

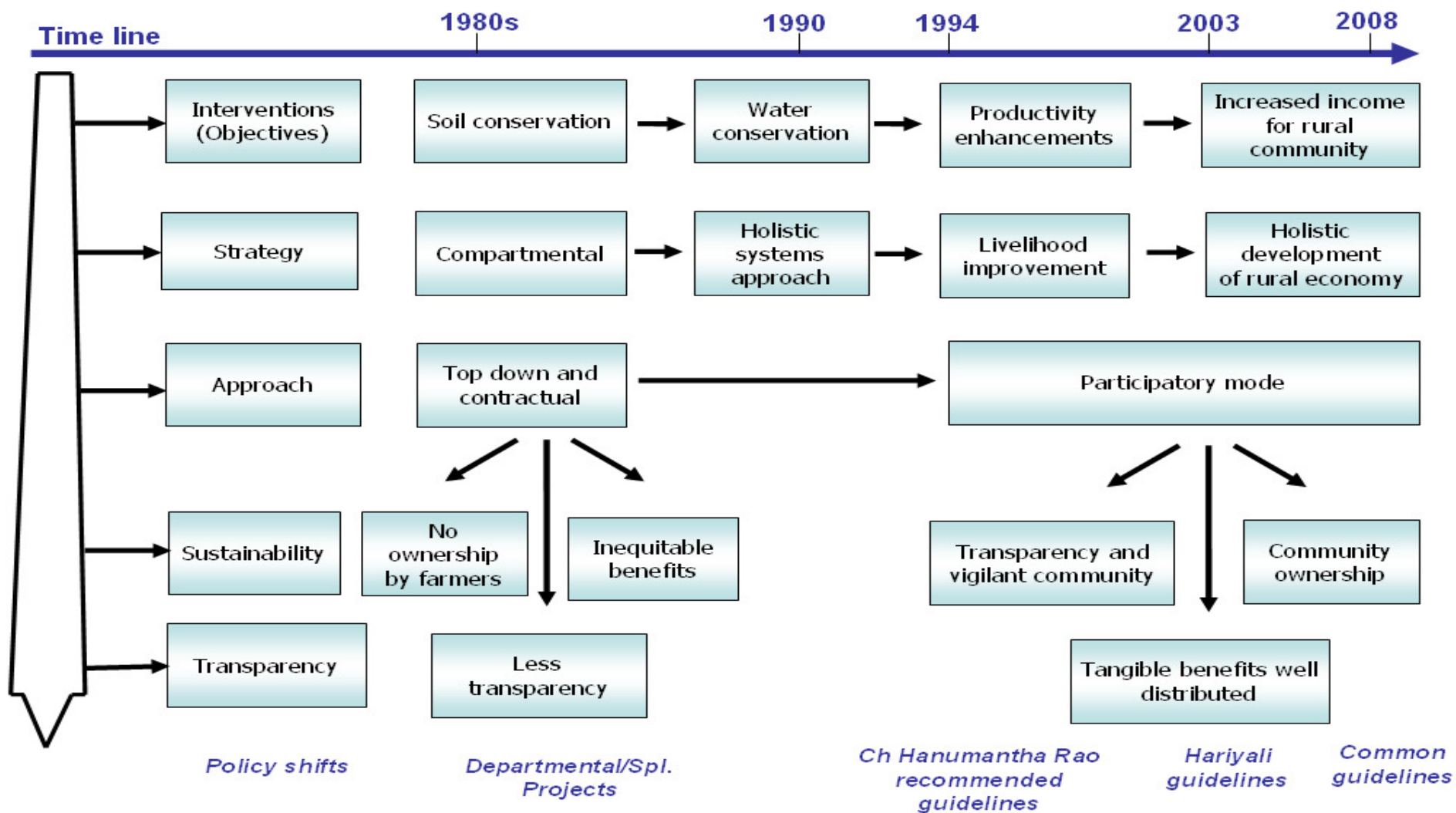
Watershed Management: A Growth Engine for Sustainable Development



