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DEVELOPMENT CONFERENCE ON INFRASTRUCTURE

29 June 2011

Cape Town International Convention Centre, South Africa

Rural Infrastructure and Agricultural Productivity: the Indian Experience

Ritu Anand,
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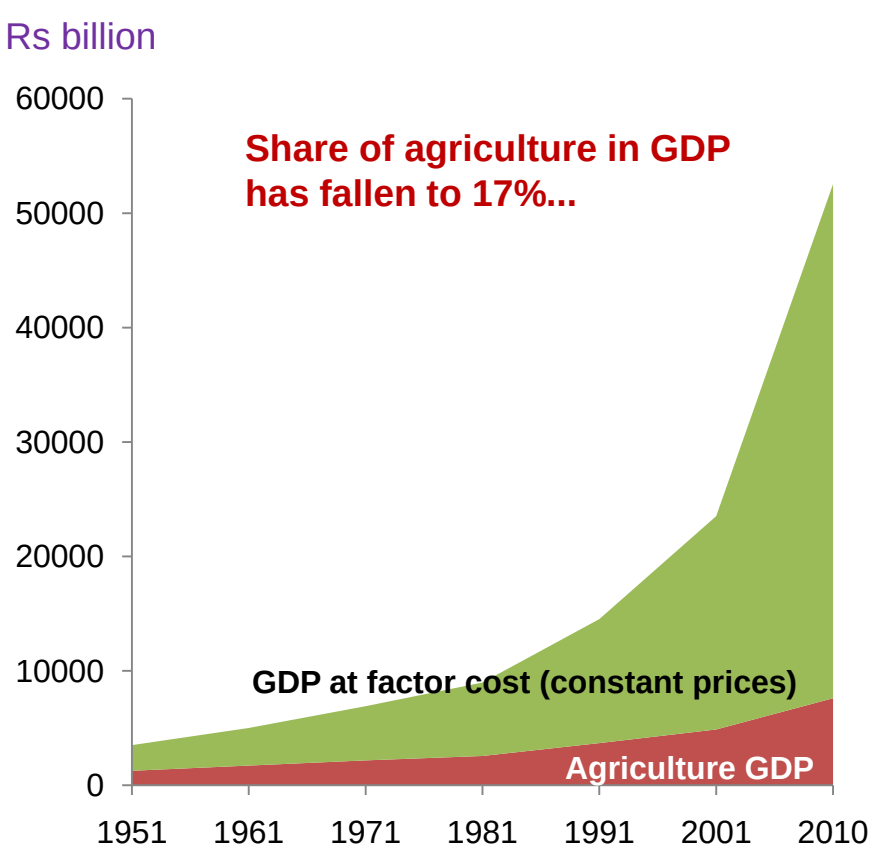
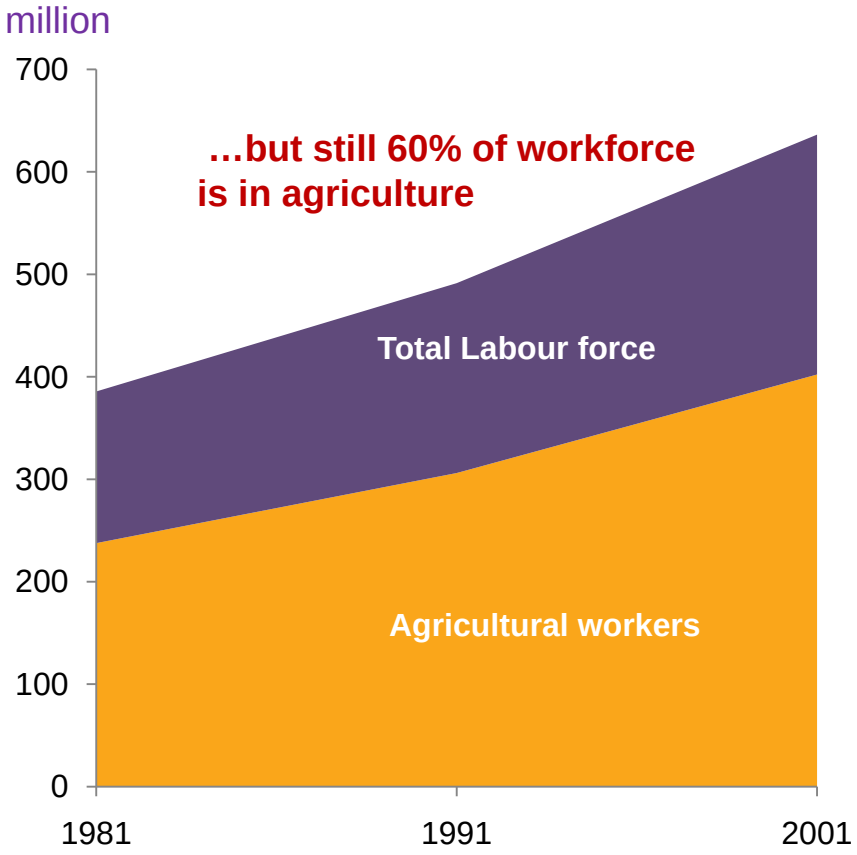
- Green Revolution and Rural Infrastructure
- Impact of Rural Infrastructure
- Challenges
- Policy Response and Way Forward

The context

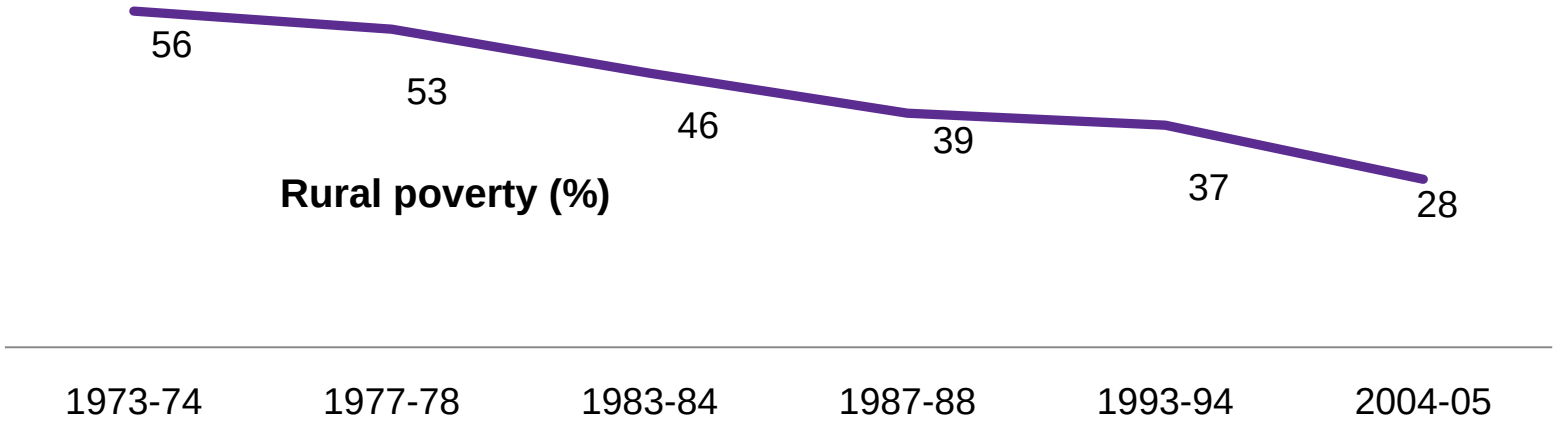




The targeted growth rate of 9-9.5% in GDP during 2012-2017 depends on a 4% growth rate in agriculture

