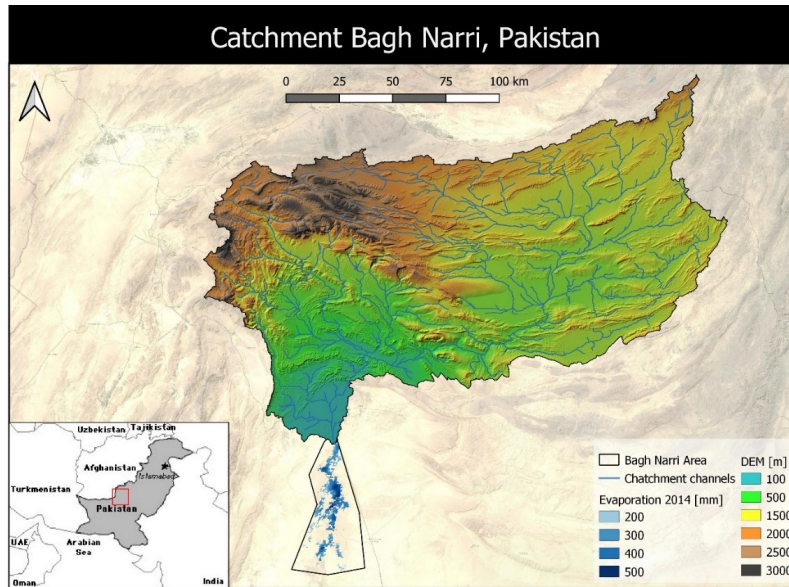
Project Partners



Overview Map Bhag Narri and Nai Gaj, Pakistan

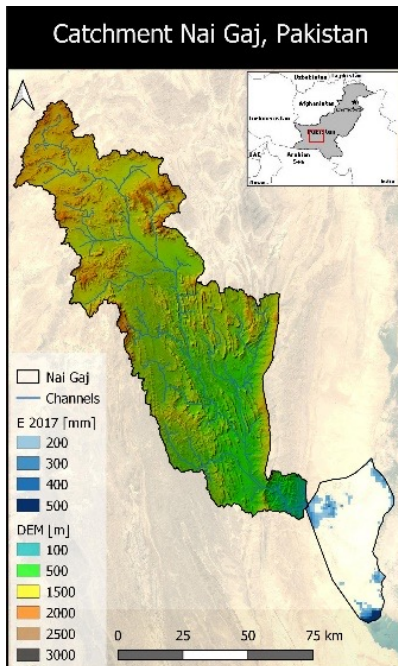






# AREA INTRODUCTION

- Bhag Narri (Balochistan)  $\pm 90,000$ ha cultivated
- Nai Gaj (Sindh)  $\pm 20,000$ ha cultivated
- Work packages – all tailored to specific context
  - Organising Water Management
    - Organization/ JMCs
    - Water distribution rules
    - Field water management
    - Drinking water supply
    - Flood protection
  - Introducing new Livelihood Opportunities
    - New crops/varieties
    - Livestock interventions
    - Livelihood
  - Upscaling the approach





**Guidebund and  
small  
regulators**



**Village protection  
bund**  
2021.02.24 11:26

**Flow regulator**



**Improved field intake**



# HIGHLIGHTS

## Restoration of infrastructure

- Cuts in embankment plugged
- Flow dividers and regulators:
- <<15.000 ha irrigated again
- Village protection bunds, to protect settlements

## Maintaining and deepening channels

- Desilting existing channels

## JMC organisation, social structure

- Involved in identification of measures
- Troubleshooting at local level
- Collection of farmer contribution and hiring of tractors



Project Overview and Vision for the NEWARBI 2



# CASE: BAHAWAL JO GANDHO



**Reconstruction of bund to divert  
water to the fields**

**Total investment ±3.3 million  
PKR (~15.000 USD)**

**Up to 18.000 acres under  
irrigation again – costs 1  
USD/acre – USD 3/ha**

**Estimated return on investment  
>100 million PKR**

**Farmers now in a position to  
restore future damages,  
resulting from floods**

**2.5 million from farmers (75%)**

**0.8 million from project (25%)**

Project Overview and Vision for the NEWARBI 2



# CASE: CHICKPEA INTRODUCTION



**3 varieties of chickpea seeds were introduced in the area**

Seeds sourced from Agricultural Research Institute



**Grown in other spate areas, not in Bhag Narri**



**After introduction it has become a major (cash) crop for farmers**

>50% of the farmers adopting

30% yield increase

20% additional income



**Additional trials for disease control and increased productivity**

Project Overview and Vision for the NEWARBI 2



# CASE: DRINKING WATER IN SPATE AREAS, BAGH NARI



**Traditionally water for domestic use comes from drinking water ponds, which are filled with flood water.**

Challenges with availability in dry season  
Water quality comprised (open water/livestock)  
Groundwater is often brackish



