Vetiver System for soil and water conservation in Tea plantations including selection of appropriate planting material and other applications

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VETIVER
An ideal plant for soil & moisture conservation in Tea Plantations

- Vegetative soil and moisture conservation measures- Inexpensive, replicable, sustainable and fully effective in stopping erosive degradation
- Vetiver as a hedge – ideal plant to conserve and stabilize embankments
- Although it has been used for many years its real impact was felt in the late 80s following its promotion by the World Bank
- It is a climax plant capable of growing over an extremely wide range of soil and climate
- It is not just another grass. It is a special grass like bamboo

- It belongs to the grass family Graminaeae as rice, maize, sugarcane etc.
- The generic name ***Vetiveria*** comes from '**vettiver**' its name in Tamil meaning 'root that is dug up'
- The specific name '***zizanioides***' means river side which reflects the fact that in the remote past the plant was found in the river banks along the water ways in India
- The plant is native to India where it is known as ***Vetiver, Vetivert, Khus, or Khus-Khus***
- Common names in other languages are:
  - Birina – Assamese
  - Khus-khus – Bengali
  - Khus, Bala, Bena or Panni – Hindi
  - Vettiver – Tamil
  - Ramacham – Malayalam
  - Vattiveru & Lavancha – Kannada

- VS in its most common form is simply the establishment of a narrow (< 1.0 m wide) live stiff grass barrier in the form a hedge.
- The system is very user friendly and it is something practical planters can do.
- In China, its use has extended from agriculture to engineering and mechanical devices are being replaced.
- It has been used successfully to stabilize flood embankments, river and canal embankments in many countries.
- Vetiver has several characteristics that make it special.
- When planted correctly, it will quickly form a dense permanent hedge which will reduce water flow velocity, divert run out water and form a very effective filter.

- It has strong fibrous root system, that penetrates and binds the soil to a depth of 3 meters and can withstand the effect of tunneling and cracking.
- It is perennial and requires minimal maintenance.
- It is practically sterile and because it produces no stolen or rhizome it will not become a weed.
- It will not compete with crop plants it is used to protect.
- It has stiff erect stem which can stand up to relatively deep water flow (0.6 to 0.8 m)
- as its crown is below the surface it protects the pants against fire and over grazing.

- Its sharp leaves and aromatic roots repel rodents, snakes and similar pests.
- Its leaves and roots demonstrated resistance to most diseases.
- Once established it is generally unpalatable to live stock. The young leaves, however, are palatable.
- It is both xerophyte and hydrophyte and once established it can withstand drought, flood and long periods of water logging.
- It is cheap and easy to establish as a hedge and to maintain as well as to remove if it is not wanted.
- It will grow in all types of soil regardless of fertility, pH, or salinity. It is highly tolerant to toxic levels of aluminum, manganese, arsenic, cadmium, nickel, copper, mercury and zinc.

- It will grow in a wide range of climate.
- It is known to grow in areas with average annual rainfall between 200 and 6000 mm and with temperature ranging from 1.0 to 45.0 C.
- It is a climax plant and therefore even when all surrounding plants are destroyed by drought, flood, pests, diseases, fire or other adversity Vetiver will remain to protect the ground from the on slot of next rain
- In their struggle for survival certain plants have evolved fantastic, unbelievable adaptations. Vetiver is one such plant.

