



INDIA



FJI



ETHIOPIA



MALAWI



INDIA



ETHIOPIA

# THE VETIVER SYSTEM FOR ON FARM SOIL AND WATER CONSERVATION





# *Special Features*

## **Morphological**

- Erect and stiff stems
- Extensive, deep and penetrating root system
- Forming thick hedges

## **Physiological: Tolerant to:**

- Extreme weather (-14 to 55°C)
- Drought and water logging
- Fire
- Adverse soil conditions: salinity, acidity, alkalinity and sodicity
- High agrochemical and nutrient levels
- Heavy metals: Al, As, Cd, Cu, Cr, Hg, Ni, Pb, Se, Zn.





## **STIFF AND ERECT STEM**

**Up to 2m  
tall in one  
year**





## Forming a thick hedge when planted close together





## **Thick growth forming a very effective filter, trapping sediment**





# DEEP, EXTENSIVE AND PENETRATING ROOT SYSTEM

One year old: 3.3m deep

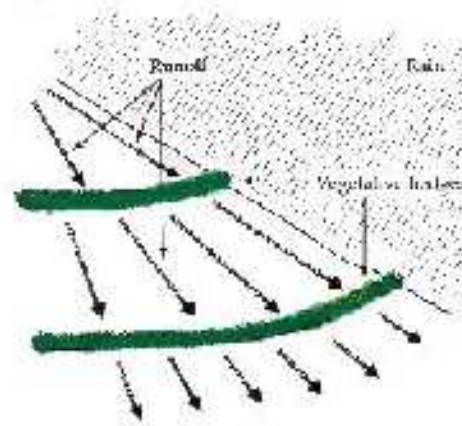
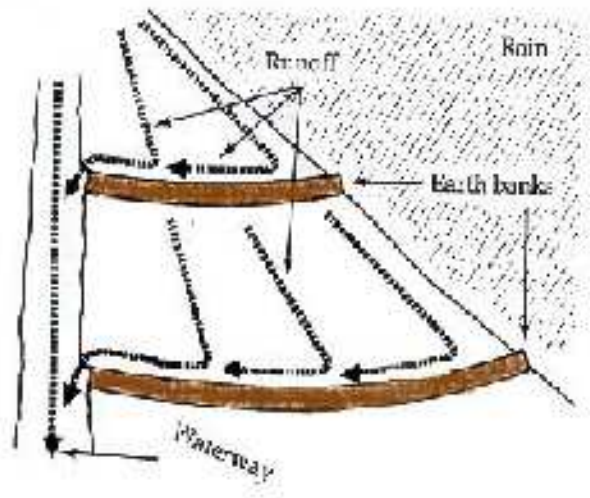
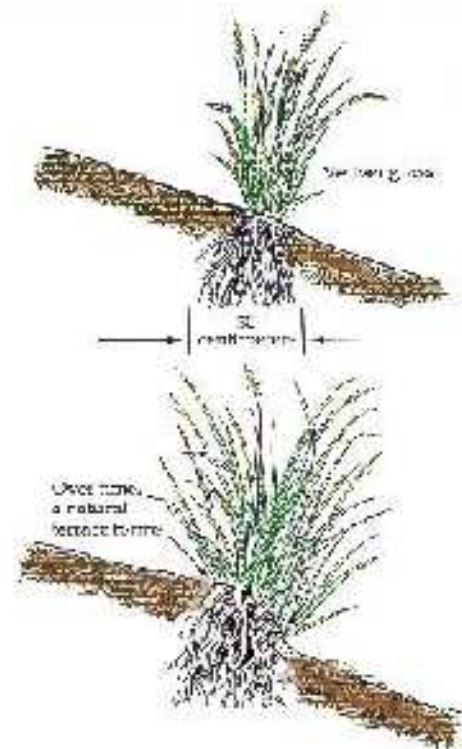
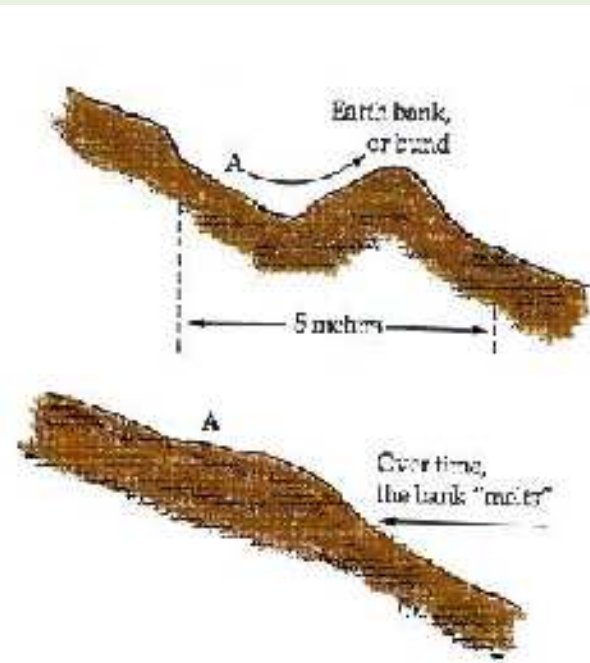


