Climate change vis-à-vis soil system modelling possibilities for Vetiver based land use in West coast of Karnataka, India

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Vetiver alongside rice-based systems in Uttara Kannada dist.,Karanataka-India

Fig.1

Unscientific methods of harvesting

Fig.2

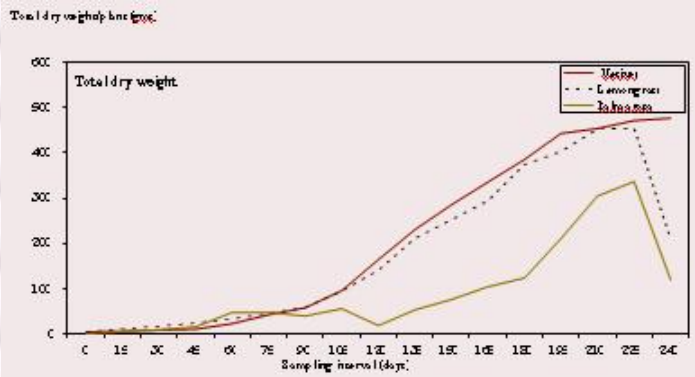
Vetiver Value-Chain

Oil Production

Waste recycling

Carbon – Sequestration By Vetiver

Crop	Carbon(%)		Drymatter (Mg ha-1 year-1)		C – sequestered (Mgha-1 year-1)		
	Shoot	root	Shoot	root	shoot	root	total
vetiver	50.53	50.27	28.62	1.56	14.46	0.78	15.24
lemongrass	44.45	48.14	10.5	1.57	4.83	0.55	5.38
palmarosa	52.77	43.49	11.11	0.65	5.86	0.28	6.14



C-sequestered by Vetiver			
Vetiver System	C-sequestered(Tg year^{-1})	% of emissions (2009)	
		India	World
Biomass	150	34.6	1.8
Soil	50	11.5	0.6
Total	200	46.1	2.4

(A Strategy for Sustainable Carbon Sequestration using Vetiver (*Vetiveria zizanioides* (L.)): A Quantitative Assessment over India
M Singh, Neha Guleria, E V S Prakasa Rao and Prashant Goswami
A Project Document under the CSIR Network Project Integrated Analysis for Impact, Mitigation and Sustainability (IAIMS)
July 2011)

