

Sustainable Agricultural Mechanization in India

Strategy and Long-term Policies



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CSAM



Indian Agriculture

- **Net sown area - 140 million ha (42.6%)**
- **Agricultural workers - 263 million**
- **Employs 52% work force**
- **Livelihood to 60% population**
- **Contributes 14% to GDP**
- **Yearly production (2016-17)**
 - **Food grains – 276 MT**
 - **Pulses – 22 MT**
 - **Fruits & Vegetables – 300 MT**
- **Land holdings – 138 million**

Indian Agriculture

LARGE > 10 ha
(1.0 mil)

Medium 4-10 ha
(5.9 mil)

Semi medium 2-4 ha
(13.8 mil)

Small 1 -2 ha
(24.7 mil)

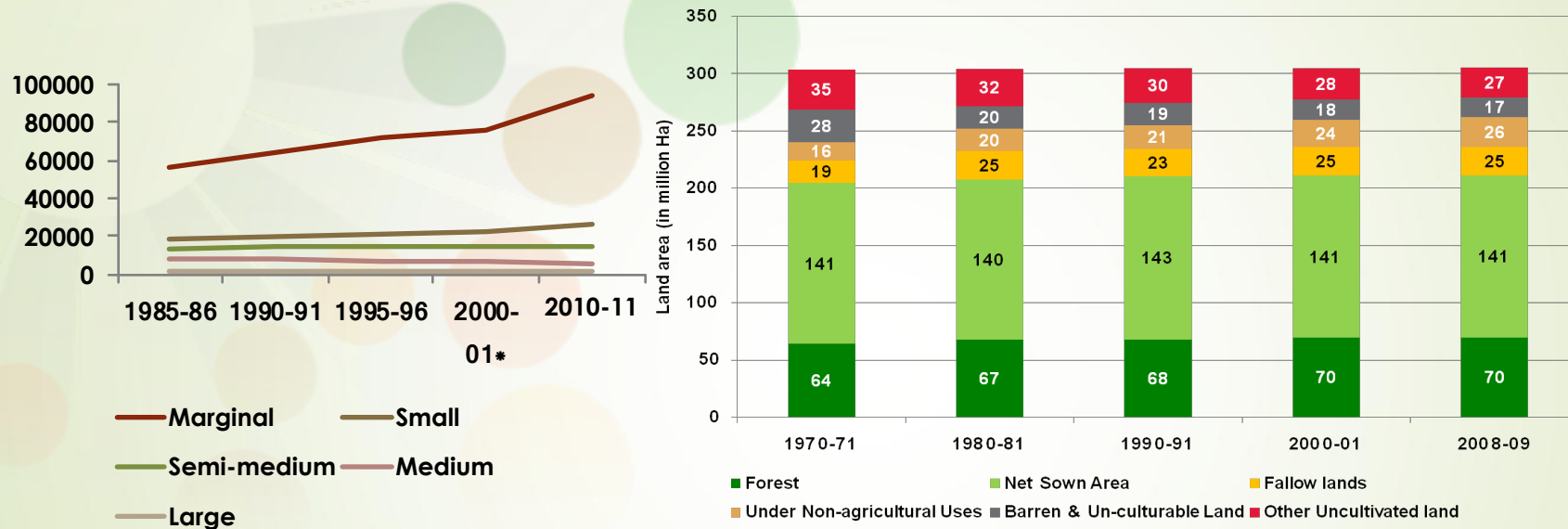
Marginal < 1 ha
(92.4 mil)

Average land holding and no. of farmers

- **Highest arable land** - 47% of total land against Avg. 11% in the world
- **Round the year cultivation** - 20 Agro-climatic regions and 46 soil types suited for round the year cultivation
- **Ranks first** in production of **Pulses**, Sorghum, Jute and allied fibers
- **Second largest producer** of Wheat, Rice, Groundnut, Tea, Fruits and Vegetables, Sugarcane
- **Third largest producer** of Mustard, Potatoes, Cotton lint, etc.
- **137.8 million cultivators**, over 5.0% own > 4 ha. Avg farm land size < 1.15 ha,

Bottom of Pyramid Country; Affordability, Equipment size are key to success.
Emerging - Cooperative ownership model/custom hiring, use of high end equipment

Land Holding Patterns Call for Smaller Mechanization Solutions...



Source: Agricultural Statistics at a Glance 2011, Ministry of Agriculture, Government of India.

