Strengthening Networking on BiomAss ResearcH and Bio-waste Conversion - BiotechnologY for EurOpe India InteGration

Strategic Research Agenda: India Perspective

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PRESENT BIOMASS SCENARIO OF INDIA

- **The current availability of total biomass in India is estimated at about 624 MT***

Table: Potential (in MW) of dominant Biomass source available in India**

States	Husk	Stalks	Straws
Punjab	3090	2073	3194
Haryana	1138	2579	976
Rajasthan	930	1609	18
Madhya Pradesh	1685	1534	109.9
Chhattisgarh	960	17	269
Bihar	971	259.8	513.9
West Bengal	381	28	852
Orissa	1672	7.2	467.4
Maharashtra	641	2447	147
Karnataka	1182	589.5	114.6
Tamil Nadu	422	57	128
Andhra Pradesh	1888	107.7	531
Gujarat	946	1119	62

Source: *SAHYOG Inventory and **MNRE 2012

Why the crisis of Biomass ?

Competition among industries

Replacement

Table: Competitive market value of Biomass

State	Type of Fuel	ì (2012)	ì (2010)*
Maharashtra	Rice Husk	2800-3200	1600-1920
	Prosopis juliflora	2625-2825	1575-1695
	Groundnut Shell	2700-2850	1620-1710
	Mung Husk	2200-2300	1320-1380
	Coconut Waste	1200-1350	720-810
Andhra Pradesh	Rice Husk	2200-2230	1320-1380
	Maize shanks	2000-2200	1200-1320
	Prosopis juliflora	1900-2300	1140-1380
	Saw dust	1500-2100	900-1260
Rajasthan	*Prosopis juliflora*	2500-2600	1200-1500
	Mustard/cumin husk	2000-2200	1200-1320
Madhya Pradesh	Rice Husk	3000-3500	1800-2100
	Maize shanks	2000-2200	1200-1320
	Groundnut Shell	2700-2850	1620-1700
	Prosopis juliflora	2400-2500	1440-1500

*Industry claims price of biomass has been increasing by 30-40 per cent every year (Source: MNRE; *figures provided by IBPA)

Status of Biomass based Industry in India

Table: Status of Biomass plants

State	No. of commissioned projects	Shut	Running
Andhra Pradesh	39	22	17
Chhattisgarh	29	25	4
Tamil Nadu	23	2	21
Maharashtra	17	11	6
Rajasthan	10	2	8

(Source: Down to Earth, Sep. 2012; Figures provided by Indian Biomass Power Association)

Table. Biomass Tariff (2012)

State	ì (per unit)
Andhra Pradesh	4.20
Chhattisgarh	4.24
Madhya Pradesh	4.77
Maharashtra	5.41
Rajasthan	5.40

- **The total installed capacity of biomass power plants in the country is 1,192 MW**

Bottlenecks for Indian Biomass Industry

- Supply chain - that could result in non-availability of feedstock
- Lack of adequate policy framework and effective financing mechanisms
- Lack of effective regulatory framework
- Lack of technical capacity
- Absence of effective information dissemination
- Limited successful commercial demonstration model experience

ISSUES & STRATEGY

Waste Water & Municipal Solid Waste for Energy Generation

- **Energy recovery potential of MSW to be 1457 MW and sewage sludge to be 226 MW**
- **Potential from MSW could go up to 5,200 MW by 2017**

