VETIVER GRASS FOR SUSTAINABLE AGRICULTURE ON ADVERSE SOILS AND CLIMATE IN SOUTH VIET NAM

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Introduction

1. Adverse soils include
   a. Acid sulfate soil: High acidity, Al and Mn
   b. Saline soil: High soluble salt
   c. Degraded gray soil: Acid, high in laterite and kaolinite
   d. Sandy, saline-sodic soil in semi-arid condition

- 2. Due to the above adverse conditions, very few vegetation can be grown or naturally grown on thses soils

- 3. However VETIVER due to its special morphological and physiological features can be grown on these soils

Objectives

The main objectives of planting vetiver on these soils are:

1. Erosion control on transport and irrigation infrastructure.
2. Improve productivity of these soils and the crops they support

Sandy, saline-sodic soil in semi-arid condition

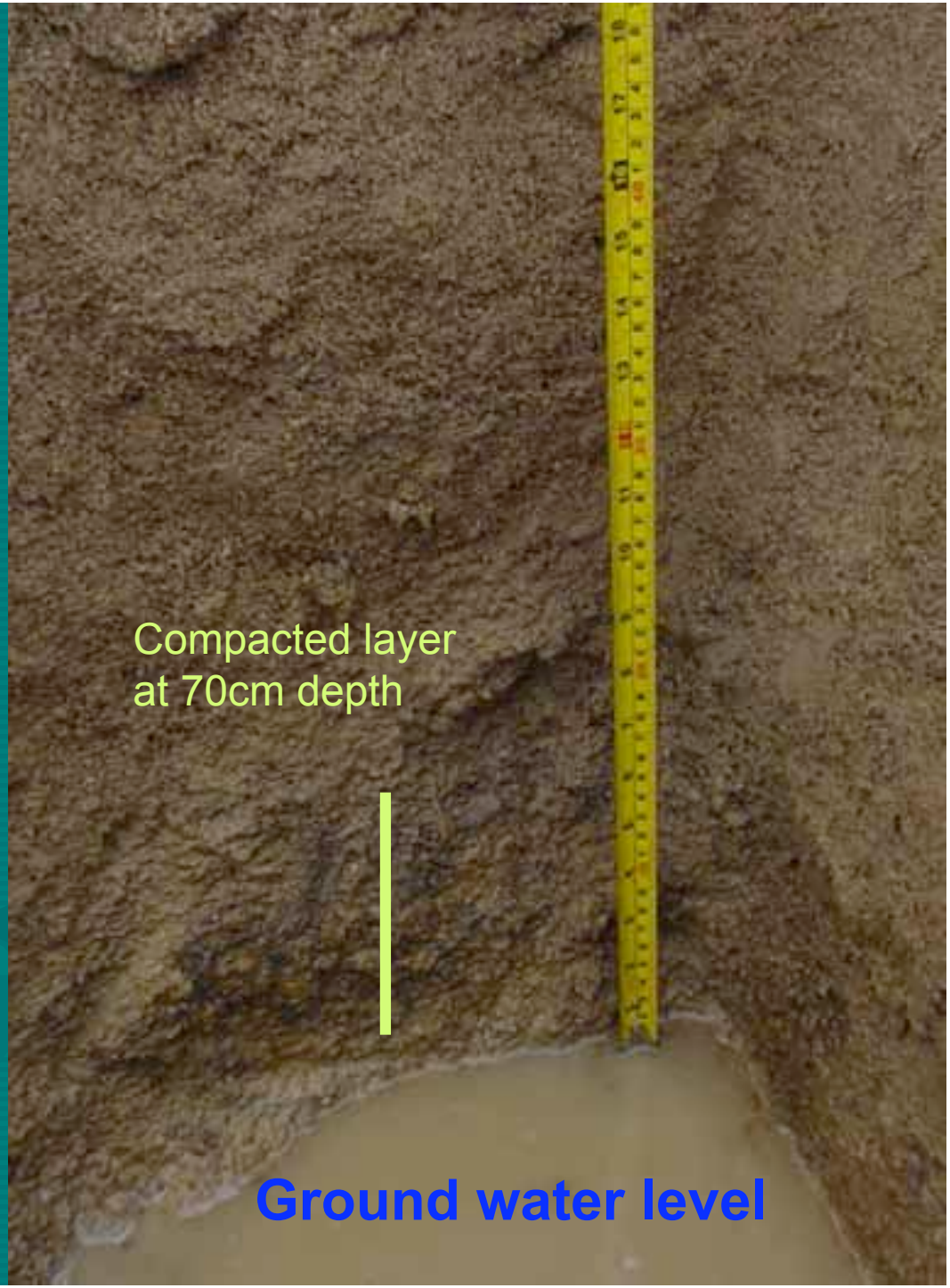
Objectives:

- - Erosion control
- - Improving salinity and alkalinity of the soil
- - improving soil organic matter and crop yield, providing fodder for livestock and compost for crops

