Establishment of small bench terraces, using hoes, in Chiang Mai Province, Thailand. The steep risers are compacted and a small drainage channel is formed on approximately every fourth terrace. (Samran Sombatpanit)

Small level bench terraces ( )

Khan ban dai din khanard lek (Thai)

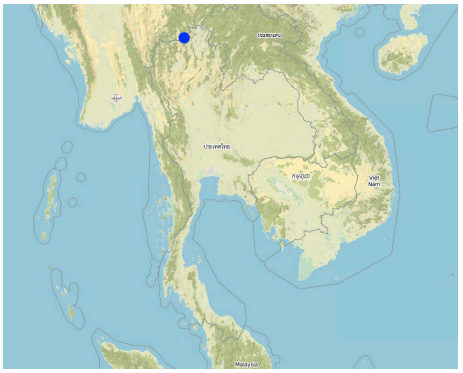
Terraces with narrow beds, used for growing tea, coffee, and horticultural crops on hillsides cleared from forests.

The terraces described in this case study from northern Thailand are found on hilly slopes with deep soils. The climate is humid and tropical, with 1,700-2,000 mm of rainfall annually. The main aim of the terraces is to facilitate cultivation of tea or coffee on sloping land: erosion control is secondary. Coffee and tea, as well as flowers and vegetables, are good alternatives to opium poppies - which it is government policy to eradicate.

Purpose of the Technology: After clearing natural and secondary forests by slash and burn, terraces are aligned by eye - and constructed by hoe. The width of the bed is 1.0-1.5 m depending on slope, though there are no specific technical guidelines. The length of each terrace can be up to 25 m. Down the slope, after every 3-4 terraces, there are lateral drainage channels, approximately 20-30 cm wide and 10 cm deep. Situated at the foot of a riser, each channel has a gradient of 0.5% or less. Excess water - some of which cascades over the terrace risers, with some draining through the soil - is discharged through these channels, generally to natural waterways. The risers are steep, with a slope of above 100%, and without a defined lip.

Establishment / maintenance activities and inputs: Natural grass cover develops on the risers: this is cut back by hand hoe or machete, or completely removed. The grass is often burned. After harvest (of annual crops), the land is left until immediately before the next rainy season. The terraces at this stage are covered by weeds and grasses. Land is then tilled by hoe. The weeds and grasses are removed and heaped in piles outside the cropped area. They are not composted or used for mulching - and here an opportunity is missed. Where soil fertility is a problem, chemical fertilizers are used. Maintenance includes building up/repairing of risers and levelling of terrace beds as required.

Natural / human environment: The technology was pioneered, and continues to be practiced, by refugee immigrants from China looking for new areas to start farming. These immigrants first came in the 1950s, and cultivated simply through slash and burn techniques. During the 1970s they visited relatives in Taiwan and brought back the idea of small terraces. Originally they settled illegally, but eventually they were given official permission to stay. However, official title deeds to their land have not yet been allocated.



: Amphur Mae Fa Luang, ChiangMai,

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- 99.2598, 19.8917

: (approx. 1-10 2)

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✓

(> 50)

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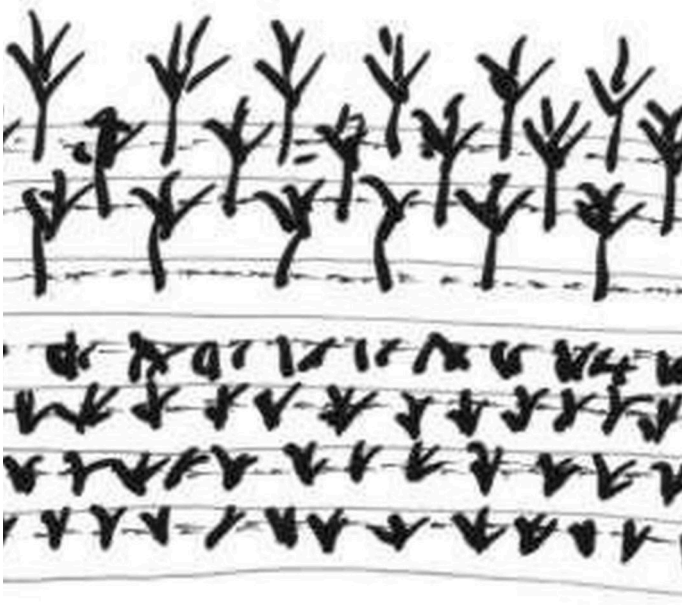
Well-established small bench terraces under horticultural crops, Chiang Mai Province, Thailand. (Samran Sombatpanit)



