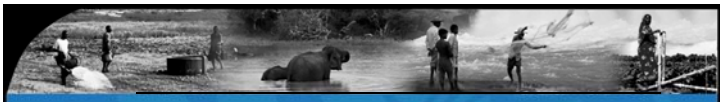


Impact of State Regulation on Groundwater Exploitation in the 'Hotspot' Region of Punjab, India

Bharat R Sharma and G K Ambili

International Water Management Institute,

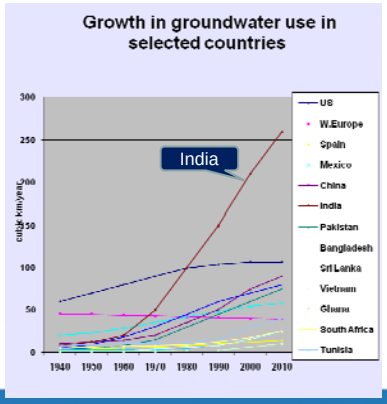
New Delhi Office, India

"Towards Sustainable Groundwater in Agriculture- An International Conference on Linking Science and Policy"

San Francisco, CA, 15-17 June 2010

www.iwmi.org

India is the world's largest user of groundwater: much larger than most other countries



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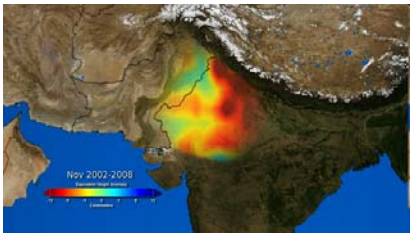
And this use is much larger in North-west of India And has become……

Environmentally unsustainable

- **Falling Water tables**
- **Critical in North-West IGB; Punjab (>1 m/yr)**



Gravity Recovery and Climate Experiment (GRACE), NASA (2009)

CGIAR Challenge Program on WATER & FOOD

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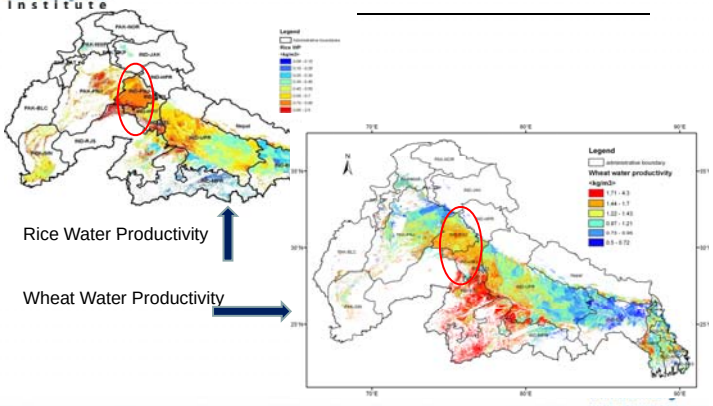
Presently, these regions also provide for the food security and have the highest food grain productivity



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One of the most productive state in the region is the PUNJAB state of India

Particulars	Punjab	All India	%	Year
Cropping Intensity	1.9	1.4	--	TE 2006/07
Geographical Area (sq. km)	50,362	3,287,263	1.5	
Gross Cropped Area (mn ha)	7.9	192.8	4.1	2005/06 (P)
Gross Irrigated Area (%)	97.2	43.3	9.3	TE 2006/07
Foodgrain production (m t)	26.4	225.9	11.7	TE 2008/09
VoO Agri+Allied (in Rs bn)	354.4	6107.4	5.8	TE 2005/06
Rice+Wheat procurement (m t)	14.7	55.53	26.4	2008/09 (P)

Source: Ministry of Agriculture, CSO, Ministry of Water Resources and www.indiastat.com

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But, continuous practice of this irrigation intensive agriculture puts the annual state water balance in the red and the associated problems……

Irrigation water demand	4.45 m ha m
Surface water availability	1.43 m ha m
Groundwater availability (net draft)	1.61 m ha m
Total irrigation water availability	3.04 m ha m
Irrigation water deficit	(-) 1.41 m ha m