Source: MNRE

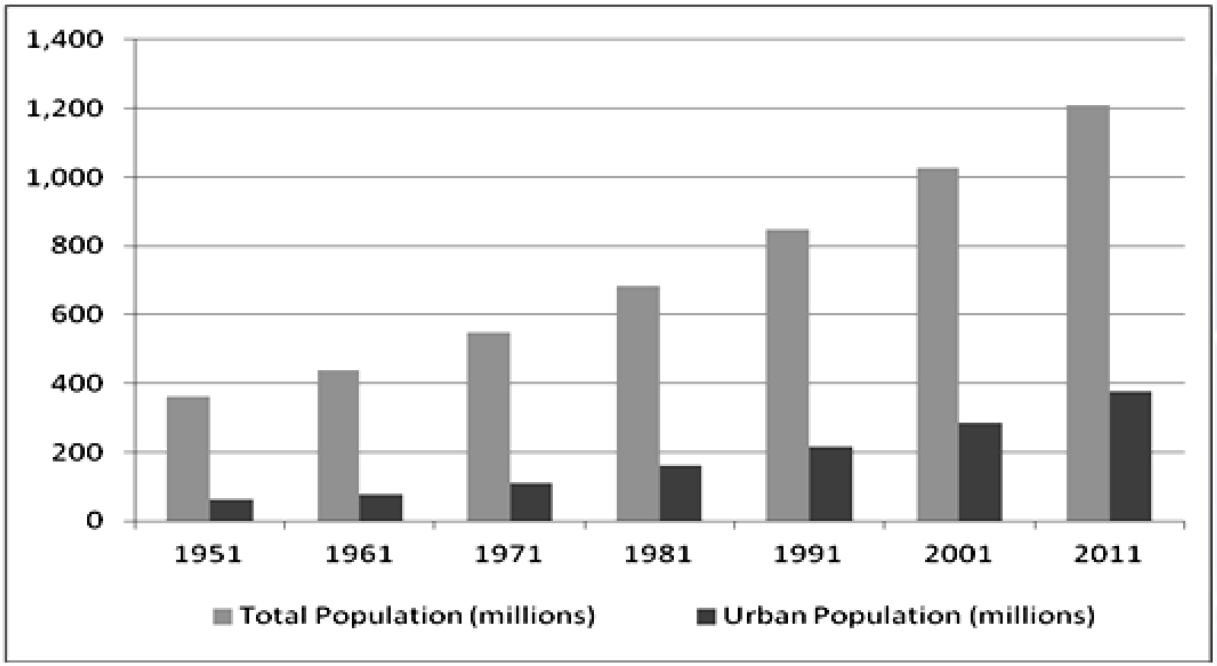


Fig. Population and MSW generation in India

- **India is 2nd most populous nation on the planet (17.66% of the world population)**
- **India's 366 cities represent 70% of India's urban population and generate 130,000 tons per day (TPD) or 47.2 MT waste per year (TPY) and 38 billion liters of sewage**

