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Design and construction of swales in hilly regions

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Abstract

The Research aim is to proposed a design and construction of swale on hilly areas, at mountain regions to restore ground water, to stop soil erosion and to maintain water content or moisture in soil strata.

Keywords: permaculture, horticulture, soil and water conservation, sustainability, forestry, natural resource management

Introduction

SWALE is water harvesting system to prevent erosion and soak water into the ground. Which is really important in lot of situation especially in high elevation desert land, where we get low precipitation. Swales are ditch on contours (means levels) made by digging following the pattern of contour levels at slopes. These are simple canals like structures which actually are ditches. Build at contour at landscape.

Theory

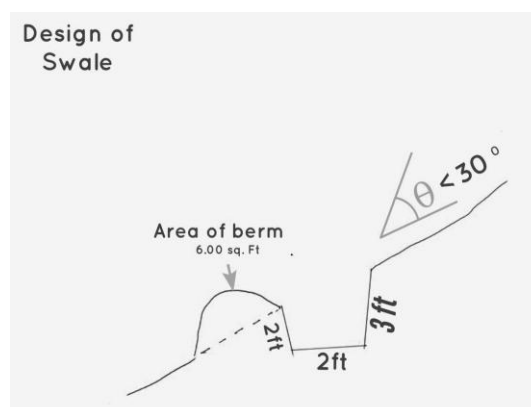
Swales prevents water from running, stop soil erosion in hilly lands where slopes lies between 30 to 45 degree. To promote permaculture – which aims to the development of agricultural ecosystems which is intended to be sustainable and self-sufficient.

Passively harvesting rain water in our ecosystem soil slowly accumulates moisture. We can make swale with regular or irregular distances berm in side.

The soil we get from swale can be placed on the down side at surface of berm. When rains, the water get accumulates in the swale the berm will prevent the water from eroding the soil. The water will also slowly percolate keeping the moisture level in soil high. Contouring the ditches or shaping the land on contour we can harvest rain water with ease.

Swales work as infiltration basins designed to manage water runoff, filter pollutants and increase rainwater infiltration. Swale concept is categorized under rainwater harvesting techniques and soil conservation strategy. Swales are used to slow and capture runoff by spreading it horizontally across the landscape, facilitating runoff infiltration into soil.

Design



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The proposed design is quite economical and easy to make. Construction process of swale is pretty simple. First Layout the level of contour line, then mark the contour line. Make the level line on the landscape.

The trench section is in trapezoidal shape which has the ideal following dimension-

Height or depth (upside) - 3 feet

Depth down side - 2 feet

Width of bed - 2 feet

At Elevation of hill 30°

Volume of soil excavated equivalent to volume of berm soil

Volume of berm = area of berm × length horizontal

Area of berm = $\frac{1}{2} (2+2) \times 3$

Equaivalent = 6 square feet

Volume of berm = 6 sqft × L

We can also make larger trapezoidal section shape as per landscape needs

We can make swales strip at every 10-15 meter intervals on downhill side through the manpower labors which are easily available with help of small equipments, laborious, especially for a shovel and pick fellow. The result sees quickly and look amazing, texturing the landscape with both purpose and beauty. Swales stop the deluge and allow the water to slowly, passively enter the soil and keep stuff working, preventing overfilling drainage systems and the need for compulsive watering.

Working of Swale

Here is the animated demonstration of working of swale

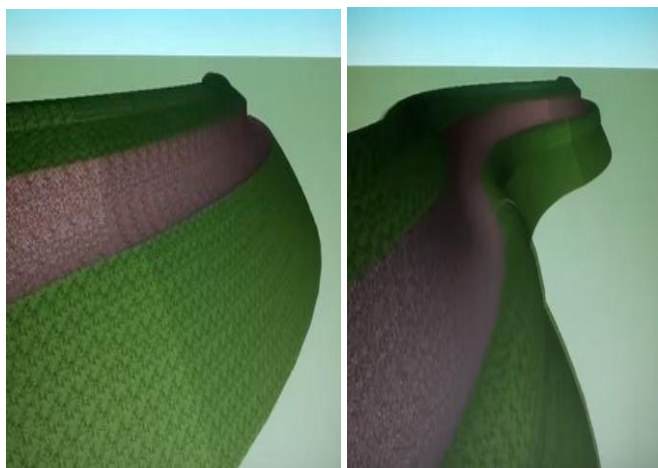


Fig 1: Digging pattern at contours



Fig 2: Collection of water after precipitation



Fig 3: Seepage flow of ground water



Fig 4: Storage of ground water. we can use berm for vegetation cultivation. Berm helps to protect soil erosion

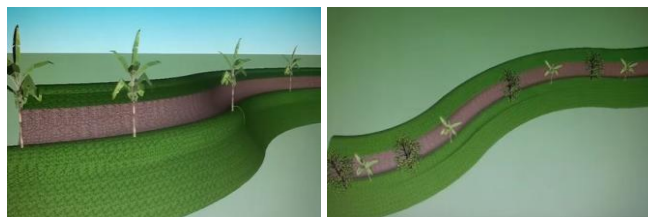


Fig 5: After vegetation cultivation it will cover the berm with the passage of time

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