Land forms in Uttara and Dakshina Kannada

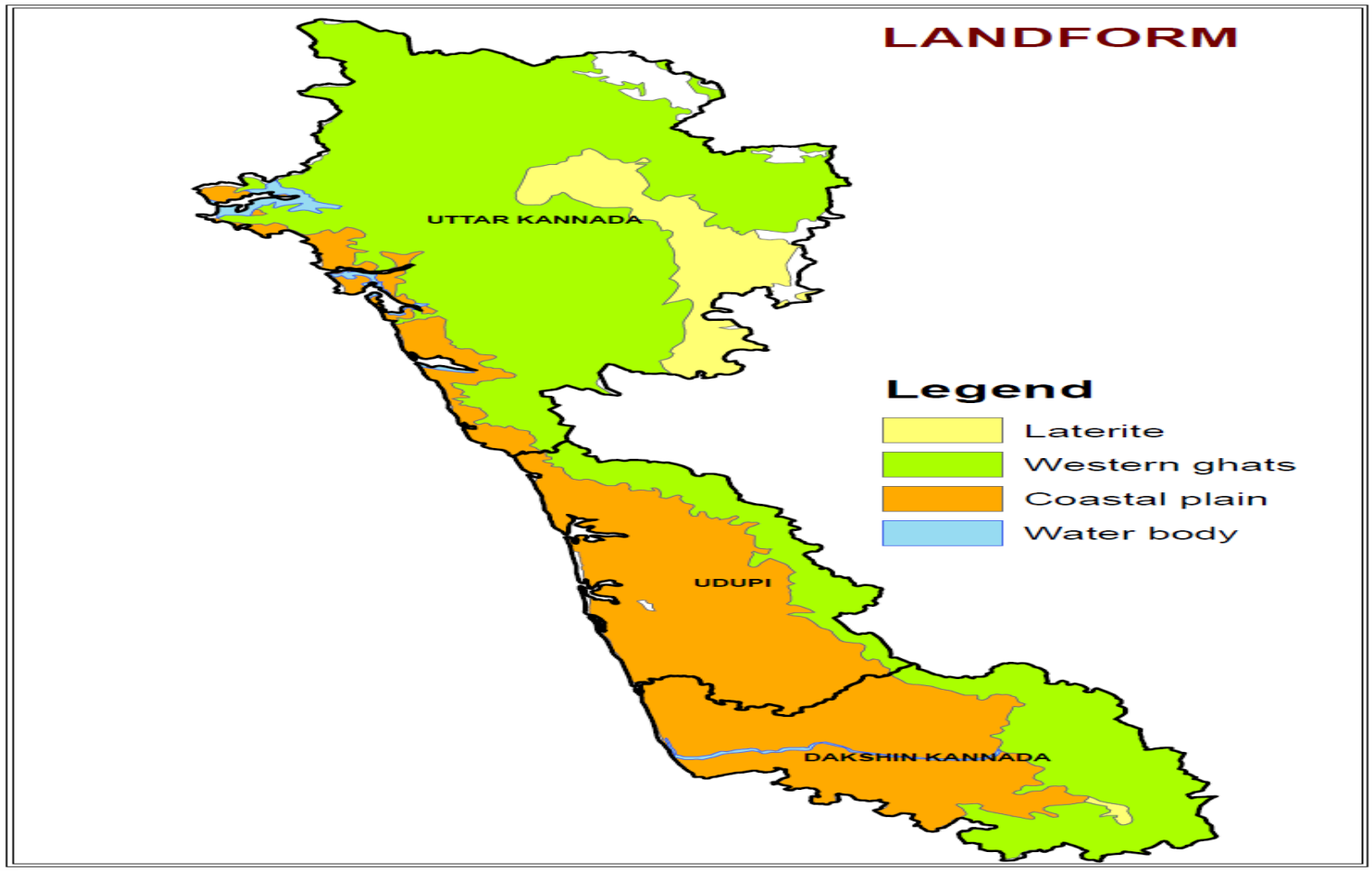


Fig.3

Soil types in Uttara and Dakshina Kannada

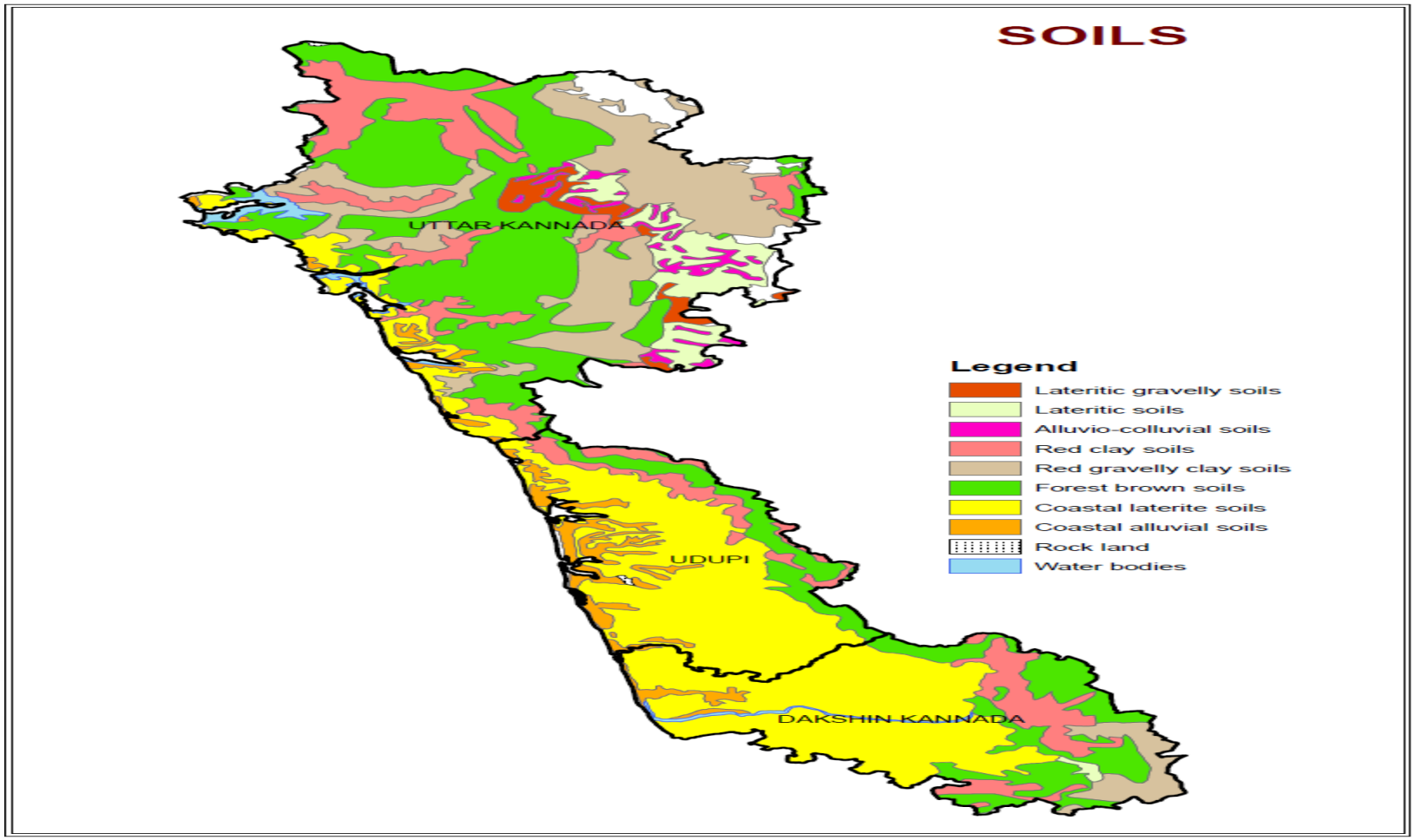


Fig.4

Soil of laterite uplands

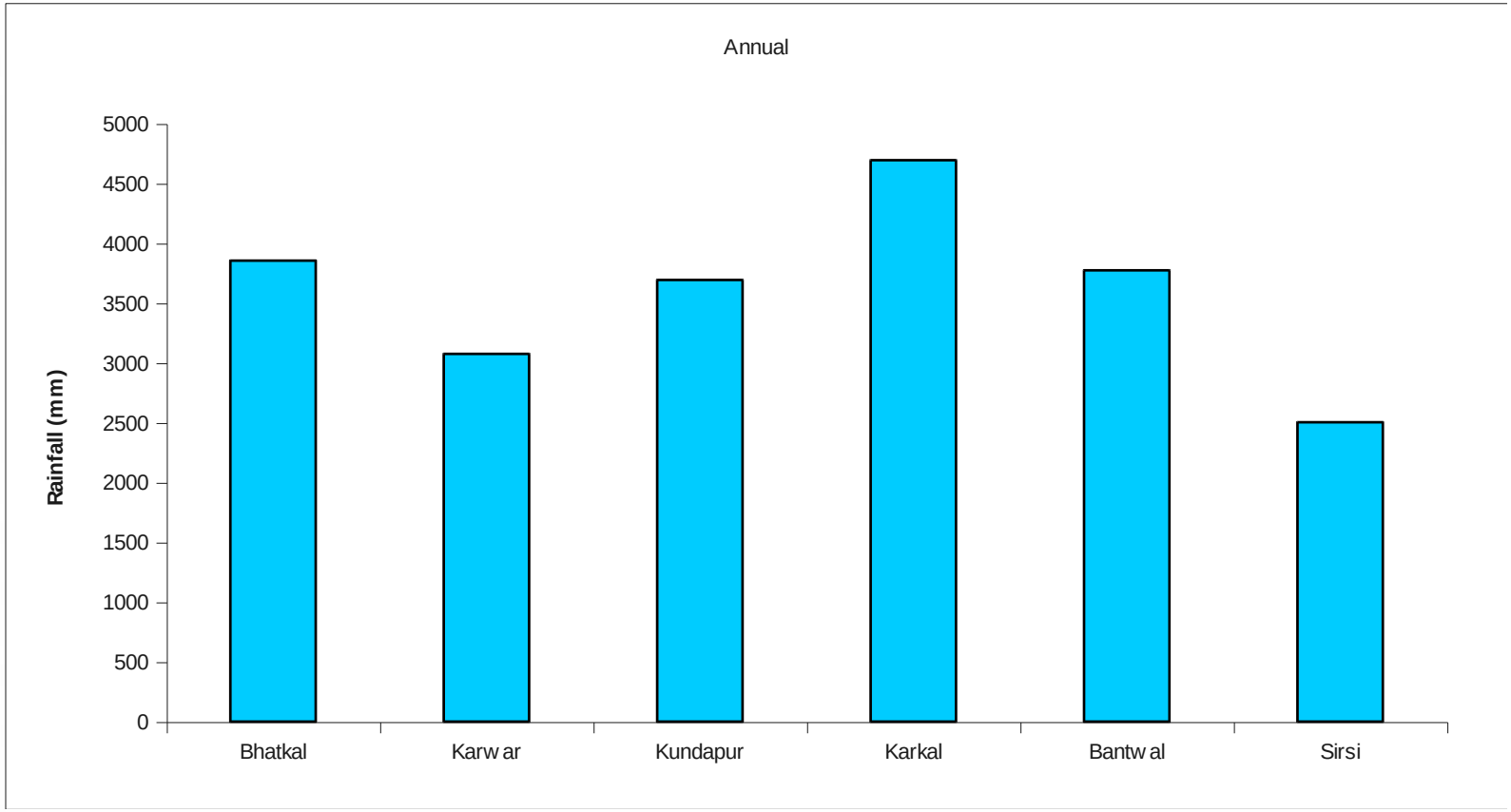
- Very deep, well-drained, gravelly clay soils with low AWC on laterite mounds, with slight erosion; associated with moderately shallow, well-drained, gravelly clay soils with low AWC and surface crusting (*Clayey skeletal Kaolinitic Kanhaplic Haplustults*). These soils cover an area of 82027 ha
- Moderately deep, well-drained, gravelly clay soils with low AWC and surface crusting on undulating uplands, with moderate erosion; associated with moderately deep, well-drained, gravelly clay soils (*Clayey skeletal Kaolinitic Kanhaplic Haplustults*). These soils cover an area of 141279 ha

Soils of low hill, foothills and undulating uplands of Western Ghats

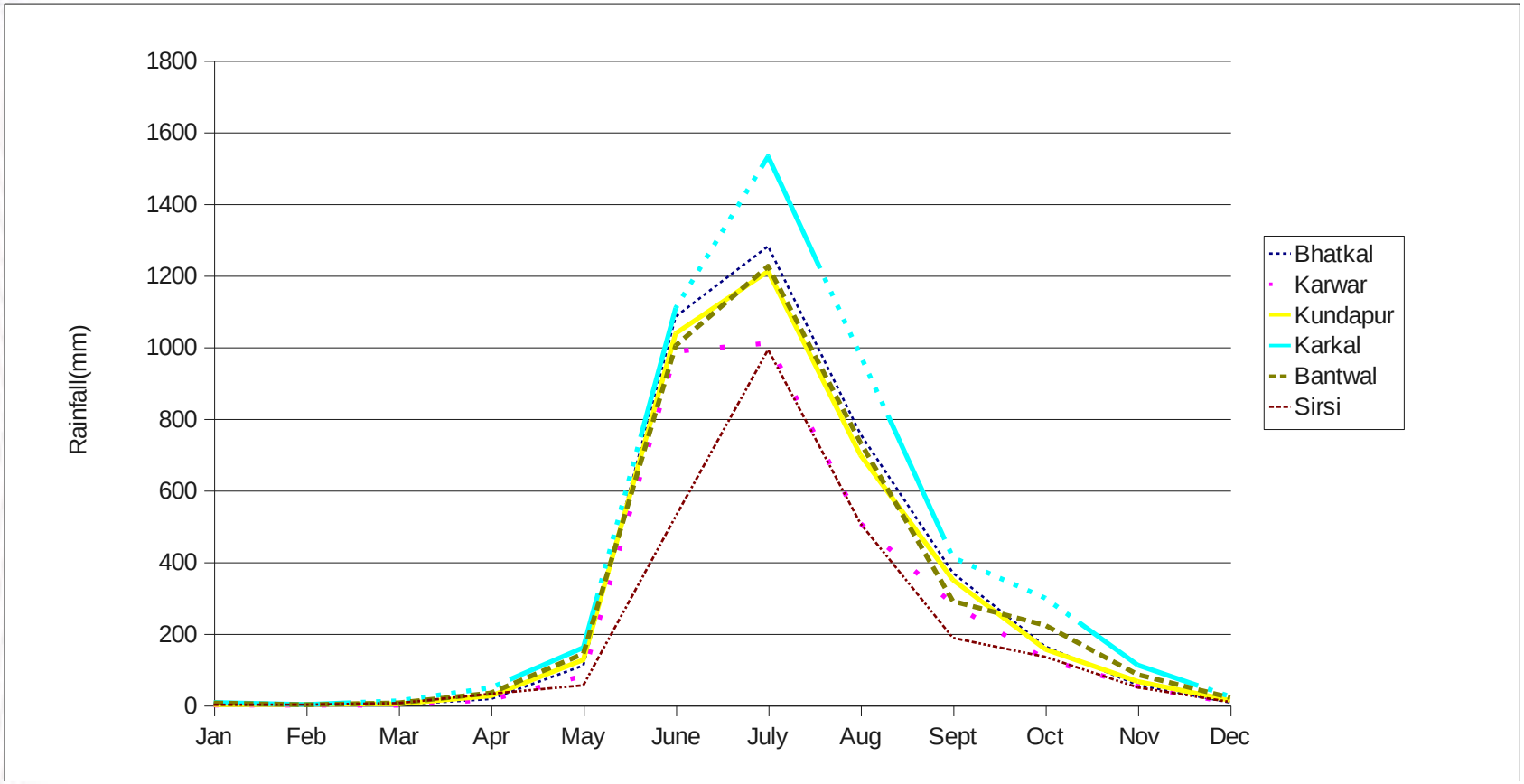
- Deep, well drained, clayey soils with medium AWC on foothill slopes, with severe erosion; association with moderately deep, well drained, loamy soils (*Fine Kaolinitic Kandic Paleustalfs*). These soils cover an area of 204321 ha.
- Moderately shallow, well drained, clayey soils with low AWC on foothills slopes, with moderate erosion, associated with deep, well drained, clayey soils with medium AWC (*Fine Kaolinitic Ustoxic Dystropepts*). These soils cover an area of 63488 ha.
- Very deep, well drained, gravelly clay soils with low AWC on low hill ranges, with moderate erosion; associated with moderately deep, somewhat excessively drained, gravelly clay soils (*Clayey skeletal Kaolinitic Ustic Haplohumults*). These soils cover an area of 212673 ha.

- Very deep, well drained, gravelly clay soils with surface crusting and compaction on undulating uplands, with moderate erosion; associated with very deep, well drained, gravelly clay soils with surface crusting and compaction (*Clayey skeletal Kaolinitic Typic Kandiustults*). These soils cover an area of 272234 ha.
- Moderately shallow, somewhat excessively drained, gravelly clay soils with hard ironstone on coastal plateau summits, with moderate erosion; associated with ironstone crust (*Clayey skeletal Kaolinitic, Peteroferric Haplustults*). These soils cover an area of 66614 ha.