Suhas P Wani and Anantha KH

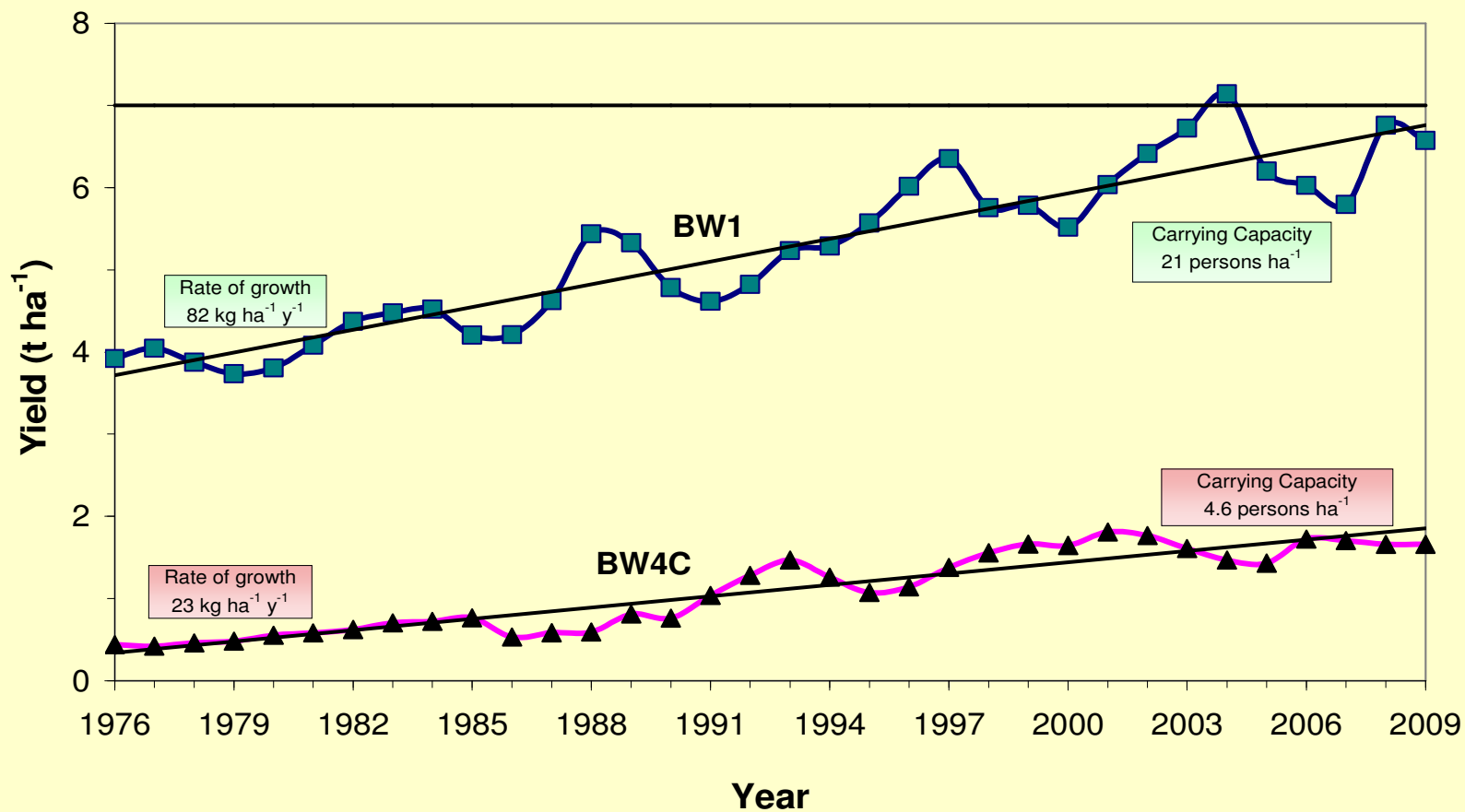
**International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)
Patancheru P. O. 502 324, Andhra Pradesh, India**

Evolution of Watershed Approach in India



Vast Untapped Potential of Rainfed Agriculture

- Current farmers' yields are lower by 2 to 5 folds than the achievable yields
- Vast potential of rainfed agriculture needs to be harnessed



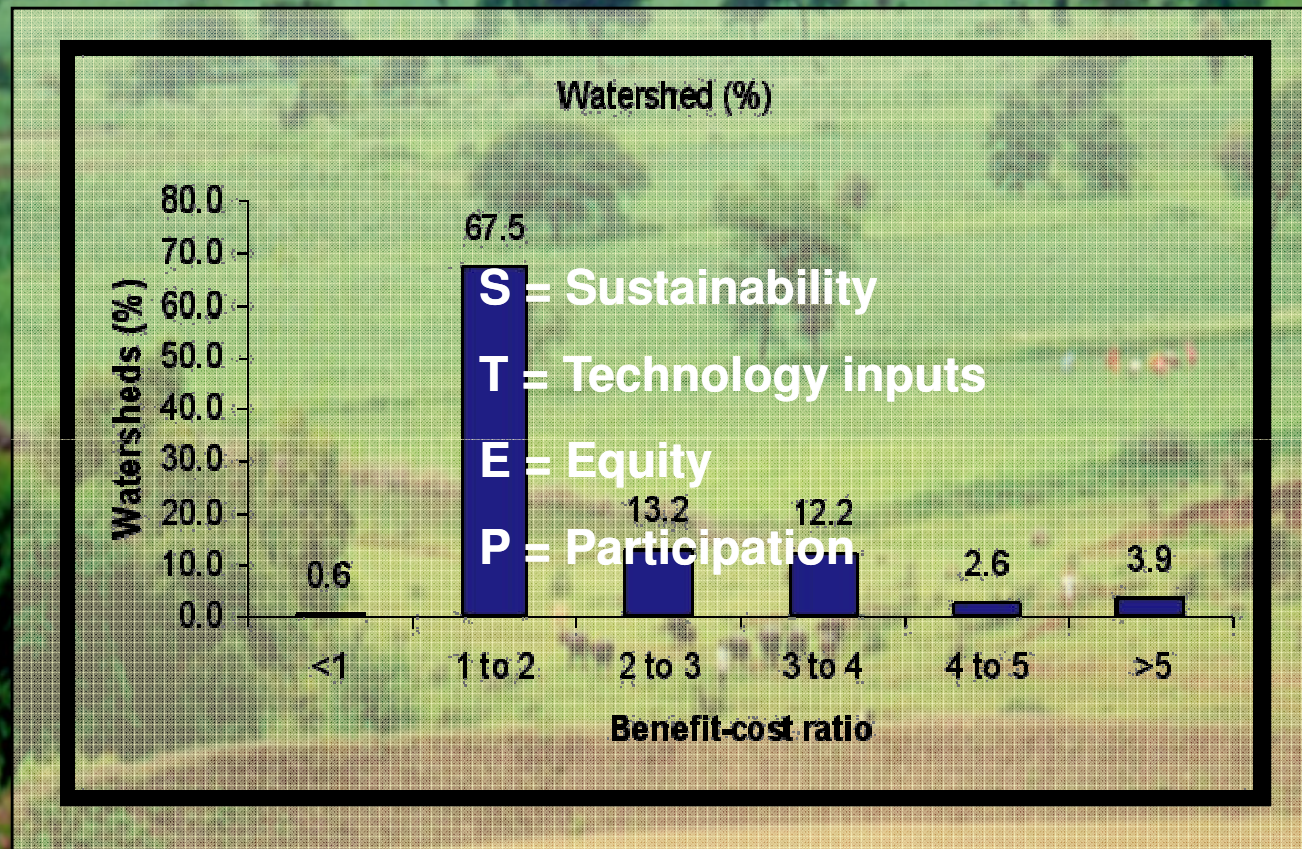
Watersheds are Revolutionising Drylands:



