


Natural Vegetative Strips (NVS)
Philippines

Within individual cropland plots, strips of land are marked out on the contour and left unploughed in order to form permanent, cross-slope barriers of naturally established grasses and herbs.

Natural vegetative strips (NVS) are narrow live barriers comprising naturally occurring grasses and herbs. Contour lines are laid out with an A-frame or through the 'cow's back method' (a cow is used to walk across the slope: it tends to follow the contour and this is confirmed when its back is seen to be level). The contours are then pegged to serve as an initial guide to ploughing. The 0.3-0.5 m wide strips are left unploughed to allow vegetation to establish. Runoff flowing down the slope during intense rain is slowed, and infiltrates when it reaches the vegetative strips. Eroded soil collects on and above the strips and natural terraces form over time. This levelling is assisted by ploughing along the contour between the NVS - through 'tillage erosion' - which also moves soil downslope. The vegetation on the established NVS needs to be cut back to a height of 5-10 cm: once before planting a crop, and once or twice during the cropping period. The cut material can be incorporated during land preparation, applied to the cropping area as mulch, or used as fodder. This depends on whether the farmer has livestock or not, on personal preference, and on the time of cutting. If the grass is applied as mulch or incorporated, the technology can be considered to be an agronomic, as well as a vegetative, measure. NVS constitutes a low-cost technique because no planting material is required and only minimal labour is necessary for establishment and maintenance. Some farmers had already practiced the technology for several years before the intervention of the ICRAF (The World Agroforestry Centre) in 1993. ICRAF came to realise that farmers here preferred NVS to the recommended 'contour barrier hedgerows' of multipurpose trees- which land users viewed as being too labour intensive. When farmers became organised into 'Landcare' groups, NVS began to gain wide acceptance. Land users appreciate the technique because it effectively controls soil erosion and prevents loss (through surface runoff) of fertilizers applied to the crop. As an option, some farmers plant fruit and timber trees, bananas or pineapples on or above the NVS. This may be during establishment of the contour lines, or later. The trees and other cash perennials provide an additional source of income, at the cost of some shading of the adjacent annual crops.

left: Agro-silvopastoral system (food crops+trees+fodder) evolve from NVS. (Photo: Jose D. Rondal)
right: These recently established NVS are clearly laid out along the contour. (Photo: Bony de la Cruz)

Location: Misamis Oriental
Region: Bukidnon
Technology area: 110 km^2
Conservation measure: agronomic, vegetative
Stage of intervention: mitigation / reduction of land degradation
Origin: Developed externally / introduced through project, traditional (>50 years ago); externally introduced through project, recent (<10 years ago)
Land use type:
Cropland: Annual cropping
Cropland: Tree and shrub cropping
Climate: humid, tropics
WOCAT database reference: T_PHI003en
Related approach: LANDCARE (PHI04)
Compiled by: Not registered
Date: 1999-06-26
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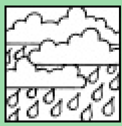
Classification

Land use problems:
- Loss of topsoil through sheet erosion and rills, leading to rapid soil fertility decline. In turn soil fertility decline results in the need for increasing levels of fertilizer inputs to maintain crop yield. However, these fertilizers are often washed away by surface runoff - a vicious circle. (expert's point of view)
Soil productivity decline; need more inputs to maintain crop yield. (land user's point of view)

Land use

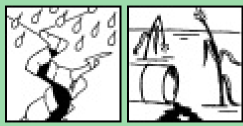
Annual cropping
Tree and shrub cropping
rainfed

Climate



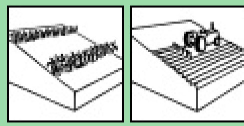
humid

Degradation



Soil erosion by water: loss of topsoil / surface erosion, gully erosion / gullying, Chemical soil deterioration: fertility decline and reduced organic matter content

Conservation measure



Vegetative, Agronomic

Stage of intervention

Prevention
Mitigation / Reduction
Rehabilitation

Origin

Land users initiative
Experiments / Research
Externally introduced: traditional (>50 years ago)
Other: externally introduced through project: recent (<10 years ago)