- 67% more fragmentation as marginal farmers increased from 56k in 1985-86 to 92k in 2011,
- Land for agriculture -141 Mha since 1970s

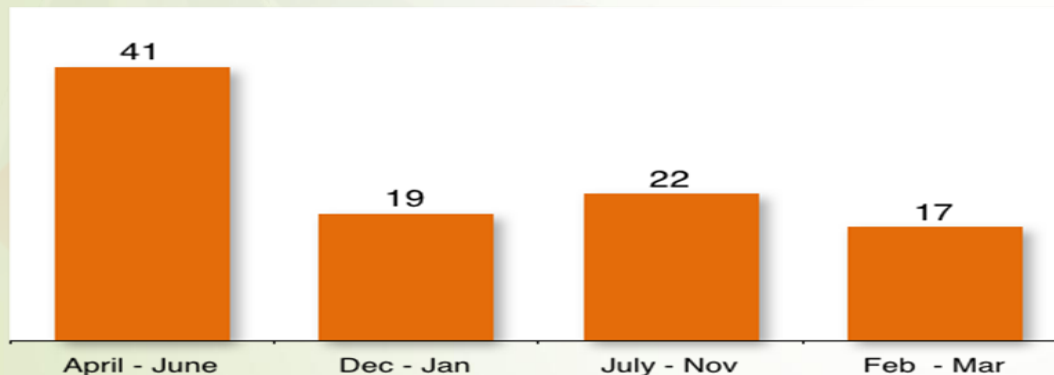
Population Dynamics of Agricultural Workers (million)

Particulars	2001	2011	2020	2050
Country's population	1029	1211	1323	1612
Total no. of workers	402	482	566	693
No. of workers as % of population	39.0	39.8	42.8	43.0
No. of agricultural workers	234	263	230	202
% of agricultural workers to total workers	58.2	54.6	40.6	26.0
No. of male agricultural workers	143.0	165.7	126.5	81.0
No. of female agricultural workers	91.0	97.31	103.5	121.0
% of females in agril. work force	39.0	37.2	45.0	60.0

Shortage of Agricultural Labour Triggering Mechanization Drive

MGNREGS wages are providing 'choice of work' to casual labour in rural areas

Seasonality in Employment



Source: Impact of MGREGA on Farm Mechanization, FICCI, 2011.

