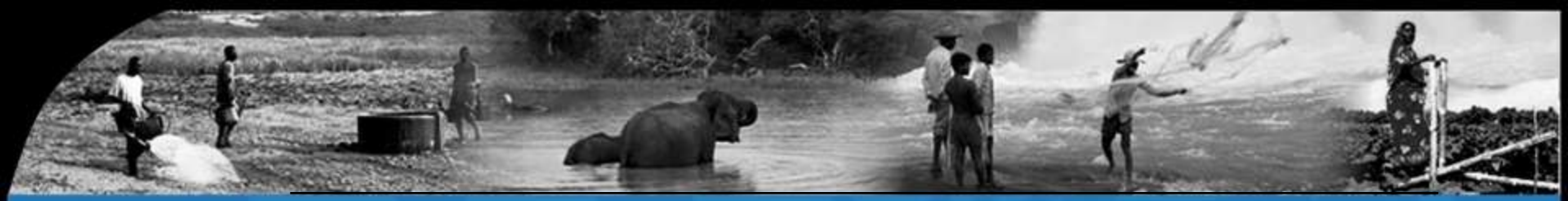


Managing Risk and Low Productivity of Rainfed Agriculture through Nationwide Water Harvesting Initiative in India

International Conference on "Water- Harvesting, Storage and Conservation",

November 23-24, 2009; IIT, Kanpur, India

Bharat R Sharma
IWMI, New Delhi

www.iwmi.org

International Water Management Institute

Scarcity of water has always been frightening for those……

Whose livelihoods depend upon……..

The randomness of rainfall!!

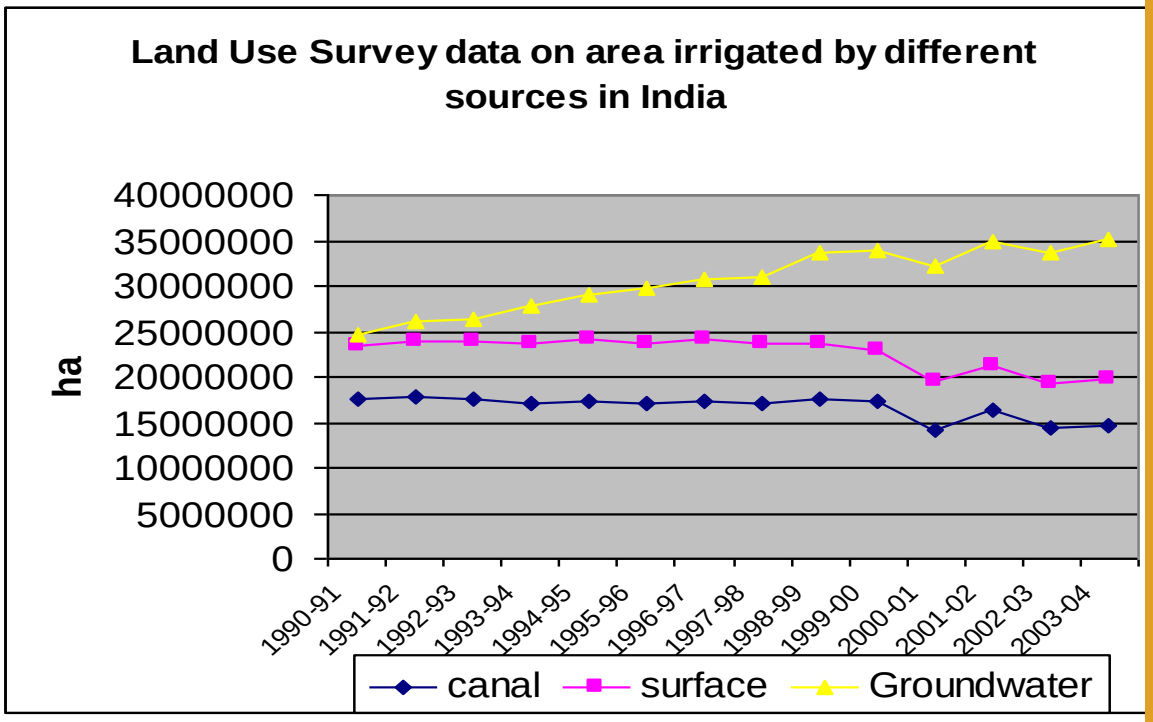
Source: Liu Changming Presentation

The individual human capacity to control and regulate the water resource

Is also very very limited!!