Applications in Tea

A typical Tea Estate and Factory at Munnar


Establishing vetiver for soil conservation in Tea


Well-established hedge after 4 months of planting


Vetiver hedge in place of conventional contour stone wall

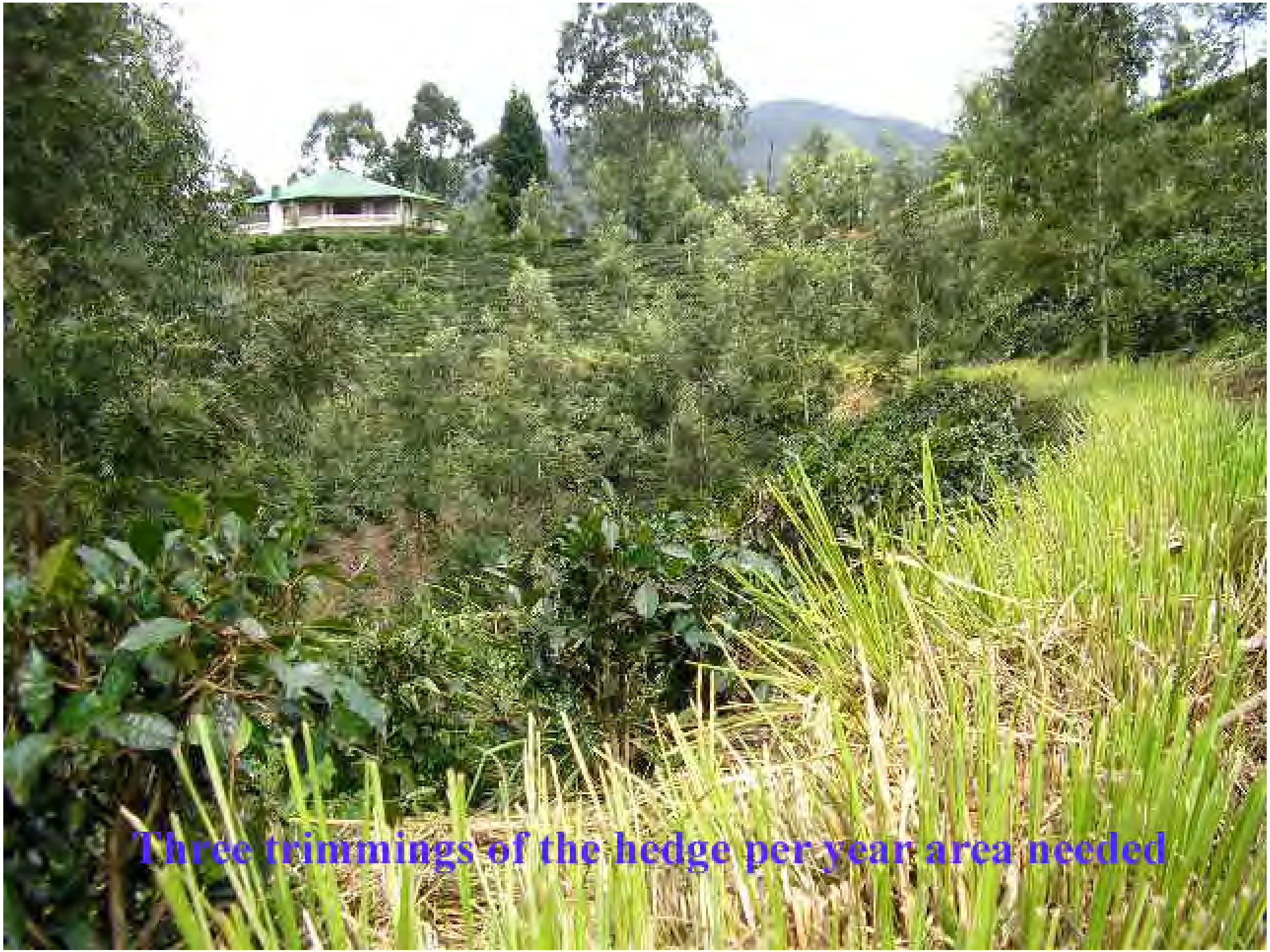

Restrengthening of stone wall by Vetiver hedge

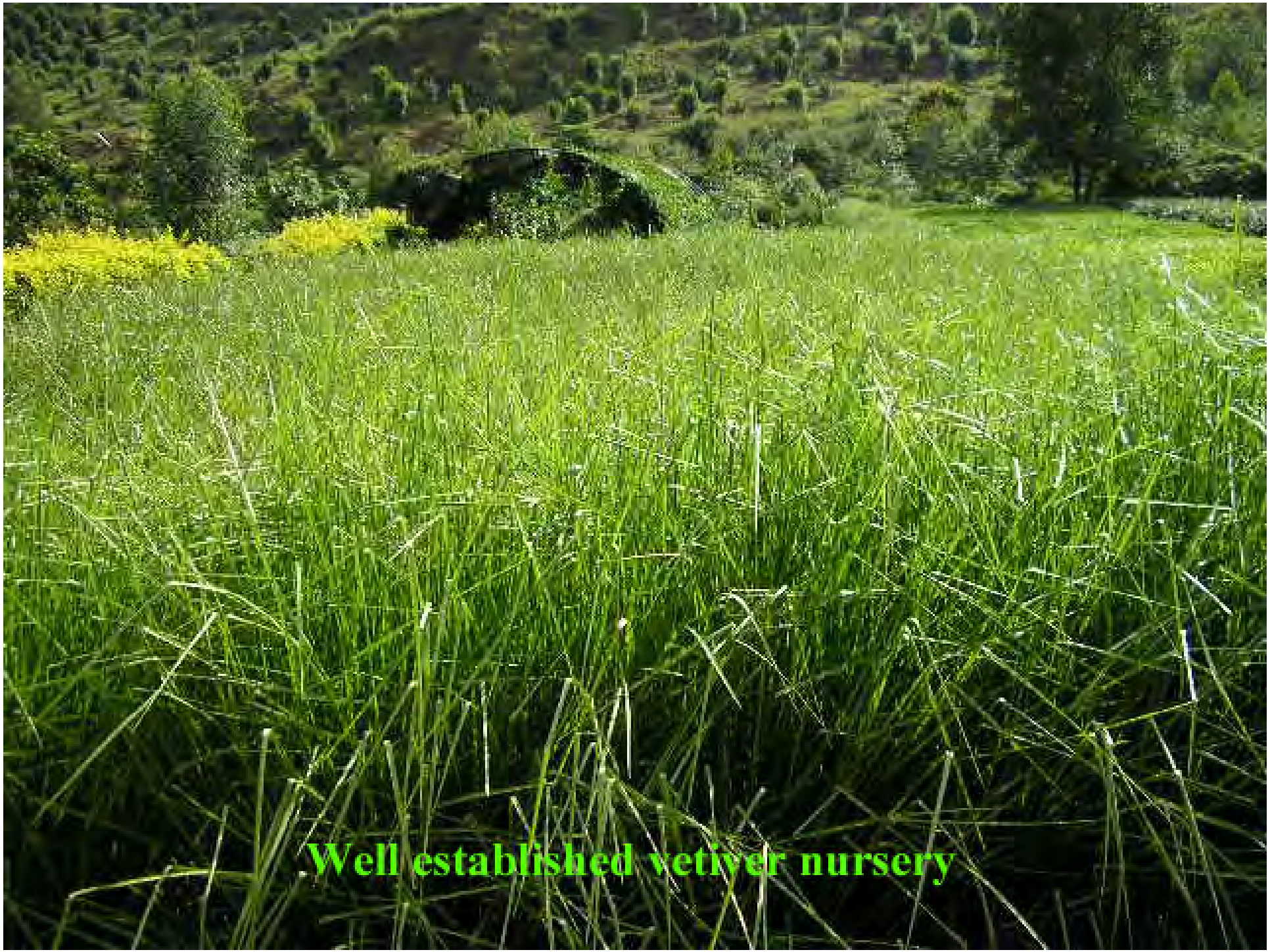
Young tea plants are mulched with trimmed vetiver foliage

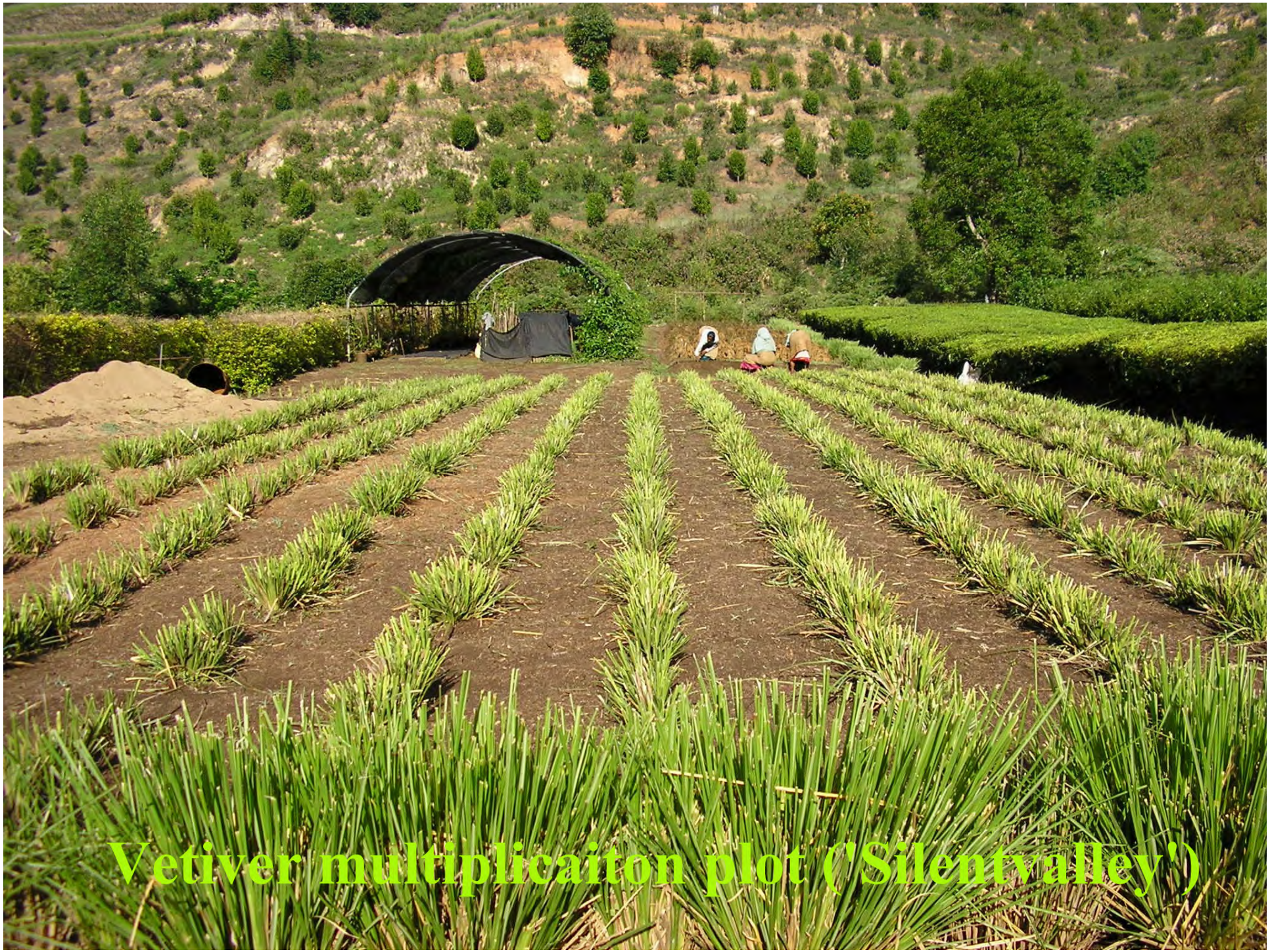
Prevention of weed growth by mulching with Vetiver

Vetiver mulch lasts longer (> a year)


