Governance of surface water and groundwater for irrigation in Hard rock areas of India

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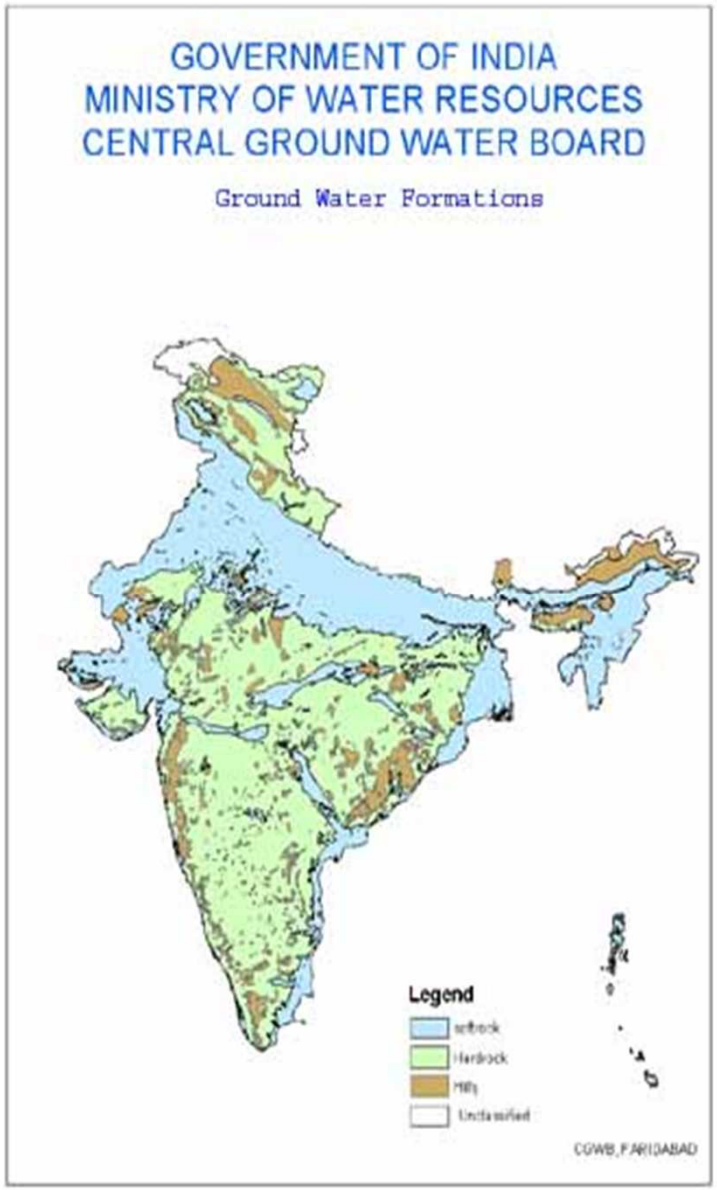
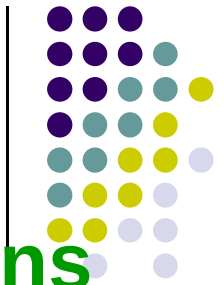
Groundwater aided India's green revolution



1. 60% of India – Hard rock areas (Recharge is 5 to 10% of the rainfall)
2. 70% of irrigated area is from groundwater
3. 70% of irrigated area is under food crops
4. India tops in GW use: 75 ha cms per irrigation well. Number swell from 0.1 million in 1960 to 25 million wells in 2010
5. Groundwater extraction increased from 37% in 1998 to 60% in 2010
6. We never know the worth of water till the well is dry

Groundwater compared



Hard rock areas

Peninsular India (No perennial rivers)

