

Understanding Climate Change / Variability

Udaipur District

19

January 2009

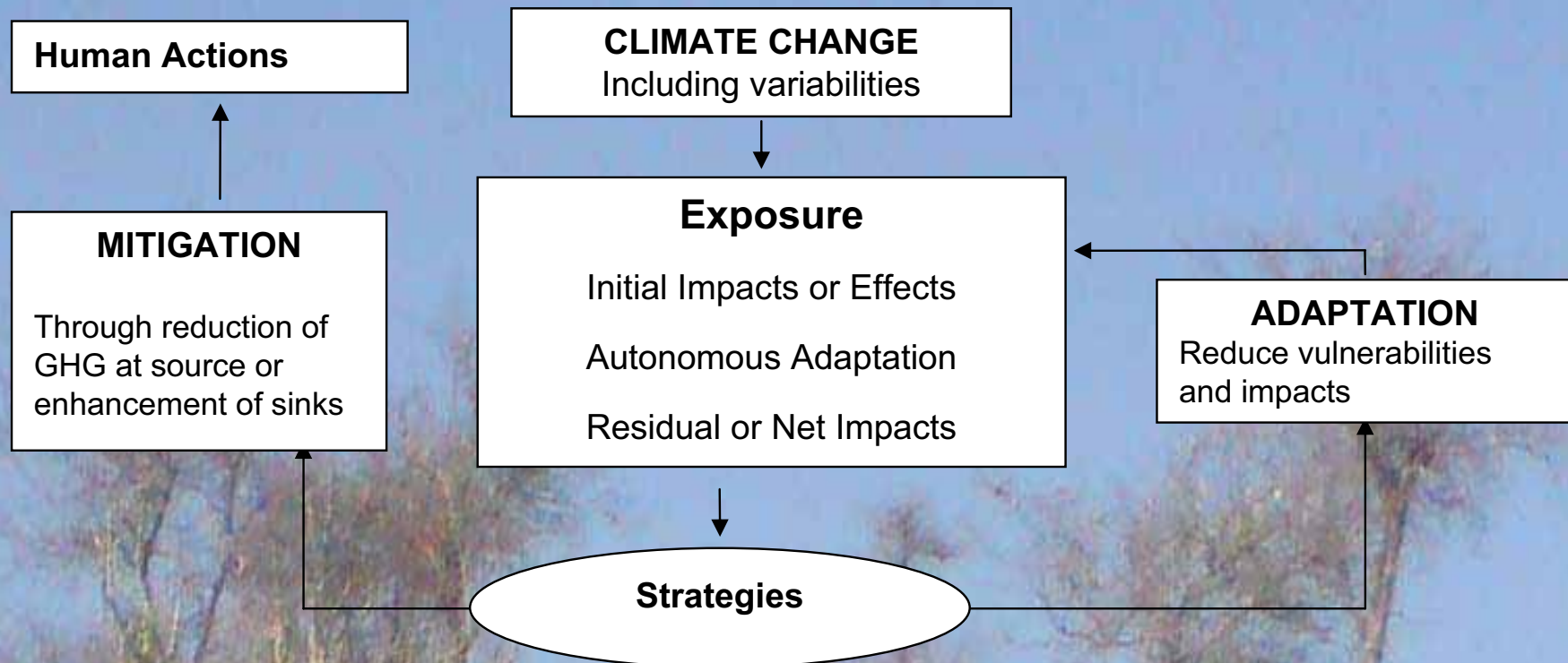
Presentation by

Foundation for Ecological Security
Udaipur Spearhead Team
18 – New Ahinsapuri, Old Fatehpura
Udaipur

Society for Promotion of Wastelands Development
Western Region Office
26-27 Mahavir Colony, Bedla Road
Udaipur

- Climate change cannot be totally avoided
- Anticipatory and precautionary adaptation is more effective and less costly than forced, last minute, emergency adaptation.
- Climate change may be more rapid and more pronounced than current estimates suggest. Unexpected events are possible
- Immediate benefit can also be gained by removing maladaptive policies and practices
- Climate change brings opportunities as well as threats. Future benefits can result from climate change

(Burton, 1996)



**Decline in Well-Stocked Forest and Pasture Area in Aravalli Region during 1972-75
and 1982-84 period [Based on RS data interpretation - Dhabriya 1986]**

Sl. No.	District [only Aravalli Hill Portion]	Forests and Pastures [in sq.km.] 1972-75	Forests and Pastures [in sq.km.] 1982-84	Percentage increase/decrease during 1972-75 and 1982-84
1.	Dungarpur	309	167	-45.96
2.	Banswara	348	197	-44.40
3.	Udaipur	4266	2415	-43.39
4.	Chittaurgarh	587	489	-16.70
5.	Sirohi	838	325	-61.22
6.	Bhilwara	35	24	-31.43
7.	Ajmer	551	266	-51.73
8.	Jaipur	458	215	-52.54
9.	Alwar	1146	694	-39.45
10.	Nagaur	81	28	-65.44
11.	Pali	821	433	-47.26
12.	Sikar	251	156	-37.85
13.	Jhunjhunu	201	77	-61.70
14.	Sawai Madhopur	530	600	+13.20
15.	Bharatpur	20	20	--
16.	Tonk	20	10	-50.00
	Total	10462	6116	-41.54

The decline in forest area by 41.54 per cent during 1972-'75 and 1982-'84 duration is an indication of the diminution of well-stocked forests on extensive level except in Sawai Madhopur district where an increase of 13.20 per cent has been registered while the forest density has declined. The rapid decline in the forest area has led to removal of the top fertile soil cover, silting of river channels and reservoirs, lowering of water table, decline in soil fertility and water accumulation capacity, all resulting in the creation of imbalance in the eco-system and depletion of the resource base in the hill areas affecting the hill people in general and tribals in particular.

