

Institute of Soil Bioengineering
and Landscape Construction



University of Natural Resources
and Applied Life Sciences, Vienna
Department of Structural Engineering
and Natural Hazards

Ingenieurbiologie

- Grundlagen und praktische Anwendungen

Santa Maria
26.11.2008_hpr

Hans Peter Rauch

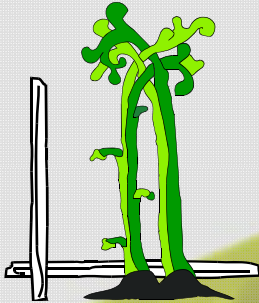
universität des lebens



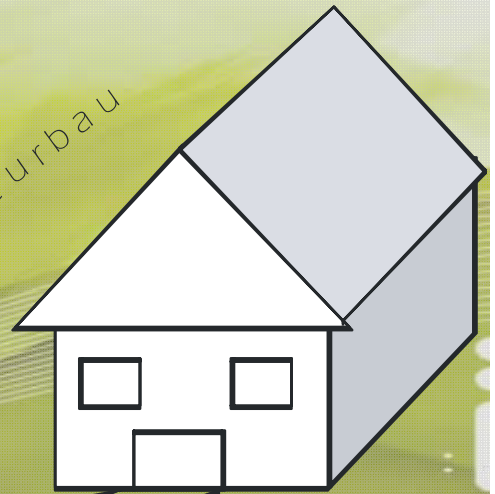
Geologie

Alpine Naturgefahren

Geotechnik



Konstruktiver Ingenieurbau



universität des lebens

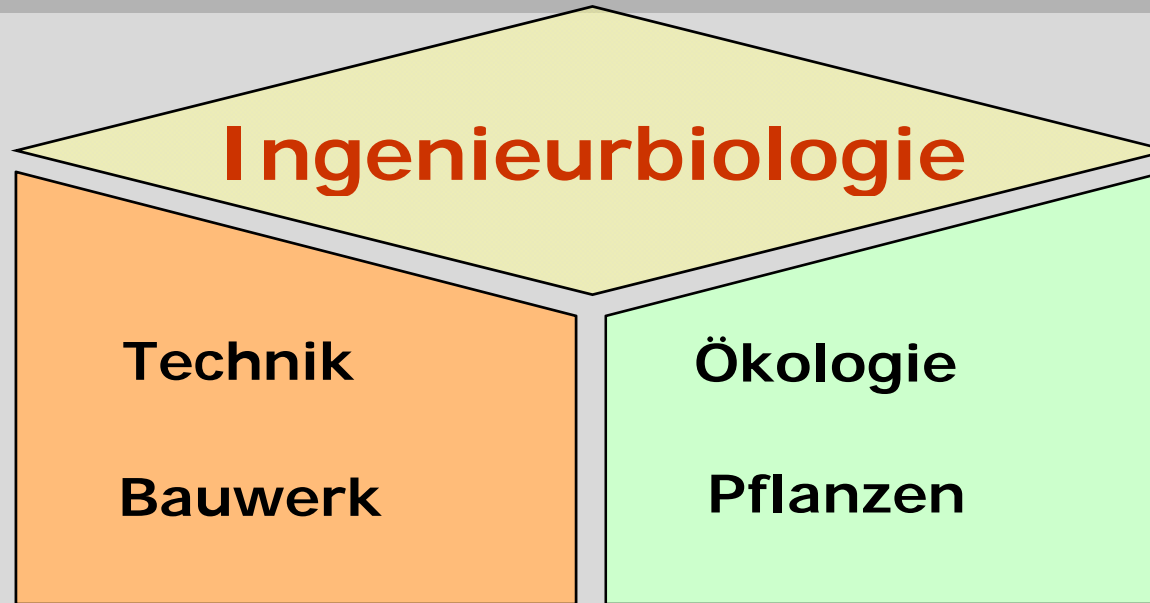


■ *Gliederung*

- ✓ **Einführung** - Begriffsdefinition
- ✓ **Grundlagen – Ingenieurbiologie**
- ✓ **Ingenieurbiologische Massnahmen**
- ✓ **Zusammenfassung**



■ **Einführung**



Verwendung von Pflanzen im Bauwesen
Begrünung
Revitalisierung

...eine Technik, die sowohl technische als auch ökologische Aspekte berücksichtigt.....

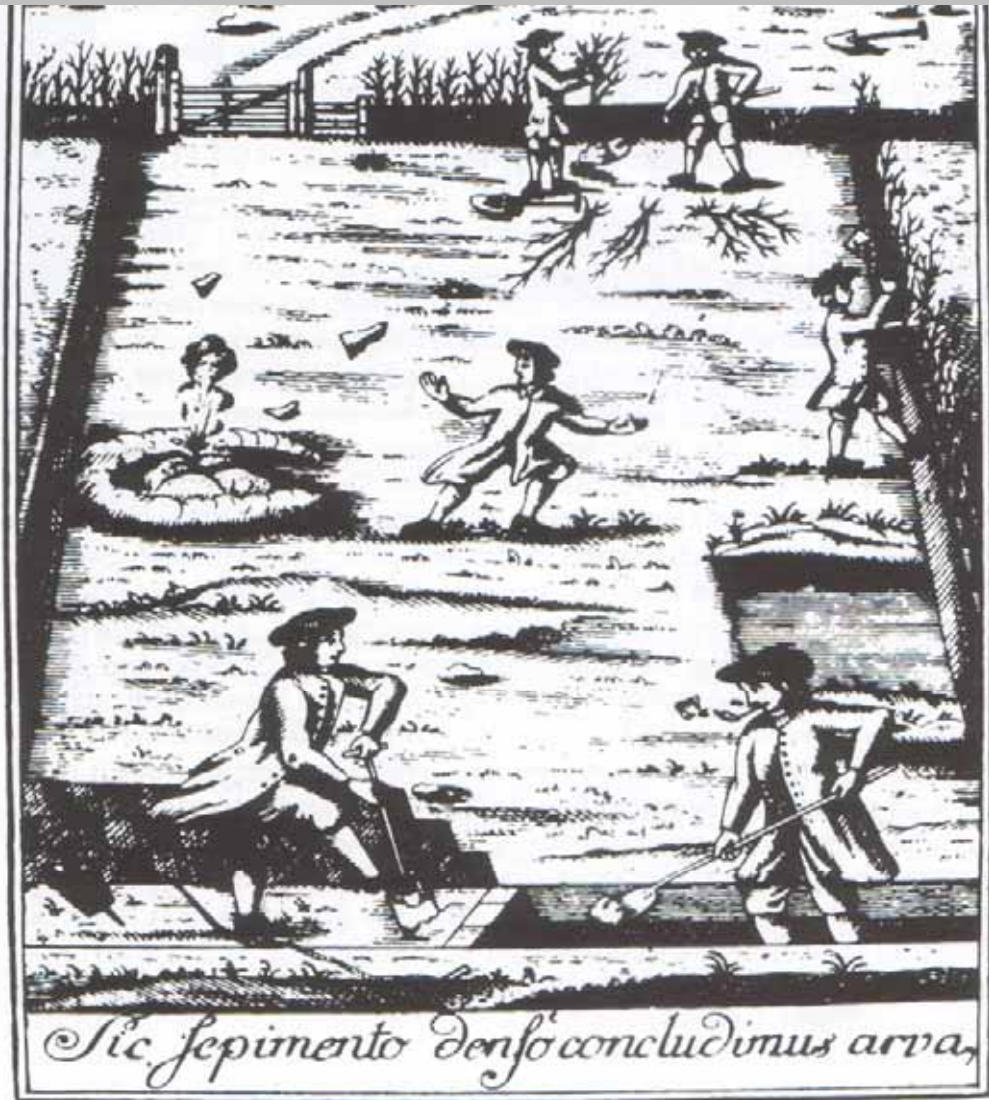
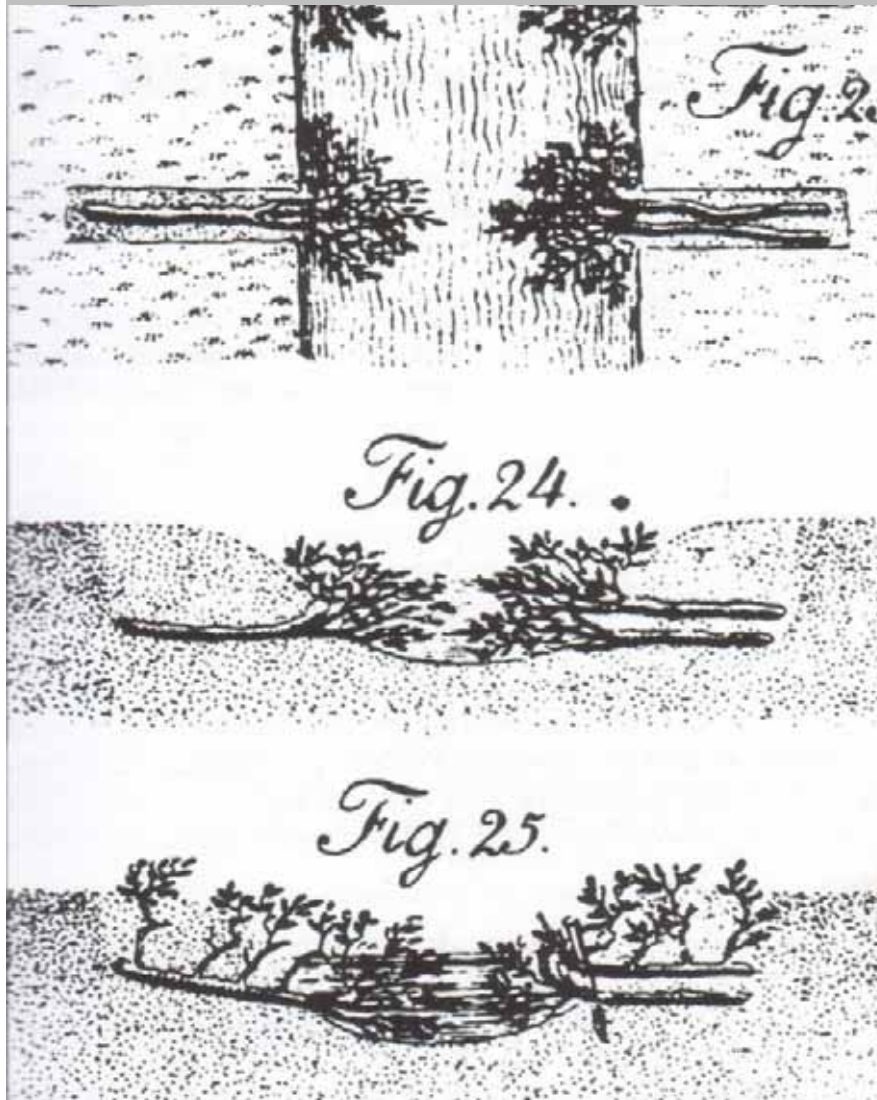


Uferschutz

(WOLTMANN 1791/92)

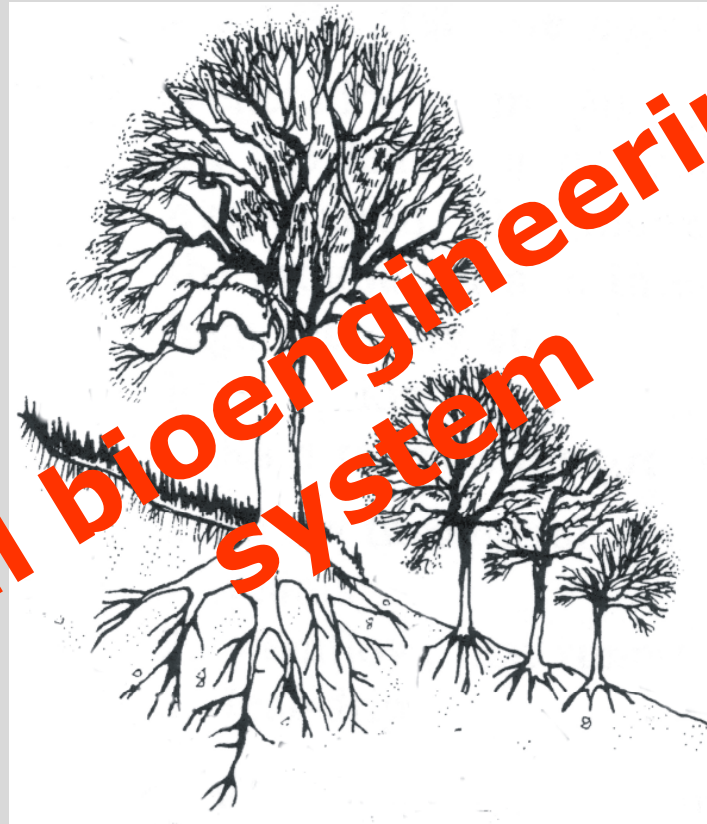
Windschutz

(1800)



