

Meeting **World Food Needs** with **GM Rice?**

**Review of Genetically Modified Rice  
in India**

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October 8-9, 2012

**UofA**

**DIVISION OF AGRICULTURE**  
**RESEARCH & EXTENSION**

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# Presentation Outline

## Overview of Indian Rice Economy

- Production

- Consumption

- Trade

- Policy

## Genetically Modified Rice

- Research Trails

## Lessons from other GM crops in India

- Bt Cotton

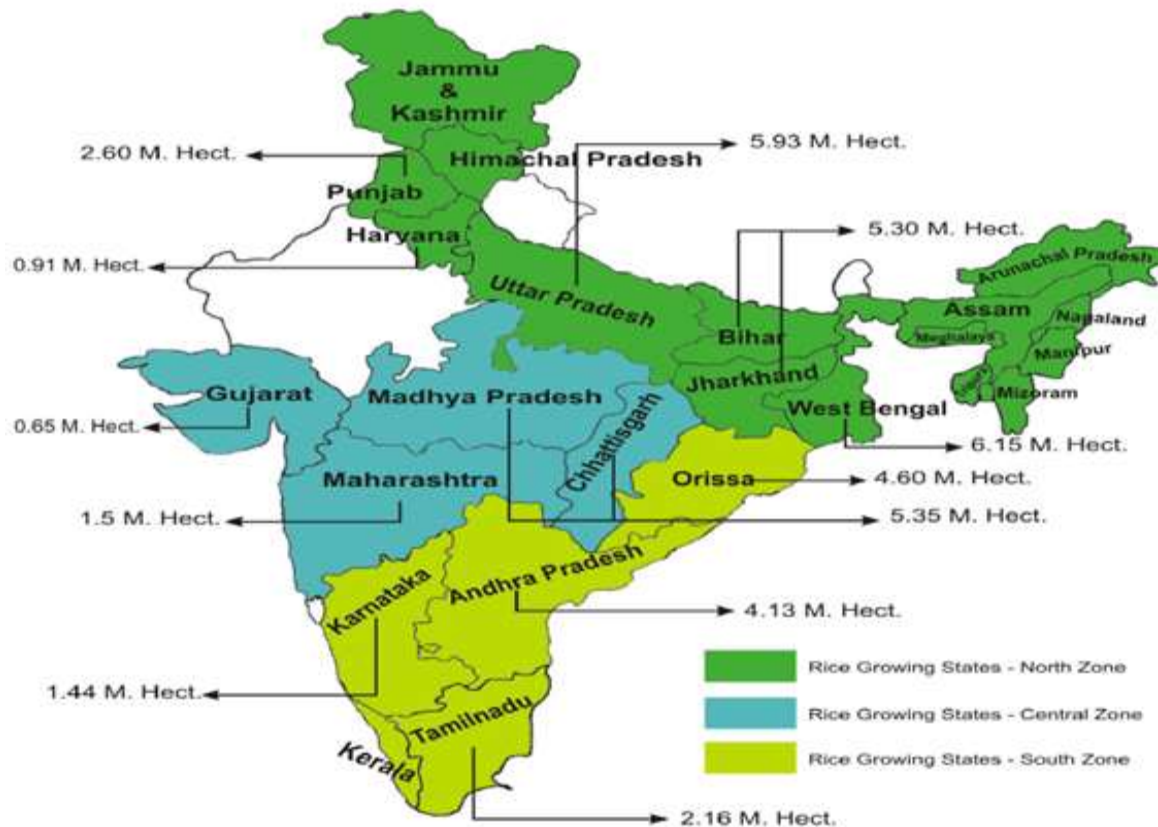
## Regulatory Framework

- Central Agencies

- State Agencies

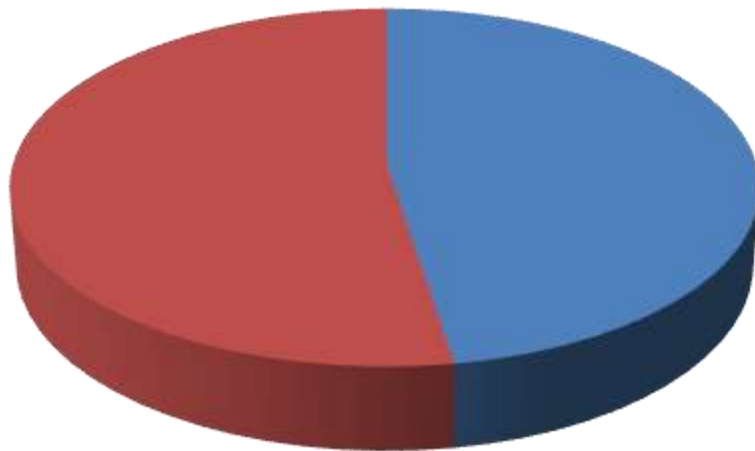
## Challenges in adoption and use of GM Rice

# Rice Growing States in India



# Rice Cultivation and Area Harvested

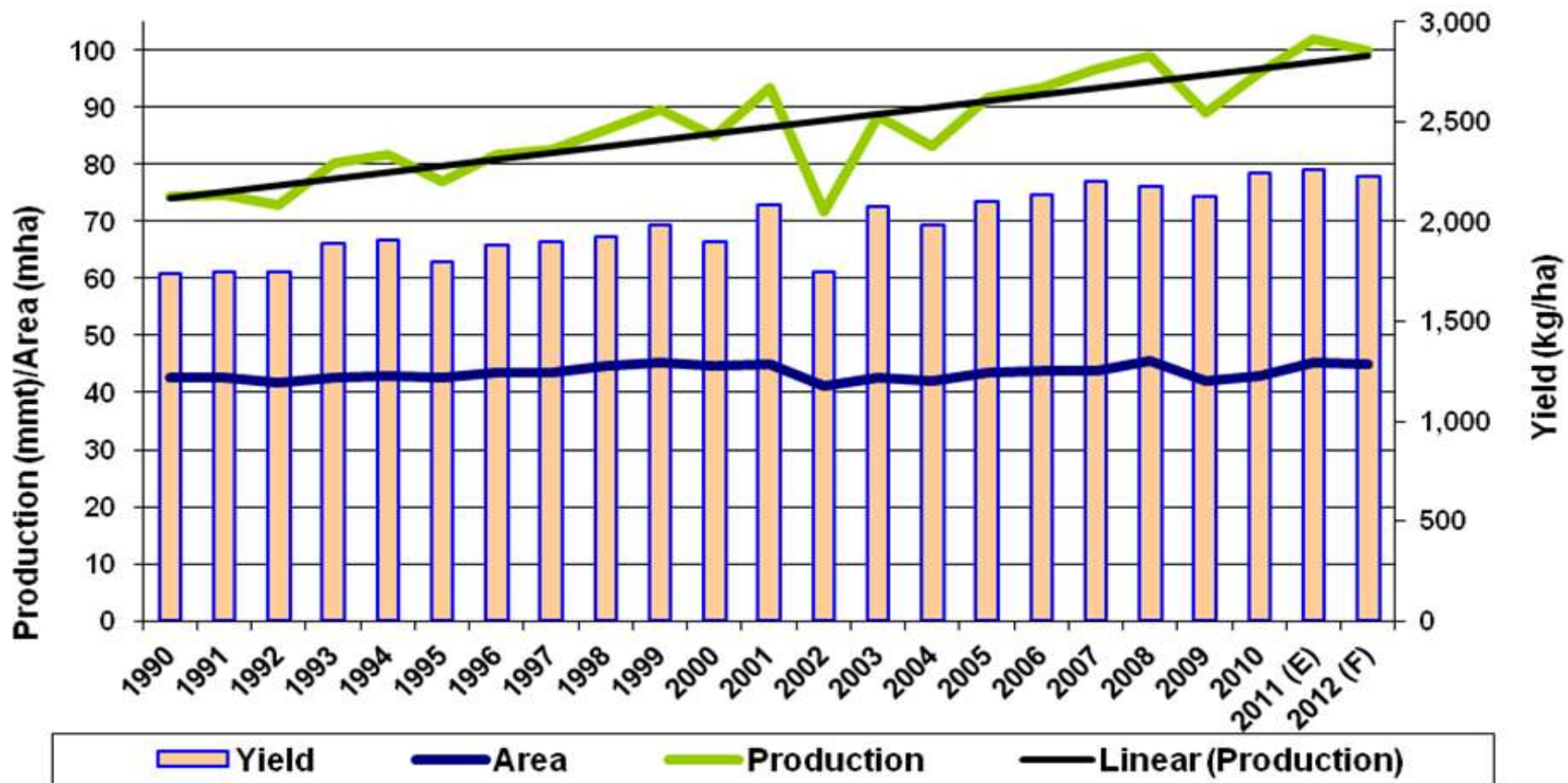
Total Rice Area in  
Percent – Year 2011