Duration of Rainy Season : 1973 - 1987

Year	Date of Onset of Monsoon	Date of Withdrawal of Monsoon	Duration [No. of days]
1973	02-7-73	10-10-73	101
1974	01-7-74	12-9-74	74
1975	21-6-75	25-9-75	96
1976	12-7-76	21-9-76	71
1977	24-6-77	26-9-77	94
1978	20-6-78	26-9-78	98
1979	26-6-79	23-9-79	88
1980	22-6-80	23-9-80	93
1981	25-6-81	11-9-81	78
1982	13-7-82	15-9-82	64
1983	04-7-83	16-9-83	84
1984	02-7-84	23-9-84	83
1985	13-7-85	15-9-85	64
1986	23-6-86	18-8-86	57
1987	14-7-87	06-9-87	55

Source : Twenty Five Monsoons in Rajasthan, 1961-85, A Schematic Study, Irrigation Department, Jaipur, 1986, Page-115 and Hydrology Deptt. Rainfall Reports.

Variation in Monsoon Rainfall [based on 'percentage deviation from normal rainfall figures between 1901-50 and 1961-85]

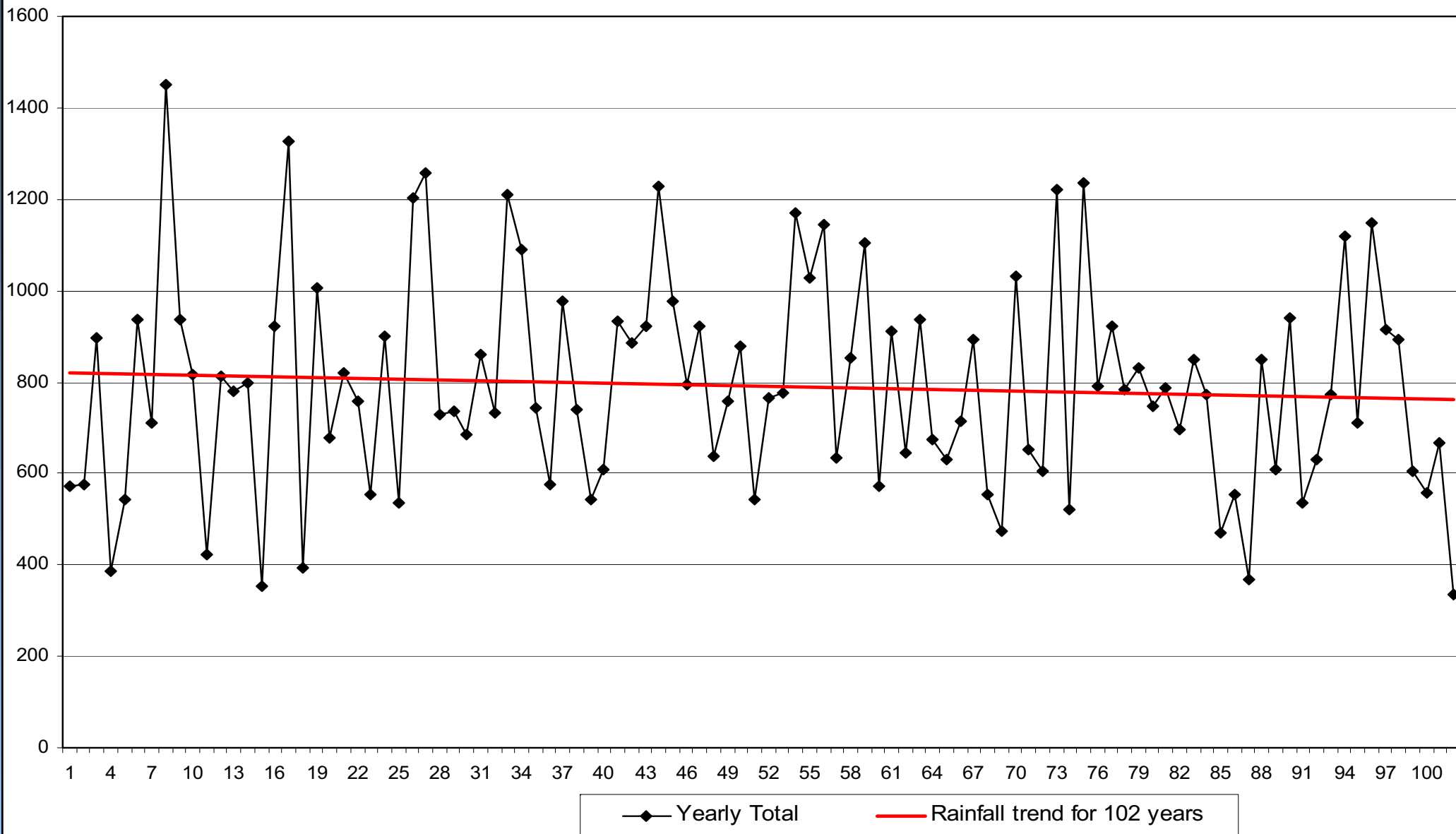
Sl.No..	District	Percentage	Variation
1.	Bikaner	[-]	15
2.	Churu		4
3.	Sriganganagar	[-]	10
4.	Barmer	[-]	22
5.	Jaisalmer	[-]	2
6.	Jalor		5
7.	Jodhpur	[-]	1
8.	Nagaur		38
9.	Pali		0
10.	Sirohi		34
11.	Ajmer		17
12.	Alwar		10
13.	Bharatpur	[-]	4
14.	Dholpur	[-]	5
15.	Jaipur		12
16.	Jhunjhunu		14
17.	Sawai Madhopur	[-]	16
18.	Sikar		11
19.	Tonk	[-]	5
20.	Bundi	[-]	4
21.	Jhalawar	[-]	20
22.	Kota	[-]	7
23.	Banswara		11
24.	Bhilwara	[-]	14
25.	Chittorgarh	[-]	24
26.	Dungarpur		4
27.	Udaipur	[-]	6

Source : Twenty Five Monsoons in Rajasthan, 1961-85: A Schematic study, Irrigation Department, Jaipur, 1986, pages 139 and 146.