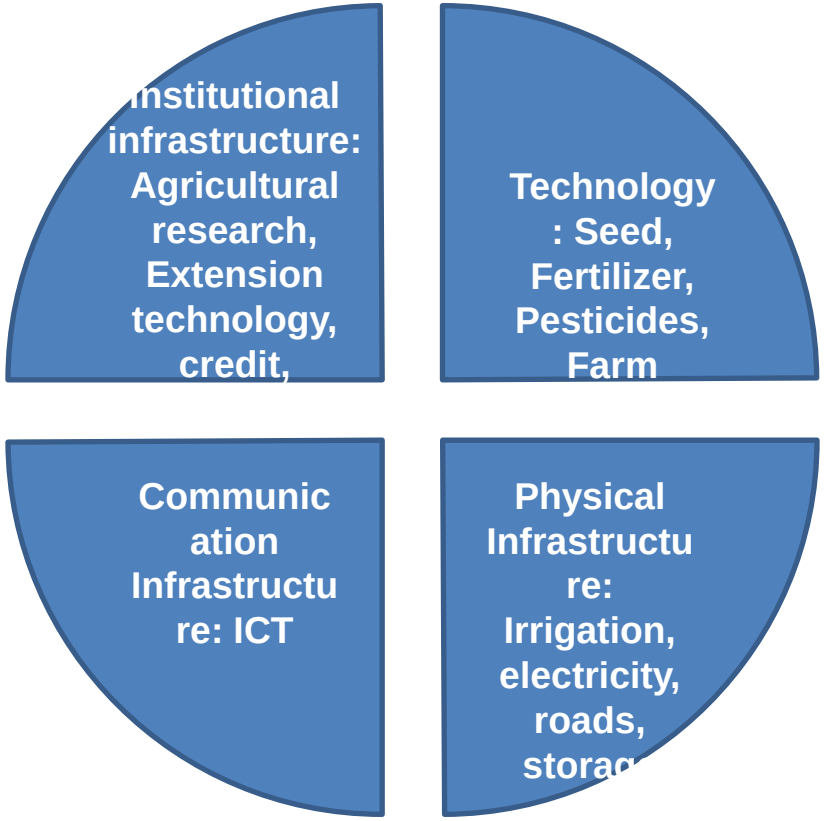
India's Green Revolution

- Food security: Sustained high foodgrain (rice and wheat) production turned India into a food self-sufficient nation
- Contributed to reducing poverty in rural areas

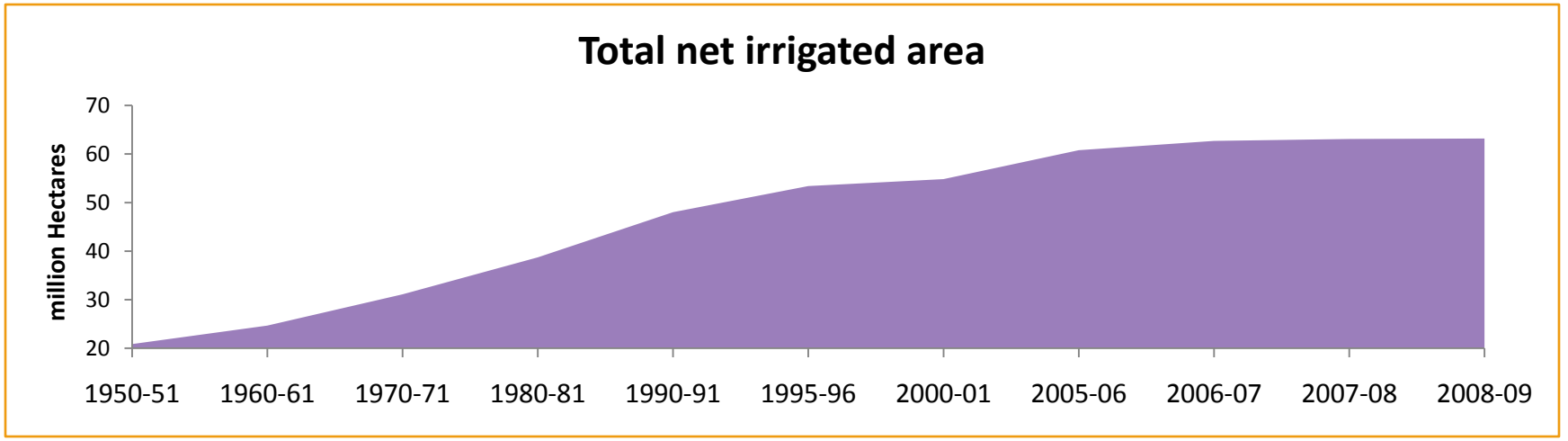


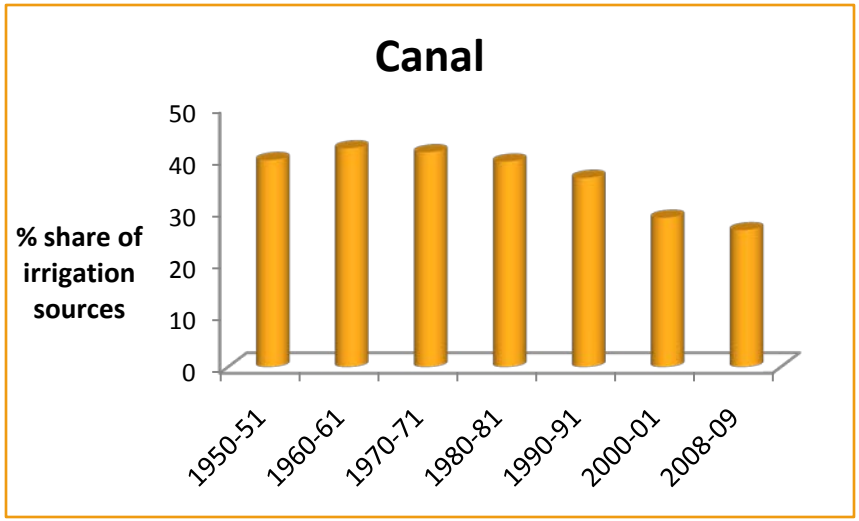
- A reassessment of the poverty line in India in 2009 led to a revision of rural poverty rates upwards. Nevertheless, the declining trend in rural poverty persists.

