



**BENEFITS OF MICRO IRRIGATION SYSTEM  
SUGAR RECOVERY & PRODUCTIVITY**

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# Flow of Presentation.....

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- PART – I
  - Water requirement for sugarcane production & sugar manufacturing
  - Effect of monsoon on Sugarcane acreage / productivity / recovery
  
- PART – II
  - How to cope with the water situation in sugarcane?
  
- PART – III
  - Drivers / Challenges / Benefits of Micro-Irrigation in sugarcane



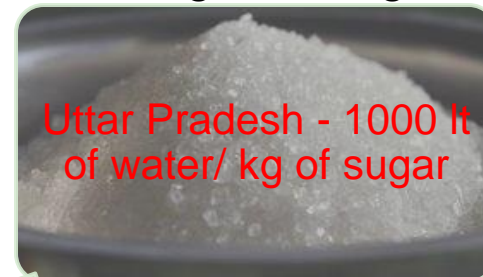
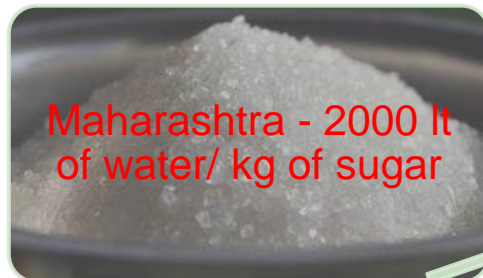
## PART - I

# Water requirement for sugarcane production

- Water requirement for sugarcane production & sugar manufacturing
- Water requirement at critical sugarcane stages
- Water requirement through rain & irrigation

# Water requirement for sugarcane & sugar

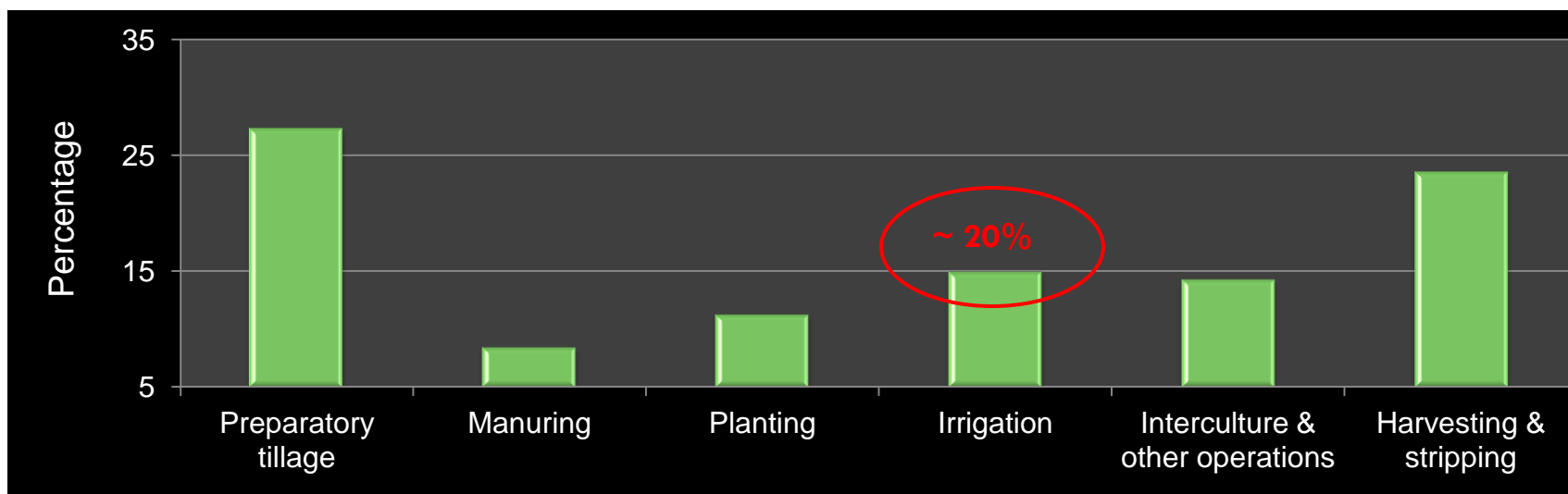
- Water requirement for Agriculture - irrigation is about 688-700 BCM/yr & growing ~ 1.5% CAGR (*\*BCM- billion cubic metre*)
- Total water requirement for sugarcane is 80-100 BCM/yr & growing at ~1.2% CAGR
- Sugarcane requires 1500-2000mm/yr to produce 100 ton millable cane (*i.e. 150 -200 lac lt/annual/ hac in full season*)
  - Plant crop - 88 kg water/kg of cane & 884 kg water/kg of sugar
  - Ratoon crop -118 kg water/kg of cane & 1157 kg water/kg of sugar