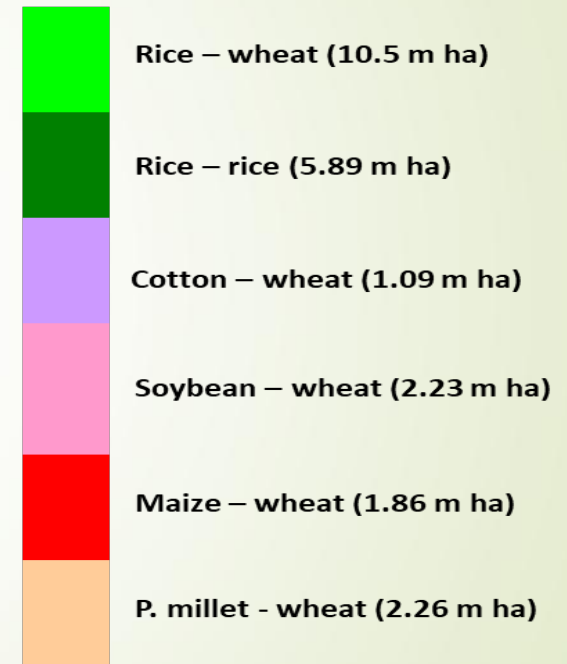
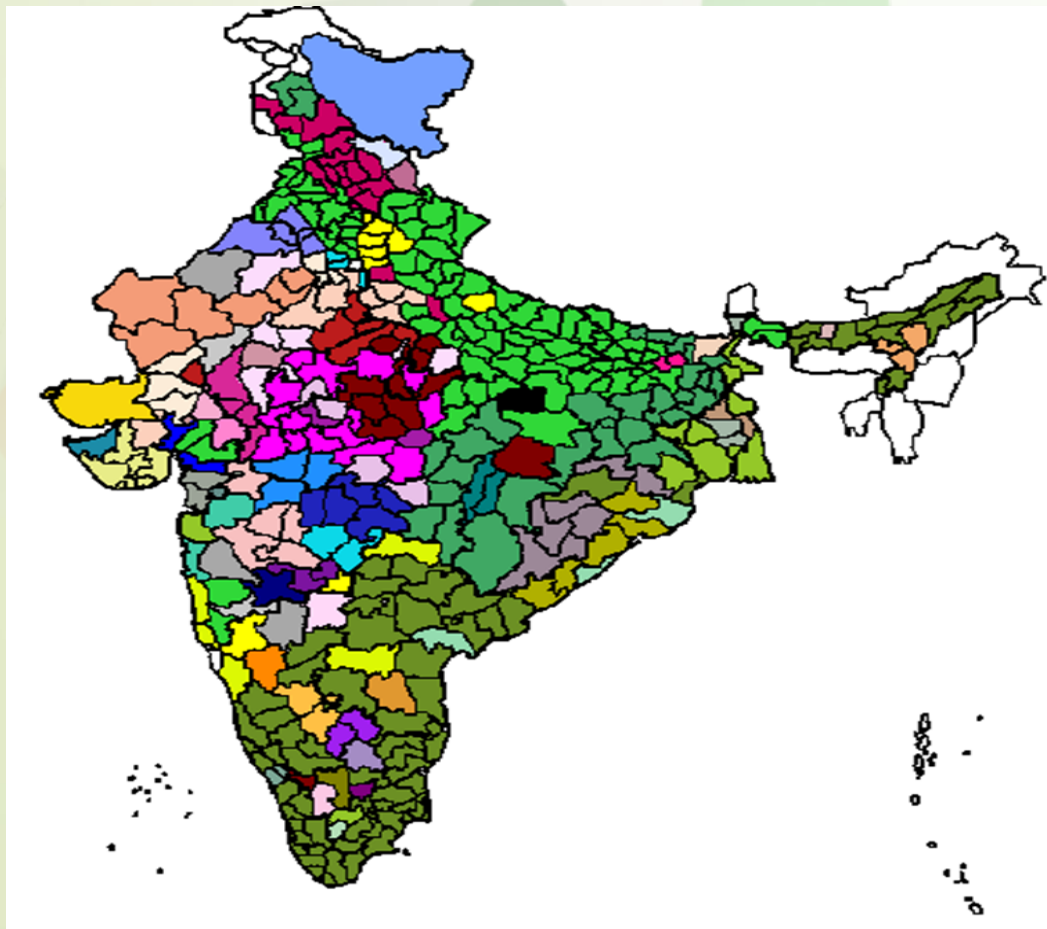
39% of annual employment under MGREGA is provided during the peak agricultural season creating shortage of unskilled labor.

