IGNFA

"Agro forestry as a means for increasing Tree Out side Forests(TOF)"-Prospects and Challenges

Arial view of the landscape near Hoshiarpur division

Arial view of the landscape near hoshiarpur division


Google

Mind Boggling facts

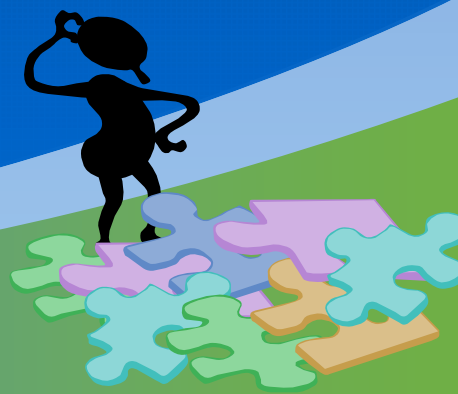
- ITC Bhadrachalam is supplying more than 2 crore seedlings annually(6000 m)
- Average Productivity of these clones is about 20-25 m^3/ha/year under rainfed condition
- Some farmers getting trend setting productivity of about 50 m^3/ha/year under irrigated conditions.

Mind Boggling facts

- Trees out side forests in Punjab
  - Stems out side forests are 612 lac
  - Growing stock out side forest area in Punjab is 20.012 million m^3
  - Harvested Timber from out side forests in Punjab is 15 lac m^3 /year. (From government forests is 1.2 lac m^3 /year)

Mind Boggling facts

- In Haryana, the area under trees on farmlands grew at a rate of 53% per annum between 1975 and 1984.
- In Haryana Timber harvested from community and farm lands is 28 lac m3/year (From government forests is 1.9 lac m^3/year)
- Over 200 factories in the twin cities of Jagadhari and Yamunanagar produce poplar and other timber products worth over
  - Rs 1000 crores per year.



Policy Imperatives & scope.

- National Forest Policy envisages 33 % tree cover(Total land available in the country-328.7 M. ha)
- NFAP envisages that by 2010 : 25 % of the area should be under tree cover.
- In 2013 -24.01%,2015-24.16%
- In 2017 achieved 24.40%(21.54+2.85)
- Total Forest cover and tree cover in the country
  - 70.80 M.ha +9.38 M. ha =80.20 M.ha.

Open forest land in the country 30.17 M.ha(25%= 7.5 M.ha)

- Out of 676 Districts in the country
  - 262 have less than 10% of forest cover
  - 175 have less than 5% of forest cover
  - 48 have less than 1% of forest cover (SFR 2017)
- The productivity of the forests is very low and the average MAI is less than $1m^3$/ha/year

An additional 28 million ha required..?

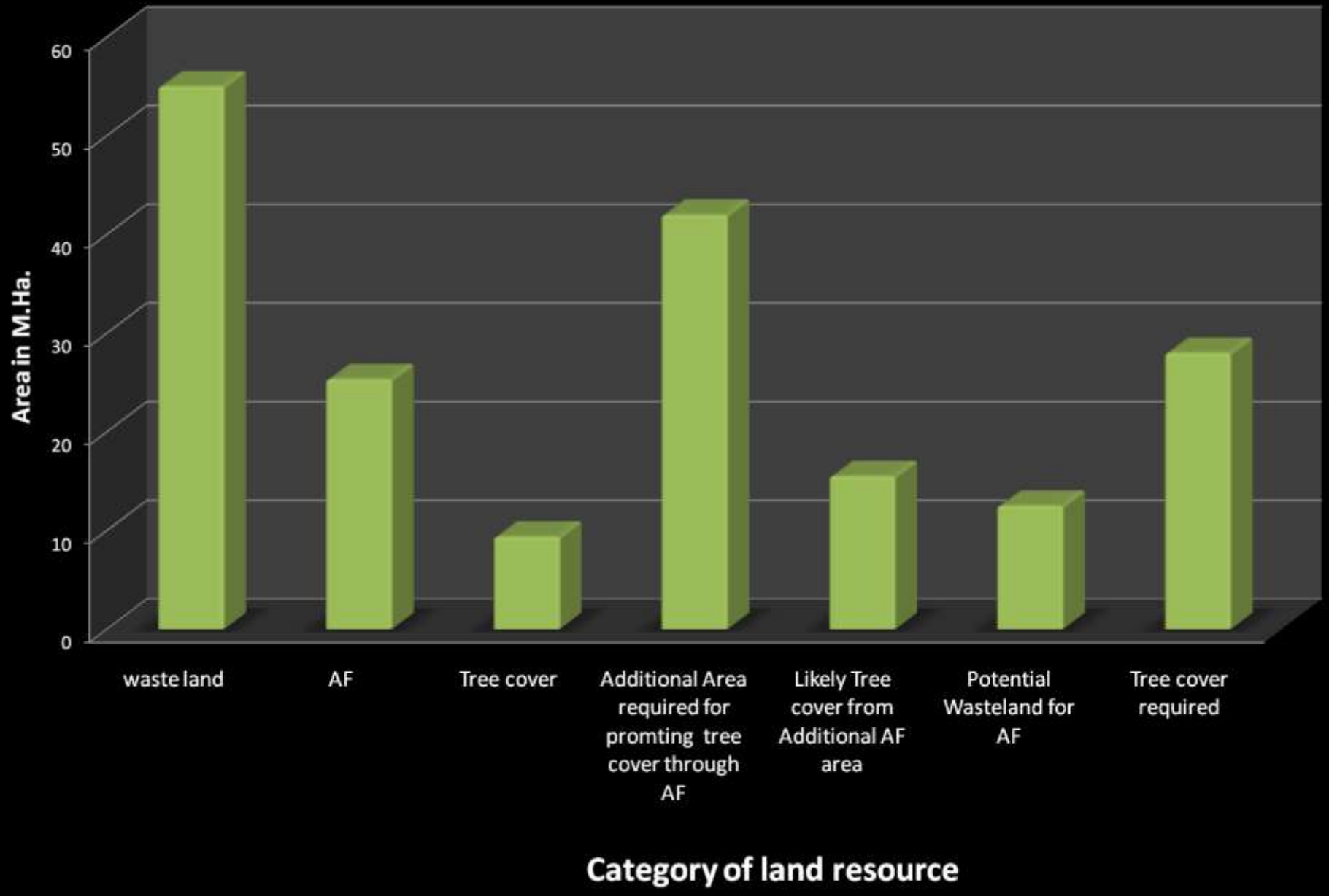
- 55 M.ha waste land (25 %=12.5 M.ha)
- 143 M.ha agricultural land

a)25.32 M.ha under AF , @18 % of Agri.Land- Dayani *et al*)

b)CAFRC-13.75 M.ha

c) FSI- 9.38 M.ha(42 M.ha agri.land need to be under AF 15.5M.ha)