■ Irrigated   ■ Rainfed

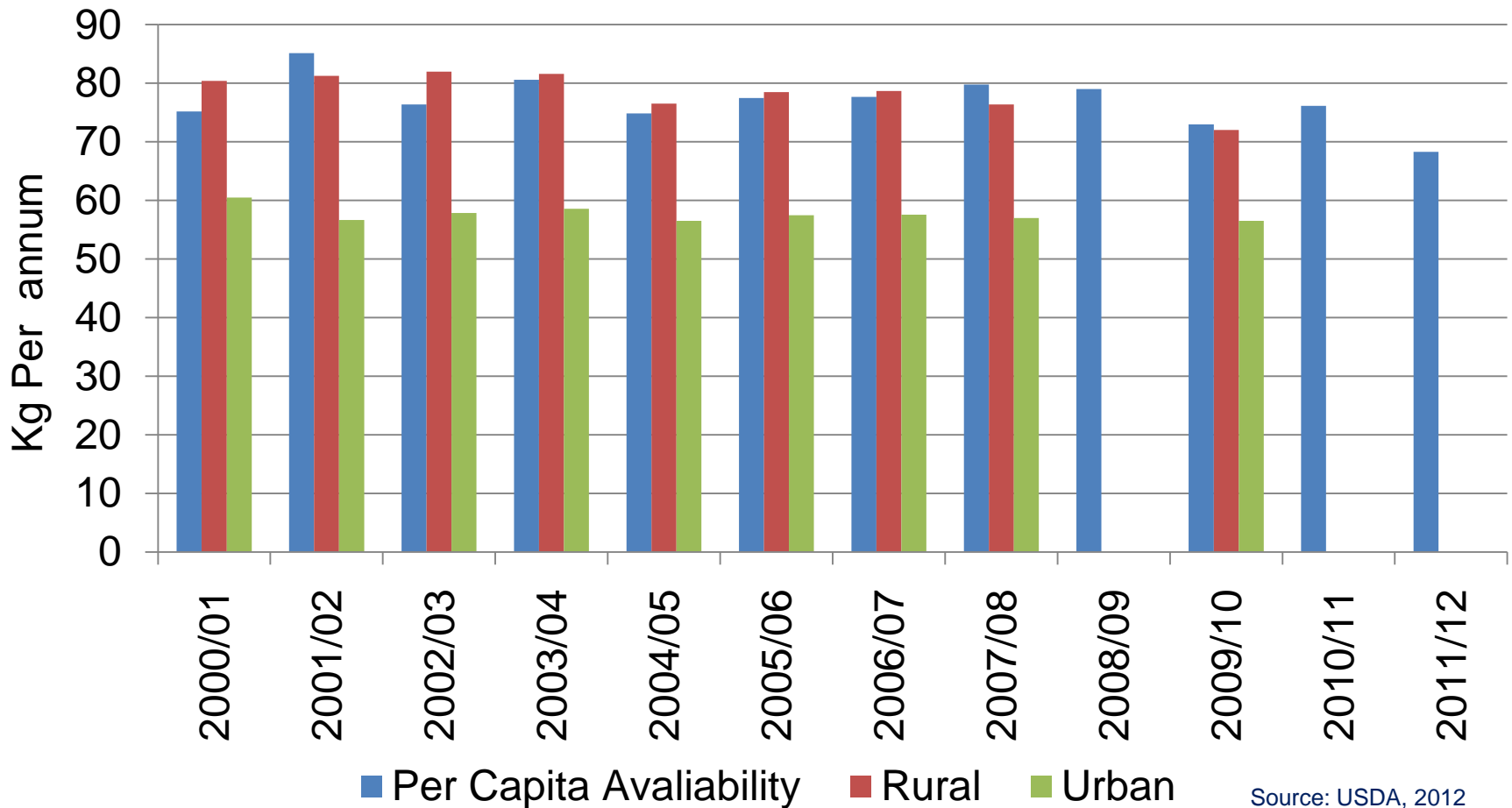
- Major staple for 65 percent of population
- 40 percent of food grain production
- Planting Season :
  - *Kharif* (Fall / Early winter harvest)
  - *Rabi* (Winter planted / spring harvest)
- 5.8 million ton of Basmati Prod.
- 1.5 million ha of Hybrid Rice