Other factors contributing to shortage of labor

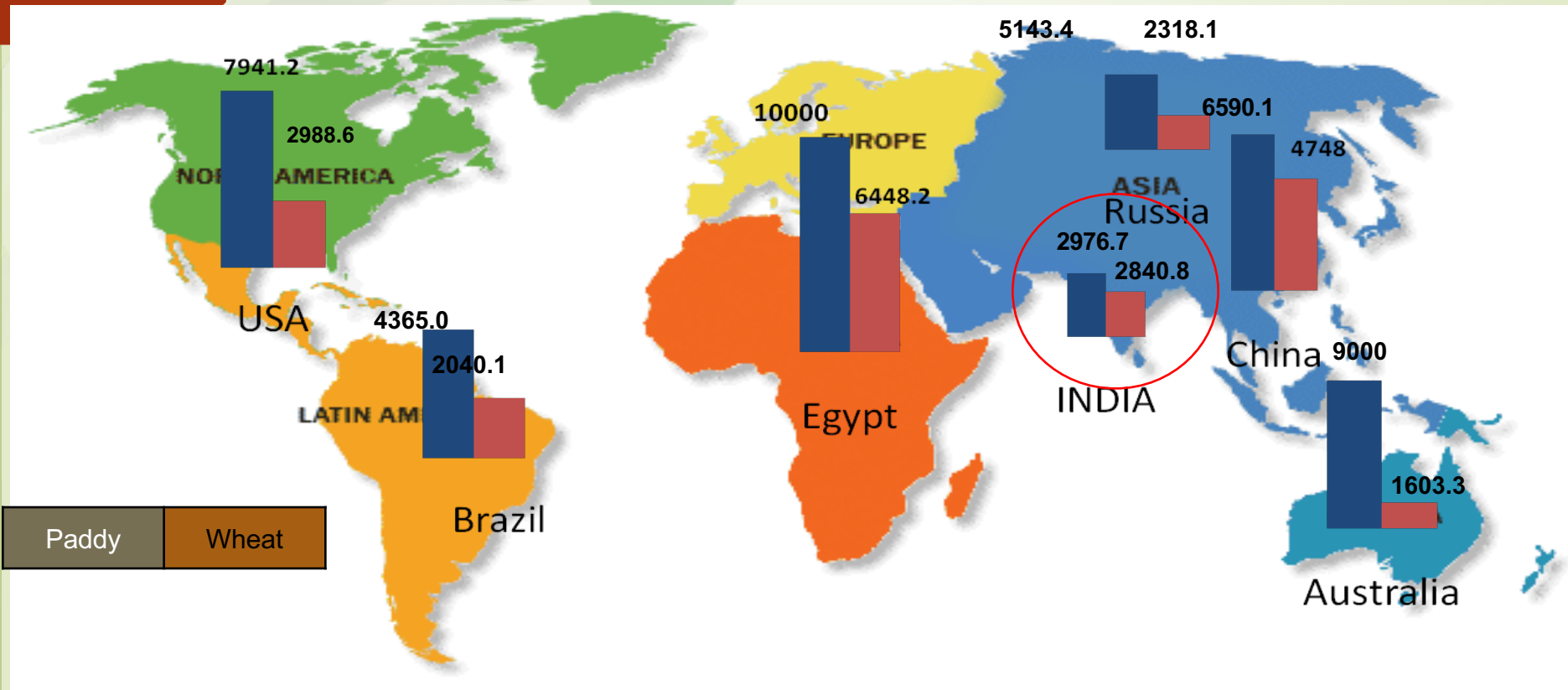
- **Shift into services sector for better working condition**
- **Increasing urbanization and migration of villagers in search of greater opportunities**
- **Rise of rural entrepreneurs who are looking to set up businesses of their own**

Shortage of Labor in the Agri Sector will drive need for mechanization and will call for machines with minimal human intervention

Major Cropping Systems



Crop Scenario



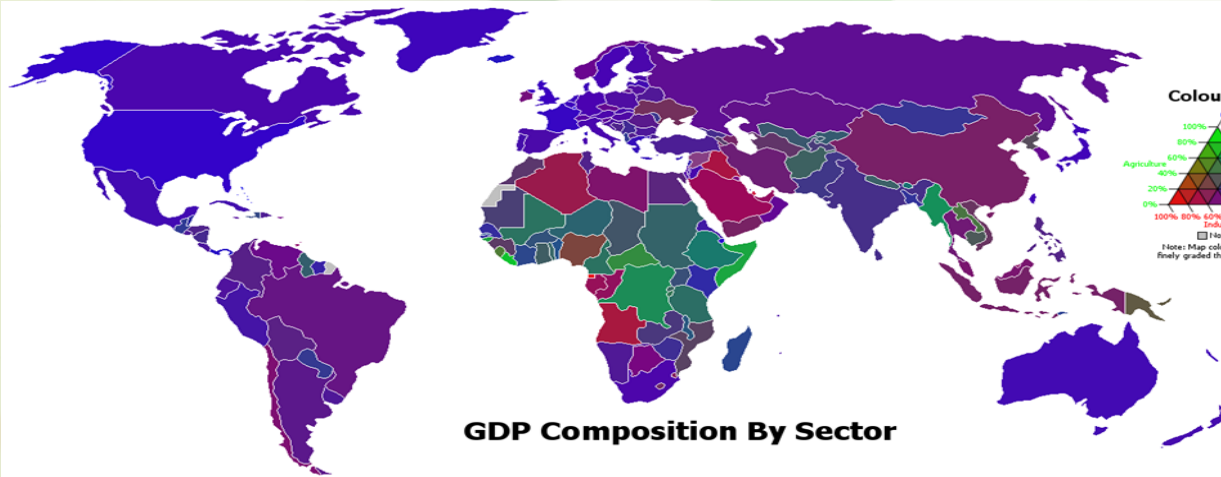
Productivity in developing nations is less