■ Grundlagen - Ingenieurbiologie

Prozesse

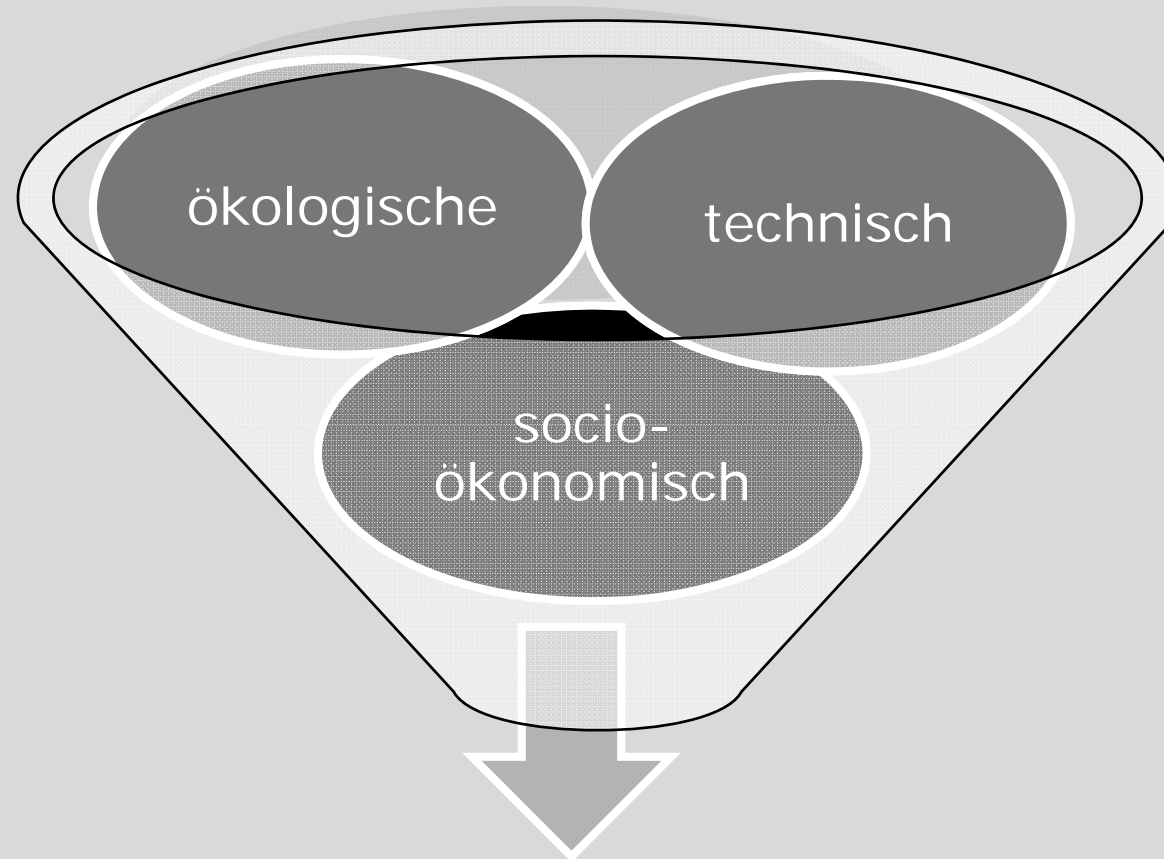


Effekte

soil bioengineering
system



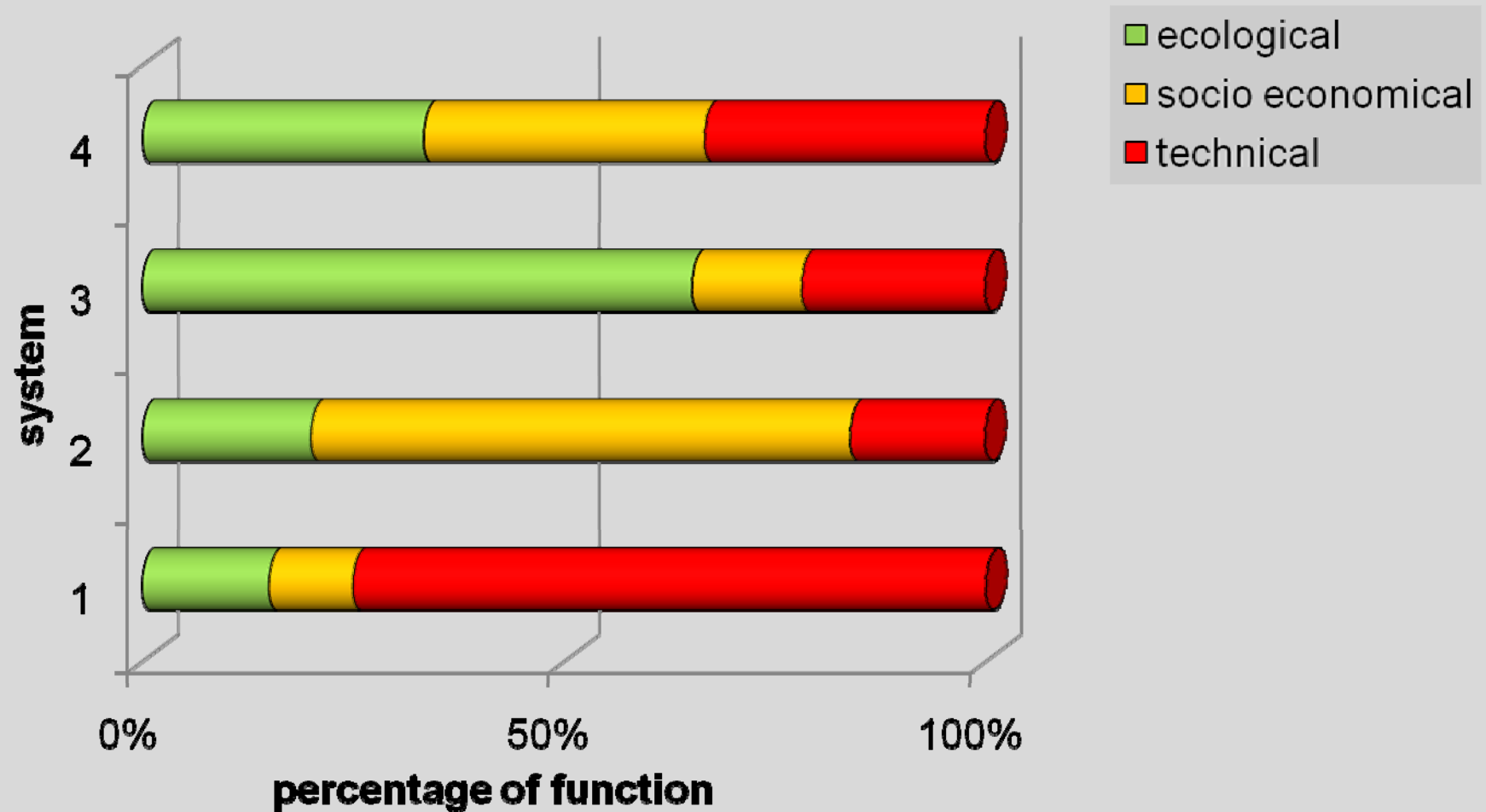
■ Grundlagen - Ingenieurbiologie



Anwendung von Ingenieurbiologie



■ Grundlagen - Ingenieurbiologie



plants = construction material

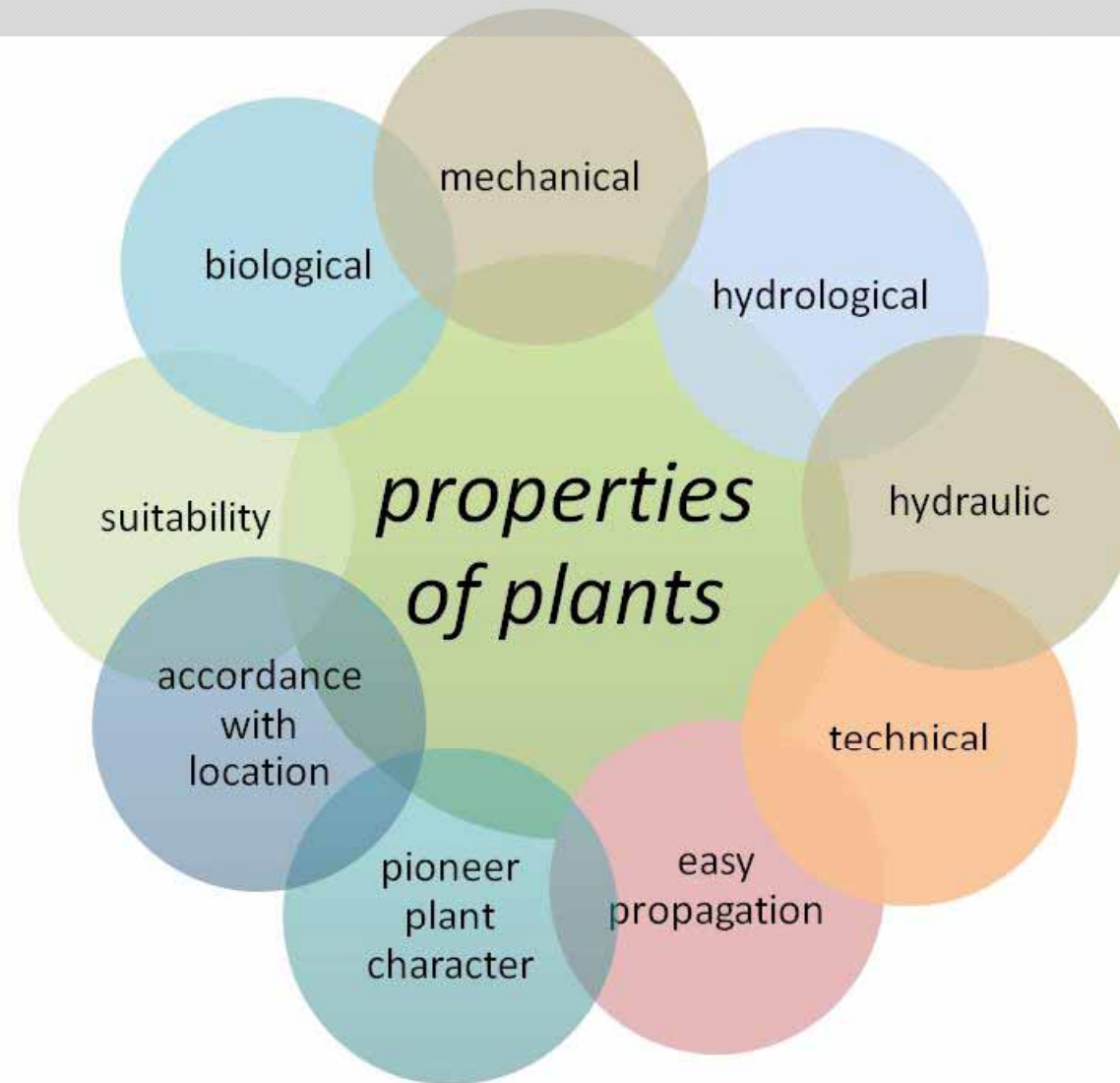
properties of plants

selection of plants

key role for the
success



■ basics of soil bioengineering



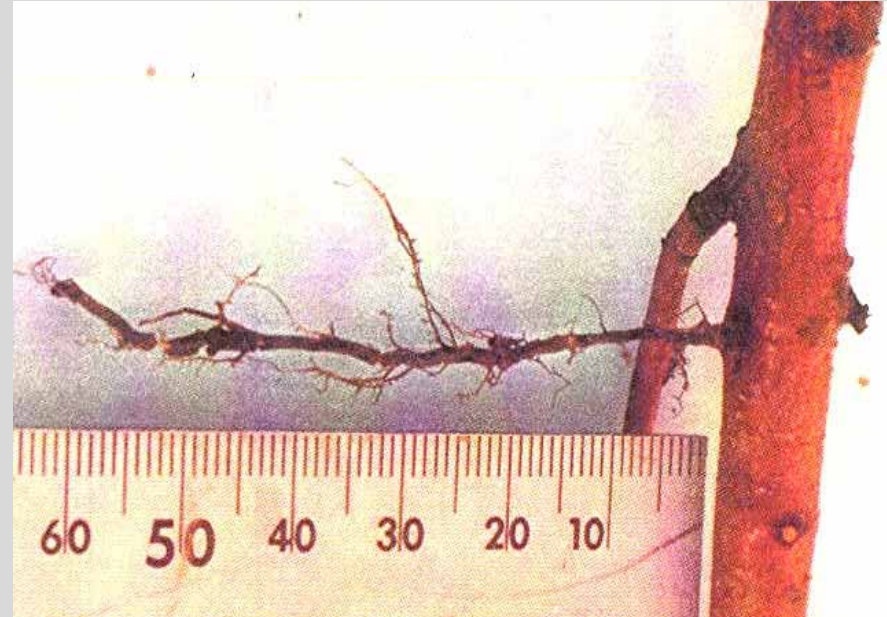
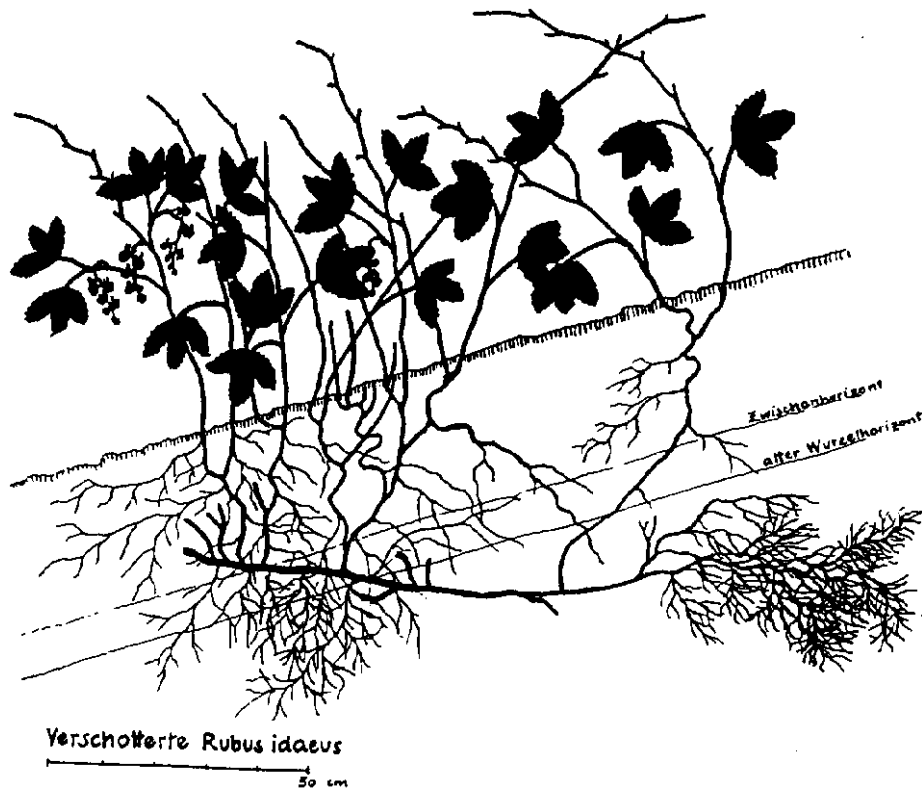
■ basics of soil bioengineering

■ vegetative reproduction

➔ plant growing from roots or parts of branches



- capability of regeneration

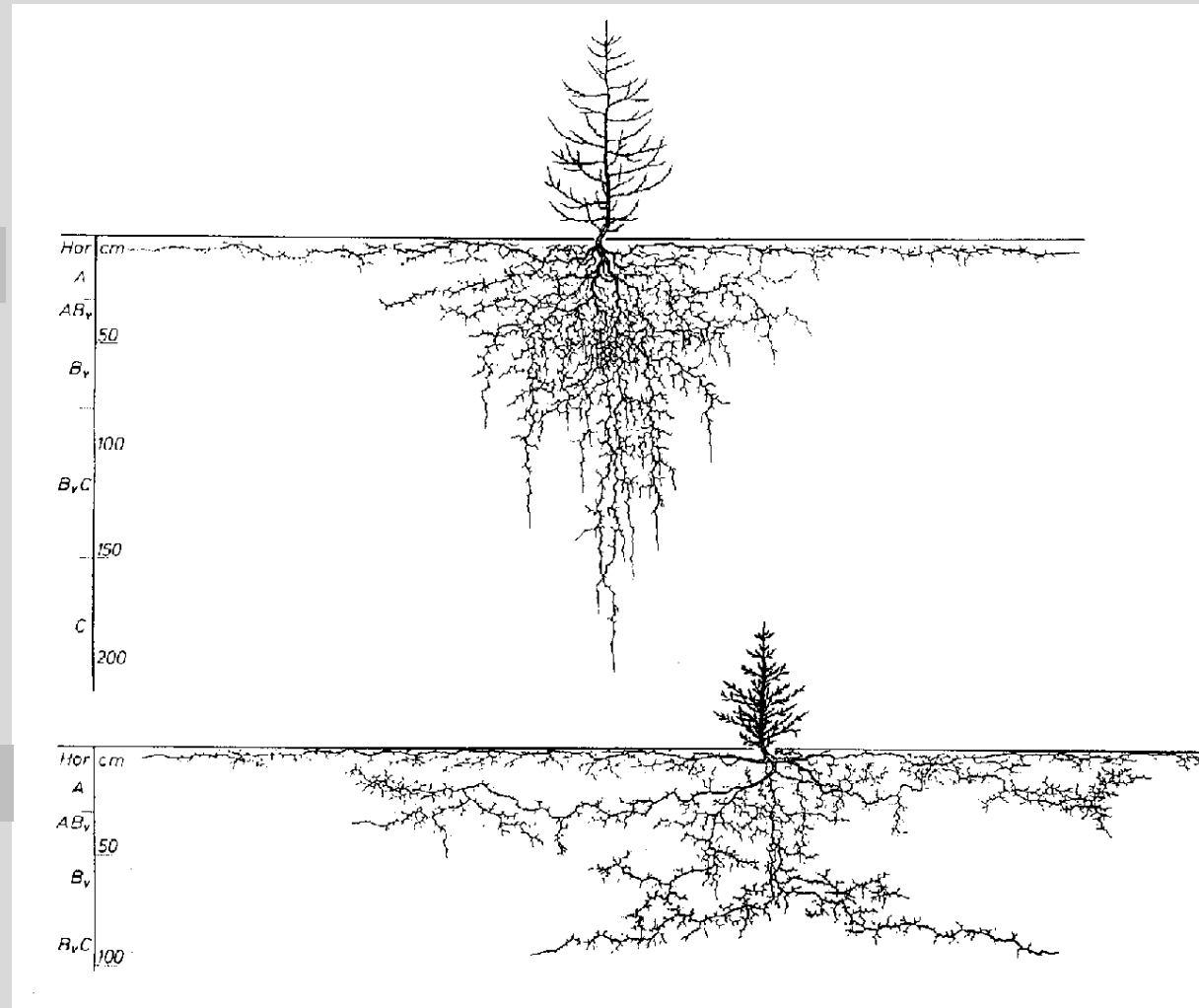


graveled raspberry (*Rubus idaeus*)
(SCHIECHTL, 1973)



- root penetration

Lärche (larch), 7 Jahre alt

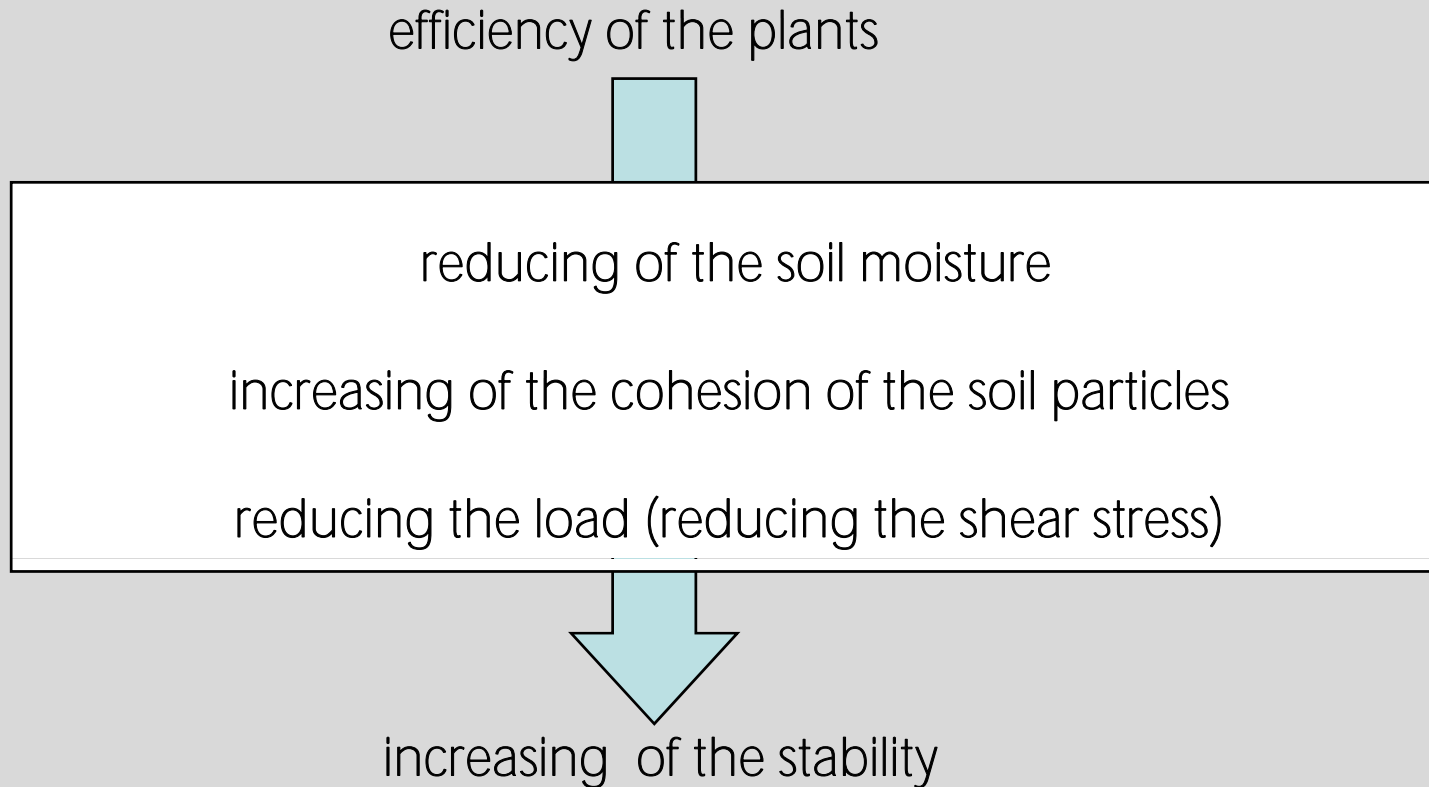


Fichte (spruce), 11 Jahre alt

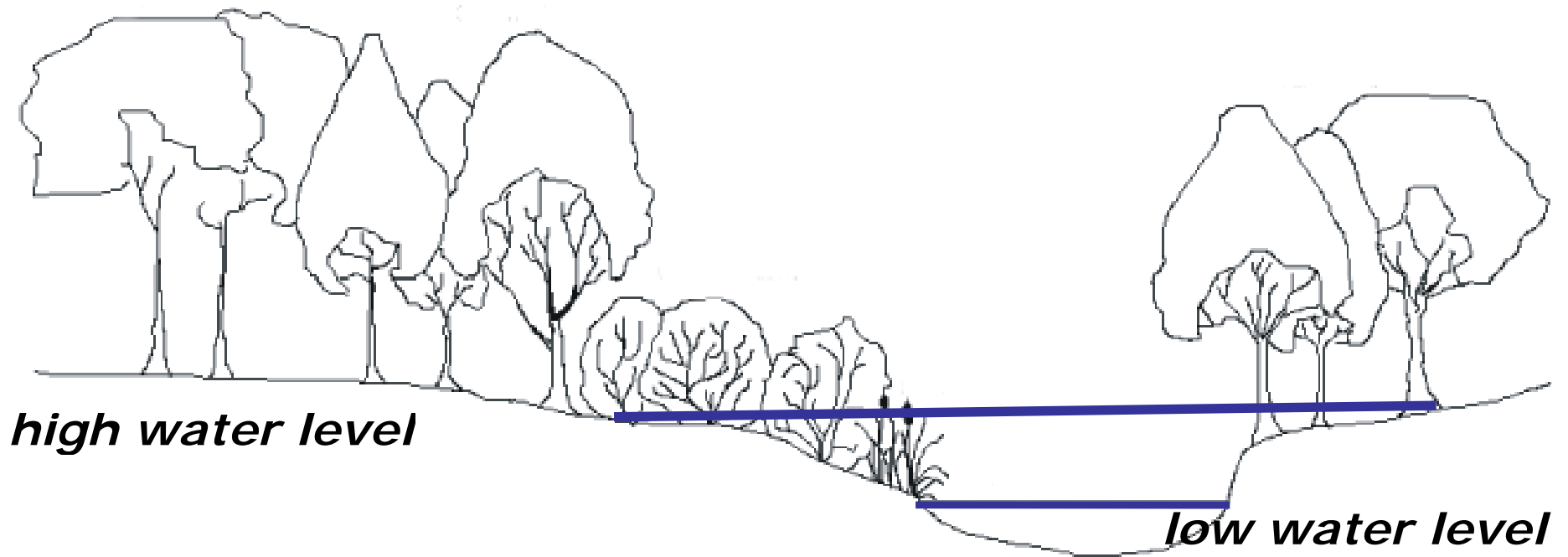
(KUTSCHERA, LICHTENEGGER, 1960)