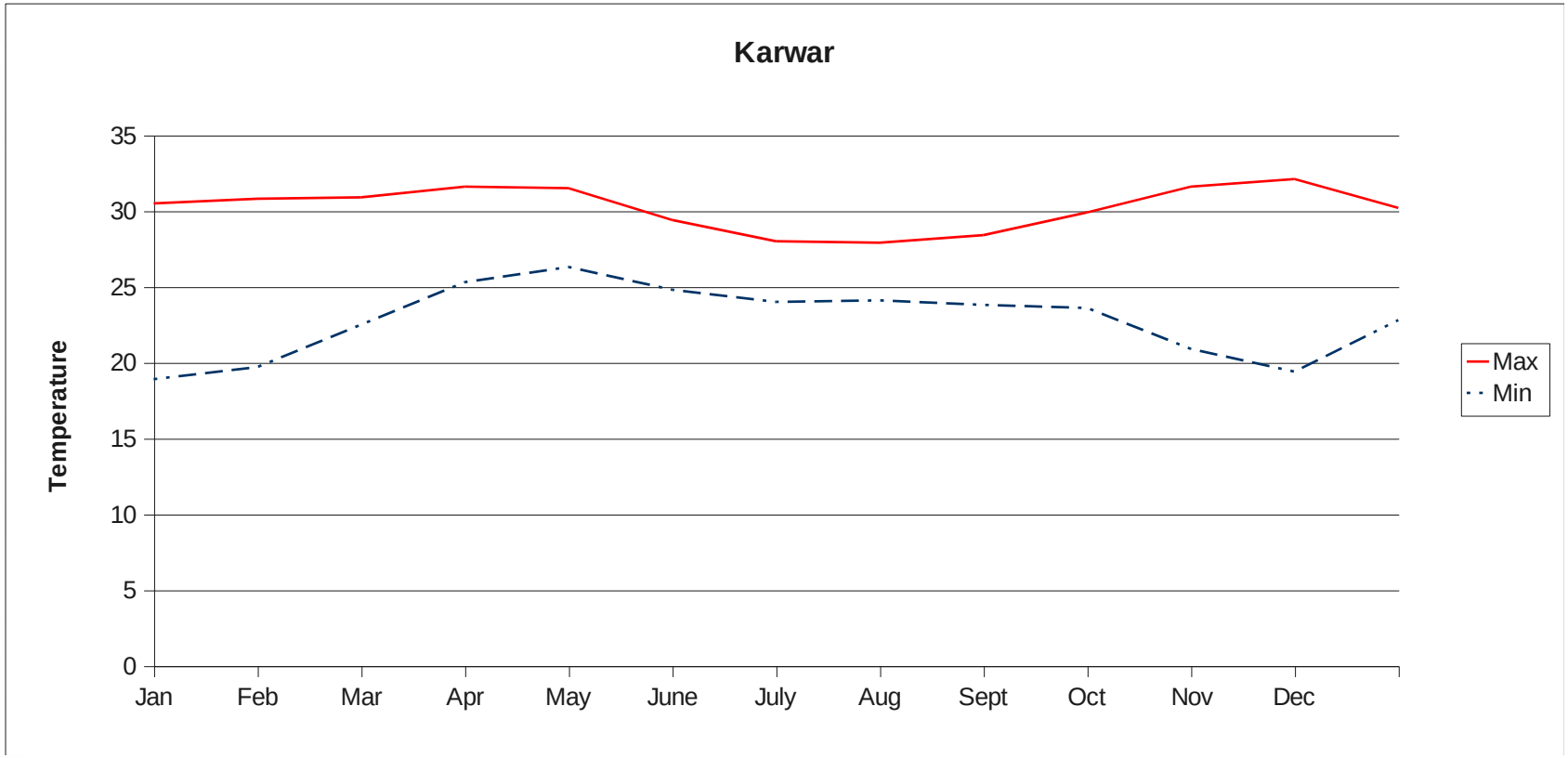
Annual rainfall in some places in Uttara and Dakshina Kannada districts



Rainfall pattern in Uttara and Dakshina Kannada districts



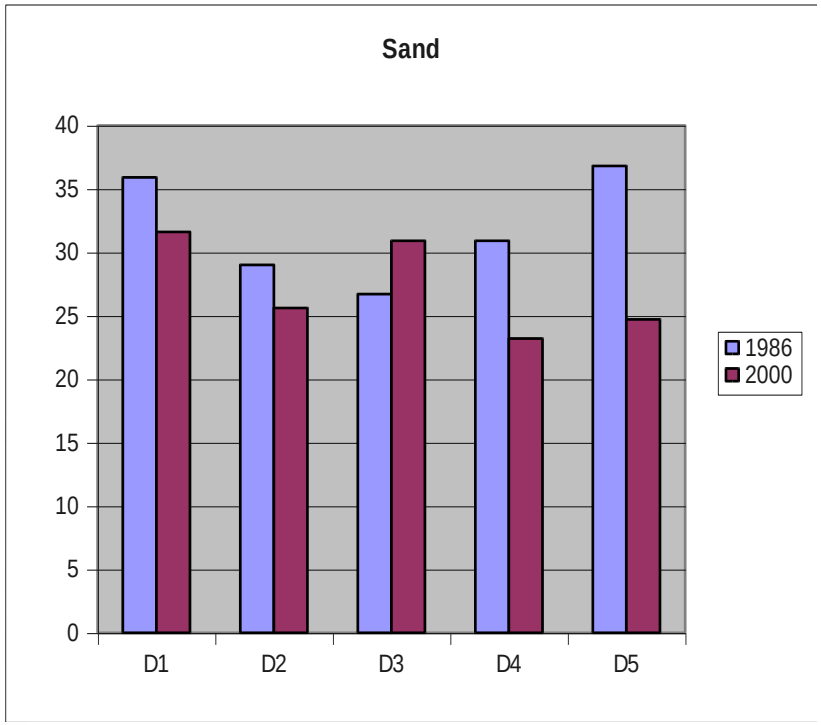
Temperature regime in Uttara Kannada district

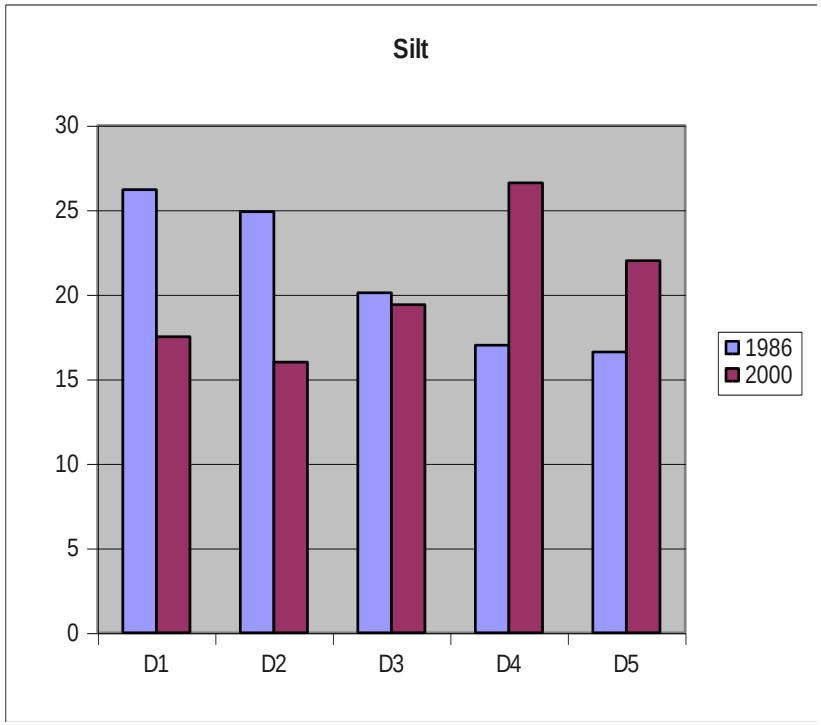


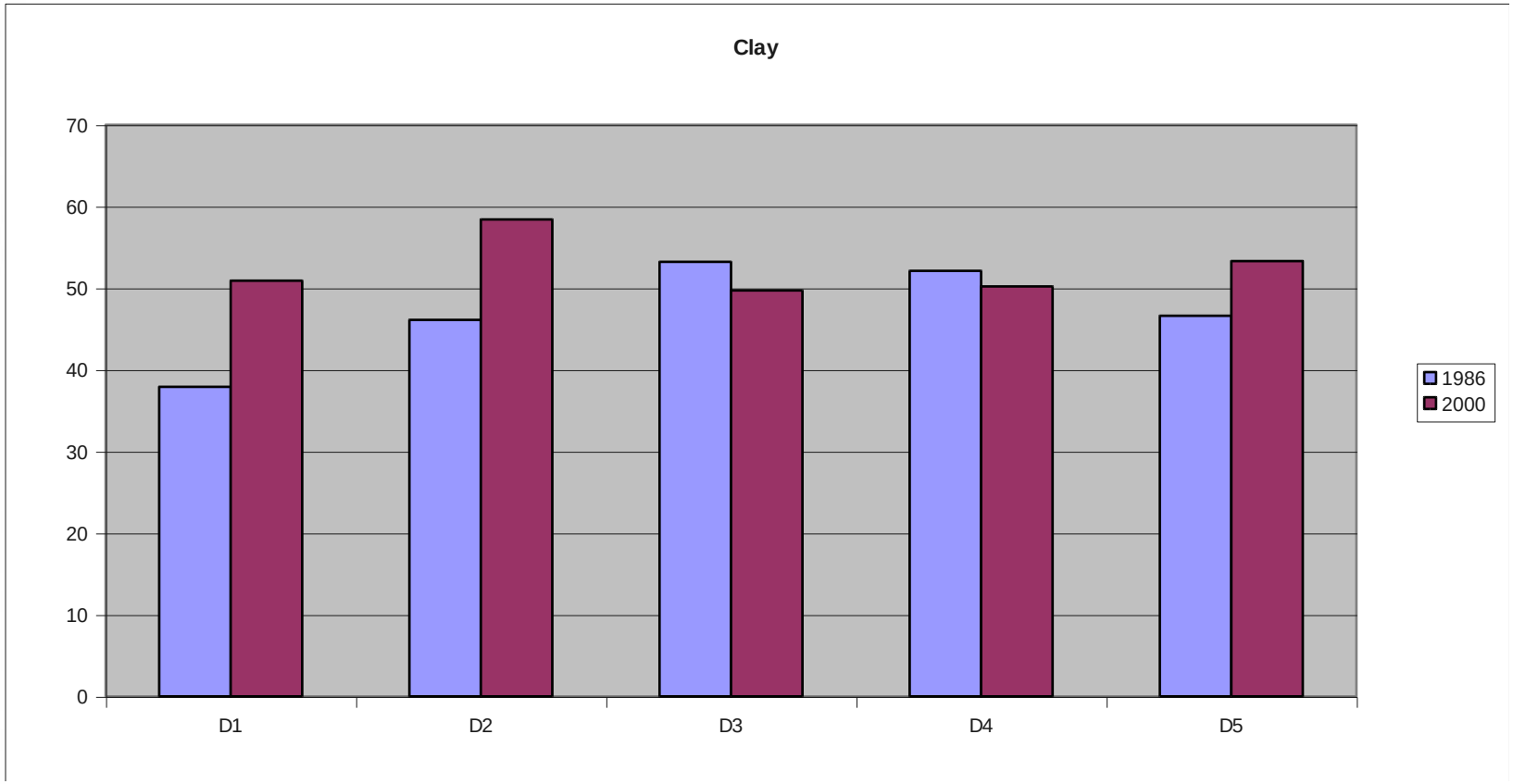
LONG TERM SOIL STUDIES (14YEARS)