11% reduction in canal irrigation, 80% increase in GW irrigation (1970-2002)

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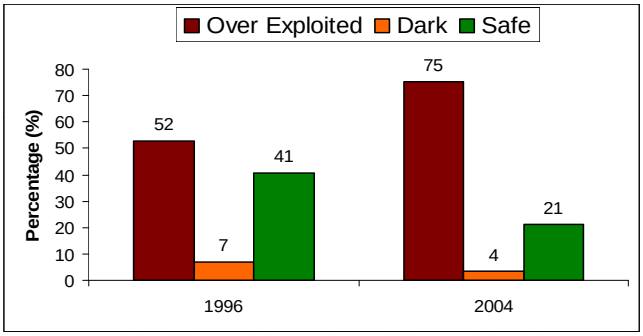
Deteriorating situation…Blocks (%) by status of Groundwater Use in Punjab (1996, 2004)



Source: CWC (2008) Water and Related Statistics 1998 and 2008

Groundwater over-draft: (Historical development with rice)

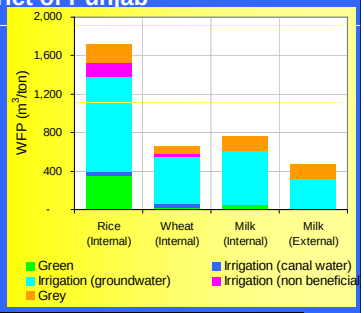
Research shows that irrigation for water-intensive rice is a dominant factor (89% of *kharif* area in Punjab being irrigated by tubewells).

Region	Rice area (000ha)			Recharge during monsoon (m)		
	1994	2005	% increase	1994	2005	% decrease
Majha	488	524	7.4	1.11	0.69	38
Doaba	364	396	8.8	1.41	0.79	24
Malwa	1424	1723	21.0	0.80	0.16	80

Water footprints of rice, milk and wheat (m^3/ton) in Moga district of Punjab

Water footprints

- Rice - 1,870 m^3/ton
- Milk- 940 m^3/ton
- Wheat- 554 m^3/ton



Commodity	Water Footprint (m3/ton)		
	Green	Irrigation	
		Canal	Groundwater
Milk	58	-	882 (94%)
Wheat	17	42	495 (90%)
Rice	346	50	984 (71%)

Why rice is the most-favored crop?

- **Power-sector policies**
  - Free power for agriculture
- **Food policies**
  - High Minimum Support Price for rice
  - Procurement mainly from Punjab and AP

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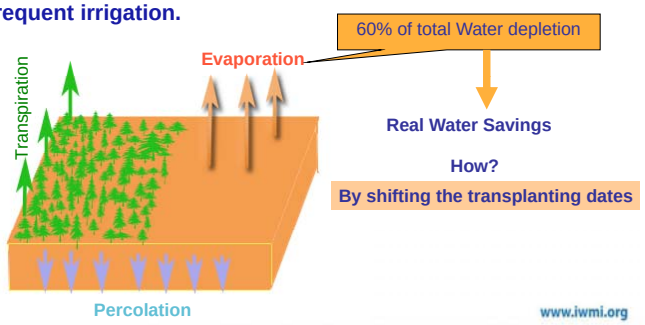
Generally, rice transplanting done during the hot month of May (~45^{0}C) when ET demand is high, demanding more frequent irrigation.



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Government have been pleading and educating Not to Access Groundwater

KISAN CHETNA MARCH : 20-22 FEBRUARY 2008

- Awareness Campaign in 5 DISTRICTS LED BY AGRICULTURE MINISTER
- Campaign for CONSERVAION OF WATER TIMELY TRANSPLANTING OF PADDY

BUT WITH LITTLE SUCCESS…

The New Water Saving Regulation:

The "Punjab Preservation of Subsoil Water Act", 2009

All paddy cultivating farmers in the state are directed to:

- Undertake Sowing of paddy nursery after only after May 10
- Undertake paddy transplanting only after June 10
- Non-compliance shall attract a penalty of INR 10,000/acre and uprooting of the crop at farmers' cost

What could be the impact and water savings ???