Cumulative interference of tube wells leads to premature well failure

Isolation distance :850 feet ; Tubewells hardly function for 0 to 5 years

Groundwater cost : 7 € per ha cm

Alluvial plains

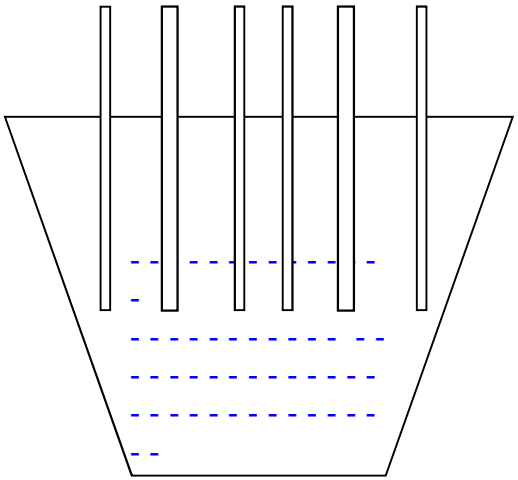
Indo-gangetic plains

Interference among tube wells relatively unaffected due to constant recharge

Marginal cost of gronundwater is low as tubewells are functional for many years

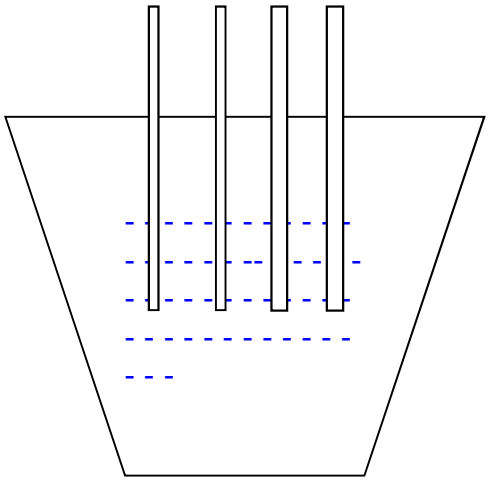