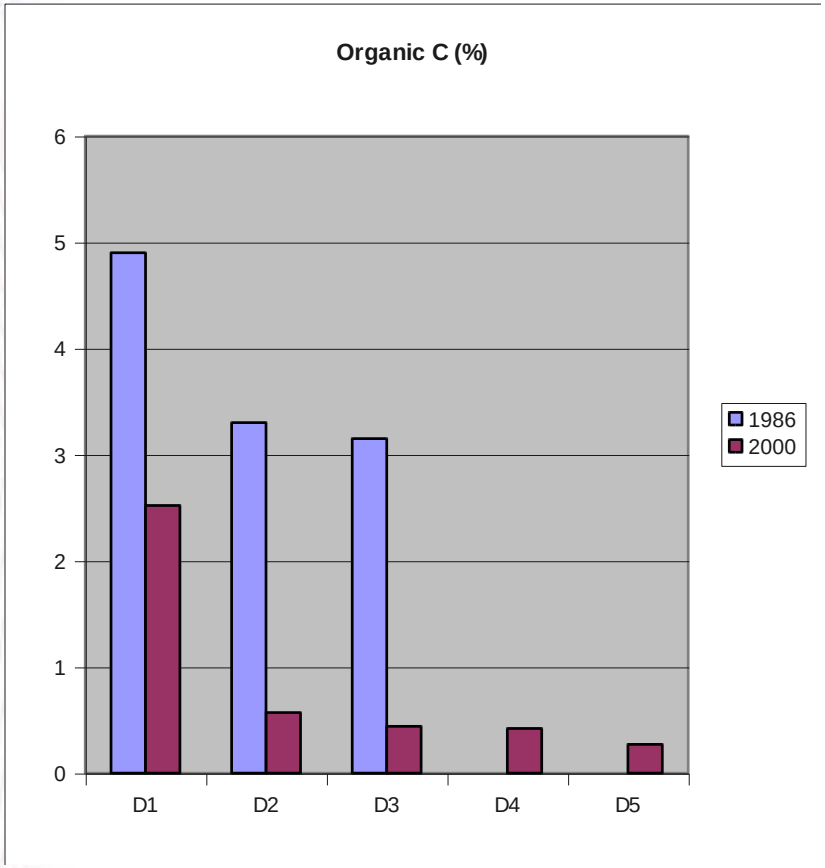
1. Gantihole village, Kundapur Taluk, Dakshina Kannada District

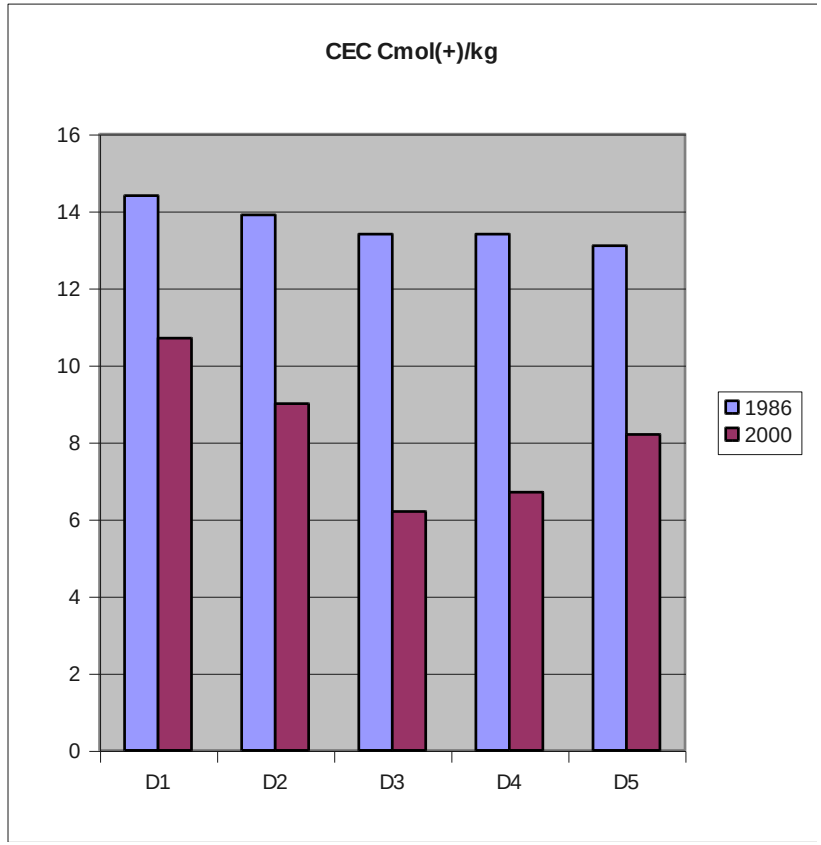
Particle – Size Distribution






Clay
70
60
50
40
30
20
10
0
D1
D2
D3
D4
D5
1986
2000


Organic C (%)
6
5
4
3
2
1
0
D1
D2
D3
D4
D5
1986
2000


CEC Cmol(+)/kg
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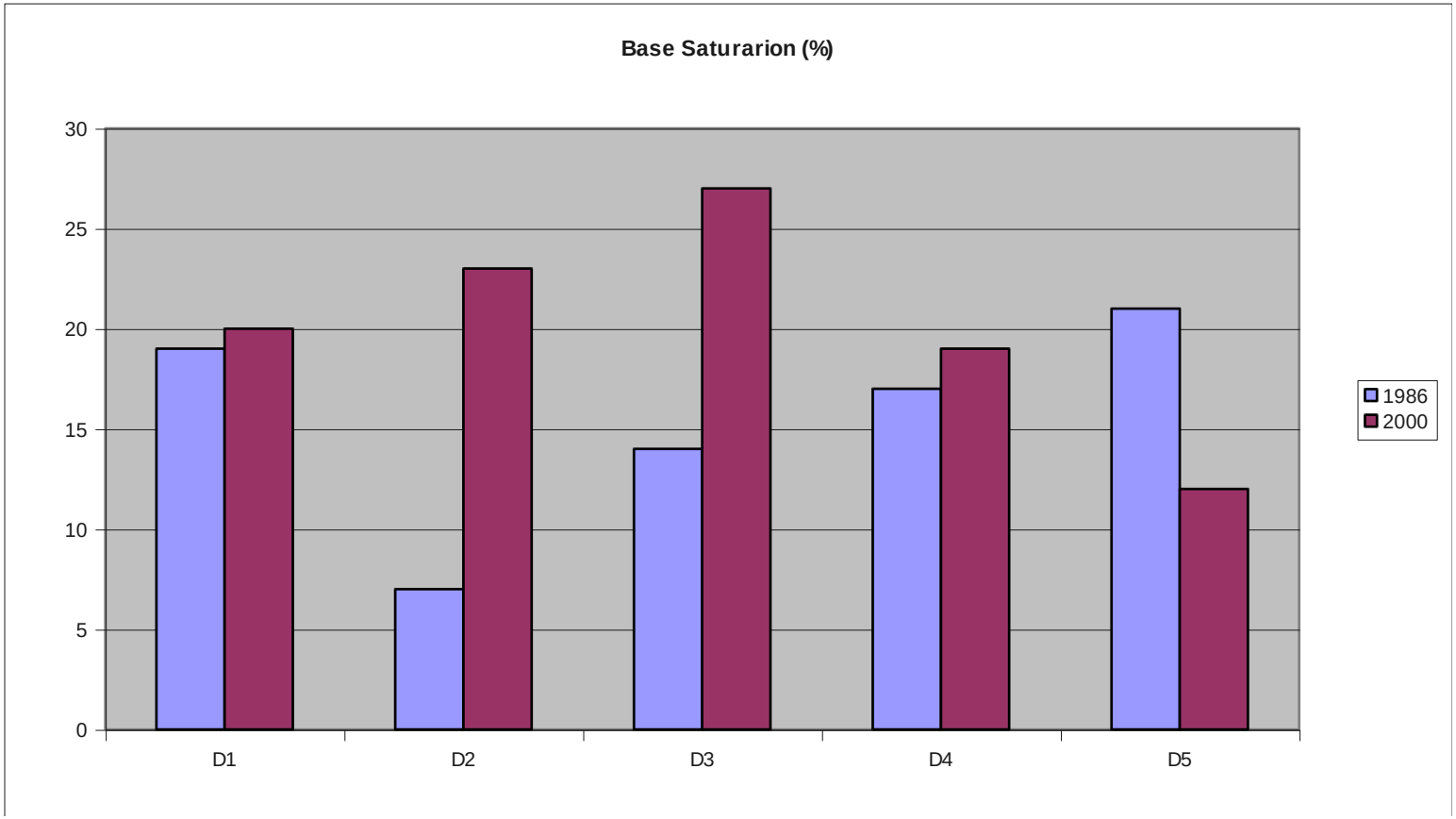
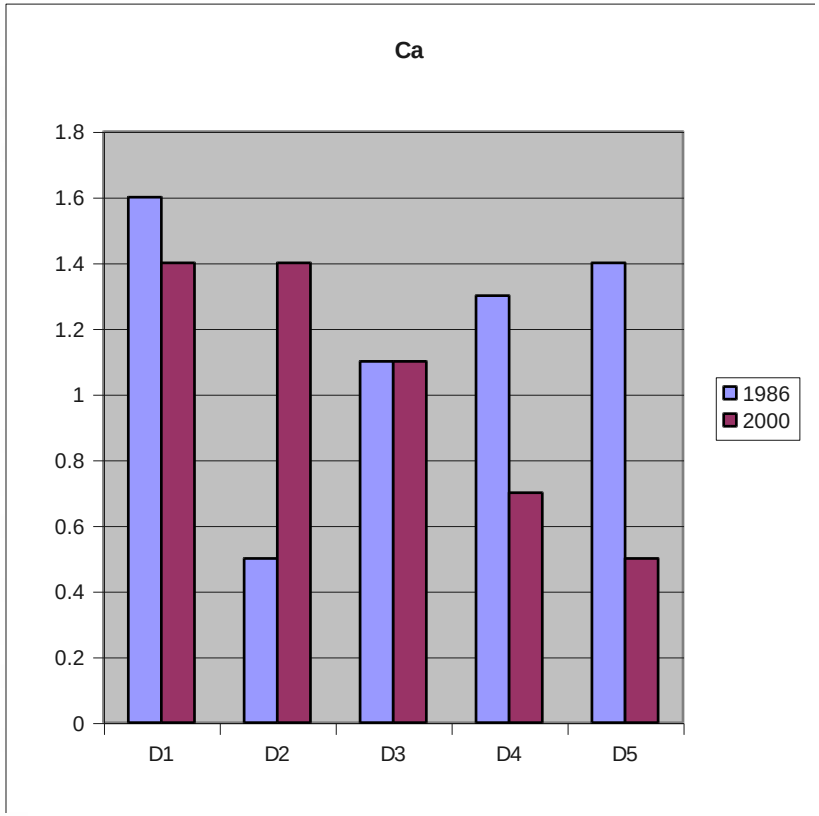
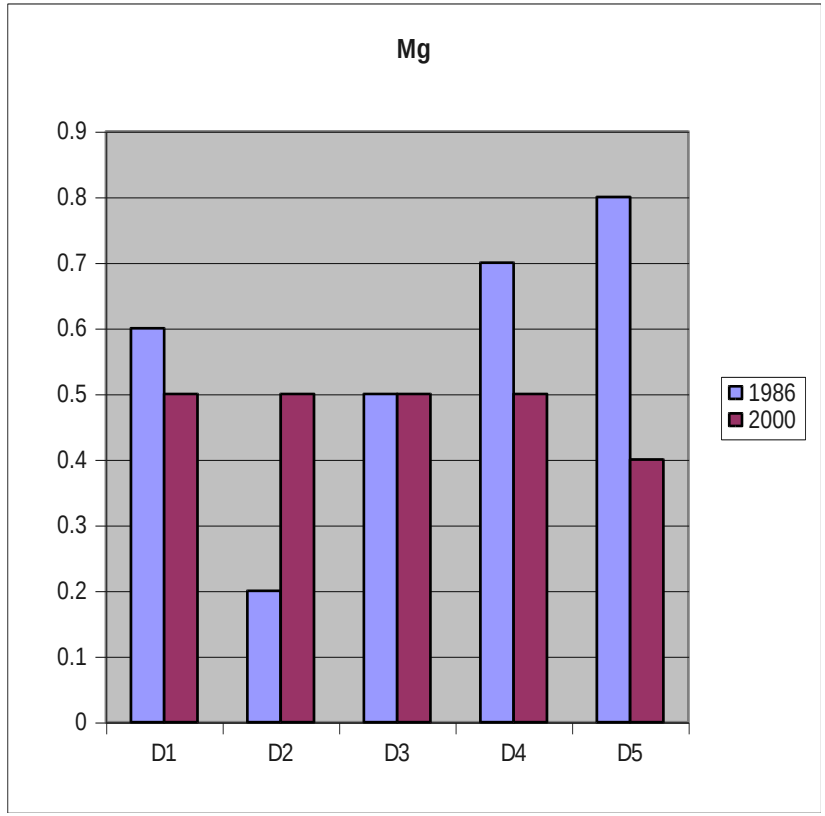
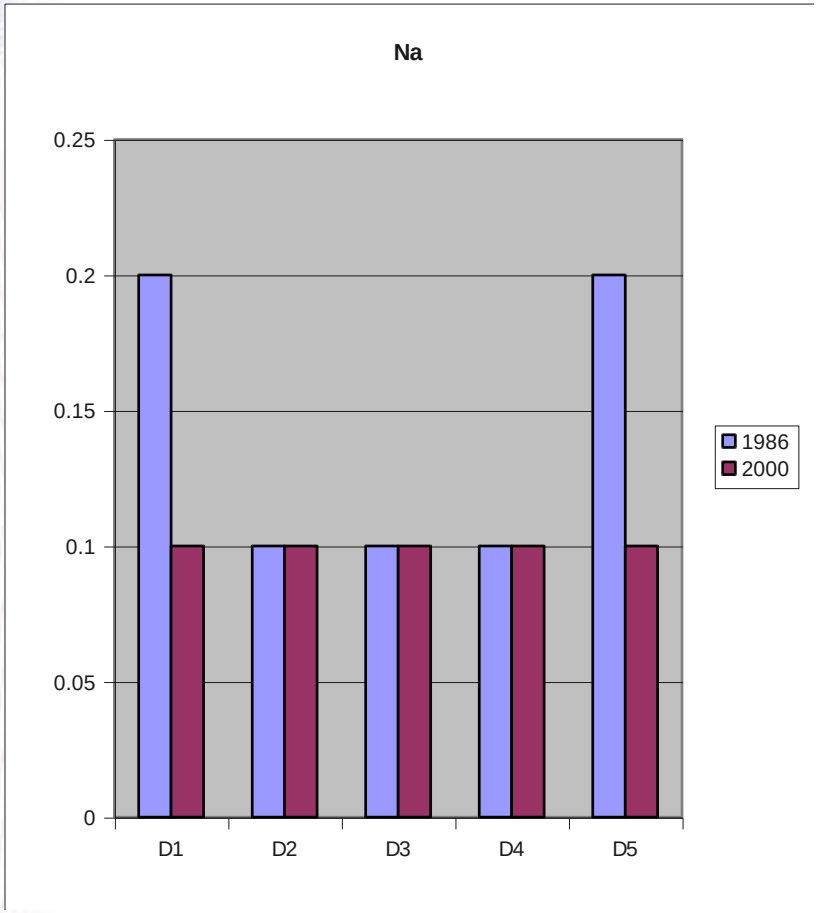
14
12
10
8
6
4
2
0
D1
D2
D3
D4
D5
1986
2000