Soil and moisture conservation in tea with Vetiver hedge


Three trimmings of the hedge per year area needed

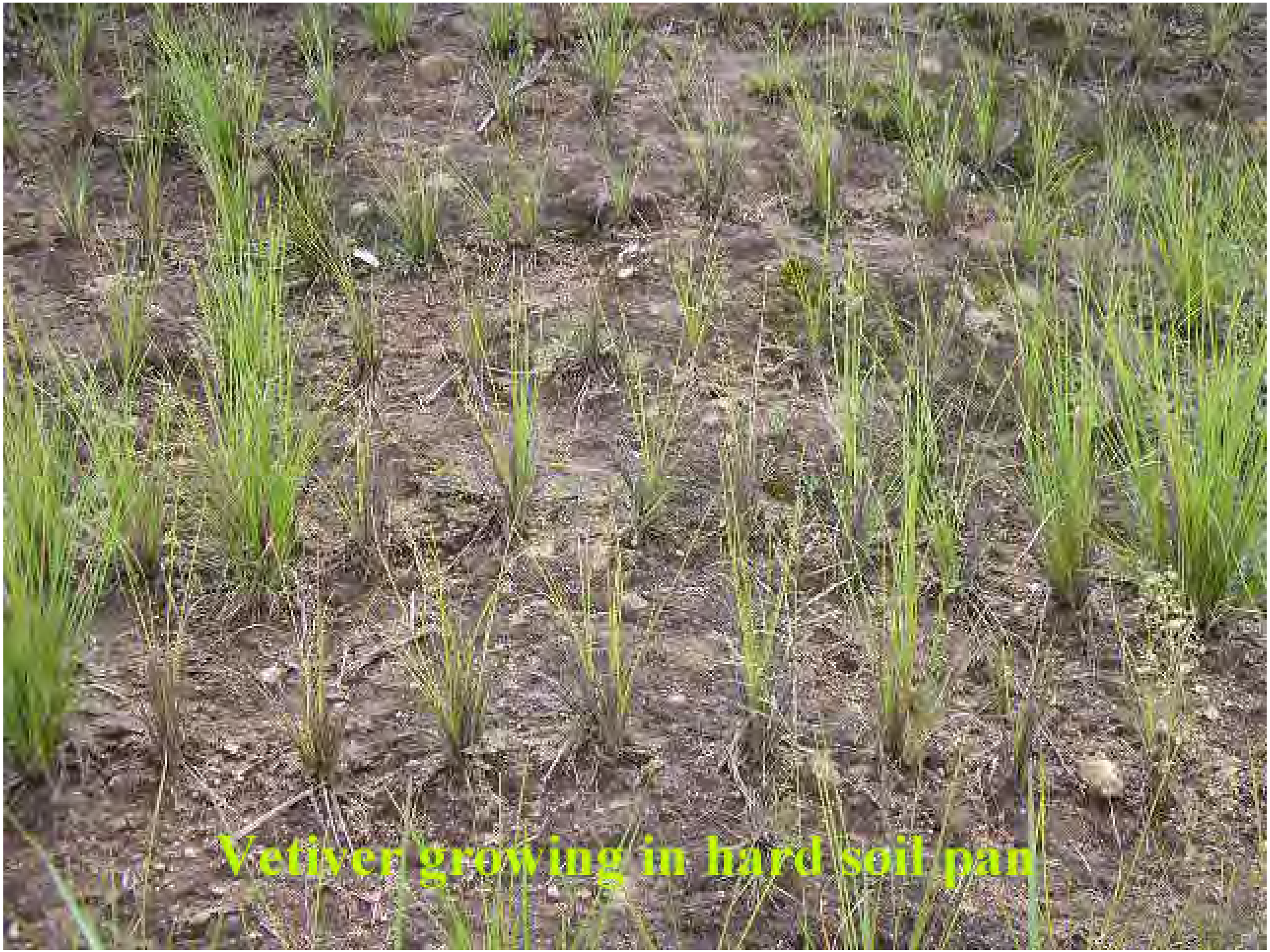

Well established vetiver nursery


Vetiver multiplicaiton plot ('Silentvalley')


SVLY
PANN
ADU


SVLY
PANN
MADU


Minimum 75 tillers per clump could be obtained in one year

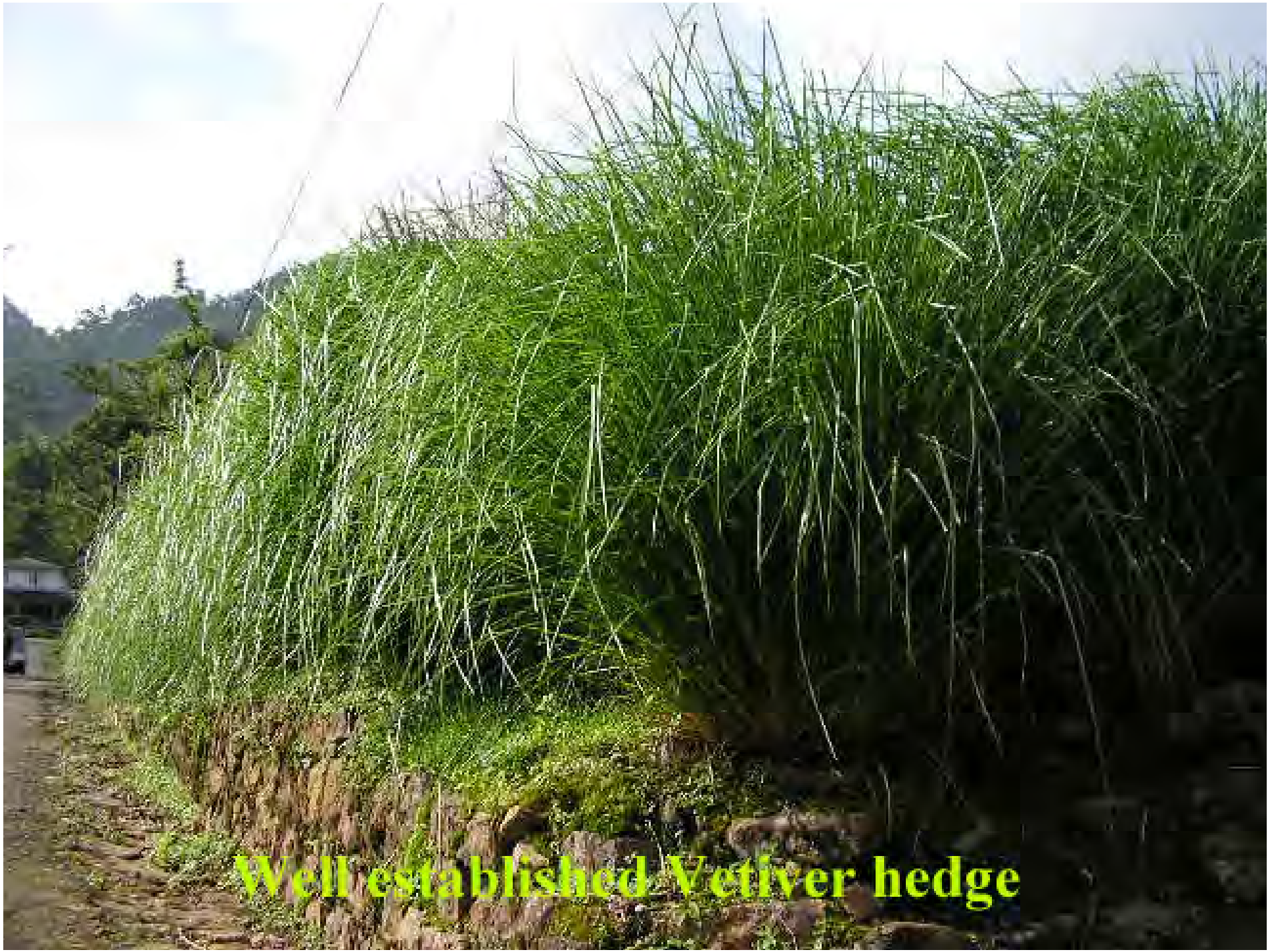

Vetiver growing in hard soil pan


Studies on root growth in tea soil (1 year)

