

WHAT IS THE OPTIMUM SPACING OF VEGETATIVE BUFFER STRIPS IN TROPICAL SMALLHOLDER CONSERVATION SYSTEMS?

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ABSTRACT

Natural vegetative filter strips (NVS) are attractive contour barrier systems compared with other alternatives because they are simple to establish and maintain, they control erosion effectively, and they compete less with associated annual crops. The recommended practice has been to space hedgerows so that there is a one-meter drop in elevation between them. This results in very close hedgerow spacing (3-6m apart) on sloping lands, which removes considerable area from crop production. We hypothesized that acceptable soil loss may be possible with fewer hedgerows, and tested the effect of hedgerow density on soil loss in an experiment on a field with 50 meters slope length and 45% slope. A single NVS across the middle of the field reduced soil loss by 60% compared with the open-field control. As hedgerow density increased (4m, 2m, and 1m drop in elevation between hedgerows) soil loss further declined, but at a decreasing rate. Erosion did not differ significantly between the 2m and 1m elevation drops, although the number hedgerows doubled in number. Maize yield declined with increasing number of hedgerows due to an increase in the cropped area. We conclude that it is most practical to space hedgerows at a distance corresponding to a 2m to 4m elevation drop. We conclude that even a single hedgerow across the middle of a field provides a reasonable starting point for a farmer to tackle erosion with minimal investment and without significant loss of cropped area.

1. INTRODUCTION

Soil erosion is one of the major problems endangering the sustainability of agricultural systems in sloping tropical uplands. Erosion causes rapid soil quality degradation, nutrient depletion, and a decline in crop productivity (El-Swaify 1993, Lal 1984, Stocking and Peake 1986, Turkelboom et al 1993). It is recognized as a major constrain to agriculture in the uplands of Southeast Asia (Cruz, Francisco and Conway 1988; Fujisaka et al 1994; Garrity, 1993, Garrity et al, 1995). Contour hedgerow systems using nitrogen fixing trees have been widely promoted to minimize soil erosion, restore soil fertility, and improve crop productivity (Huxley 1986, Kang and Wilson 1987, Young 1986, 1987). They have been recommended as a common feature of extension programs for sustainable agriculture in Asia (Garrity, 1996). But this innovation has not been widely adopted by upland farmers (Fujisaka, 1994) despite the positive results reported in a number of experimental and demonstration sites.

The constraints that limit the effectiveness and adoption of pruned-tree hedgerows have become more apparent to researchers and extensionists in recent years. They include the tendency for the perennials to compete for growth resources and reduce the yield of associated crops planted in adjacent rows, and the inadequate amount of phosphorus that is recycled to the crop from the tree-leaf prunings (Garrity 1996). However, the major problem is the large amount of labor needed to prune and maintain woody hedgerows. ICRAF (1996) estimated that the amount of labor required to prune leguminous-tree hedgerows was about 31 days per hectare, or 124 days annual labor for four prunings in the Philippines. There is a great need for simpler, less labor intensive but effective contour hedgerow systems

The use of natural vegetative strips (NVS) has proven to be an attractive alternative because they are so simple to establish and maintain. NVS are laid out along the contour lines by leaving unplowed strips 40-50 cm wide across the field on the contour. These strips are spaced at desired intervals down the slope. The recommended practice for spacing contour buffer strips has been to place them at every one meter drop in elevation. The contour lines are determined by using an A-frame. The natural vegetation that is naturally growing in the strips filters the eroded soils, slows down rate of water flow, and enhances water infiltration, making them very effective for soil and water conservation. Researchers found that these natural vegetative contour strips have many desirable qualities (Garrity, 1993). They needed much less pruning maintenance compared with fodder grasses or tree hedgerows, and offered little competition to the adjacent annual crops