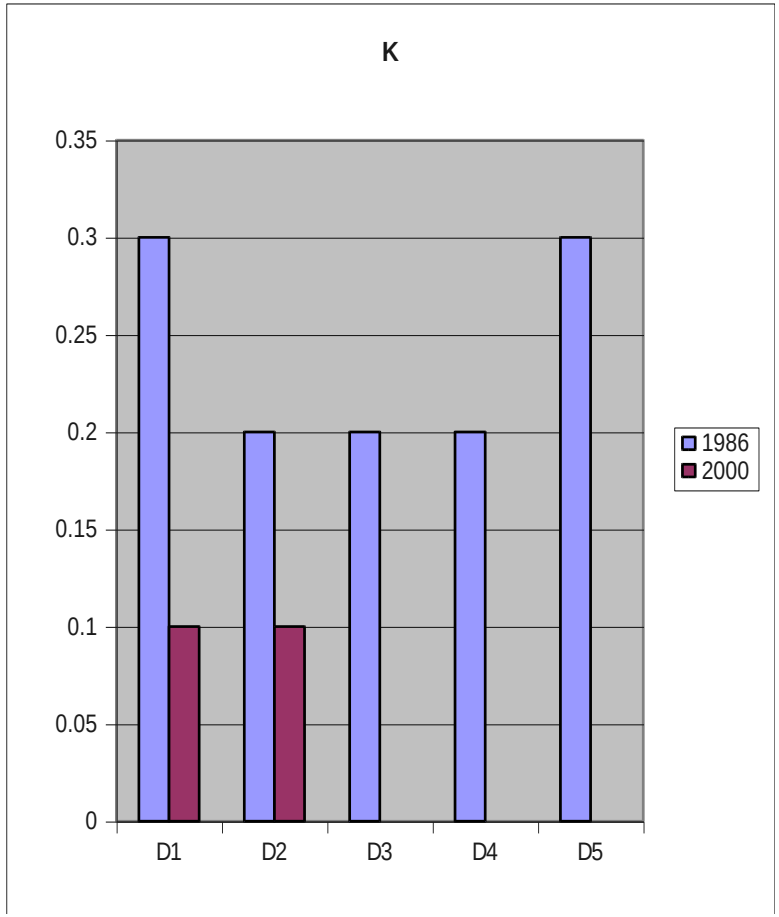

Base Saturarion (%)
30
25
20
15
10
5
0
D1
D2
D3
D4
D5
1986
2000

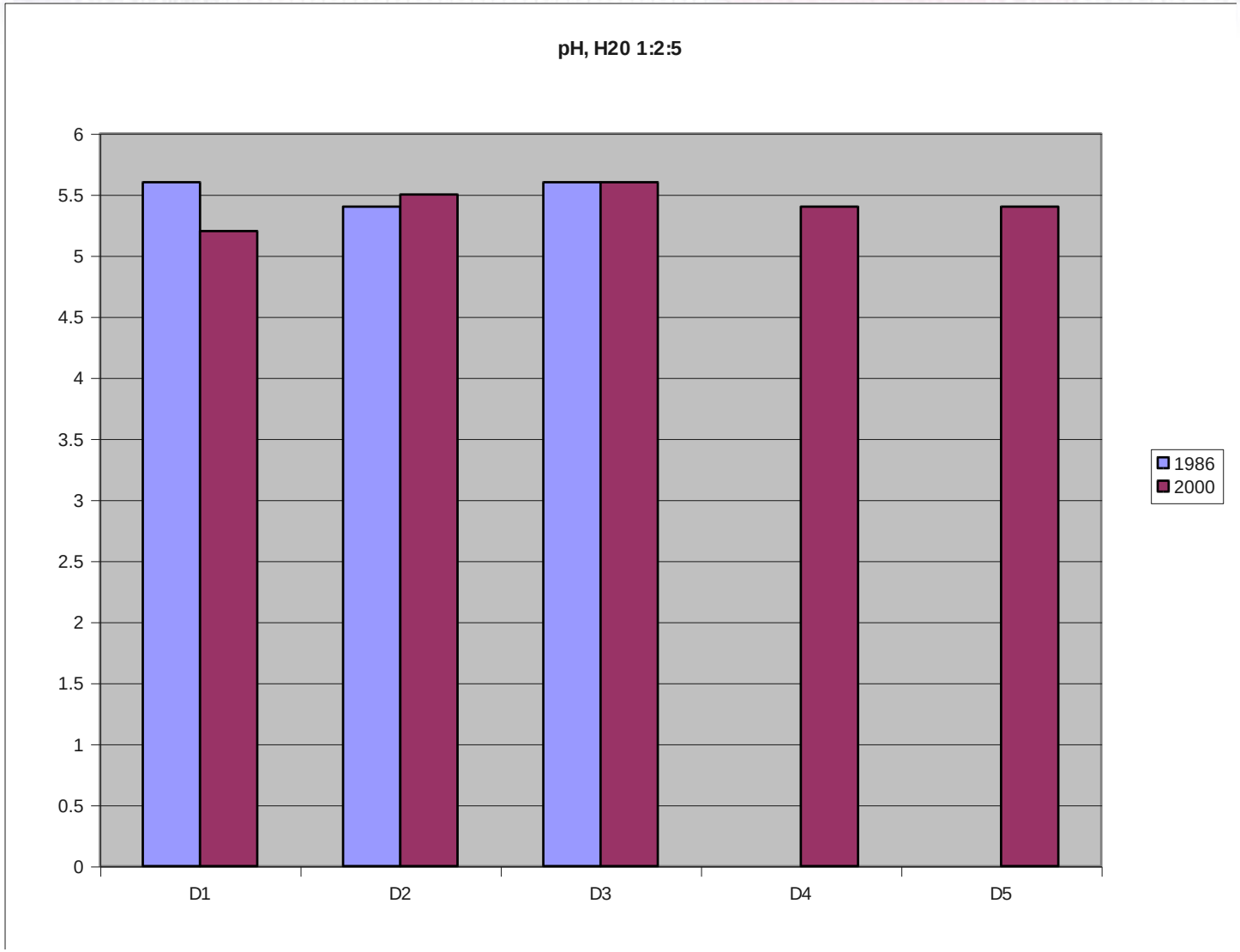
Exchangeable bases Cmol (+)/kg





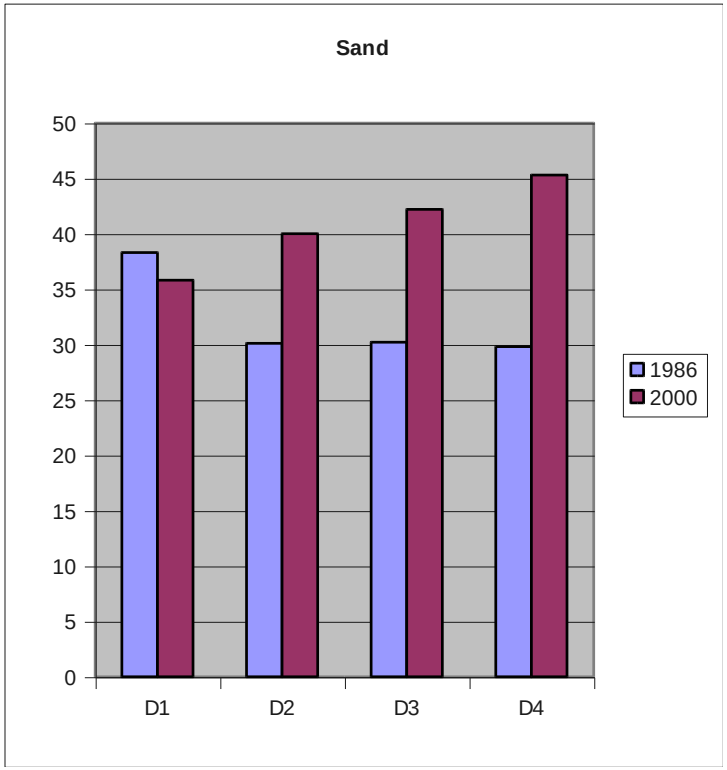

Na
0.25
0.2
0.15
0.1
0.05
0
D1
D2
D3
D4
D5
1986
2000

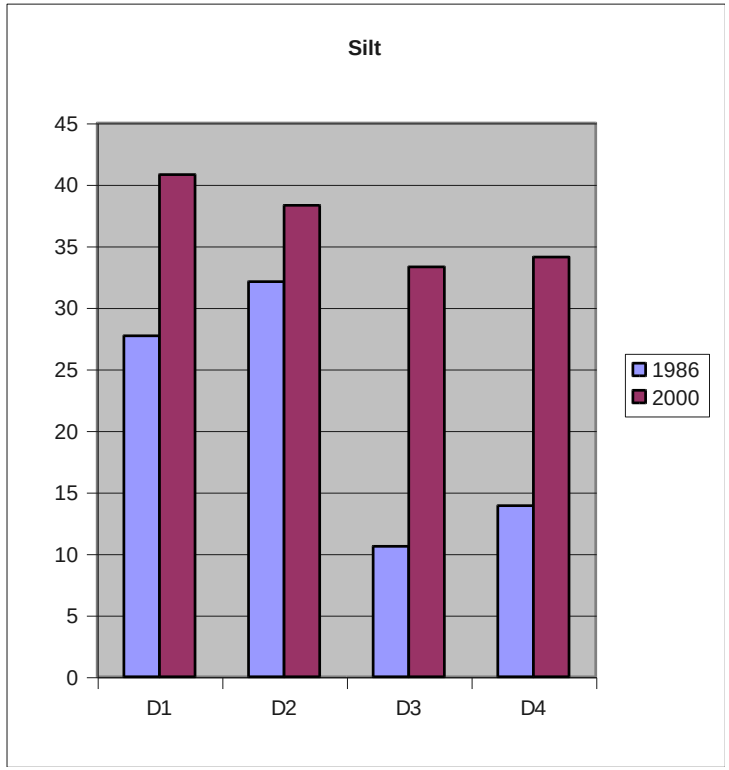

K
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
D1
D2
D3
D4
D5
1986
2000

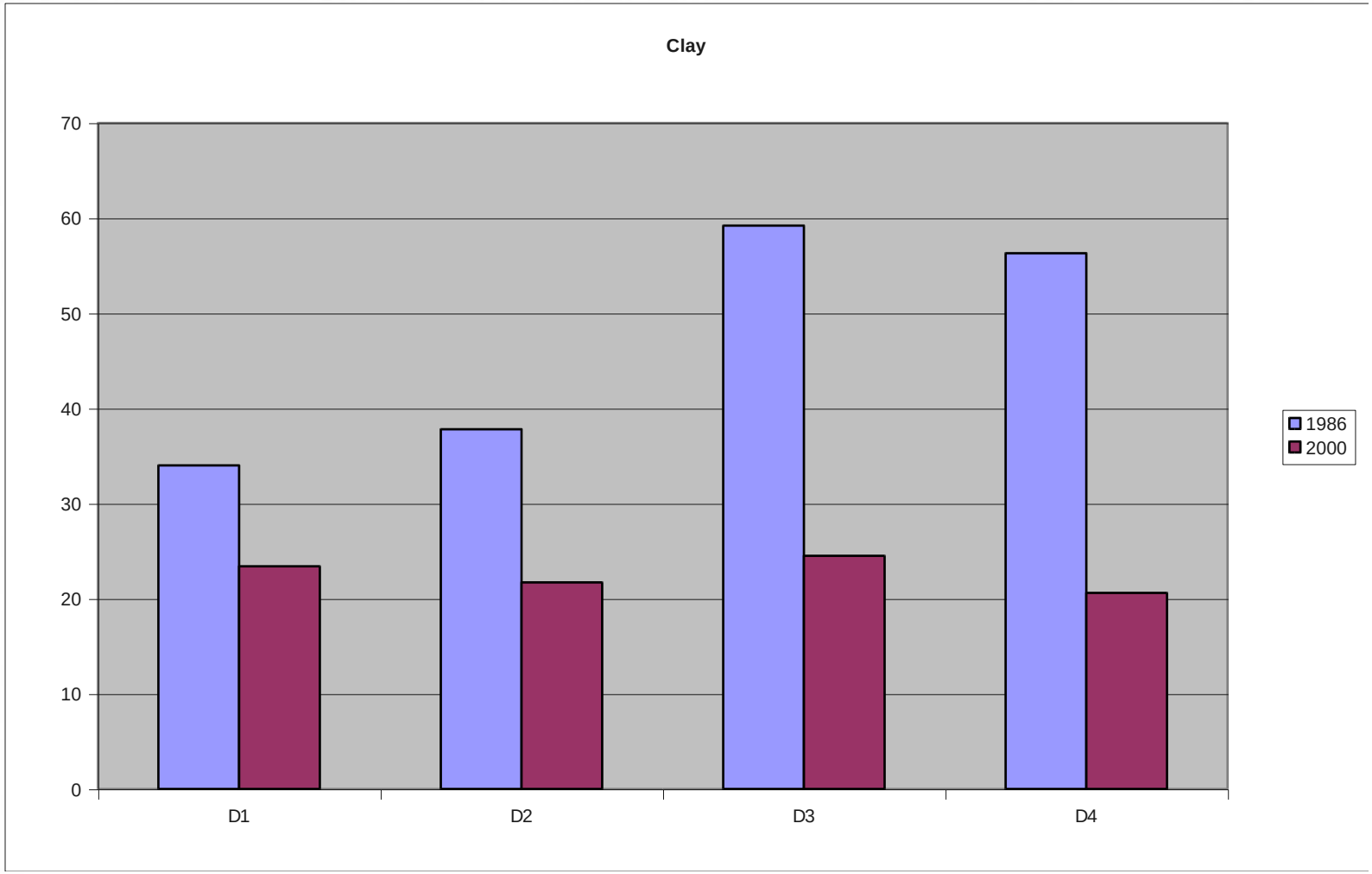

pH, H20 1:2:5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
D1
D2
D3
D4
D5
1986
2000

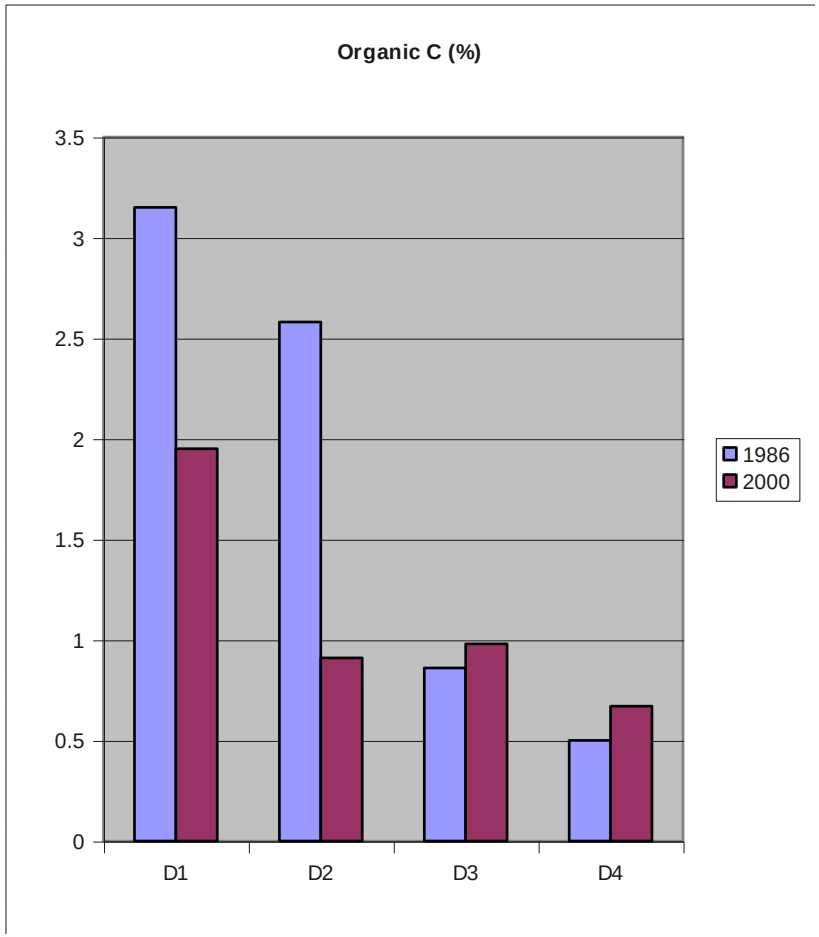
2. Kalatodu village, Kundapur Taluk, Dakshina Kannada District