Meta-analysis – 636 Case Studies

	Particulars	Unit	No. of studies	Mean	Minimum	Maximum	t-value
Efficiency	B:C ratio	Ratio	311	2.01	0.82	7.30	35.09
	IRR	Per cent	162	27.43	2.03	102.70	21.75
Equity	Employment	Person days ha ⁻¹ y ⁻¹	99	154.53	0.05	900.00	8.13
Sustainability	Increase in irrigated area	Per cent	93	51.55	1.28	204.00	10.94
	Increase in cropping intensity	Per cent	339	35.51	3.00	283.00	14.96
	Runoff reduced	Per cent	83	45.72	0.38	96.00	9.36
	Soil loss saved	t ha ⁻¹ y ⁻¹	72	1.12	0.11	2.05	47.21

STEPS to Achieve Impact



- Less than 1% watersheds are economically non-remunerative
- Two-thirds of watersheds' performance can be improved

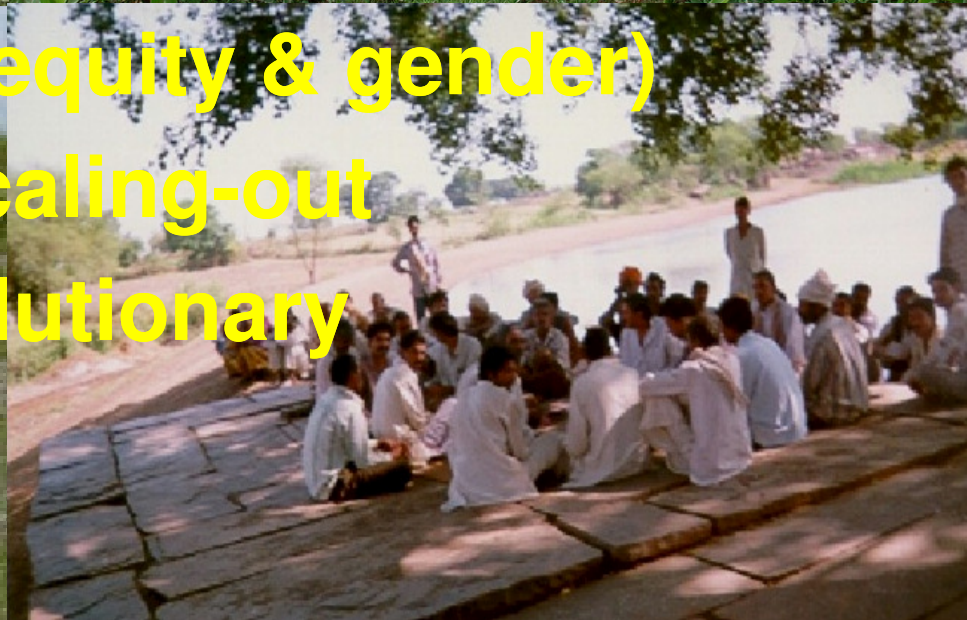


ICRISAT

Science with a human face

Farmers' Centric Watershed as an Entry Point

- **IGNRM, holistic livelihood approach**
- **Science-based approach**
- **Sustainability, empowerment and KS**
- **Social inclusion (equity & gender)**
- **Scaling-up and scaling-out**
- **Learning and evolutionary**





ICRISAT

Science with a human face

Consortium and Convergence for Holistic Livelihood Promotion

- ❖ Multi-disciplinary/multi-institutional partnerships
- ❖ Convergence of schemes/programmes
- ❖ Improved communication
- ❖ Participatory M & E
- ❖ Transparency





Productivity enhancement



Soil and Water Conservation practices in Kothapally





ICRISAT

Science with a human face

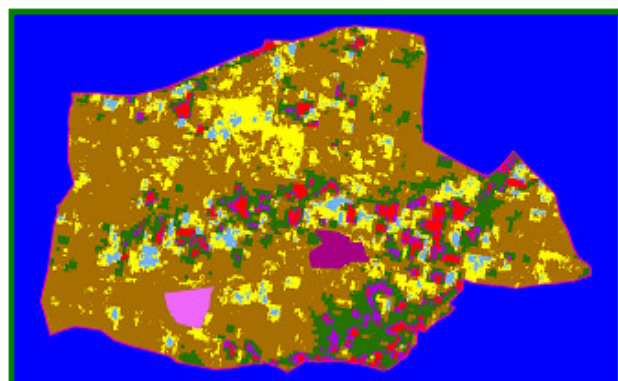
Impacts

- *Improved land cover*
- *Reduced runoff and soil loss*
- *Improved groundwater levels*
- *Increased productivities*
- *Increased household income*
- *Changes in cropping pattern*
- *Human resource development*
- *Flow of technologies*