**Extremely Vulnerable Aravalli Blocks in Rajasthan on the Basis of Total
'Notified Forest Area'**

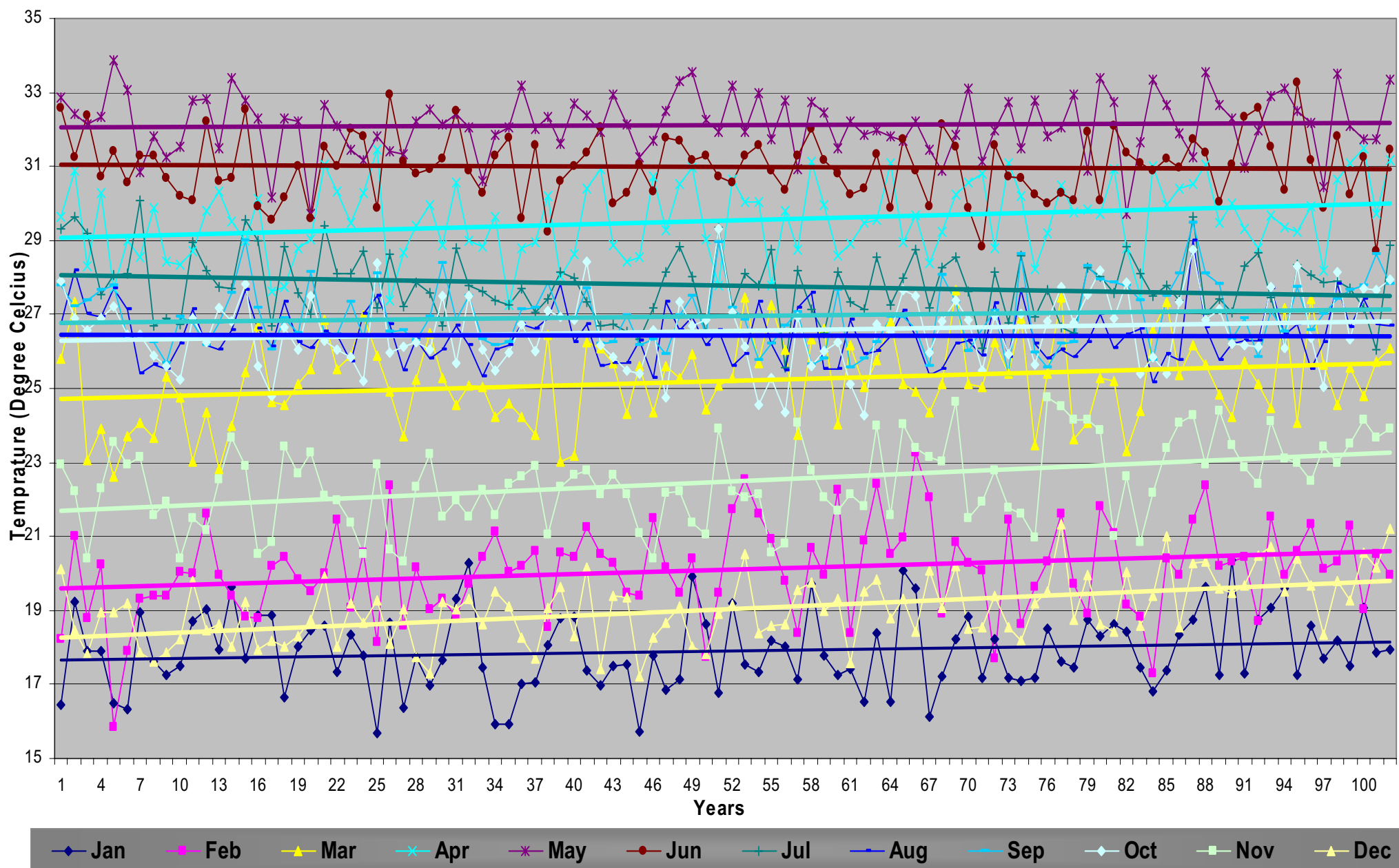
District	Development Block	Percentage of Notified Forest Area to Total area of the Block
[2]	[3]	[4]
Udaipur	1.Bargaon	29.94
	3.Girwa	3.68
	4.Gogunda	16.29
	6.Kotra	24.95
	8.Sarada	7.78
	9.Kherwara	21.59
	10.Salumbar	14.90
	14.Dhariawad	20.98
	15.Mavli	0.88
	17.Vallabhnagar[Bhindar]	2.12
Udaipur	1.Jhadol	51.28

Yearly Average Rainfall in Udaipur District (1901 to 2002)