Particle -size distribution






Clay
70
60
50
40
30
20
10
0
D1
D2
D3
D4
1986
2000


Organic C (%)
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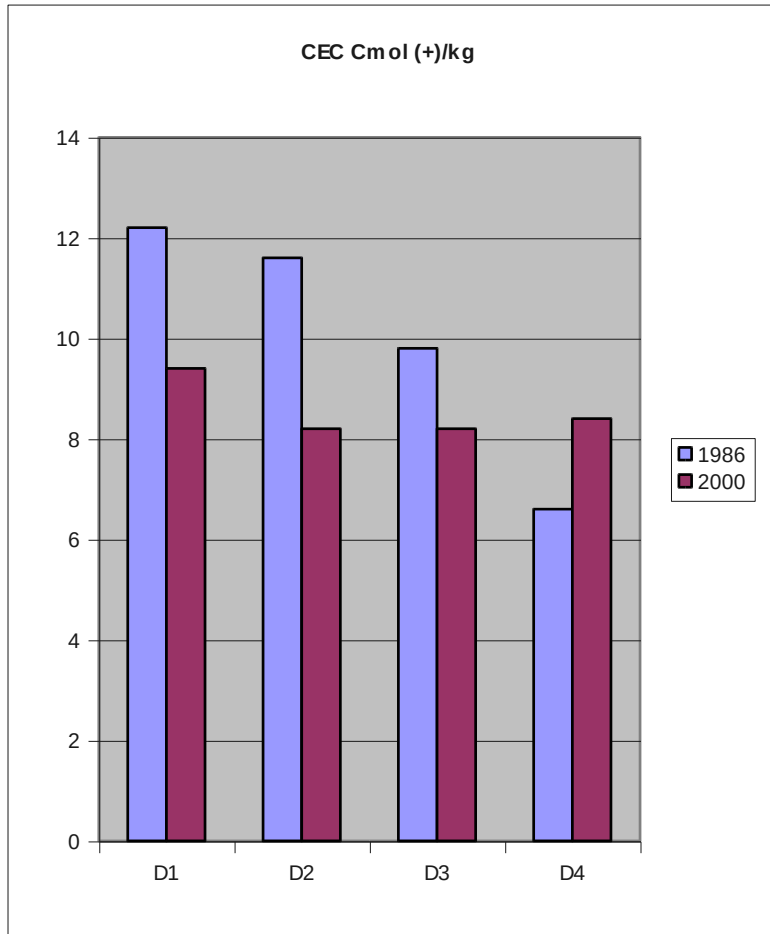
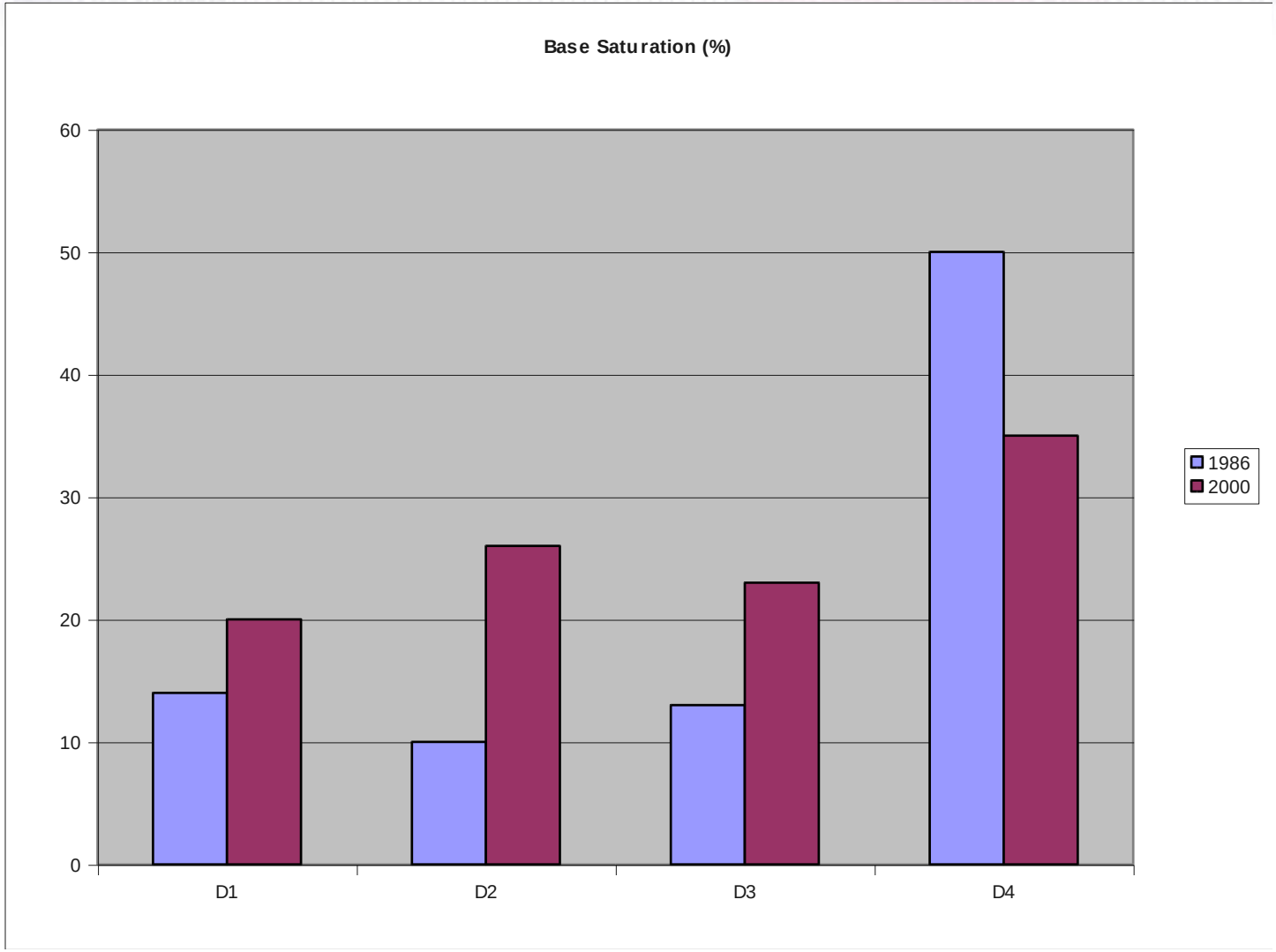
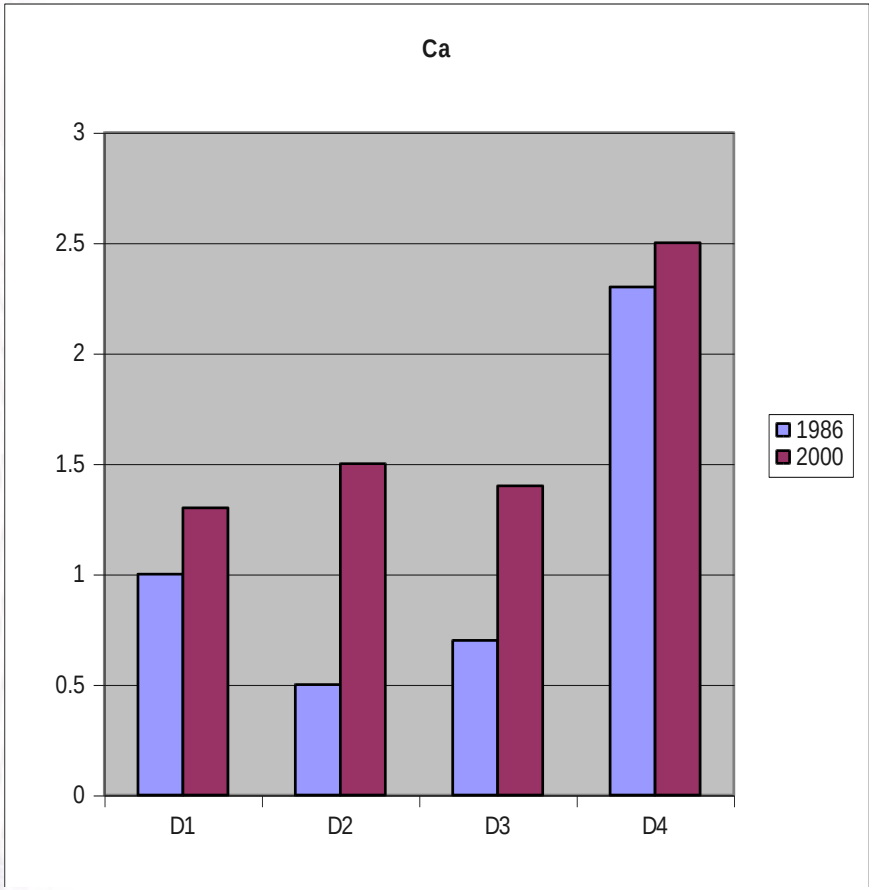
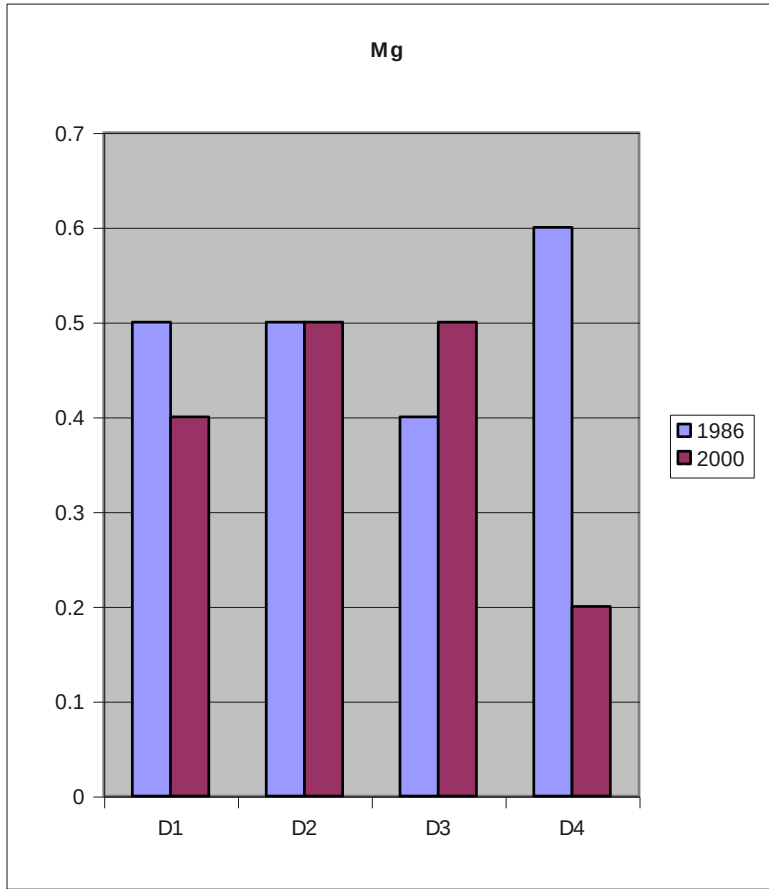
3
2.5
2
1.5
1
0.5
0
D1
D2
D3
D4
1986
2000