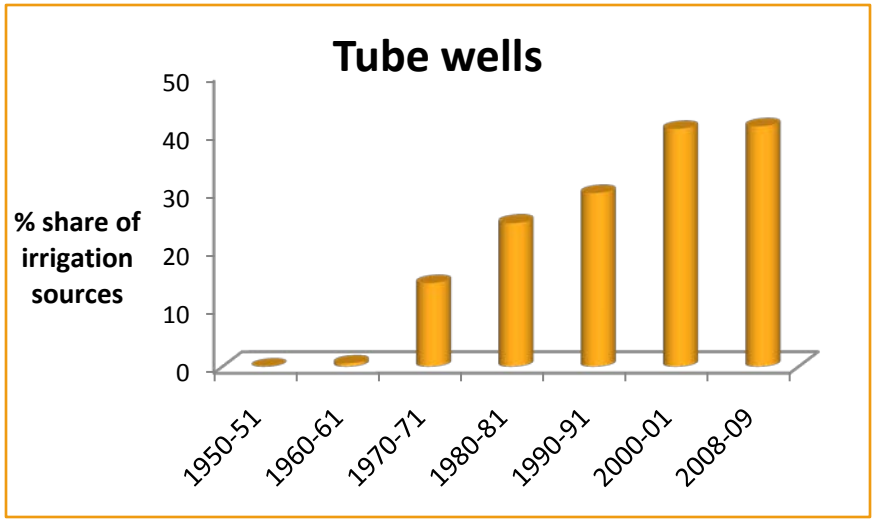
Components of green revolution



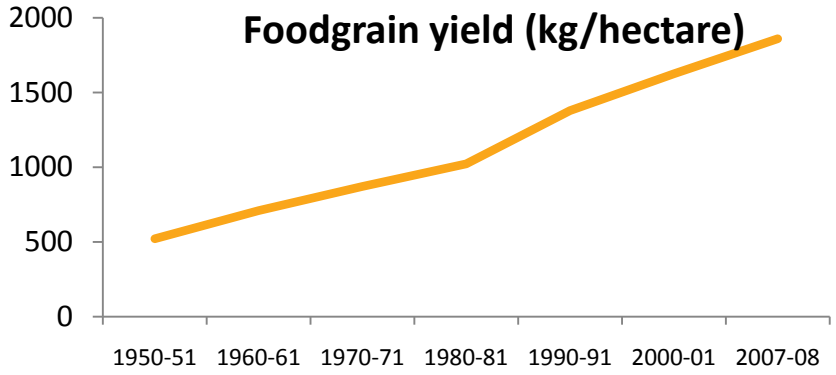
Irrigation: The “quiet revolution” of groundwater

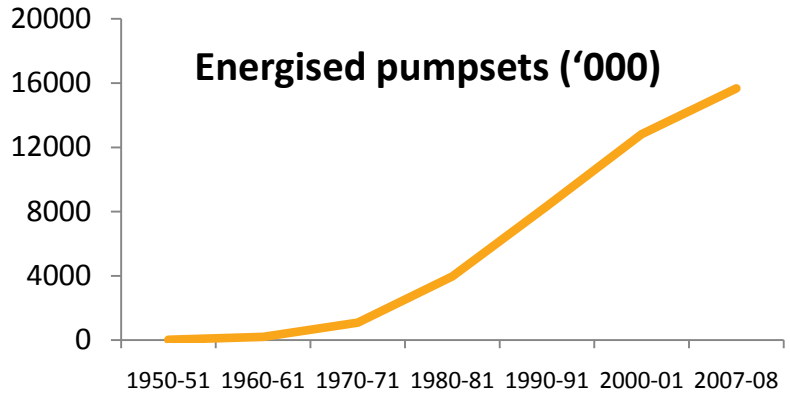


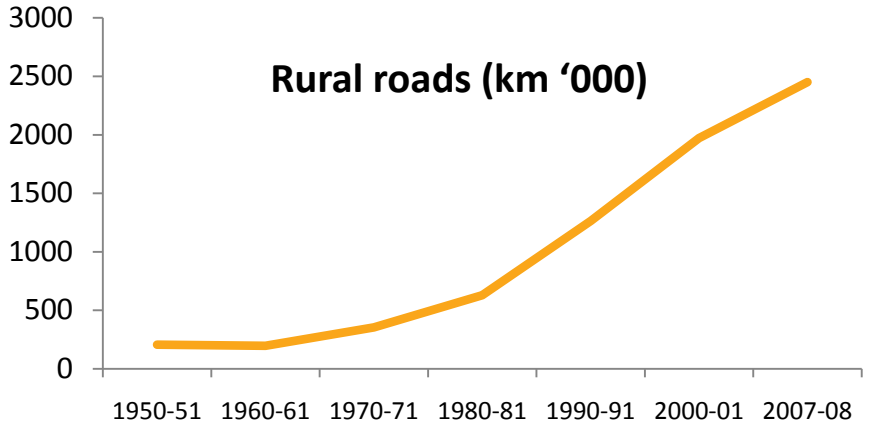


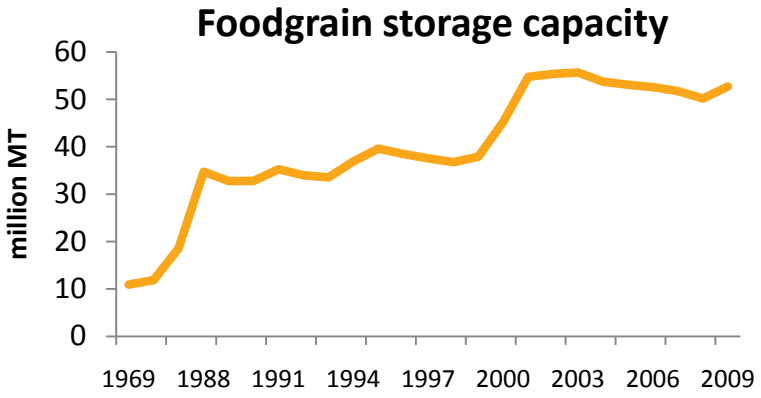


Infrastructure support to agriculture









Some key factors underlying the spread of rural infrastructure

- Farmers, not the public sector, expanded irrigation
- Could not have been possible without grid extension; REC was established to provide loans to State Electricity Boards for rural electrification; state governments subsidized electricity provision to agriculture
- Government expanded rural roads network
- Government set up Food Corporation India in 1965 to market agricultural produce
- The Government broadcaster, All India Radio played a vital role in creating awareness of new seeds, fertilizers, and farm techniques