GW cost : 1 € per ha cm

Predicament of cumulative interference among irrigation wells



High cumulative interference

(Higher number of wells extracting a given volume of groundwater

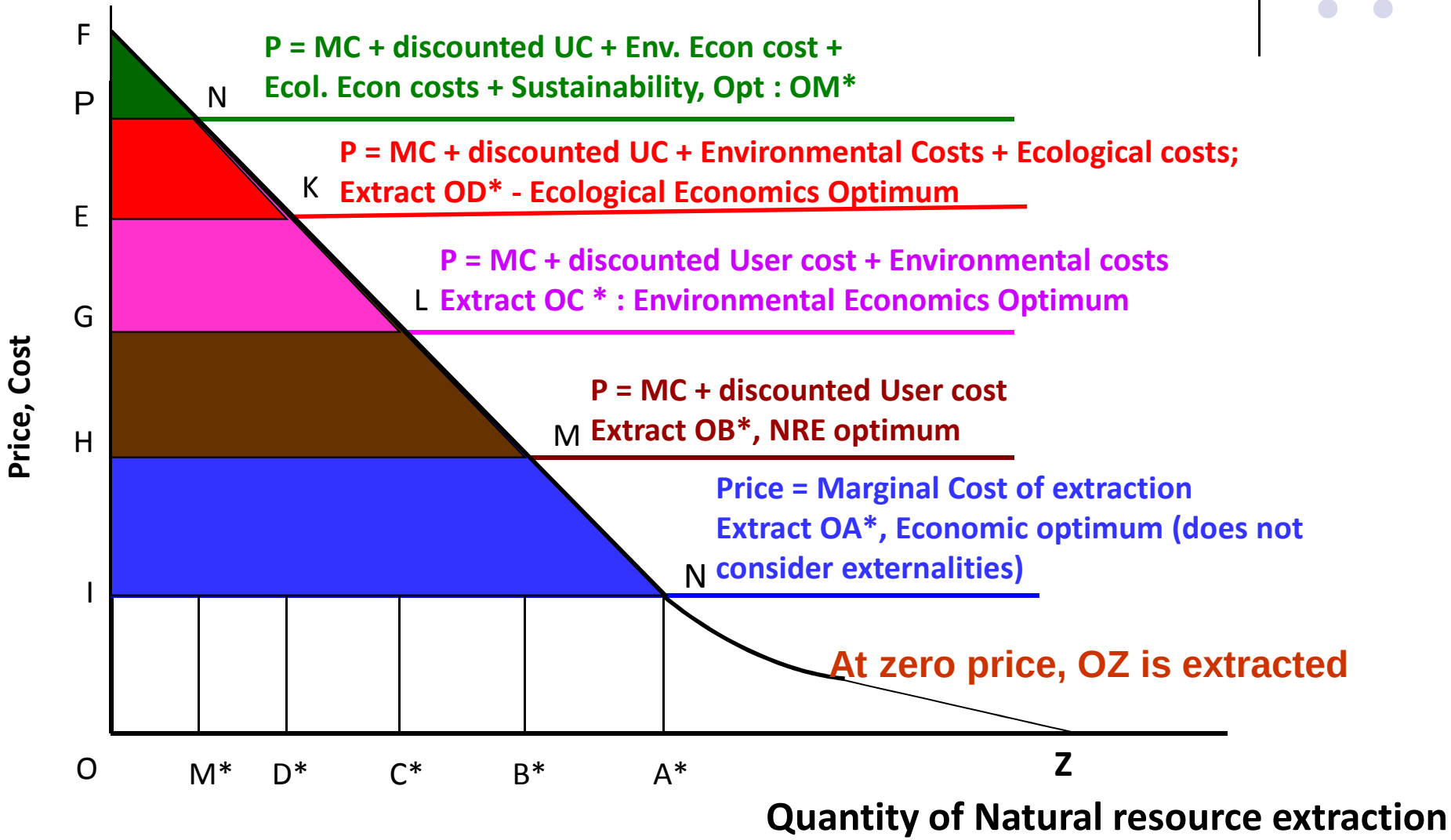


Low Cumulative interference

(Lower number of wells extracting a given volume of groundwater

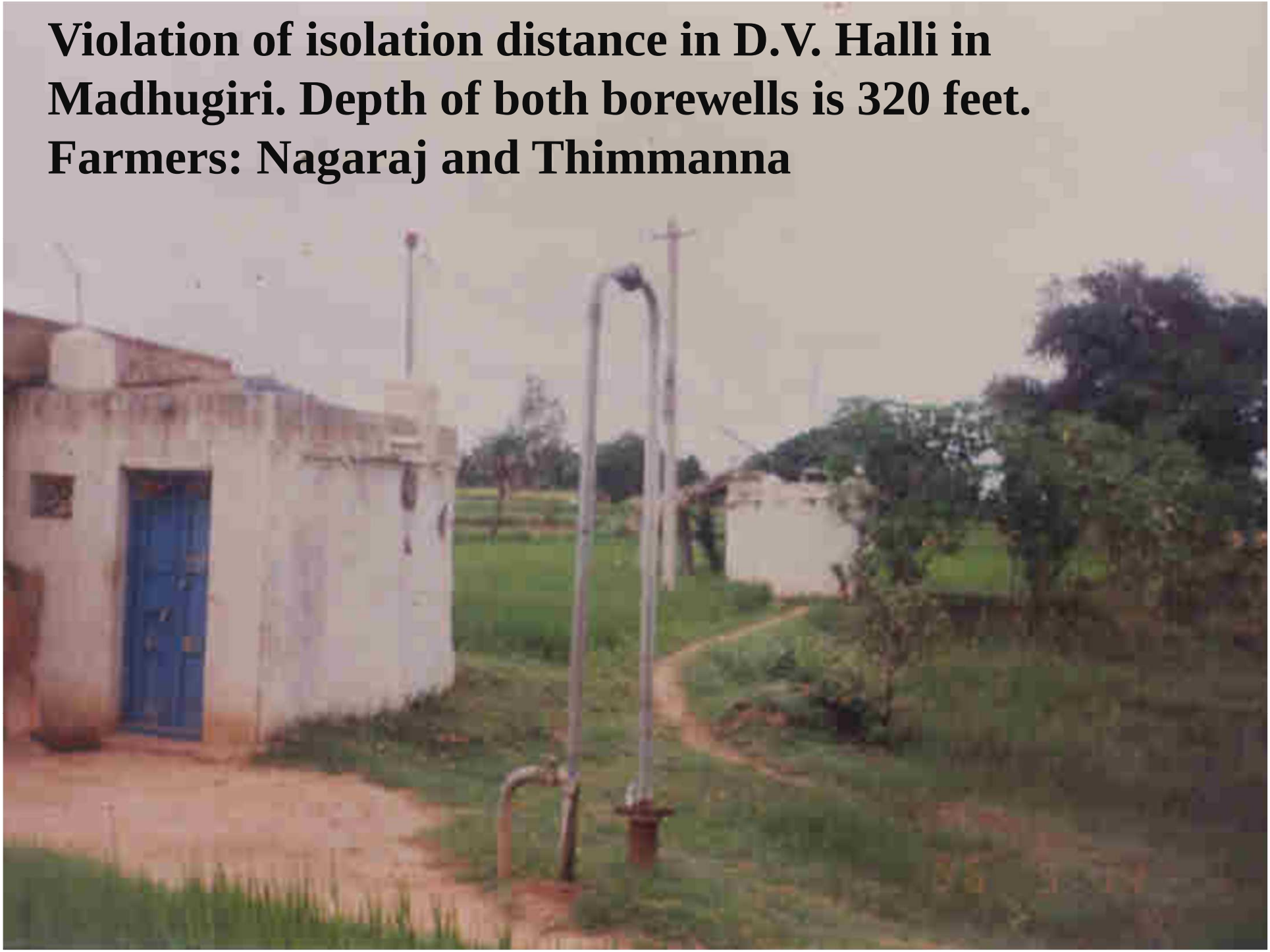
Heuristic Net social benefits from NR use according to Economics, NRE, Env Econ, Ecol Econ

Sustainable use of NR requires sacrifice in extraction. Technology, institutions can help to sustain production (ex: Micro irrigation)



‘ ‘We never know the worth of water till the well is dry”

Violation of isolation distance in D.V. Halli in Madhugiri. Depth of both borewells is 320 feet. Farmers: Nagaraj and Thimmanna



A failed well in Thippanahalli, HWIV, Non-tank command
Farmer: Kariyanna; Depth of well: 60 ft.