Table: India - Potential of Energy Recovery from Urban and Industrial Wastes

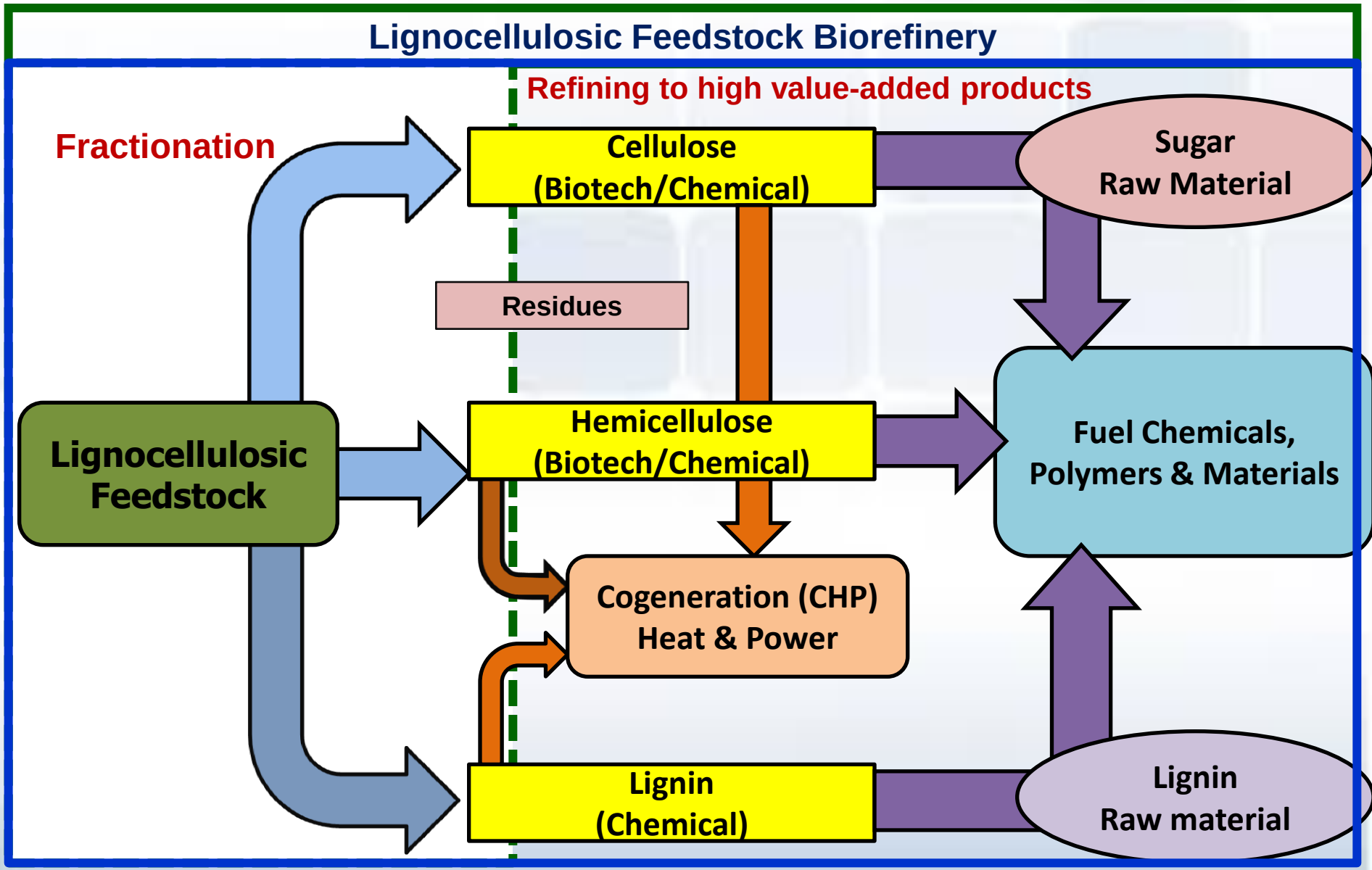
State/Union Territory	From sewage sludge (MW)	From MSW (MW)	Total (MW)
Andhra Pradesh	16.0	107.0	123.0
Bihar+Chhattisgarh+Jharkhand	6.0+2.0+2.0	67.0+22.0+8.0	107.0
Delhi	20.0	111.0	131.0
Gujarat	14.0	98.0	112.0
Haryana+Punjab+Chandigarh	6.0+6.0+1.0	18.0+39.0+5.0	74.0
Himachal Pradesh	0.5	1.0	1.5
Rajasthan	9.0	53.0	62.0
Karnataka	26.0	125.0	151.0
Kerala	4.0	32.0	36.0
MP	10.0	68.0	78.0
Maharashtra	37.0	250.0	287.0
Assam+ Manipur, Meghalaya, Mizoram, Tripura	2.0+2.0	6.0+5.0	15.0
Orissa	3.0	19.0	22.0
Pondicherry	0.5	2.0	2.5
Tamil Nadu	14.0	137.0	151.0
Uttar Pradesh	22.0	154.0	176.0
Uttarakhand	1.0	4.0	5.0
West Bengal	22.0	126.0	148.0
Total	226.0	1457.0	1683.0

*Of the existing potential, only about 24 MW has been exploited, which is less than 1.5% of the total potential

The major stakeholders in the management of MSW

- Ministry of Environment and Forests (MoEF)
- Ministry of Urban Development (MoUD)
- Central and State Pollution Control Boards
- Department of Urban Development
- State Level Nodal Agency
- Urban Local Bodies
- Private