# Rice Area, Production, and Yield



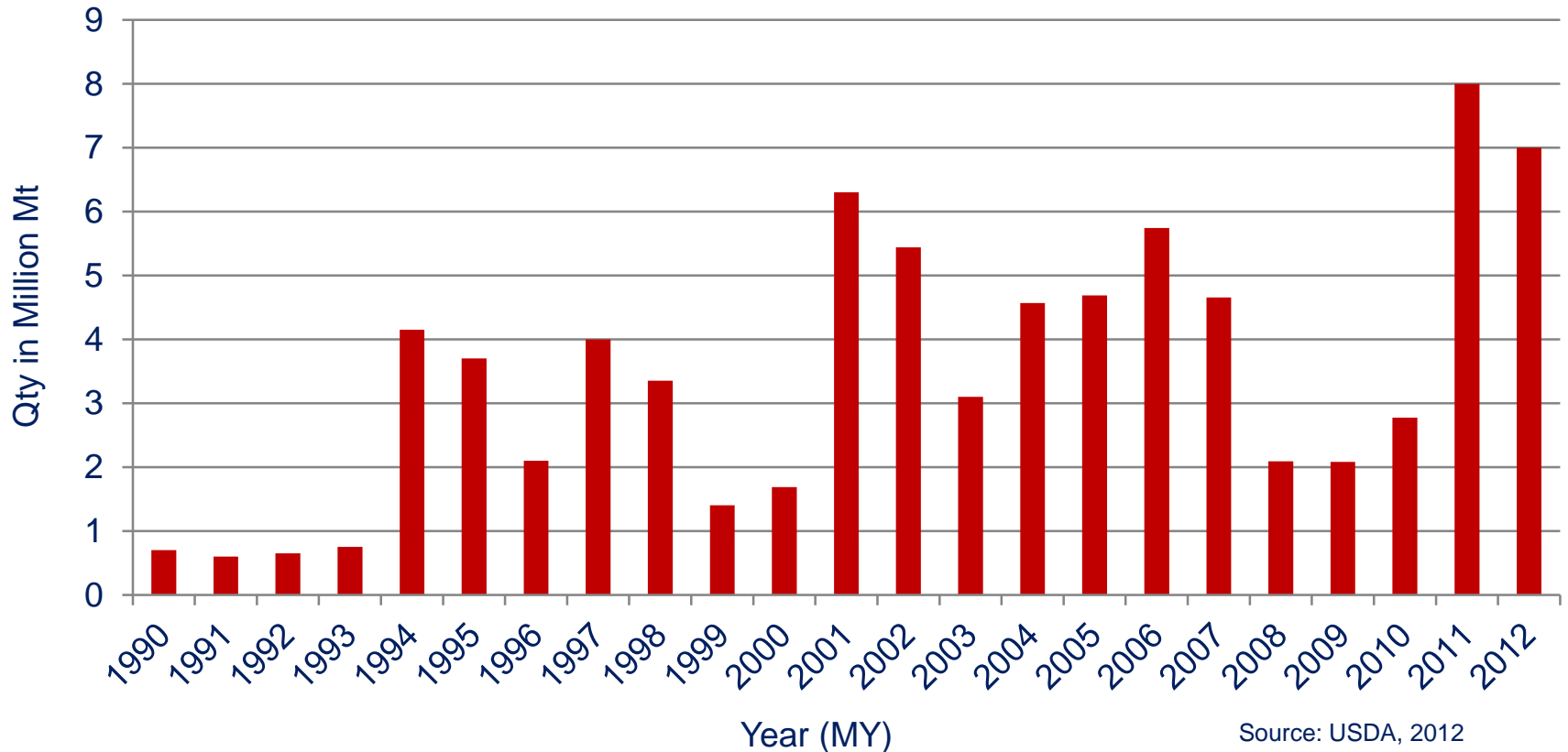
Source: Retrieved from Attaché Report USDA, 2012 as of on 11/12/2012