- soil moisture control

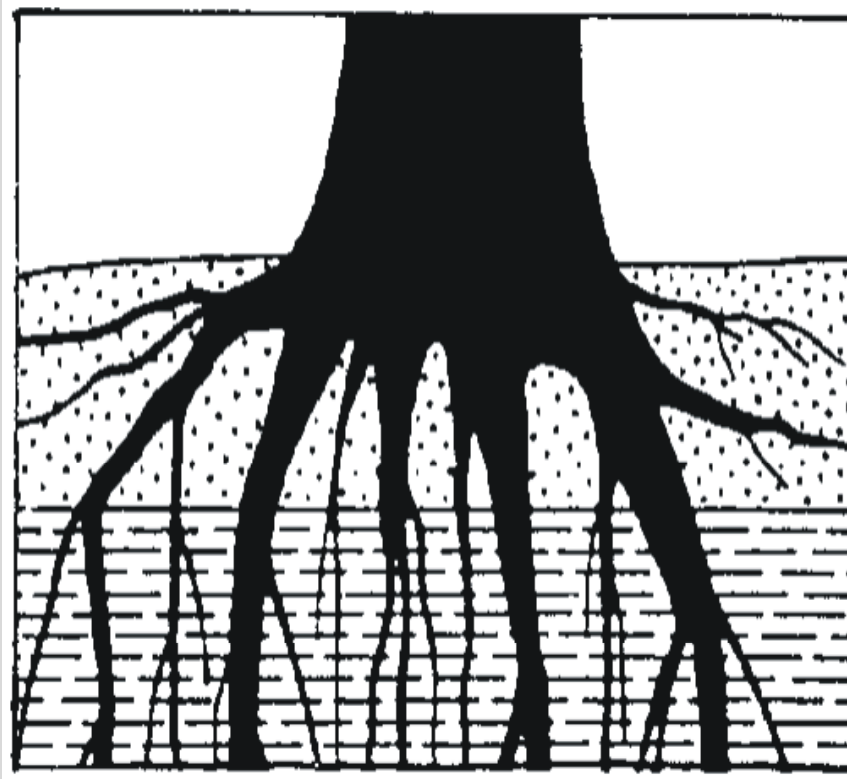


■ principles of river engineering

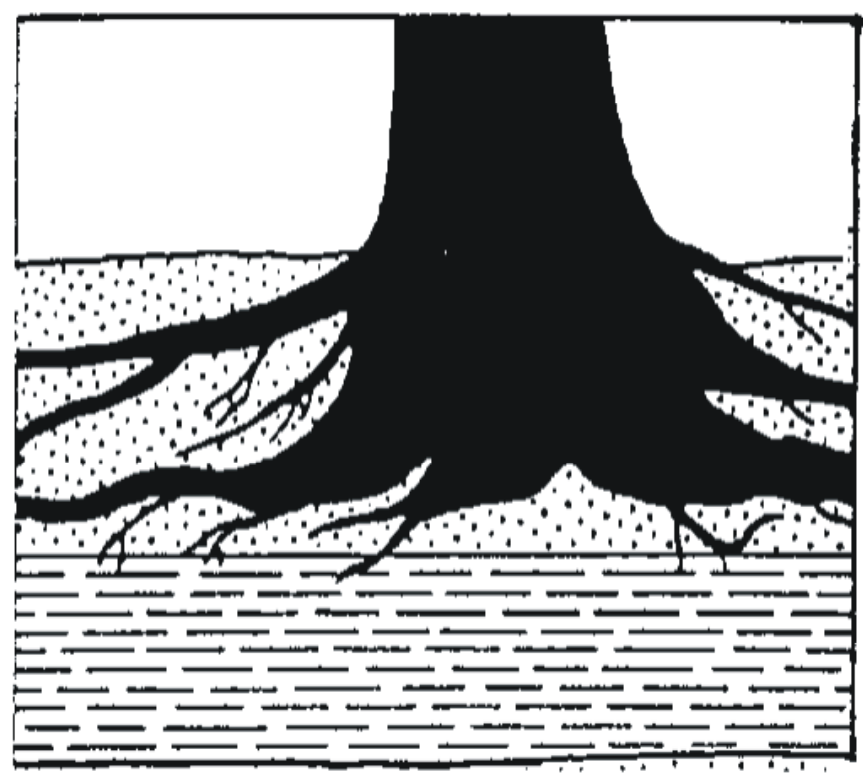


■ principles of river engineering

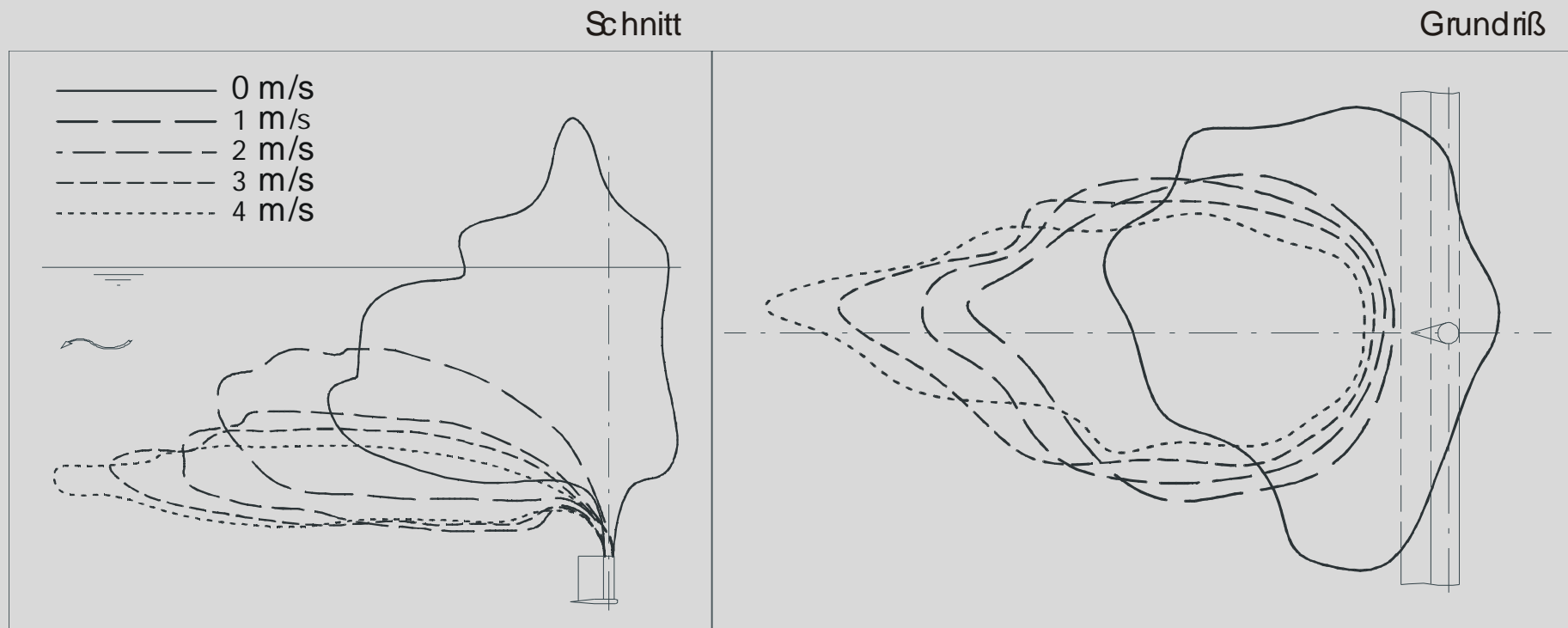
Gehölze unmittelbar
am Mittelwasserbereich



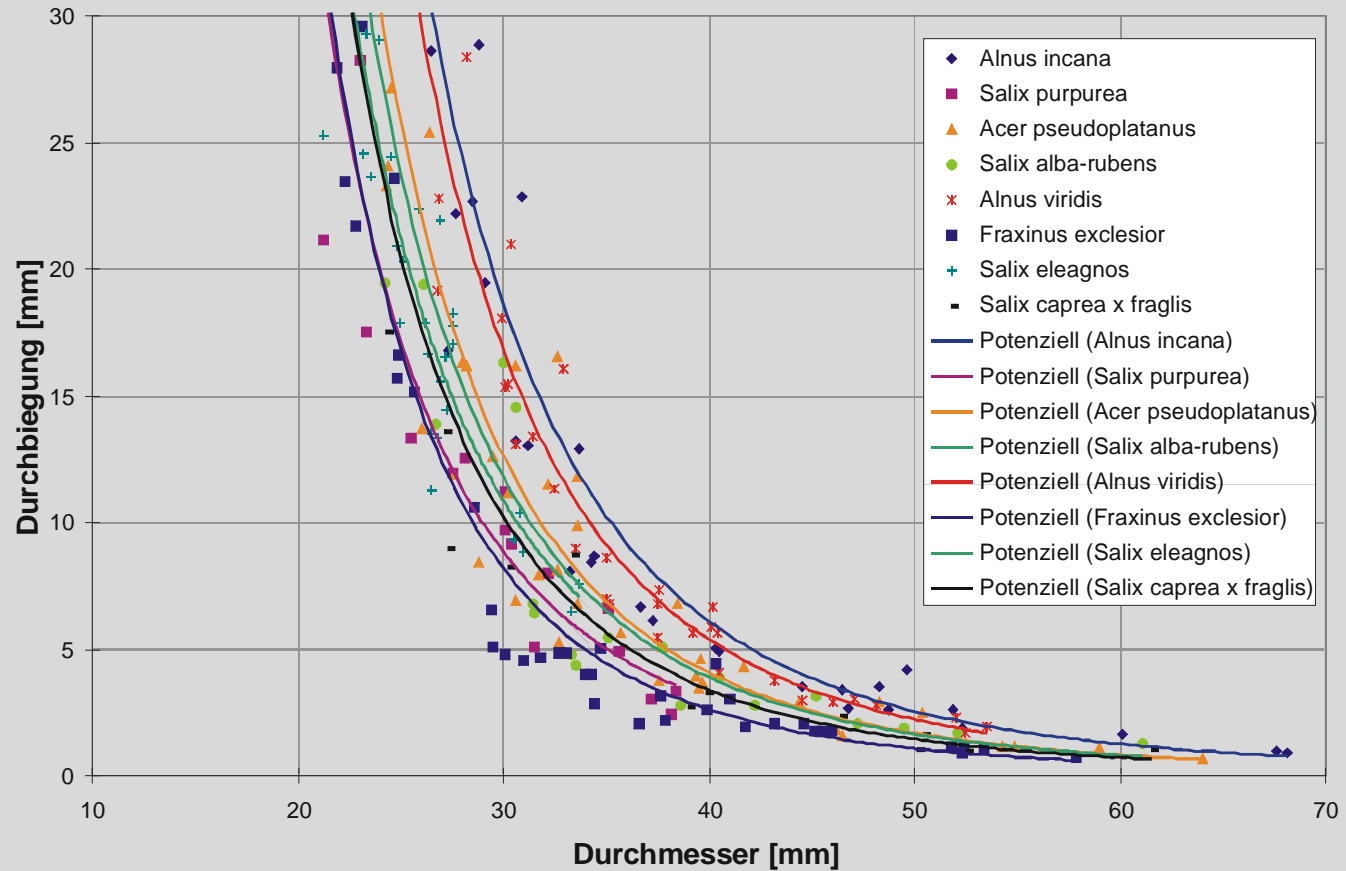
Gehölze unmittelbar
oberhalb des Mittelwasserbereiches



■ principles of river engineering



■ elasticity and bending strength



comparision of the bending of different species; length of the testing example of 1,0 m and a force of 10 N; (Weitzer et al, 1998)



■ principles of river engineering

development of riparian vegetation



flexible

rigid



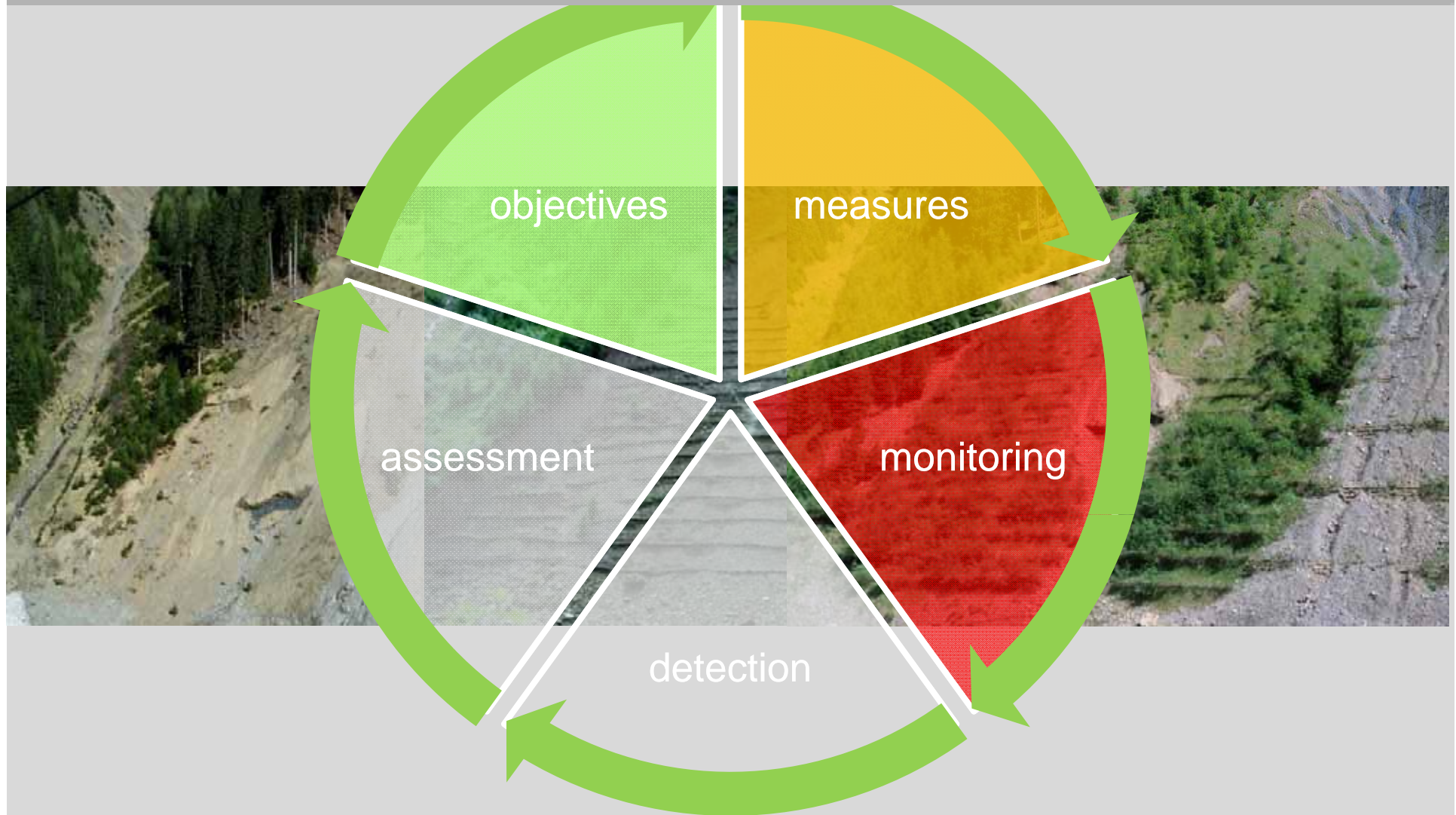
■ Grundlagen - Ingenieurbiologie

material	dead material	living plants	auxiliary material
technique	soil bioengineering		
application	slopes and gullies	above the timberline	river and riparian areas