Potential Area Available for promoting TOF



Change in Tree Cover

Andhra Pradesh	**2141.59 sq.km-**	**Conservation of plantation in forest and outside forest**
Assam	**567 sq.km**	**Outside Forest**
Bihar	**4551 sq.km-**	**Due to plantation and TOF**
Goa	**19 sq.km**	**TOF**
Gujrat	**47 sq.km**	**Plantation & conservation in forest & outside forest**

Haryana	859 sq. Km	Expansion outsided tree forests
Karnataka	1101 sq. Km	Mainly palm plantation outside forest area & Density improvement in scrub forests & Expansion of management forest
Kerala	1043 sq. Km	Commercial plantation TOF and better resolution
Punjab	66 sq. Km	TOF
Telengana	565 sq. Km	Mostly TOF
Uttarakhand	23 Sq. Km	TOF
West Bengal	21 Sq.Km	TOF
Dadra & Nagar Haveli	1 sq. Km	TOF

Growing Stock

- Total Growing Stock is estimated to be 5822.377 million cubic meters
- Less than 1% increase in 2 years
- 54.97 cubic meters Average Growing Stock per ha in Forests

Forest
4218.380
million cum

TOF
1603.997
million cum

STOCK-present

- In two years 23.33 M.cum stock in forest over a area 7,64,500 sq.km(0.305 cum/ha) has increased
- Whereas, 30.6 M.cum increased in TOF over a area of 93,815 sq.km(3.262 cum/ha) which is thrice more than the forest stock.

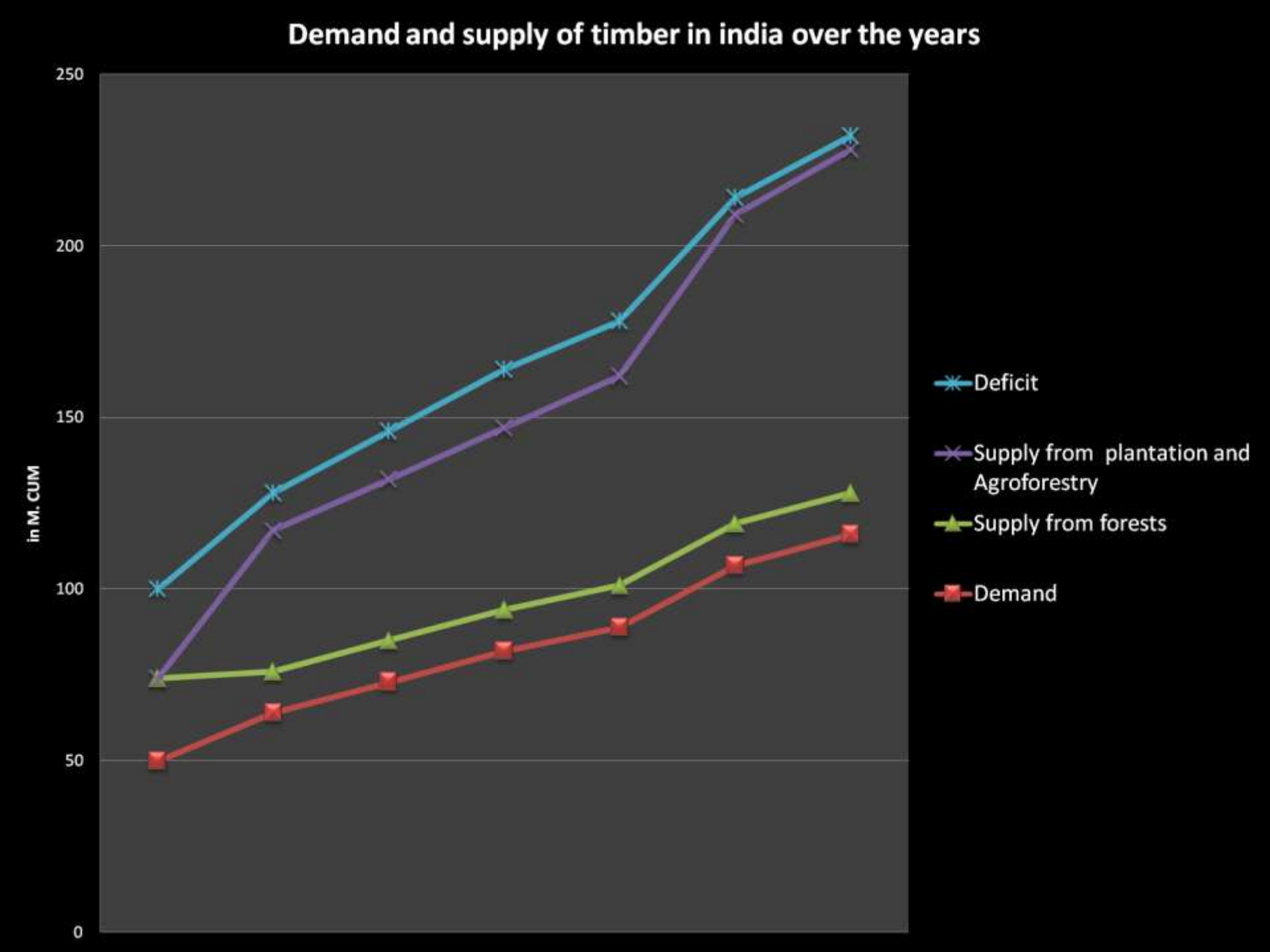
Potential production of timber from TOF

- TOF plays an important role in production of timber and fuel wood
- About 80% of people's demand of timber and fuel wood is met from TOF.
- As per the latest assessment, total annual production of timber from TOF is estimated as 74.48 m.cum.

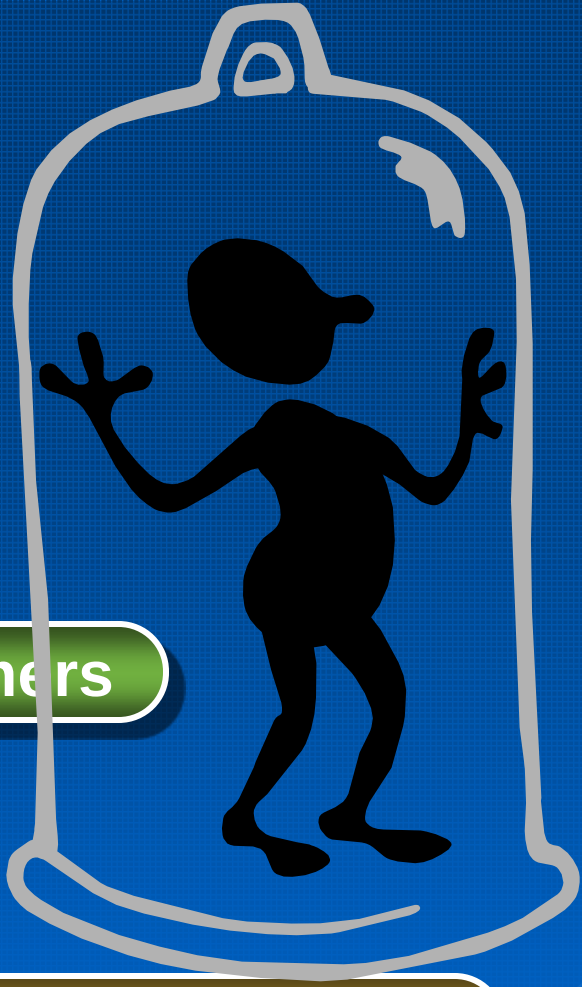
Demand and supply of timber for Furnitures, Agriculture and Industry (m cum)