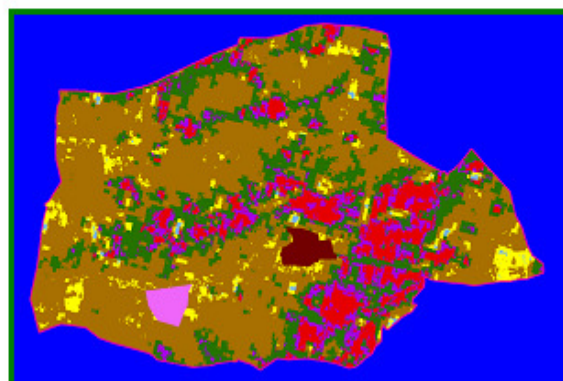


ADARSHA WATERSHED, KOTHAPALLY, RANGA REDDY DISTRICT, ANDHRA PRADESH

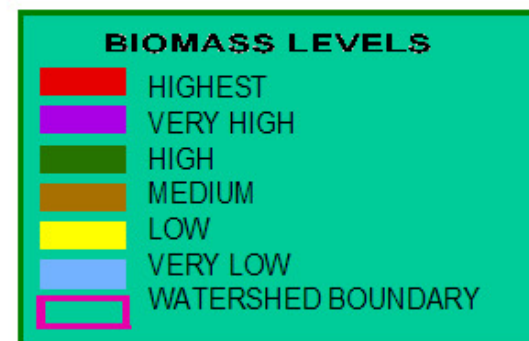
NDVI / BIOMASS IMAGE - 1999



NDVI / BIOMASS IMAGE - 2007



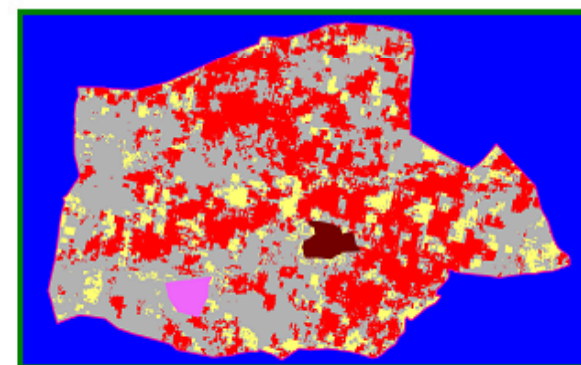
LEGEND



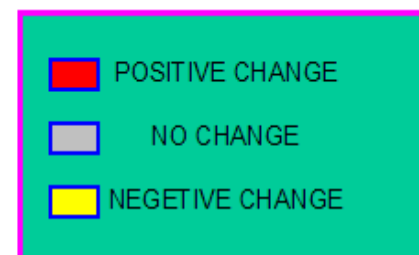
CHANGE (BIOMASS) IMAGE BETWEEN 1999 & 2007

TABLE B : CHANGE ANALYSIS : VEGETATION VIGOUR (NDVI BASED) – SUSTAINABILITY

Sl No	Vegetation Vigour	Pretreatment (1999-2000)		Post treatment (2006-2007)		Changes	
		Area	%	Area	%	Area	%
1	Highest	17.56	3.72	44.74	9.48	27.18	5.76
2	Very High	14.92	3.16	35.51	7.52	20.59	4.36
3	High	66.00	13.99	106.80	22.63	40.80	8.64
4	Medium	282.42	59.85	254.75	53.98	-27.67	-5.87
5	Low	74.52	15.79	28.20	5.98	-61.61	-9.81
6	Very Low	16.48	3.49	1.91	0.40	-14.57	-3.09
	Total	471.90	100.00	471.90	100.00	±88.57	±18.76



LEGEND





ICRISAT

Science with a human face

Rainfall, runoff and soil loss from Adarsha Watershed, Kothapally, 1999-2004

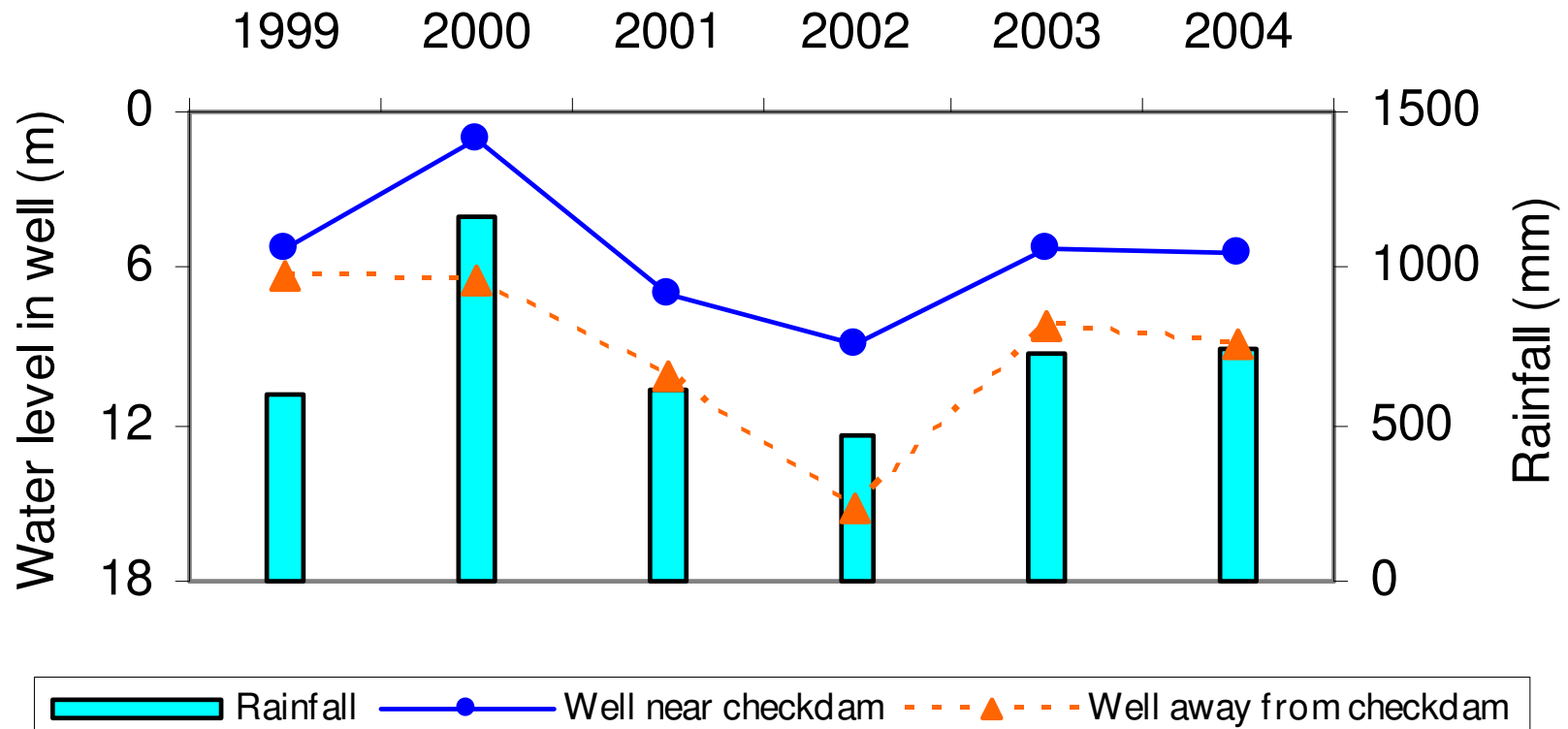
Year	Rainfall (mm)	Runoff (mm)		Soil loss (t/ha)	
		Untreated	Treated	Untreated	Treated
1999	584	16	*	*	*
2000	1161	118	65	4.17	1.46
2001	612	31	22	1.48	0.51
2002	464	13	Nil	0.18	Nil
2003	689	76	44	3.20	1.10
2004	667	126	39	3.53	0.53

