USE OF INNOVATIVE TECHNOLOGIES IN SUSTAINABLE FOREST MANAGEMENT IN BHUTAN

DEPARTMENT OF FOREST AND PARK SERVICES
INNOVATIVE TECHNOLOGIES IN SUSTAINABLE FOREST MANAGEMENT IN BHUTAN

1. Forest Information and Database
2. Forest and Wildlife Resources Assessment
3. Remote Sensing and GIS
4. Timber Extraction
5. Timber Processing
Forest Information and Data Base Needs

Strong Information online Databases on Forest and Wildlife Resources for informed decision making and for National Forest Monitoring system

Information and Communication for timely and accurate information

ICT Technologies for development of online information system.
Forest Information and Data Base systems

SDSS (Spatial Decision Support System)
- Management Regimes
- Forest Functions
- Ecosystems

FIRMS (Forest Information Reporting and Management System)
- Central Forest information database

Geospatial portal

National Forest Monitoring Systems

SMART (Spatial Monitoring and Reporting Tool)

NFI (National Forest Inventory)
- Growing Stock
- Carbon Stock
- Biomass
- FRL and Emissions

National WildLife Survey
- Population
- Density
- Habitat
- Diversity
Existing Technologies in Use for Forest and Wildlife Resource Assessment

**Forest Resource Potential Assessment**
- Satellite Images (Landsat, Sentinels…)
- GIS
- Remote sensing

**Land Use and Land Cover**
- Satellite Images (Landsat, Sentinels…)
- GIS
- e-Cognition software

**National Wildlife Survey**
- Camera Traps
- Radio telemetry
- Non-invasive genetic sampling

**NFI (National Forest Inventory)**
- Open Forest Collect tool
- Collect Mobile
- Calc (R-Statistical Package)
- Laser Hypsometer
- Trimble GPS with inbuilt survey design
Remote Sensing and GIS technology Opportunities for SFM in Bhutan

Un-Manned Aerial Vehicles (Drones)

LiDAR (Light Detection and Ranging)

Online Sensors and Detectors (AVHRR (1 km pixel) and MODIS (250 m to 1 km pixel))

RaDaR (Radio Detection and Ranging)

Satellite Imageries (Landsat, Sentinels)
Remote Sensing and GIS technologies (Area of opportunities)

- Forest Fire Detections
- National Forest Inventory and Wildlife Survey
- Mapping land use change and land use categories (LULC)
- Mapping outbreak of pest and diseases
- Mapping forest and studying species shift forest dynamics.
Timber Extraction and Transportation Technologies in Use

Low Impact Logging using cable cranes (1500 m coverage)

Extraction of timber from cable lines using cable cranes

Low Impact Logging using K-500 machine (500 m coverage)
Tractor Mounted mini cable cranes for extraction

Penz Log Loader and Trucks

Telly Logger

Trucks

Swing Yarder

Timber Extraction

Penz Log Loader

Penz Loader and Trucks

Tractor Mounted mini cable cranes for extraction
Challenges in Timber Extraction

- Fragile Mountain Ecosystem
- Rugged terrain with poor accessibility
- Depleting Conifer Timber and high value broadleaved timber Resources.
- Only about 16% of the total forest area feasible for commercial harvesting.
- Scattered Timber Resources with high extraction cost.
- Lack of competitive marketing (price, quality and quantity).
Sawmilling Technologies in Use

Indian band sawmill
Lucas sawmill
Timberking sawmill
Wood-Mizer sawmill
Norwood sawmill
Mebor sawmill
Wood Processing Technologies in Use

- Drilling machine
- Table saw
- Moulder machine
- CNC Router
- Vertical band saw
- Wood panelling machine
- Surface planer
- HF vaccum drying machine
Wood Processing Technologies in need

- More efficient processing technologies delinking end-use products from raw wood characteristics (Less preferred species like Oak and other Broadleaved timber)

- Technologies allowing more efficient processing, less waste and more recycling.

- Integrated Wood Based Technologies with Improved Sawmills, Wood processing machines with office automations to minimize wastage and for production of value added products for export and Import substitution (Engineered Wood Products)
Challenges in Wood Processing & Utilization

- Preferential demand for conifer timber over broadleaved timber
- High timber wastage due to inefficient logging, conversion and timber processing skills and technologies.
- Low investment in improved technologies due to resource constraints
- Lack of competitive marketing (price, quality and quantity).
- Poor seasoning and wood treatment.
Thank You