Artist's impression of small bench terraces (Samran Sombatpanit (Bangkok, Thailand))

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- Ha:

SLM

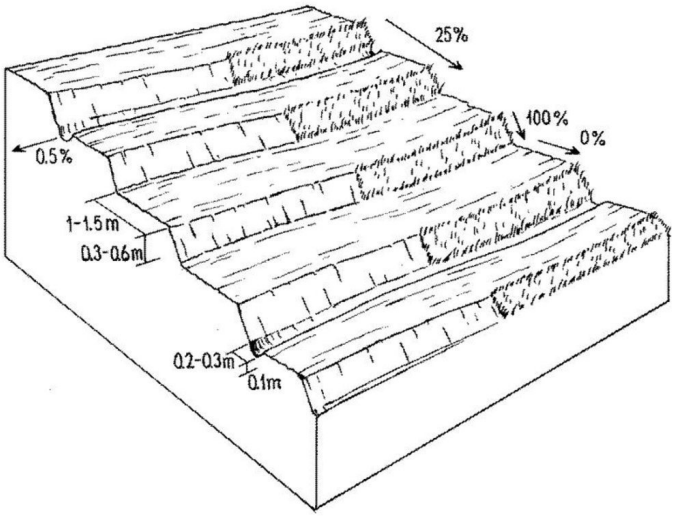
SLM

- V2:

2

- S1:

Layout of small level bench terraces. After every third or fourth terrace a lateral drainage channel is built. Later, protective grass cover is established on the risers (right).



Author: Mats Gurtner

Technical knowledge required for field staff / advisors: moderate

Technical knowledge required for land users: moderate

Main technical functions: control of dispersed runoff: retain / trap, reduction of slope angle, reduction of slope length

Secondary technical functions: control of concentrated runoff: impede / retard, increase of infiltration, increase / maintain water stored in soil

Vegetative measure: grass on risers (optional)
Vegetative material: G : grass

Vegetative measure: Vegetative material: G : grass

Vegetative measure: Vegetative material: G : grass

Vegetative measure: Vegetative material: G : grass

Terrace: bench level
Vertical interval between structures (m): 0.4
Spacing between structures (m): 0.3
Height of bunds/banks/others (m): 0.4
Width of bunds/banks/others (m): 1.5
Length of bunds/banks/others (m): 25

Structural measure: drainage channels
Depth of ditches/pits/dams (m): 0.1
Width of ditches/pits/dams (m): .02 - .3

Construction material (earth): It is the earth dug in situ.

Lateral gradient along the structure: 0%

Vegetation is used for stabilisation of structures.

- **Baht**
- ( ) 1 USD = 37.0 Baht
- 2.16

The slope factor affects most because it will require longer time to construct.