# Per-Capita Availability and Consumption at Household Level



Source: USDA, 2012

# Rice Exports (1990 – 2012)



# Rice Policy in India

- Domestic price support, and Procurement
  - Minimum Support Price
  - 30 percent procurement by Govt.
- Public Distribution Programs(PDS)
  - Above Poverty Line
  - Below Poverty Line
  - AAY
- National Food Security Mission (2007 – 2012)
  - Under Ministry of Agriculture
  - Increase production of Rice, Wheat, Pulses by 10, 8, and 2 million Mt respectively.



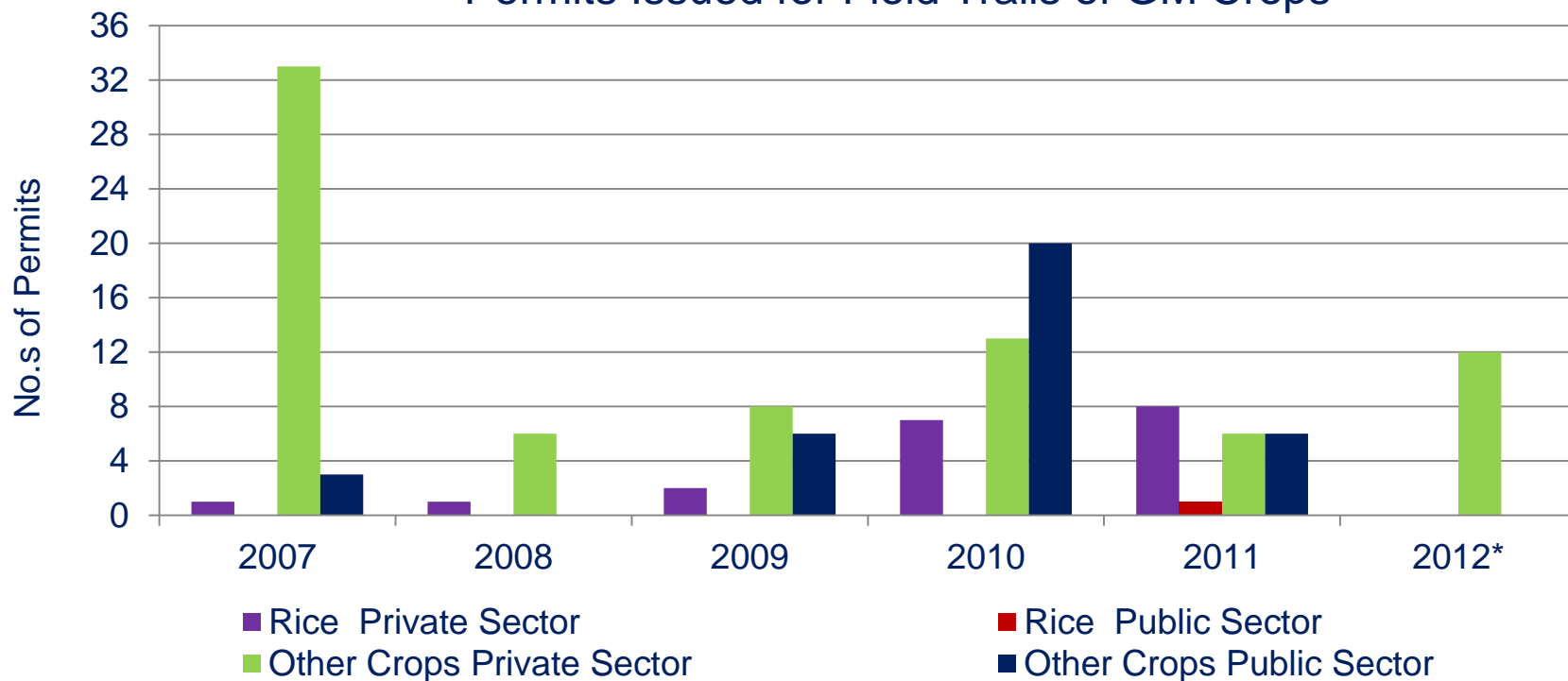
# GM Rice Trial Sites in India

Company	Site in India
E.I. DuPont India Pvt. Ltd	Medak, AP Raipur, CH Hubli Bangalore, KA
BASF India Limited	TNAU, Coimbatore, TN
Bayer Biosciences Pvt. Ltd.	Patancheru, AP Davangree, KA
University of Calcutta	Chin surah, WB
Metahelix Life Sciences Pvt. Ltd.	Ranga Reddy, AP
Maharashtra Hybrid Seeds Co. Ltd.	Nizamabad, AP