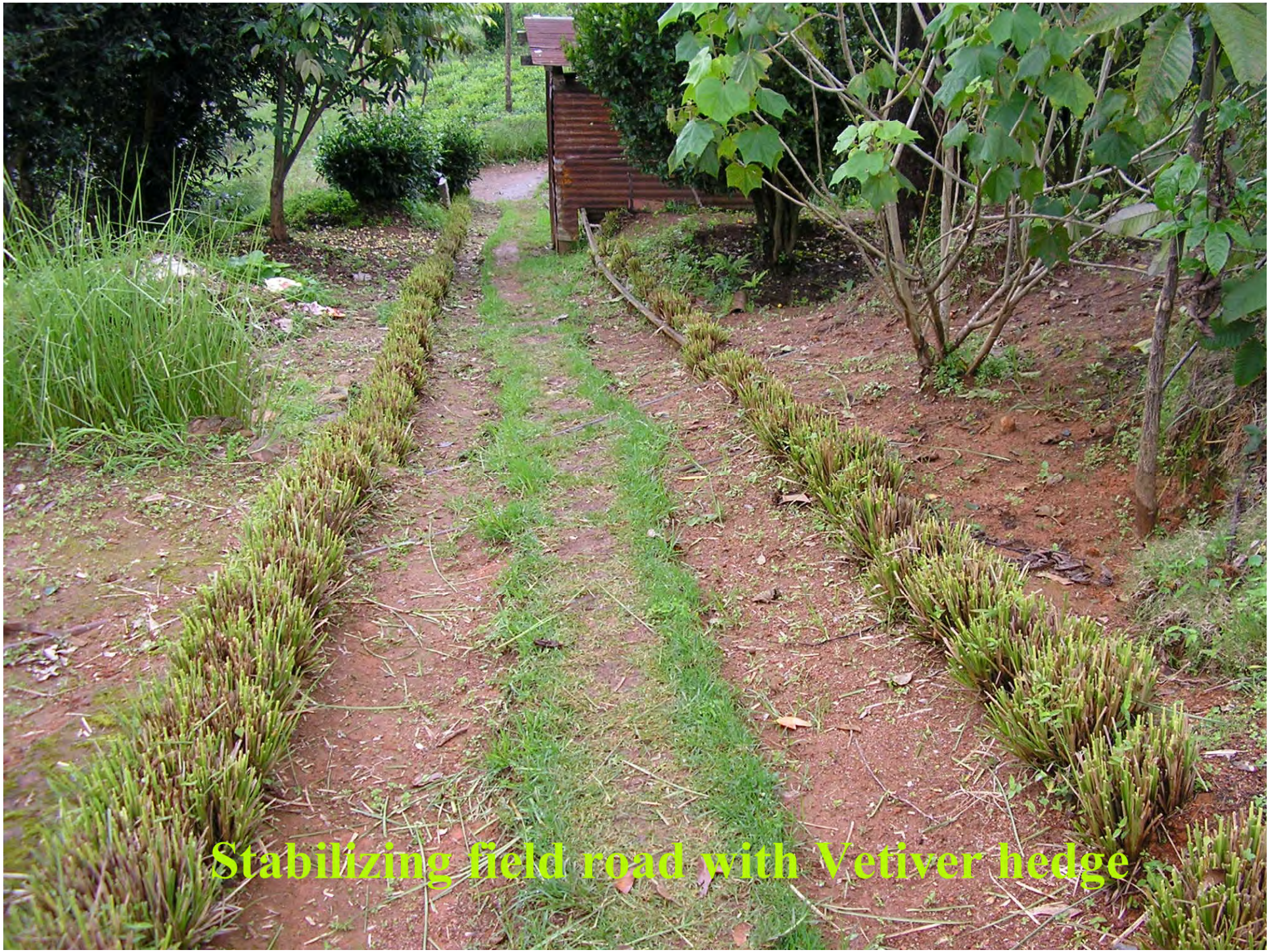
Studies on Vetiver cultivars

Variety	Length of roots (cm)	Total bio-mass (g)	Shoot –weight (g)	Root weight (g)	Shoot : root ratio	No. of tillers	DMC %	Oil %
SVLY	75	5257	4647	610	7.62	115	81.16	1.07
PANN	92	7093	6513	580	11.23	155	86.43	0.27
MADU	73	507	303	203	1.49	28	83.50	0.30
ODV-1	81	3150	2933	217	13.52	108	85.20	0.84
ODV-2	68	1393	1153	240	4.80	96	85.31	0.70
ODV-3	83	1910	1653	257	6.43	72	76.00	0.42
ODV-4	77	2530	2217	313	7.08	122	76.36	0.41
ODV-5	72	2443	2040	403.3	5.06	89	85.00	0.55
ODV-6	66	670	463	206.7	2.24	31	86.79	0.68
ODV-7	96	4180	3710	470	7.89	115	80.23	0.81
ODV-8	91	1470	1243	227	5.48	44	85.89	0.37
ODV-9	91	5820	5277	543.0	9.72	209.0	91.64	0.33
ODV-10	78	987	743	243.3	3.05	34.0	85.21	-
ODV-11	93	4487	4110	377.0	10.90	147.0	88.60	0.64
ODV-12	78	2207	1920	287	6.69	53	90.17	0.31
ODV-13	47	227	127	100	1.27	10	89.69	0.58

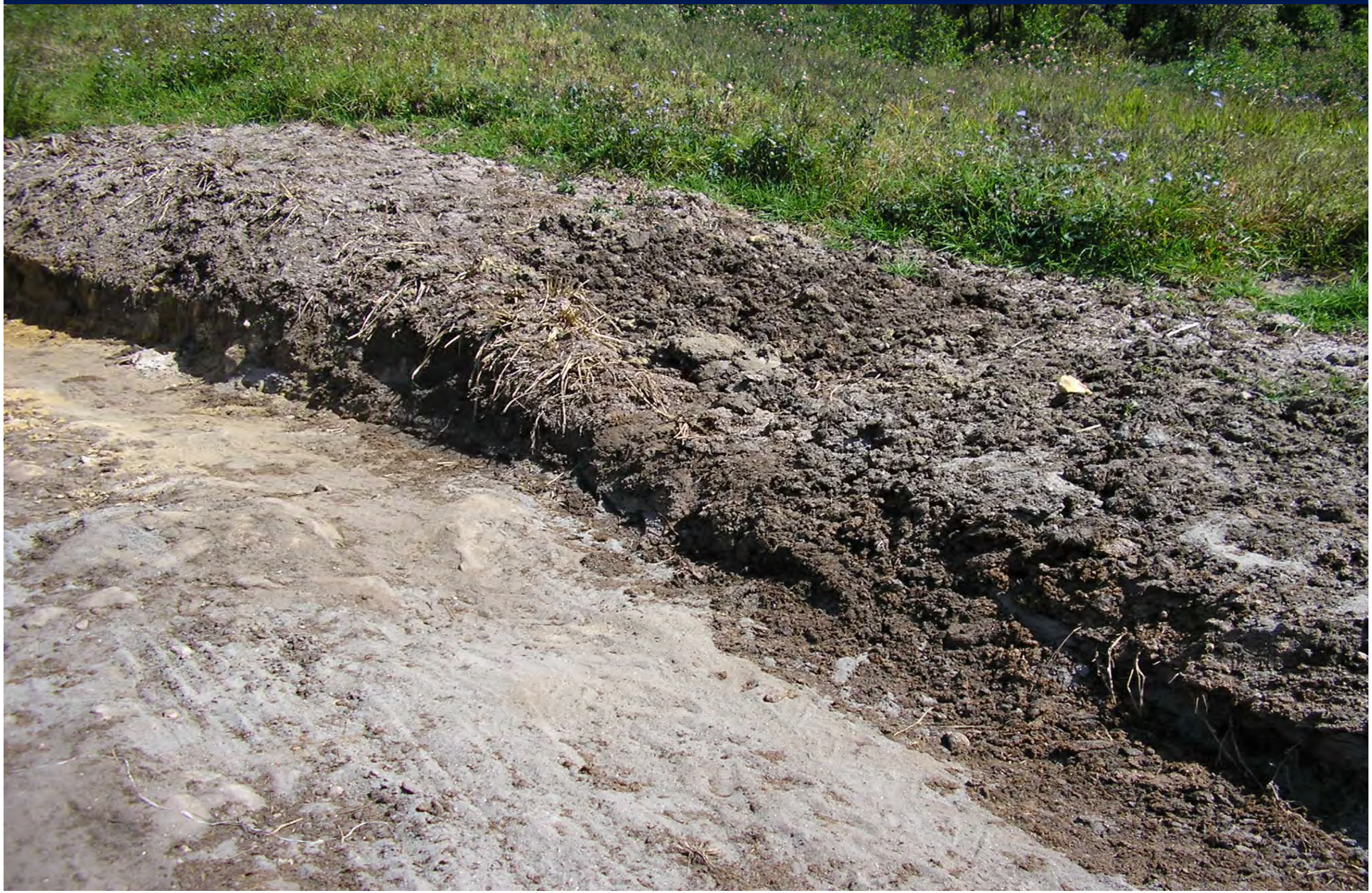
ODV-14	89	1820	1517	303	5.01	56	86.15	0.18
ODV-15	87	1370	1080	290	3.72	70	90.30	0.30
ODV-16	90	2610	2280	330	6.91	103	89.93	0.46
ODV-17	85	1653	1397	256.7	5.44	65.3	91.50	0.29
ODV-18	89	1143	860	283.3	3.04	64	88.70	0.58
ODV-19	88	2267	1927	340	5.67	141	88.90	0.62
ODV-20	78	1758	1593	163	9.77	65	88.90	0.30
ODV-21	89	373	267	107	2.50	18	88.00	0.23
ODV-22	69	1367	1147	220	5.21	49	88.30	0.67
ODV-23	98	4367	3917	450	8.70	133	90.10	0.68
ODV-24	105	4173	3757	417	9.01	159	88.90	0.63
Average	**83**	**2490**	**2178**	**312**	**6.28**	**87**	**87**	**0.51**
SD	12.129	1769.55	1650.04	132.656	3.135	49.777	4.131	0.221