* Figures represents Yield of major crops during 2009

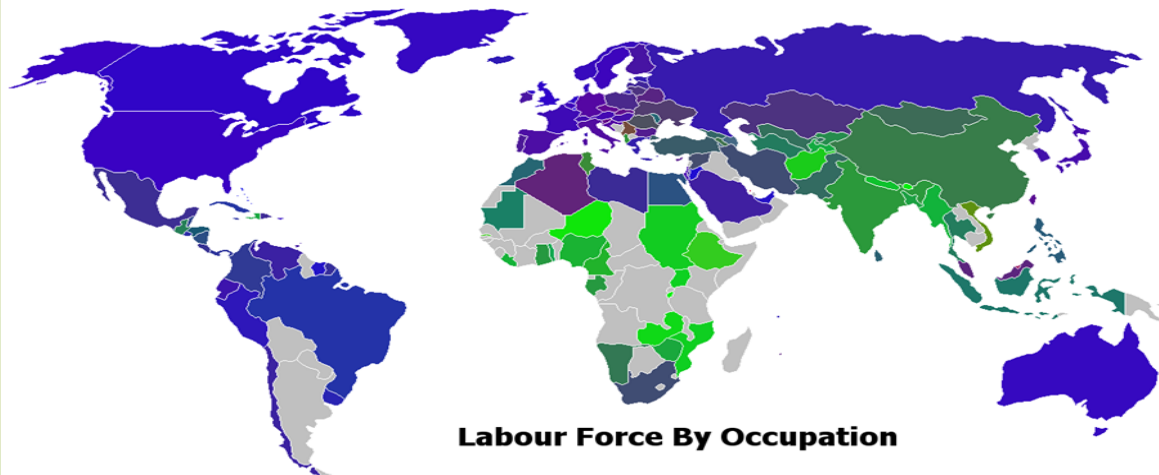
** Yield is defined as kg/ha

Source: FAOSTAT

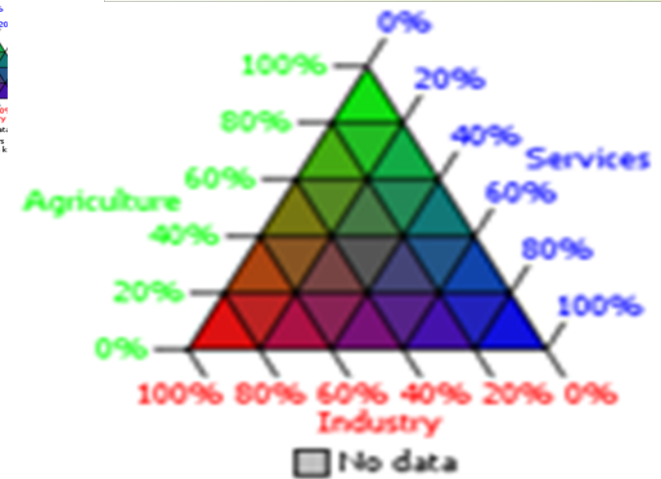
Mechanization - Precursor of Development