The links between physical infrastructure, agriculture and development

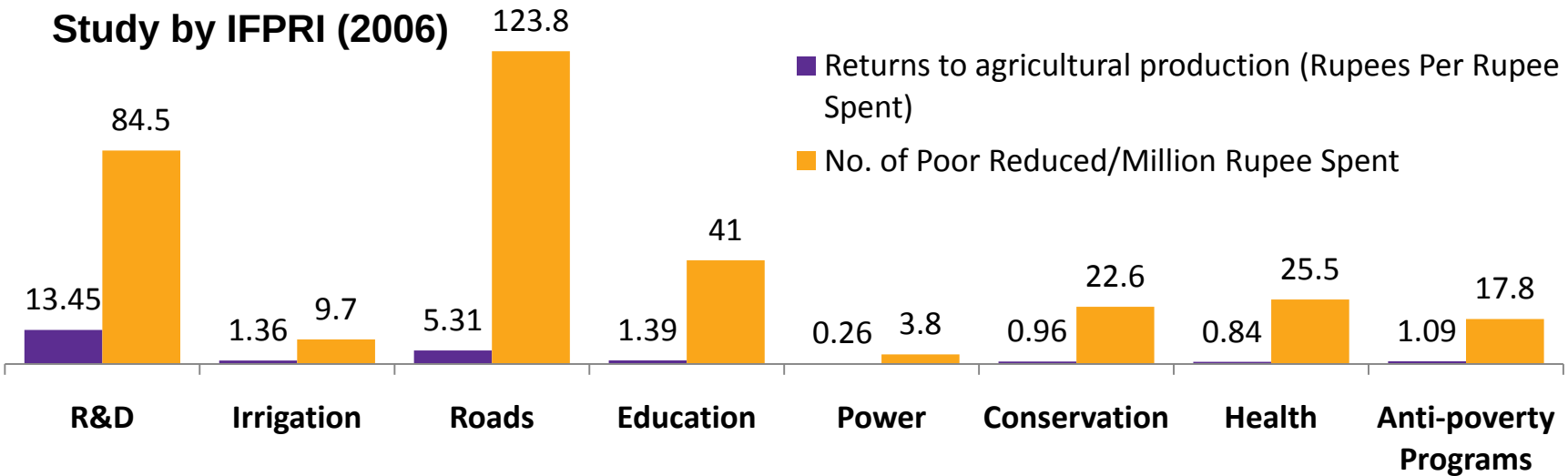
- Irrigation, rural electrification and rural road development have significant impacts on agricultural output and productivity
- Direct impact on agriculture:
  - Increase in crop intensity and crop yield from better input supplies
  - Increase in share of cash crops by improving input supplies and providing access to markets
- Indirect impacts – increasing non farm incomes:
  - Each rupee increase in value added in agriculture stimulated an additional rupee of value added in the regional non farm economy
  - Half the indirect income gain was due to demand for inputs and marketing/processing services, and the remaining half from increased consumption due to higher agricultural incomes.
  - The multipliers for physical infrastructure were much higher than for social spending.
- Poverty impact: large number of beneficiaries are small farmers and landless labourers

Irrigation and roads have a significant impact on productivity and incomes

Study by NABARD (2010)

	Irrigation	Roads
Sample size	338 projects	15 roads
Increase in crop intensity	10-42%	Up to 15%
Change in crop pattern	11-33%	Up to 30%
Increase in crop yield	10-50%	Up to 20%
Savings from wastage		nearly 3% of the crop; price gain of more than 2%

Study by IFPRI (2006)



Socio-Economic Benefits

Irrigation

- Recharge of groundwater from surface water schemes
- Increased availability of drinking water
- Increased dairy activity
- Increase in flora and fauna

Roads

- Increase in land value
- Increase in asset holding including cattle, tractors, housing, etc.
- Access to transport facilities, education, medical facilities

World Bank (2005): prevalence of poverty in irrigated districts is one-third of non-irrigated rural districts

Planning Commission (2010) evaluation of 138 rural road projects

- Agriculture income increased by 17.6% whereas income from nonfarm activities increased by 12.11%.
- 79% of the residents in the sample project villages reported that access to markets improved significantly. 77% also reported that access to nearby urban areas improved significantly.
- Direct poverty impact: A majority of the beneficiaries are either landless labourers or have less than 3 acres of land (60%).

Role of Rural Telephony

- Several studies show that telephones have the following uses in agriculture:
  - Information regarding seeds is the most important use
  - Mandi (market) price is the second most important
  - This is followed by plant protection and fertiliser application
- An overwhelming majority of farmers report that mobile phones increase household income
- From a livelihoods perspective, the telephone is most used to address vulnerability at times of crisis and for social networking, particularly within the family

Avaaj Otalo: A “voice blogging” service…

- Designed by an NGO and IBM India
- An interactive, on-demand informational resource that would complement a weekly Gujarati radio program.
- Farmers found tremendous value in listening to other farmers’ questions. 77% of interviewees identified this as the main reason they liked the forum.

AO: *Welcome to Avaaj Otalo! You can get to information by saying a single word, or by dialing the number. To ask a question, say ’question’, or dial 1; to listen to announcements, say ’announcements’, or dial 2; to listen to the radio program, say ’radio’, or dial 3.*

User: (dials 1)

AO: *OK, you want to ask a question. To record your own question, press 1.*

To listen to the questions and answers of other farmer friends, press 2.

User: (dials 1)

AO: *OK, you want to record a question. Please say your question slowly and clearly after the beep.*