Lignocelluloses Biorefinery



Bamboo : Potential Source of Biomass

- Bamboo occupies 13 million hectares of India's forested area and its growing stock is about **169 MT**
- **Now declared a Minor Forest Produce- (FRA-2006) in 2011**
- Scheduled Tribes and traditional forest dwellers have right to own, access to collect and dispose of Bamboo

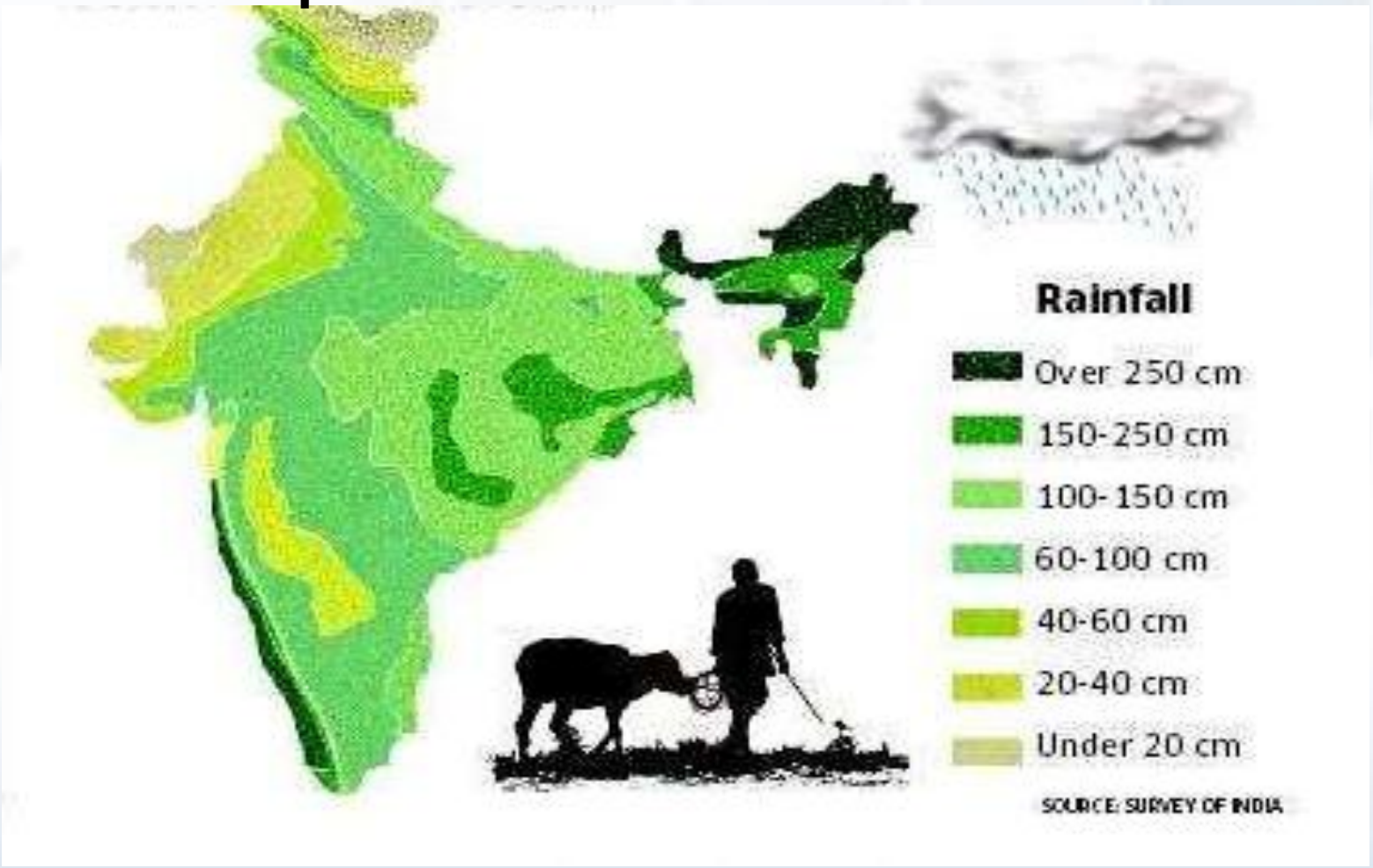
Source: Down to Earth

Lignocelluloses in India

- x **Wood/Timber (Forest)**
- ✓ **Grass (169 MT Bamboo can be a potential source)**
- ✓ **Agricultural produce (624 MT)**
- ✓ **MSW (47.2 MT)**