Particulars	1985	1996	2001	2006	2010	2020	2025
Demand	50	64	73	82	89	107	116
Supply from forests	24	12	12	12	12	12	12
Supply from plantation and Agroforestry	0	41	47	53	61	90	100
Deficit	26	11	14	17	16	5	4

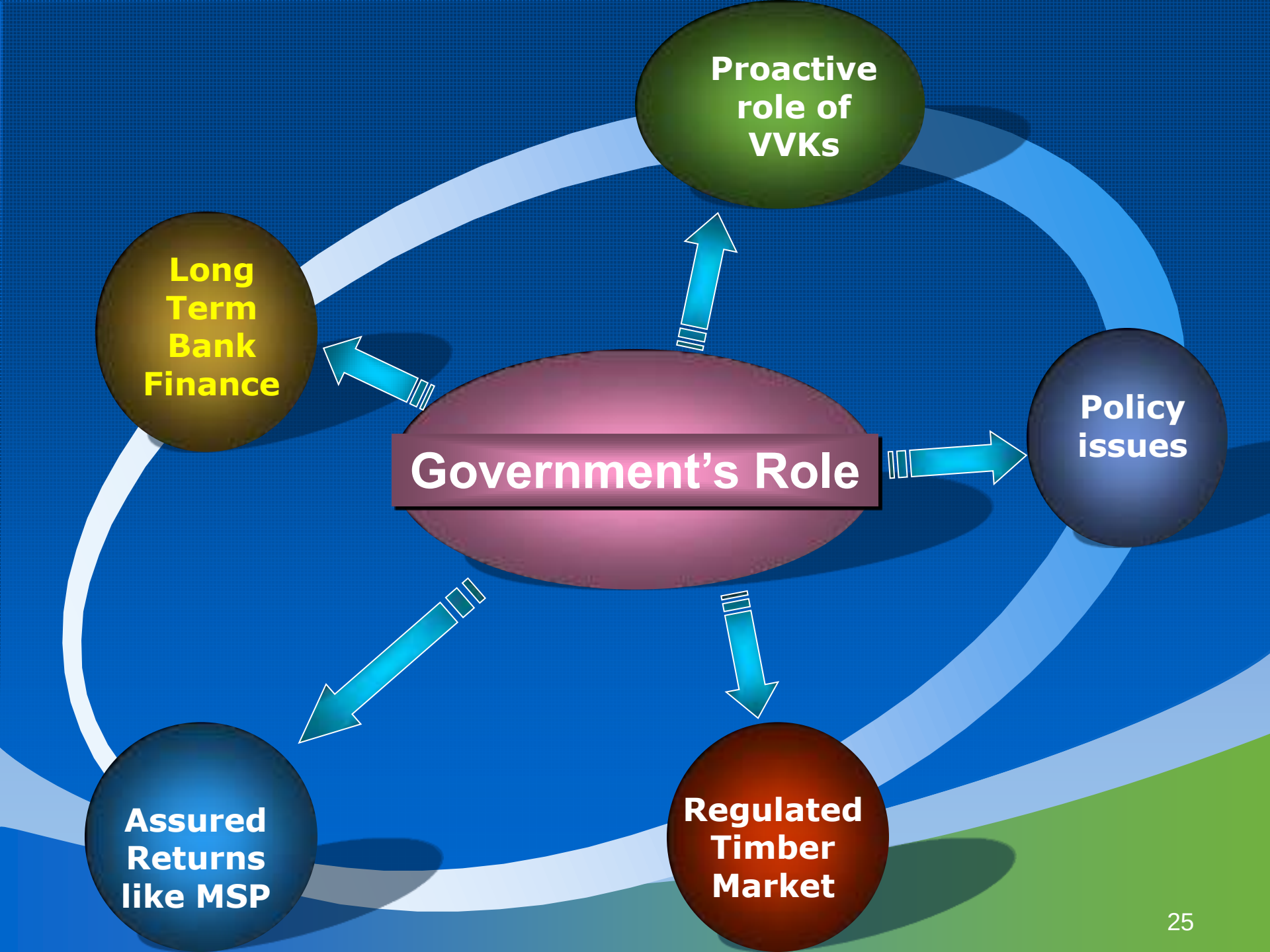
NCRAF 2007


Demand and supply of timber in india over the years
250
200
150
100
50
0
in M. CUM
Deficit
Supply from plantation and Agroforestry
Supply from forests
Demand

Constraints



1. Lack of market information
2. Lack of financing options
3. Information of buyers not with farmers
4. Margins of middlemen quite high
5. Assured Quality and Quantity problem for buyer
6. Highly unorganized sector
7. Lack of Volume tables/productivity of species


Proactive role of VVKs
Long Term Bank Finance
Government's Role
Policy issues
Assured Returns like MSP
Regulated Timber Market

Way ahead….

Insurance

AF plantation Insurance- TN- United India Ins.

– Kerala- coconut,rubber

– Agricultural Insurance Company India Limited

Bio fuel plant /tree

- Credit and market facility.
- PPP- Model TNPL,ITC,West Coast Paper, JK paper,WIMCO

- Agroforestry tree manual.
- Region based model for small, marginal &large farmers.
- Uniform regulatory regimes
- Need to focus on PES of agroforestry system.

Carbon Sequestration potential and likely CDM benefits

Plantation model	Annual sequestration potential (t/ha)	Likely Annual benefits (Rs/ha)
Rupnagar, Punjab		
Poplar bund	1.42	298
Eucalyptus bund	1.62	340
Bazpur Uttarakhand		
Eucalyptus bund	1.64	344