GDP Composition By Sector

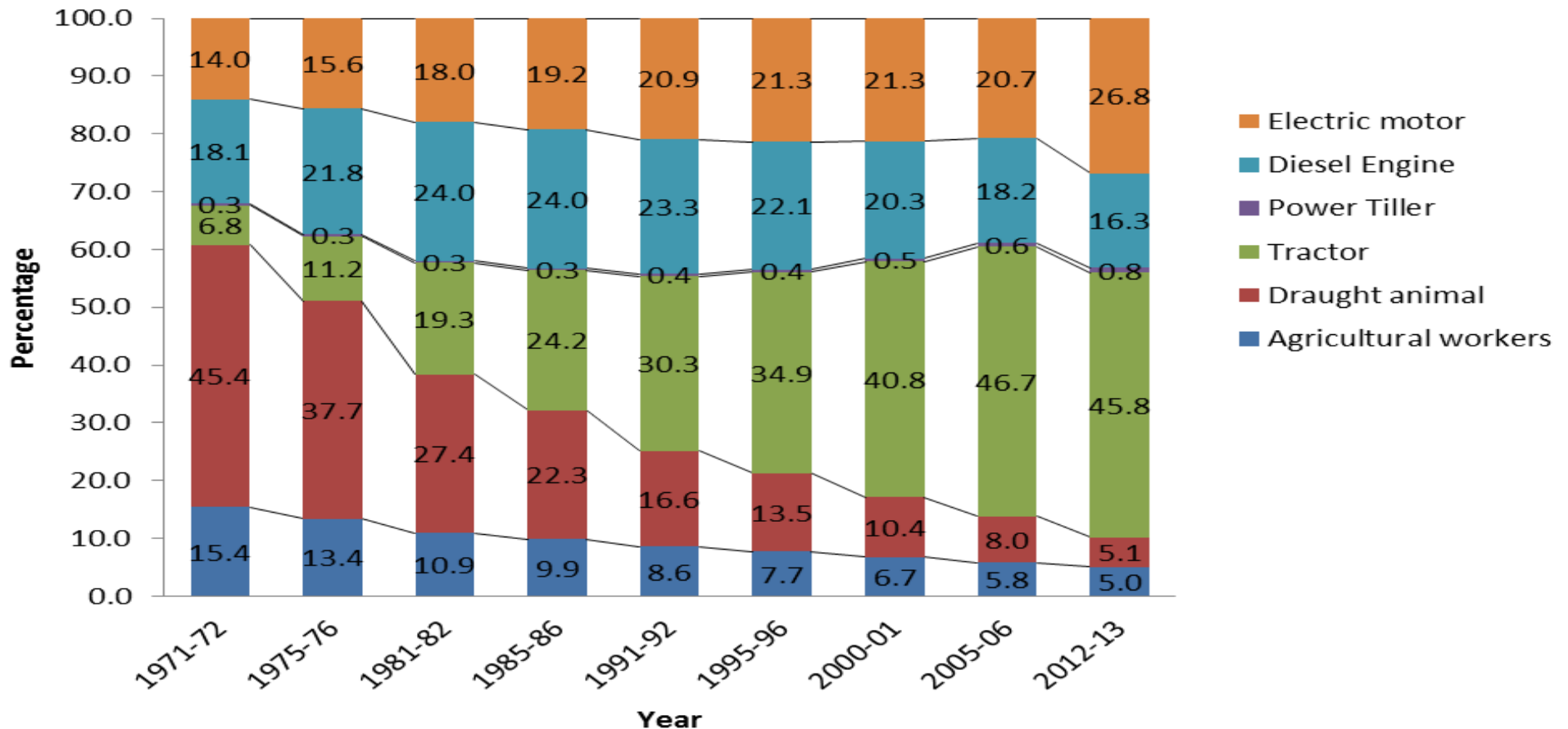


Labour Force By Occupation



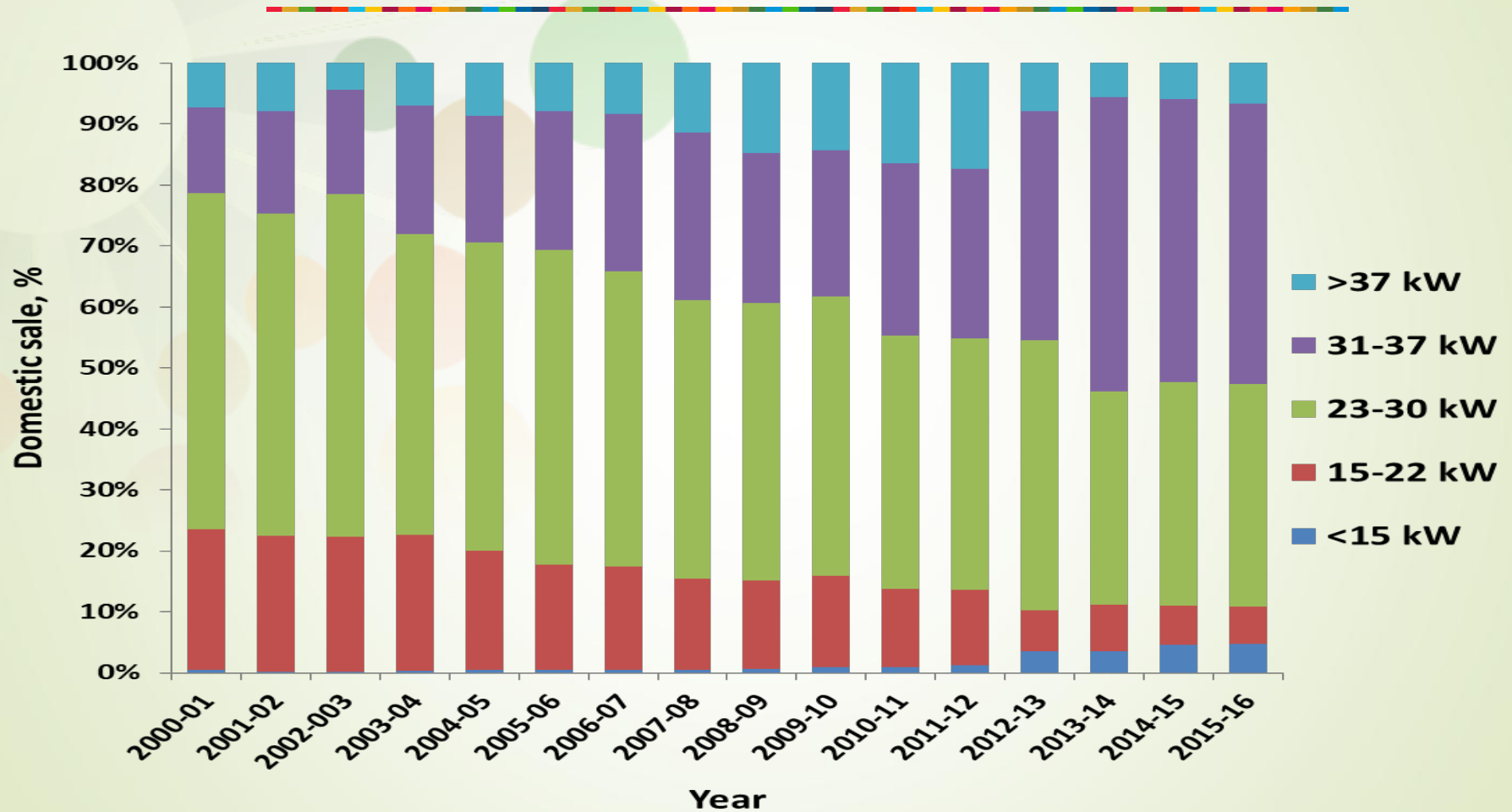
The green, red, and blue components of the colours of the countries represent the percentages for the agriculture, industry, and services sectors, respectively.