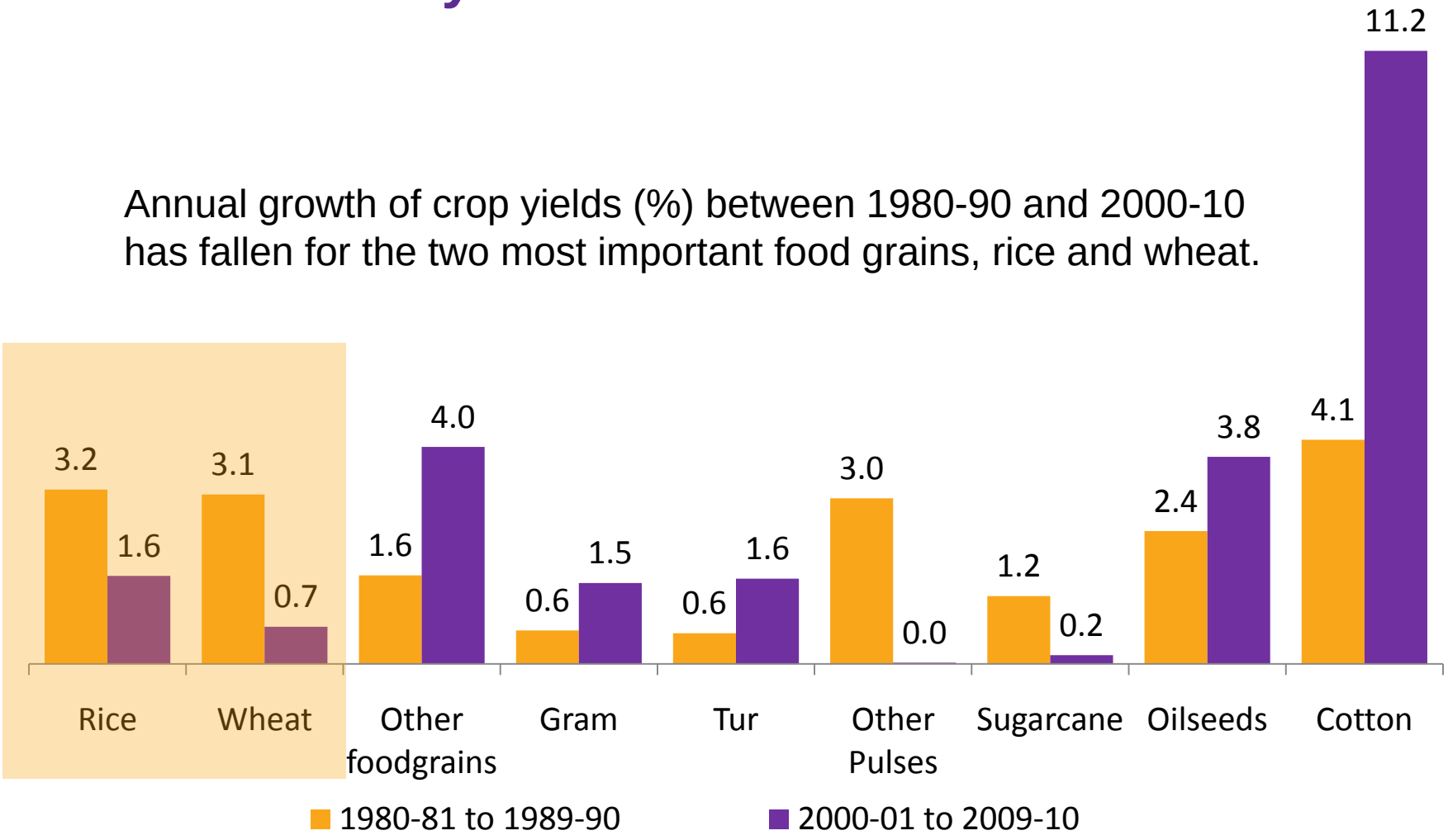
User: How can I protect my cotton crop from mealy bugs?

Challenges

- Decelerating growth in foodgrain production
- Falling public investment
- Large subsidies
- Over-use of natural resources
- Storage and marketing chain

Growth rates in yields

Annual growth of crop yields (%) between 1980-90 and 2000-10 has fallen for the two most important food grains, rice and wheat.