Assumption 1 t c= 5$ and one US$ = Rs.42/-

Gera et al., 2006, Hooda et al., 2005

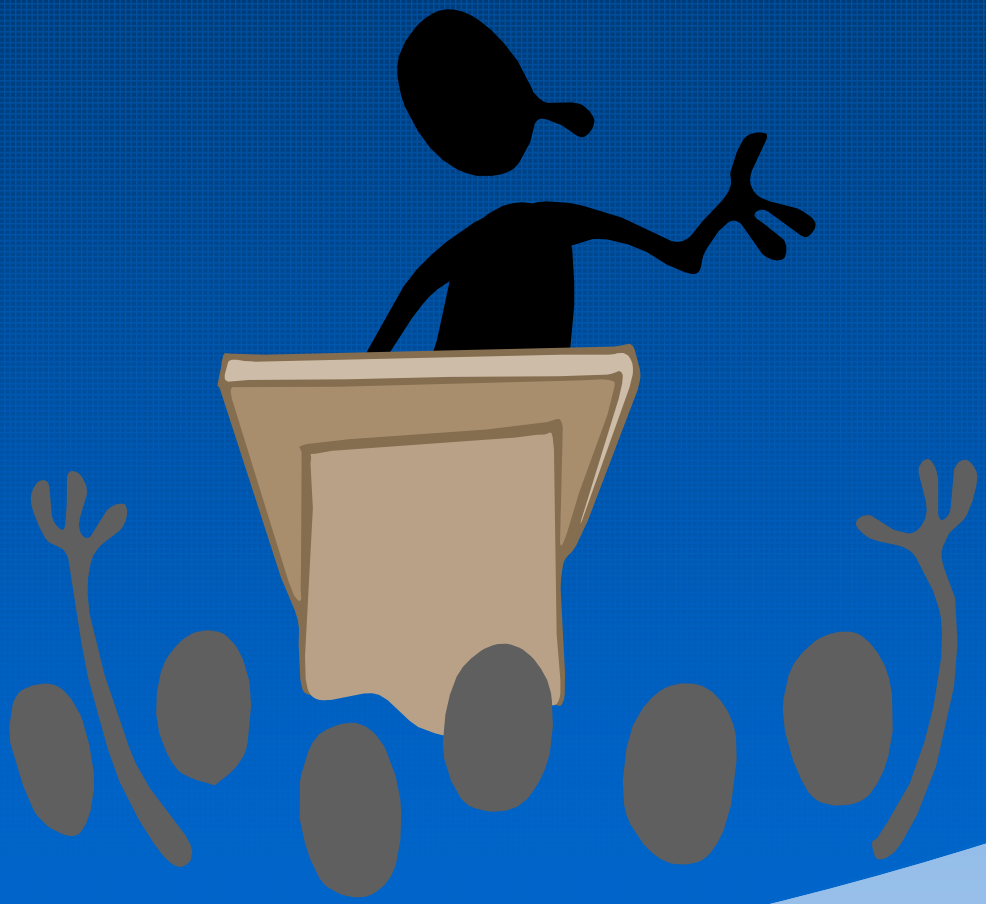
- Average carbon storage by Agroforestry systems
  - Semi arid - 9Mg C /ha
  - Subhumid -21Mg C /ha
  - Humid -50Mg C /ha
  - Temperate- -63Mg C /ha
- Contribution of agro forestry to global carbon sequestration is 1.9 Pg of carbon over 50 years.(world wide estimates of 1023 M ha)

- NAF Mission/Board- Target oriented
- Strengthening zone based research on species.
- Create a base line agro forestry plot in term of no of trees and size of plot under AF for subsidies &incentives.
- Precession assessment –GIS(Area,stock availability)- i-Hariyali
- Certification- seed,planting material in long turn lead to less to zero input farming-

- Contract farming modal- TN
  - Credit
  - Research Institute(material,site specific Tech.)
  - Contract with industry.

  Revive &replicate time tested sustainable model.
  - Convergence of Govt. scheme

Queries ??



Contributions of Agroforestry produce to national demand by 2025

Product Category	Total Demand	Contribution from Agroforestry			Contribution from Agroforestry(%)
		Traditional	Improved	Total	
Timber(M cu m)	116	52	48	100	86
Fuel Wood(MT)	330	60	13	73	22
Fodder(MT)	1040	100	12	112	11
Fruits(MT)	43	1.5	4.4	5.9	14
Bio fuel(million of bio-diesel)	10	0.5	5.4	5.9	59
Food(MT)	308	7	15	22	7
Bioenergy(MW)	16000	4000	1000	5000	3

NCRAF 2007

Yes....possible

Species	Variety	Spacing (in feet)	Density / ha	Period (In years)
Casuarina	MTP 2	5x5 ft	3200	3
Eucalyptus	MTP 1	6x6 ft	3000	3
Melia	Melia CL26	6x6 ft	3000	2
Subabul	FCRI LL15	4x4 ft	5500	3
Dalbergia	MTPDS18	6x6 ft	3000	3
Kadam	AC 13	6x6 ft	3000	3
Jatropha	CJH12	10X10ft	1100	Annual after 3 years

Governments Interventions

- Protection to farmers from import in initial stages
- License process for new wood based industries be eased in areas where raw material is not forest produce.
- Permit Raj
- Ceiling limits be revised for the waste lands
- Tax Benefits be given to attract more investment in the sector

Governments Interventions

Facilitate → **Propagate** → **Sustain**

1. Protection to farmers from import in initial stages
2. License Raj be eased
3. Permit Raj
4. Ceiling limits be revised for the waste lands
5. Tax Benefits be given to attract more investment in the sector

1. **Ensure higher economic returns**
2. **Involve corporate sector in producing High quality planting stock**
3. **Subsidies for farm/agro forestry from NABARD**
4. **Government should supply only high yielding varieties to farmer**

Governments Interventions

Facilitate

1. Protection to farmers from import*
2. License Raj be eased
3. Permit Raj be stopped
4. Ceiling limits be revised for the waste lands
5. Tax Benefits be given to attract more investment in the sector

Propagate

1. Ensure higher economic returns
2. Involve corporate sector in producing High quality planting stock
3. Financing for farm/agro forestry from NABARD
4. Government should stop supplying poor planting material*