## Salt tolerance level of Vetiver grass as compared with some crop and pasture species grown in Australia.

Species	Soil EC <sub>se</sub> (dSm <sup>-1</sup> )	
	Saline Threshold	50% Yield Reduction
Bermuda Grass ( <i>Cynodon dactylon</i> )	6.9	14.7
Rhodes Grass (C.V. Pioneer) ( <i>Chloris guyana</i> )	7.0	22.5
Tall Wheat Grass ( <i>Thynopyron elongatum</i> )	7.5	19.4
Cotton ( <i>Gossypium hirsutum</i> )	7.7	17.3
Barley ( <i>Hordeum vulgare</i> )	8.0	18.0
<b>Vetiver (<i>Vetiveria zizanioides</i>)</b>	<b>8.0</b>	<b>20.0</b>



**Contour terraces are costly to build and maintain, take up more land for the terraces and waterways and do not conserve water**



**Vetiver System is cheaper to plant and maintain, wastes no land for waterways and conserve soil moisture**





# SOIL AND WATER CONSERVATION AND CROP YIELD ON 1.7% LAND SLOPE IN INDIA

	<b>Runoff (% Rainfall)</b>	<b>Soil loss (t/ha)</b>	<b>Grain yield (t/ha)</b>
<b>Control</b>	<b>23.3</b>	<b>14.4</b>	<b>2.52</b>
<b>Vetiver System</b>	<b>15.5</b>	<b>3.9</b>	<b>2.88</b>
<b>% Changes</b>	<b>Reduction -35.5</b>	<b>Reduction -72.9</b>	<b>Increase +14.2</b>