Plate 6 : Failed dug well in JSYS tank command

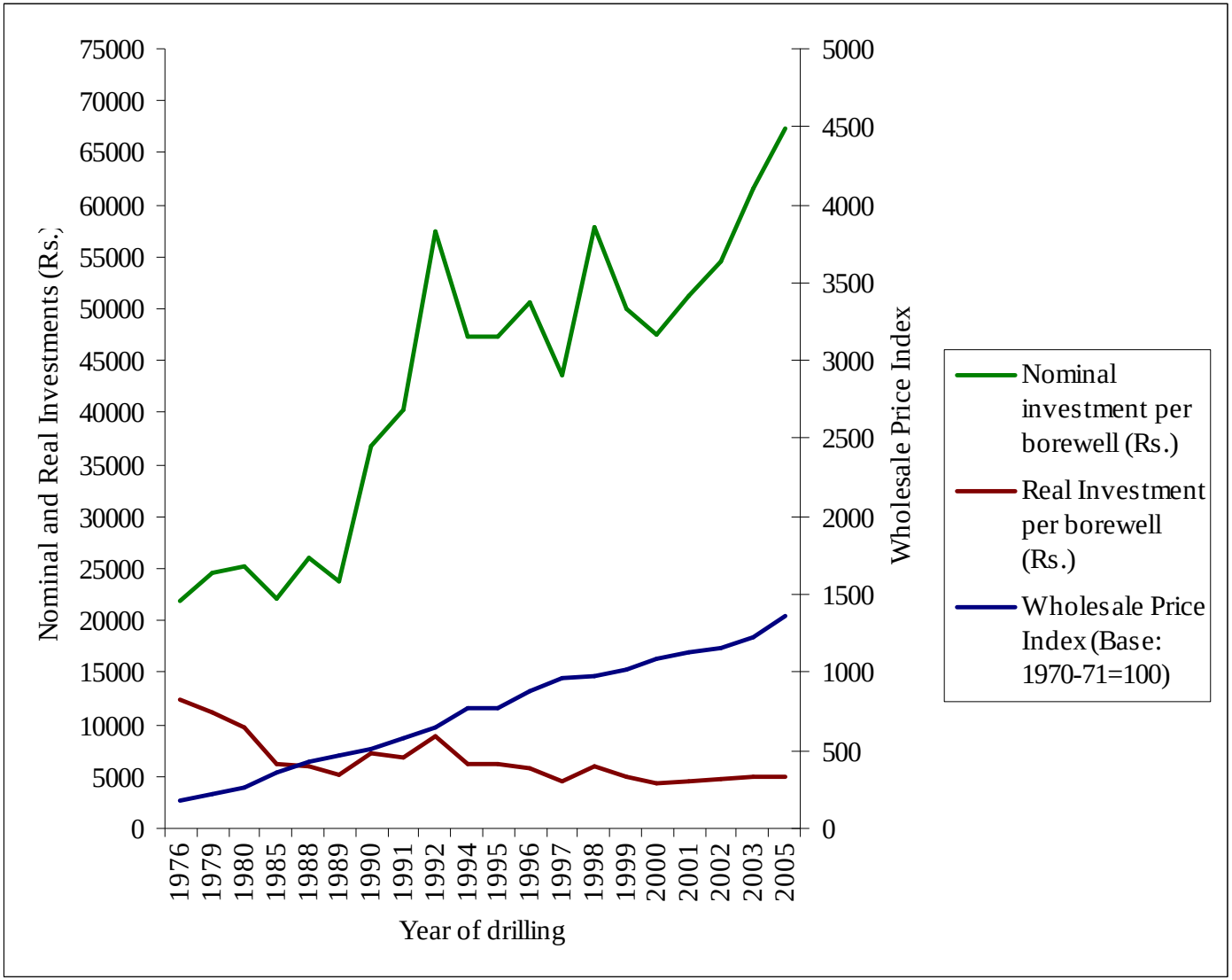
A failed borewell in Thippanahalli, HWIV, Non-tank command. The horizontal distance with the nearest well (borewell) is 100 feet

Plate 10 : Tomato crop grown under drip irrigation and conventional irrigation

Sand mining to a depth of 30 feet in Uttara pinakini river stream in Kalludi in Gauribidanur Taluk, Karnataka

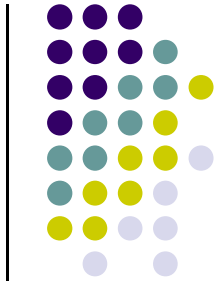
Farmers engaged in sand mining activity along North pinakini river stream

Nominal and real investment per well over time, Kolar district



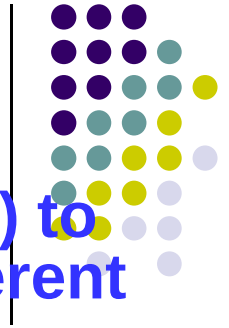
Well investments are increasing not because of low energy costs, but because of falling real investments and farmers fail to consider Externalities Of premature Well failure