## Water requirement at critical sugarcane stages....

Growth phase	Water requirement	
	Subtropical %	Tropical %
Germination	17	12
Tillering	24	22
<b>Grand Growth</b>	<b>37</b>	<b>40</b>
Maturity	22	26

- Crop faces drought conditions in tillering stage (during summer months) and waterlogging in grand growth period (during monsoon)



# Water Requirement through rain & irrigation

- In last three decades, irrigation coverage on sugarcane has been increased from 80% to 93% .....

State	Total water requirement (ha- mm)	Rain water consumed (%)	Water requirement through irrigation (%)	Crop duration (months)
UP/North	1400- 1600	45	55	9- 10
<b>Maharashtra</b>	2500- 3500	20	80	12- 16
Tamil Nadu	1850- 2150	30	70	10-12
Karnataka	2000- 2200	30	70	12-14

- >60% ground water irrigation done through deep well pumping
- Adsali crop in Maharashtra requires maximum water of about 3500 ha-mm

State	Season	Planting	Crop duration (months)
Maharashtra	Adsali	July - Aug	16 - 18
	Pre-seasonal	Oct - Nov	14 - 15
	Suru	Nov - Jan	13 - 14
Uttar Pradesh	Autumn	Oct	12
	Spring	Feb - Mar	10



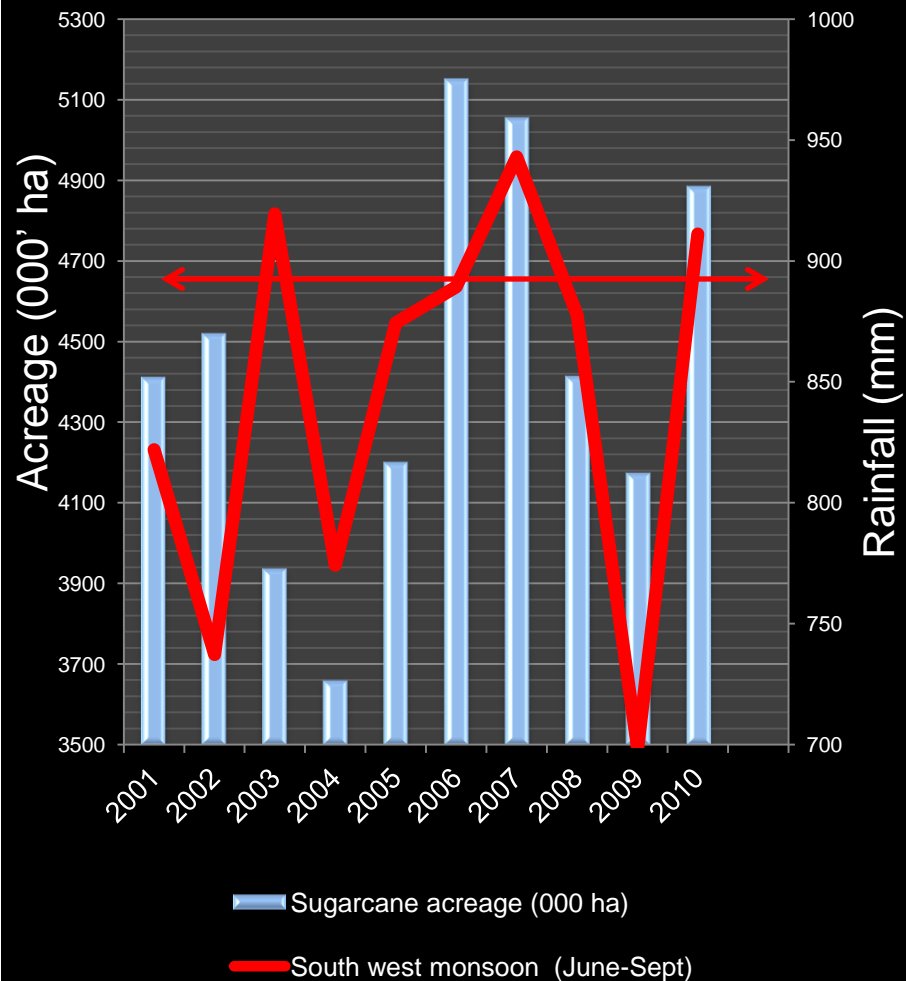
PART – I....

