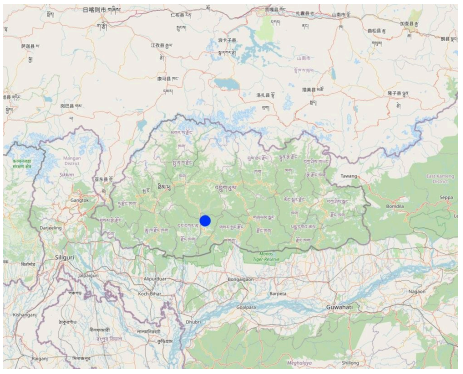
Adoption of technology in early chili production (Dhan Gallay)

Plastic mulching for cash crops ( )

Nyuel Thok Nang Chhu Sho Thing Ni (དཉུལ་ཐོག་ནང་ཆུ་ཤོ་ཐིང་ནི།)

Plastic mulching comprises thin plastic sheets laid out on raised soil surfaces around plants to help conserve soil moisture, prevent water and wind erosion, control weeds, and regulate soil temperature. It is used in agriculture to increase crop yields. However, there are environmental concerns about soil contamination and waste disposal.

Plastic mulching is a widely used agricultural practice in Bhutan, primarily employed in the cultivation of cash crops. Farmers have adopted plastic mulching to enhance crop production and address specific agricultural challenges. It allows farmers to optimize water usage by reducing evaporation and maintaining soil moisture levels, which is crucial in regions where water resources are limited. It also helps suppress weed growth, minimizing competition for nutrients and ensuring healthier crop growth. Additionally, the regulation of soil temperature through plastic mulching can extend the growing season and improve crop quality and yields. These benefits are particularly valuable in Bhutan's mountainous terrain and varied climatic conditions.
However, the application of plastic mulching can have both direct and indirect impacts on the natural environment. Improper disposal or management of plastic mulch can lead to environmental pollution, including soil contamination and plastic waste accumulation. Therefore, sustainable practices and appropriate waste management techniques are crucial to minimize the potential negative effects on the natural environment.
Plastic mulching serves several purposes and functions in agricultural practices. One of its primary functions is moisture conservation, as it helps prevent water evaporation from the soil surface by acting as a barrier. Additionally, plastic mulch controls weeds by blocking sunlight and inhibiting weed seed germination, reducing competition for nutrients. Another important function is soil temperature regulation, as plastic mulching traps heat from the sun, raising soil temperatures in cooler climates and promoting faster plant growth. Overall, plastic mulch contributes to enhanced crop performance.
Furthermore, it helps prevent soil erosion by protecting the soil surface from wind and water erosion, thus maintaining soil structure and fertility, and creating a barrier between plants and the soil, reducing the risk of soil-borne pests and diseases affecting the crops. It can also deter certain pests by disrupting their habitat and limiting access to plants.
Plastic mulching involves the use of thin sheets or films made of polyethylene or similar materials, which come in various colours and thicknesses. Manual tools are utilized to lay the sheets evenly over the prepared soil. Before laying the plastic mulch, the soil is typically ploughed, levelled, raised, and cleared of debris to create a smooth surface. To prevent displacement by wind or other factors, the plastic mulch needs to be securely anchored to the ground. Plastic mulching can be combined with drip irrigation systems to provide water and nutrients directly to the plant roots.
Some specific advantages pointed out by the land user include the opportunity to achieve higher returns on agricultural investments. It reduces the need for manual weeding or herbicide application, saving time, labour, and resources. Additionally, it reduces the frequency of irrigation. It also extends the growing season expanding options and potential profits. There are many advantages of mulching but there are some serious disadvantages of the technology. Plastic mulching poses environmental concerns related to soil contamination and waste accumulation. Plastic mulches are a significant source of microplastic pollution in agricultural soils and these microplastics negatively affect soil health. The disposal of plastic mulches is a challenge as recycling options are limited resulting in waste accumulation on farms. These accumulated wastes are eventually burned and release greenhouse gases, contributing to climate change and global warming. Additionally, the residues left behind after burning plastic mulches can persist in the soil for extended periods thereby contaminating the soil. Also, the cost of purchasing plastic mulch can prove to be too high for farmers if the land area is huge. Though mulching helps increase crop yields, it has negative effects on the natural environment - thus the use of mulching necessitates careful consideration.