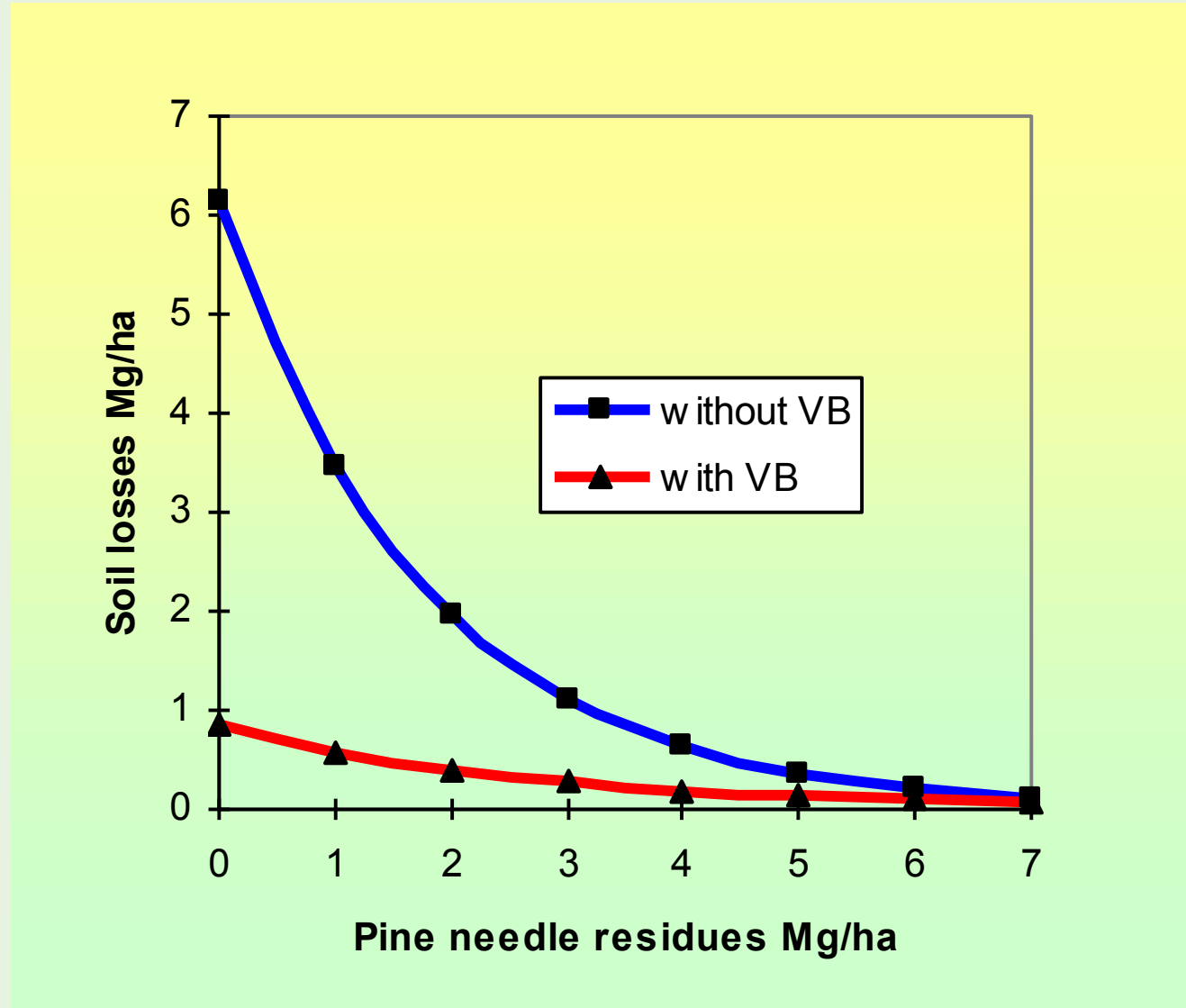
# SOIL AND WATER CONSERVATION AND CROP YIELD UNDER VETIVER SYSTEM ON 6% LAND SLOPE IN NIGERIA

<b>VS Effects</b>	<b>% Changes</b>
<b>Runoff Reduction</b>	<b>130</b>
<b>Soil Loss Reduction</b>	<b>70</b>
<b>Soil Moisture Increase</b>	<b>2 - 50</b>
<b>N Use Efficiency Increase</b>	<b>40</b>
<b>Grain Yield Increase</b>	<b>Cowpea: 11 – 26</b> <b>Maize: 50</b>





# Soil loss under different level of surface cover, with and without vetiver contour hedges



Soil trapped by contour hedge on high slope farming land in Australia





# Soil erosion control in Ethiopia





Anno Farm (commercial) Ethiopia. 300 km of vetiver hedgerows halted erosion increased groundwater flow to springs and increased maize yields by >30%