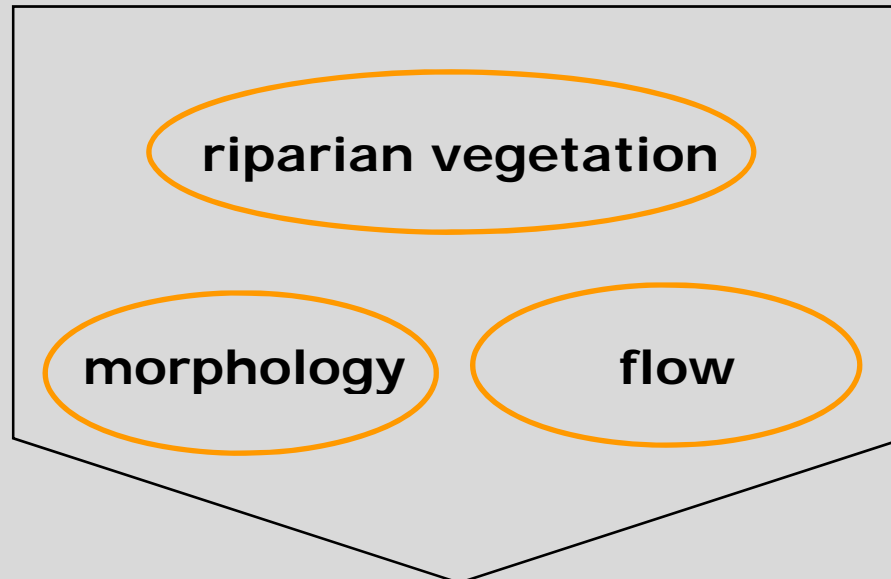


■ Grundlagen - Ingenieurbilogie



■ soil bioengineering measures

interaction



objectives

- flood protection
- habitat for animal and plants
- recreation areas



■ soil bioengineering measures



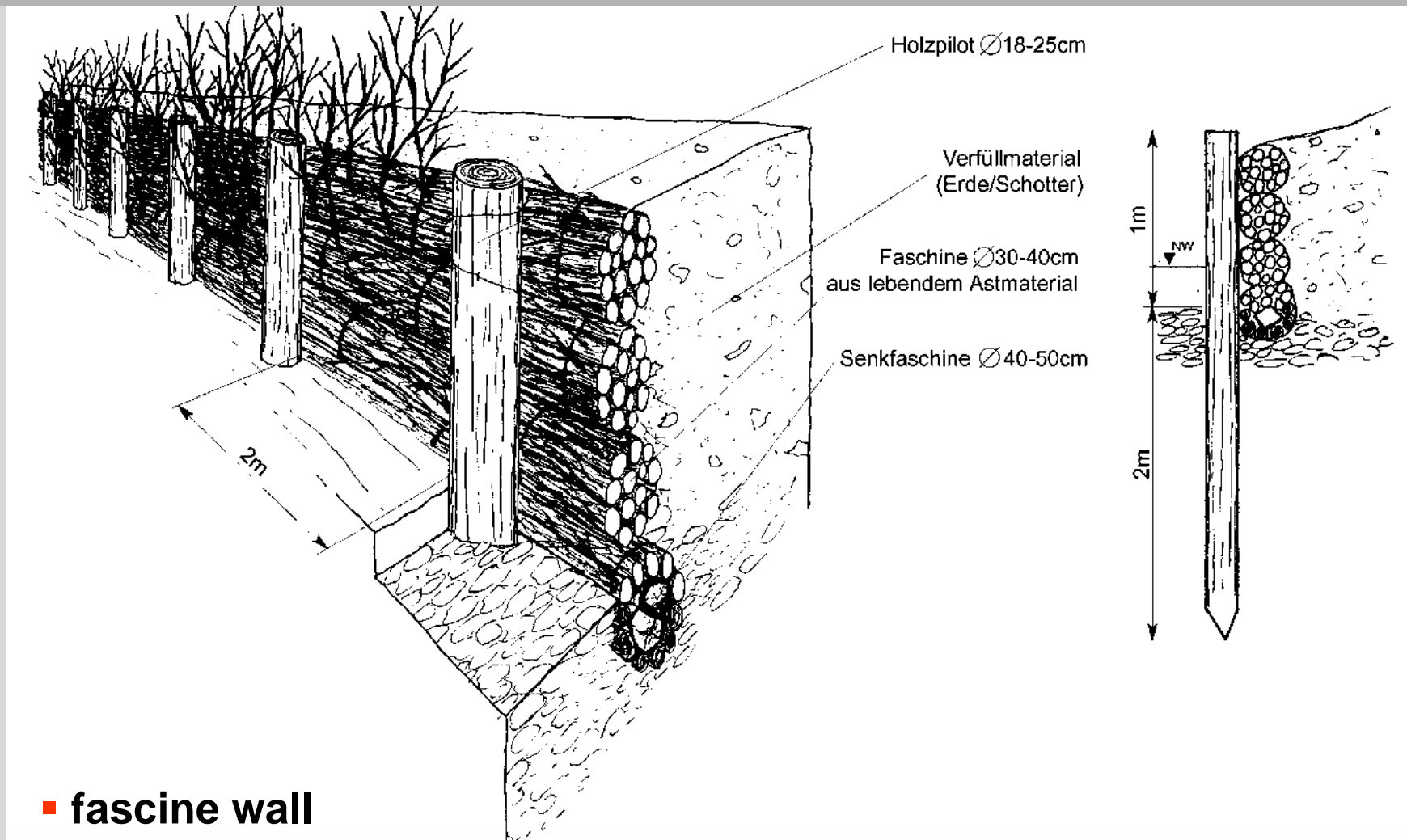
■ soil bioengineering measures



■ soil bioengineering measures



■ soil bioengineering measures



■ fascine wall

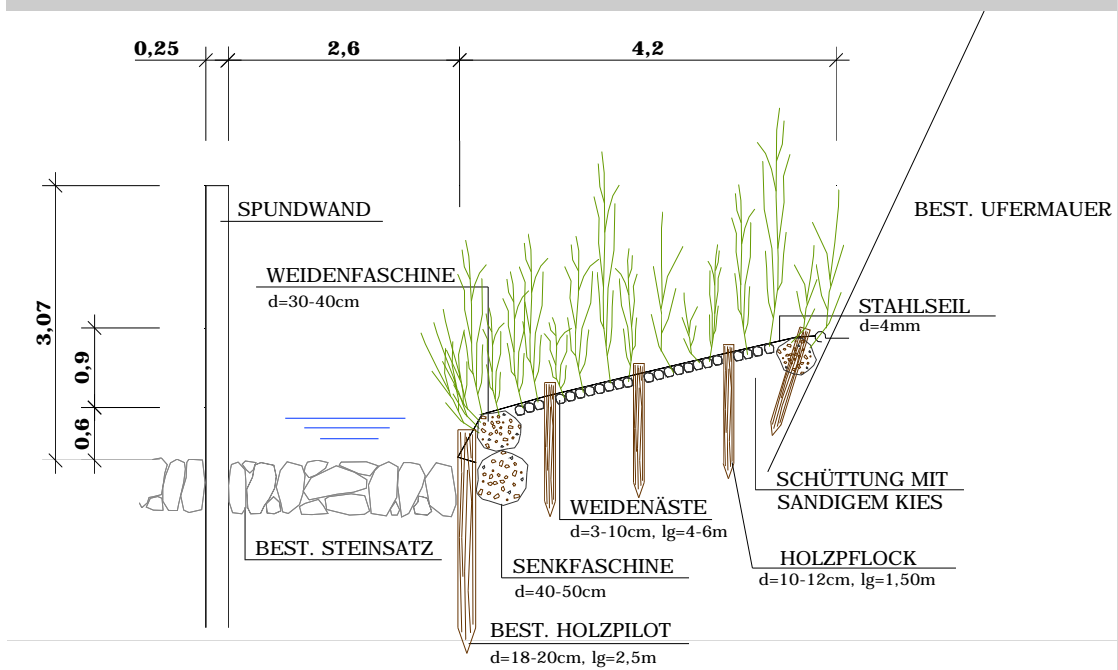


■ soil bioengineering measures

■ fascine wall



branch layer

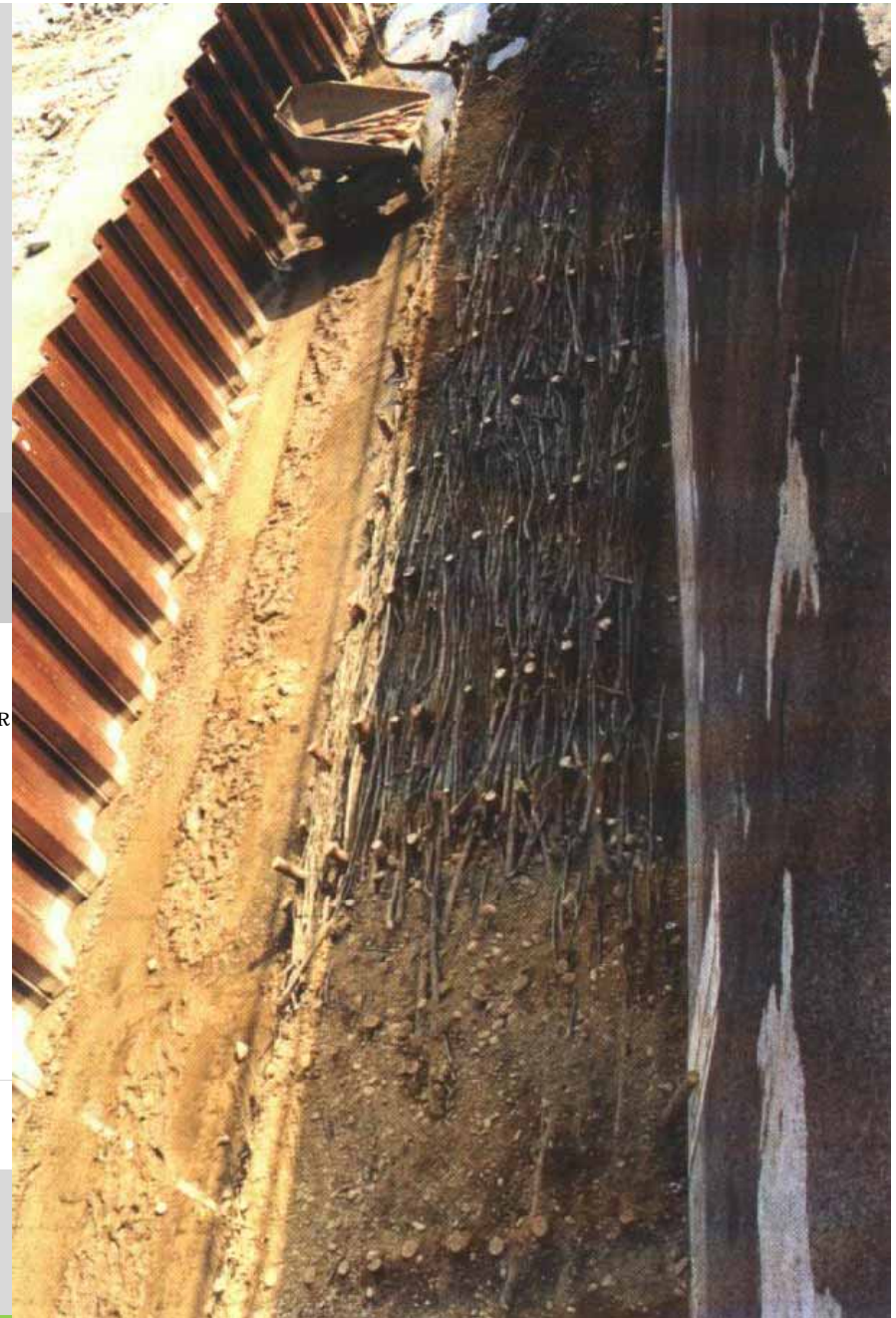
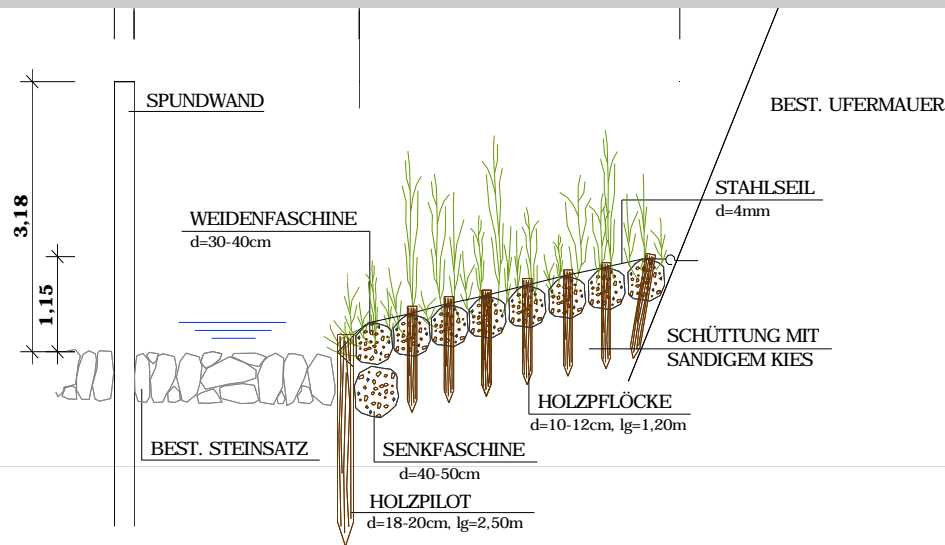