The Two Major Responses have been……..

1. Creation of large canal systems with public funds
2. Development of groundwater resources with private funds……But ?



Rs 100 000 crores spent since 1991, but no additional benefits. There has been no addition to Canal Irrigated areas for 14 years

And Groundwater Resources are becoming

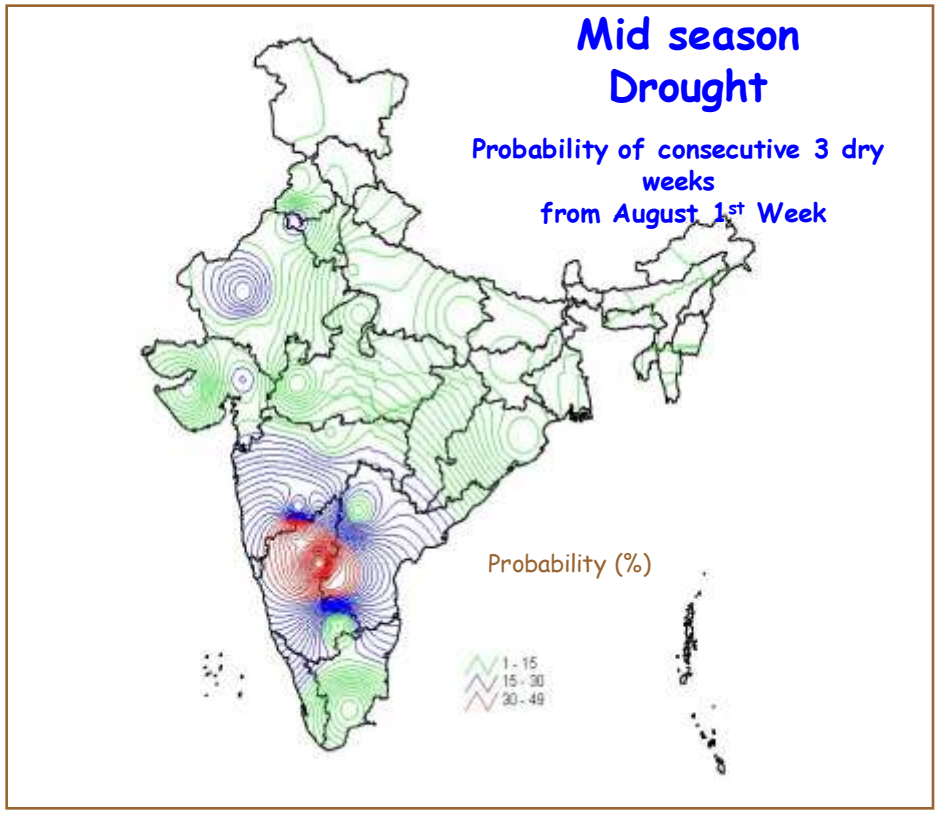
Unsustainable in large areas due to over-exploitation, lower recharge, high energy prices and inequality in access.

