VETIVER FOR ENVIRONMENTAL CONSERVATION

S. Subramanian and Shoukath
KWALITY, Chikballapur
Karnataka, India

Abstract

Vegetative hedges along contours are effective in soil and moisture conservation. They are very effective in vertisols, since contour bunding gets destabilized by the development of cracks in bunds during summer shrinkage. A 25-percent enhancement in moisture conservation and a reduction of soil loss from 2.5 kg/m^2/yr to 0.2 kg/m^2/yr is recorded. Details of contour marking, planting and establishment are described. 'A' frame and mason's siphon tubes are advocated for contour marking. The vegetative hedges make the running water walk and thus substantially reduce the soil-carrying capacity of the storm water. By retaining the soil, especially soil organic matter, vetiver contour hedges lend sustainability and life to the soil and thus contribute to environmental conservation. Participatory group action with gender equity is advocated for effective implementation.

Introduction

Man's interference with nature to earn his food, shelter and communication is slowly but surely degrading the environment. In the past five decades, chemical intervention has augmented the productivity of crops, but large-scale use of chemicals has polluted the environment. Conserving the natural resources for agriculture, the soil and moisture, is imperative for sustaining the productivity. Depending on the lie of the land and the cultivation processes, 0.05 kg to 3 kg/m^2 of soil are estimated to be lost every year. In India experts estimate the erosion loss on one hectare of land at 16 tons per year. Rainwater is the dominant factor that causes erosion.

India, with just 2% of the world's land area and 1% of its rainfall, has to support 16% of the human population and 15% of the cattle of the world (Table 1).

Table 1. Resources of India as compared to the world

Attributes	India	% to world
Geographical land area	327 million ha	2
Rainfall	400 million ha m	1
Population	1 000 million	16
Livestock		15

Of the 400 million hectare-metre of rainfall, 50% is captured and 85% of captured water is used for agriculture. Two thirds of the cultivated area are under rain-fed agriculture. The runoff is estimated at 40%.

Extensive and intensive agriculture has damaged the ecological foundations: soil, water, biodiversity and atmosphere. Vetiver promises to be the only panacea for redeeming and conserving the soil and water in order to achieve sustainable agriculture.

The mechanical means of conserving soil are costly. Besides they have certain inherent defects. Contour bunding for slopes below six percent is widely recommended and practised in India against erosion. The black soil, the predominant soil type in dry land agriculture, has montmorillonite clay. The clay lattices, being linked with H_2O, expand with water addition and shrink when withdrawn. The result is the development of deep cracks on bunds during the summer months. Contour bunds therefore get destabilized in deep vertisols. During rainy periods, the saturation zone above the bunds gets inundated due to the poor infiltration rate of the soil. Vegetative hedging for deep vertisol seems to be advantageous.

Establishment of Vetiver Hedges

When the first author of this paper was based at the Aruppukkottai Regional Research Station of the Tamil Nadu Agricultural University, vegetative hedging was initiated during 1987. Valuable information had been generated on the establishment of vetiver as a contour hedge and its effect on moisture conservation and soil loss. The booklet, *Vetiver: A method of vegetative soil and moisture conservation*, brought out by the World Bank which served as motivating force, was translated in Tamil, the local language, by the same author and widely distributed to farmers as a guideline for vegetative hedging.

Just before the monsoon season, contours are to be marked. A wooden frame in the shape of the letter A, called an 'A' frame, with a pendulum at the centre, is useful for marking the contour line. The mason's siphon tube is useful also. A smooth line has to be made connecting contour points with a bullock-drawn wooden plough. The distance between two contour lines may range from 50 to 100 m depending on the slope of the land.

Soon after the first rains, vetiver slips of 10-15 cm split from the clump are to be planted along the contour line and pressed. Dipping the root of the slips in *Azospirillum* slurry, a non-symbiotic, free-living N-fixing bacterium, ensures better establishment and growth, as evidenced by the number of tillers and height measured at periodic intervals. Zigzag planting at 15-20 cm spacing is advantageous. Dusting 10-percent BHC along the contour line will ward against possible termite attacks. A single tiller develops into 30 to 40 tillers per clump during the first year itself and 55 to 70 during the second year. Gap filling may be necessary during the second year.

The rooting is dense, extending to 30 cm vertically and 50 cm horizontally during the first year and 50 and 70 cm, respectively, during the second year. The roots or the clumps do not hamper beyond 1 m horizontally. This is advantageous because of non-interference with the crop cultivation between hedges. The contour hedges act as the guideline for contour farming, ploughing, seeding and other cultivation operations. Each furrow acts as a miniature reservoir in conserving moisture and soil.

The soil moisture was monitored. The moisture percentage was higher in the hedged areas than in the non-hedged areas. During the summer months it was 45% in vetiver hedged areas and only 20% in non-hedged areas. The soil loss in non-hedged areas was 2.5 kg/m^2/yr as against 0.2 kg/m^2/yr.

The Role of KWALITY

KWALITY has advocated and demonstrated vetiver contour hedges in the red soils of Karnataka, greatly involving itself on knowledge and material dissemination. The reason for the higher soil moisture and soil conservation is obvious. The rainwater during storms gains velocity as it flows down the slope. When unchecked, the velocity assumes erosive power. The contour vegetative hedges act as a barrier preventing storm water from gaining greater velocity. The running water is made to slow down when it passes through the vetiver hedge. The soil and organic matter carried along the running water is filtered and deposited along the hedge. Only clear water passes through, loosing much of its velocity. Since the soil-carrying capacity increases by square to its velocity (1^2, 2^2, 3^2, etc), the soil loss in the hedged area becomes negligible.

The first casualty of erosion is the organic matter that is light and in the top soil, hence easily carried by the running water. The organic matter is effectively intercepted by the hedge. Organic matter lends life to the soil. Innumerable micro-organisms depend on it for their sustenance. The micro-organisms are responsible for converting the minerals into forms which the plants can absorb. In the absence of organic matter, the biochemical activities will cease and the soils will become dead. For binding the soil particles, humus, the ultimate product of organic matter, is essential.

Through erosion the land gets degraded not only through soil loss but also through loss of its life. Thus live hedges lend life to the soil and act against land degradation. Group action greatly enhances the value of vegetative hedges. Participatory management is essential for environmental conservation. KWALITY is advocating a participatory approach and gender equality in its programs, the prime reasons for the success of its endeavours.