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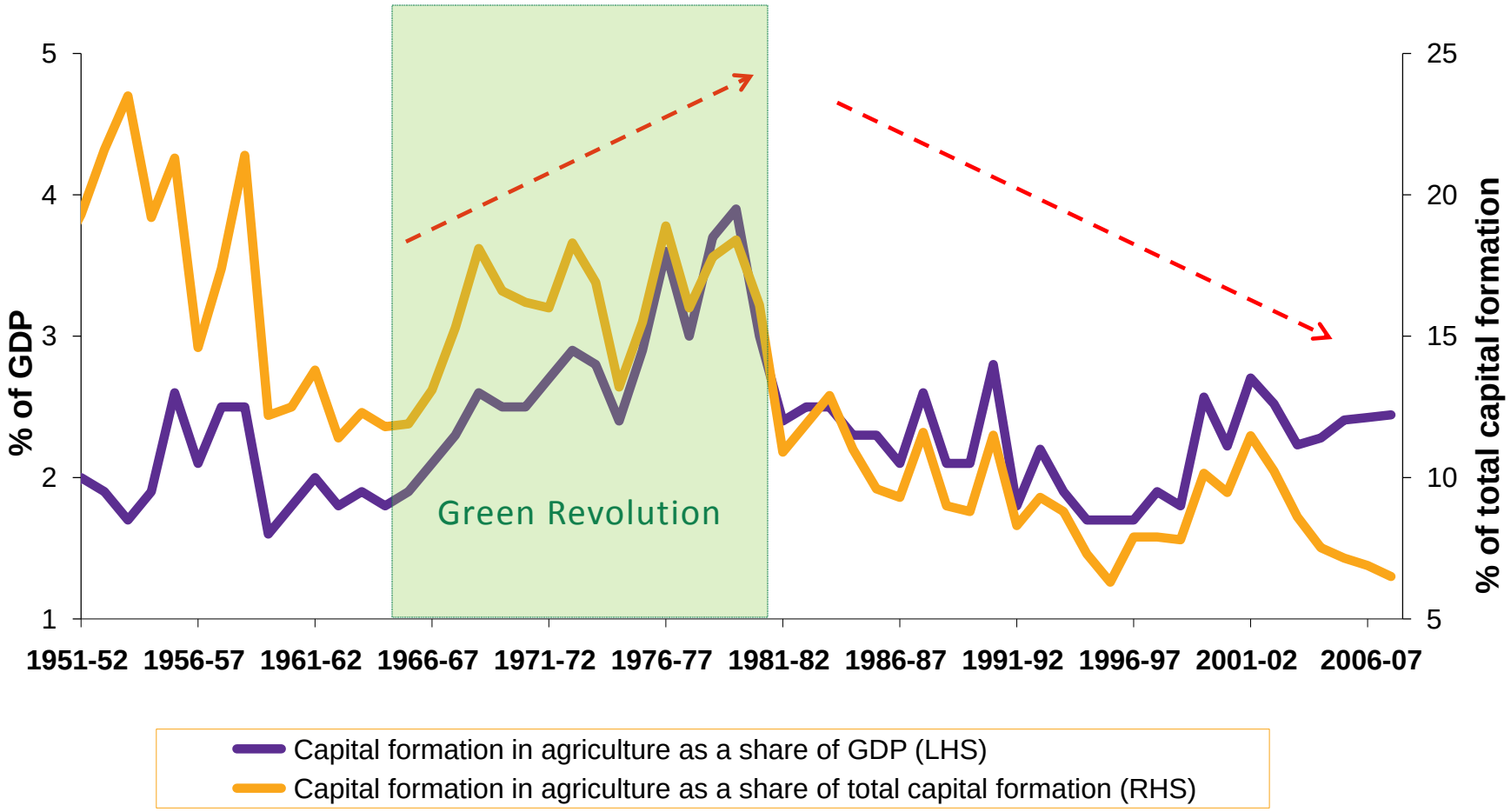
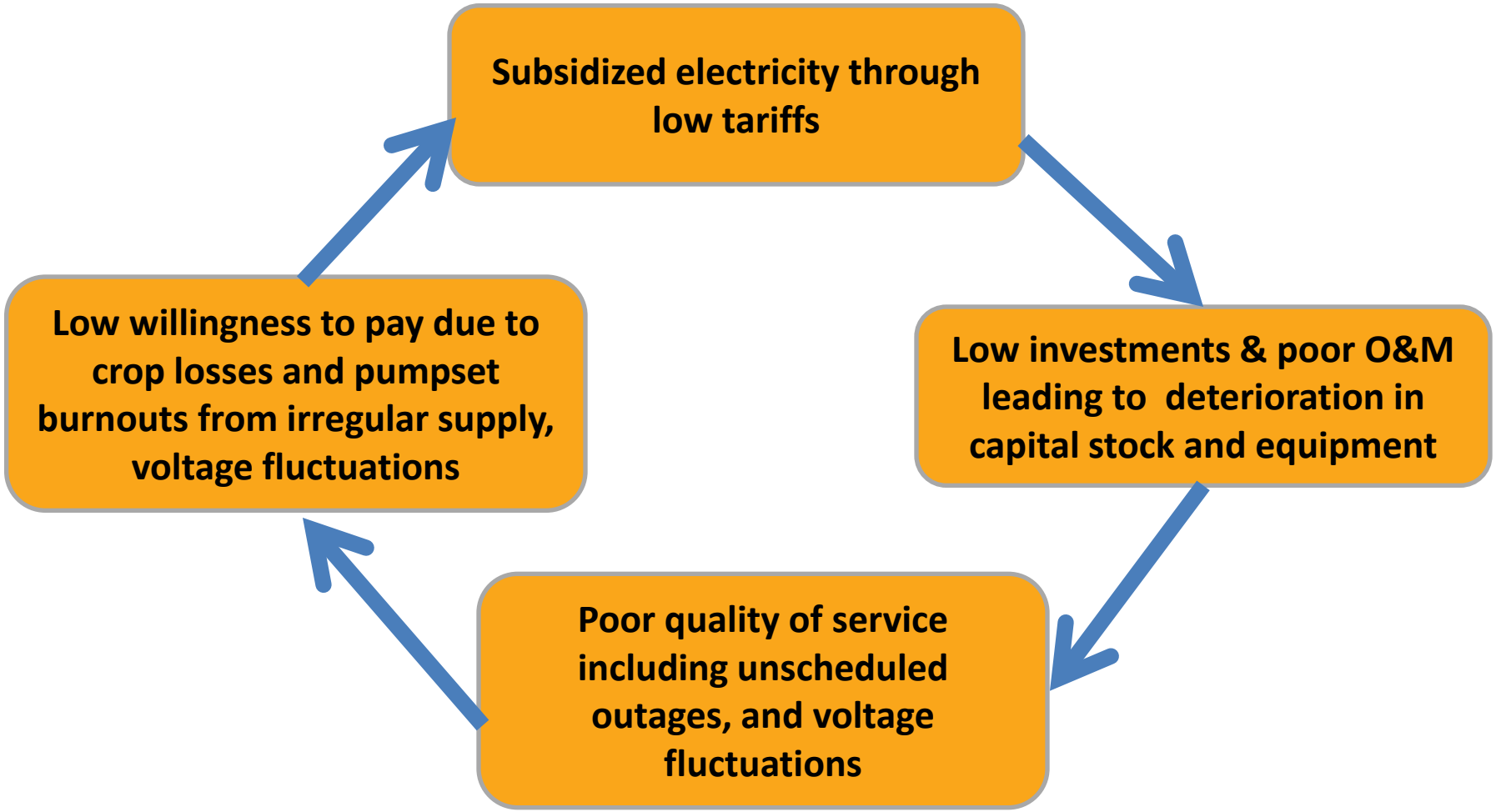
Fall in agricultural investment



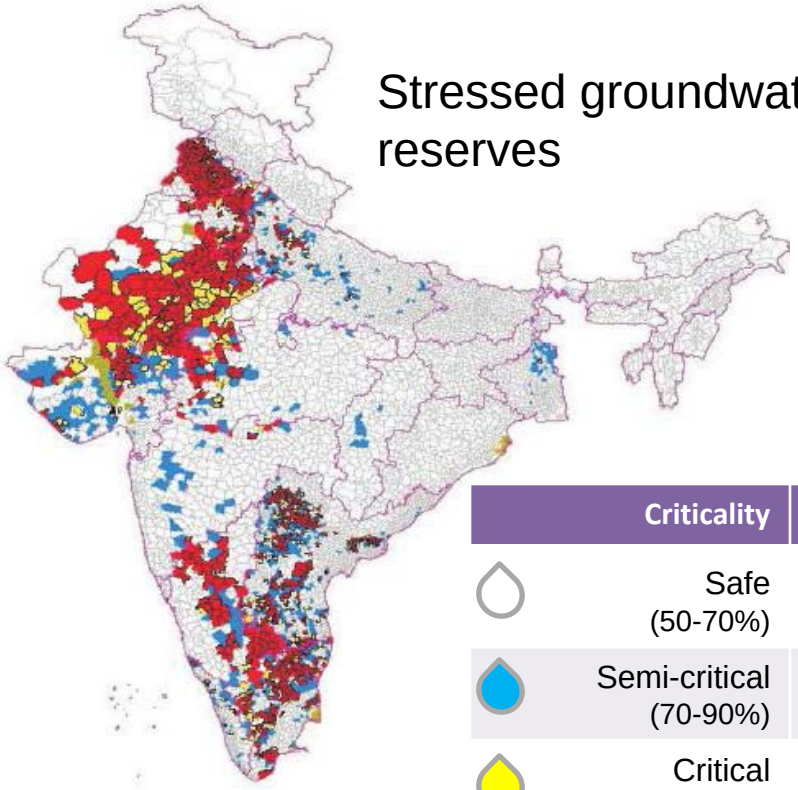
Large subsidies

- Fertilizer subsidy introduced in 1970 and has increased to Rs 613 billion in 2009/10 (nearly 1% of GDP).
- Irrigation subsidy
  - Canal irrigation estimated to vary between 0.05% - 0.19% of GDP amongst 5 states reported in World Bank (2004)
  - Electricity subsidy for tube well irrigation, with electricity tariff for agriculture just 15% of cost of electricity
- Food subsidy: Rs 585 billion in 2009/10, nearly 1% of GDP.