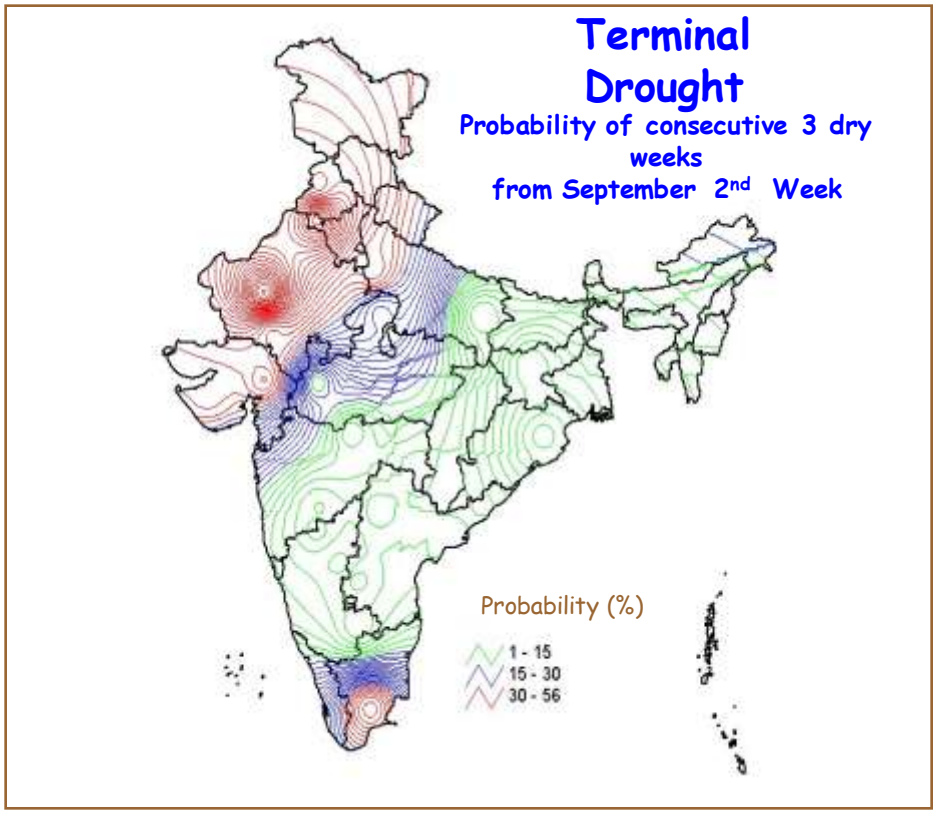
Source: Liu Changming Presentation

Further, this '***access vs. no access***' to water has created a large stratification in the rural landscape of India and elsewhere

Variation in rural poverty in the Indian states……..
Is access to water an important determinant?
YES, in very large number of cases!!

RWH may be a sustainable and equitable way out?