: Sergithang, Tsirang,

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- 90.1267, 27.10645

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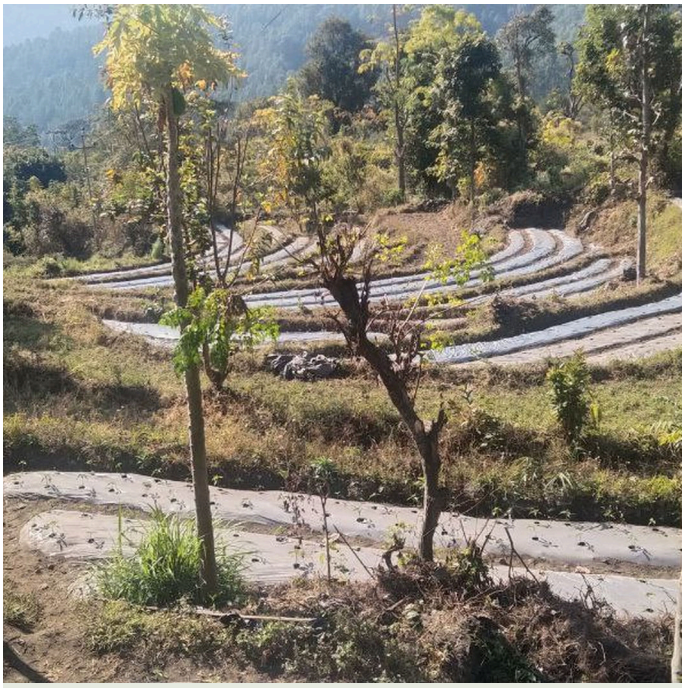
☑ It was introduced by the gewog Agriculture Extension Officer and through exposure to social media.



Adoption of mulching technology by the land user in Sergithang (Dhan Gallay)

Plastic mulching used in early chilli production (Dhan Gallay)

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- Weed management

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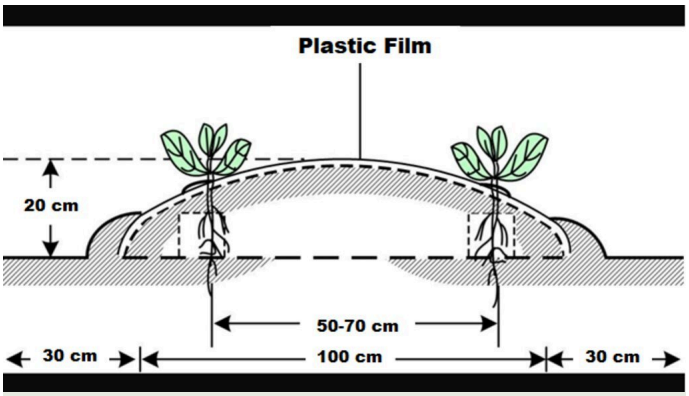
- Plastic mulching may fall under structural measures.

This diagram shows a cross-section of a raised bed using plastic mulching. The plants grow through the punctured holes in the plastic. The length of the bed varies from farm to farm and is 1 m wide and spaced 30 cm apart (bed-bed spacing) for easy access/movement. The bed is usually raised to 20 cm in height. The planting distance shown in the diagram is for chilies, 50-70 cm. The distances will vary according to the crop/variety.



Author: Thinley Penjor Dorji

- (**1 acre**)
- **Ngultrum**
- ( ) 1 USD = 82.1 Ngultrum
- Nu 400

Higher cost of plastic mulching and hiring a power tiller.

