



NINTH EXECUTIVE FOREST POLICY COURSE

**SUSTAINABLE DEVELOPMENT GOALS, CLIMATE CHANGE
AND THE FUTURE OF FORESTS IN THE ASIA-PACIFIC**

24 May - 2 June 2016, Yogyakarta, Indonesia

**TECHNOLOGICAL CHANGES IN
FORESTRY: AN OVERVIEW**

CTS Nair



BACKGROUND

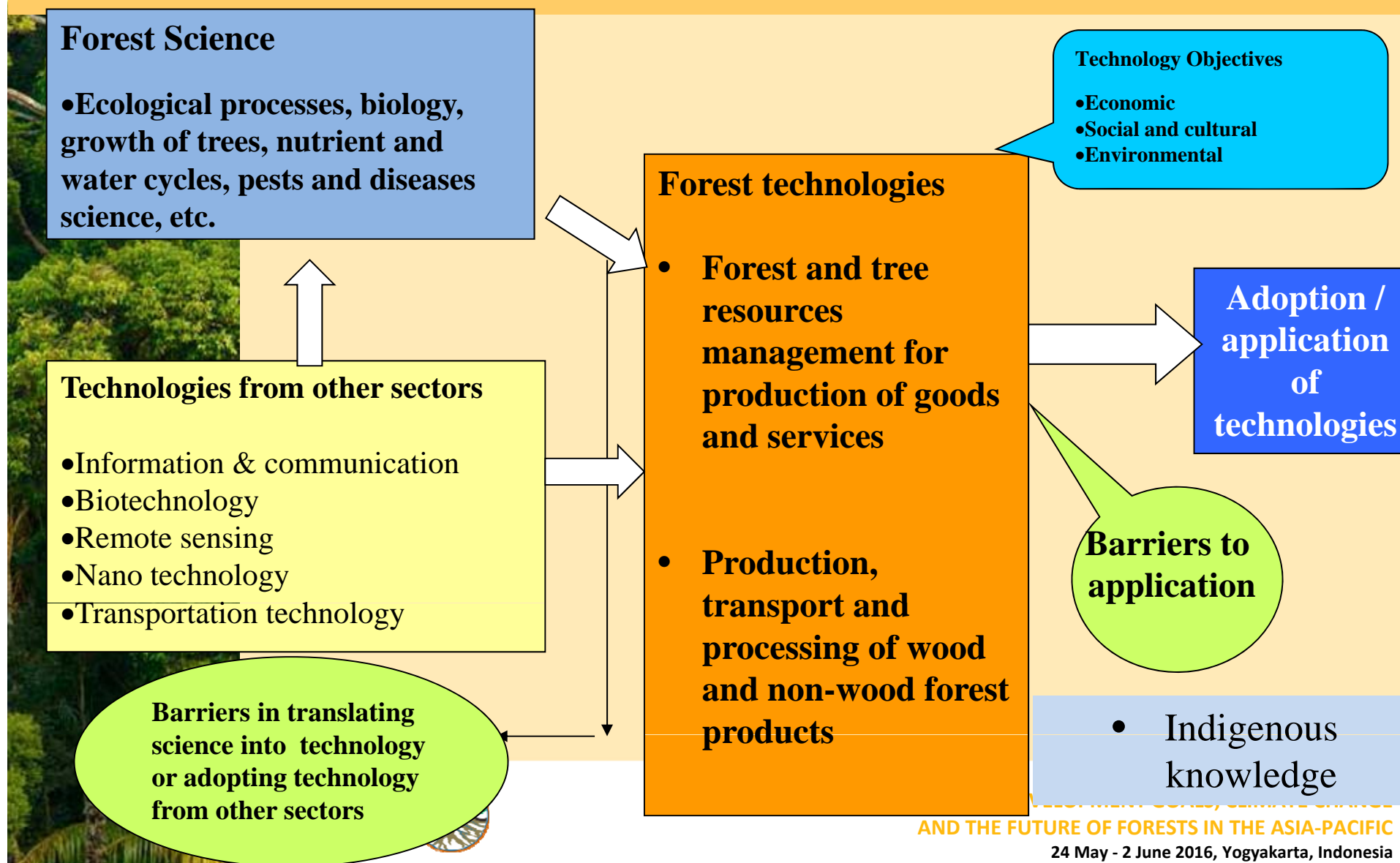
- Technological innovations form a key to adaptation of society to the changing situation.
- The history of human civilization is a story of technological changes.
- The way we use forests including the technology adopted has undergone major changes.
- An important aspect that needs to be considered is how the technological transformation has taken place and to what extent they have helped society to deal with the many challenges of balancing increasing demand for various products with the supply.
- Considering the mainstreaming of climate change mitigation and adaptation and sustainable development goals what should be the direction of technological change?