* Not installed



ICRISAT
Science with a human face

Effect of water harvesting structures on groundwater recharge at Adarsha Watershed, Kothapally, 1999-2004.





Crop yields in Adarsha Watershed Kothapally during 1999-2009



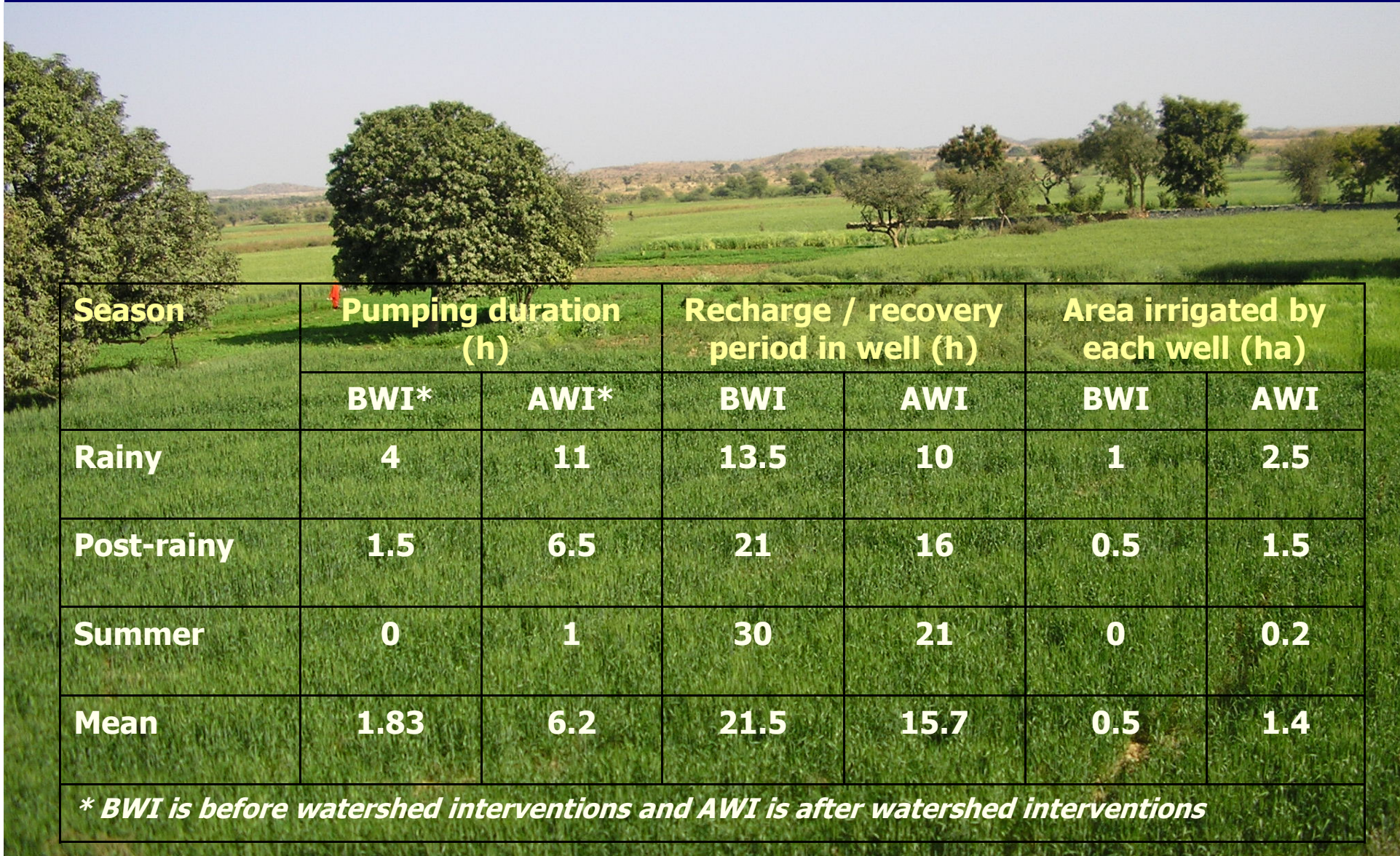
Crop	1998 base-line yield	Yield (Kg ha ⁻¹)											
		1999-2000	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	Average yields	SE±
Sole maize	1500	3250	3750	3300	3480	3920	3420	3920	3635	4680	4808	3830	263
Improved Intercropped maize	-	2700	2790	2800	3083	3129	2950	3360	3180	3990	4163	3200	245
Traditional inter-cropped Maize	-	1700	1600	1600	1800	1950	2025	2275	2150	-	-	1890	116
Improved inter-cropped pigeonpea	-	640	940	800	720	950	680	925	970	640	760	830	112
Traditional inter-cropped pigeonpea	190	200	180	-	-	-	-	-	-	-	-	190	-
Improved Sole Sorghum	-	3050	3170	2600	2425	2290	2325	2250	2085	-	-	2530	165
Traditional Sole Sorghum	1070	1070	1010	940	910	952	1025	1083	995	-	-	1000	121
Intercropped Sorghum	-	1770	1940	2200	-	2110	1980	1960	1850	-	-	1970	206



ICRISAT

Science with a human face

Effect of watershed interventions on the performance of open wells in Bundi watershed, Rajasthan,

A photograph of a rural landscape in the Bundi watershed, Rajasthan. The scene shows green fields, scattered trees, and a clear sky, representing the environment where the study was conducted.