## Effect of monsoon on acreage

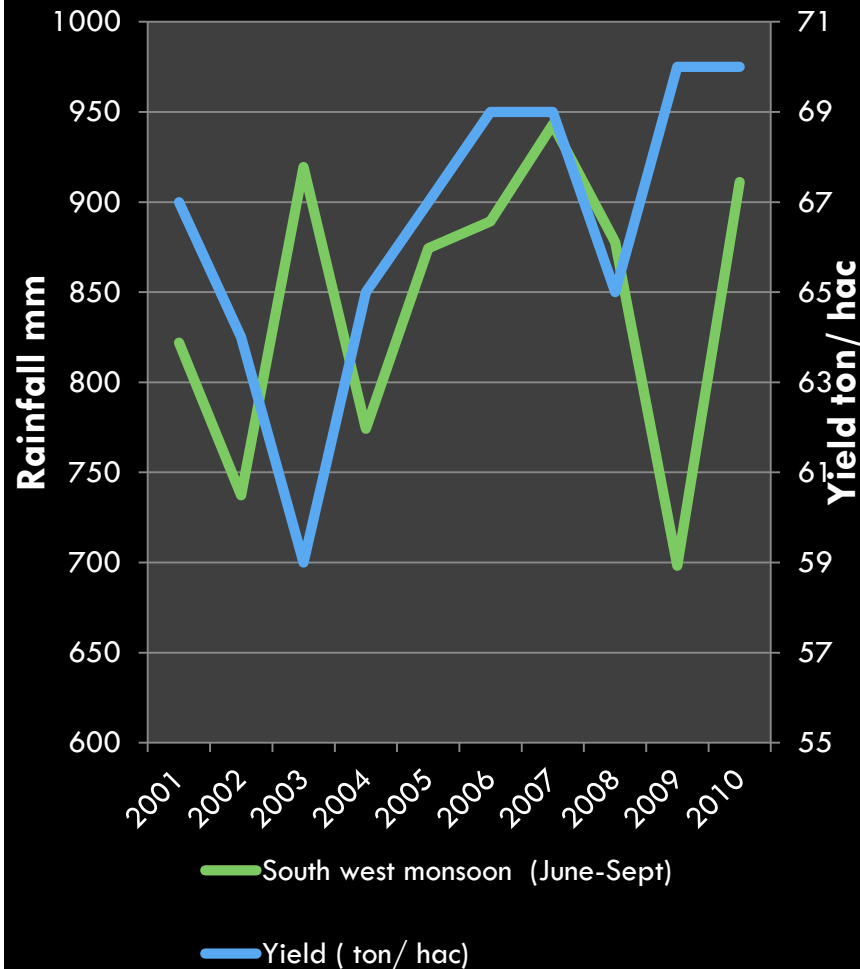
- Southwest monsoon with sugarcane acreage & yield
- Maharashtra & UP Rainfall & Cane acreage
- Is sugarcane a water guzzler?