AREAS OF SIGNIFICANT TECHNOLOGICAL CHANGES

- Give an example of technological improvement in forestry that you have witnessed during your career.
- To what extent this has impacted forestry and the way we do business.
- How this has taken place?



SCIENCE AND TECHNOLOGY: AN OVERVIEW



INNOVATIONS: WHO ARE AT THE FOREFRONT?

- Who are at the fore-front of developing innovations?
- Who are actually putting innovations into practice?
- Demand driven and supply driven technologies?



INNOVATIONS: KEY PLAYERS

- Industry managed research.
- Equipment manufacturers.
- Independent think tanks and civil society research institutions.
- International public sector research institutions and networks.
- Universities.
- Public sector forestry research organizations.



DIRECTIONS OF TECHNOLOGY DEVELOPMENT



- Enhancing economic benefits through producing new products and services and cost reducing and productivity enhancing technologies
- Environment conserving technologies (including energy saving technologies).
- Socially appropriate technologies.



NATURAL FORESTS

- ❑ **Practically stagnant and in some cases erosion of knowledge about management**
 - ❖ **Reduced dependence on natural forests for wood production**
 - ❖ **Environmental concerns and increase in the extent of protected areas**

- ❑ **Any future for ecosystem approach (or close to nature forest management)**
 - ❖ **Reduced impact logging:
Applied in a very limited area**
 - ❖ **Close to nature forestry – Is it worth the efforts?**



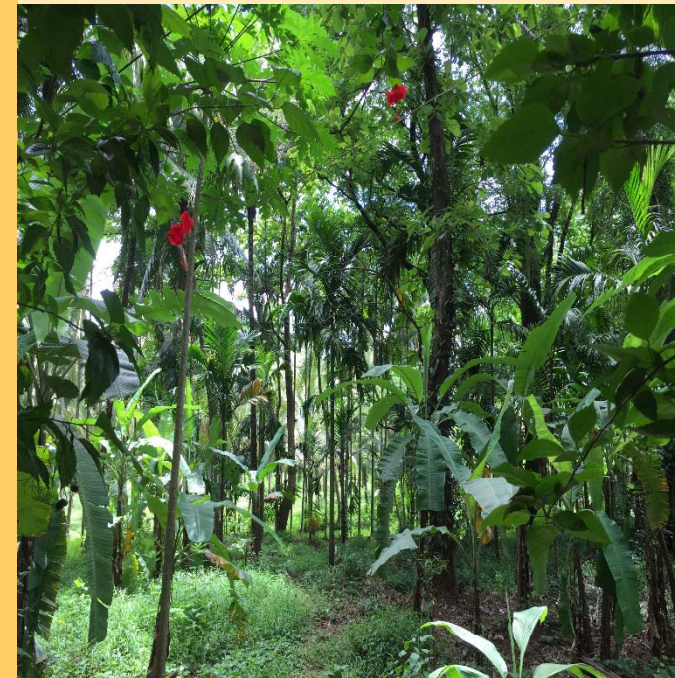
PLANTED FORESTS

- ❑ Almost all technological developments focused on planted forests.
- ❖ Most efforts focused on productivity enhancement with particular thrust on tree improvement and site management.
- ❖ Application of biotechnology including genetic modification.
- ❑ Private sector playing a major role in technology development and application.
- ❑ Increasing concern about environmental and social issues (Voluntary guidelines on planted forests).