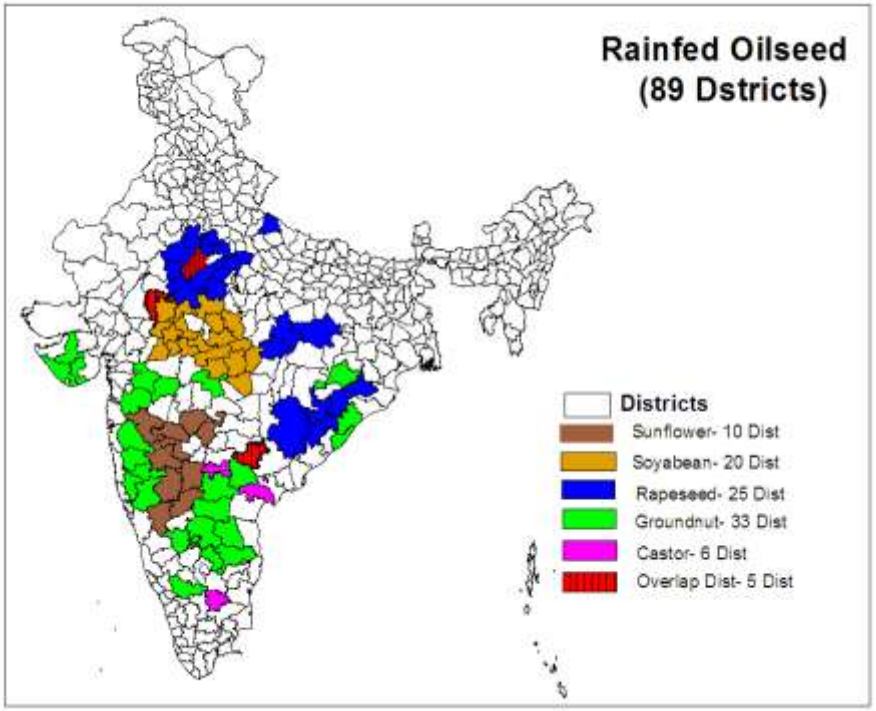


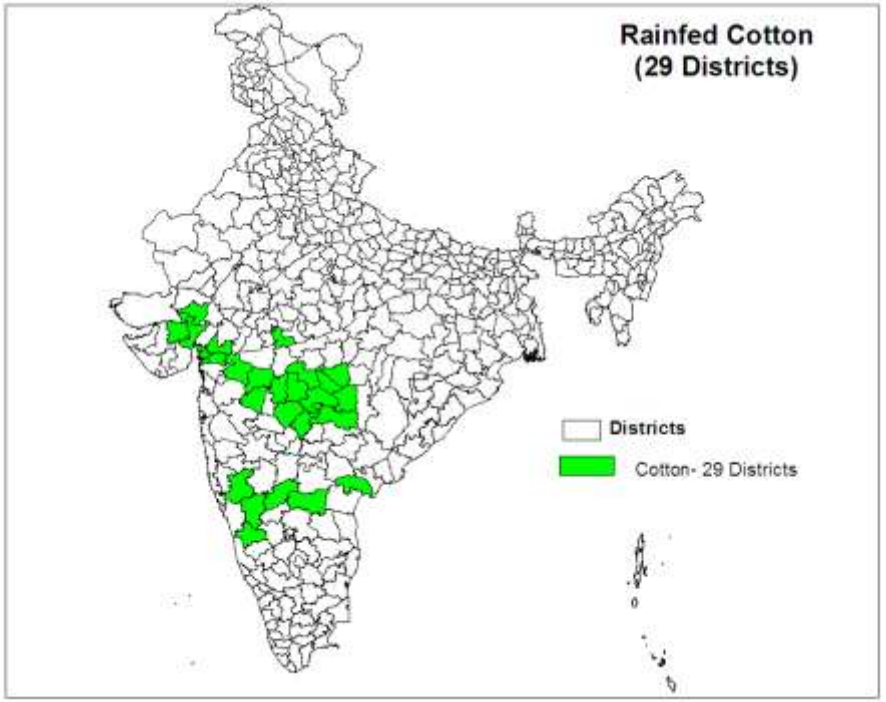
Mid-season and terminal droughts in rainfed regions

Effect of critical irrigation on yield

Crop	Without irrigation	Critical irrigation	% increase in yield
Wheat	1.92	4.11	114
Barley	2.60	3.36	29
Sorghum	0.98	1.82	86
Upland rice	1.62	2.78	72