1. Field preparation (tilling) (/ : Winter)
2. Field preparation (rotary tilling) (/ : Winter)
3. Manure application (/ : Winter)
4. Bed preparation (/ : Winter)
5. Laying of plastic mulch (/ : Winter)
6. Making holes in the plastic (/ : Winter)
7. Transplantation (/ : Winter)

			(Ngultrum)	(Ngultrum)	%
Field preparation (tilling)	Person/day	5,0	400,0	2000,0	100,0
Manure application and rotary tilling	Person/day	8,0	400,0	3200,0	100,0
Bed preparation, laying of plastic mulch and making holes	Person/day	12,0	400,0	4800,0	100,0
Transplantation	Person/day	8,0	400,0	3200,0	100,0
Power tiller (tilling)	Per day	1,0	2500,0	2500,0	100,0
Power tiller (rotary tilling)	Per day	1,0	2500,0	2500,0	100,0
Seeds	Packet	5,0	15,0	75,0	100,0
Plastic mulch	Rolls	4,0	2800,0	11200,0	100,0
Food and Refreshment	per person	33,0	350,0	11550,0	100,0
				41'025.0	
				499.7	

n.a.

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29823,0

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- [ ] 1,001-1,500
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Falls under Humid Sub-tropical Zone with an annual rainfall of 1200-2500 mm

The rain estimate has been derived based on the agro-ecological zone (AEZ) the area falls under. Bhutan is divided into AEZs (source: https://www.fao.org/3/ad103e/AD103E02.htm). Bhutan has six AEZs. The wet sub-tropical zone is from 150 to 600 m,

- [x] 1,501-2,000
- [x] 2,001-3,000
- [ ] 3,001-4,000
- [ ] > 4,000

followed by the humid sub-tropical zone from 600 to 1,200 m. The dry sub-tropical zone starts at 1,200 m and extends to 1,800 m, followed by the warm temperate zone, which reaches 2,600 m. The cool temperate zone lies between 2,600 and 3,600 m and, finally, the alpine zone between 3,600 m and 4,600 m.

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

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

- [ ] 0-100
- [ ] 101-500
- [x] 501-1,000
- [x] 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)
- [ ] (21-50)
- [x] (51-80)
- [ ] (81-120)
- [ ] (> 120)

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

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- [x] 10%
- [ ] 10-50%
- [ ] 50%

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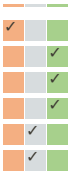
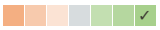


The production of winter chili has increased to 700-800 kg following the use of mulching.

Crop quality has increased due to reduced competition from weeds.

The risk has decreased as mulching helps conserve moisture, prevent water and wind erosion, control weeds, and regulate soil temperature.

Mulching reduces soil erosion.



The farm income from chilli has increased resulting from mulching

Workload has decreased due to a reduction in weeding requirements.

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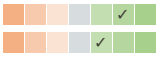
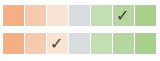
The land user produces enough for self-consumption as well as for commercial purposes.

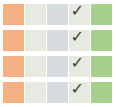
Soil moisture is retained and the need for frequent irrigation is reduced.

Soil erosion has reduced due to mulching.





In the long run, the benefits will be negative, as the land user has to invest in additional costly plastic mulch. Furthermore, the existing mulching plastic is not durable.



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- [ ] 1-10%
- [ ] 11-50%
- [x] > 50%

- [ ] 0-10%
- [ ] 11-50%
- [ ] 51-90%
- [x] 91-100%

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All the land users of Sergithang have implemented the technology.

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- Plastic mulching technology increases crop production.
- The workload is reduced as there is reduction in the need of weeding.
- It isn't a very complex technology and can be adopted easily.
- Controls weeds.

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- It aids off-season (winter) crop production.
- Conserves moisture.
- Reduces erosion (wind and water).

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- Plastic mulching poses environmental concerns related to soil contamination and waste accumulation. Disposal of plastic mulch is a challenge as recycling options are limited resulting in waste accumulation on farms. But one thing that the land users can do is switch to biodegradable plastic mulches or even better organic mulches (straw and Artemisia myriantha). In Bhutan straw and Artemisia myriantha mulches are very common.
- Plastic mulching can prove to be very expensive if the land area is huge. Opt for other more environmentally friendly alternatives such as straw and Artemisia myriantha mulching.

/ / :

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: 19 2023 : 30 2024

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https://qcat.wocat.net/km/wocat/technologies/view/technologies_6864/

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- National Soil Services Center, Department of Agric (National Soil Services Center, Department of Agric) -
- 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)

- Vegetable cultivation Theme 3 Mulching: http://rcbajo.gov.bt/wp-content/uploads/2020/05/Veg-Theme-03-Mulching-printing.pdf