

ANAEROBIC SOIL DISINFESTATION (ASD): PRACTICAL INFORMATION



This factsheet contains complementary information to the Best4Soil video on Anaerobic Soil Disinfestation (ASD): Practical information

Anaerobic soil disinfestation (ASD) is an alternative for chemical soil treatments (fig. 1). ASD reduces a wide range of soil borne diseases, pests and weeds. The method requires incorporation of easily degradable organic material into the soil, after which

the soil is covered with an airtight plastic sheet to prevent the inflow of oxygen which creates an anaerobic environment. All oxygen is used by soil micro-organisms while degrading the organic material. For some organisms these anaerobic conditions alone are already lethal. The organic material degrades further through fermentation, by which volatile fatty acids are being released that are lethal to many other species of soil organisms. Many useful species survive both anaerobically and these volatile compounds, so there is no question of sterilization.

HOW DOES IT WORK?

The Best4Soil video Anaerobic Soil Disinfestation: Practical information (link##) shows the principle of anaerobic soil disinfestation (ASD). ASD is an alternative for chemical soil disinfestation. Figure 2 gives an overview of the steps to take for successful application of ASD (at the top) and their effect (at the bottom).



Fig. 1: Anaerobic Soil Disinfestation in a glance (from top to bottom):
Incorporation fresh organic matter
Closing the surface
Wetting the soil
Covering with virtually impermeable film (VIF)