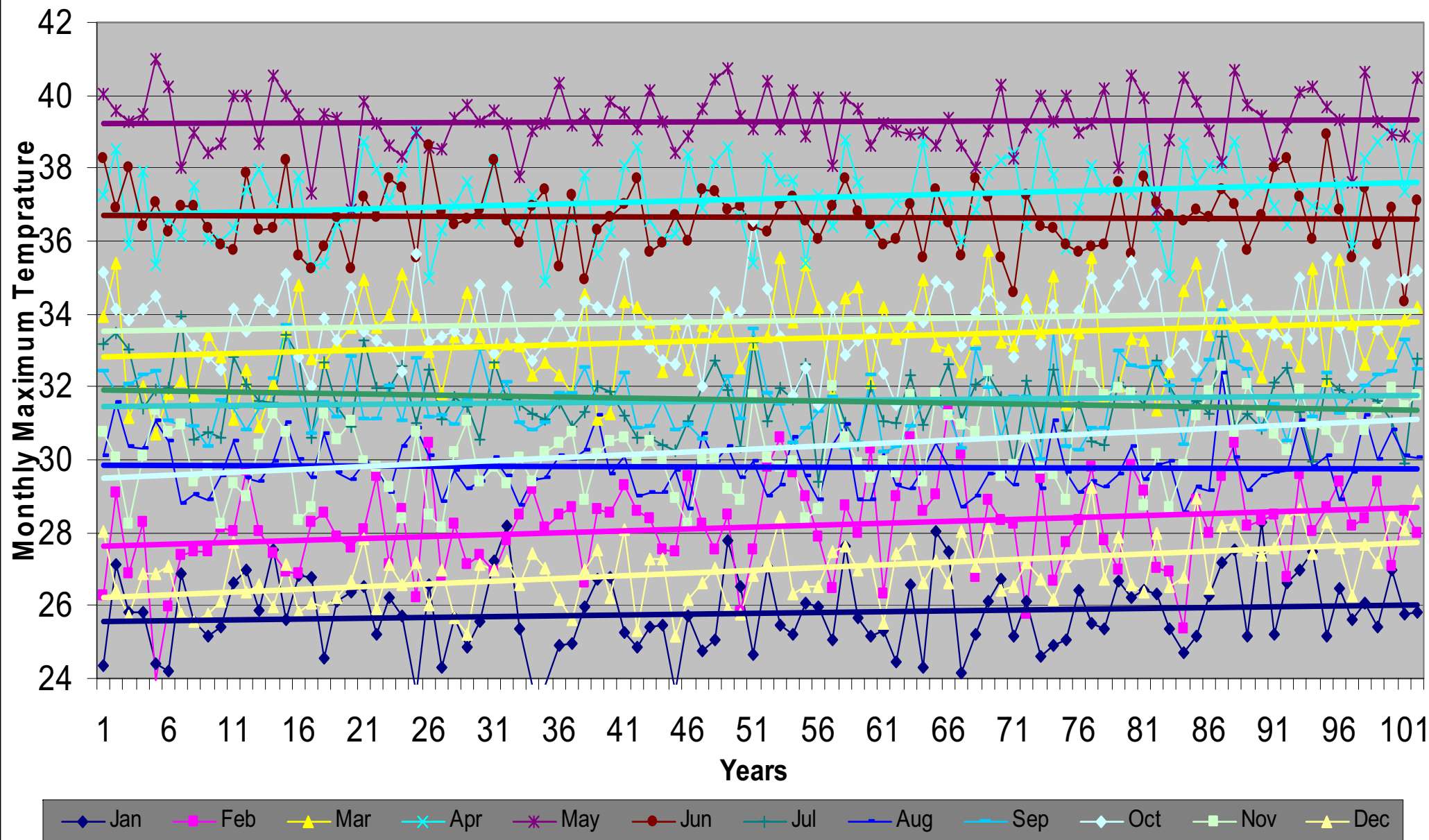
Agriculture will be adversely affected not only by an increase in the overall amounts of rainfall, but also by shift in the timing of the rainfall. For instance over the last few years, the Chattisgarh region has received less than its share of pre monsoon showers in May and June. These showers are important to ensure adequate moisture in fields being prepared for rice crops (Ramakrishna et al. 2002)

Monthwise Average Temperature with 102 years trends (1901 to 2002)