AGROFORESTRY

- ❑ **Optimisation of different components taking advantage of local conditions.**
- ❑ **Focused on small holders**
- ❑ **Balancing the environmental, social and economic considerations and adoption of approaches that overcome sectoral barriers.**
- ❑ **Most research focused on understanding/ assessing the different systems and potential for wider adoption**



NON-WOOD FOREST PRODUCTS

- ❑ Wide range of products and related technologies for production and processing.
- ❑ Hunter-gatherer system most predominant in the case of the large number of products.
- ❑ Advancements in domestication of a few items of commercial importance.
- ❑ A range of technologies for processing depending on end uses.



BIOMASS ENERGY

- ❑ Traditional collection to cellulosic biofuel production.
- ❑ Access to technology and its suitability to the prevailing conditions remain the most critical.



WOOD PRODUCTS

- Substantial innovation in wood products in response to consumer demand.
- Most innovation driven by large private sector - to remain competitive.
- Focus on profitability, with increasing attention on energy efficiency and fulfillment of environmental obligations.



WOOD PRODUCTS

- ❑ New generation biomaterials, including through use of nanotechnology.
- ❑ Advancing the concept of bio-refinery.
- ❑ Minimise environmental impacts.



Nanotechnology Opportunities for Current Forest Products & Processes

- Sensors to monitor processes and product history
- Revolutionize separations
- Breakthrough surface characteristics
- Incredible bonding
- Dramatic simplification of production processes
- Significant synergy with forest biotechnology
- Significant reduction in the need for energy

SCIENCE AND TECHNOLOGY OUTSIDE THE FOREST SECTOR

□ Information and Communication Technology:

- ❖ improving access to information
- ❖ networking
- ❖ impacting institutional culture/ structure

□ Remote Sensing/ Geographic Information Systems

- ❖ revolutionising forest management



SCIENCE AND TECHNOLOGY OUTSIDE THE FOREST SECTOR

□ Nanotechnology

- ❖ enhancing properties
- ❖ energy and material efficiency

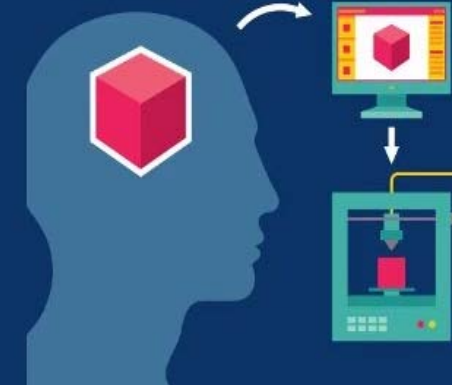
□ Other technologies

- ❖ modelling and visualisation, tags, laser and x-ray scanners

• Biotechnology

- ❖ tree genomics
- ❖ cellulosic biofuel production

3D PRINTING



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SUMMARY

- ❑ Most of the science and technology developments are driven by private sector, especially in the products segment.
- ❑ Within forestry most of technology development and application have been in the plantation sector.
- ❑ Resource conservation and reduction of adverse environmental impacts is expected to become a thrust area for future technological development.



SUMMARY

- ❑ Most of the knowledge pertains to the development of highly simplified systems – especially monoculture plantations. We are yet to develop/ improve our knowhow on nurturing the development of complex ecosystems providing multiple products and services.
- ❑ Climate change related uncertainties and risks will necessitate more efforts to build knowledge on developing more resilient ecosystems.
- ❑ Efforts to understand the human dimension require much more efforts.
- ❑ Developments in science and technology, especially outside the traditional forestry sector will continue to be a key driver of change.





THANK YOU



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