Trend in Farm Power Availability



Share of agricultural worker & draught animals came down from 60.8% in 1971-72 to 10.1% in 2012-13

Power-wise Sale Trend of Tractors



AGRICULTURE SCENARIO

- ❖ Low utilisation efficiency of critical inputs
- ❖ Benefits of engineering R&D not reaching farmers
- ❖ High post harvest losses in grains and perishables
- ❖ Only 10% of produce processing against 40-60% in other South Asian countries
- ❖ Low value-addition in production catchments
- ❖ Nutritional insecurity of rural population.

SCENARIO

- **Declining profitability due to:**
 - **High production cost and low productivity**
 - **Subsistence farming not professional enterprise**
 - **Low returns to farmers**
 - **Low levels of by-product utilisation**

SWOT

➤ Strengths

- Infrastructure of 20,000 manufacturers in small scale industry
- Vast network of academic and R&D institutions including AICRPs under NARES
- Trained manpower for R&D in agricultural engineering
- Over 150 cooperating centers of AICRPs
- Computer Aided Design for high pace of R&D.

SWOT

➤ Weaknesses

- After Sales Service
- TOT through state departments
- Liaison with industries for R&D and commercialization
- Marketing of Agricultural Equipment.

SWOT

➤ Opportunities

- Entrepreneurship for custom hiring
- Processing and value addition through APCs
- Increase irrigated area by micro-irrigation
- Precision farming technologies

SWOT

Threats

- Low profitability in agricultural enterprises
- Migration of farmers
- Fragmentation and reduction of operational holdings
- Slow pace of R&D and commercialization
- Inadequate after sales support
- Renewable energy technologies subsidy dependent

The background features a light green gradient. On the left side, there is a large, semi-transparent sunburst graphic with rays extending towards the center. Scattered across the upper left and center are several overlapping circles in various colors, including shades of green, blue, orange, and yellow. In the bottom left corner, there is a solid red arrow pointing to the right.