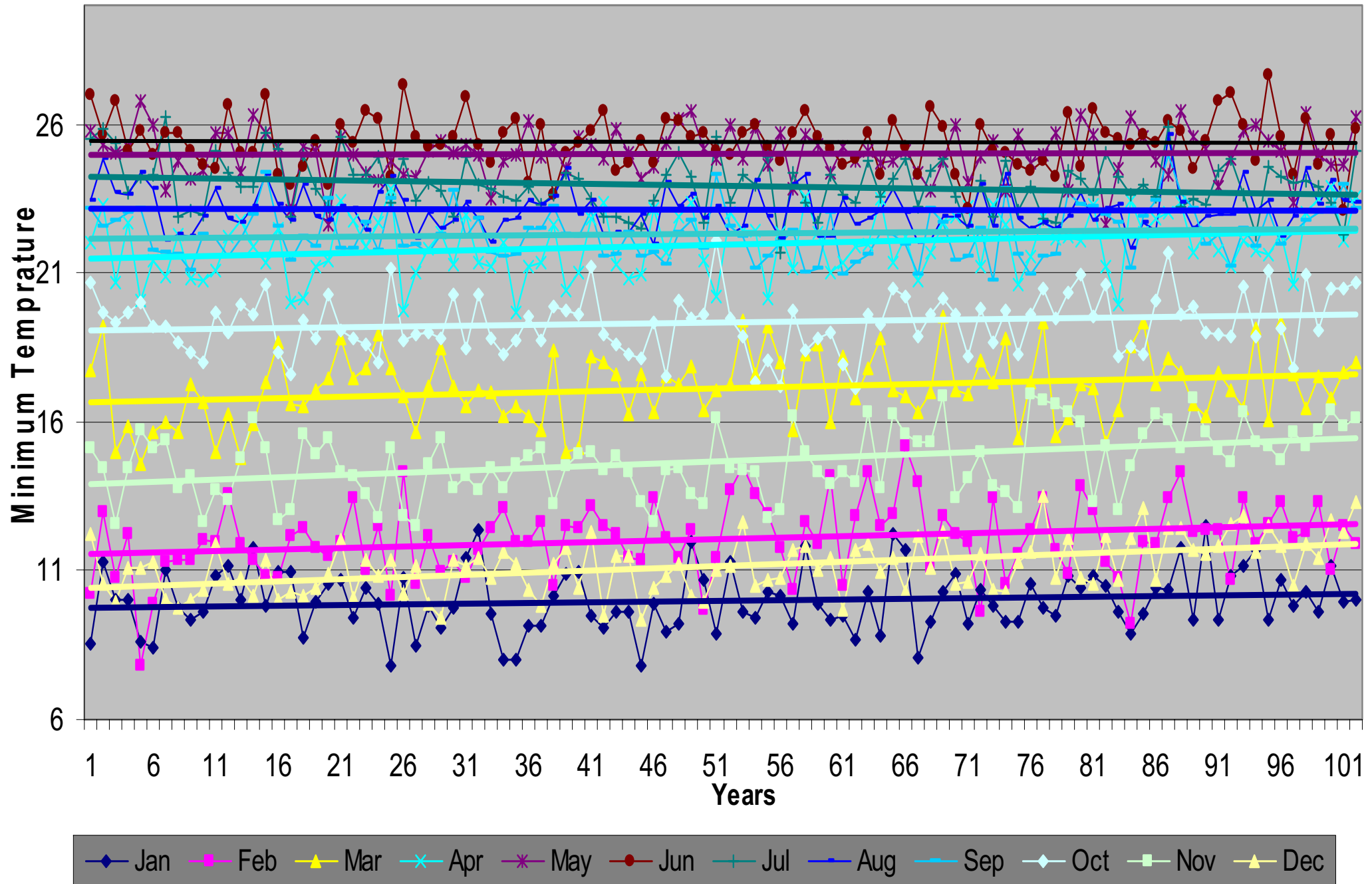
In Rajasthan a 2°C rise in temperature was estimated to reduce production of pearl millet by 10-15% (Ramakrishna et al. 2002).

Monthwise maximum Temperature and trends over 102 years (1901 to 2002)