Well established Vetiver hedge

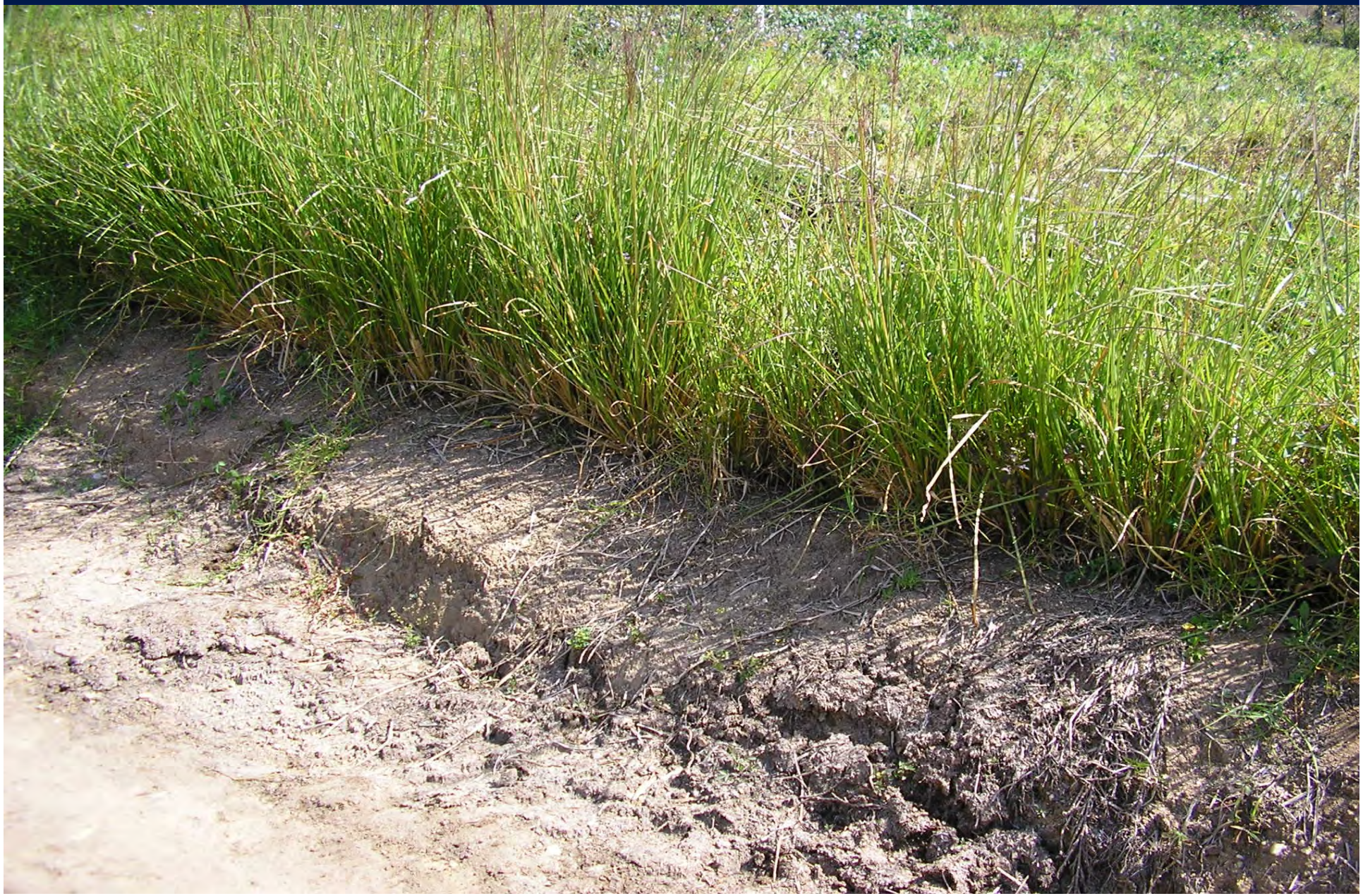

Well established multiplication plot


Stabilizing field road with Vetiver hedge