Source: <http://igmoris.nic.in>, 2012

# Approved Field Trails by GEAC

## Permits Issued for Field Trails of GM Crops



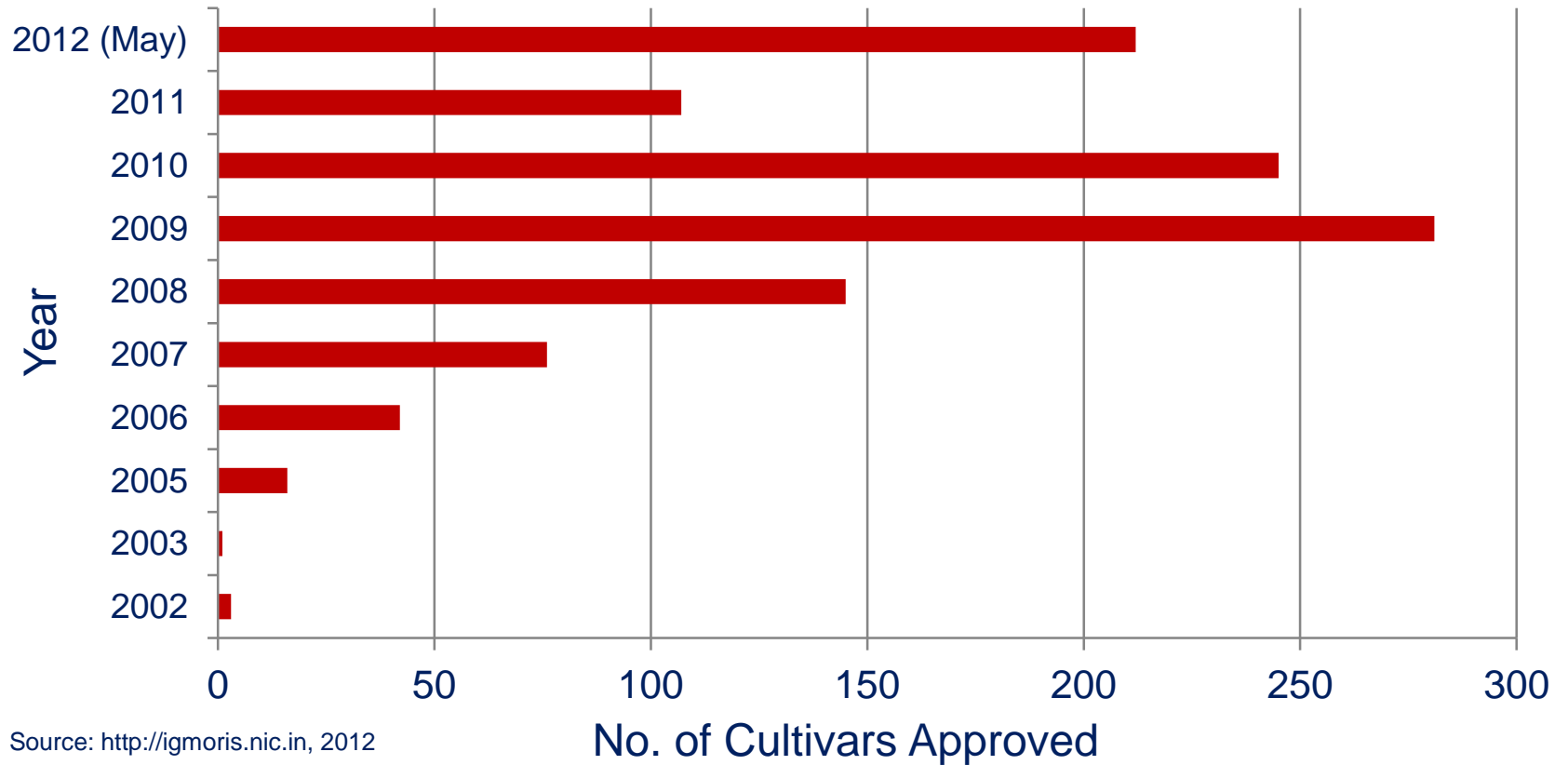
Source: <http://igmoris.nic.in>, 2012

# Lessons from Bt Cotton

- Only approved commercial GM Crop
  - Non food crop
  - Private Sectors initiative
    - Monsanto – Mahyco
- Bt Cotton controversy
  - Navjeevan Seeds (NB151)
    - Lack on regulation and monitoring
- Lessons for GM Rice
  - who should commercialize GM rice
    - Public or Private sector

# Lessons from Bt Cotton

## Commercially Approved Bt Cotton Cultivars



# Regulatory Framework

Ministry of Science and Technology

Department of Biotechnology (DBT)

**The Recombinant DNA Advisory Committee (RDAC)**

Rules and Regulation biosafety in research and application on GMO

**The Review Committee on Genetic Manipulation (RCGM)**

Grant approvals and monitor safety of research project in GMO

Ministry of Environment and Forests (MoEF)

**The Genetic Engineering Approval Committee (GEAC)**

Approval of proposal for release of GMO into environment and responsible for food safety approval for GM products

• Commercial use of GMO's and carry large scale field trails

• GMO application for research and small scale field trails

Institutional Biosafety Committee (IBSC)

Monitoring and Evaluation Committee (MEC)

District Level Committee (DLC)