■ soil bioengineering measures

■ fascine wall



fascine layer

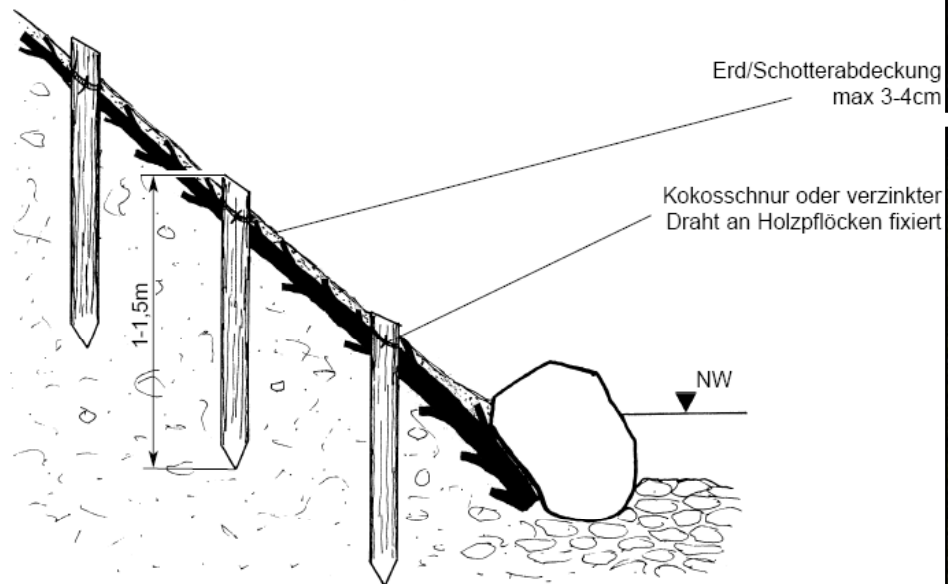


■ soil bioengineering measures

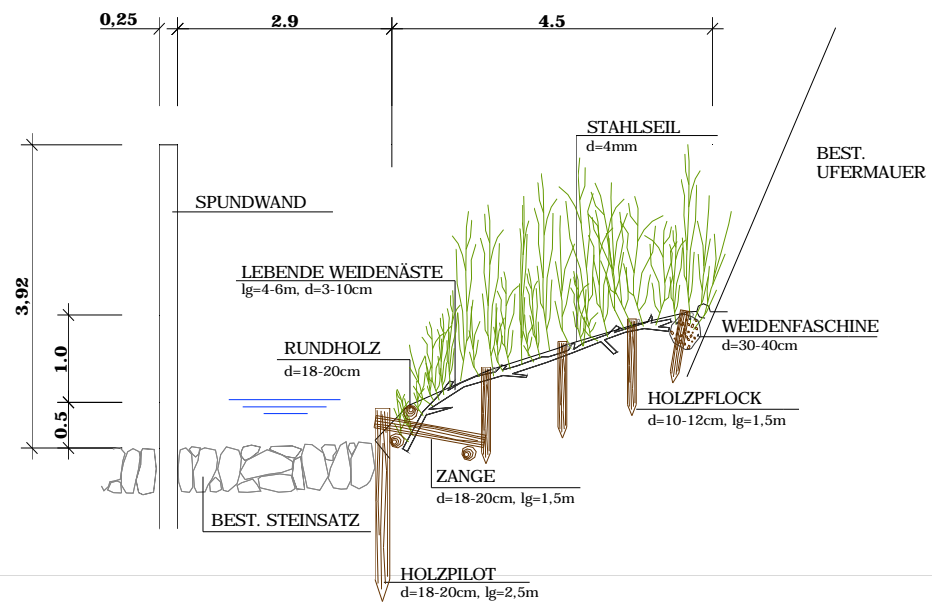
■ willow brush mattress

Spreitlage

mit Steinblöcken als Fußsicherung



willow brush mattress



■ soil bioengineering measures



~ 1950



■ soil bioengineering measures



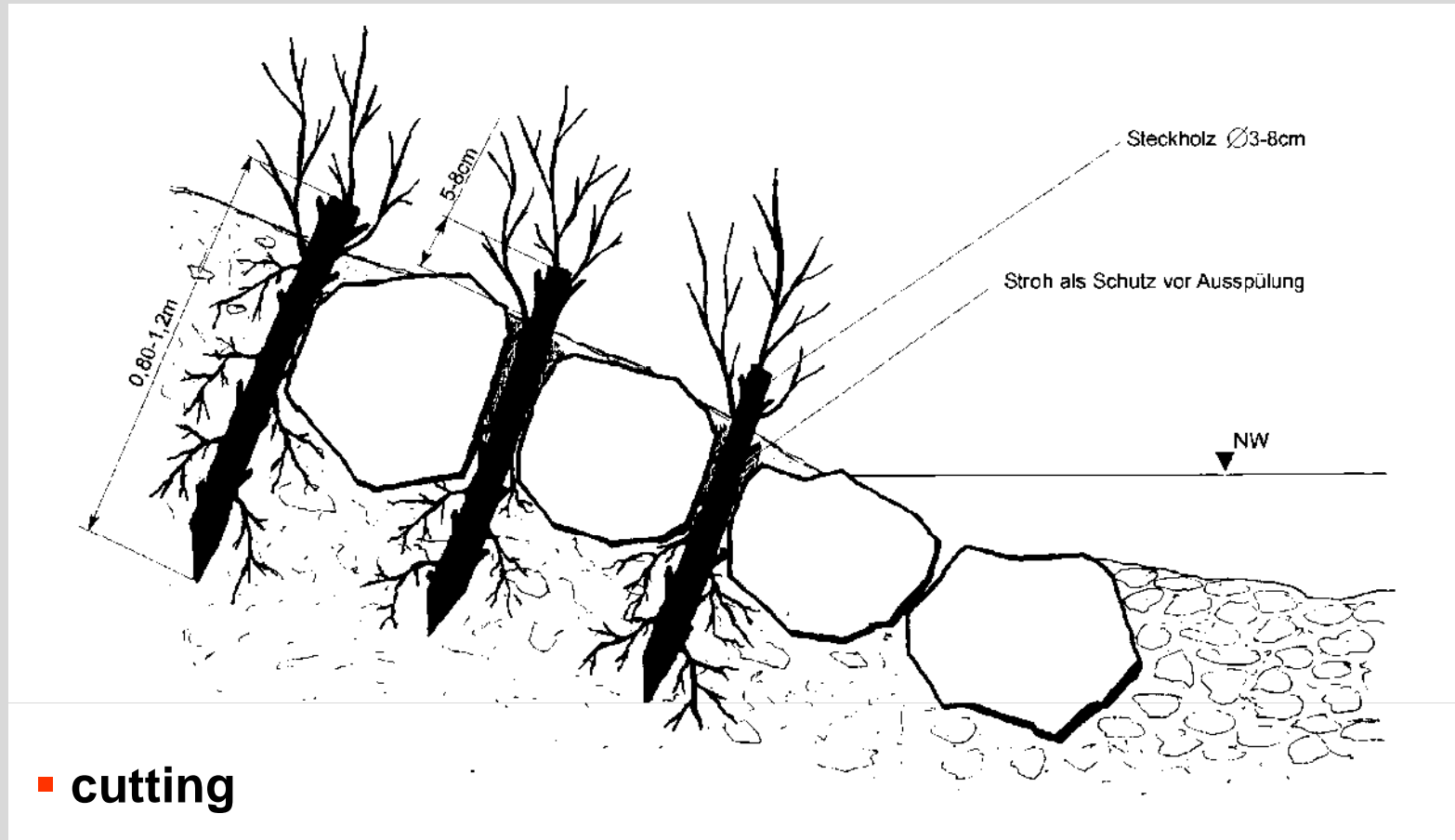
■ soil bioengineering measures



■ soil bioengineering measures



■ soil bioengineering measures



■ soil bioengineering measures



■ cutting



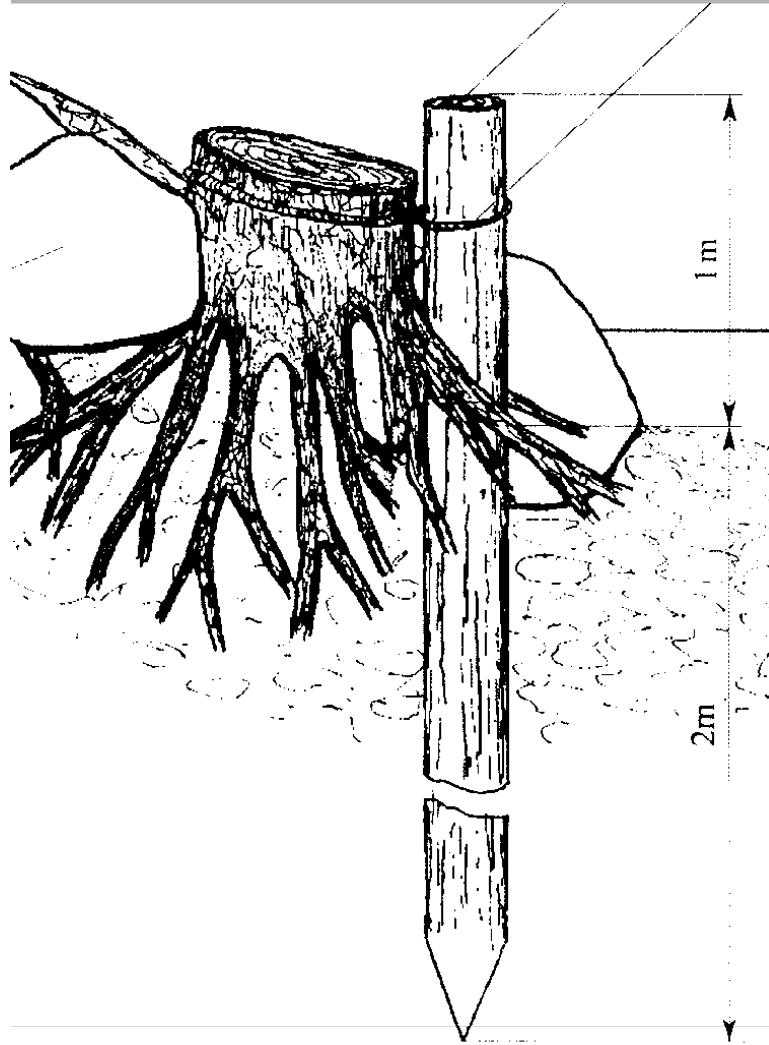
■ soil bioengineering measures



■ soil bioengineering measures



■ soil bioengineering measures

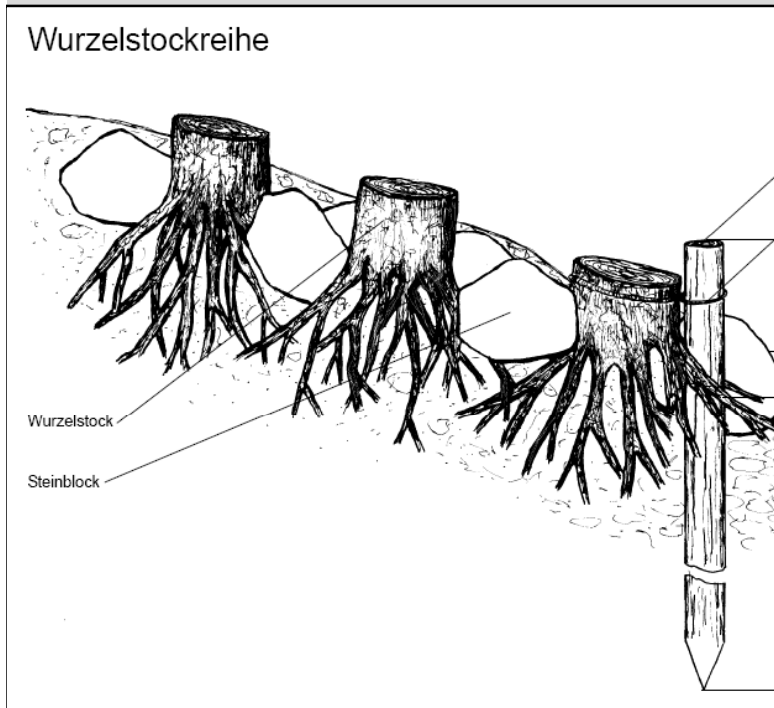


■ dead trunks



■ soil bioengineering measures

■ dead trunks



■ soil bioengineering measures

■ fascine groynes

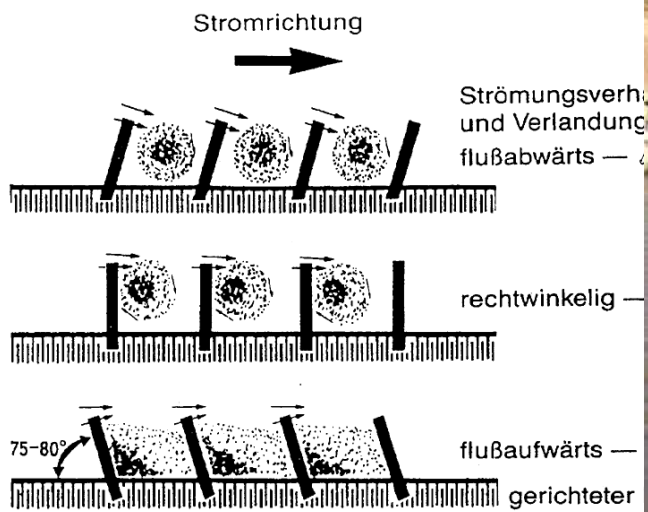


Abb. 43.: Wirkungsweise verschiedener Bühnenrichtungen – Grundriss (BN)



■ soil bioengineering measures

■ fascine groynes



■ soil bioengineering measures



■ soil bioengineering measures





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■ soil bioengineering measures