The Concept of Dominant Rainfed Districts for the Rainfed Crops





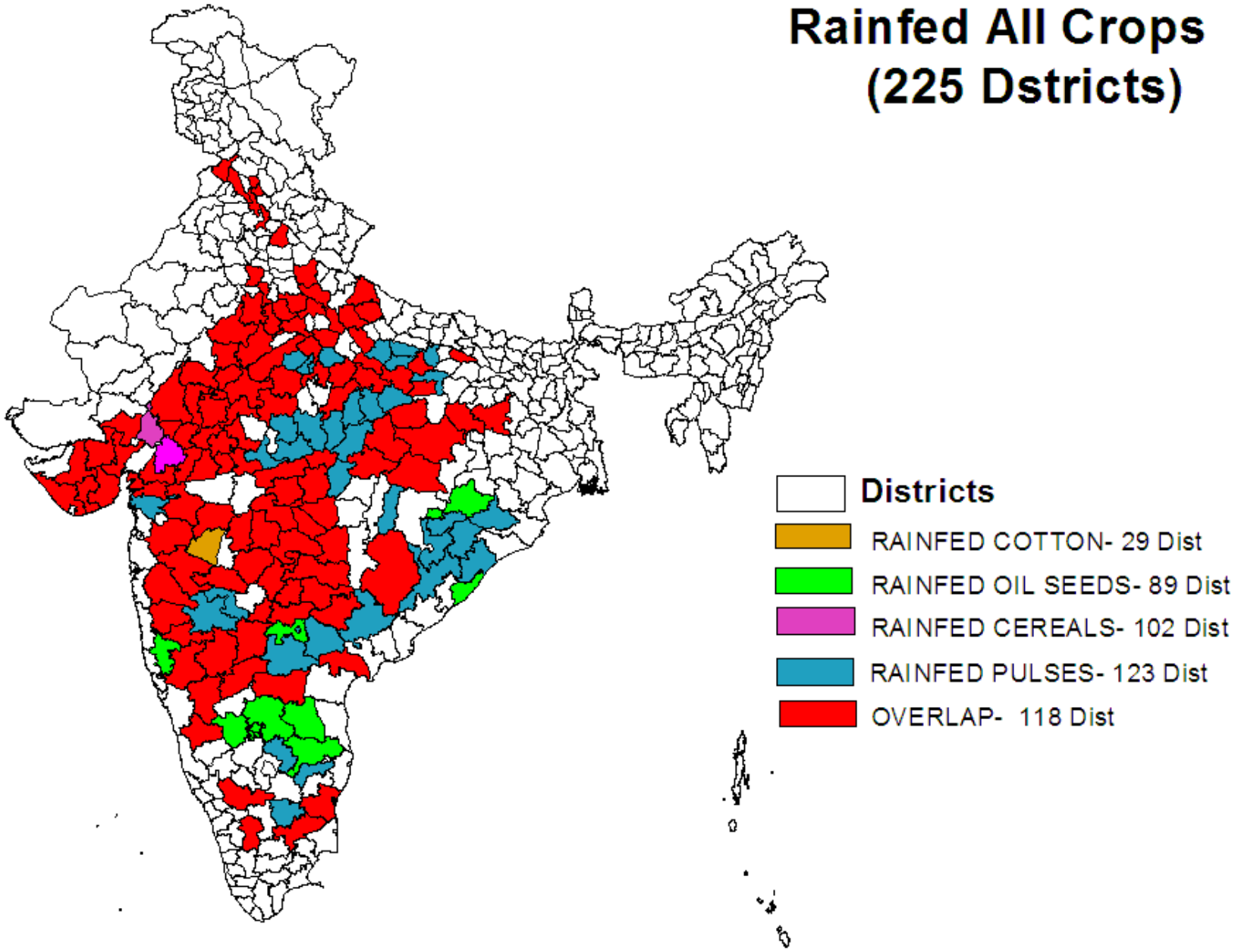
Priority districts for different rainfed crop groups

International Water Management Institute

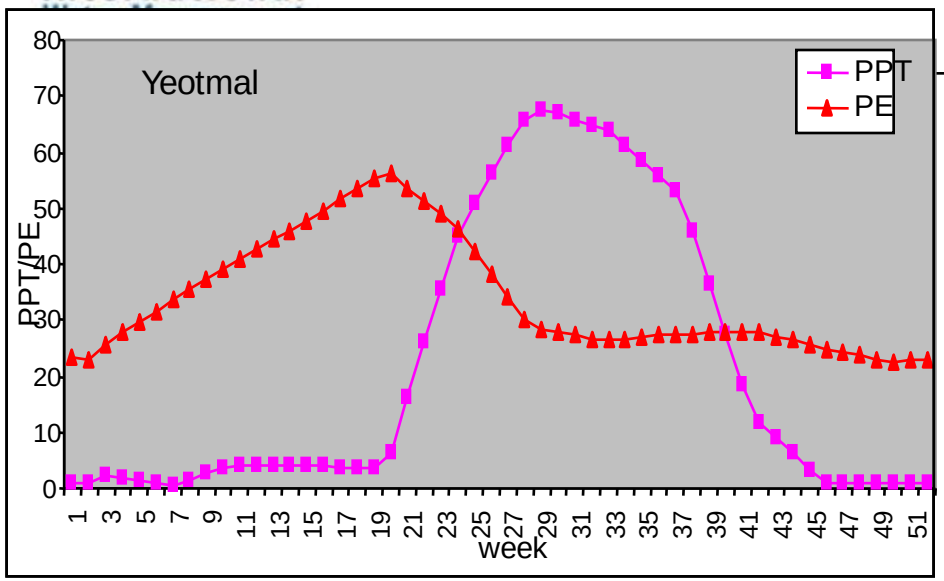
Target districts for Rainwater Harvesting in India