Rain Water Harvesting /Conservation & Management

About 60 % of India's Agri Land is Rain-Dependent.....



- **India gets most of its water from the 3 months of rains**

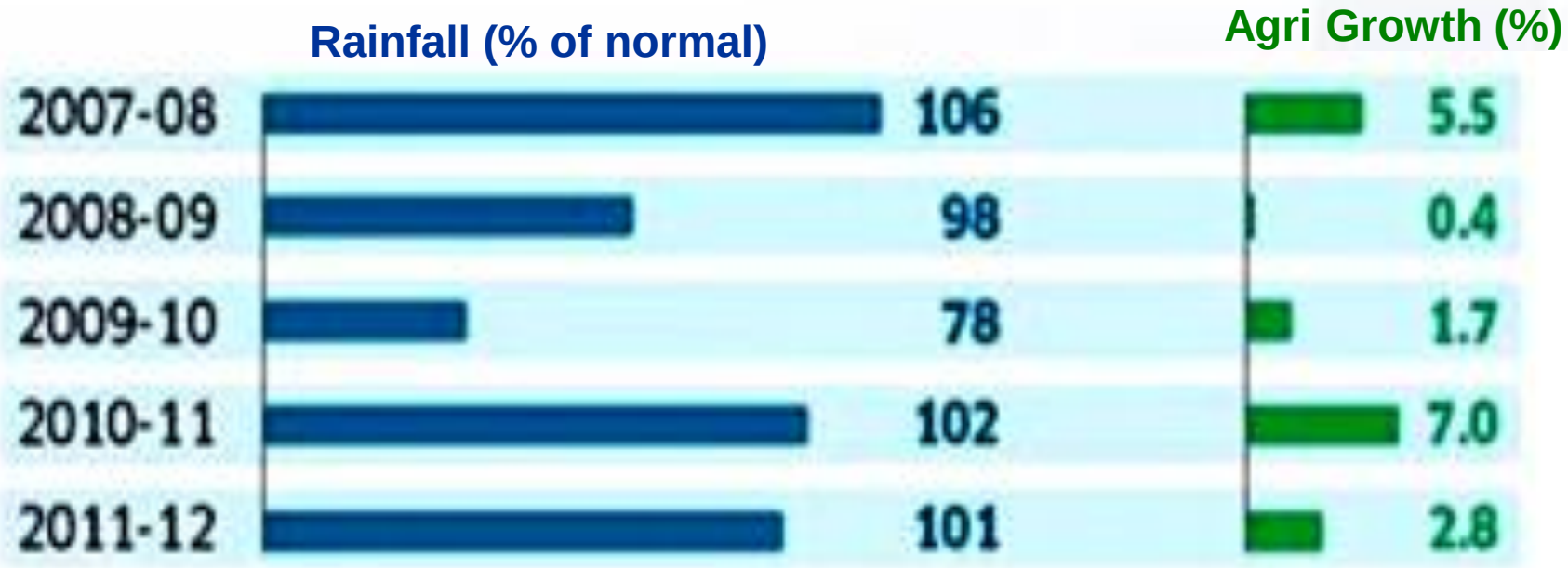


Fig. Relationship between monsoon and farm sector growth

- **Increase in irrigation facilities has helped reduce risks**
- **Improved practices for rain water harvesting and its utilization programme would improve India's ability to withstand monsoon shortfall**