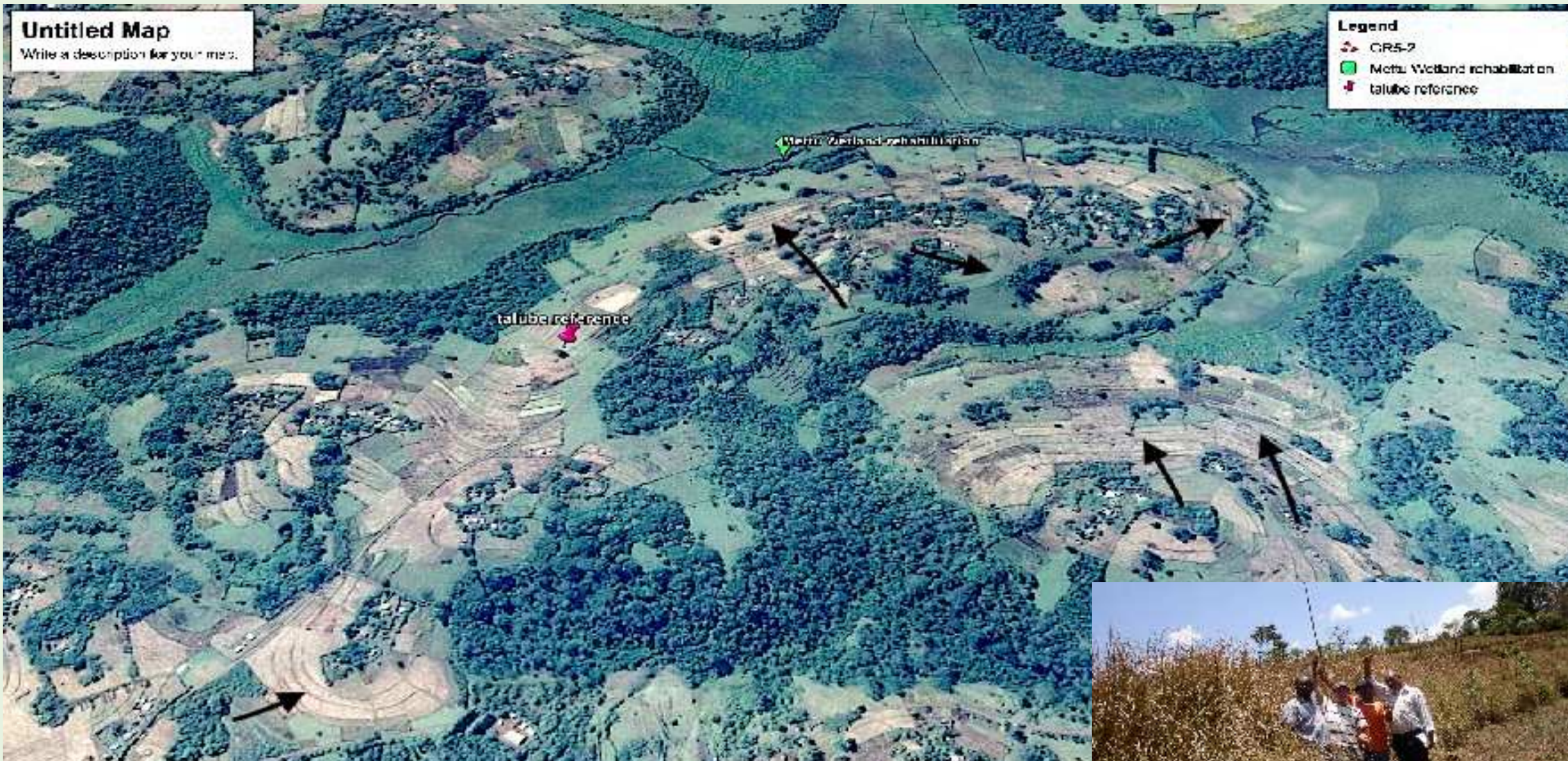




Over 20,000 farmers planted vetiver hedgerows in the Mettu area of western Ethiopia resulting in significant reduction in soil loss, increased and sustainable crop yields, and reduced conservation maintenance costs







Talube area, near Mettu, Ethiopia. Vetiver hedgerows significantly increased crop yields and the improved ground water recharge, the latter positively impacted on the rehabilitation of adjacent wetlands.







**Top left** - Well laid out vetiver hedgerows in western Ethiopia. Note some of the hedgerows have been cut for forage or thatch. **Bottom left** - Excellent stand of maize down hill of vetiver hedgerow as a result of spreading of rainfall runoff by hedge. The farmer above from Talube doubled his maize yields and was able to use fertilizer and other inputs including improved seed because of the reliability of the vetiver hedge.