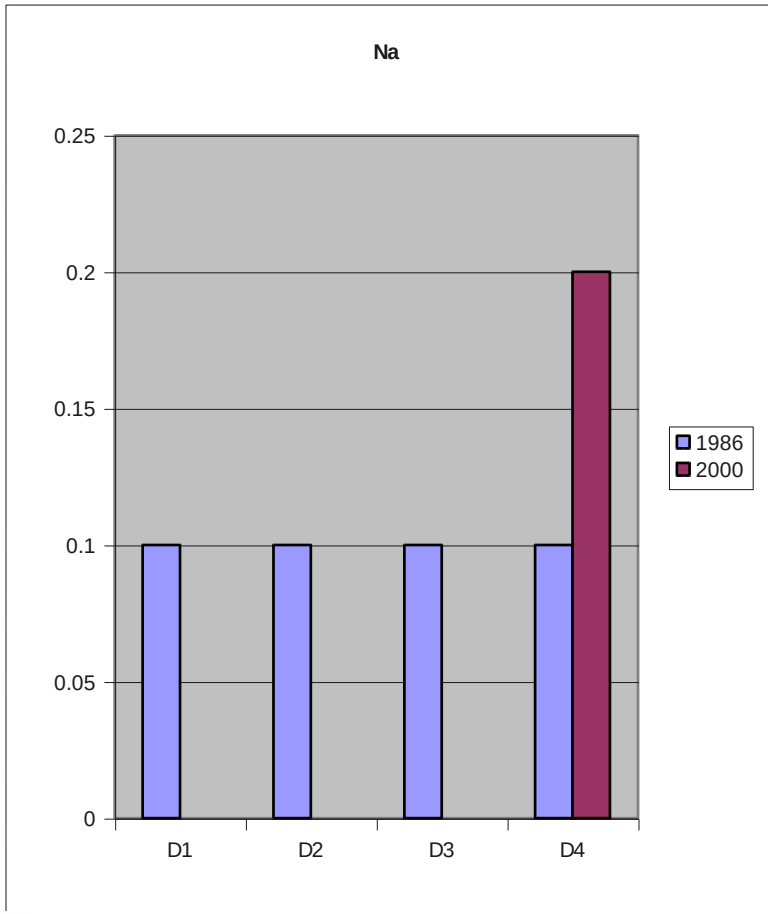

CEC Cmol (+)/kg
14
12
10
8
6
4
2
0
D1
D2
D3
D4
1986
2000

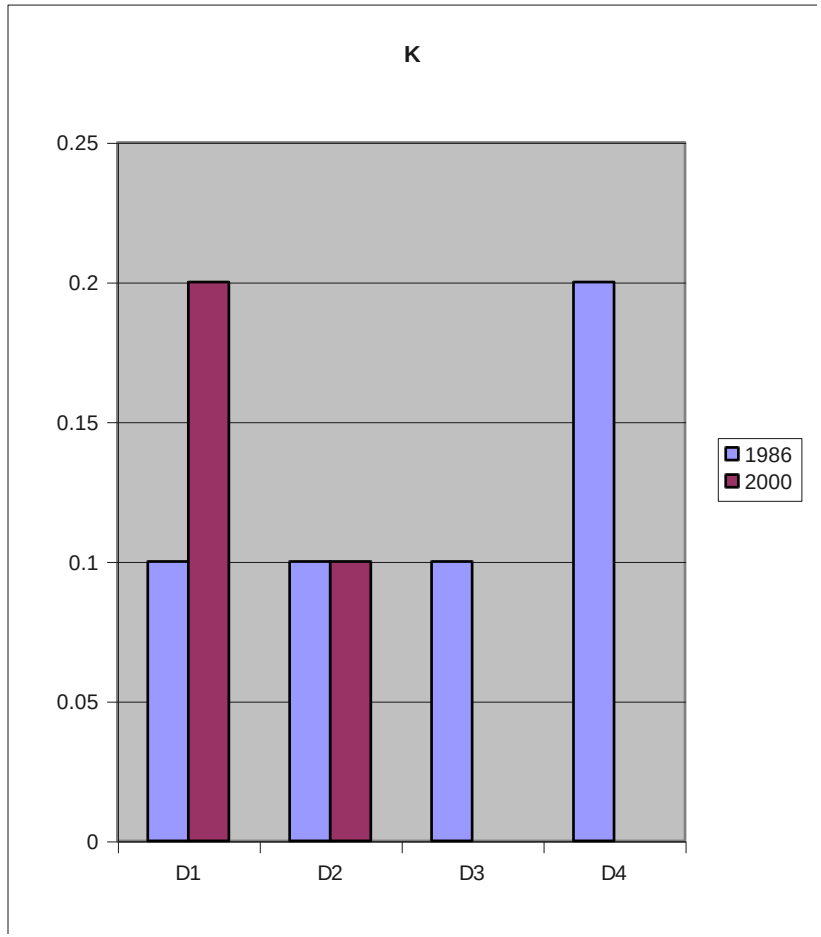

Base Saturation (%)
60
50
40
30
20
10
0
D1
D2
D3
D4
1986
2000

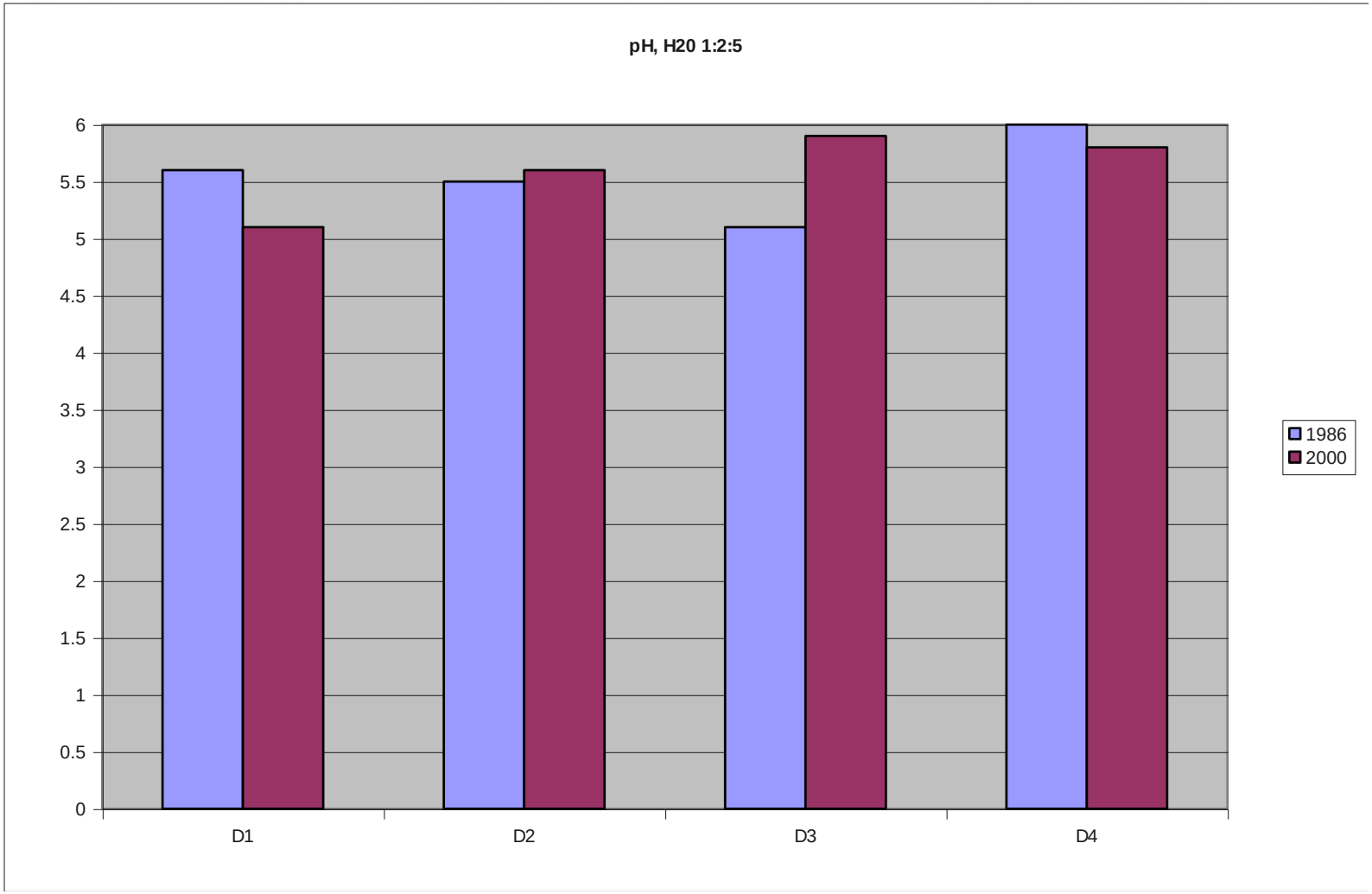
Exchangeable bases Cmol (+)/kg






Na
0.25
0.2
0.15
0.1
0.05
0
D1
D2
D3
D4
1986
2000


K
0.25
0.2
0.15
0.1
0.05
0
D1
D2
D3
D4
1986
2000


pH, H20 1:2:5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
D1
D2
D3
D4
1986
2000

Vetiver and Climate Change

Mitigation of climate change :

- Soil Conservation
- Carbon Sequestration
- Phyto-Remediation
- Lively-hood Support Systems

It is necessary to assess and project quantitative requirements of quantities such as cropping area and duration to determine the feasibility and impact

- Sensitivity experiments with validated climate model to simulate vetiver vs non-vetiver scenarios needed to project quantitative requirements such as area coverage and impact.

THANK YOU