The Journey of Poplar Cultivation under Agroforestry in India

-Responding to drivers of change

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Haryana State
INDIA
### Forest Cover of India

<table>
<thead>
<tr>
<th>Class</th>
<th>Area (per ml. ha.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Dense Forest</td>
<td>8.59</td>
</tr>
<tr>
<td>Moderately Dense Forest</td>
<td>31.54</td>
</tr>
<tr>
<td>Open Forest</td>
<td>30.04</td>
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<td>Total Forest Cover</td>
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<td>Non Forest</td>
<td>254.42</td>
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<td>Total Geographical Area</td>
<td>328.73</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Extent of Forest Area (m.ha.)</th>
<th>Per capita forest area (%)</th>
<th>MAI (cu. mt. per ha.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>World</td>
<td>3999</td>
<td>0.52</td>
</tr>
<tr>
<td>India</td>
<td>70.17</td>
<td>0.054</td>
</tr>
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- **Very Dense Forest**: 8.59
- **Moderately Dense Forest**: 31.54
- **Open Forest**: 30.04
- **Total Forest Cover**: 70.17
- **Scrub**: 4.14
- **Non Forest**: 254.42
- **Total Geographical Area**: 328.73

- **Forest Cover of India**

![Forest Cover of India Pie Chart]

- **Very Dense Forest**
- **Moderately Dense Forest**
- **Open Forest**
- **Scrub**
- **Non Forest**
Forests not able to meet domestic and industrial wood demand in India.
Forestry scenario in world

- Global population increasing & so is global demand for wood - 5.6 billion cu.mt. by 2020

- Global forest area declining – 4128 m.ha in 1990 - 3999 m.ha in 2015 (GFRA - 2015) - Net loss – 129 m.ha

- Of 3999 m.ha, 93 % is Natural forest area and rest 7 % planted – since 1990 Planted forest area increased by 110 million ha

- As more Forest land is converted to agriculture more wood needed from less Forest land.

- The global demand for wood can never be met sustainably from natural forests.

- Plantations of fast growing Poplars and other species outside natural forests provide goods and services, reduce pressure on natural forests
Trees outside forests in India

- 97% Forest Area owned / managed by Government - Forests not easily accessible to wood Industries for raw material

- 90% wood based products manufactured in Private sector – Raw material coming from trees outside forests grown on Farm lands under private ownership.

- India State of Forests Report 2015 - Trees outside forests exist on 9.70 m ha. area, equivalent to 2.82% of the total geographical area.

- Due to growing demand for forest products and environmental services, the area of trees outside forests is likely to increase in coming years.
Synergy of Forest, Agricultural and Agroforestry policies

National Forest policy-1988
Forest & tree cover in the country is to be increased through massive afforestation on all denuded forests lands and agro forestry on private lands.

National Agricultural policy-2000
Agro forestry and trees outside forests are prime requisites for maintenance of ecological balance. The farmers will be encouraged to take up farm and agro forestry for higher income generation.

National Agroforestry Policy 2014
To meet the ever increasing demand of timber, food, fuel, fodder, fibre, and other agroforestry products; conserving the natural resources and forest; protecting the environment and increasing the forest / tree cover, there is a need to increase the availability of these from outside the natural forests.

The three policies
• Brought the concept of optimal & rational land use
• Instrumental in planting of fast tree growing sps.
• Increased employment potential in farm sector
• Companies invested in research & development of new clones.
• Poplars & other fast growing species emerged as future green economies.
• Lead to setting up of veneer and ply industry
Emergence of poplars on Indian Agro forestry scene

- Exotic poplars - *Populus deltoides* introduced in 1967
  - Six indigenous spp.; *P. ciliata*, *P. laurifolia*, *P. gamblei*, *P. euphratica* and *P. jaquemontiana*. Var. glauca

- Western India Match Company - Initiatives in 1980’s
  - Distributed seedlings free of cost
  - Started Bankable projects & buy back scheme
  - Research & development of new clones

- Research Institutes & Forest Department’s Initiatives
  - Developed new clones
  - Encouraged farmers to adopt agro forestry
  - Developed poplar agro forestry models

- Contributions of progressive farmers
Poplar based agro forestry in India is very dynamic and vibrant; Over 1-million hectare agricultural land under Poplar cultivation

**Poplar based Agro-forestry models:**
Agricultural crops grown under Poplar are turmeric (Curcuma longa), sugarcane (Saccharum officinarum), wheat (Triticum aestivum), paddy (Oryza sativa), potato (Solanum tuberosum), bajra/pearl millet (Pennisetum typhoides), chari (Sorgum vulgare) fodder, maize (Zea mays) fodder and barseem (Trifolium species)

*Interspaces* - 5x5 mts., 6x4 mts., 7x3 mts., 8x3 mts.

