



Sheet mulching

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What is sheet mulching?

Sheet mulching is a simple, low-maintenance practice for weed suppression and erosion prevention, that builds soil organic matter. It increases soil health and productivity. Sheet mulching is a three-layered mulching, soil, and water conservation practice used for crops and trees. It can be done using waste materials, such as cardboard, shredded paper, grass clippings, green waste, among others.

The benefits of sheet mulching

- Prevents trunk damage from bushcutters by controlling weeds near base of plants
- Conserves water and reduces soil erosion
- Suppresses weed growth
- Releases nutrients slowly as mulch decomposes
- Increases soil organic matter content that contributes to soil fertility
- Increases diversity of soil life (e.g., populations of beneficial soil microorganisms, earthworms, and insects)
- Improves soil structure and texture, water infiltration, and aeration
- Reduces soil-borne pathogens splashing up on the foliage and spreading disease
- Insulates the soil from heat and drying air
- Increases plant root development, health, productivity, and pest resistance
- Reduces landscape maintenance costs

Soil analysis

Prior to the sheet mulching process, a soil analysis is recommended to determine the site's pH and nutrient levels. For instructions on how to take a soil sample see UOG CE&O's "Soil Sampling" brochure (Motavalli, 1998).

Step 1: Site identification

Choose a site where the garden will be placed. An



Figure 1.
Compost used in the concentrated nutrient layer.

ideal spot is a level area that receives full sunlight and is accessible to water. Sheet mulching can be used in almost any garden/farm site. Limestone soils (prevalent in northern Guam), clay soils (most frequently found in southern Guam) and areas with shallow soils will be improved by sheet mulching due to the increase in soil organic matter.

Step 2: Site preparation

To prepare the site, tall weeds should be mowed, cut down, or trampled down flat in the garden (Elevitch & Wilkinson, 2002). Leave existing vegetation on site unless it is woody or bulky. The organic matter left will decay and add nutrients to the soil. Thoroughly soak the soil with water before beginning the next step.

Step 3: Build concentrated nutrient layer

To build up the nutrient layer, add to the soil surface fertilizer and/or soil amendments, such as compost and manure. Poultry, swine, cattle, or carabao manure, and



Figure 2.
Cardboard overlapped as weed barrier.

food/produce waste materials are local materials high in nutrients. Nitrogen and other nutrients will accelerate microbial activity. These organisms are responsible for breaking down organic materials and releasing nutrients into the soil. Once the materials for the concentrated nutrient layer are applied, the area should be watered thoroughly.

The weed barrier layer is a thick biodegradable material that blocks undesirable plants in the soil from sunlight, while allowing water to soak through. If weeds are unable to receive sunlight, they die, decompose and release their nutrients. Biodegradable items, such as newspaper or cardboard can be used to create this barrier. Materials are overlapped so weeds can't penetrate through the layer (Fig. 2). Thoroughly soak the weed barrier layer prior to and after it is laid down. Over time (4-8 months) it will decompose and add to the soil organic matter. The weed barrier layer, in sheet mulching, is the unique step that differs from other mulching methods.

Step 4: Apply mulch/compost layer

Next, a layer of weed free mulch is added on top of the weed barrier. Locally available materials include; shredded paper (Fig. 3), wood chips, tree/brush clippings, coconut fronds, ironwood needles, banana leaves, or other organic matter. As this layer decomposes, the micronutrients enrich the mulch and underlying soil. The layer should be 2-5 inches thick and new material should be added periodically. After it is applied soak the layer with water to settle it in place. In areas of high wind, it may be advisable to include heavy mulch material, like branches and palm fronds, to prevent the weed barrier from blowing away. This layer slows water runoff and promotes water soaking through the weed barrier. When using sheet mulching, it's important to have a layer over the weed barrier to slow water runoff, so water soaks



Figure 3.
Shredded paper applied over weed barrier.



Figure 4.
Planting in the sheet mulch.

through the weed barrier. A dry un-mulched weed barrier can actually shed water away from the crops.

Step 5: Plant vegetables in a sheet mulched area

Once the sheet mulch layers are established, wait approximately two weeks before planting vegetable seedlings. This allows the new nutrients and soil microbes to come into balance under the sheet mulch. To plant seedlings, punch a hole through the weed barrier and place the seedling in the hole, then fill around it with soil or compost (Fig. 4). Water thoroughly and care for the plants as in any other gardening situation. A key benefit is the minimal weed pressure during the growing season (Figure 5).

Maintenance

Sheet mulching is an on-going process. Once an area is established under sheet mulch, weeds are suppressed, water is conserved, and soil quality improved. The weed barrier layer and mulch layer will need to be replenished as they decompose. These three layers become part of the

nutrient layer (6-9 months), but the need for fertilizing, watering, and weeding is reduced. In high rainfall areas of the tropics, mulch materials break down very fast. When used with other agroforestry practices, sheet mulching is a key practice in sustainable tropical permaculture systems.

Sheet mulch in tree plantings

In Guam, the primary killer of trees in landscapes is bush-cutters. Sheet mulching can help prevent this damage by keeping weeds away from the base of trees, so bush-cutters do not need to be used near the trees (Figure 6). The sheet mulching process starts with the initial planting of the tree. One must dig a hole, slightly larger than the root system of the tree to be planted. After planting, the soil around the tree should be amended with a light layer of nitrogen fertilizer, or manure. The fertilizer should extend about 2 - 4 feet from the tree's trunk or to the end of its canopy (or drip line) for established trees. This is also the time to add any extra compost, manure, or other amendments to the soil under the drip line.

Next, place a weed barrier around the tree in the shape of a ring. Leave sufficient room (2-6 inches) free of mulch around the tree trunk for good air circulation. The materials used for the weed barrier, such as cardboard, should overlap one another, so weeds will not emerge. As with sheet mulching for vegetable crops, each layer must be soaked thoroughly.

A layer of mulching material is then spread over the weed barrier. It is important to leave a gap between this layer and the tree trunk for good air circulation.

In most cases, the benefits of sheet mulching outweigh its negative aspects. It requires little maintenance compared to conventional weed control; however, there can be some drawbacks. Slugs are attracted to fresh mulch, but populations usually decrease as the organic matter decomposes. Chickens and certain rodents are also attracted to mulch. Chickens will scratch the mulch and spread it over a wide area. A border planting/filter strip with lemon grass, for example, can keep the mulch in the desired area.

A living mulch, like sweet potato or cover crop, like perennial peanut (in acidic soils) can be planted in the sheet mulched area around the tree. In Guam, there are many waste materials that people send to the landfill that are ideal for use in sheet mulching systems (Table 1).



Figure 5.
Vegetable crops grown in sheet mulch, with wood chips as the mulch layer.



Figure 6.
A breadfruit tree that has been sheet mulched.

Table 1.
Materials for mulch and how much to apply.

Materials for mulch	How to apply
Newspaper	Should not be > 1/2" thick
Paper, shredded	Should not be > 2" thick
Cardboard	An excellent weed barrier for weed suppression
Yard clippings (leaves, branches, etc.*)	Light materials should be placed under heavier materials
Vegetable kitchen waste (green waste)**	Should be placed under leaves, grasses, and branches
Coffee grounds**	Should be placed under leaves, grasses, and branches
(Chicken, hog, steer, rabbit, carabao/hedge-row cuttings)	Should not be > 2" thick

* = Take precautions to prevent materials from blowing away

** = Place under other mulch materials to help control odors and pests

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