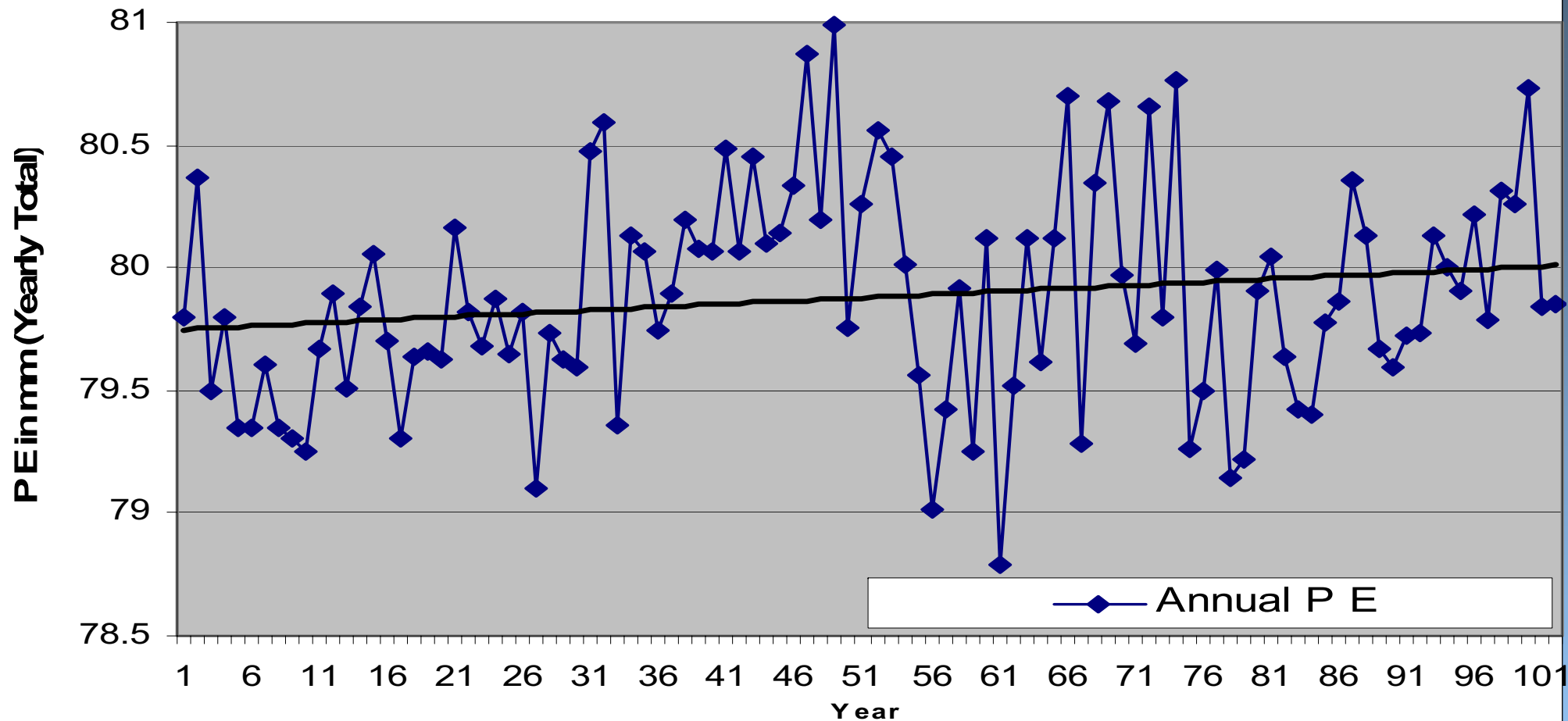


2 – 5 % decrease in yield potential of wheat and maize for a temperature rise of 0.5 to 1.5° C in India (Agarwal, 2003)

Monthwise minimum Temprature with trends over 102 years (1901 to 2002)

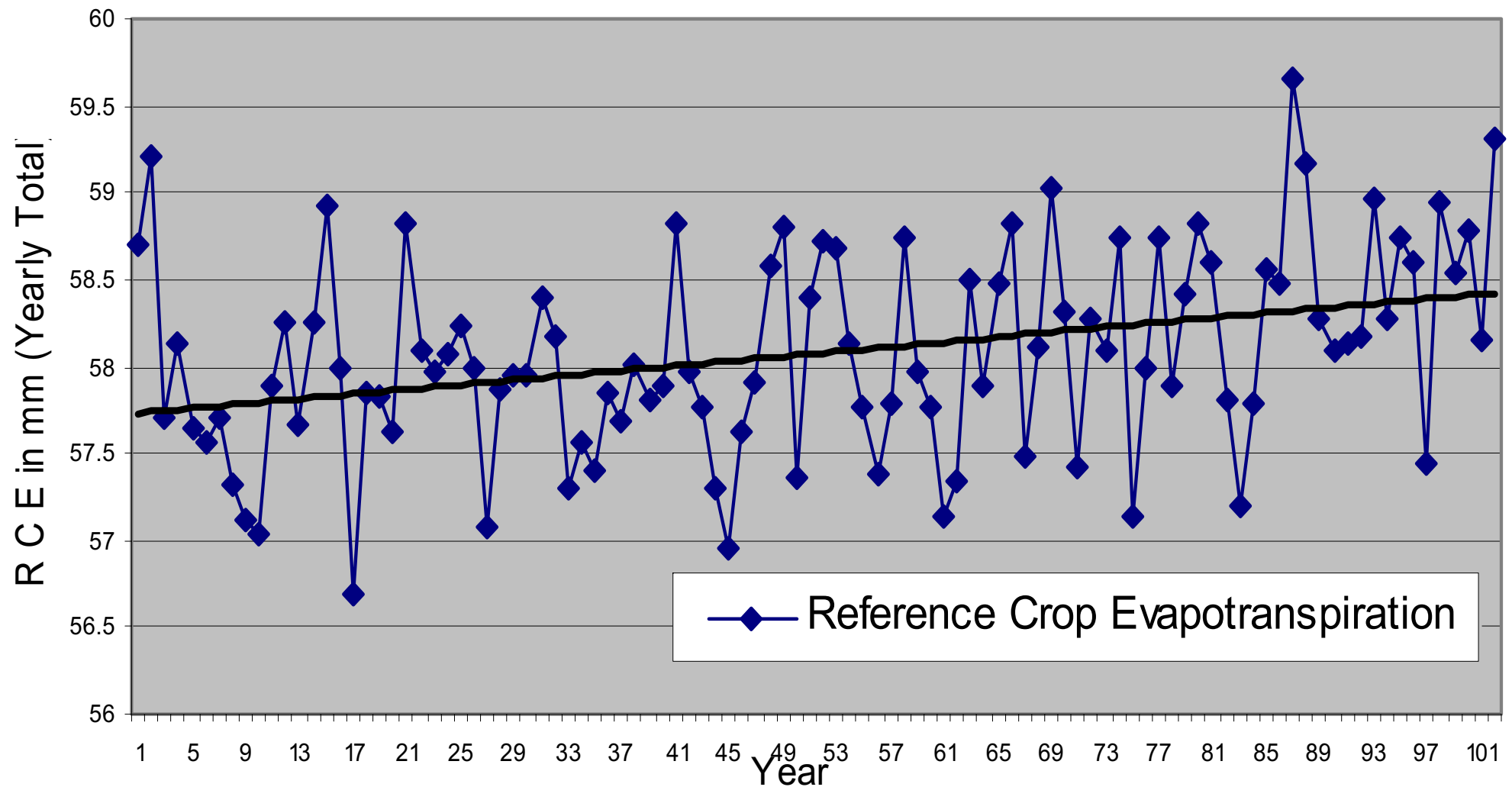


Potential Evapotranspiration (1901-2002)



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Yearly Totals for Reference Crop Evapotranspiration



According to some studies, soybean yields could go up by as much as 50% if the carbon dioxide in the atmosphere doubles. However, if this increase in carbon dioxide is accompanied by an increase in temperature, as expected, than soybean yields could actually decrease. If the maximum and minimum temperature go up by 1° and 1.5°C respectively the gain in yield comes down to 35%. If maximum and minimum temperature rise by 3° and 3.5°C respectively, than the soybean yields will decrease by 5% compared to 1998 (Lal et al. 1999).