■ soil bioengineering measures



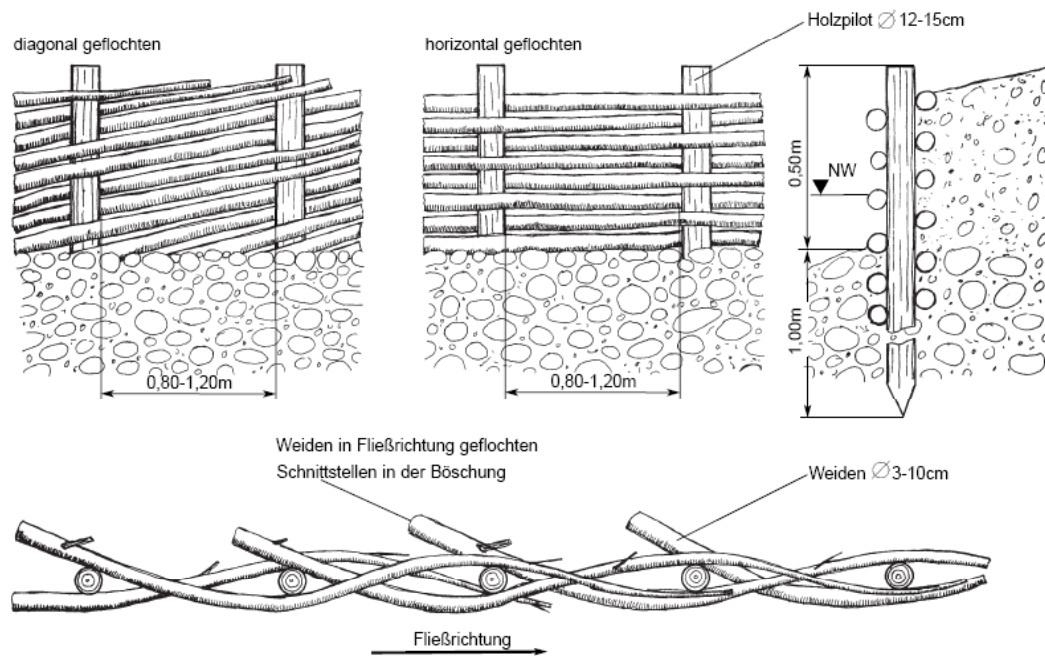
■ soil bioengineering measures



■ soil bioengineering measures

■ wattle fence

Ufer-Flechtzäune

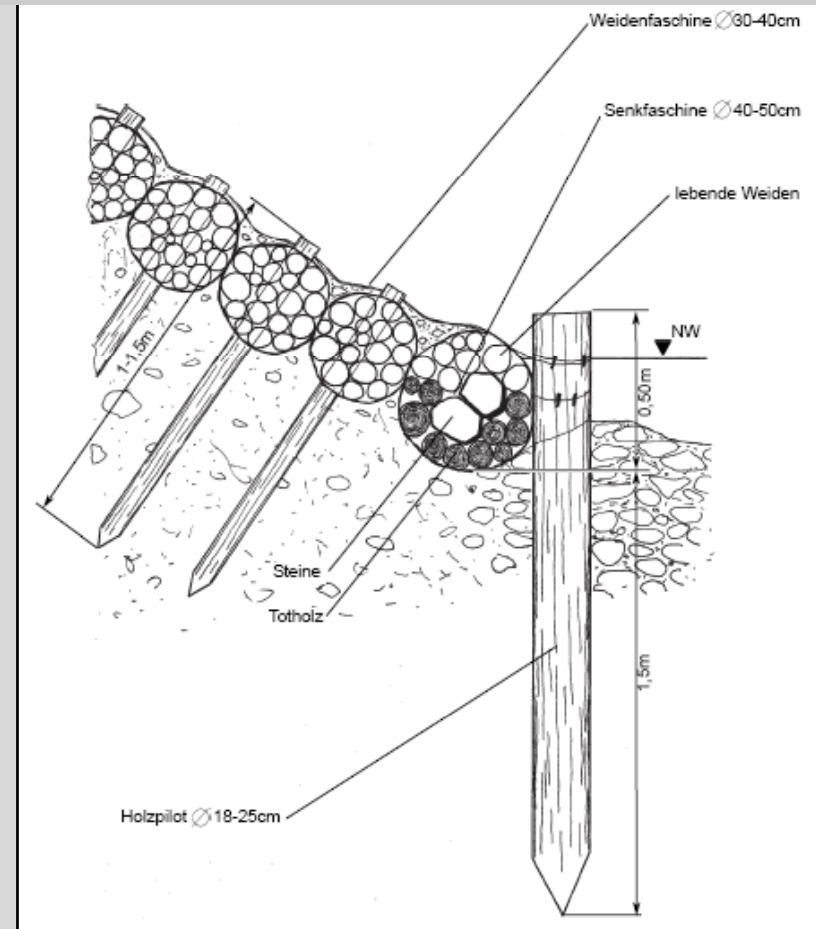


■ soil bioengineering measures

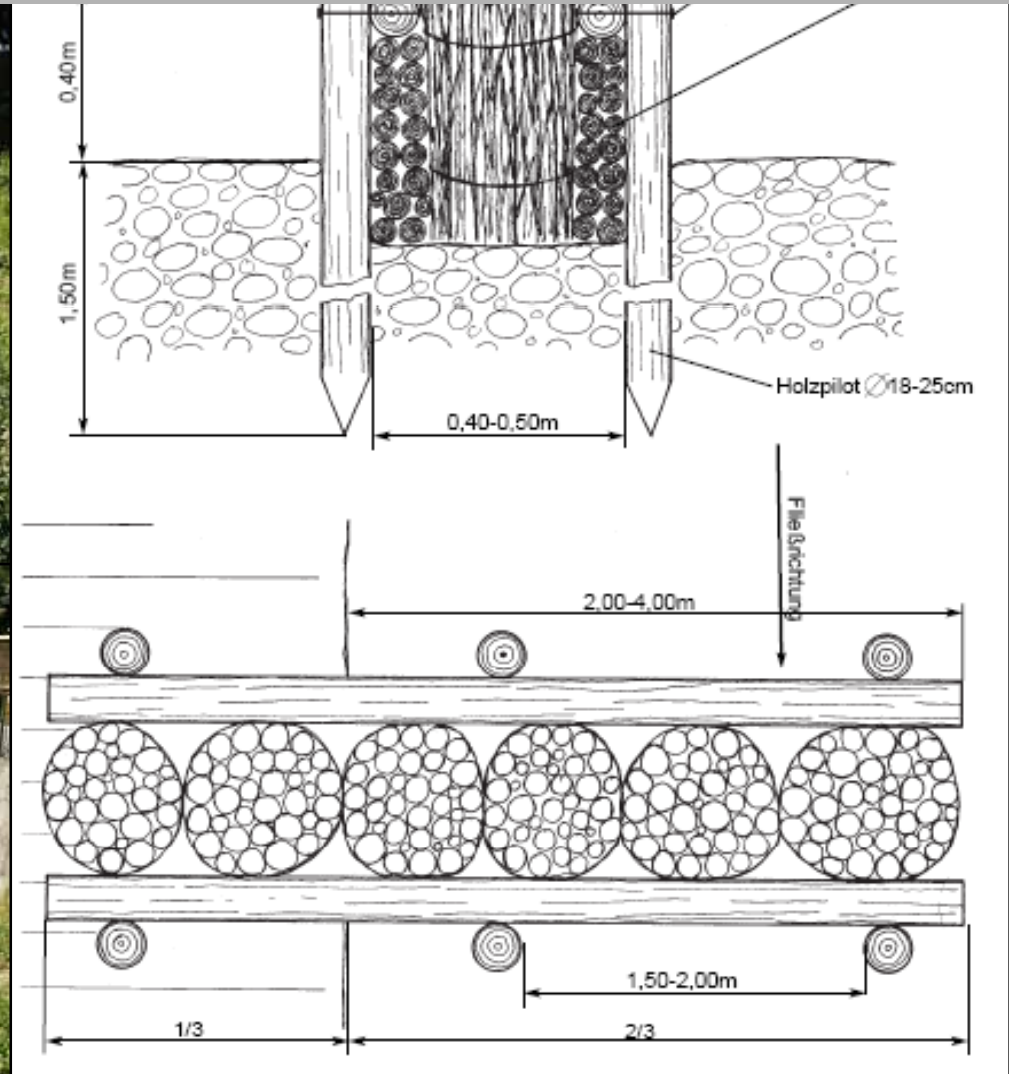
■ fascine rows



Senkfaschine und Weidenfaschine

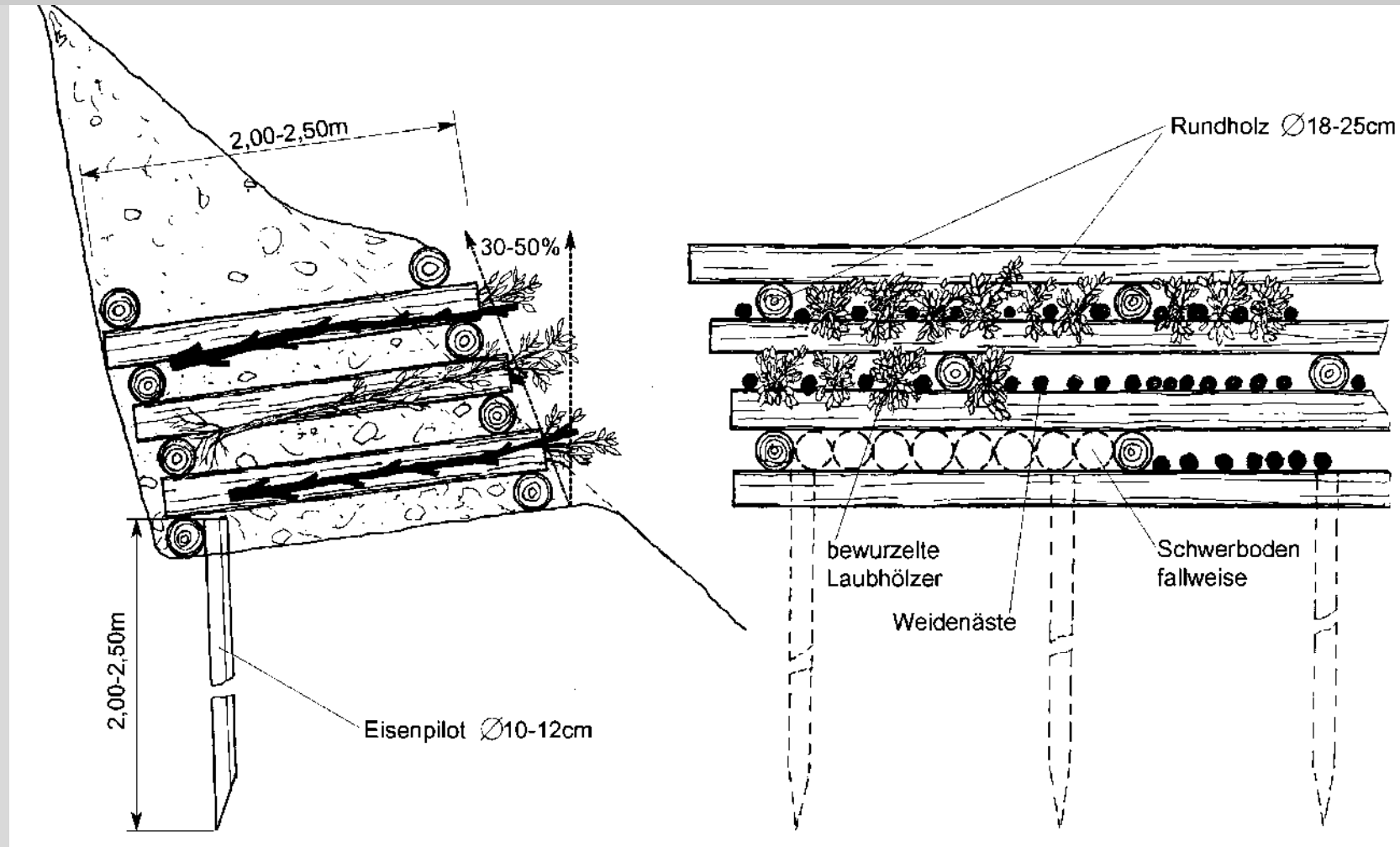


■ soil bioengineering measures



■ soil bioengineering measures

■ vegetated crib wall



■ soil bioengineering measures

■ vegetated crib wall



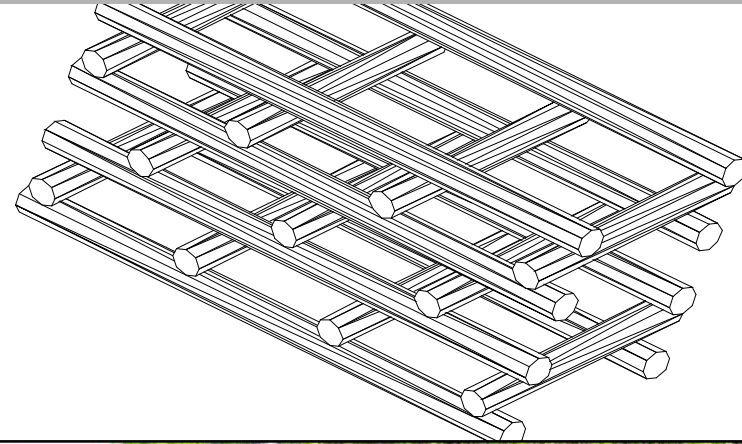
■ soil bioengineering measures

■ vegetated crib wall



■ soil bioengineering measures

■ vegetated crib wall

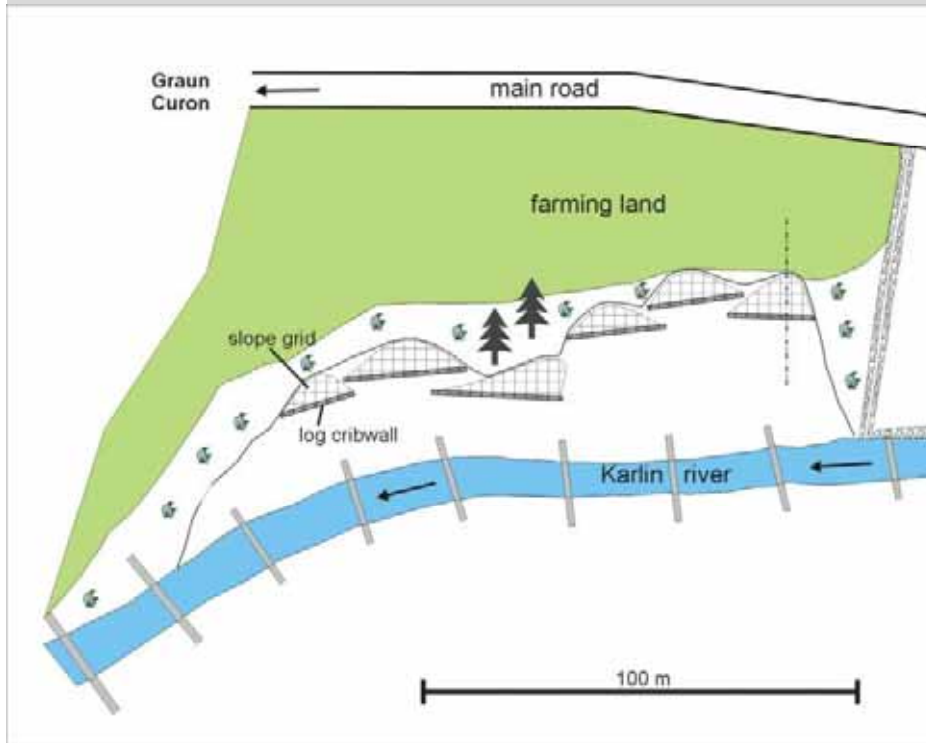


■ soil bioengineering measures

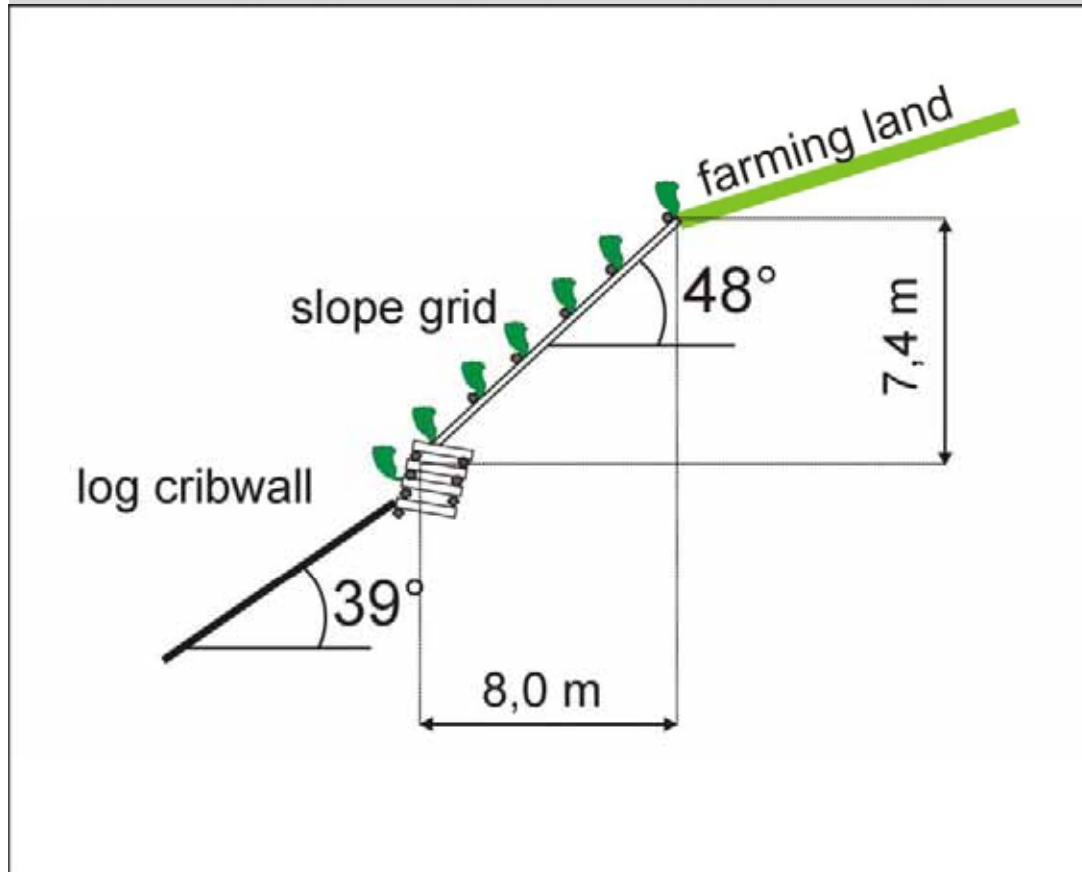
■ vegetated crib wall



- vegetated cribwall – construction site Langtaufers (I)

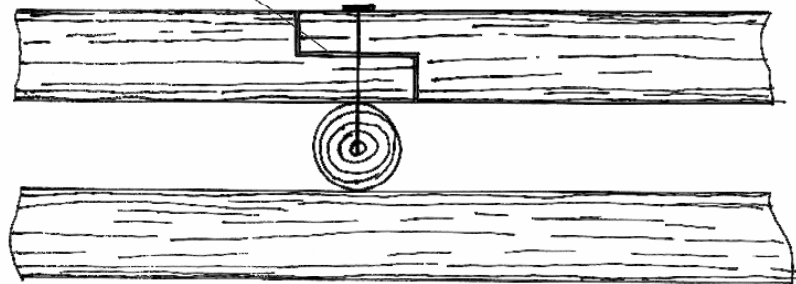


- vegetated cribwall – construction site Langtaufers (I)

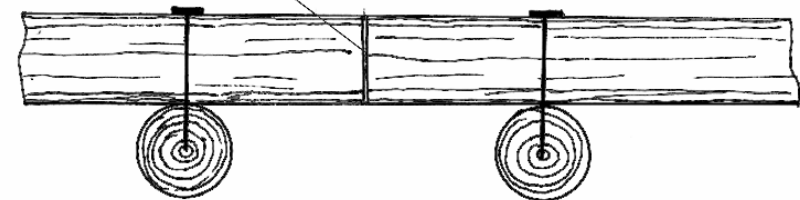


- vegetated cribwall

Überblattung



auf Stoß verlegt



- vegetated cribwall – compound effect of the logs



- vegetated cribwall - durability of wood

enhancement of the durability of logs:

- **using fresh wooden logs**
- **uniform moisture of wooden logs**
- **shadow of the plants**
- **using galvanized spikes**
- **using drilled and sharpened spikes**
- **no damage of the wooden structure**



- vegetated cribwall - walking excavator



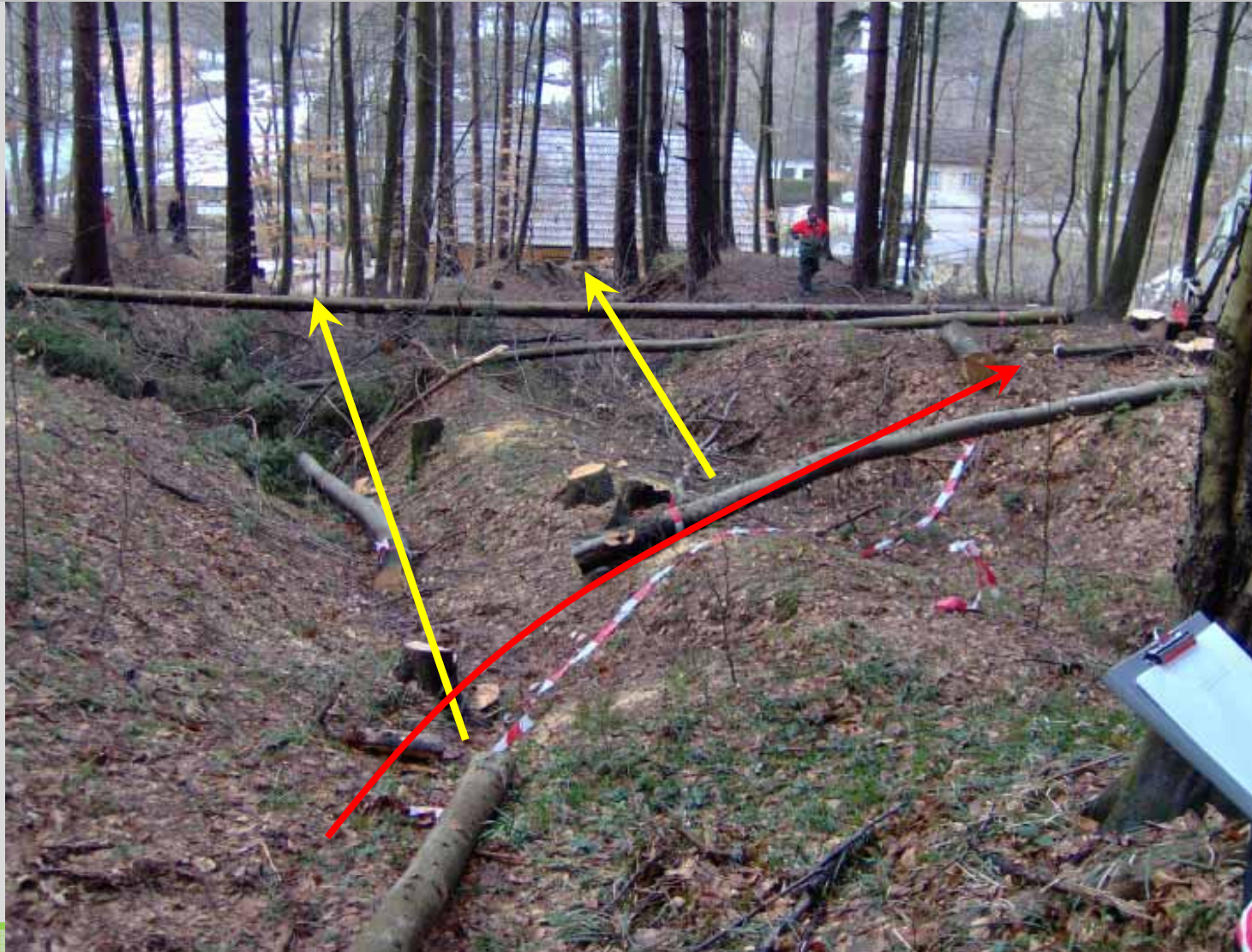
- vegetated cribwall - construction site 2006



- vegetated cribwall - WLV Bruck/Mur, Prolebbach, 2006



- vegetated cribwall - construction site Irental, Wien, 2006



- vegetated cribwall - construction site Irental, Wien, 2006



- vegetated cribwall - construction site Irental, Wien, 2006



- vegetated bamboo cribwall - construction site Nepal, 2001



- vegetated bamboo cribwall - construction site Nepal, 2001



- vegetated bamboo cribwall - construction site Nepal, 2001



- vegetated bamboo cribwall - construction site Nepal

2003



2005



- vegetated bamboo cribwall -construction site Kathmandu (N)



■ vegetated bamboo cribwall -construction site Kathmandu (N)



- vegetated bamboo cribwall -construction site Kathmandu (N)



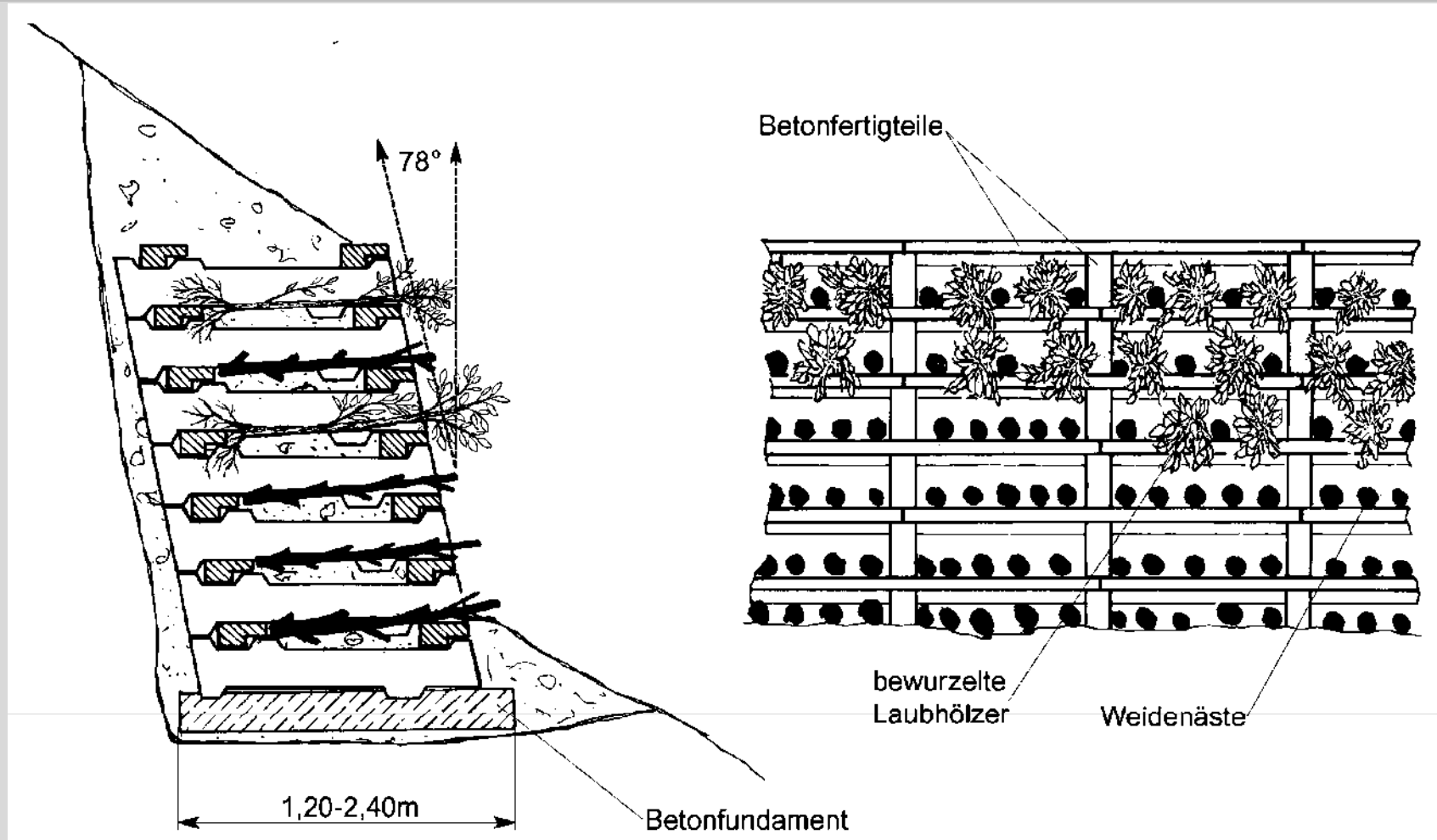
- vegetated stand alone cribwall - for noise protection