Season	Pumping duration (h)		Recharge / recovery period in well (h)		Area irrigated by each well (ha)	
	BWI*	AWI*	BWI	AWI	BWI	AWI
Rainy	4	11	13.5	10	1	2.5
Post-rainy	1.5	6.5	21	16	0.5	1.5
Summer	0	1	30	21	0	0.2
Mean	1.83	6.2	21.5	15.7	0.5	1.4

** BWI is before watershed interventions and AWI is after watershed interventions*



ICRISAT

Science with a human face

Increased area under irrigation (ha), 1995-2003, Rajsamadhiayala watershed, Gujarat

Cropping season	1995	1999	2003	% Increase in 2003 over 1995
<i>Kharif</i>	402	518	643	60
<i>Rabi</i>	356	469	551	55
Summer	11	18	24	118
Total	769	1005	1218	58



ICRISAT

Science with a human face

Increased Private Investment due to Improved Water Availability

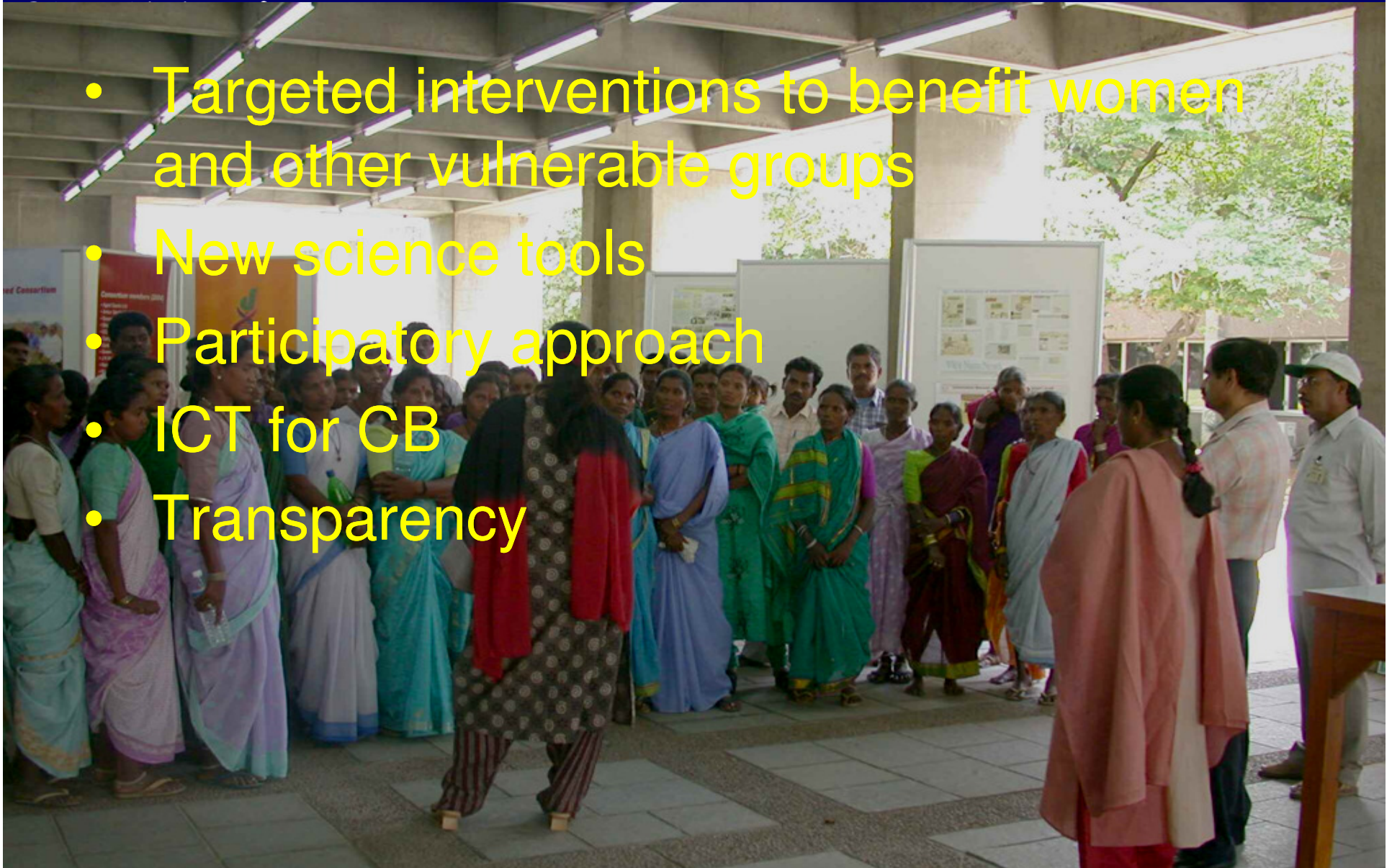
- **Increased water availability due to various watershed development activities encouraged private investment from farmers on procurement of irrigation facilities and farm machineries**
- **Change in the number of farmers having access to irrigation, Rajsamadhiyala watershed, Gujarat**

Farmers category	1995	1999	2003	Increase in 2003 over 1995 (%)
Small	25	82	98	292
Marginal	16	28	35	317
Large	32	65	87	172
Total	73	175	210	188



Empowerment of Vulnerable Groups

- Targeted interventions to benefit women and other vulnerable groups
- New science tools
- Participatory approach
- ICT for CB
- Transparency