National Communication Report of India to the UNFCCC

- An annual mean surface temperature rise by the end of century, ranging from 3 to 5°C under A2 scenario and 2.5 to 4°C under B2 scenario, with warming more pronounced in the northern parts of India expected.
- A 20% rise in all India summer monsoon rainfall and further rise in rainfall is projected over all states except **Punjab, Rajasthan and Tamil Nadu, which shows a slight decrease.**
- Extreme in maximum and minimum temperatures are also expected to increase and similarly extreme precipitation also shows substantial increase, particularly over the west coast of India and west central India.

(Sathaye et al. 2006)

Climate Change / Variability

Impacts

- Lesser rains
- Less numbers of rainy days
- Increased temperature

Mitigation measures

- Bio fuel promotion
 - Jatropha plantations on degraded areas
 - Jatropha plantation on agricultural lands
- Increasing forest cover by afforestation efforts on
 - Forest lands
 - Common pastures
 - Private pastures
- Production forestry
 - Plantations for timber wood
 - Plantation of medicinal species
 - Plantation of other commercial species
- Reducing emission of GHG

Climate Change / Variability

Adaptation measures

- Land use management
 - Soil & water conservation measures
 - Pasture land development
 - Introducing stress tolerant crops & New varieties of crops able to adapt changed conditions
 - Agricultural and land use related advisories (with the help of new technologies available)
- Water resource management
 - Watershed development for water conservation
 - Timely prediction of weather conditions for coping with extreme conditions
 - Rain water harvesting & surface storage of rain water
 - Ground water recharge
 - Growing less water demanding crops
 - Revival of traditional practices of water management
- Livestock management
 - Development of pastures
 - Breed conservation
 - Up-gradation of local breeds
 - Promoting dairying and small ruminants as alternative livelihood option in draught periods
- Efficient Energy management
 - Efficient utilization of locally available energy options
 - Promotion of renewable energy sources
 - Promotion of bio-fuels to cater local energy needs
- Ecological restoration
 - Promotion of traditionally conserved areas such as sacred grooves, orans, etc
 - Ecological monitoring of conservation of bio diversity
 - In situ ex situ conservation of bio diversity to support local livelihoods

ECOLOGICAL CHANGES IN UMARADA



Time period	Status	Changes/ Impacts
Before Independence	good density of wild & domestic flora-fauna	-
60s	Tree felling on large scale	Vegetative cover decline
70s	Establishment of Jamarkotara Rock-Phosphate mine	Loss of vegetation & top soil cover
80s	Severe drought	Major livestock & vegetation decline
90s	Establishment of Processing Units	Air & water pollution, Species population decreased, some species locally got extinct
Current decade	More industrial units & Urban influence	Change in landuse, livestock population & human health

CHANGES IN AGRICULTURE SPECIES

Sr.	Local name	Scientific name	Past status *	Present status *
1	Chana	<i>Cicer areitinum</i> L.	+++++	-
2	Gawar	<i>Cyamopsis tetragonoloba</i> (L.) Taub.	+++++	+
3	Khira	<i>Cucumis sativus</i> L.	++	+
4	Kikodi	<i>Momordica dioica</i> Roxb. ex Willd.	++	+
5	Lauki	<i>Lagenaria siceraria</i> (Molina) Standl.	++	+
6	Maal	<i>Eleusine corocana</i> (L.) Gaertn.	+ with Makki	-
7	Makki	<i>Zea mays</i> L.	100%	20%
8	Mirch	<i>Capsicum annuum</i> L.	+++++	-
9	Samlai	<i>Panicum sumatranse</i> Roth. Ex R. & S.	+	Rarely
10	Til	<i>Sesamum indicum</i> L.	+++++	++

* : +++++ = Abundant, +++ = Common, ++ = Less common, + = Occasional (in some area only), - = Absent

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CHANGES IN WILD PLANT SPECIES

Sr	Local name	Scientific name	Past status	Present status *
1	Aam	<i>Mangifera indica</i> L.	++++*	- if +, fruitless
2	Anwala	<i>Emblica officinalis</i> Gaertn.	+25%	5%
3	Atedi	<i>Helicteres isora</i> L.	++	-
4	Bel	<i>Aegle marmelos</i> (L.) Corr.	++	15%
5	Dhavda	<i>Anogeissus latifolia</i>	+++++	+
6	Gingasi	<i>Grewia flavescens</i> A. Juss.	+++++	16%
7	Godal	<i>Lannea coromandelica</i> (Houtt.) Merr.	+++++	+
8	Gonda	<i>Cordia dichotoma</i> Forst. f.	+++++	+
9	Kamdi	<i>Carissa congesta</i> Wt.	+++++	-
10	Khair	<i>Acacia catechu</i> (L.f.) Willd.	+++++	-
11	Khajur	<i>Phoenix sylvestris</i> (L.) Roxb.	+++++	-
12	Khakhara	<i>Butea monosperma</i> (Lam.) Taub.	+++++	1-2%
13	Mahua	<i>Madhuca indica</i> J.f. Gmelin.	+++++	-,only 2 trees but fruitless
14	Pipal	<i>Ficus religiosa</i> L.	+++	+
15	Thoor	<i>Euphorbia caducifolia</i> Haines.	+++++	-
16	Timaru	<i>Diospyros melanoxylon</i> Roxb.	+++++	+

* : ++++ = Abundant, +++ = Common, ++ = Less common, + = Occasional (in some area only), - = Absent