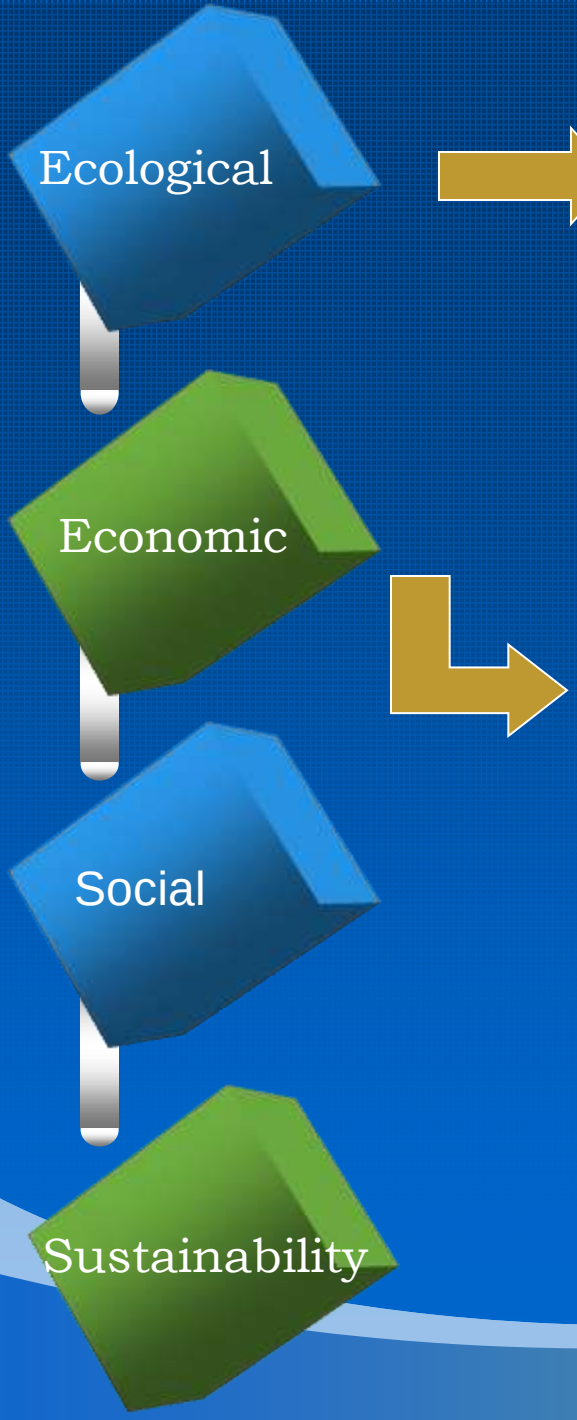
Sustain

1. Market regulation by government to
   - Avoid price crash
2. Create long term demand

Need for Agro forestry

1. Higher productivity
2. Soil conservation
3. Cycling of nutrients,
4. Better microclimatic conditions for crops

Need for Agro forestry



1. Higher productivity
2. Soil conservation
3. Cycling of nutrients,
4. Better microclimatic conditions for crops

1. Better economic yield, Insurance against floods and droughts
2. Reduce timber demands from natural forests
3. For the development of wastelands
4. To reduce demand supply gap

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1. Rural dependency on fodder and fuel wood
2. Reduce biotic pressure on natural forests
3. Pollution reduction
4. Climate change

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1. For Maintaining soil Productivity
2. For maintaining Ground water level

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Agro forestry potential answer to problems in India's forestry sector

Economics

- On lease -30 – 40 thousand /acre/year
- On cultivation- (Rice and Wheat)
  Input –Rs 22,000
  out put-Rs 42,000
  profit –Rs62,000

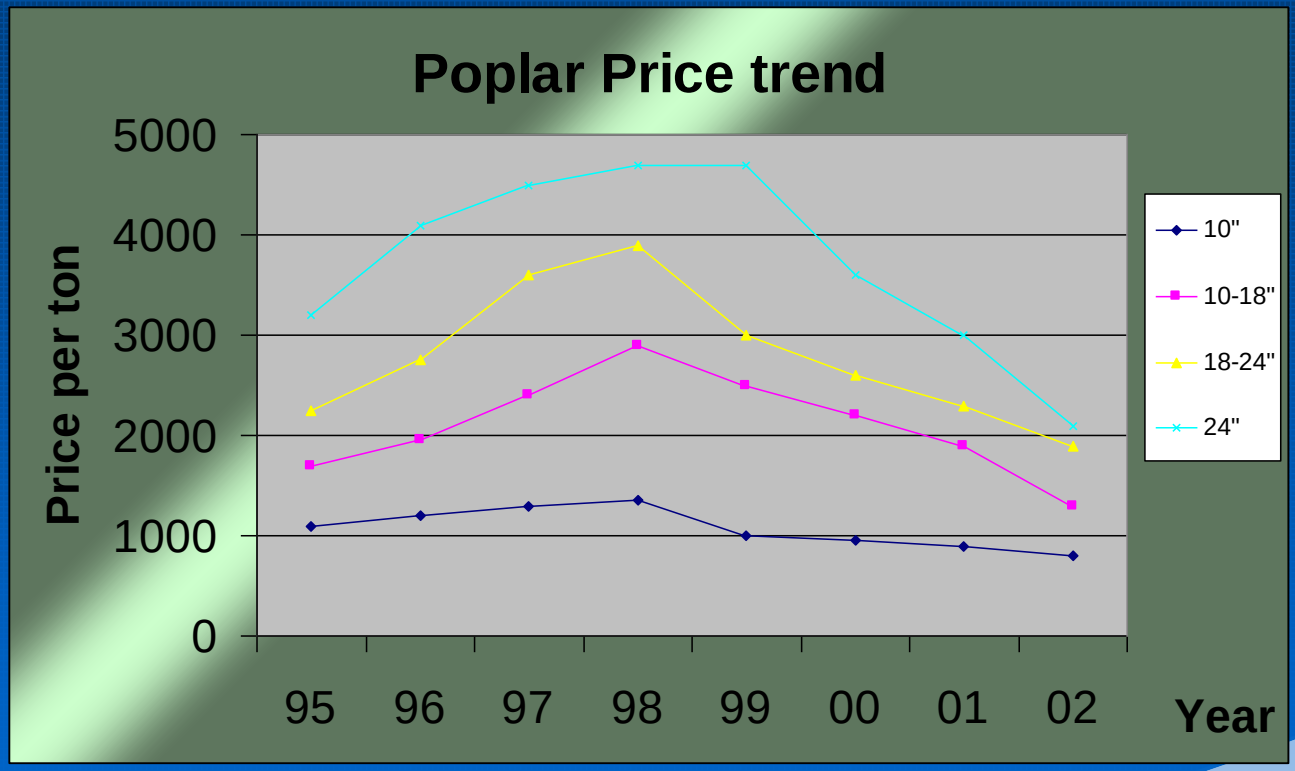
- In agro forestry model
- 1st year Popular +Wheat+Haldi= Rs 42,000+25,000
- 2nd year popular+ wheat+Maize or Haldi= Rs 42,000+25,000

- 3rd year Popular + Haldi =Rs25,000
- 4th year popular +Fodder crop= Rs10,000
- 5th year popular harvesting.
- 200-400 plant/acre fetches 3-4quintal *2000= Rs4,00,000.
- From agriculture=Rs 2,00,000
- Agroforestry Rs 4,00,000 +1,10,000 =5,10,000

Threats
Case study of poplar price crash

Farmers in Haryana Alone Lost Rupees 210 Crore annualy during the price crash on 14 Lac tonnes of poplar due to drop in price of @ 1500/- per ton. In four years losses to farmers have been to the tune of 840 crores