**Above:** Vetiver hedgerows in Cuba, and **right:** vetiver hedgerow protecting a Cuban tobacco crop.



**Above:** Vetiver hedgerows in Haiti as a garden boundary hedge and for erosion control





# Soil erosion control in orchard in Thailand



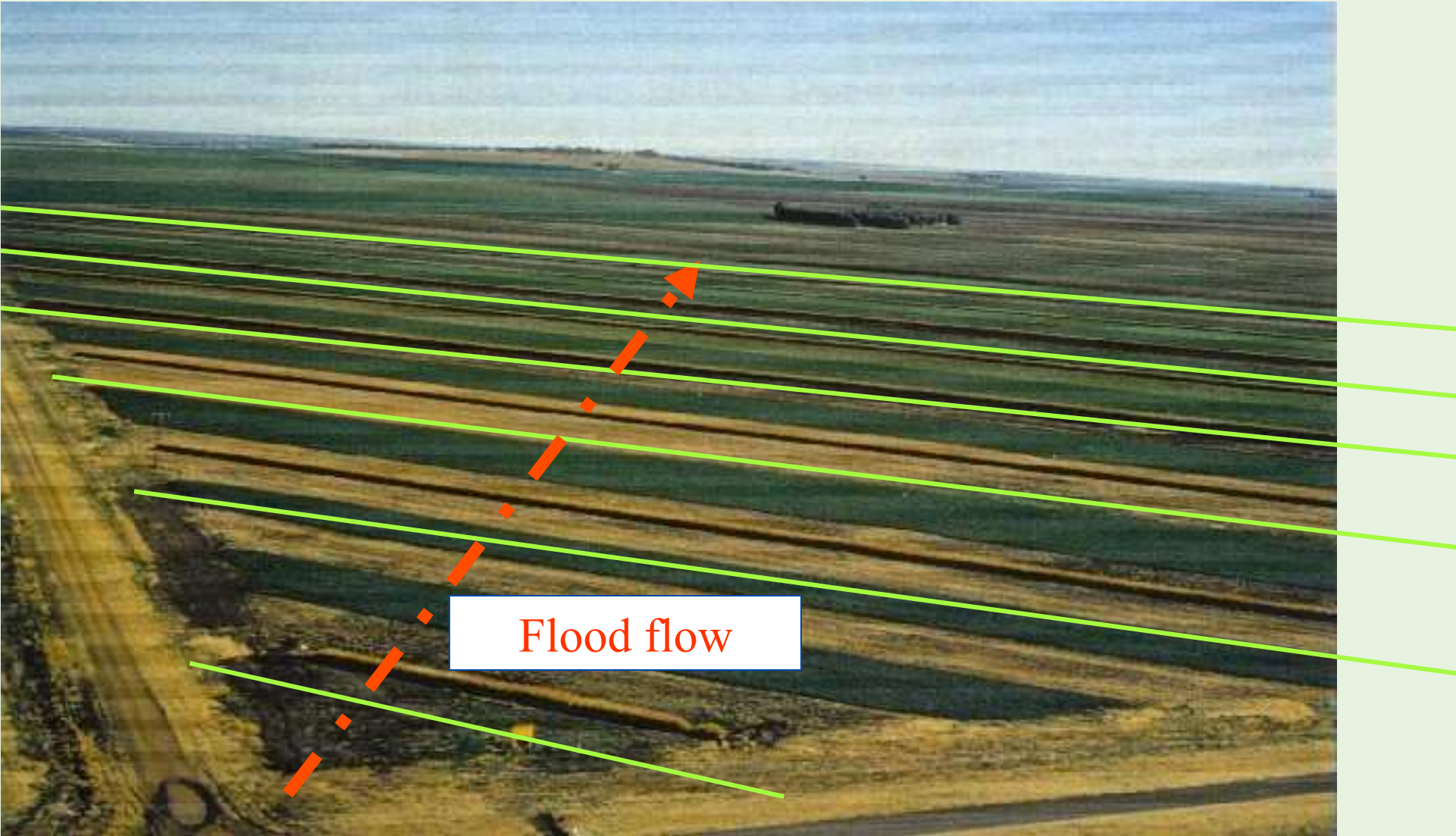


# EROSION CONTROL ON A FLOODPLAIN IN AUSTRALIA

***Strip Cropping*** is designed to protect crops and to control soil erosion on the flood plains subjected to deep overland flooding. Crops are planted on the contour in a sequence of crop, stubble and fallow strips (latter 22 meter wide) perpendicular to the flood flow



**Experimental site: Six rows of vetiver planted at 90m interval.**





## Well established young and mature vetiver hedges





## A major flood event in 1996





## No sign of rill and minimal surface erosion after the flood





# Trapping sediment





# No flood damage and excellent crop of sorghum





**As vetiver hedges provide a permanent protection measure to crop and soil erosion. Farmers can use the whole area to opportunity crops and hence increase productivity by 30% %**