Agriculture Practices and Crop Improvement

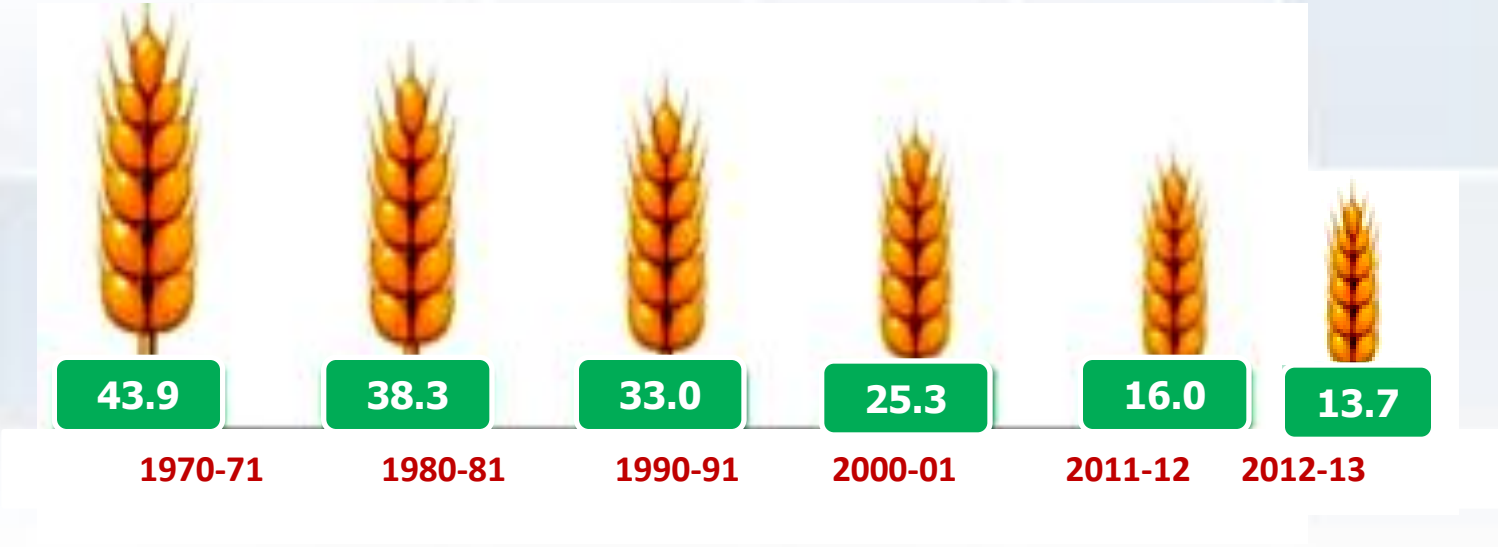
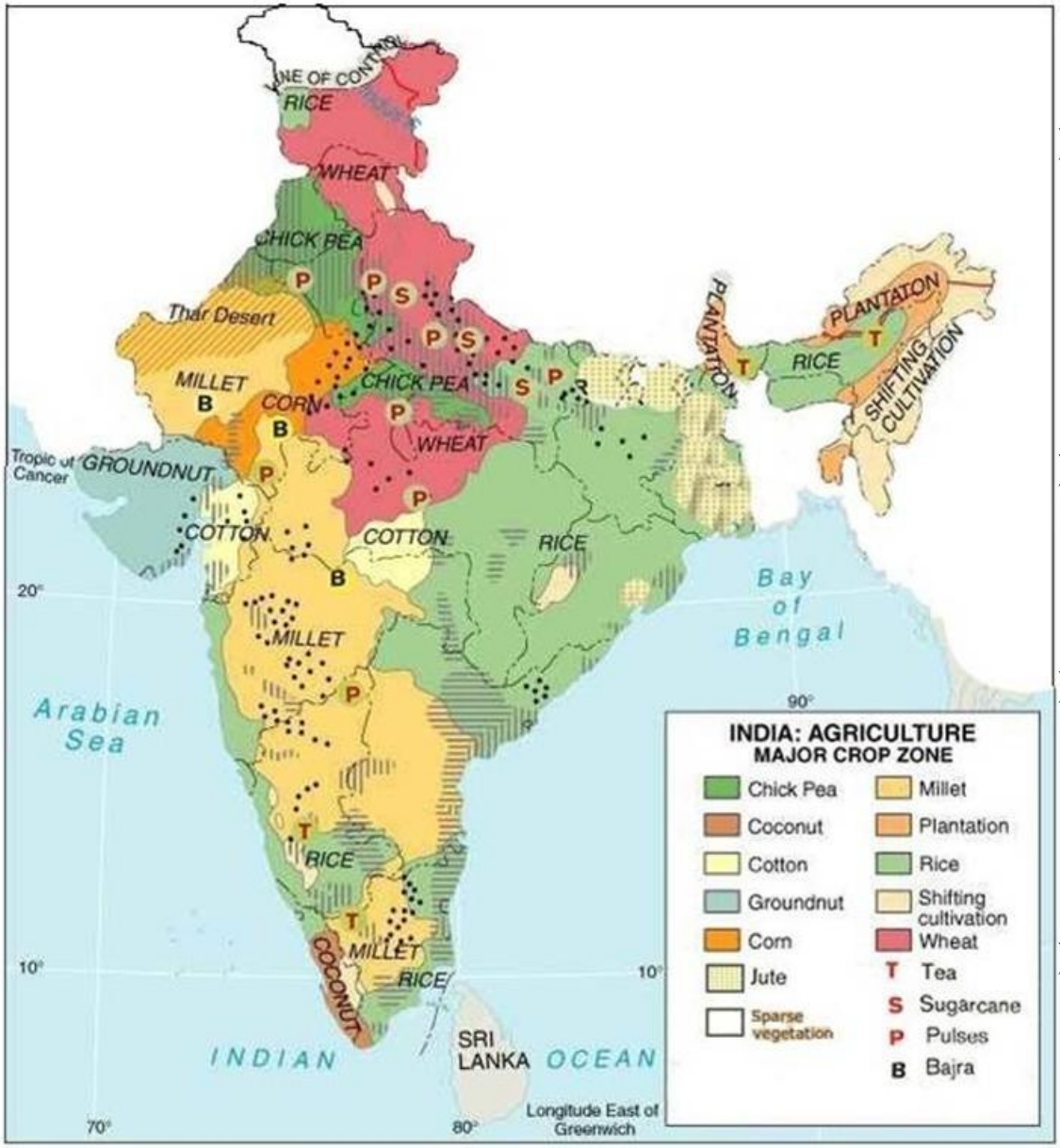


