Forest operations

Improving and Advancing Co-ordination of Forest Research and Development in Europe

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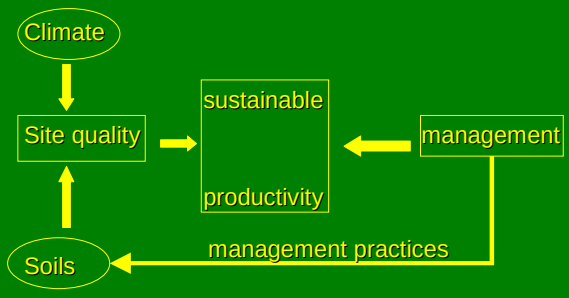
Forest operations



Establishment and Tending

- Establishment methods
  - Natural regeneration *vs* direct sowing of seed *vs* planting seedlings raised in a nursery

- nutrition
- cleanings
  - height/age
  - stocking
    - narrow *vs* wide spacing

Establishment and Tending

- Ground preparation
  - Reduction of the operations
    - by using appropriate systems
    - intensive *vs* minimal preparation
      - area and intensity
      - operations efficiency

- to maintain the capability of producing forest products and services on a sustainable basis
- to minimise negative impacts on the environment

Establishment and Tending

- Tending
  - weed and shrub control
    - fire protection
    - to reduce competition
    - intensity and effects on productivity
    - with or without incorporation of vegetation
    - using woody biomass as an energy source
  - fertilisation
    - to know adequate supplies of nutrients
    - management practices of woody biomass and its contribution as nutrient supply by mineralization
    - management practices - herbaceous vegetation *Leguminosae*
  - pruning and thinning

Harvesting

- Methods
  - to select methods best suited to the circumstances of the operation
    - equipment type *vs* stand
      - ground conditions and roughness
      - cut area
      - slope
      - forest yield - tree size, type of cutting
      - markets

  - clear cut area *vs* environment *vs* economical factors
  - efficiency
  - to avoid damage to retained stands and trees as well as to the forest soil and water resources

Harvesting

- Impacts of harvesting on site quality
  harvesting levels should be sustainable in the long-term, with due regard to nutrient offtake
- soil physical damage by heavy machinery
- nutrient removal in biomass
  - frequency of harvesting
  - level of biomass use


Harvesting

- Harvesting and woody biomass
  - woody biomass as organic-matter
    - study of the effect of wood residues on the forest stands productivity:
      tree growth,
      organic matter content
      nutrient mineralization
      nutrient availability

  - woody biomass as an energy source
    - examination of the technical potentials of recovered wood and wood residues as both secondary raw materials and as energy sources

Transport

- Type of equipment
- Efficiency
- Emissions
  - rail *vs* road
- Logs *vs* chips transport

Factors associated with soil capacity are important for evaluating long-term changes in site productivity associated with forest operations

GROUP	VARIABLES	EXPERIMENTAL CONTROL
Plant Potential	Species, genotype, stocking, age, plant competition	Minimize differences among "matched" and treatments within part of experimental treatments
Climate	Temperature, precipitation, humidity, growing season length, atmospheric transfers and pollution, sunlight	Differences removed by co-variance analyses for successive rotations; assessed not to interact with experimental treatments in field studies
Soil Capacity	Soil depth, rooting volume and restrictions, organic matter content, water-holding capacity, nutrient storage, nutrient mineralization, and availability	Experimental manipulation and measurement
Catastrophic	Hurricane damage, volcanic activity, extreme salt/plant losses or drought, insect or disease epidemics not associated with treatments	None

In Dyck, W.J.; Cole, D.W. & Comerford, N.B.1994. Impacts of forest harvesting on long-term site productivity. Chapman &Hall. 368 pp.

Long-term sustainable productivity

- Future research associated with forest operations
  - experimental control, manipulation and measurement of factors associated with soil
- Forest management practices
  - ground preparation
  - weed and shrub control
  - nutrient balance: fertiliser application
  - harvesting
  - use of woody biomass

Topics suggested for future research

- Minimal preparation
  - (area, intensity, type of equipment)
- Weed and shrub control
  - (area, intensity, type of equipment, fertilisation application)
- Relation soil/specie/nutrient balance
  - (fertilisation)
- Management practices of residual biomass
  - (as nutrient supply)
- Harvesting: adequacy of equipment and efficiency
- Transport: adequacy of equipment and efficiency