ICRISAT

Science with a human face

Income Generating Activities

- Vermicomposting
- Value addition: *Daal* mills installed
- Village-based seed bank
- Nursery raising by SHGs



Scaling-up of Watersheds

- 
- Convergence
 - Collective action
 - Capacity building
 - PPP-business model to promote high-value crops
 - Technical Backstopping

Drivers of Collective Action

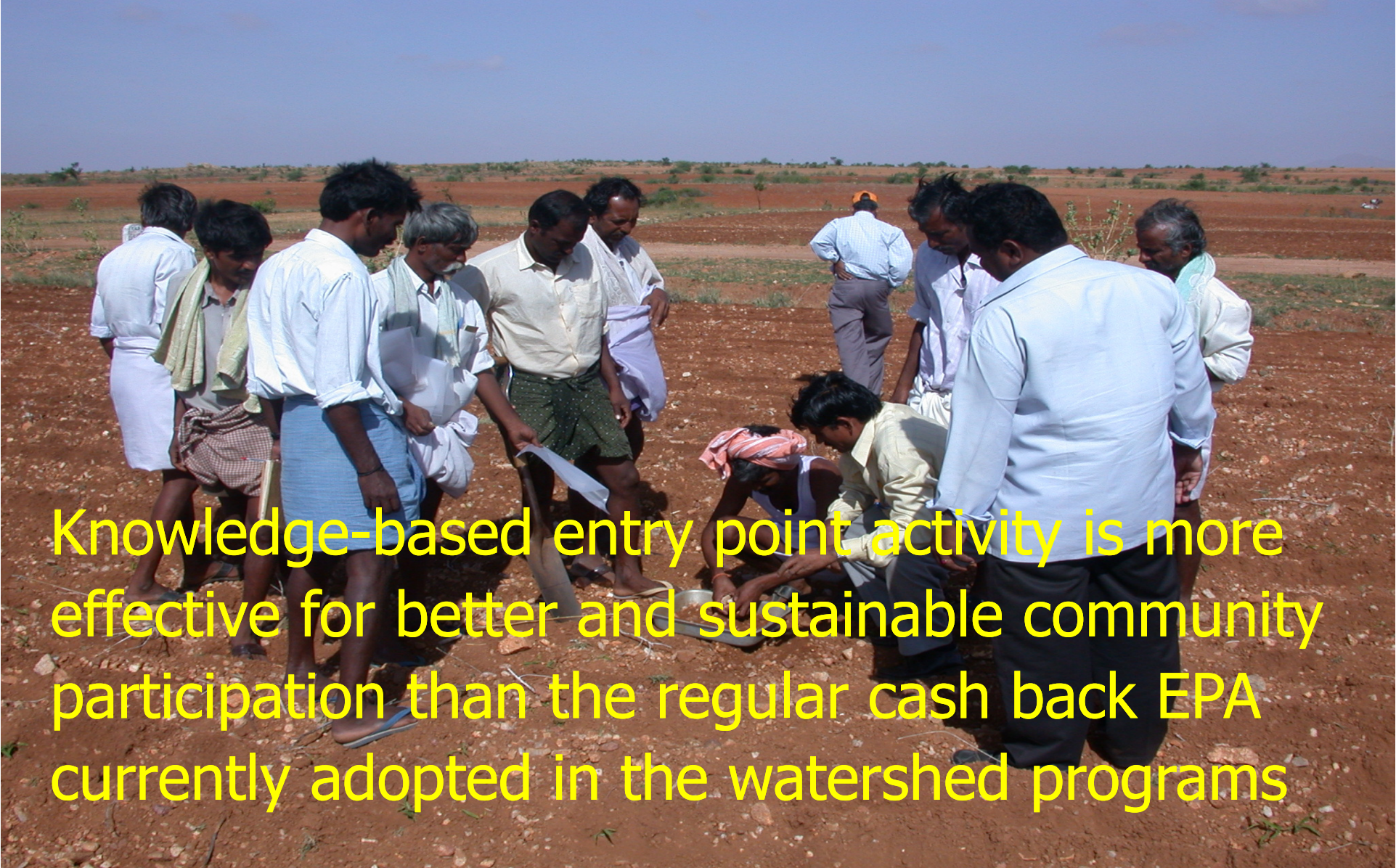
- 
- Tangible economic benefits for individuals
 - Income-generating activities
 - High-value crops
 - Holistic approach – IGNRM approach



ICRISAT

Science with a human face

Main Emerging Messages (Contd..)

A group of approximately 15 men are gathered in a dry, open field with reddish-brown soil. They are dressed in light-colored shirts and traditional Indian attire like dhotis or saris. One man is kneeling on the ground, looking at a document or a small object. The others are standing around him, some holding papers, suggesting a collaborative activity or a field demonstration. The background shows a flat, open landscape under a clear sky.

Knowledge-based entry point activity is more effective for better and sustainable community participation than the regular cash back EPA currently adopted in the watershed programs



ICRISAT

Science with a human face

Main Emerging Messages (Contd..)

Capacity building is the weakest link for scaling-up meaningful watershed programs





ICRISAT

Science with a human face

Addressing Equity and Gender concerns



- Livelihood approach
- Investment in small water harvesting structures
- CPR Management
- Space for landless and women in the Programme
- Promotion of micro enterprise
- Promotion of non-traditional roles for women



ICRISAT

Science with a human face

Analysis of Three Case Studies

Sl. No	Description	Powerguda	Janampet	Kothapally
1	Rights			
	Property	Men	Men/Women	Men
	Financial resources of the family	Men	Women	Men
	Employment	Men/Women	Men/Women	Men/Women
	Education	Men	Men	Men
	Social status of women	Medium	Good	Medium
	Awareness among women	Leader fully aware	Very good	Not to the mark
	Agricultural decision making	Men/Women	Men/Women	Men/Women
	Resistance by men	Nil	Initial	Nil

Contd..