# Southwest monsoon with sugarcane acreage

## SW Monsoon vs Area

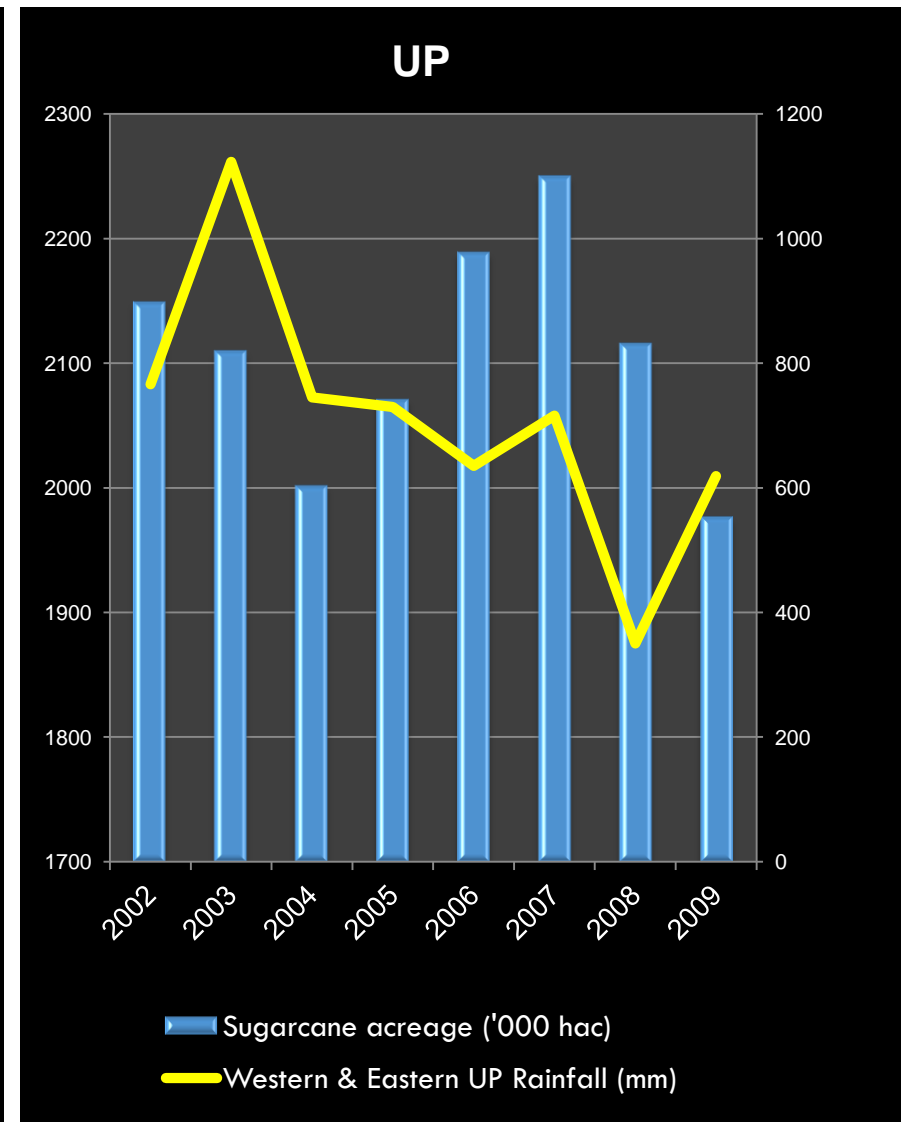
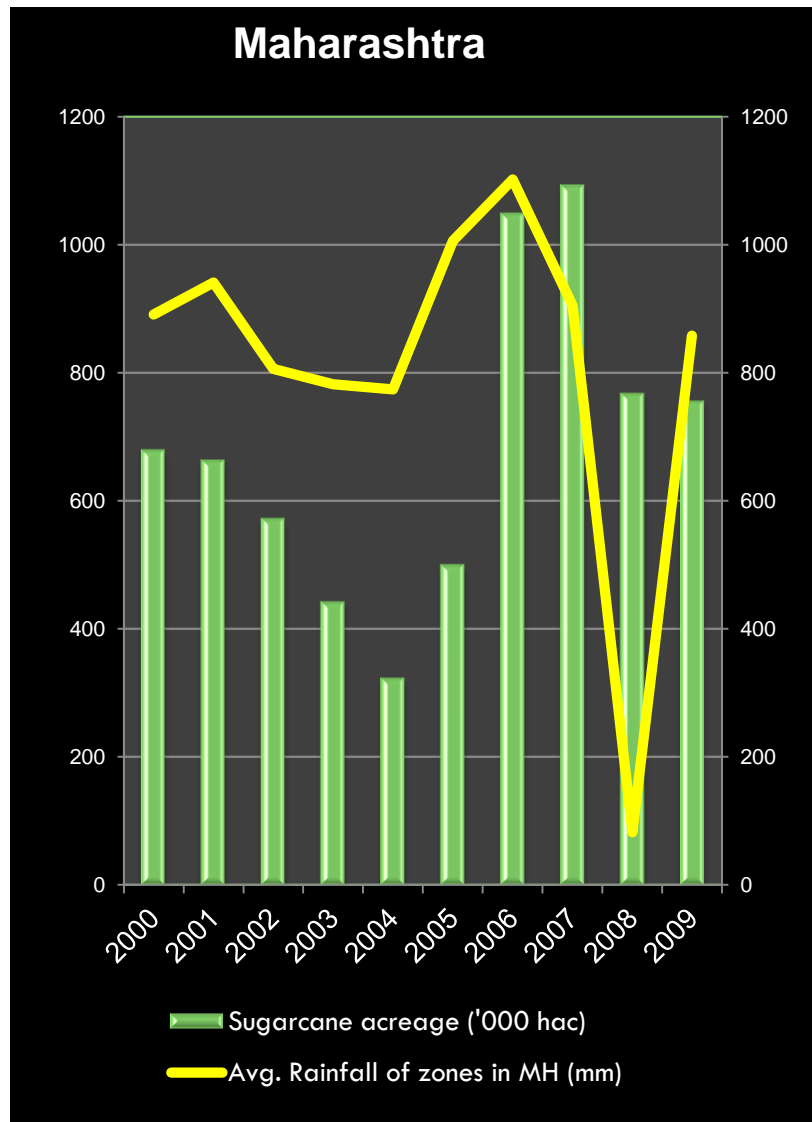


