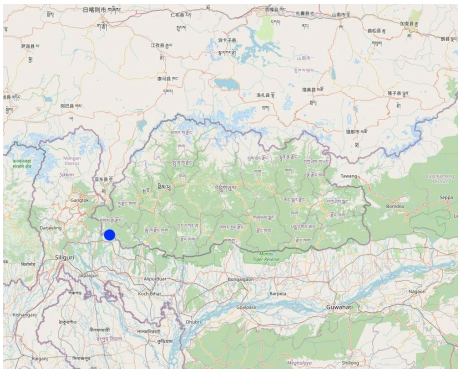
Consolidated Terraces (Irrigated Paddy Fields) (Sonam Wangchuk)

Terrace Consolidation by Machine ( )

Thruel Chhey Lag Len Thap Tey Aring Ja Kaed Tang Ni (ཐྲུལ་ཆས་ཐོག་ཙམ་རིང་བརྒྱ་སྐྱེད་བཏང་ནི།)

Terrace consolidation is the merging of existing narrow bench terraces into larger terraces to enable farm mechanization, commercial farming and crop intensification. This technology is promoted as the existing terraces are generally narrow and this limits efficient operation and utilization of land and other resources.

Terrace consolidation involves merging of small terraces into larger terraces using a machine to make more efficient use of land through farm mechanization, commercial farming and crop intensification. This technology is promoted as the existing terraces are generally narrow and this limits efficient operation and utilization of land and other resources.
The consolidation of narrow terraces is recommended if the general slope of the proposed site is less than 20° (36%) with good soil drainage and low risk of land degradation. While consolidating narrow terraces, it is strongly recommended to remove the topsoil from the terraces and put it back once the levelling is completed. The consolidated terrace should maintain a maximum riser height of 1.5 m and bed width of 3.5 m. For slopes below 12° (21%), the bench width should not exceed 5–6 m.
Farmers can expand the amount of arable land available, maximize agricultural operations, and encourage sustainable farming methods for higher crop output and enhanced ecological resilience by converting narrower and more steep bench terraces into bigger ones (NSSC, 2020). A large portion of hillside farmers around the world rely on terracing. For the purpose of facilitating the growth of field crops, horticultural crops, fodder, and other crops that require specific management practices (e.g., irrigation), alone or in agroforestry systems, hilly or mountainous terrains are divided into narrow but graduated steps, typically 2-3 m wide and 50-80 m long across the slopes (Chapagain & Raizada, 2017).
Enlargement of terraces begins with a thorough survey and analysis of the topography and terrain. In order to build larger terraces with the least amount of environmental damage, this phase is essential. The next step in the construction process is to reshape the present, small terraces into larger, more open ones. To make wider terraced levels, this may entail moving soil and cutting through slopes. Furthermore, filling up the gaps and levelling the land's surface is required in order to reduce the number of risers and produce a continuous, gently sloping terrace. The installation of suitable drainage systems is also crucial to guarantee adequate water management and stop soil erosion.
Larger terraces enhance water management capabilities. With a more extensive surface area, water runoff is minimized, and the distribution of irrigation water becomes more even, promoting better soil moisture retention and reducing erosion. This, in turn, contributes to soil health and fertility, supporting sustainable farming practices. Moreover, the consolidation of smaller terraces into larger ones reduces the overall number of risers, thereby enhancing accessibility for farmworkers and farm machinery. This ease of access further optimizes the use of resources and fosters better crop management. Additionally, larger terraces can enable the implementation of crop diversification strategies, such as intercropping and crop rotation, promoting biodiversity and mitigating the risk of crop failure due to pests or adverse weather conditions.
However, the process of enlarging terraces involves altering the terrain, which can lead to soil erosion, habitat destruction, and ecological imbalances. This environmental impact may negatively affect local flora and fauna, reducing biodiversity and disrupting the delicate ecological equilibrium (Deng et al., 2021). Planning for safe discharge of excess water out of the terrace system effectively helps preserve soil fertility and reduces runoff. It is essential also to pay close attention to the preservation of the local ecosystem and biodiversity throughout the process.



: Sang-Ngag-Chhoeling, Samtse,

: 2-10

- 88.97161, 26.95436

: (approx. < 0.1 2 (10))

?:

: 2021

(> 50)

/

Terrace Consolidation in Progress using an excavator (Tashi Wangdi)

Consolidated Terraces (Sonam Wangchuk)

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- Wt:
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SLM
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SLM
- S1:
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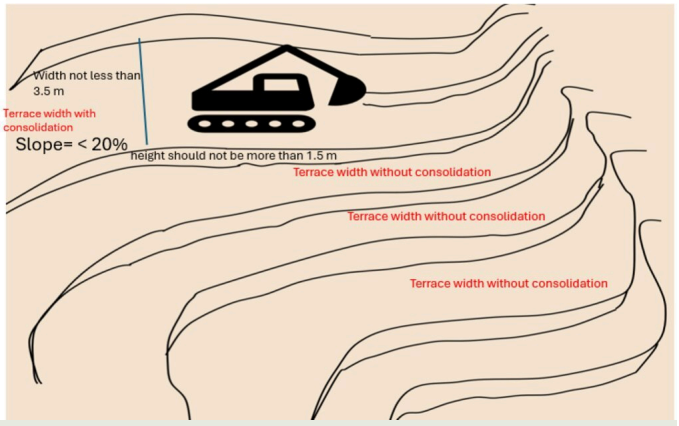
consolidation of old and small terraces with machines