# Assessment in Adoption and Use

- Producer Level
  - Genetic contamination
    - Impact on Basmati Rice Exports
  - Distribution and logistics
    - E.g. Hybrid
  - Patent Issues and cost of bt seed
    - IPR
- Consumer Level
  - Appearance
    - Golden Rice
  - Taste and quality: Hybrid Rice ( USDA , 2012)
    - Diversity in consumer preferences
    - Poor cooking quality of rice

# Stakeholders

- Public and Private Sector
  - Public Sector
    - Central Govt.
      - Department of Biotechnology and Ministry of Environment and Forests
      - State Govt.
    - Agricultural Research Institutes
      - Regional Research Stations, National Agricultural Research Institutes
    - Multinational Companies
      - Monsanto, BASF, Syngenta
    - National Companies
      - Mahyco
  - Non Government Organization
    - International
      - Green Peace, Gene Campaign
    - National
      - Bharatya Kisan Union (BKU), M.S Swaminathan Foundation (MSSRF)
    - Local
      - Karnataka Rajya Raitha Sangathana (KRRS), Shetkari Sangathana

# Power of GM Rice

- C3 to C4 (CRRI, 2011)
  - 50 percent increase in yield
  - 30 percent efficient use of water and fertilizer
- Nutrition
  - Higher Iron and Vitamin A
    - University of Calcutta
  - Zinc
- Adopting to Climate Change
  - Salt and drought tolerant rice
    - Indo-US collaboration
  - Use of mangrove gene