

Environmentally-friendly Technology for Preventing Surface Soil Erosion Utilizing Soil Organisms

Background of New Technology Development – Biological Soil Crust

■ Biological Soil Crust (BSC) is a soil substrate of microorganism colonies. The colonies are formed by filamentous fungi, soil algae, lichens and mosses, which entangle soil particles and clods on the ground surface.

■ BSCs are natural phenomena which appear at the beginning of vegetation succession. After the BSC has formed by soil algae and other organism, grasses and trees proceed to invade gradually.

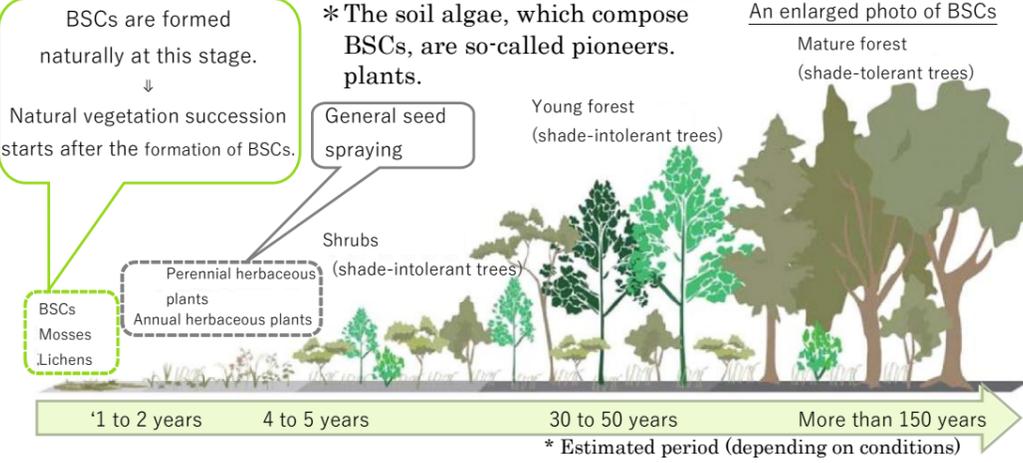


BSCs in agricultural land: a pineapple field

BSCs in a ravine slope

BSC examples formed on the surface soil of bare grounds.

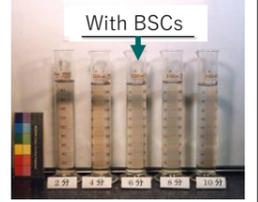
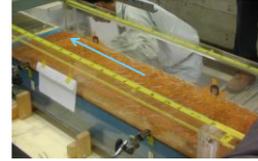
■ BSCs have the effect of preventing surface soil erosion. Therefore, if BSCs could be formed at an early stage, they would be a natural measure to prevent soil erosion.



Sequence of vegetation succession on the bare grounds: xerarch succession series

Note: Added to "Manual of the slope revegetation method for conservation of regional ecosystem, Technical note of National Institute for Land and Infrastructure Management, No.722, Jan 2013".

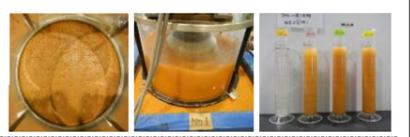
A test example of waterway erosion



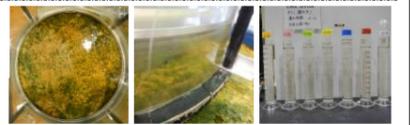
A test example of rotating flow erosion



Without BSCs

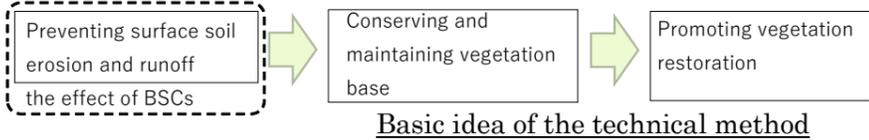


With BSCs



Technical overview and features "BSC method": utilizing BSCs to prevent soil erosion and restore vegetation by natural plant invasion from the surrounding areas.

■ Implementing technology to promote vegetation succession with early BSC formation. (Prevention of surface soil erosion and promoting of natural plant invasion)

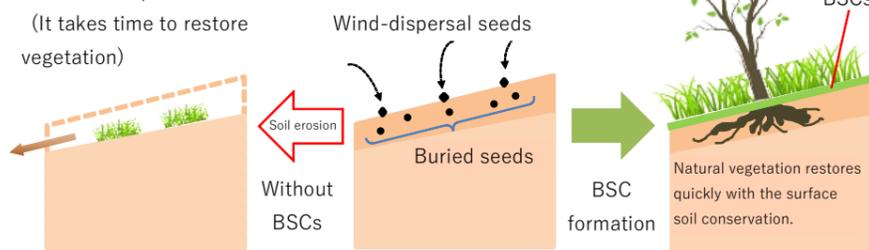


Basic idea of the technical method

The image figures

Running off not only surface soil but also buried seeds and wind-dispersal seeds (It takes time to restore vegetation)

Bare ground (devastated by collapse, construction, and more.)



■ Utilizing soil algae, which exists around the world and forms BSCs, makes it possible to avoid environmental impacts on native species. (Furthermore, a clonal proliferation avoids generic pollutions.)



Massive cultivations of useful species and materialization with algae makers' cooperation.

■ Requesting only to change from the seed spraying method to BSC material (without changing fertilizer, base material, and more.)

* Other methods, such as hand seed spreading, are also possible to apply according to the site conditions.



* Constant stirring is required. Seeding truck for spraying



Outline of construction method and an example of construction conditions

■ BSC method enables lower cost and easier implementation than conventional natural plant invasion. However, BSCs are biological materials, so it is necessary to consider the influence of the base environment, weather, and others; the same as conventional greening work.

[Benefits of promoting BSC method of natural plant invasion]

- It is cheaper than the conventional method. (direct construction cost 1,200 yen/m² as of August,2018.equivalent to a base material spraying in Japan)
- It is basically able to implement without shaping construction of slope surface and the accompanying construction of earth-removing and surplus soil disposal.
- The hose length can be extended to around 100m, depending on the capability of the pump and other equipment to be used. This makes it possible to spray from the bottom of the slope to a high position. (Reduction of temporary construction and associated risk.)
- There is no impact on natural vegetation. This method is also suitable for places where environmental conservation needs to be considered.

Construction examples etc.

-The Best Award for 2015 Subtropical Greening Case Presentation: Okinawa



-An application example for red-soil discharge prevention from a mountain stream's collapsed place (Okinawa main island)



-A test construction example relating to early vegetation restoration to prevent gravel etc. falls due to slope surface erosion (Hokkaido)

* There are other multiple construction examples mainly in the Okinawa area.

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