Level of technical knowledge

Agricultural advisor
Land user

Main causes of land degradation:
Direct causes - Human induced: deforestation / removal of natural vegetation (incl. forest fires)
Indirect causes: Lack of enforcement of legislat./authority

Main technical functions:
- reduction of slope angle
- reduction of slope length
- control of dispersed runoff

Secondary technical functions:
- increase of infiltration
- increase in soil fertility

Environment

Natural Environment

Average annual rainfall (mm)

> 4000 mm
3000-4000 mm
2000-3000 mm
1500-2000 mm
1000-1500 mm
750-1000 mm
500-750 mm
250-500 mm
< 250 mm

Altitude (m a.s.l.)

> 4000
3000-4000
2500-3000
2000-2500
1500-2000
1000-1500
500-1000
100-500
<100

Landform

plateau / plains
ridges
mountain slopes
hill slopes
footslopes
valley floors

Slope (%)

flat
gentle
moderate
rolling
hilly
steep
very steep

Soil depth (cm)

0-20
20-50
50-80
80-120
>120

Growing season(s): 240 days(Mar - Dec)
Soil texture: medium (loam)
Soil fertility: low
Topsoil organic matter: low (<1%)
Soil drainage/infiltration: good

Soil water storage capacity: medium

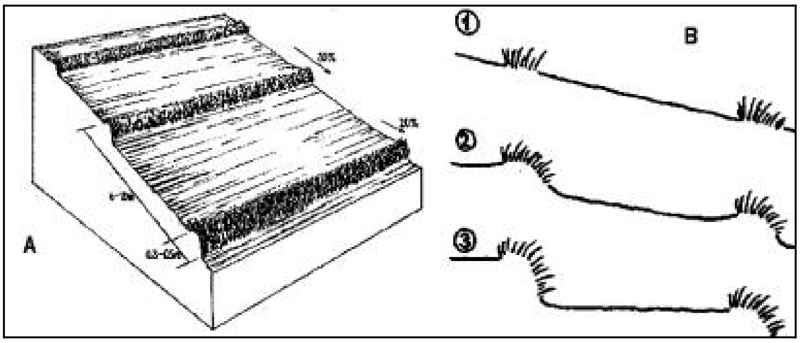
Human Environment

Cropland per household (ha)

<0.5
0.5-1
1-2
2-5
5-15
15-50
50-100
100-500
500-1,000
1,000-10,000
>10,000

Population density: 50-100 persons/km2
Annual population growth: > 4%
Land ownership: individual, titled
Land use rights: individual
Relative level of wealth: average 40% of the total area is owned by average land users

Importance of off-farm income: 10-50% of all income: Carpentry, trade, business, labour for neighbouring farms and other labour intensive agricultural activities (e.g. vegetable production)
Access to service and infrastructure:
Market orientation: mixed (subsistence and commercial)



Technical drawing

A - Spacing of natural vegetative strips depends on the slope. B- The insert shows the evolution of terraces over time through tillage and soil erosion, leading to accumulation of sediment behind the strips (steps 1-3). (Mats Gurtner)

Implementation activities, inputs and costs

Establishment activities

- Layout of contours with the use of an A-frame (or cow's back method, see Annexe T3)) placing wooden pegs along the contours.
- Seeding (T, F, C)
- Transplanting
- Land preparation

Establishment inputs and costs per ha

Inputs	Costs (US$)	% met by land user
Labour	15.00	100%
Equipment		
- animal traction	40.00	100%
- tools	25.00	100%
- stakes (pegs)	4.00	100%
Agricultural		
- seeds	75.00	100%
- seedlings	25.00	100%
- fertilizer	80.00	100%
- biocides	5.00	100%
- seeds (g) -trees	9.00	%
TOTAL	**278.00**	**96.76%**

Maintenance/recurrent activities

- nitial establishment: 2. Initial ploughing along the contour: leaving unploughed strips.
- Planting
- Mulching
- Fertilization
- Interim cultivation/weeding
- Ploughing mulch into the soil during normal land cultivation.
- Weeding (T, F, C), Slashing grass
- Spreading the cut materials evenly in the alleys (between strips) as
- Pruning