**Average productivity**
25-30 cu.mt. per hectare per year

**Progressive farmers**
50-60 cu. mt. per hectare per year, through;
✓ Better inputs-nitrogen, potash and phosphorus
✓ Termite control
✓ Management of insect pests and diseases
✓ Intercultivation operations
### Block Plantation Model (Poplar - Sugarcane – Wheat – Sorghum (Fodder))

<table>
<thead>
<tr>
<th>Crop</th>
<th>Planting/Harvesting Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poplar and sugarcane</td>
<td>First year</td>
</tr>
<tr>
<td>Two crops of sugarcane</td>
<td>First &amp; Second year</td>
</tr>
<tr>
<td>wheat</td>
<td>Sown in December first, second year harvested in April third year</td>
</tr>
<tr>
<td>Sorghum vulgare (fodder)</td>
<td>Sown in May third year harvested in September.</td>
</tr>
<tr>
<td>Wheat and Sorghum</td>
<td>grown in alternation till sixth year.</td>
</tr>
<tr>
<td>Poplar crop</td>
<td>harvested in seventh year.</td>
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### Boundary Plantation Model (Poplar-Paddy-Wheat)

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<th>Planting/Harvesting Details</th>
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<tbody>
<tr>
<td>Poplar</td>
<td>Planted in Feb. First year on raised field boundaries</td>
</tr>
<tr>
<td>Rice</td>
<td>Sown in June harvested in November same year.</td>
</tr>
<tr>
<td>Wheat</td>
<td>Sown in December first year harvested in April second year.</td>
</tr>
<tr>
<td>Wheat &amp; Rice</td>
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### Cost and Returns under block and boundary plantation models (in US $)

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<tr>
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<th>Boundary System</th>
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<tr>
<td>Cost of crops</td>
<td>4645</td>
<td>1550</td>
</tr>
<tr>
<td>Cost of trees</td>
<td>7140</td>
<td>347</td>
</tr>
<tr>
<td>Total Cost</td>
<td>6385</td>
<td>1897</td>
</tr>
<tr>
<td>Gross returns from crops</td>
<td>9022</td>
<td>3950</td>
</tr>
<tr>
<td>Gross returns from trees</td>
<td>12694</td>
<td>14810</td>
</tr>
<tr>
<td>Total gross return</td>
<td>23832</td>
<td>16644</td>
</tr>
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<table>
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<tr>
<th>Agroforestry System</th>
<th>Benefit : Cost Ratio</th>
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<tr>
<td>Block System</td>
<td>3.85</td>
</tr>
<tr>
<td>Boundary System</td>
<td>2.22</td>
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</table>
Young wheat crop under Poplar Agro-forestry

Mature wheat crop under poplar Agro-forestry
Poplar trees along boundary of rice field

Poplar along boundary of Sugarcane fields
Poplars with Turmeric under Agro-forestry

Mustard under poplars in Agro-forestry
Agro-Horti-Silviculture system
Wheat under Poplar & Mango trees

Api-culture with Poplar and Wheat Agroforestry
Demand pattern of wood for various end uses (million cu.mt)

Source: A study report, instituted by Ministry of Environment, Forests & Climate Change Govt. of India
POPLAR AGRO FORESTRY - EMPLOYMENT POTENTIAL

On Farm Lands

- Seedling development
- Tree planting
- Cultural operations
- Harvesting & transportation.

- One hectare poplar plantation → 450 person days employment
- Total agricultural land in 4 major poplar growing states → 17.7 million hectare
- With 10-12% farm lands under poplar and other fast growing agro forestry species means livelihood for 10 million people over the rotation period of 6 years.