CHANGES IN BIRD POPULATION IN THE AREA

Decline

Locally Extinct

Sr	Common english name	Local name	Scientific name
1	Black Kite	Harjan	<i>Milvus migrains</i>
2	Black Redstart		<i>Phoenicurus ochruros</i>
3	Black-rumped Flameback	Suthariya	<i>Dinopinum beghalense</i>
4	Changeable Hawk Eagle	Harjan	<i>Spizaetus cirrhatus</i>
5	Common Moorhen		<i>Gallinula chloropus</i>
6	Common Pochared		<i>Aythya ferina</i>
7	Common Tailorbird		<i>Orthotomus sutorius</i>
8	Europeon Wryneck		<i>Jynx torquilla</i>
9	Gray Francolin	Titar	<i>Francolinus pondicerianus</i>
10	Grey-breasted Prinia		<i>Prinia hodgsonii</i>
11	House Crow	Kagda	<i>Carvus splendens Vieillet</i>
12	Indian Bushlark		<i>Mirafra erythropera</i>
13	Indian Nightjar		<i>Caprimulgus asiaticus</i>
14	Indian Peafowl		<i>Pavo cristatus</i>
15	Indian Robin	Devti	<i>Saxicoloides fulicata</i>
16	Indian Silverbill		<i>Lonchara malabarica</i>
17	Jungle Bush Quail	Lawri	<i>Perdicula asiatica</i>
18	Laughing Dove	Chhoti	<i>Streptopelia senegalensis</i>
19	Lesser Whitethroat	Jarki ^{Kamedi}	<i>Sylvia currca</i>
20	Paddy field Pipit		<i>Anthus rufulus</i>
21	Spotted Dove	Kamedi	<i>Streptopelia chinensis</i>

Egyptian Vulture	<i>Neophron</i>
Long-billed Vulture	<i>percnopterus Gyps indicus</i>
White- Umped Vulture	<i>Gyps bengalensis</i>

ECOLOGICAL CHANGES IN HARI KANTHARIYA

**Offshoot of the ongoing study:
People's Biodiversity Register of
Hari Kanthariya region, Jhadol**

LSE/ Biodiversity elements	Nature of change	Reasons for change	Impact on Biodiversity	Impact on People
Forest with good biodiversity and near to villages	Forest were cut for land for habitation and agriculture	Due to change in land use	Negative	---
	land Forest were cut for getting more wood, fodder, etc.		Negative	Negative
	Mining	Change in	Negative	Negative
	Forest cut	Ownership For broadening of road & other dev.	Negative	Negative

CHANGES IN AGRICULTURE SPECIES

Sr	Local name	Scientific name	Past Status*	Present status*
1	Maal	<i>Eleusine corocana</i>	+++	+
2	Kuri	<i>Urochloa panicoides</i>	+++	+
3	Samo	<i>Echinochloa colonum</i>	+++	++
4	China	<i>Panicum miliaceum</i>	++++	+
5	Shamlai	<i>Panicum sumatranse</i>	+++	+
6	Kodra	<i>Paspalum scrobiculatum</i>	++	-
7	Bajara	<i>Pennisetum typhoides</i>	+++	++
8	Kalivari (Rice Var.)	<i>Oryza sp.</i>	+++	+
9	Hegdo (Rice Var.)	<i>Oryza sp.</i>	+++	+

CHANGES IN WILD PLANT SPECIES

Sr	Local name	Scientific name	Past status*	Present Status*	Approx. time of the change
1	Atedi	<i>Helicteres isora</i>	++	+	NA
2	Baheda	<i>Terminalia bellerica</i>	+++	+	20 years ago
3	Bans	<i>Dendrocalamus strictus</i>	++++	+	20 years ago
4	Dhavda	<i>Anogeissus latifolia</i>	++	+	NA
5	Godal	<i>Lannea coromandelica</i>	++	+	15 years ago
6	Kadaya	<i>Sterculia urens</i>	++	+	10 years ago
7	Kamdi	<i>Carissa congesta</i>	++	+	15 years ago
8	Khair	<i>Acacia catechu</i>	++++	+	25 years ago
9	Mocha	<i>Schrebera swietenoides</i>	+++	+	25 years ago
10	Mozad	<i>Casearia elliptica</i>	++	+	NA
11	Salar	<i>Boswellia serrata</i>	++	+	15 years ago

* : ++++ = Abundant, +++ = Common, ++ = Less common, + = Occasional (in some area only), - = Absent

CHANGES IN FAUNA

Sr	Local name	English name	Scientific name	Past status*	Present status*	Approx. time of change	Reason
Birds							
1	Jungli Murga	Grey Jungle Fowl	<i>Gallus sonneratti</i>	+	-	25 yrs ago	Forest cut, poaching
2	Giddha	White rumped Vulture	<i>Gyps bengalensis</i>	++	-	20 yrs ago	Forest cut
3	Titar	Grey francolin	<i>Francolinus pondicerianus</i>	++	+	NA	Poaching
4	Alaval, Halewar	Yellow-footed Pigeon	<i>Treron phoenicoptera</i>	+++	+	NA	
Mammals							
1	Cheetra	Panther	<i>Panthera pardus</i>	+	R	25-30 yrs ago	Habitat loss
2	Reech	Sloth Bear	<i>Melursus ursinus</i>	+	-	30 yrs ago	Habitat loss
3	Batar	Four-horned Antilop	<i>Tetracerus quadricornis</i>	++	-	5-10 yrs ago	Poaching, forest cut, medicinal use
Reptiles							
1	Ajgar	Indian Python	<i>Python molurus</i>	+	-	NA	Habitat loss

* : +++++ = Abundant, +++ = Common, ++ = Less common, + = Occasional, R=Rare, - = Extinct

Thanks