Free electricial power: Myths and realities



Myth	Reality
1. Zero cost of electrical power leading to over extraction. Hence if electricity price is increased farmers will reduce using groundwater	• 1. Electrical power forms 20% of cost of GW. Real cost of well drilling is falling due to technology. But farmers fail to account externality. 66% of pumpsets in India are diesel sets (NSSO, 2005)
2. Power shortage leads to low groundwater extraction	• 2. Power shortage has lead to low water crop pattern and drip irrigation. In some areas, farmers have generators to pump groundwater. Farmers switch to diesel pump sets

What Governance should do



- Creation of ‘Irrigation management service’ (IMS) to educate farmers on volume of water use for different crops
- Devise low cost water meters to enable farmers to appreciate volume of water use and crop water budgeting

- Educate farmers on use of right quality pumpsets, with the right Horse Power depending on yield of the well, well depth, conveyance structures, volume of water to be extracted in different seasons depending on crop pattern based on ‘reasonable’ use and not ‘beneficial’ use
- Make certification by IMS mandatory before electrical installation and make agricultural Engineers accountable for their decision

Cap on the number of irrigation wells a farmer can have

- **Groundwater regulation : impose a cap on the maximum number of successful wells a farmer can possess**
- **Discourage cultivation of water intensive crops such as paddy, banana, sugarcane using groundwater**
- **Provision of subsidy only for farmers following water use efficient practices such as drip irrigation, low water intensive crops, on farm soil and moisture conservation practices, as certified by GWUAs (Groundwater user associations).**

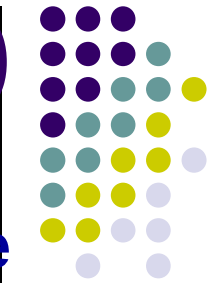
Micro irrigation:

- **Subsidy for micro-irrigation for narrow spaced crops such as vegetables, flowers.**
- **Quality of micro-irrigation to be certified by agricultural engineering graduates from the 'Irrigation Management Service' (IMS) and be made accountable**
- **Preferential involvement in developmental programs/schemes of farmers who have followed water use efficiency practices as certified by IMS.**

Groundwater markets for irrigation and other uses

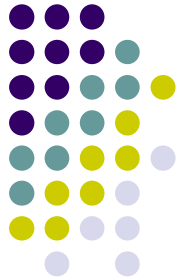
- **Promote Groundwater markets for equity**
- **Ban groundwater extraction from wells in urban areas as they result in failure of domestic groundwater wells in urban areas, which lack recharge capacities.**
- **Urban planning should incorporate incentive / penalty structure to leave open spaces for groundwater recharge. Those households with domestic well should keep at least 100 sq feet of soil open space with appropriate groundwater recharge facility, else pay the corresponding annual rental value of that space to the Corporation as penalty.**

Water Users Cooperatives (WUCs)



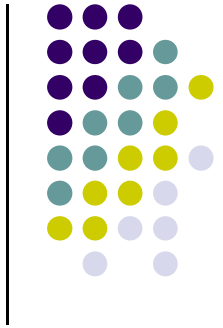
- 1. **Farmers have capacity to pay for canal water**
- 2. **massive water awareness campaigns need to be organized through WUCS, WALMI, Irrigation Department and Departments of Agriculture and Horticulture including SAUs to convince farmers to pay for irrigation and to adopt efficient irrigation practices.**
- 3 **For farmers following conjunctive use of surface and groundwater, canal water charges can be waived, as they are bearing the brunt of groundwater cost**.
- **4. For involving canal farmers in developmental programs, schemes, trainings, subsidies, loans, loan waiving schemes, farmers should have paid the water rate and adopted efficient water use practices including conjunctive use. A certificate testifying the above from WUCs must be made mandatory for receiving benefits from any of the Governmental schemes.**

Water rate be collected from rice mills and sugar mills



Water user coops should collect water rate from rice mills / sugar mills as farmers have resistance to pay for water directly

Irrigation management service to educate surface water farmers towards water use efficiency across crops and locations



THANK YOU