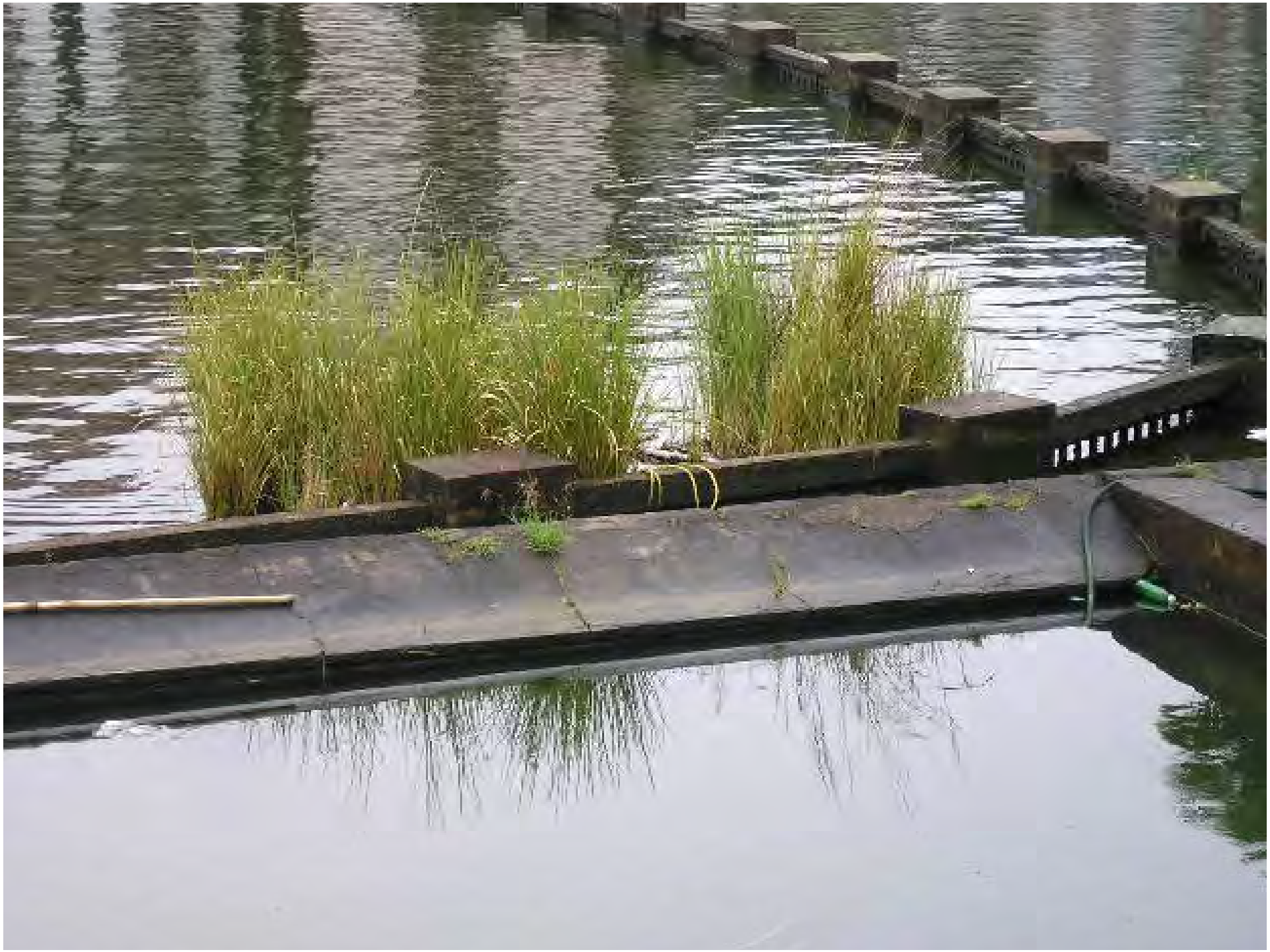
Before planting

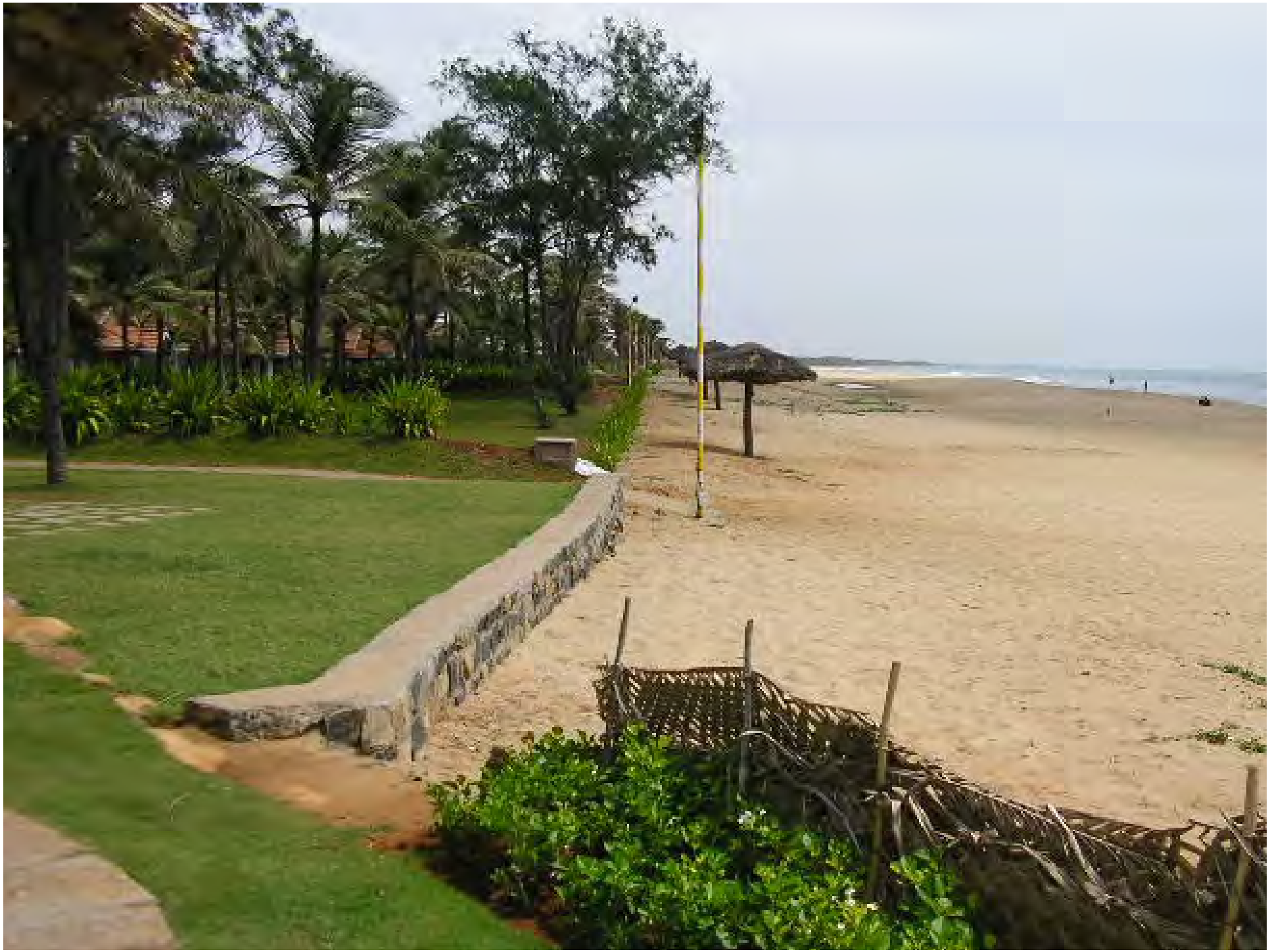