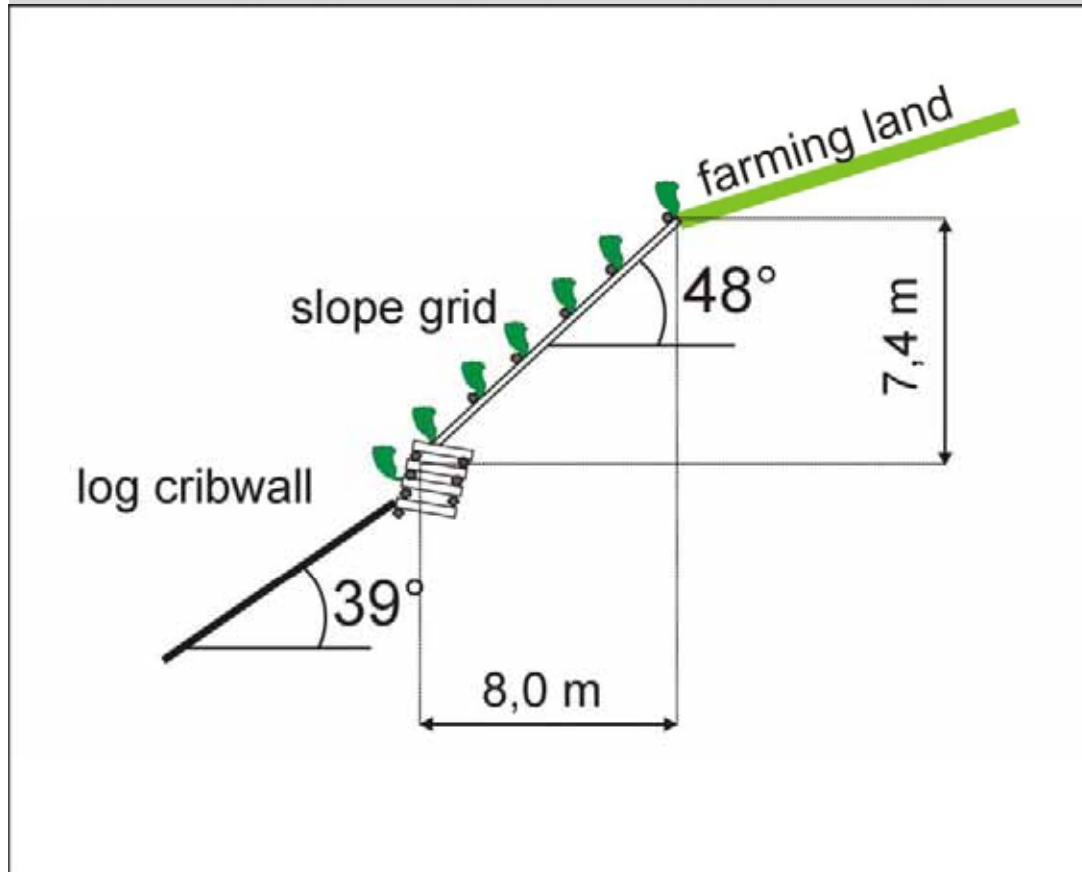
- vegetated stand alone cribwall - for noise protection



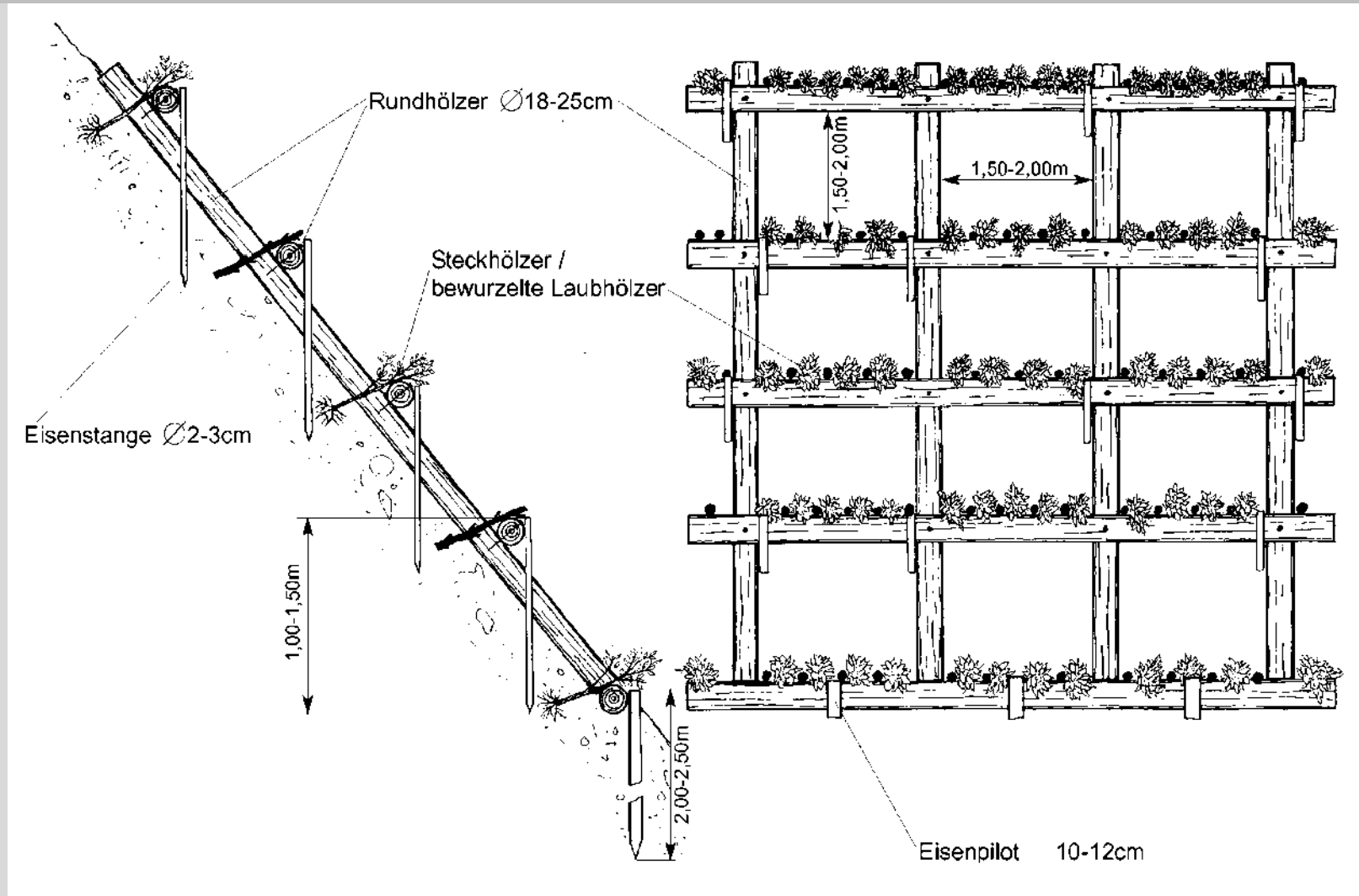
- vegetated concrete cribwall



- vegetated slope grid – construction site Langtaufers (I)



- vegetated slope grid



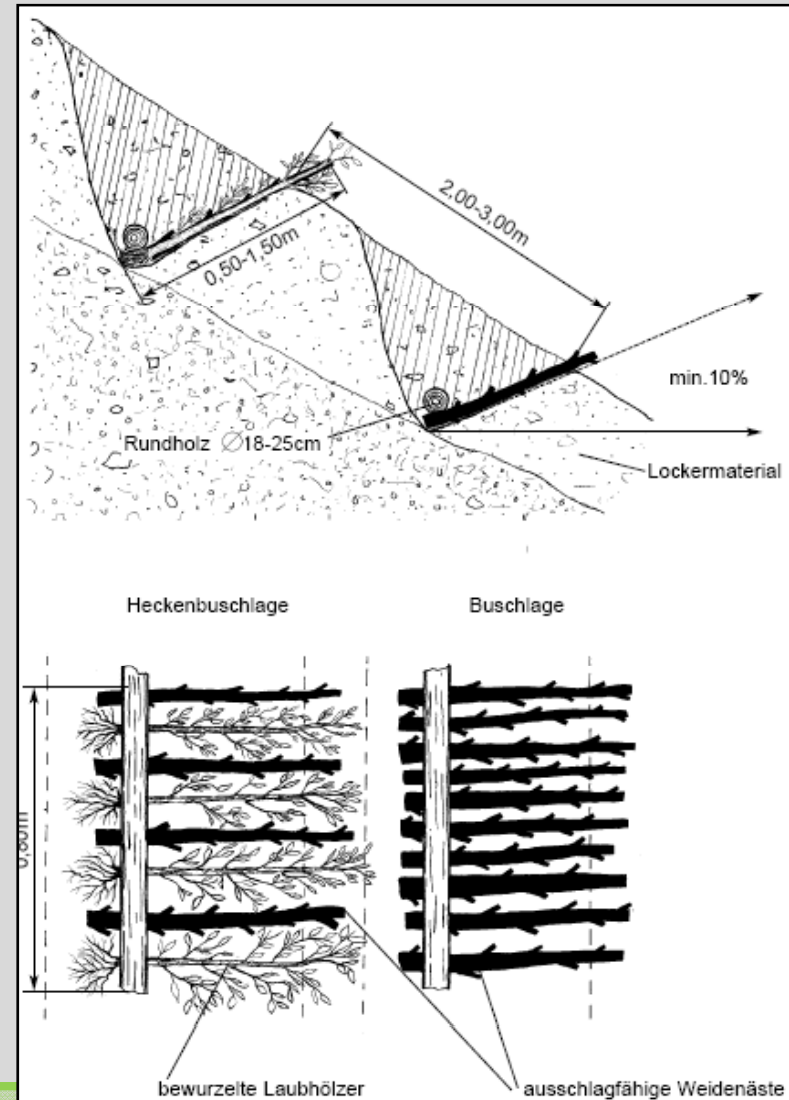
- vegetated slope grid – construction site Langtaufers (I)



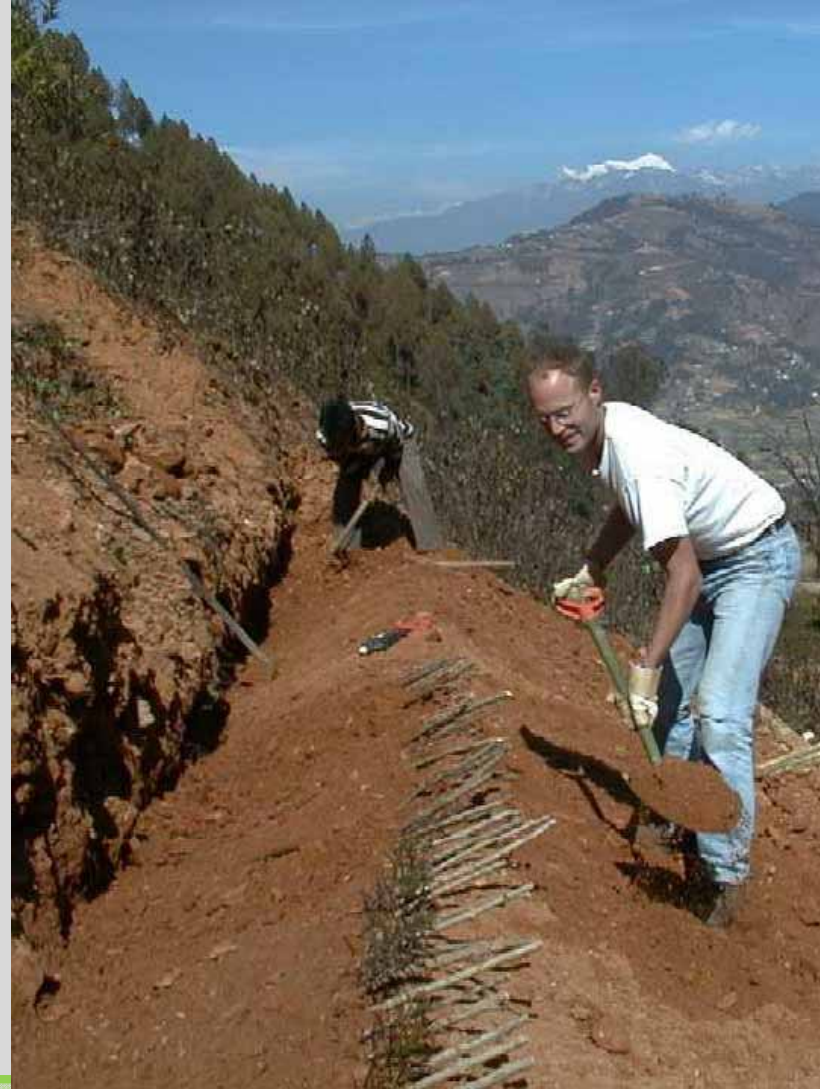
- vegetated slope grid – construction site Langtaufers (I)



- hedge brush layer – stabilising unconsolidated rock



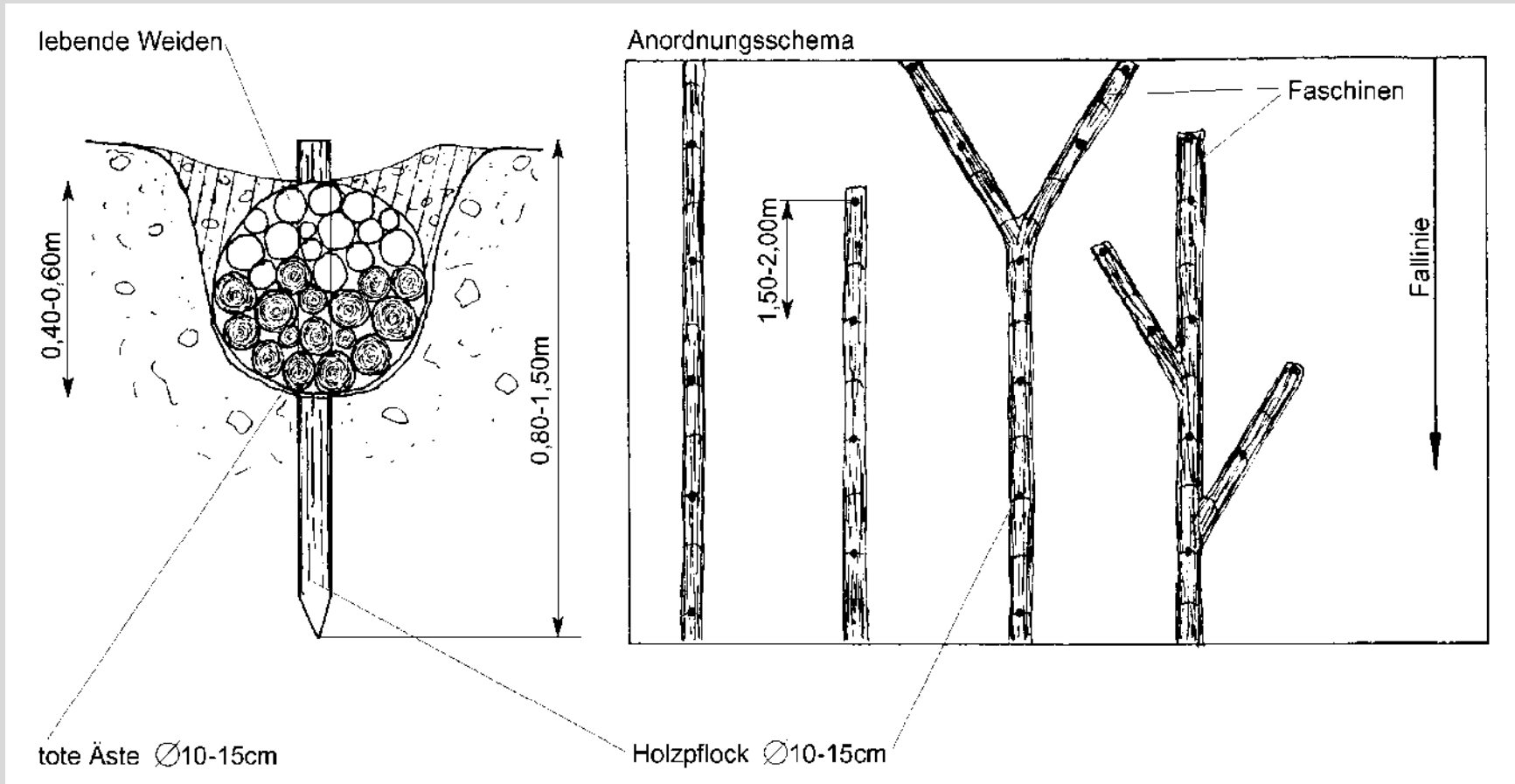
- hedge brush layer – Nepal (Thankot ,2002)