Strategies for Mechanization of Indian Agriculture

Strategies

- **Design, development and commercialization of farm implements and machinery for mechanisation of -**
 - **conservation agriculture**
 - **high capacity energy efficient machines for custom hiring**
 - **spraying of tall tree**
 - **cotton picking**
 - **sugarcane harvesting**
 - **horticultural crops**
 - **hill area agriculture**
 - **nursery raising under covered cultivation**

Strategies

- **Design, development and commercialisation of farm implements and machinery for mechanisation of -**
 - **root crops harvesting**
 - **feed and fodder production**
 - **seed spices crops**
 - **dryland agriculture**
 - **oilseeds and pulses**
- **Development of machinery for precision farming**

Strategies

- **Adoption of manual power operated equipment for hill areas**
- **Efficient and optimum utilization of machinery**
- **Testing for standardization and quality control in manufacturing**
- **Develop packages for major cropping systems for different states**
- **Multiply R&D products at Prototype Manufacturing Workshops**

Strategies

- **Establish Farm Machinery Banks**
- **Prototype feasibility testing and FLDs**
- **Promote custom hiring services for high capacity farm equipment**

Strategies

- **Increase farm power from 1.84 kW/ha in 2013 to 2.5 kW/ha by 2020**
- **Consolidation of land holdings**
- **Mechanization for all farmers and regions**
- **Interaction among all stakeholders**

Sub Mission on Agricultural Mechanization

- **Increasing the reach of farm mechanization**
- **Promoting ‘Custom Hiring Centres’**
- **Hi-tech, hi-value, hi-productive machinery hubs**
- **Awareness among stakeholders**
- **Quality control through testing and certification**

Sub-mission on Agricultural Mechanization

S. No.	Components
1	Promotion & strengthening of agricultural mechanisation through training, testing and demonstration
2	Post harvest technology and management
3	Financial assistance or procurement subsidy for selected agriculture machinery and equipment
4	Establishment of farm machinery banks for custom hiring by small and marginal farmers
5	Establishing hi-tech and high productive equipment hub for custom hiring
6	Enhancing farm productivity at village level by introducing appropriate farm mechanization in selected villages
7	Creating ownership of appropriate farm equipment among small and marginal farmers in the eastern/north eastern regions

Testing Network in India

1. CFMT&TI, Budni, M.P.
2. NRFMT&TI, Hisar, Haryana
3. SRFMT&TI, Garladinne, A.P.
4. NERFMT&TI, Biswanath Chariali, Assam

Other Institutions for Testing Agricultural Machinery in India (30)

SAUs	:	22
ICAR Institutes	:	3
IIT	:	1
State Govt. Institute	:	4 ¹

Policy Mandate

- **Requirement for Farm Mechanization**
 - Farm power requirement by 2020 - 2.5 kW/ha
 - Removal of regional disparities
- **Infrastructural and Institutional Framework**
 - Adequate infrastructure at implementation level
 - Effective training and extension services
 - Repair and maintenance facilities
 - Machinery banks for custom hiring services
 - Credit at simple terms
- **Appropriate Farm Machines and Equipment**
 - For small and marginal land holdings
 - Crop specific quality machines
 - For hill agriculture
 - Gender specific

Policy Initiatives to Promote Farm Mechanization

- **Training**
 - Establish 4 Farm Machinery Training and Testing Institutes
- **Demonstration**
 - Large scale demonstration of equipment at farmers field
- **Incentives for Purchase of Equipment**
 - Subsidy through MMA, NFSM, NHM and other schemes to all categories
 - Incentives for establishing Machinery Banks for custom hiring services
- **Identification of Machines**
 - Hill agriculture
 - Gender friendly tools and equipment
 - Crop specific package of machines

Policy Initiatives to Promote Farm Mechanization

➤ Manufacturing Sector

- De-reservation of manufacturing of agricultural machines from small scale sector
- Training on manufacturing technologies

➤ Quality of Machines

- Minimum performance standards for tractors, power tillers and combine harvesters framed
- Standard specifications for all machines
- Equipment promotion through subsidy: Testing by FMTTI or BIS certification is mandatory

➤ Credit

- NABARD refinance available and financing norms simplified

➤ Agro Processing Sector

- Scheme on post harvest technology
- Technologies developed by ICAR promoted

Conclusions

- Sources of power and availability
- R&D in farm mechanization through PPP mode
- Equipment / technology for increasing input use efficiency
- Custom hiring – high capacity and high labour productivity
- Quality manufacturing and reliable after sales support

Conclusions

- **Mechanization of horticulture and hill agriculture**
- **Mechanization of sugarcane harvesting and cotton picking**
- **Centralized nursery raising for horticultural crops and rice**
- **Conservation agriculture and Precision farming**
- **Ergonomics and safety in design**
- **Farm Machinery Banks**



Thank You

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