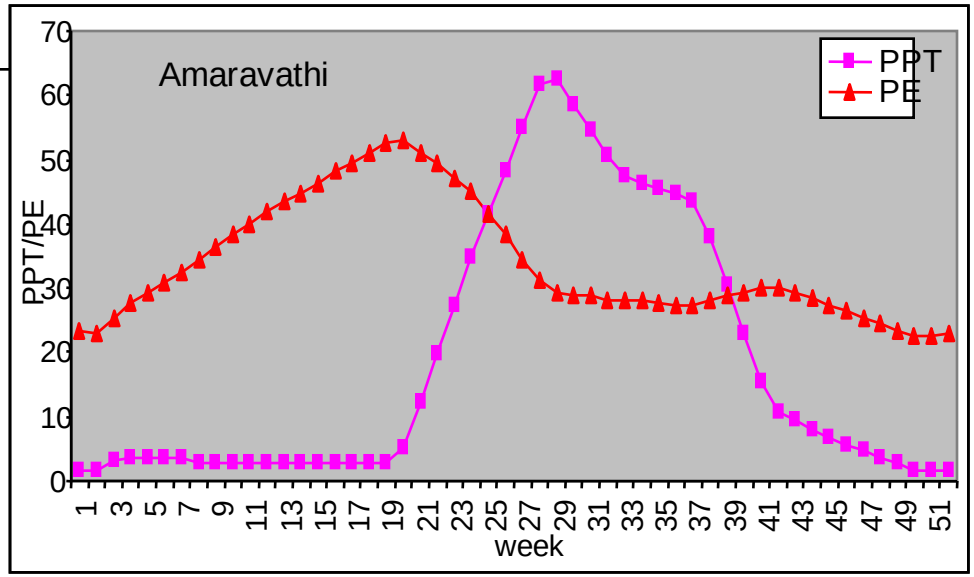
Crop	Districts in rainfed states	Districts covering cumulative 85% area	Yield (kg/ha) in districts in Column 3
Sunflower	224	11	441
Soybean	202	21	911
Groundnut	316	50	1040
Cotton	296	29	180
Maize	346	67	1352
Pigeon pea	266	83	698

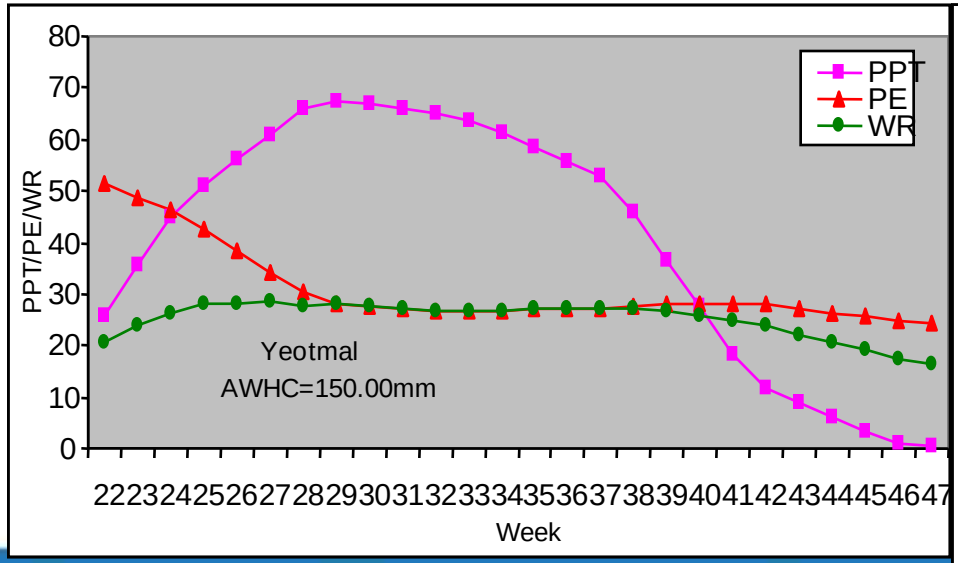
Rainfed All Crops (225 Dstricts)