## SW Monsoon vs Yield





# Maharashtra & UP Rainfall & Cane acreage



# Is sugarcane a water guzzler?

- Comparison of crop rotation basis for a year on per hectare of land:-

Sub Tropical	Average irrigation water requirement (mm)	
Crop sequence	UP	Bihar
Sugarcane (sole crop)	850-1000	700-800
Paddy + Paddy	3200-3500	3100-3300
Paddy +Wheat	2200-2400	930-1000

Tropical	Average irrigation water requirement (mm)		
Crop sequence	Maharashtra	Karnataka	Tamil Nadu
Sugarcane	2800	1550	1400
Banana	3000	2800	3100
Paddy+ Turmeric	-	1920	2220

# Water requirement for Production of 1kg sugar

S.NO.	Parameter	Maharashtra	Uttar Pradesh
1.	Land Productivity (qtl./hac)	800.97	595.83
2.	Average Recovery Rate (%)	11.32	9.16
3.	Average no. of irrigation per hac	25.00	7.60
4.	Average height of water (in cms.) per irrigation	7.50	7.50
5.	Average water required (in lac liters) for one irrigation of 1 cm height per hac	1.00	1.00
6.	Average water requirement (lac liters) per hac for entire sugar season	187.50	57.00
7.	Production of sugar (qtl./hac)	90.67	54.58
8.	Water requirement for production of one quintal of sugar (lac litres)	2.07	1.04
9.	Water requirement for production of one kg of sugar (litres)	2068	1044

# Water Productivity in Maharashtra / UP

Season/ Variety	Irrigation Requirement (in terms of lac litres) per hac.	Recovery Rate (%)	Crop duration (months)	Water Productivity per lac lit of water after adjusting for recovery rate & crop duration
<b><u>Maharashtra</u></b>				
Adsali	243.75	12.30	17.00	6.61
Pre-seasonal	206.25	12.00	14.50	5.72
Suru	168.75	11.45	12.00	5.19
Ratoon	168.75	10.50	11.00	4.42
<b>Total/ weighted average</b>	187.50	11.32	12.85	<b>5.18</b>
<b><u>Uttar Pradesh</u></b>				
Plantation	60.00	9.50	10.00	11.33
Ratoon	52.50	8.65	9.00	9.65
<b>Total/ weighted average</b>	57.00	9.16	9.60	<b>10.66</b>
<b><i>Efficiency gap in UP w.r.t. Maharashtra</i></b>				<b>-105.74</b>



## PART - II

# How to cope with the water situation in sugarcane?

- Sustainable sugarcane productivity under depleting water resources
- Comparative performance of sugarcane in different irrigation method
- Penetration level of Micro – irrigation in India

# Sustain productivity under depleting water resources

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- Methods of irrigation economizing water:
  - a) skip furrow
  - b) micro – irrigation / drip irrigation
- Preventing water loss as evaporation from soil surface- trash mulching.
- Applying irrigation at critical stages of growth.
- Cultivation of less water-requiring/drought tolerant varieties.
- Laser leveling of the field.

## Some Field Results.....

- Comparative performance FIM & DIM

Particulars (Case from Maharashtra)	Flood irrigation method (FIM)	Drip irrigation method (DIM)	Saving over FIM (%)
Water consumption(mm/hac)	1800 - 2000	900 - 950	~ 50 – 60 %
Cane yield (ton/hac)	128	170	~ 33

- Economics of some agronomic measures on sugarcane production (plant cane)