Author: karma Wangdi

- (**2.5 acre** = 1ha)
- **Ngultrum**
- ( ) 1 USD = 80.0 Ngultrum
- 500

The major factor affecting the cost for implementing this technology is in hiring of excavator

1. Secure funding support from GCF (/ : January (Before cropping))
2. Action planning in consultation with beneficiaries and the stakeholders (/ : February (Before cropping))
3. Arrangement of excavator machine (/ : First week of March (Before cropping))
4. Activity implementation (/ : Second week of March till April (Before cropping))

			(Ngultrum)	(Ngultrum)	%
Assisting operator (reaching fuel)	no	60,0	500,0	30000,0	100,0
Labelling of terraces	no	60,0	500,0	30000,0	100,0
Hiring of Excavator	day	6,0	20000,0	120000,0	
				180'000.0	
				2'250.0	

n.a.

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

- [ ]
- [x]
- [ ]
- [ ]

1500.0

The gewog experiences mostly heavy shower with annual rainfall ranging from 1500 mm to 4000 mm

National Center for Hydrology and Metrology (NCHM), Bhutan

Subtropical monsoon climatic zone

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

- [ ]
- [x]
- [ ]
- [ ]
- [ ]
- [ ]

- [ ] 0-100
- [ ] 101-500
- [x] 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

- [ ]
- [x]
- [ ]

- [ ] (0-20)
- [x] (21-50)
- [ ] (51-80)
- [ ] (81-120)
- [ ] (> 120)

( )

- [ ] / ( )
- [ ] (,)
- [ ] / ( )

(> 20)

- [ ] / ( )
- [ ] (,)
- [ ] / ( )

- [ ] (>3%)
- [ ] (1-3%)
- [ ] (<1%)

- [ ] < 5
- [x] 5-50
- [ ] > 50

- [ ]
- [x]
- [ ]
- [ ] /

( )

- [x]
- [ ] ( )
- [ ] ( )
- [ ]

?

- [ ] /
- [x]
- [x] /
- [ ]

SLM

10%
10-50%
50%

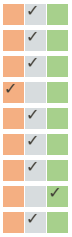
/

/

/

< 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

Family



Before the terrace consolidation they used to have minimum production but now they are producing for both self consumption and commercial purpose. these are expert estimates or data measured.

The merging of small terraces has increased the cropping area. These are expert estimates or data measured.

Overall Land management has become easier for them as they can use more machines due to larger flat terraces

The deployment of number of labor has reduced with the intervention of farm machineries, thus reducing the cost of production with reduced time and man power. These are expert estimates or data measured.

Farm income has increased compared to past as they have larger area of cultivation.

The time and resources saved from this technology intervention has been beneficial in for other use. These are expert estimates or data measured.

Due to mechanized farming favoured by terrace consolidation, the workload at an individual level has significantly reduced. These are expert estimates or data measured.

/

The increased cropping area and contributed in increase in production, thus enhancing the food and nutrition security. These are expert estimates or data measured.

The better crop productivity is found to be contributing better health quality of the farm household. These are expert estimates or data measured.

SLM /

Could have better understanding on SLM and its benefits through the sensitization programs. These are expert estimates or data measured.

The flat terraces has been always been adventitious in controlling overall soil and nutrient loss. These are expert estimates or data measured.

Because of very minimum soil loss, the soil accumulation rate in these terraces has been very high. These are expert estimates or data measured.

( )

/

1-10%
11-50%
> 50%

?

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

/

8 households

?

/

?

/

( )

:

- Increased production
- Enhanced farm mechanization and workability

:

- Reduced surface runoff
- Optimal use of resources
- Increased production
- Enhanced farm mechanization and workability

/ / :

- cost for terrace consolidation help and support through government and projects

/ / :

- Heavy and large machineries (excavator) used to carry out terrace consolidation might pose soil compaction and sealing Use of smaller excavators specifically designed for terracing

Editors

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: 21 2023 : 4 2024

Ram Bahadur Limbu -

https://qcat.wocat.net/km/wocat/technologies/view/technologies_6871/

SLM

- National Soil Services Centre, Department of Agriculture, Ministry of Agriculture & Livestock (NSSC) -
- Strengthening national-level institutional and professional capacities of country Parties towards enhanced UNCCD monitoring and reporting – GEF 7 EA Umbrella II (GEF 7 UNCCD Enabling Activities_Umbrella II)

- BHUCAT, NSSC, 2011: Website
- Agronomic Challenges and Opportunities for Smallholder Terrace Agriculture in Developing/ Countries/: https://doi.org/10.3389/fpls.2017.00331
- Advantages and disadvantages of terracing/A comprehensive review. International Soil and Water Conservation Research: https://doi.org/10.1016/j.iswcr.2021.03.002
- PARTICIPATORY SLM ACTION PLAN 2020 /Supporting Climate Resilience and Transformational Change in the Agriculture Sector in Bhutan Funded by Green Climate Fund.: https://www.bhutangcf.gov.bt/wp-content/uploads/2021/12/SLM_Action-Plan_2020.pdf
- Soil and Water Conservation / Lesson 5 Terraces for Water Erosion Control: http://ecoursesonline.iasri.res.in/mod/page/view.php?id=2098