Site Characteristics

Soil texture: 96% sand
Alkaline: pH =10 to 1m depth
High in soluble Ca and Na
Annual rainfall 300mm, hot (40^0) and dry wind in summer
Very poor natural vegetation and crops

Although the ground water level is only 700mm below surface, plant roots can not reach it because of the compacted layer

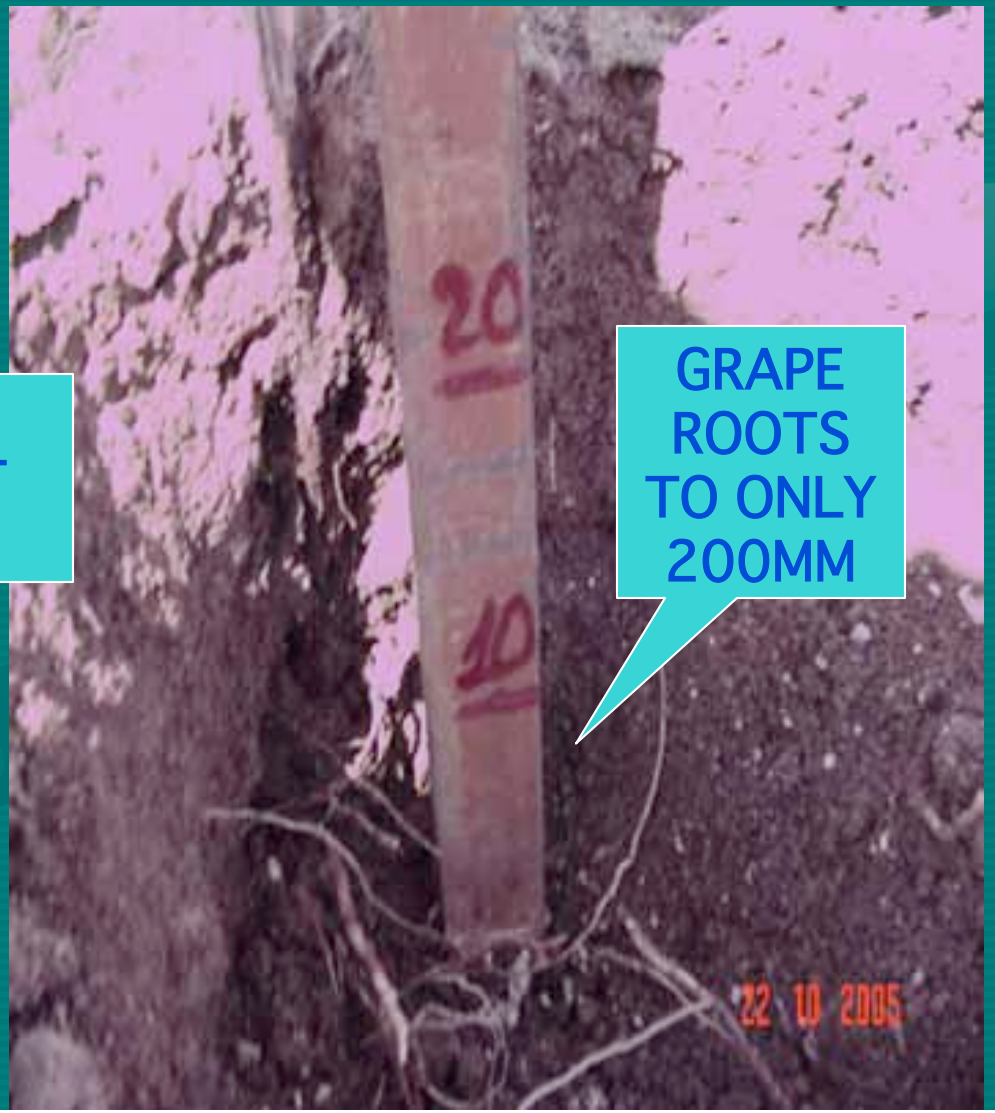


Therefore this corn crop could not survive without irrigation or rain

BUT VETIVER GREW EXTREMELY WELL UNDER THE SAME CONDITONS 75 DAY OLD CROP

75 DAY OLD CROP PRODUCED 25T/HA OF FRESH LEAVES (800g FRESH LEAVES/ CLUMP) ON THIS SOIL WITHOUT RAIN OR IRRIGATION

AFTER 3 MONTHS VETIVER ROOTS REACHED 700MM, PENETRATING THROUGH THE COMPACTED LAYER. REACHING THE UNDERGROUND WATER TABLE



IMPROVING SOIL pH

Soil depth (cm)	Before vetiver planting	3 months after vetiver planting	3 years after grape planting	Non cultivated soils
0-20	9.72	8.02	9.45	9.66
20-40	9.67	7.89	8.03	9.62
40-60	9.82	7.62	7.30	10.16
60-80	10.10	6.90	8.04	10.13
80-100	10.12	7.84	9.79	10.14

IMPROVING SOIL EXCHANGEABLE SODIUM

(meq/100g __T)