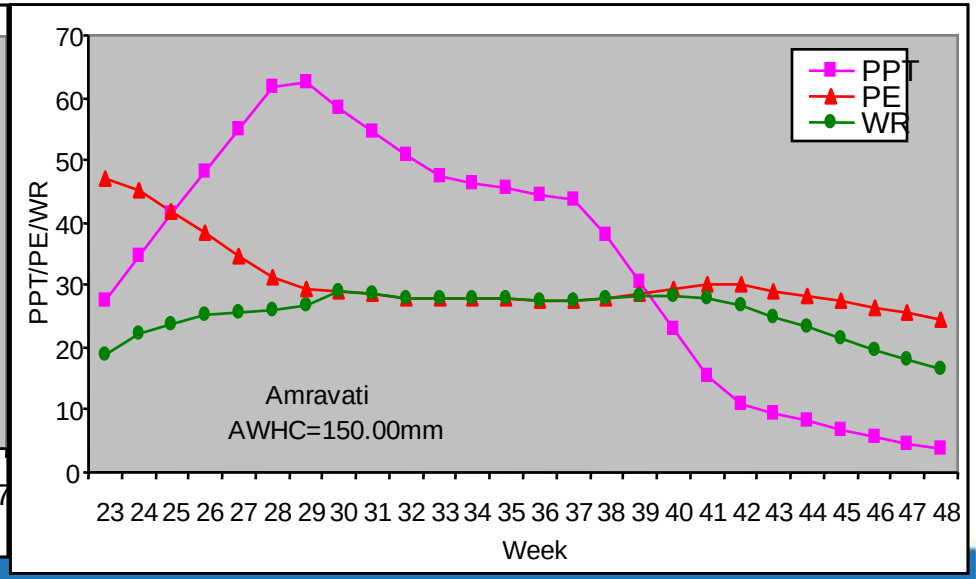


Dominant districts for Cotton

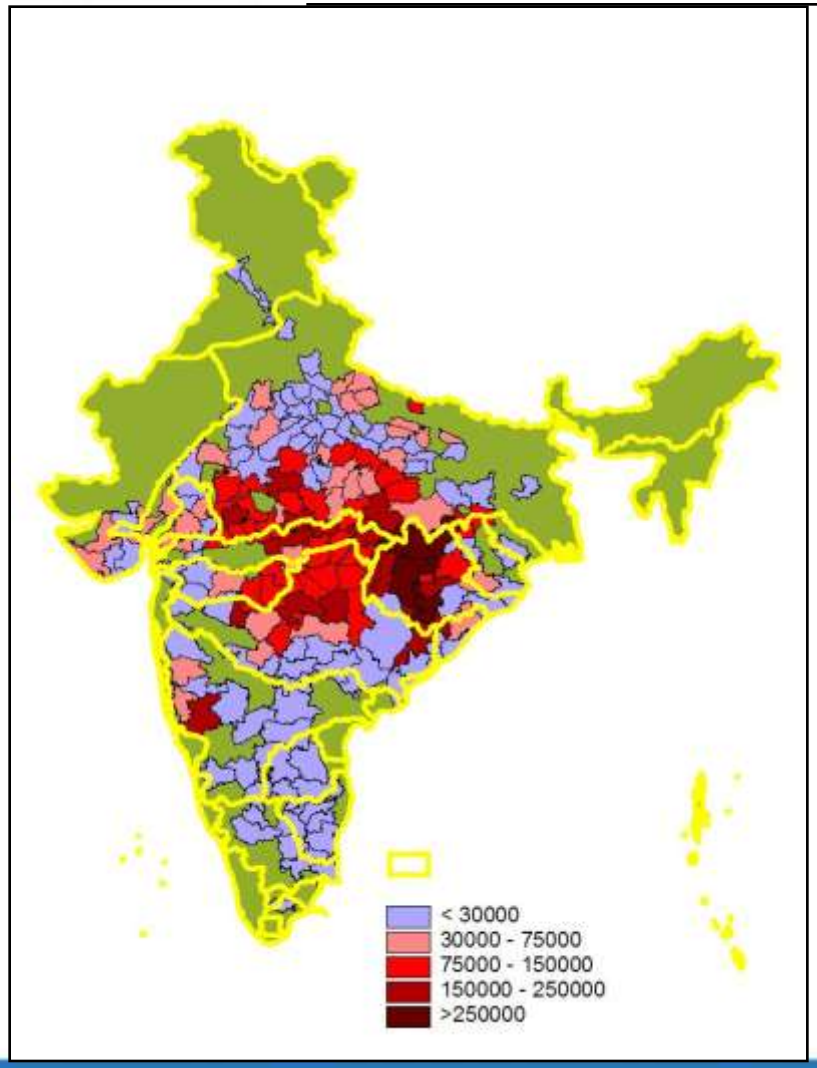








Spatial distribution of surplus runoff (ha-m) across dominant rainfed districts and river basins of India.



Crop	Area, M Ha	Surplus runoff, BM3
Rice	6.3	41.2
Coarse Cereals	7.5	20.6
Cotton	3.2	7.6
Oilseeds	6.3	24.2
Pulses	5.3	20.44
G Total	28.6	114.0

Efficient use of the harvested water

Runoff water harvesting and recycling for SI

Estimates of surplus irrigable area

'000ha

Crop	Rainfed area	Drought year	Normal year
Rice	5.478	5.425	5.478
C. cereals	6.735	4.184	5.865
Cotton	3.067	1.615	2.546
Oilseeds	5.270	3.848	4.560
Pulses	4.455	3.677	4.295
Total	**25.004**	**18.749**	**22.743**

Yield increase with S Irrigation

'000 tonnes

Crop	Traditional production	Addl. Production, normal	Addl. Production ,drought
Rice	6476	3592	3812
C cereals	7209	4645	3603
Cotton	412	282	192
Oilseeds	3880	1768	1672
Pulses	3355	1248	1166
Total, REY	29171	14637	13241

Net benefits from WH and Supplemental Irrigation

Crop	Annul cost, B Rs.	Net benefits, B Rs.
Rice	11.71	8.52
C. Cereals	13.88	3.66
Cotton	**5.88**	**8.27**
Oilseeds	**10.52**	**24.44**
Pulses	**8.93**	**49.51**
Grand total	*50.91*	*94.40*