1. Layout is simply by eye and best judgment. (/ : None)
2. Work begins on the lower part of the slope, and then progresses uphill. (/ : None)
3. Farmers cut into the hillside with hoes and drag the soil down to formthe risers and level the terrace beds. (/ : None)
4. Risers are then stabilised/compacted by hoe. (/ : None)

			(Baht)	(Baht)	%
Labour	ha	1,0	270,0	270,0	100,0
Tools	ha	1,0	5,0	5,0	100,0
				275.0	
				7.43	

1. Weeds and grasses are removed and piled outside the cropping area. (/ : None)
2. Land is prepared through tillage by hoe. (/ : None)
3. Risers are built up/repaired where necessary. (/ : None)
4. Terrace beds may need levelling. (/ : None)

			(Baht)	(Baht)	%
Labour	ha	1,0	45,0	45,0	100,0
Tools	ha	1,0	45,0	45,0	100,0
				90.0	
				2.43	

SLM

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

✓

Average 1600-1800 mm
Thermal climate class: tropics

(0-2%)
(3-5%)
(6-10%)
✓ (11-15%)
✓ (16-30%)
(31-60%)
(>60%)

✓
✓

0-100
101-500
✓ 501-1,000
✓ 1,001-1,500
1,501-2,000
2,001-2,500
2,501-3,000
3,001-4,000
> 4,000

(0-20)
(21-50)
✓ (51-80)
✓ (81-120)
(> 120)

( )
/ ( )
✓ (,)
/ ( )

(> 20)
/ ( )
(,)
/ ( )

(>3%)
(1-3%)
✓ (<1%)

< 5
5-50
> 50

/

( )
( )

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/
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SLM

✓ ( )
(/)
✓ /

10%
✓ 10-50%
50%

✓
✓

✓
✓
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(
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)

< 0.5
0.5-1
1-2
2-5
5-15
15-50
50-100
100-500
500-1,000
1,000-10,000
> 10,000

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illegal (initially) (see Annex T3)

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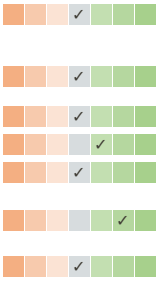
illegal (initially) (see Annex T3)



Production is not decreased.

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/
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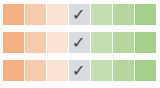
Ease of cultivation. Can walk and work in the farm easier

Input constraints

increased decreased



SLM: 20
SLM: 15

During dry spells due to increased infiltration

SLM: 50
SLM: 10
Soil erosion is reduced

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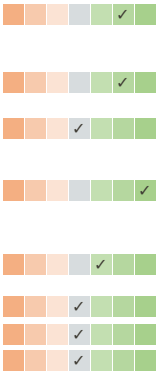

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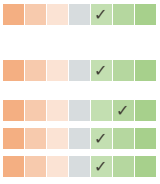

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/

- 1-10%
- 11-50%
- > 50%

?

- 0-10%
- 11-50%
- ✓ 51-90%
- 91-100%

/

500

?

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( )

:

- For facilitating picking of tea leaves
- For using as farm path
- For increasing soil fertility

:

- A relatively cheap method of terracing which makes cultivation easier and provides erosion control

  How can they be sustained / enhanced? Should be further promoted by extension
  agencies (in areas where cultivation is officially allowed). Allocation
  of official title deeds to land will speed up the adoption automatically.
- For improving/maintaining soil fertility
- For increasing the yield of tea leaves

  How can they be sustained / enhanced? Inspecting the field during/after rain to see how efficient they are in conserving soil and water and repair as needed
- For using as farm path
- Compared with normal bench terraces, construction does not bring infertile subsoil to the surface.

/ / :

- Farmers have to pay for its construction. The government may be able to help in the future.

/ / :

- Does not lend itself to mechanisation: the terrace beds are narrow and only suited to hand hoeing. Teach farmers techniques of composting and/or mulching.
- In this situation grasses and weeds are merely piled and burned rather
  than being used to improve soil fertility

Editors

Samran Sombatpanit

Fabian Ottiger
Alexandra Gavilano

: 6 2011 : 7 2019

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Wichai Cheewinkuntong - SLM

https://qcat.wocat.net/km/wocat/technologies/view/technologies_1404/

SLM

- World Association of Soil and Water Conservation (WASWC) -
- Book project: where the land is greener - Case Studies and Analysis of Soil and Water Conservation Initiatives Worldwide (where the land is greener)

- No references: