

VETIVER FORAGE and BIOMASS

Vetiver grass is a very versatile plant that has been used worldwide to address a myriad of environmental and engineering rehabilitation issues.

Due to its unique ability, except for nutrients N P K, vetiver retains all of its absorbed contaminants, especially heavy metals in its roots, so its shoot biomass is safe for animal feed in both fresh and dry forms

Its shoot biomass harvested from various applications such as soil and water conservation in agricultural land, mining waste rehabilitation and phytoremediation of wastewater, is a valuable resource for forage, biofuel, handicraft, thatching and mulch.

This presentation will concentrate only on its most valuable contribution – FORAGE PRODUCTION.



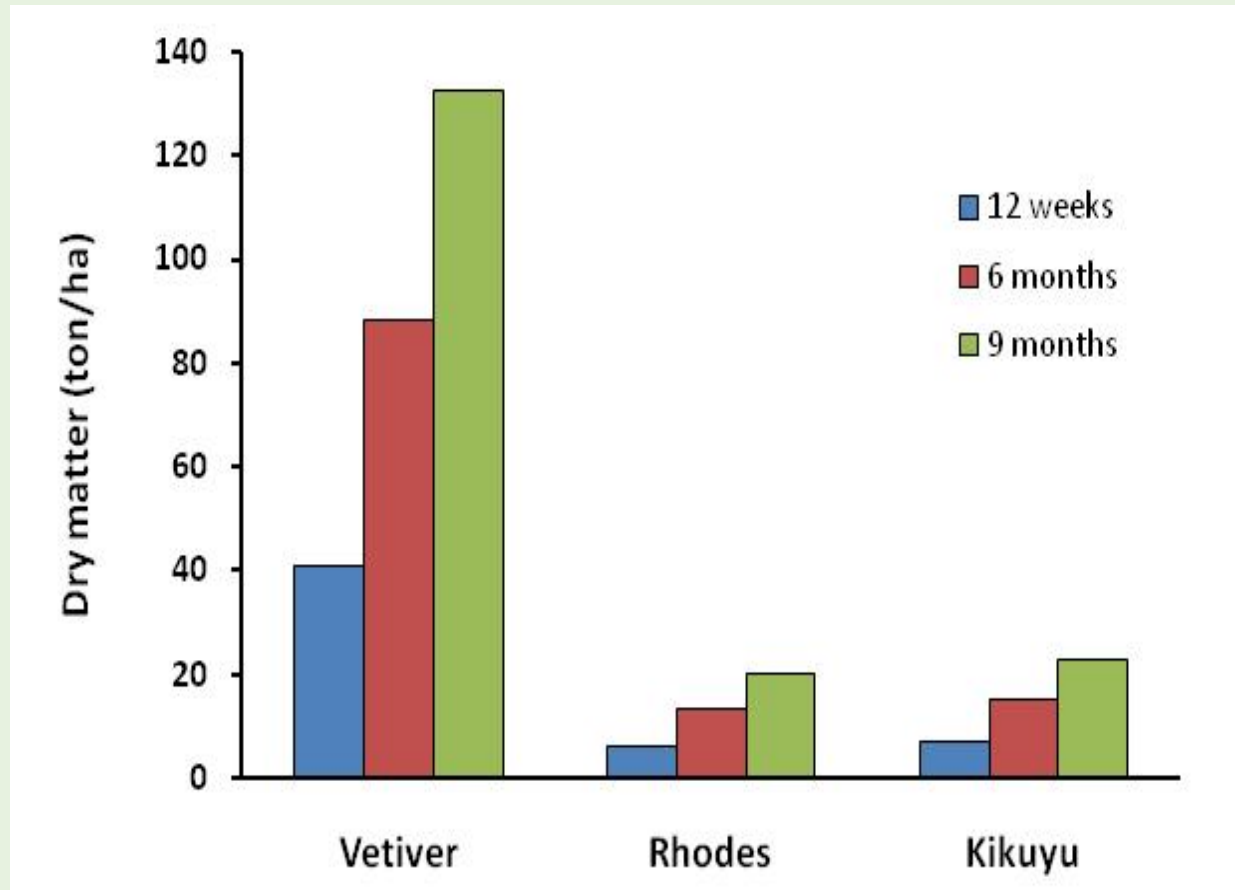
Major Attributes of Vetiver as a Forage Plant

- High yield comparing with common tropical and subtropical pasture grasses
- Nutritional values comparable with common tropical and subtropical pasture grasses
- Tolerance to extremely adverse climatic variations: drought, flood, inundation, fire
- Tolerance to extremely adverse edaphic variations: heavy clay to sandy soil and hardpan
- Tolerance to extremely adverse growing conditions: extreme pH, alkalinity, salinity, sodicity
- Tolerance to most pests and diseases
- Tolerance to most agrochemicals: herbicides and insecticides



Vetiver Growth and Biomass

As a result of the unique photosynthetic (C4 plant) ability, Vetiver can produce massive biomass, 100t/ha under field conditions and 130t/ha under experimental conditions



Potential dry matter yield of three grasses over time





**Vigorous growth and massive
biomass under favorable conditions**



Analytes	Units	Vetiver grass			Rhodes	Kikuyu
		Young	Mature	Old	Mature	Mature
Energy (Ruminant)	kCal/kg	522	706	969	563	391
Digestibility	%	51	50	-	44	47
Protein	%	13.1	7.93	6.66	9.89	17.9
Fat	%	3.05	1.30	1.40	1.11	2.56
Calcium	%	0.33	0.24	0.31	0.35	0.33
Magnesium	%	0.19	0.13	0.16	0.13	0.19
Sodium	%	0.12	0.16	0.14	0.16	0.11
Potassium	%	1.51	1.36	1.48	1.61	2.84
Phosphorus	%	0.12	0.06	0.10	0.11	0.43
Iron	mg/kg	186	99	81.40	110	109
Copper	mg/kg	16.5	4.0	10.90	7.23	4.51
Manganese	mg/kg	637	532	348	326	52.4
Zinc	mg/kg	26.5	17.5	27.80	40.3	34.1

High Nutritional Values



Vetiver Grows Under Extremely Adverse Conditions

Arid tropical savannah



On beach sands



In water



**On heavy black
cotton soil**



Vetiver Grows Under Extremely Acidic Conditions

Vetiver thrives at soil pH=3.8 and Aluminium Saturation Percentage (ASP) of 68% and 87% under field conditions



pH	2.0	2.2	3.8	4.4	4.8	5.5	7.3	7.6
Al%	90	90	68	36	11	2	trace	trace



Highly erodible acid sulfate soil (pH 3.0) in coastal Australia

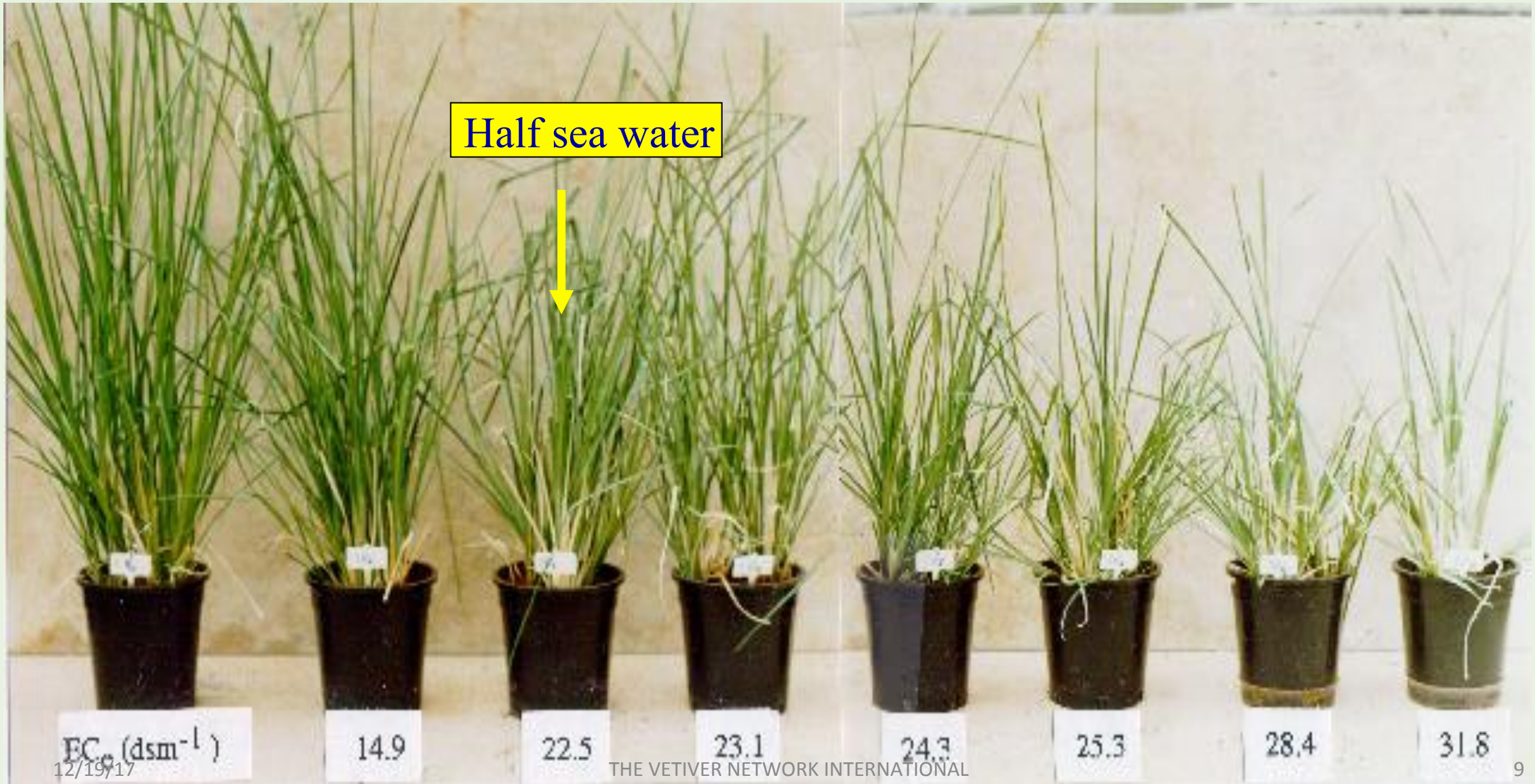


One year after planting on acid sulfate soil (pH 3.0) in coastal Australia

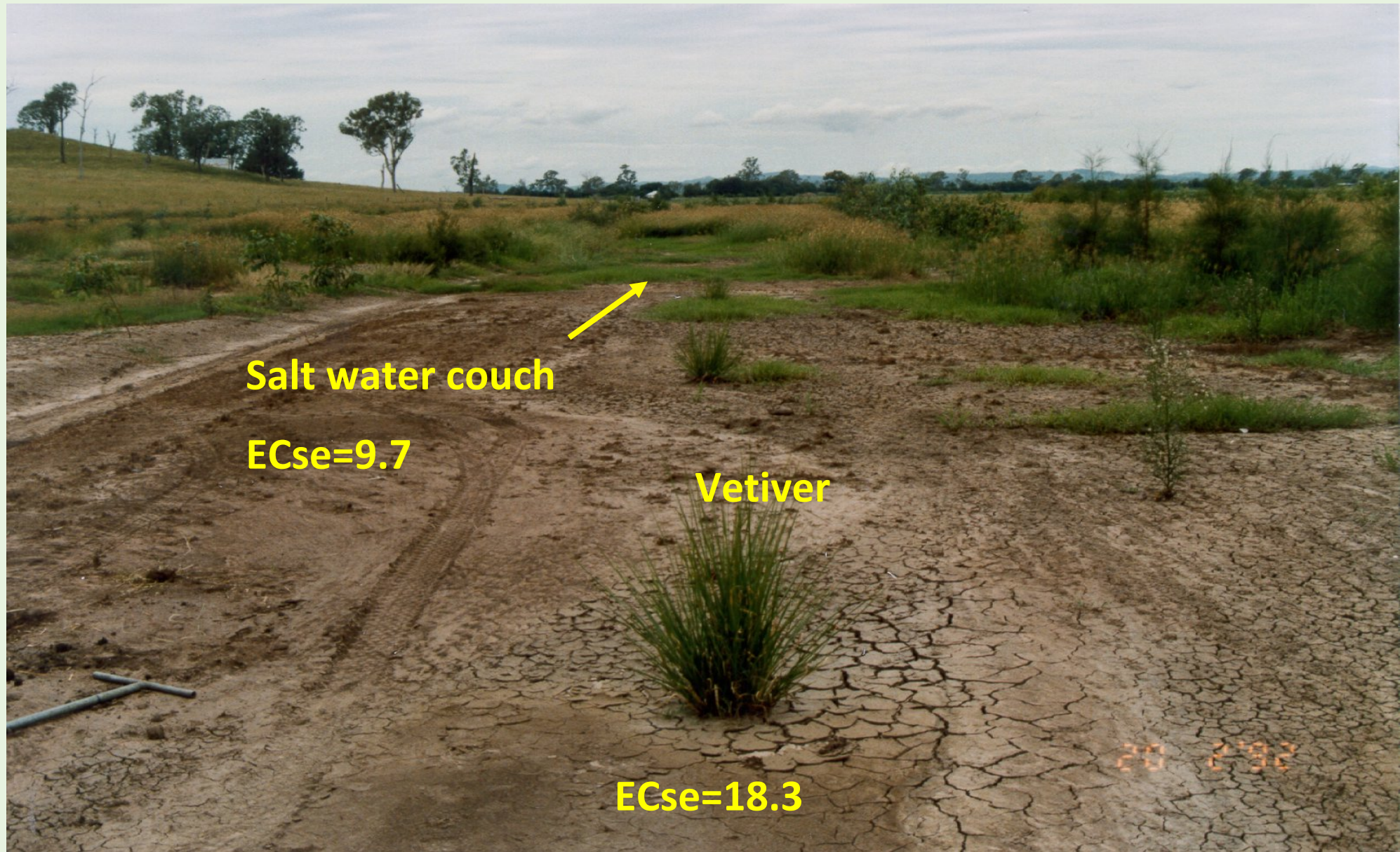


Vetiver is Highly Tolerant to Saline Conditions

Vetiver can survive at soil salinity level of $E_{cse} = 47.5 \text{ dSm}^{-1}$ under dryland salinity conditions



Vetiver can tolerate almost twice as much salt as salt water couch



Vetiver growing between mangrove seedlings in brackish water



Vetiver Grows Under Extremely Cold Conditions

In California's Mojave Desert

Vetiver grass can survive temperatures as low as minus -12°C (10°F) if following daytime temperatures rise well above freezing and the ground is not frozen.

Summer heat is often at 43+°C (110+°F) or higher

Vetiver was covered by 35cm of snow for 4 days and fully recovered in spring in Jordan



THE VETIVER NETWORK INTERNATIONAL



Vetiver Is Fire Proof

Soil is a very good insulator, as Vetiver buds are underground, they are not affected by fire



Some Common Sources of Vetiver Biomass



ETHIOPIA

**Vetiver grass
contour hedges for
soil and water
conservation, and
habitat
rehabilitation on
Ethiopian
highlands.
Biomass harvested
for fresh and dry
animal feed**



AUSTRALIA



**Free range
grazing on gold
mine tailings
rehabilitation
site**



AUSTRALIA - Hay from Sewage Effluent Treatment Plant



Some Examples of Vetiver As a Forage Crop

Free range grazing by cattle in
Australia



Free range grazing by buffalo in China



Right: Free range grazing by cows in India





Left: Fresh fodder for cattle in New Zealand



Right: Fresh fodder for milking cows in Vietnam



Fresh fodder for goats and pig in Vietnam. Also vetiver straw is very good for bedding – soaks up urine



Yard grazing by horse in Australia



Yard grazing by horse in South Africa



Info from South Africa indicates that vetiver reduces worms in horses



Feed for Wildlife



Kangaroo in Australia



**Giraffe and Rhino at Animal Kingdom,
Florida, USA**