Vicious cycle arising from electricity subsidies



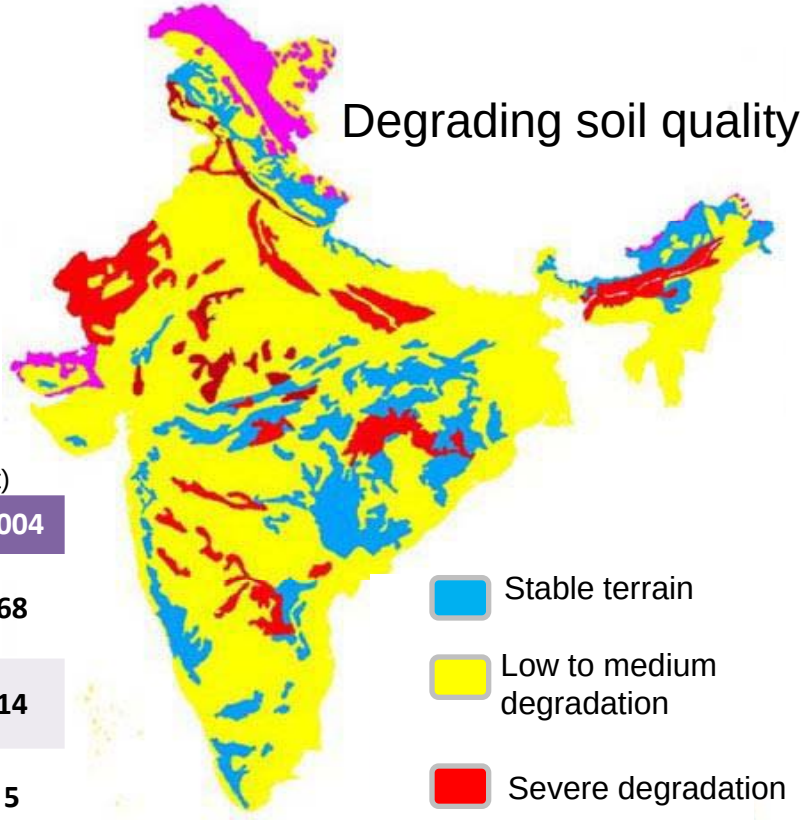
Excessive utilisation of natural resources



Stressed groundwater reserves

(Per cent)

Criticality	1995	2004
Safe (50-70%)	96	68
Semi-critical (70-90%)	2	14
Critical (90-100%)	1	5
Over-exploited (>100%)	2	14



Degrading soil quality

‘Food saved is food produced’: an inefficient supply chain

- Food grains
  - Lack of adequate storage facilities
  - Majority of storage facilities are located far away from areas of consumption, increasing ‘food miles’
- Horticulture
  - Post harvest losses of 20 to 30 per cent in horticulture crops
  - Poor packaging, grading, processing and sorting facilities
  - Lack of adequate means of transportation
  - Hugely inadequate storage capacity
    - Present storage capacity of cold stores is sufficient for only 12 per cent of the total production of fruits and vegetables
    - Cold storage facilities for meat are almost negligible and in states like West Bengal, there is none for a commonly consumed product such as fish
    - Issues of utilization for existing facility: 80 per cent facilities are accounted for by potatoes

The Agricultural Marketing Chain

- R&D, extension, market intelligence services by government, but inadequate
- Inefficiencies in agricultural markets in India, primarily due to:
  - Regulatory regime: undue state intervention in pricing, marketing etc.
  - Barriers to entry by private operators
  - Non-transparent methods of pricing, e.g. lack of auction of graded items
  - Small farmers have limited access to wholesale markets

After intermediaries' margins and handling costs get added, farmer gets only 25% - 60% of the price that the consumer pays finally

Government's Response and Way Forward: importance of rural infrastructure

- Gradual shift from subsidies to productivity-enhancing investments
- Regeneration of natural resources
- Agricultural diversification
  - **Measures to increase the improved functioning of markets (rural infrastructure) and value-addition (eg agro-processing, cold chains)**

Bharat Nirman: Government of India's response to the rural infrastructure deficit

- An umbrella programme, Bharat Nirman was launched in 2005 for up-gradation of the rural infrastructure
- 30 per cent of total projected investment of Rs. 13 trillion by Central and state governments on all infrastructure to be spent on rural infrastructure

	Target	Achievement*
Ministry of Rural Development	• Habitation over 1000 population to be provided an all-weather **road (**54648 habitations) • Every habitation to have a safe source of **drinking water (**55,067 uncovered and 331,000 slipped back habitations) • 6 mn **houses** to be constructed for the rural poor	• 73 per cent of target habitations and 86 per cent of road length completed • Almost 99 per cent achieved • About 83 per cent of target completed
Ministry of Power	• Every village to be provided **electricity** • (119,570 un-electrified villages)	• Over 80 per cent completed
Ministry of Communications and IT	• Every village to be connected by **telephone** (66,822 villages)	• Nearly 98 per cent of villages connected
Ministry of Water Resources	• 10 million hectares of additional **irrigation** capacity	• 73 per cent of target achieved

** Attempt has been made to source latest data, and are from 2009 to 2011, and only meant to provide a broad sense of project status. Time periods not the same for all sectors.*

Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) and its links to agriculture

- Launched in February 2006, the largest employment programme in human history provides at least **100 days** of ***guaranteed*** wage employment in every financial year to every rural household that demands work
- Employment within **15 days of application for work**
- At least **one-third of persons have** to be **women**
- Central government outlay of Rs. 335 billion in 2009-10 generating **employment for over 52 million households** during the year

- MGNREGA's objectives include the creation of sustainable rural livelihoods through **regeneration of natural resources**
- Contributions to the agricultural sector
  - 70 per cent works relate to '**Green Jobs**' - water conservation, water-harvesting, restoration, renovation and desilting of water bodies, drought-proofing, plantation and afforestation
  - Improvement in ground water, agricultural productivity & cropping intensity, soil fertility and moisture conservation
  - Earnings per household has increased from Rs 2795 in 2006-07 to about Rs 5000 per month in 2009-10 – led to increase in agriculture minimum wages – better bargaining power

Need to focus on moving from wage employment to sustainable rural livelihoods; from unskilled to skilled labour; productivity increases for small and marginal farmers in rainfed areas