Soil depth (cm)	Before vetiver planting	3 months after vetiver planting	3 years after grape planting	Non cultivated soils
0-20	2.53	0.40	2.12	7.70
20-40	4.81	0.75	0.08	11.78
40-60	7.18	0.39	0.51	9.33
60-80	1.34	0.70	1.32	7.67
80-100	5.05	0.21	6.72	6.20

Fodder for livestock

When the green vetiver shoot and leaf was composted and used for corn and grape crops, yields improved markedly

Contrast between Vetiver and corn crops 2 months after planting

The reasons why there was so much discrepancy in growth between Vetiver and corn

- Once the penetrating and massive Vetiver roots pierced through the compacted gypsum layer it would tap into the underground water supply

- In contrast the corn plant can not do this because:
  - its poorer root system.
  - Even if its root could reach the underground water supply, corn cannot tolerate the high pH and saline water.

- Resulting in very poor growth in the corn crop

As a result of this, farmers now planting vetiver with their grape crop to benefit from vetiver soil chemistry and water supply improvement

Acid Sulfate Soils

Main objectives are erosion control on:

1. Transport and irrigation infrastructure.

2. Flood protection dikes on farm land

3. Flood protection dikes on rural population settlements.

Highly erodible canal and dike banks, and road batter

Almost bare of native vegetation

One month after planting

- **Vetiver can be established and grew well on these extreme acid sulfate soils**

Six months after planting

Erosion was reduced to 1/3-1/5 of the level before vetiver planting

Trapped sediment

15 months after planting

- No more erosion and return of local native vegetation between vetiver rows

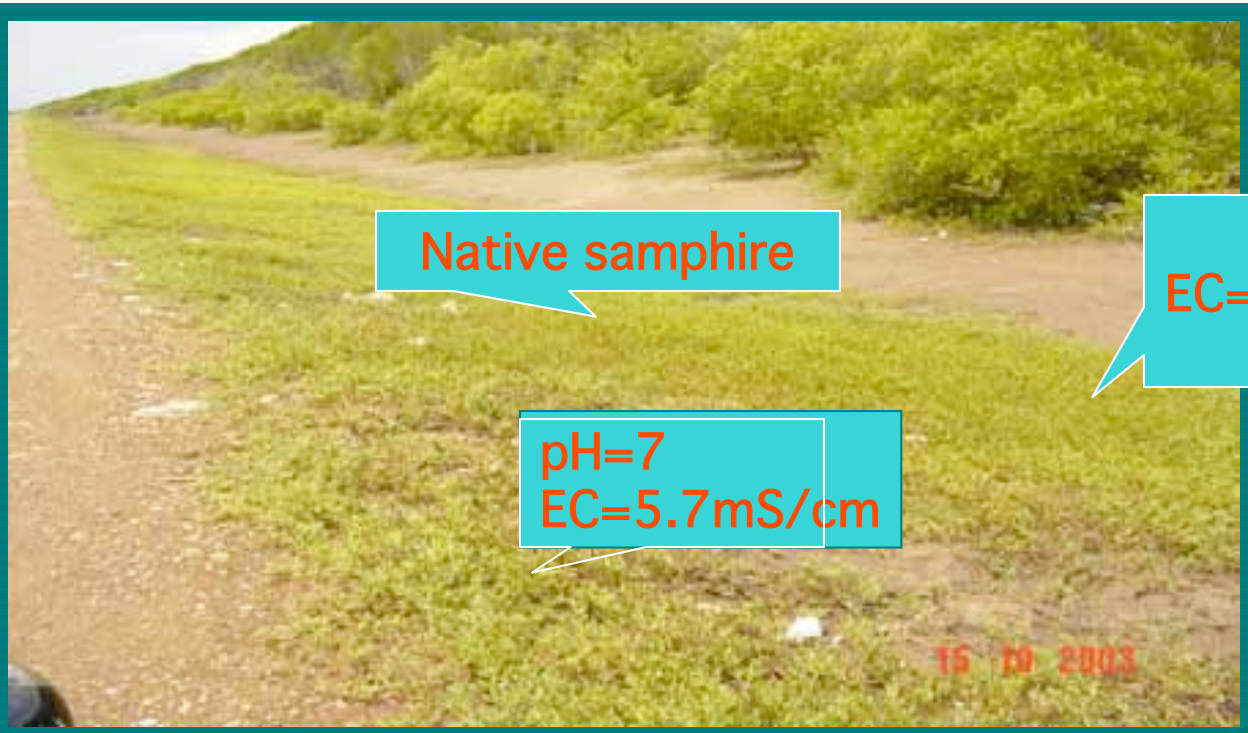
15 months after planting

Saline Soils
For Sea Dike Protection

A sea dike in the Mekong Delta

Mangrove

Sea water intrusion


Native samphire
pH=8
EC=11.1mS/cm
pH=7
EC=5.7mS/cm


Eroded materials

12 months after planting

Three years after planting

Degraded gray soil

Acidic, high in laterite and kaolinite


Compacted soil part (90% kaolinite)
Concrete part
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One year after planting, no more erosion on the channel banks and the trees returned

One year after planting, the road stabilised