Fig: Share of Agri and allied activities in GDP (%)

- **The share of agriculture and allied sectors in India's GDP has declined due to shift from traditional agrarian economy to industry and service sectors**

Crops Diversity in India



- In total of 28 states in India, each is dominated by a specific type and/or variety of the crops
- Basis is different Agro-ecological zones (AEZ)
- Agriculture is highly dependent on soils and climate
- Estimated to have over **49,219** plant species representing **12.5%** of the total **world diversity**

- **Optimization of tripartite approach:**
  Soil quality determination-Selection of Crop-Appropriate variety

- **Pilot scale project/programme for assessment of intermittent cropping and crop rotation system**

- **Emphasis should be on diversified crops based on agro climatic condition**

Microalgae and Marine Biomass

Macro Algae

Carbo-hydrates → Sugar → Bioethanol

Enzyme

Micro Algae

Oil, hydrocarbons → Biodiesel

- **Biodiesel from microalgae appears emerging sources of sustainable energy in India**

- **Algae farming in less than 2-3% of India's total land can make the country self-sufficient in liquid fuel**

- **The investigations so far done are meagre, considering the extensive marine algal resource and unique ecological niches along coastline of India**

- **Extensive efforts are underway to achieve commercial-scale production of microalgal biodiesel which is likely to be possible in near future**

Suggestions

Thank You