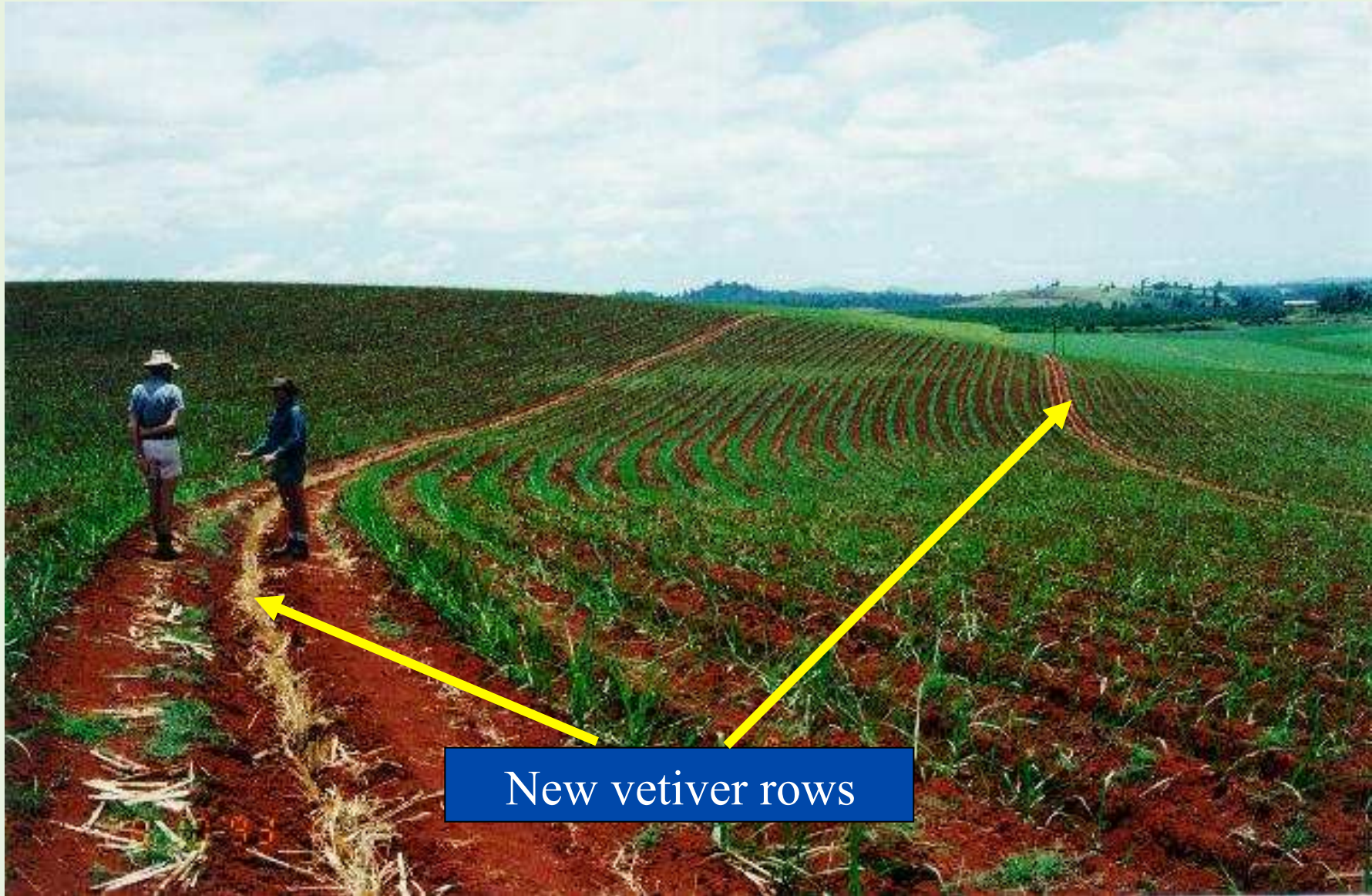


# Contour bank (terrace) replacement





# Contour bank replacement: In sugarcane farms





## A well established hedge two years after planting







## Trapping sediment in one year





# Contour bank (terrace) replacement: In grazing land in Australia