Poplar Price Crash



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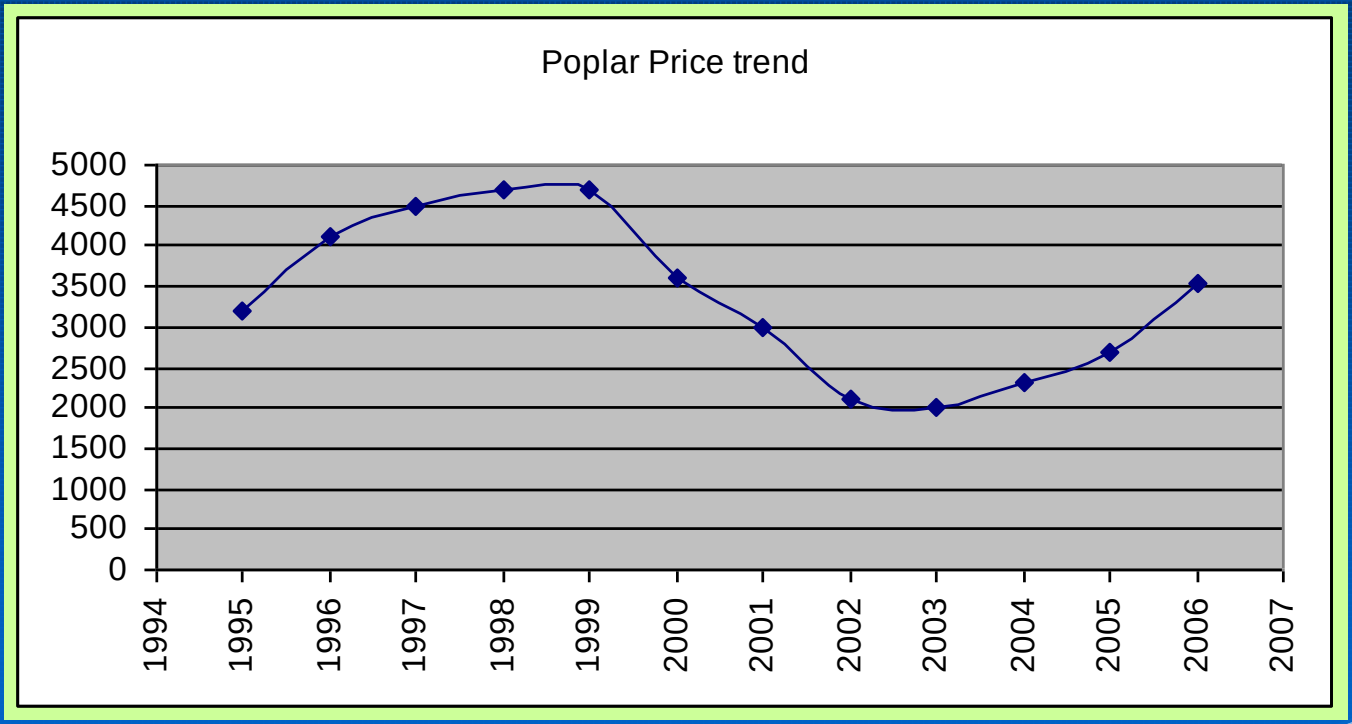
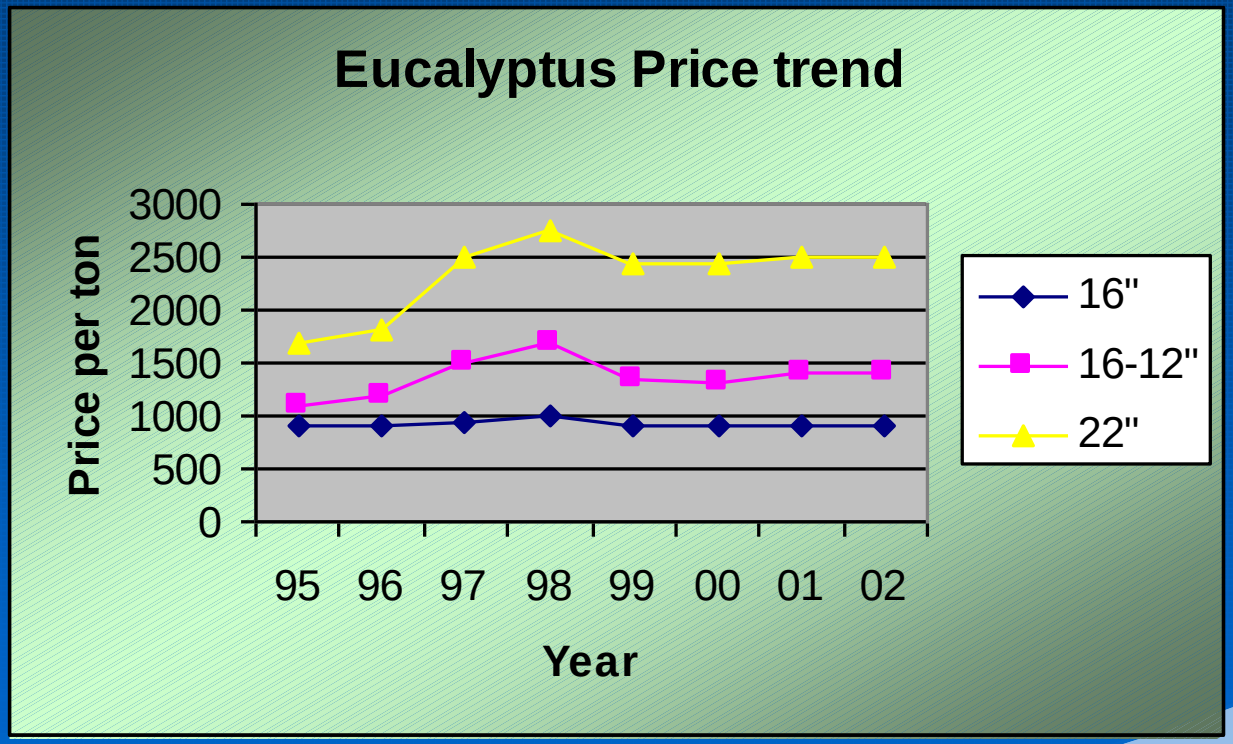
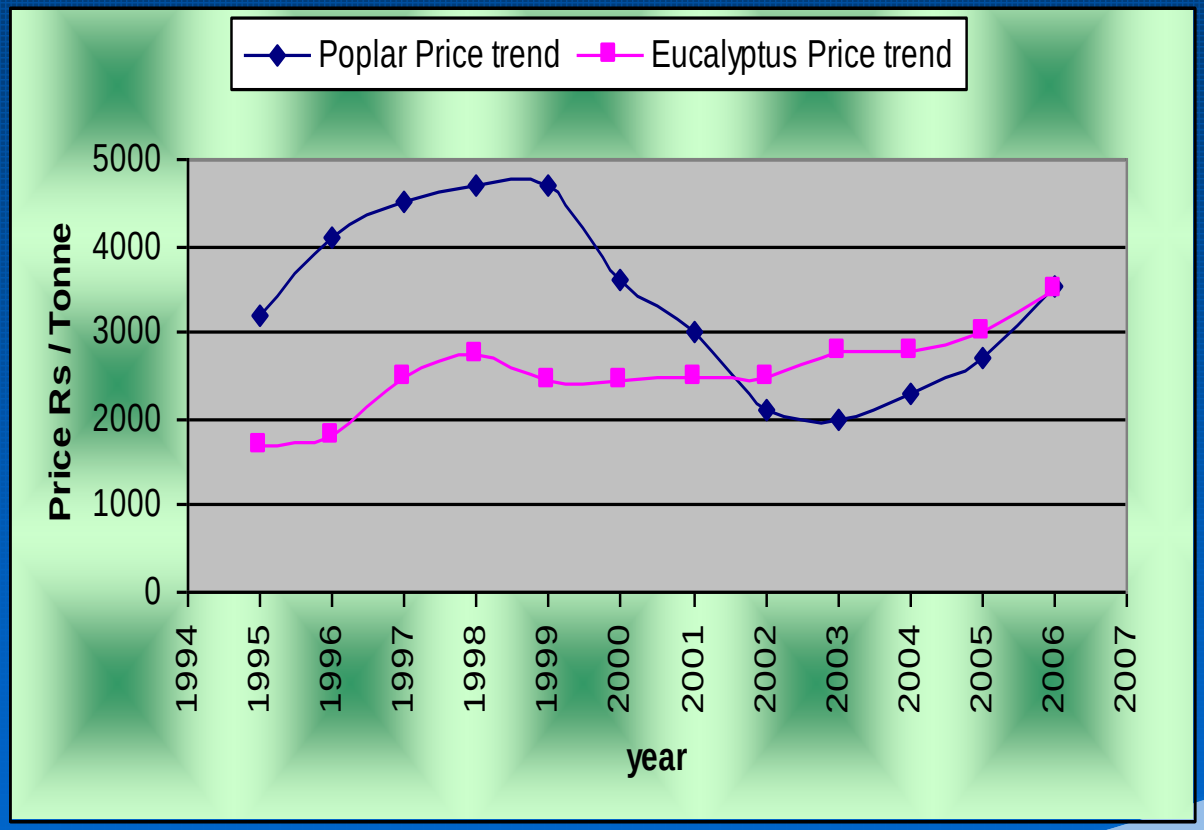