**Intervention to construct shallow wells, next to ponds, to access sweet water lenses/water infiltrated from ponds**

Constructed at 30+ locations  
Including town water supply Bhag  
Providing improved drinking water

Project Overview and Vision for the NEWARBI 2

Management of Hill Torrents: Opportunities and Challenges - Untapped Potential of Spate Irrigation in Pakistan



**Typical Drinking Water Pond**



**Water fetched from the shallow wells**



# CASE: THE POWER OF JMCS IN NAI GAJ

In the Nai Gaj spate area 2 JMC have been established:

Pat Mohammed Wah

Bahawal Jo Gandho Wah

Initial function of JMCs is to facilitate cooperation and water management improvements (repairing major flood channels, restoring flood damage)

Its role in society has become much broader education, repair of road connection, identity cards:



Project Overview and Vision for the NEWARBI 2







## What is the FBLN?

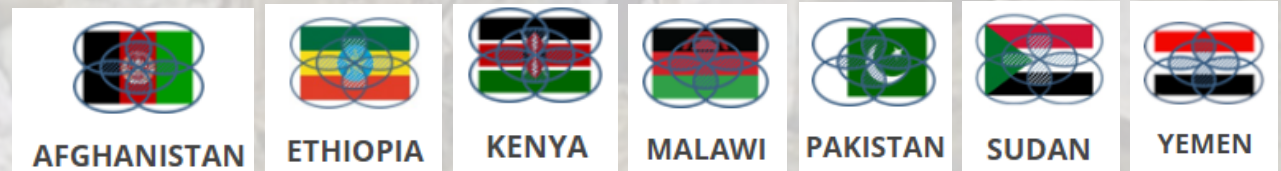
FBLN is a network of 1000 flood based farming/ spate irrigation professionals and practitioners.

## What are the objectives?

- 1 Capacity building Familiarize policy makers, implementing agencies (), research agencies and funding agencies on development scope, experiences and practical approaches to FBLS development
- 2 Document good practices and initiate practical research in FBLS
- 3 Support programs on the ground

Objective: to promote better livelihoods in flood-based natural resource systems

## FBLN Country Network Teams



## Visit the FBLN website and join our Network

- Visit the FBLN website [here](#)
- Join the FBLN Network [here](#)



## FBLN resources and publications

Access the FBLN documents [here](#).