Water Management

Challenging times ahead…

- Aging assets which are in urgent need of maintenance
- Low water storage capacity of 200 cubic meters per capita compared to over 5000 cubic meters for every citizen in Australia and USA, 2500 cubic meters per capita in China
- Large number of irrigation projects have been started but not completed
- Dependence on ground water for irrigation : annual extraction of groundwater is highest in the world
- Largely government dominated, little interest from private sector
- Too many decision chains in the water management cycle
  - Ministry of Water Resources: irrigation
  - Ministry of Rural Development: watershed management, MGNREGA, rural drinking water
  - Ministry of Agriculture: water use efficiency
  - Ministry of Urban Development: urban water supply

…initiatives underway, but progress has been slow

- **Increased outlay**: Eleventh Plan outlay is nearly as much as the entire expenditure on watershed programmes since their inception in India
- **Expanding irrigation area**: Against the anticipated annual rate of creation of irrigation potential of about 3.2 million ha, the average rate of creation of irrigation potential during 2009-10 will be about 1.83 million ha per year
- **Participatory Irrigation Management** : By the end of 2007, about 20 per cent of the total command of existing irrigation projects had been covered through Water Users Associations
- **Technology adoption**:
  - Drip irrigation, farm ponds in Andhra Pradesh
- **National Mission on Micro Irrigation**: launched in June 2010 with an initial outlay of Rs 80 billion; assistance available for drip and sprinkler systems, implementation of advanced technology

Water Management and Energy Efficiency: some pragmatic solutions to energy groundwater nexus

- Targeted investments and innovations in water storage and management facilities like farm ponds and check dams
- Harnessing, conserving and developing degraded natural resources through watershed programs that are community-led

Significant energy savings possible from the use of efficiency pump sets. Savings of 55% of energy consumption have been reported

Drip irrigation could reduce energy consumption by 20% and ground water use by 42%

- Use of DDG Renewable Energy for water pumping has carbon saving benefits as well

Use of local resources for rural energy

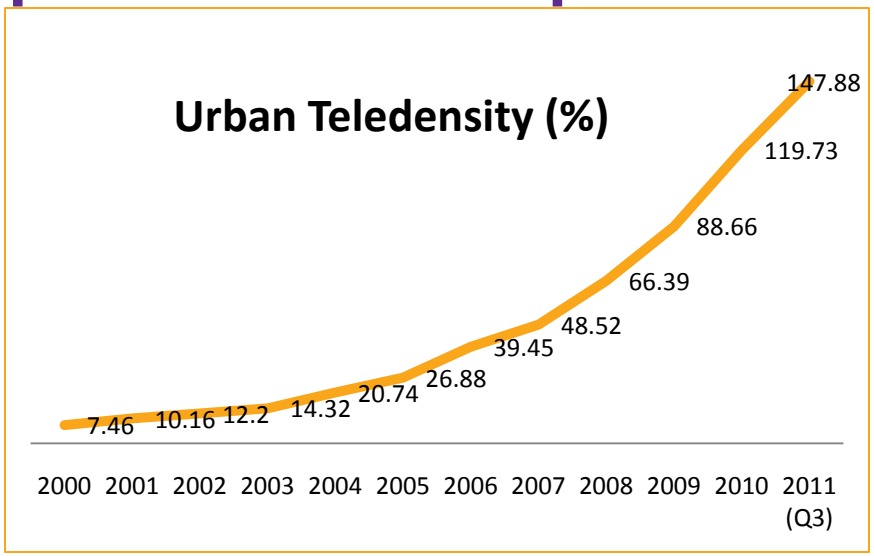
- There exists potential for greater use of renewable energy in DDGs
- Innovative alternatives to grid extension need to be explored. DDG+mini-grids offer flexibility in design and operation to meet the very modest energy needs in rural areas and can be readily deployed in areas where grid extension is expensive or infeasible Potential for greater use of renewable energy in DDGs
- Encourage use of alternative/renewable electricity for powering telecom infrastructure

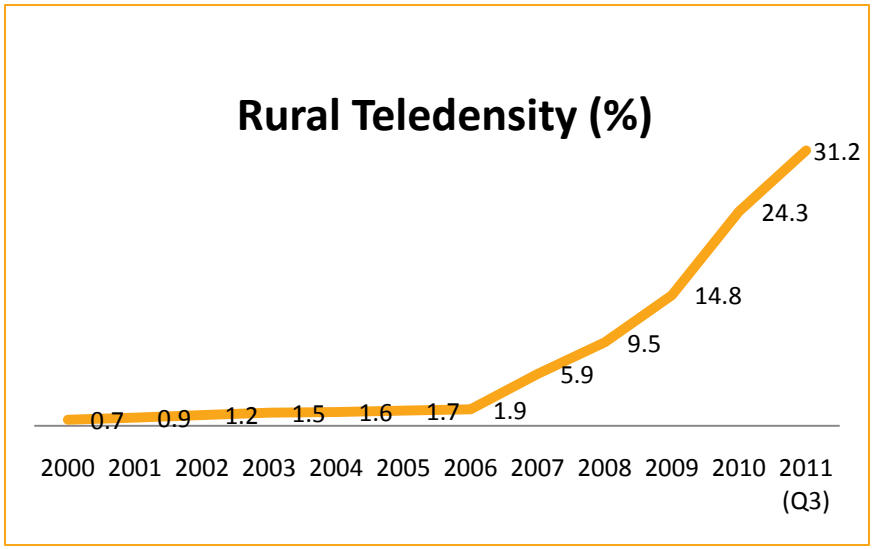
Managing the changing food basket

Faster growth in per capita incomes and urbanization triggering shift towards high vale commodities like fruits, vegetables, fats and oils, and animal products such as dairy, poultry and eggs

- **New wave of agriculture: Agro-based industries**
  - Huge opportunities for establishing agro – processing units for oilseeds, food grains, sugarcane and animal products
- **Innovations in storage decentralization**
  - Moving towards a decentralized food storage system has long lasting implications for reducing food miles besides improving access and entitlement to the needy
- **Public Private Partnerships**
  - Involving private sector in the management of food procurement and distribution
    - FCI awarded contract for bulk movement to a private player, Adani Agri Logistics in 2008
- **New mechanisms to link farmers to markets**
  - Contract farming: tried out in a few States
  - National spot exchanges: for reducing handling costs and better access to information
  - Infrastructure facilities in market places

Rapid increase in rural teledensity due to reduced prices from competition





- While rural teledensity increased by 18 times since 2006, urban teledensity increased by 5 times at best over any 5 year period.
  - Saturation of urban markets causing telelcos to move to rural areas.
  - Sharing of infrastructure such as cell towers allowed telecos to reduce costs.
  - To extend connectivity to remote areas, provide support (through USOF) to private mobile operators in setting up communication networks irrespective of technology proposed

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THANK YOU