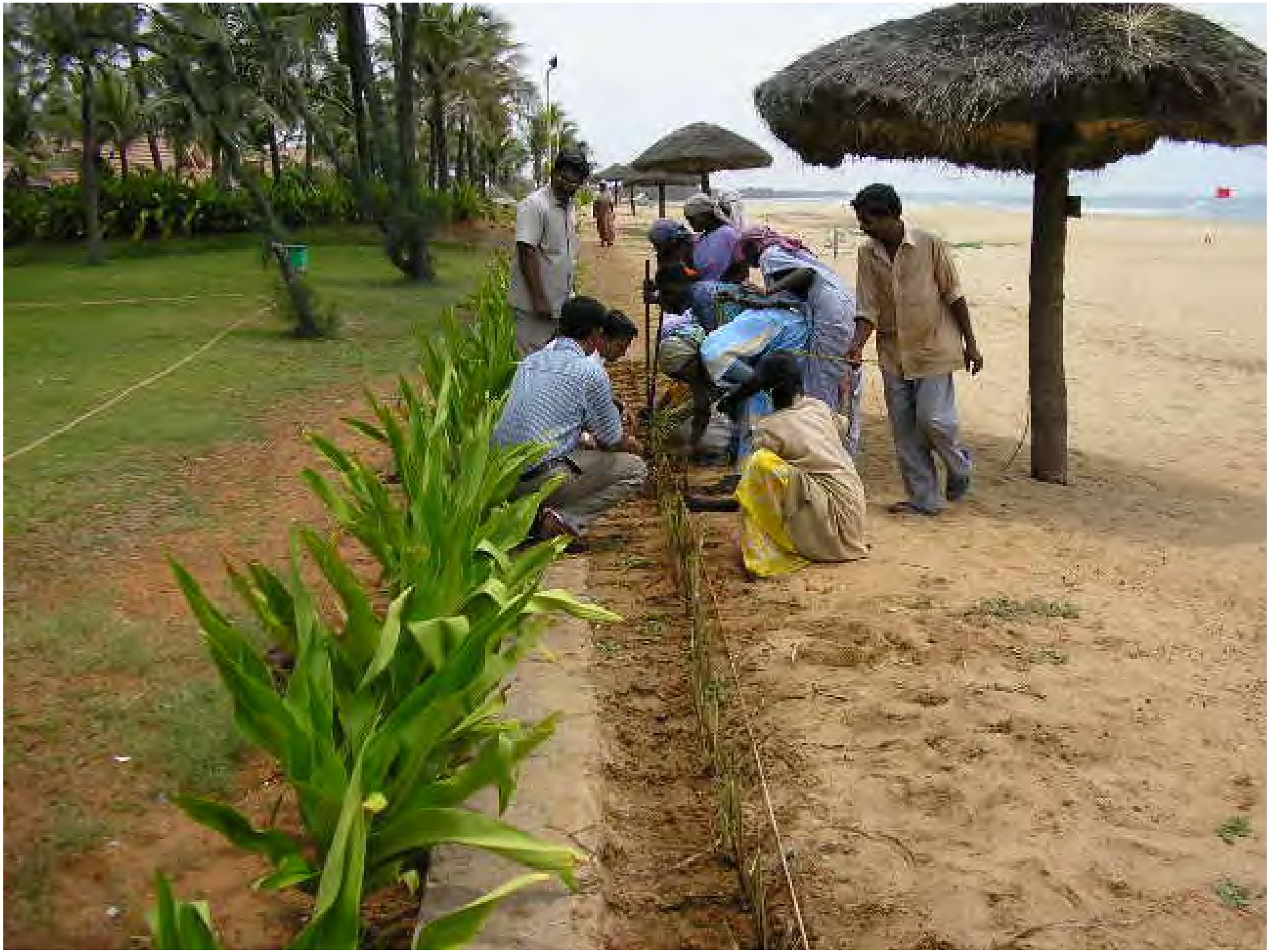
After planting

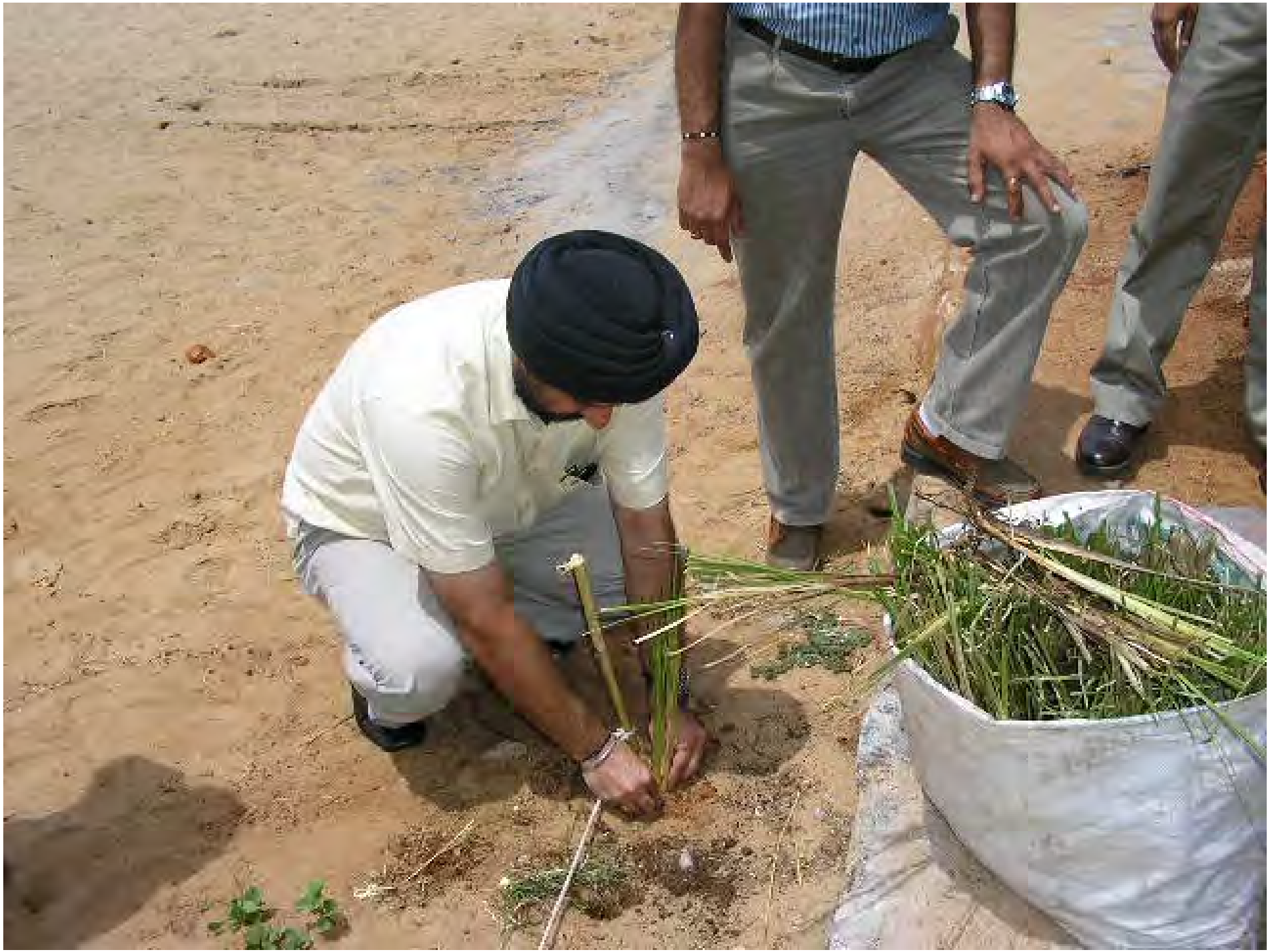


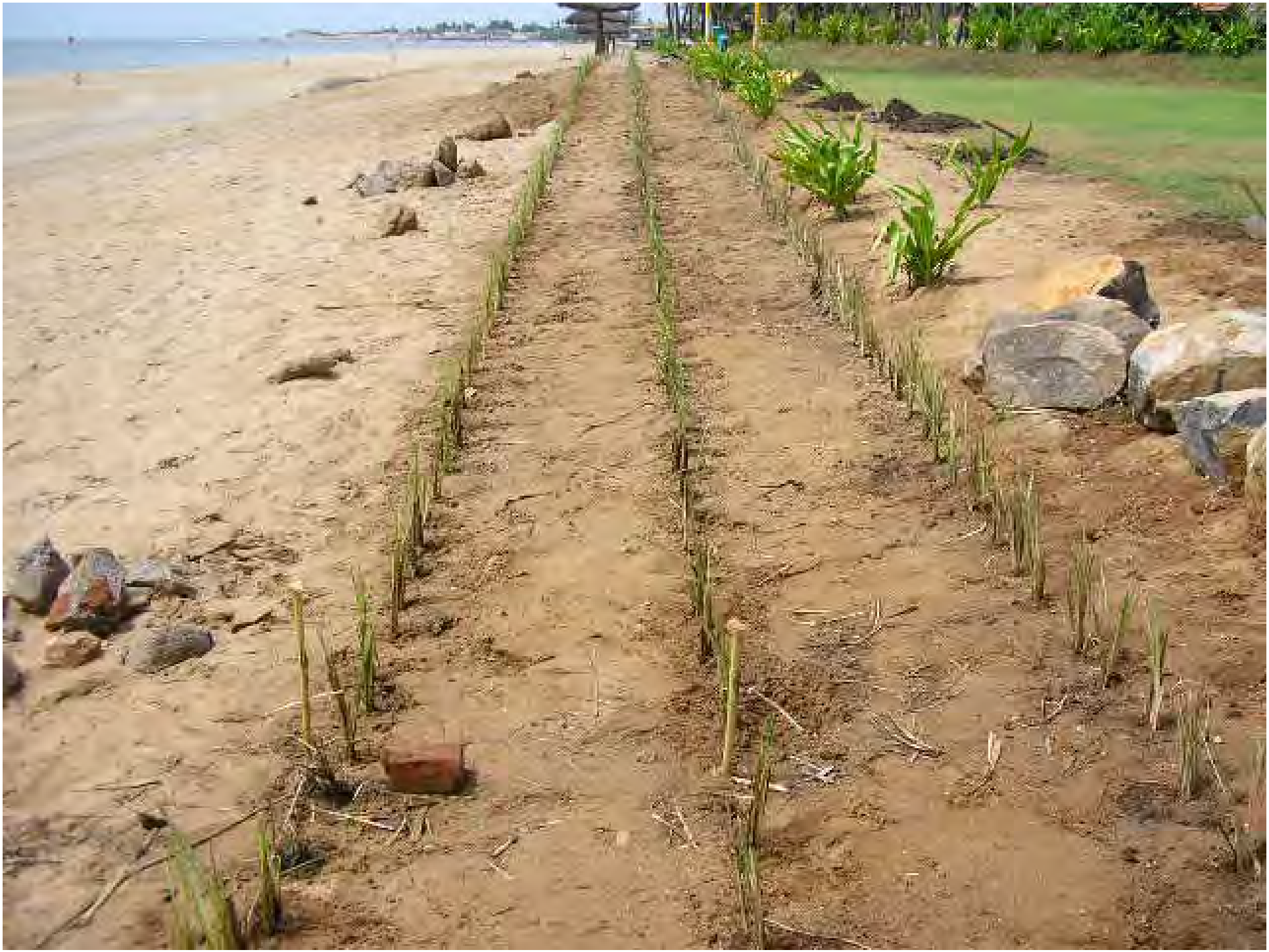