ICRISAT

Science with a human face

Analysis of Three Case Studies

Sl. No	Description	Powerguda	Janampet	Kothapally
2	Workload on women	+	+++	++
	Wages (Rs/day)			
	Men	50	50	50
	Women	30	30	30
	Load of invisible work	Same	Same	Same
	Work load on men	No	No	Yes
	Time spent on economic work by women	+	+++	++
	Time on social/ community work	High	High	Medium
	Marketing of agriculture produce by women	-	Yes	-

Contd..



ICRISAT

Science with a human face

Analysis of Three Case Studies

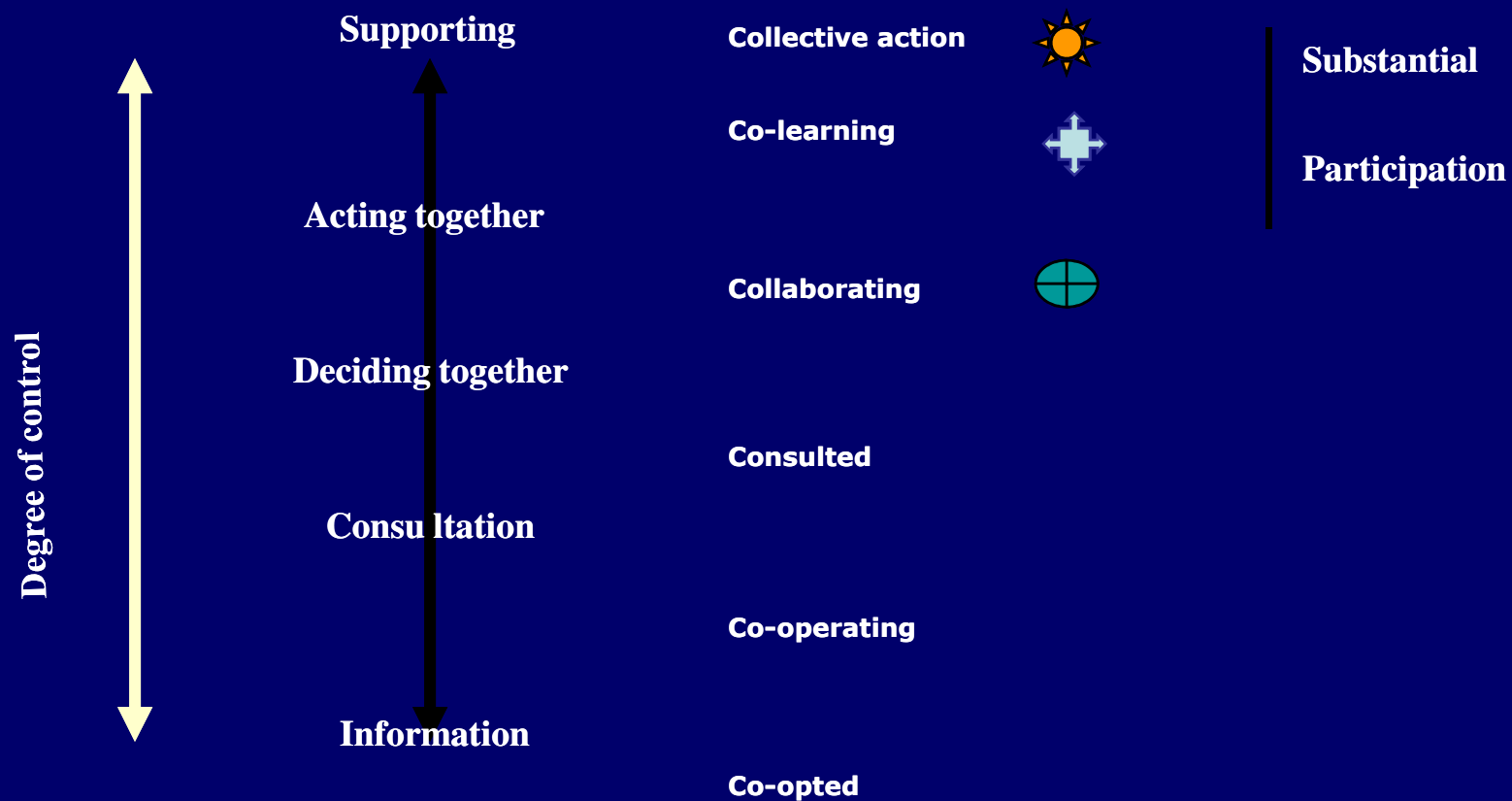
Sl. No	Description	Powerguda	Janampet	Kothapally
3	Access to Assets			
	Access to community assets	Men/Women	Men/Women	Men/Women
	Access to credit	Women	Women	Women
	Access to income	-	Women	-
	Access to information	Yes	Yes	Yes
	Access to service	Nil	Yes	Yes
4	Control on financial resources	Low	High	Low
5	Self-confidence	Slowly building-up	High	Low
6	Opportunities for exploration	Minimum	Very high	High
7	Understanding on health	Medium	High	Medium
8	Distressed Migration	0	0	0
9	Driver identified	Leader	Mahila samakhya (Federation of women)	Improved water availability

Contd..



ICRISAT
Science with a human face

On the ladder of participation





ICRISAT

Science with a human face

Gender case study findings

- It is evident that the higher on the ladder of participation the stronger are the institutions
- Constraints surmountable through mutual co-operation
- Supportive policy for institution building is a driver
- The benefits of development that usher through integrated watershed development could maximize if the energies of all the contributing stakeholder are harnessed esp. women.
- Capacity building of women in income generation activities, financial management, social dynamics of groups yielded substantial results.
- Critical areas identified for capacity building
 - Technical know-how
 - Functional literacy
 - Enhanced awareness of their rights
- For the inclusion of gender perspective in IWMP it is necessary to use the existing institutions, small groups (Women), and federation of these groups as levers of holistic development



ICRISAT

Science with a human face

Thank you