The proposition makes a good economic sense to invest in rainwater harvesting- to start with in the dominant rainfed districts.

Western and Southern India have 10 milli
Dugwells. Many are out of use but are
Excellent recharge structures.

India - Dug Wells
- 1 Dot = 5000

India - Shallow Tube Wells
- 1 Dot = 5000

Bangladesh - Shallow Tube Wells
- 1 Dot = 5000

Pakistan - Shallow Tube Wells
- 1 Dot = 1500

Managing Droughts with Groundwater Bankin

Multiple uses of harvested water in the eastern region

Economics of Secondary Reservoirs			
Income Rs/yr		Cost Rs/yr	
From Veg	5682	Digging of pond	10011
From Horti	4020	Labour (100 mandays)	5000
Fish	20000	Others (hort/veg consumables)	2000
Total	**29702**	Fish feed	2000
		Water Supplemention	2000
		Total	**21011**
Profit from 1363 m2			8691
Profit / ha / yr			63766

Conclusions

- ***Close correlation between hunger, poverty and water.***

- ***75% of water required to meet 2015 hunger reduction target shall come from rainfed agriculture.***

- ***Small investments in SI structures can more than double yields and incomes.***

- ***Substantial payoffs for society.***

- ***RWH based groundwater banking creates resilience during distress.***

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