Improving quality of water with Vetiver

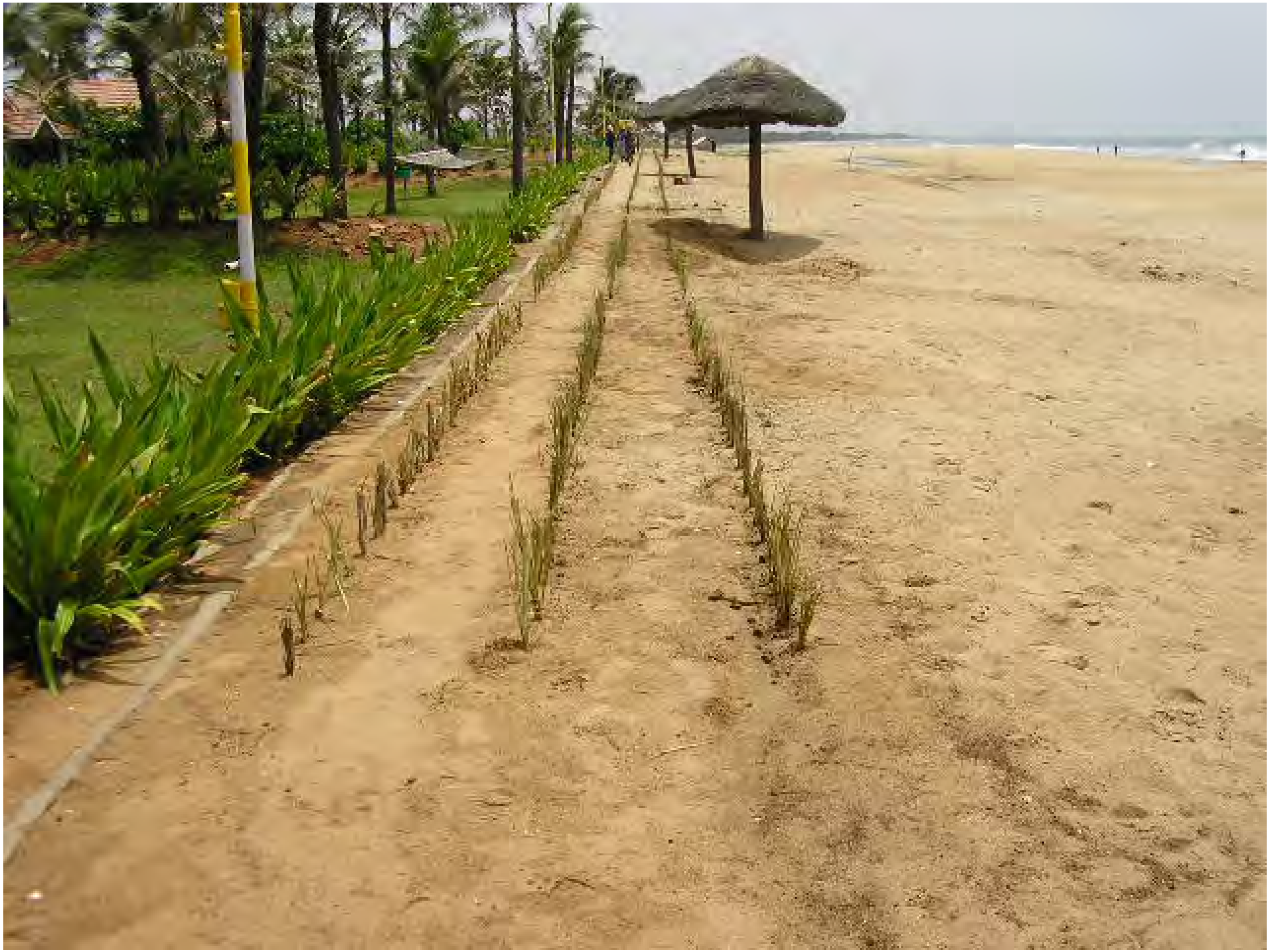


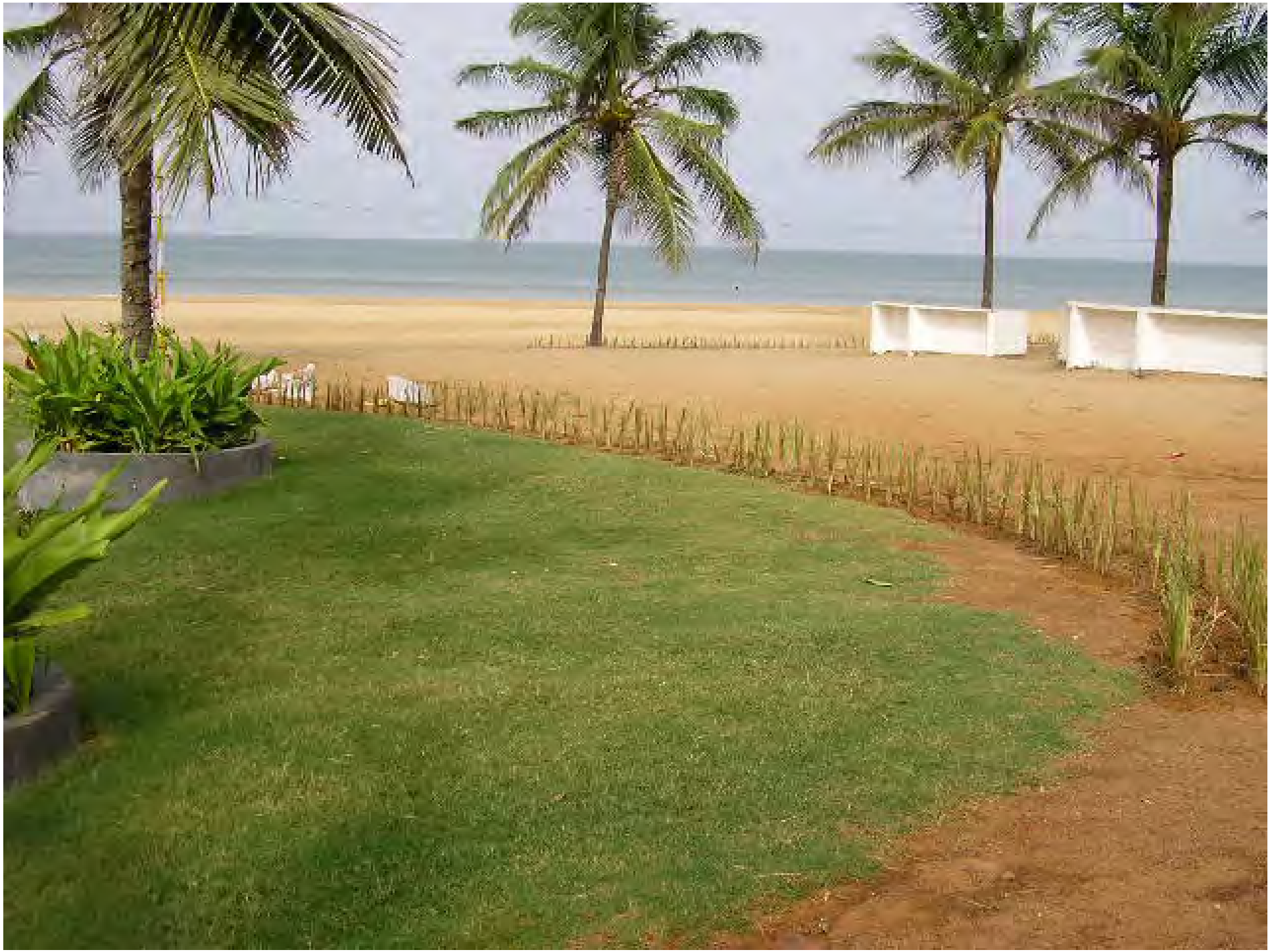












Thank you