Practical Notes

Papers

Guidelines &  
Manuals

Framer  
Learning  
Material

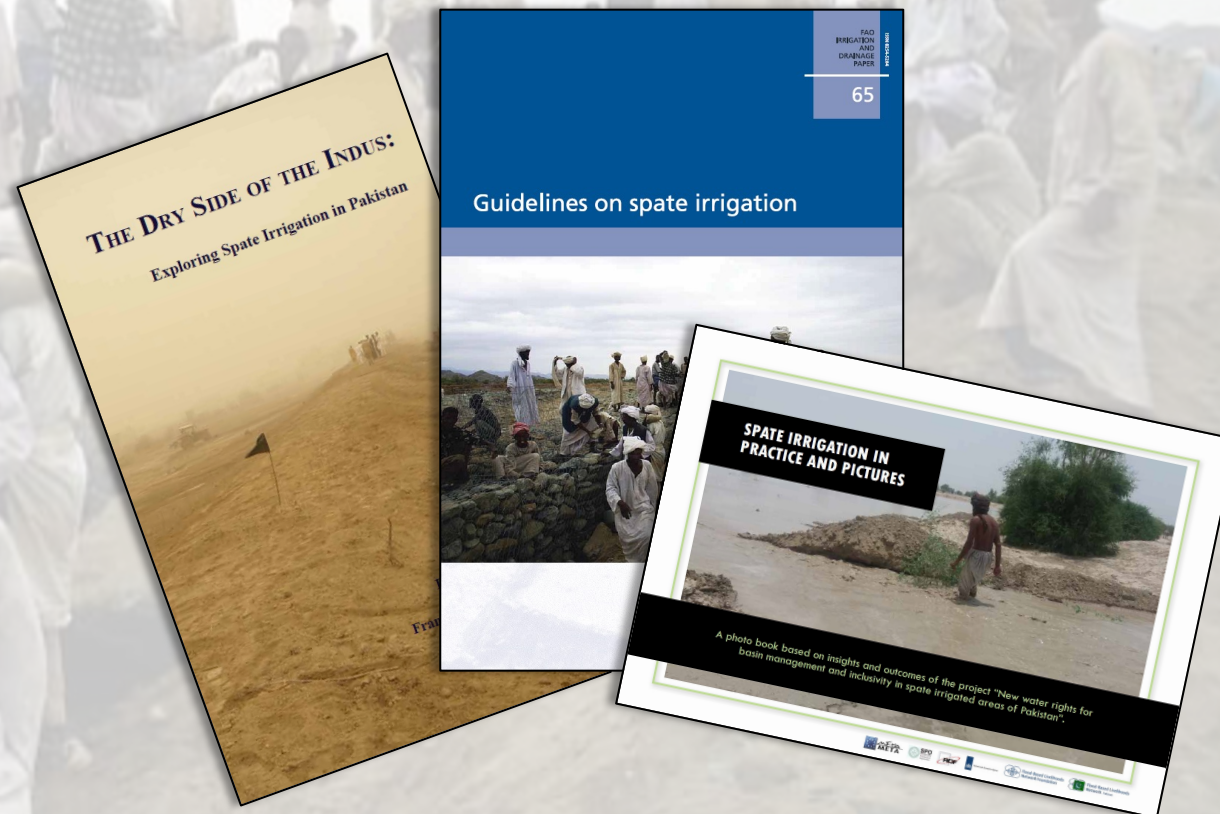
Library of  
documents

Flyers and  
brochures

Photo Library

Videos

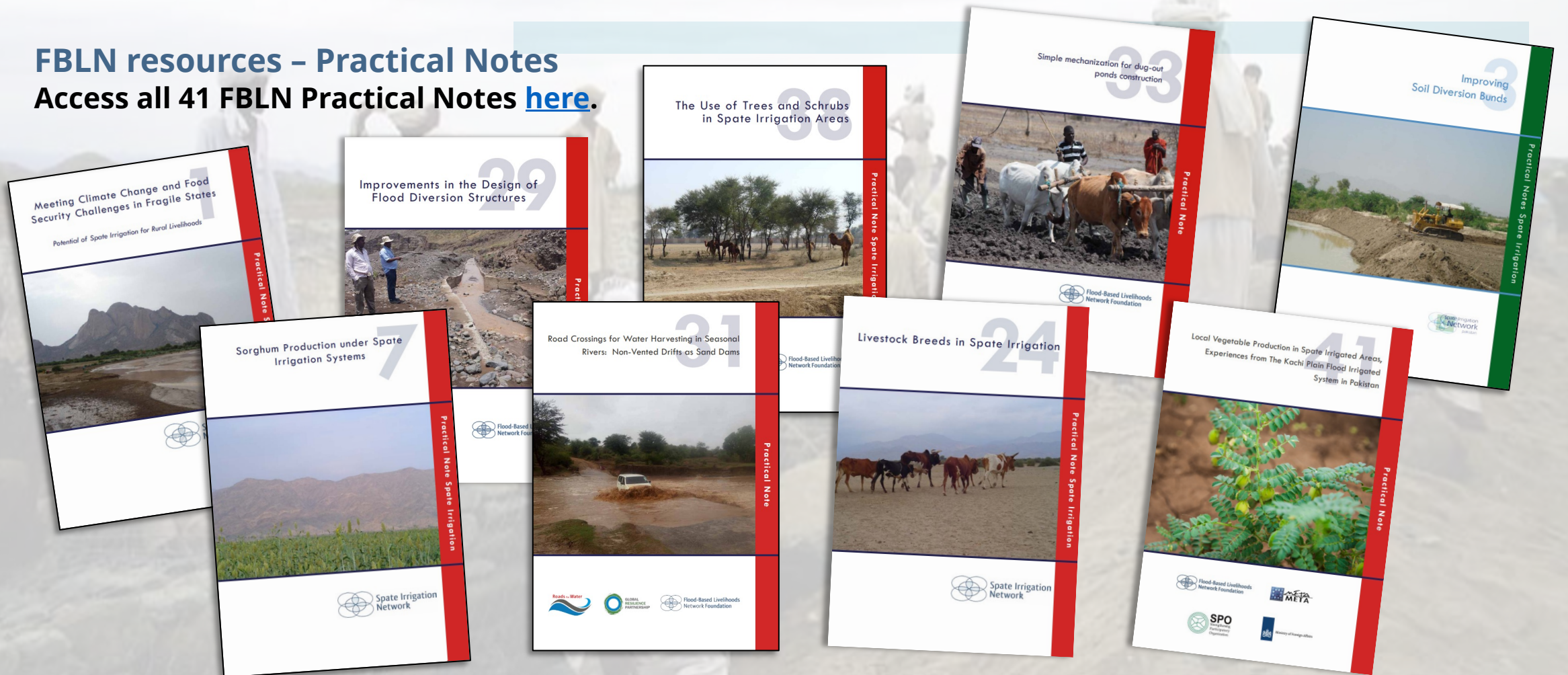
## Examples of publications





## FBLN resources – Practical Notes

Access all 41 FBLN Practical Notes [here](#).







# THANK YOU

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[www.metameta.nl](http://www.metameta.nl)

[www.floodbased.org](http://www.floodbased.org)