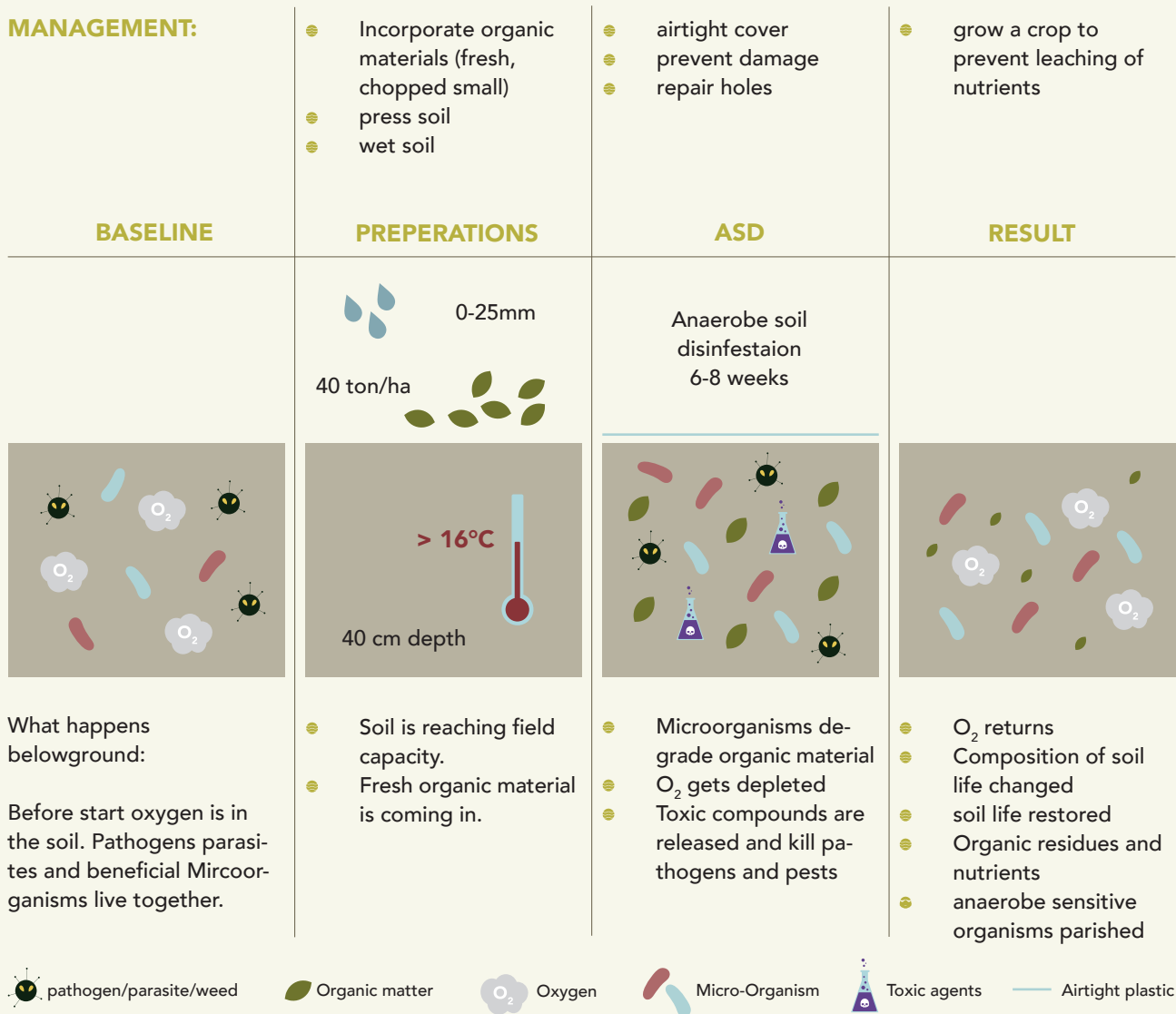


Figure 2: ASD steps (top) operating mechanism (bottom)

STEP 1: THE RIGHT MATERIALS AND CONDITIONS

Organic materials

It is important that the organic materials are easily degradable for the soil micro-organisms. Basically any source of fresh plant material will do, e.g.:

- Fresh crop residues
- Fresh grasses
- Fresh cover crops and green manures
- Protein rich residual flows

When grown in the same location, it is preferable that the organic material is from a non-host plant, to prevent the multiplication of unwanted nematodes or pathogens. The

material should be fresh, so composted material, straw or sludge are not suitable. When external organic matter is brought in, it should be free of pathogen/pests and seeds.

- You need about 40 tons/ha fresh organic material to disinfest 40 cm depth of soil.
- The smaller the organic material is chopped, the better: it makes it easier for bacteria to colonize and the O₂ depletion takes place faster.



Plastic cover material

Not all plastic is suitable for ASD because it needs to be strong enough to prevent it from being damaged, and it should be airtight. Suitable plastics are Virtually Impermeable Films (VIF) or thick polyethylene with a 0.20 to 0.40 mm thickness (often used for silage). Other plastics are generally not sufficiently airtight.

Conditions

Soil moisture and temperature conditions are other important factors for a successful application of ASD:

- The micro-organisms need a soil temperature above 16°C to break down the organic material quickly. The refore anaerobic soil disinfestation should be applied when temperatures are above 16°C. The higher the temperature, the better.
- Make sure that the soil is wet. For best results, the soil moisture should be at field capacity. If not, then irrigation is needed for a good result. Field capacity is defined as the soil moisture 2 days after the soil was water saturated (e.g. after a heavy rainfall), when all the tall and medium size pores do not contain water anymore. In general irrigating 20mm will do.
- Use VIF (VIF: virtually impermeable film) or thick polyethylene with a 0.15 to 0.20 mm thickness (silage). Other plastics are generally not airtight enough.
- Make sure the soil surface is flat, preventing clods and residues from puncturing the plastic. In the case of clay soil it helps to have a wet soil.
- Covering the soil with plastic can be done mechanically. In the video with practical information on ASD you can see how a special machine is covering the field with the airtight plastic
 - Prevent wind damage by adding bags with sand on top of the plastic sheet.
 - Prevent damage by animals by chasing or setting up a fence. Make sure no seeds or other attractive food under the sheet is visible for birds.
 - Check the sheets frequently and repair holes a.s.a.p. to maintain an O₂ free atmosphere underneath the plastic.
- Apply ASD for a duration of 6-8 weeks, during a period with temperatures above 16°C.

STEP 2. INCORPORATION OF THE MATERIALS

- ASD is possible on most soils, on sandy soils however it performs better in general and is easier to apply than on clay soils.
- The organic material should be well distributed/incorporated into the upper 0-20 or if required 0-40 cm soil depth.
- The working depth depends on several factors. Generally, ASD occurs in the layer where the organic matter is homogeneously mixed with the soil.
- In case of pathogens infecting the entire root system, it is necessary to treat the soil over the entire rooting depth.
- Adjust the amount of materials to the operating depth: 40 tons/ha for a 40 cm operating depth, up to 80 tons/ha for an 80 cm operating depth.

STEP 3. SOIL CONDITIONS AND COVERAGE

- Make sure that the soil is wet before you cover it with the sheet.
- Preferably the soil is compacted with a roller or by driving track to track with a tractor after incorporation of the fresh organic material. This closes big soil pores and increases the concentration of toxic volatile compounds in the soil atmosphere.