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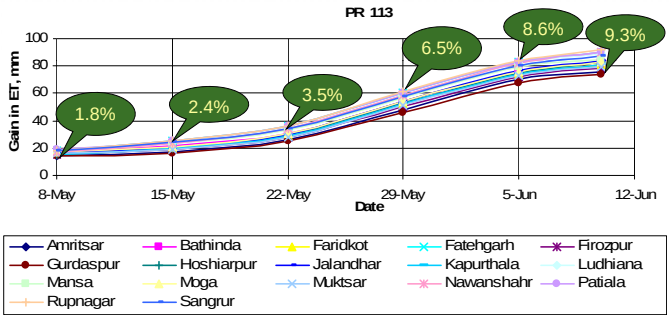
Water savings, Gain in ET



With reference to 01-May

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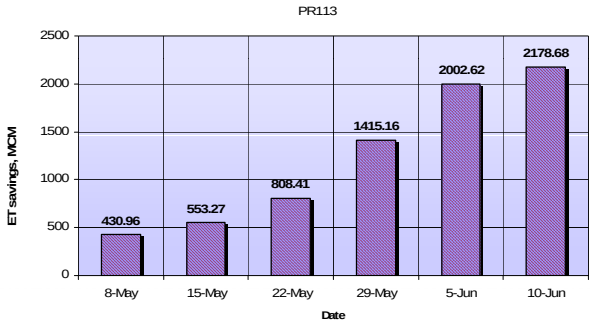
Water savings for the whole state



From 2.62 Mha of rice area (33% of total cropped area)

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Percentage Savings in Groundwater by transplanting on June 10

District	ET savings, MCM	Annual GW draft for irrigation, MCM	% GW saved	Stage of GW Development
Amritsar	267	3667	7.27	152
Fatehgarh Sahib	76	836	9.05	161
Jalandhar	123	2571	4.80	254
Kapurthala	89	1249	7.13	204
Ludhiana	221	3233	6.83	144
Mansa	53	1404	3.75	175
Moga	139	2145	6.50	178
Nawanshahr	48	1149	4.15	175
Patiala	213	2650	8.05	165
Sangrur	315	4141	7.61	183
State	2179	30336	7.18	145

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Impact on Agricultural Energy Consumption

District	No. of pump hrs saved per ha	Total Pump hrs saved, million hrs	Total electricity savings (million KWh)#
Amritsar	10.86	3.81	21.44
Fatehgarh Sahib	12.86	1.08	6.08
Jalandhar	12.00	1.76	9.92
Kapurthala	11.57	1.27	7.16
Ludhiana	12.71	3.15	17.74
Mansa	12.14	0.75	4.23
Moga	11.86	1.99	11.21
Nawanshahr	12.86	0.68	3.83
Patiala	12.86	3.05	17.14
Sangrur	12.43	4.50	25.31
State		31.12	175.07

#For a pump capacity of 7.5 hp

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Highly Promising:

- High adoption rate.
- Rise in water tables reported from Northern districts of the state.
- Actual electricity savings of 276 million units for agriculture reported by Punjab State Electricity Board in 2008-09 paddy season in spite of an increase in rice area by 1.53% and increase in tubewell connections by 3.7%.

Technology and Policy Recommendations:

- The Regulation has proved to be a win-win situation and needs to be implemented with the same vigor till it becomes a 'practice'.
- Inter-linkage of water-energy-agriculture suggests that any change in one of the components would be accompanied by changes in the other two.
- Policy regulation in delayed transplanting of paddy may shorten the window for transplanting and cause labour scarcity. Research on mechanical transplanters and direct sowing of paddy needs to be intensified.
- In the medium to long term water and energy infrastructure in water abundant areas in the east needs to be improved to reduce compulsions in northwest- and the region may move to high value diversified agriculture.