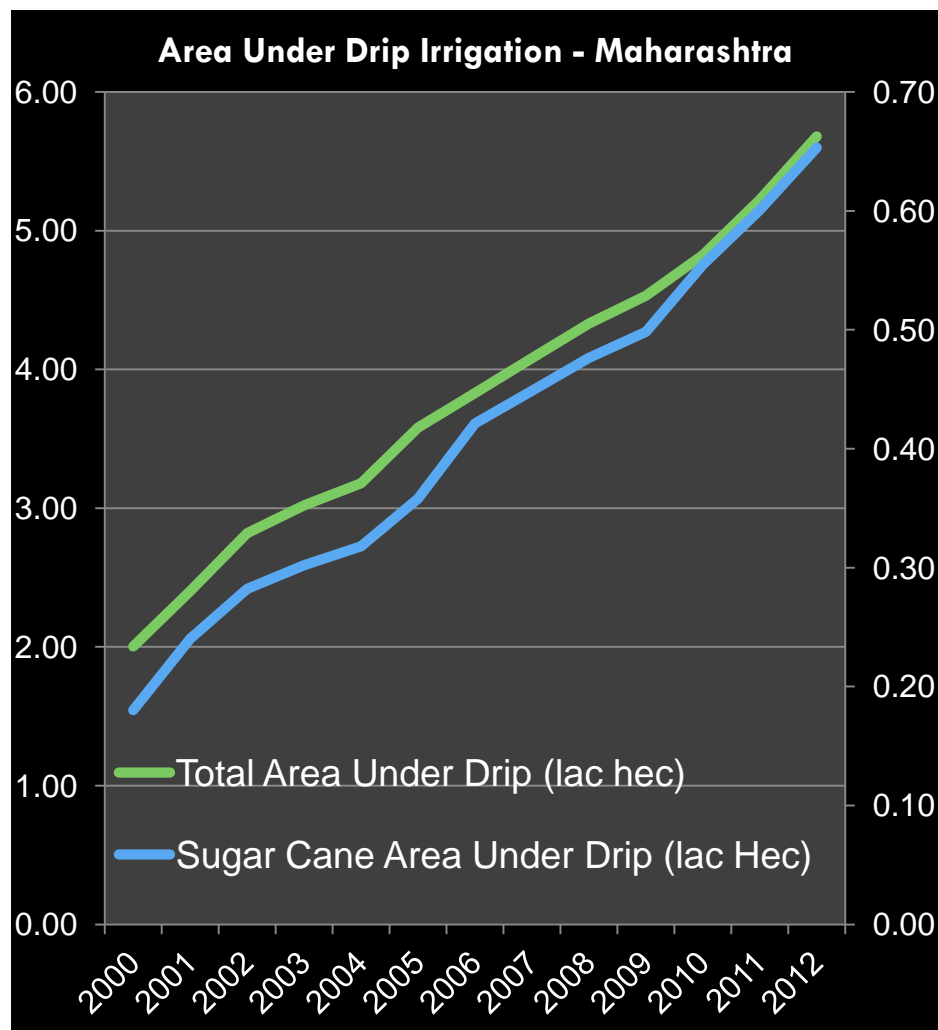
Parameter	Demonstrated agronomic measure			
	Farmers' practice	TM	ICGS	SF
Cost of Production (Rs/ ha)	56721.0	43034.0	58790.0	54831.0
Cane yield (t/ha)	65.7	75.9	82.8	82.8
Gross return (Rs/ha)	91980.0	106288.00	115920.0	115920.20
Net return (Rs/ha)	35259.0	63254.0	57130.0	61089.0
Benefit : cost ratio	1.62	2.47	1.97	2.11

TM – Trash mulching; ICGS – Irrigation at critical growth stages; SF – Skip furrow

Source: Anon

# Penetration of Drip Irrigation .....

State	2008-09 ('000 hac)	2009-10 ('000 hac)
Maharashtra	36	50
Gujarat	25	35
Andhra Pradesh	70	90
Karnataka	30	40
Tamil Nadu	25	35
Madhya Pradesh	12	18
Rajasthan	15	25
UP	0.75	1.5
Punjab	1.5	2.5
Haryana	3	4
All India	220	305



In India, potential area under sugarcane suitable for drip irrigation has been identified as 2.50 m ha .....





## PART - III

## DRIVERS, CHALLENGES & BENEFITS OF MICROIRRIGATION

- Drivers & Challenges.
- Benefits of Micro – Irrigation System in Sugarcane

# Drivers & Challenges of Micro Irrigation.....

## Drivers

- Scarcity of water
- Increasing the demand
- Greater emphasis on yield increase
- Timely requirement of water
- Monsoon disparity
- Efficiency in Fertilizer use
- More emphasis on cultural practices
- Reduce weed growth.
- Water distribution in field



## Challenges

- High initial cost.
- Maintenance is high.
- Interfere in harvesting.

# Benefits of Micro – Irrigation System in Sugarcane

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- Water saving of 50% - 60% by using drip irrigation over FIM
- 30%- 35% of fertilizer can be saved by fertigation
- Sugarcane yield increase by 30% -35% & also reduces the 25% Nitrogen intake
- Easily irrigate the undulated Topography
- Concentration of salt in the root zone reduced by regular application of water by drip
- Weed germination can be reduce 50% & reducing the risk of disease
- Mulching in sugarcane field with drip installed, can save 30% to 40% additional water.

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***Thank you***

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