Eucalyptus Price trend



Price Trend Eucalyptus and Poplar



Reasons For price crash

- Year 2002 being the drought year there was distress selling by farmers.
- Land consolidation in UP and Uttaranchal
- Lack of market information, rumors, exploitation by middle men
- Judgment in the case of godaverman regarding sawmills and wood based industry lead to rumors, given air by small industries and contractors.

- ToF supplies 49% of the 201 million tonnes of fuelwood and 48% of the 64 million m^3 of timber consumed annually in India

(Multifunctional agroforestry systems in India,Deep Narayan Pandey Center for International Forestry Research (CIFOR), Bogor, Indonesia)

Problem or Need Assessment

- The average size of land holdings is very small (less than 20,000 m^2)
- over-manned- unemployment - low productivity of labour- Poverty
- Low Productivity of farm land
- Irrigation facilities are inadequate

Objectives

- To improve the standard of living of small and medium farmers of Central India region
- To diversify agriculture through agroforestry
- To increase the productivity of land

Methodology

- maintenance of the traditional agroforestry systems and strategic creation of new systems
- Identification of Beneficiaries district wise – 1,25,000 for 5yrs
- Formation of Agro-Forest Society in every district
- By free distribution of Saplings, Medicinal Plants
- Planting and first year maintainence
- Incentives to farmers from 2nd year onwards
- Data Collection-Base line and Annual
- Capacity Building for Value addition
- Market Assistance (Convergence with Agricultu

Proposed Agroforestry Models

- Silvi-agri
- Silvi-horti-agri
- Silvi-olericulture
- Silvi-pastoral
- Agri medicinal plant
- Silvi medicinal

- **Silvi-agri models**: (1) *Dalbergia sissoo with Cajanus cajan* (2) Babul with Paddy: The components used are *Acacia nilotica* var. *indica; cupressiformis* with short duration varieties of paddy - JR75 and JR353.

- **Silvi-horti-agri models**: The components include Poplar, Citrus (kinnow, seedless lemon and orange) with wheat/soybean.

- **Silvi-olericulture models**: Nine vegetable crops (brinjal, radish, carrot, tomato, spinach, cluster bean, cowpea, French bean and lady finger) were raised in the interspaces of 5 tree species viz. *Acacia nilotica, Albizia procera, Dalbergia sissoo*, *Gmelina arborea* and *Tectona grandis*.
- **Silvi-pastoral models**: D. sissoo was found successful with *Pennisetum pedicellatum* (Dinanath grass) and *Panicum maximum* (Guinea grass).

- **Agri medicinal plant model** Paddy with buch (*Acorus calamus*)

- **Silvi medicinal model**: *Chlorophytum borivillianum* (Safed musli) under the idle space of teak plantations.

Species Composition

Name of the Species	Remarks
A.nilotica (Babul)	For wind-break ,on field bunds
A.excelsa (Maharukh)	Shelter belt,along tanks, wood for packing industry
A.indica (Neem)	Good for drier areas,seed oil, medicinal, industrial
C.equisetifolia (She-Oak)	Quick growng, wind break,good for sandy saline areas
E.umbellata (Mysore Gum)	Very fast growing, pulp industry etc.
Zizyphus mauritiana (Jujube)	Good for Dry tracts

Agriculture Crops:
Paddy, Wheat, Cajanus cajan, Soyabean

Horticulture Crop:
Citrus Sps

Medicinal Plants:
Safed Musli, Buch

Grasses:
Pennisetum pedicellatum (Dinanath grass) and *Panicum maximum* (Guinea grass) Lemon grass

Vegetable Crops;
Brinjal,Radish,Ladies Finger, French Bean

Outcomes

- **Socio-economic Aspects-**
  - **Breaking the poverty (sustained employment and higher income)**
  - **food insecurity circle**
  - **Improvement of nutrition and health**
- **Enhancing soil fertility and water use efficiency**
- **Less pressure on forests**
- **Agroforestry systems as carbon sinks**
- **Biological pest control**
- **Biodiversity conservation**

Satellite Imagery Based Assessment of Forest Cover and Tree Cover in India by Forest Survey of India

Year	India's Percent Cover
1990	19.49%
1992	19.48%
1994	19.31%
1997	19.43%
2000	22.42%
2002	23.71%
2004	23.44%
2007	23.89%
2010 (Forecast)	23.97%