- hedge brush layer – WLV Bruck/Mur, Prolebbach, 2006



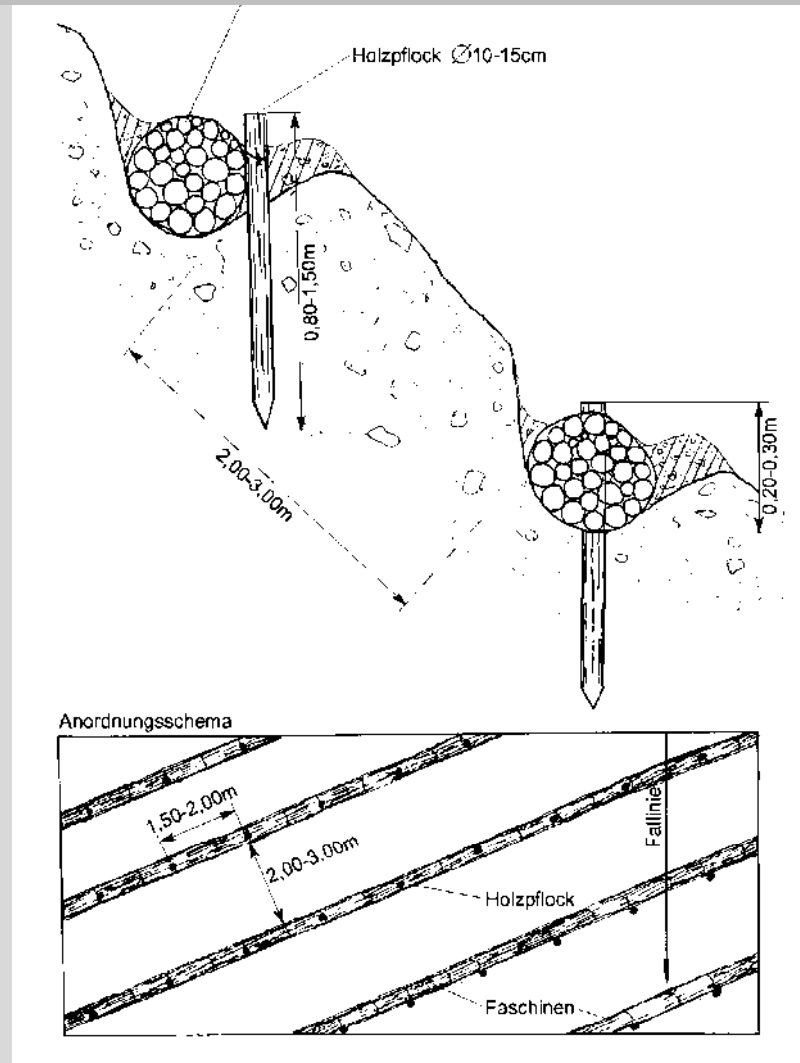
- drain fascine – principle



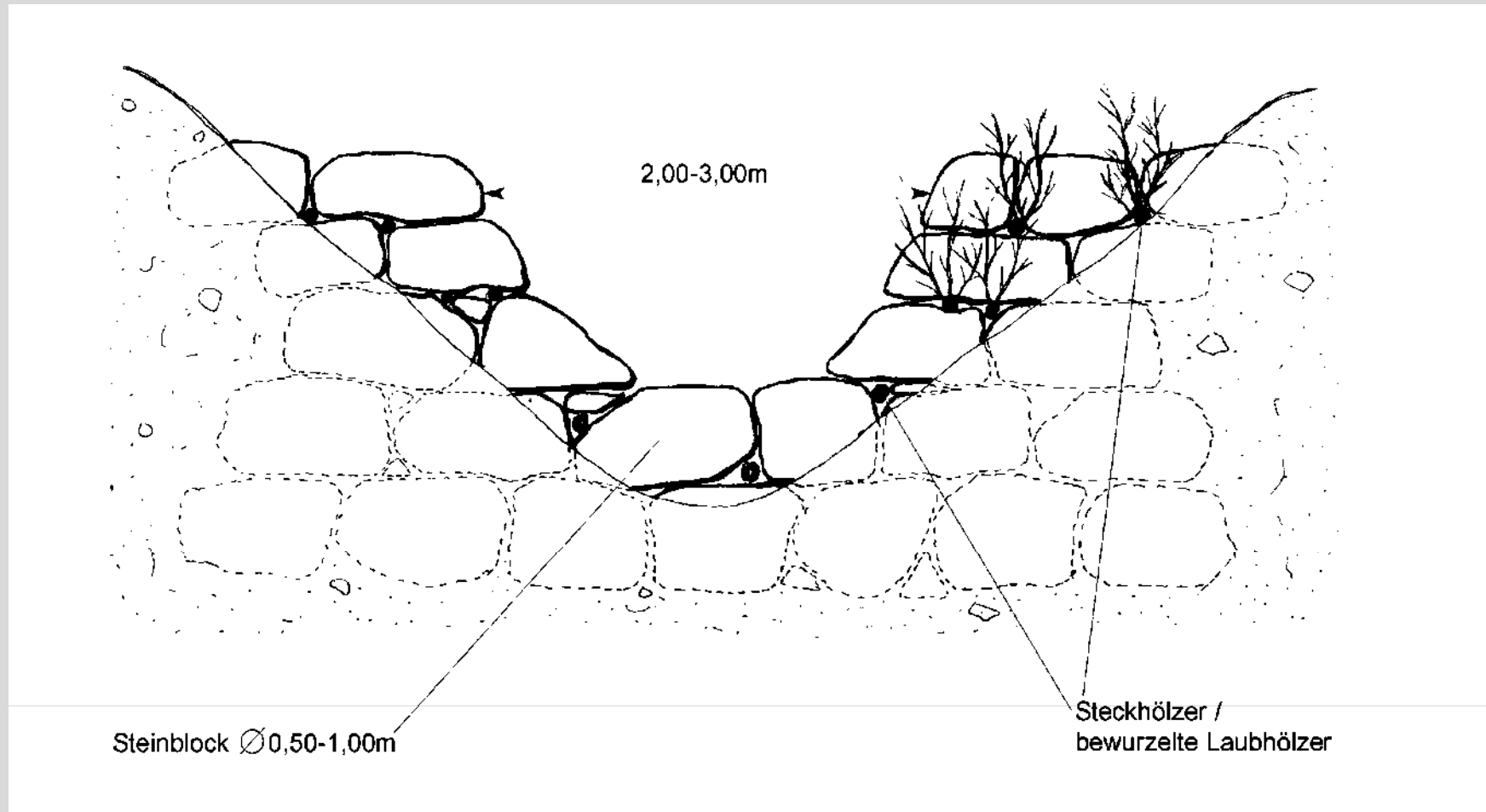
- drain fascine – construction site, Nepal, 2002



- drain fascine – principle



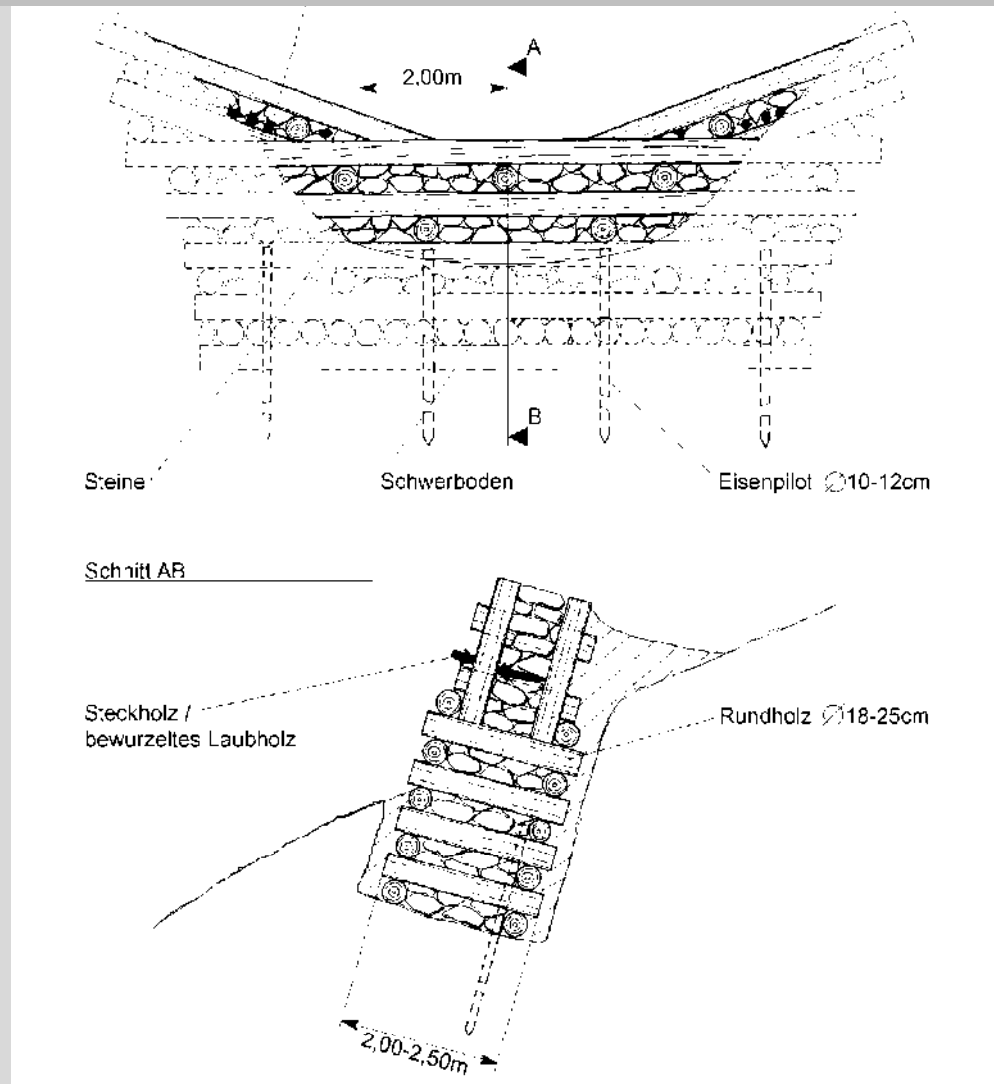
- rock check dam – construction principle



- rock check dam– WLV Bruck / Mur (Mitteraibach, 2006)



- wooden check dam – construction principle



- wooden check dam–WLV Bruck/Mur (Proleb, 2006)



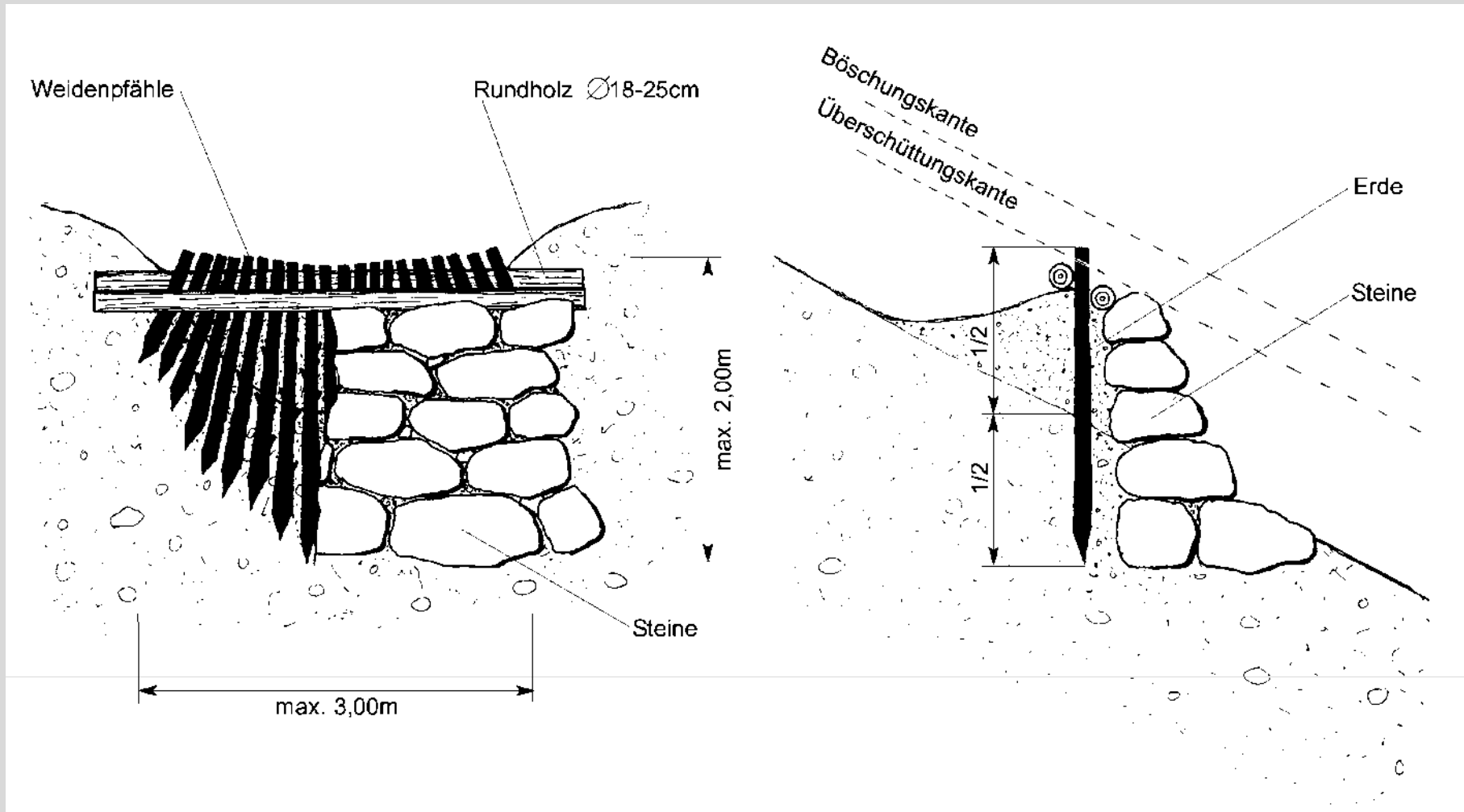
- wooden check dam–WLV Bruck/Mur (Proleb, 2006)



- wooden check dam – Meran 2000



- palisade - principle of construction



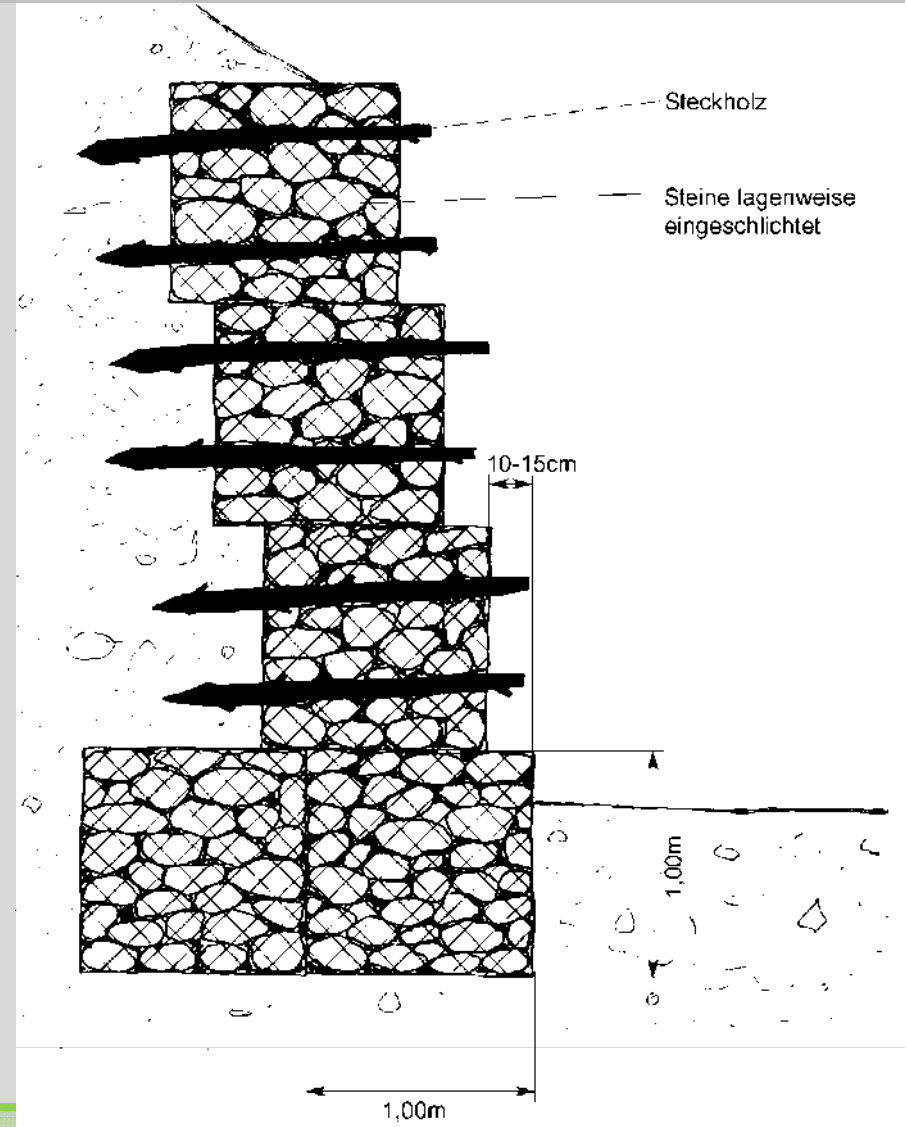
- palisade – construction site Nepal, Thankot, 2002



- palisade – construction site Nepal, Thankot, 2002



- gabion - principle of construction



- gabion - application

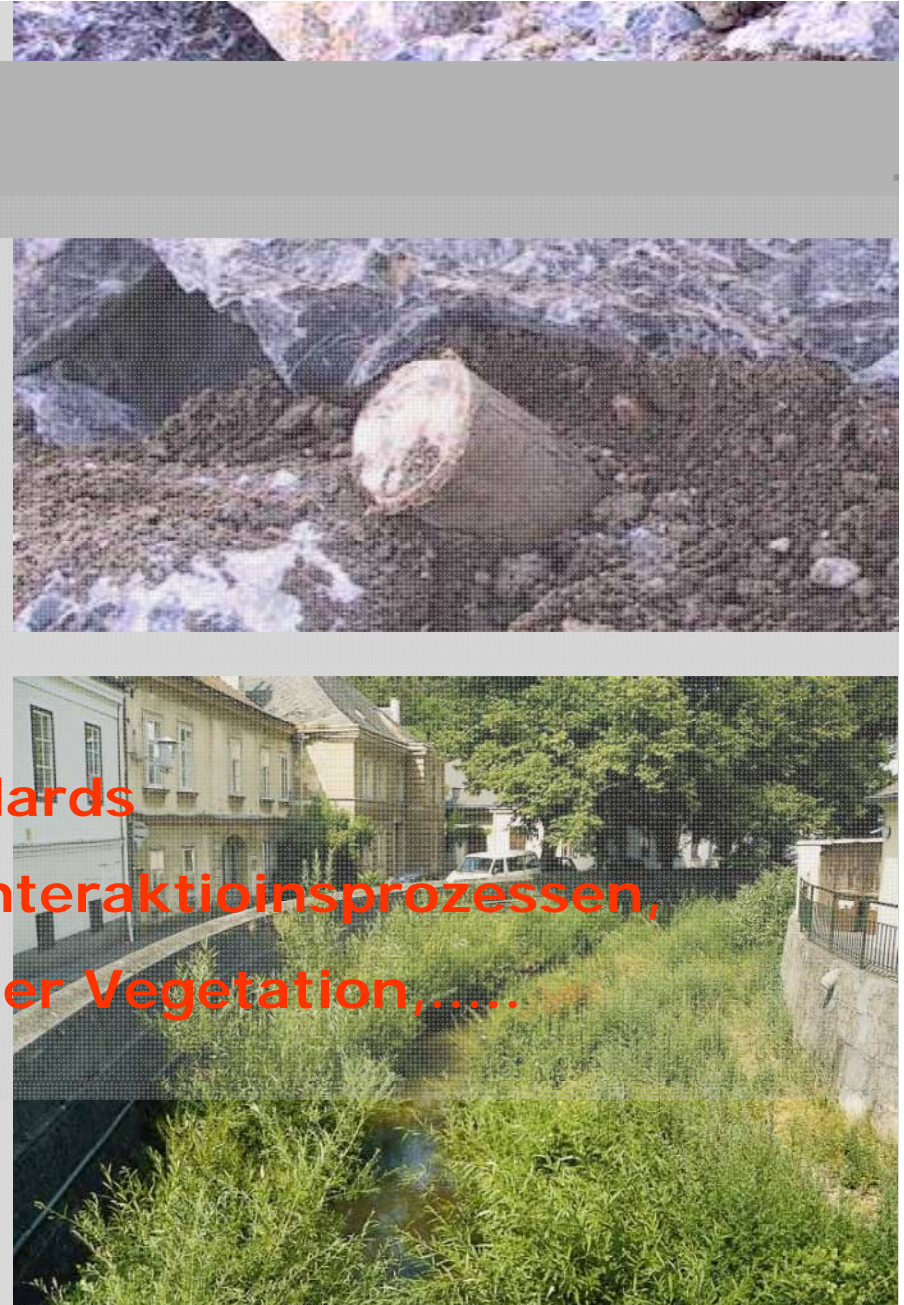


■ Zusammenfassung

✓ simple Technik

brush mattress, branch layer, fascine layer, fascine wall, cutting, vegetated crib wall, dead trunks, fascine groyne, wattle fence,.....

- ✓ Fehlen von Bemessungsstandards
- ✓ Forschung – Erfassung von Interaktionsprozessen, biomechanischen Verhalten der Vegetation,.....



kef

commission for development studies
at the austrian academy of sciences