Maintenance/recurrent inputs and costs per ha per year

Inputs	Costs (US$)	% met by land user
Labour	36.00	100%
Equipment		
- animal traction	40.00	100%
- tools	2.00	100%
Agricultural		
- seeds	75.00	100%
- fertilizer	80.00	100%
- biocides	5.00	100%
TOTAL	**238.00**	**100.00%**

Remarks:
Slope is the dominant factor in cost calculation. The steeper the slope, the more difficult the mobility is and the more closely-spaced the contours are .
Costs of establishing contours and maintenance by slashing are calculated by total length of NVS. This example is from a typical field with an 18% slope: at an NVS spacing of 5 m, the approximate total linear distance for one hectare is 2,000 m. In this example, the farmer has paid for everything him/herself (see section on acceptance/adoption). Note that the establishment cost is more or less equivalent to the cost of standard land preparation by ploughing. When 'enrichment planting' of the strips is carried out, extra cost for seedlings (of fruit trees for example) and associated labour for planting are incurred.

Assessment

Impacts of the Technology

Production and socio-economic benefits

- +++ increased fodder production
- +++ increased fodder quality
- +++ very low inputs required
- ++ increased farm income
- + increased crop yield

Production and socio-economic disadvantages

- + hindered farm operations
- + crop area loss, before NVS can evolve to fodder grasses
- + pest sanctuary

Socio-cultural benefits

- +++ improved conservation / erosion knowledge
- ++ community institution strengthening
- ++ national institution strengthening

Socio-cultural disadvantages

Ecological benefits

- +++ improved soil cover
- +++ reduced soil loss
- +++ soil structure improvement
- + increased soil moisture
- + increase in soil fertility
- + biodiversity enhancement

Ecological disadvantages

- +++ weed infestation due to seed dispersion and grass roots

Off-site benefits

- ++ reduced groundwater river pollution
- + increased stream flow in dry season

Off-site disadvantages

Contribution to human well-being / livelihoods

Benefits /costs according to land user

Benefits compared with costs	short-term:	long-term:
Establishment	positive	very positive
Maintenance / recurrent	positive	very positive

Acceptance / adoption:

50% of land user families have implemented the technology with external material support.
50% of land user families (2000 families; 30% of area) have implemented the technology voluntary. estimates
There is strong trend towards (growing) spontaneous adoption of the technology. factor that helped was the formation of Landcare associations which have benefited their members in various ways. There is a strong trend towards spontaneous adoption, especially where Landcare associations are in operation.

Concluding statements

Strengths and → how to sustain/improve	Weaknesses and → how to overcome
Easy to establish and maintain → Strengthen farmers associations. These could be transformed into cooperative which serve as conduits in marketing. Intensify information and education campaign.	Effect on yield and income is not readily felt, since reduced erosion is not easily translated into increased income or yield → Farmers should have supplementary sources of income (eg livestock). Education about what long-term sustainability means.
Less competition for space, sunlight, moisture and nutrient. → Ensure continued regular trimming of vegetative strips and use of these as fodder or mulch.	Reduction of productive area by approx 10% → Optimum fertilization to offset production loss. Nutrients are conserved under NVS and this will result in the reduction of fertilizer requirement after some years.
Low labor and external inputs requirement → Use only naturally growing grass species.	Creation of a fertility gradient within the alley (soil is lost from the top of the alley and accumulates above the NVS where fertility then concentrates) → Increased application of fertilizer on the upper part of alley.
Effective in reducing soil erosion (by 90%) → Adopt other supportive technologies like mulching, zero tillage/minimum tillage, etc.	Overall increase of production value is low → Land users could ask for subsidy/assistance from Government: eg for fertilizers, establishment of nurseries, free seedlings (for higher value fruit trees).
Easy to establish and maintain → More research in agroforestry	High initial establishment cost → Subsidy/assistance from government
Improve soil fertility → Continuous training for farmers	Effect of technology is not readily seen → Education about what long term sustainability means
Prevent soil erosion → Improvement of infrastructure and marketing service	High gestation period for some component of the system → Proper mix of annual and perennial crops

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