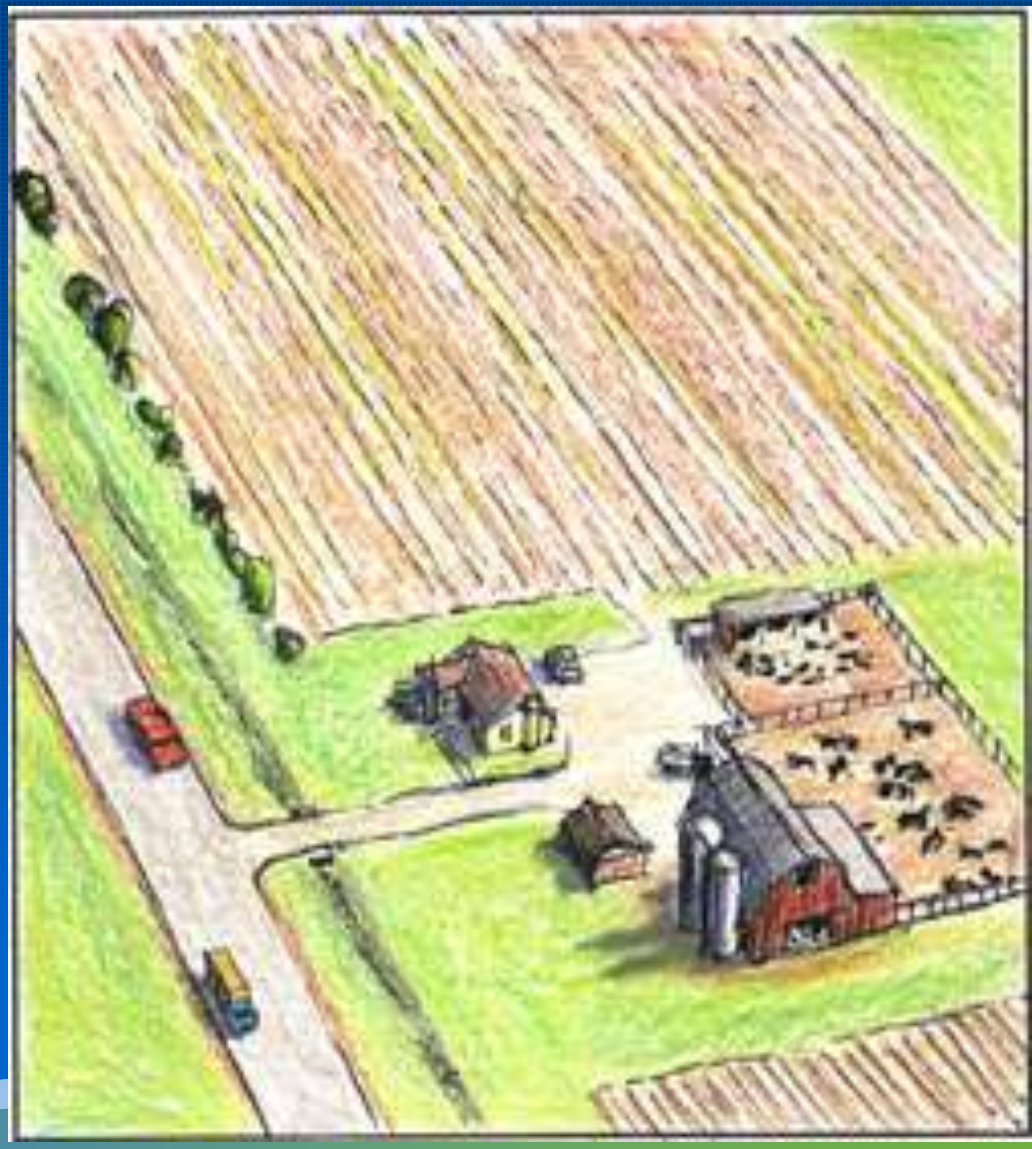
Government of India proposes to launch an ambitious Green India Mission to increase the quality and quantity of forest cover in 10 million hectares of land.

The country has no option but to keep on promoting the large-scale tree planting on non-forest lands under any name.

Problem 1

- Does your farm have...

1. Unsheltered farmsteads
2. Livestock areas
3. Fence lines, roads
4. Degraded windbreaks?



Possible Remedies

- Multiple Row wind breaks
- Evergreen fruit plants
- Fodder plantation mixed with Agriculture

Possible Remedies

- Improved Woodlots
- Try to get medicinal plants

Problem 3

Is your farm:-

- Less productive and at uplands

Possible Remedies

- Trees and Shrubs
- Fruit Trees
- Agriculture minimal

Problem 4

- Is your farm

Along the streams?

Possible Remedies

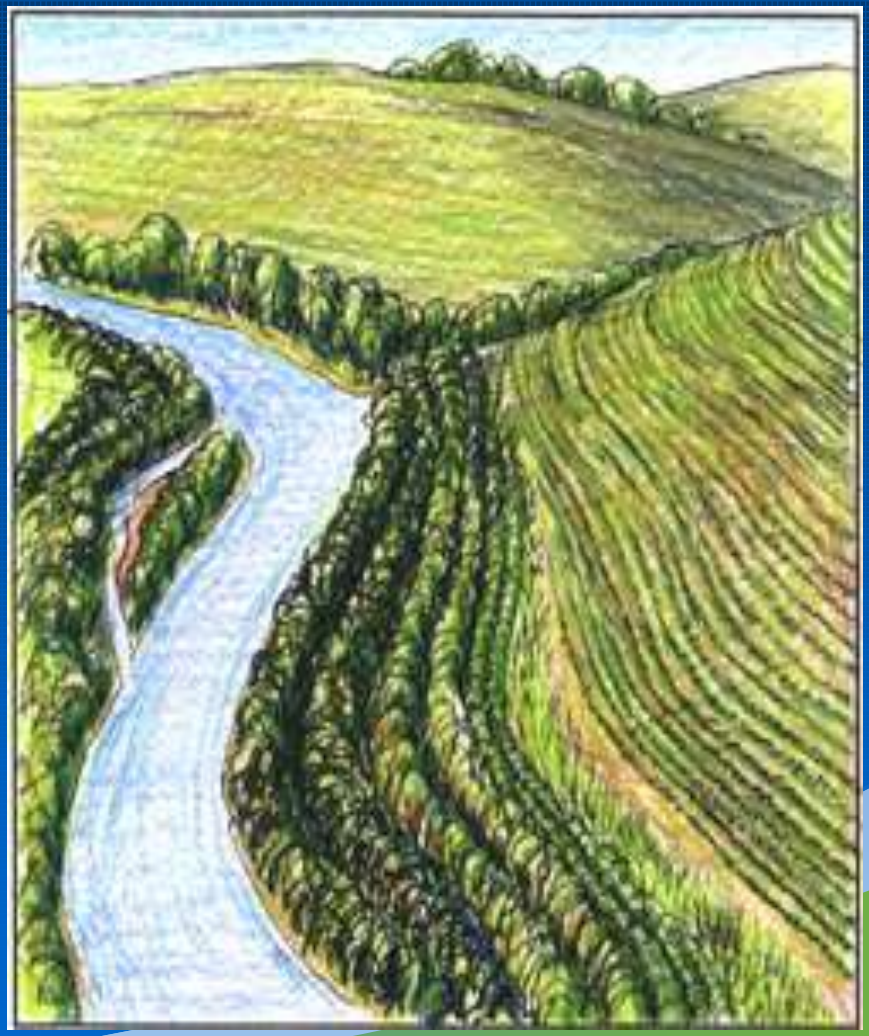
Make Riparian Buffer

Trees, Shrub, Herbs

High Quality Wood spp

Good Biomass Production

Protection from soil Erosion



Problem 5

Does your Farm have

Corners ?

Possible Remedies

Try to plant the corners

Use high variety plants

Eucalyptus, Poplus

Problem 6

Is your farm frequently

Flooded

Possible Remedies

Water logging resistant species

Hybrid Poplus

Use the agricultural crop which can withstand flooding