In Wood Industry

- Contractors
- Commission agents, Traders
- Industrial labour

- Total wood based value chain → sustainable livelihood for 22 million people

Indian furniture market
- Estimated at; 8.0 billion US $, employment potential; 0.3 million people

Housing & construction
- Wood/ply requirement for doors, windows, flooring, cabinets etc. 3.0 billion US $
Ample employment opportunities with Poplar Agro Forestry

1. Cutting of wood
2. Transportation
3. Peeling of wood
4. Veneering
Labour harvesting mature wheat crop in Agro forestry system

Harvesting Sugarcane grown with Poplars in Agro-forestry
Price trend of Poplar wood for last 20 years (1996 to 2016)
Poplar price trend

Price dip of 2004

- Consolidation of land in the main poplar growing regions
- Supreme Court of India imposed a ban on un-licensed Industrial units
- Absence of State Control over un-regulated market system
- Lack of direct farmer-industry linkage.
- The role played by timber merchants acting as commission agents,

During next 10 years, the Poplar price saw a rising trend, stabilizing at times.

Price dip of 2012

- The slump in real estate business (i.e. housing) caused by stricter Income Tax laws and more financial accountability bottomed the demand for plywood and veneer
- The changes in General Sales Tax (GST) structure brought in desired accountability and transparency in wood business
- The imports of soft woods and furniture from other countries influenced the local ply and veneer industry and therefore Poplar agroforestry.
Restrictive regulatory regime:

• Restrictions on harvesting and transportation to prevent pilferage from government forests.
• Obtaining permits for harvesting and transportation cumbersome, costly and frustrating, discourage farmers from undertaking tree planting on farm lands.
• Changes required in policies and rules of State Govts.
• State Governments slowly responding to desired policy changes

Insufficient research, extension and capacity building:

• Over 30 research centers of ICAR involved in agroforestry research, coordinated by the National Research Centre for Agroforestry (NRCAF).
• Need to set aside some seed money to fund time-bound research projects with specific objectives
• Lack of a dedicated extension system, replication required on the ground.

Dearth of quality planting material:

• Planting material - Seeds, Seedlings, clones, improved hybrids varieties not available.
• Certification of nurseries, seeds and planting material required
• Private sector participation required in production and development of quality planting material.
• Work being done but much more desired.
Institutional finance and insurance coverage:

• Institutional finance lacking as techno-economic parameters required by financial institutions (FI) to evaluate finance needs and viability of the projects are not satisfactory.
• Little done in developing and popularizing insurance products for agroforestry ventures.
• Need for setting up of banking institutions to address specific needs of agroforestry sector.
• Dedicated Farmers Producers Organizations (FPO) required to organize the farmers.

Weak market access for agroforestry produce:

• The marketing infrastructure (market yard, etc.), including “price discovery” mechanisms unavailable except in few states, so a buyer’s market and the middlemen get the major share in profit.
• Marketing infrastructure and market information system similar to one for agricultural commodities, is required with more private sector participation.

Industry operations at a sub-optimal level:

• Regulations governing industry are quite stringent, cumbersome and time consuming and not encouraging to instill confidence in industries.
• Nearly $7-8 billion worth wood-based products are imported annually due to low import tariff responsible for negative growth of Agro forestry and WBI in India.
• Agroforestry policy need to facilitate production of finished goods at competitive prices for generating local employment and reducing burden on imports.
In India Poplar based agro-forestry success has ensured:

- Opportunities to all stakeholders in meeting the socio-economic needs, environmental development and preservation of gene pool & bio-diversity.

- Supply of Poplar wood grown under agro-forestry system has taken off pressure from natural forests.

- To a considerable extent Industries are able to meet their raw material requirements from locally available farm based wood products.

- Agro-forestry has provided an opportunity to meet the challenges of social issues viz; poverty, hunger, health and environmental sustainability.

- Multiplier effect on economy through overall socio-economic development.

- Ecological restoration through increase in tree cover.

- Carbon sequestration, carbon credits climate change mitigation.

Poplar Agro Forestry has proved to be a land management system for Integrated rural & industrial development.
THANKS