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Optimisation of financial returns from environmental services on plantation forestry estates in South Africa

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Faculty of AgriSciences

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Ecosystem services

- Ecosystem services (ES) - outputs of ecological systems that generate quality of life or well-being for people
  - Provision of goods
  - Regulatory services
  - Information and spiritual services
  - Supporting services

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Rising importance of ES

- Past economic development focussed on land, labour and capital to fuel economic activities - unlimited access to natural capital
- Natural capital becoming limiting factor in economic development
- Value of land and natural resources, important commodities with rising value

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Ecosystem services and climate change

- Widespread recognition that climate change and biodiversity are linked
  - Climate change both a cause and effect of biodiversity change
  - Changes in species distribution and abundance
  - Fires and other disaster events
  - Pests and diseases

Ecosystem services and climate change (2)

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- Biodiversity changes affects flow of ecosystem services
- Mitigation of climate change
  - Management of both GHG emissions from productive processes and carbon sequestration
  - Management of biodiversity for ecosystem resilience

Plantation areas

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- SA Forestry plantation estate - mosaic of exotic tree plantations and natural vegetation areas
- Only 70 to 75% of estates afforested
- Un-afforested areas - conservation
- Can contribute significantly to water yield, biodiversity and habitat conservation

Wesa plantation

Current status

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- Forestry companies spend large amount of resources on maintaining conservation areas
  - FSC certified
  - SANBI grasslands
  - High quality grassland areas
- Manage conservation areas to maintain ecosystem services
- Limited if any return on investment

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Research problem

- No major financial benefits from management of conservation areas
- True financial value of conservation areas not included in valuation of forestry estates

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Possible solution

- Dynamic decision support framework to optimise financial value of ecosystem services from forestry plantation estates
- Novel way of guiding companies in developing variety of treatment options or “management paths” for conservation areas on estates

Possible solution (2)

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- Ultimate aim to identify optimum combination of management paths
  - Optimise financial returns from commercial and conservation area
  - Not compromise sustainability
- Will require:
  - Definition and quantification of ES from conservation areas
  - Value linked to identified service
  - Management of service

Valuation of conservation areas

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Models to quantify volume and value of environmental services from conservation areas

- Quantity/quality of services
- Value of services

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Quantity of ES

- Carbon, water, biodiversity
- Other services - direct/indirect use values
  - Tourism
  - N(C)TFP
  - Aesthetics

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Quantity of ES (2)

- Carbon models
  - Selection of 30 carbon models/software programmes
  - Multi-criteria selection
    - Relevance to plantation forestry
    - Calculate above/below ground carbon
    - Input data required (parameters)
    - Region in use
    - Relevant range with test area parameters

Quantity of ES (3)

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- Two water models
  - Agricultural Catchments Research Unit (ACRU) Model
    - Current use to quantify water use in SA forestry industry – water tax calculations
  - Soil and Water Analysis Tool (SWAT)
    - Predict the effect of management decisions on water, sediment, nutrient and pesticide yields

Quantity of ES (4)

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- Biodiversity
  - Few attempts made to set quantitative targets
  - Multi-criteria rating of biodiversity for conservation areas
    - Based on expert opinion
    - Biodiversity attributes and relative weighting

Value of ES

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- PES vs opportunity cost of forestry
  - Most PES schemes designed for rural small scale farmers/land holders
  - Relative low opportunity costs
  - High opportunity cost of commercial forestry
  - Consider alternatives to direct ES payments

Value of ES (2)

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- Need to define value
  - Direct financial value
  - CSR value
  - Marketing value
- Need to define transaction (buyer and seller)
  - PES one buyer one seller
  - Indirect gains
  - No direct return but access to market (FSC)

Value of ES (4)

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- Approach towards defining value
  - Delphi study with international experts
  - Local auction study
  - Non market value study
  - Analysis of share value
    - (e.g. PSG Investment group – R0.10 /share = paintings in head office)

Timber and conservation interactions

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- Development of models to define interactions between conservation areas and timber stands
  - Seek to identify management actions that will optimise timber stand and conservation area's contribution to overall management strategy
  - Spatial relationship with other stands and open areas on forestry estate

Timber and conservation interactions (2)

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- Types of interactions/ relationships
  - Water use
  - Conservation corridors
  - Fire breaks and boundaries
  - Management activities
  - Could be based on multiple path theory

Decision support framework

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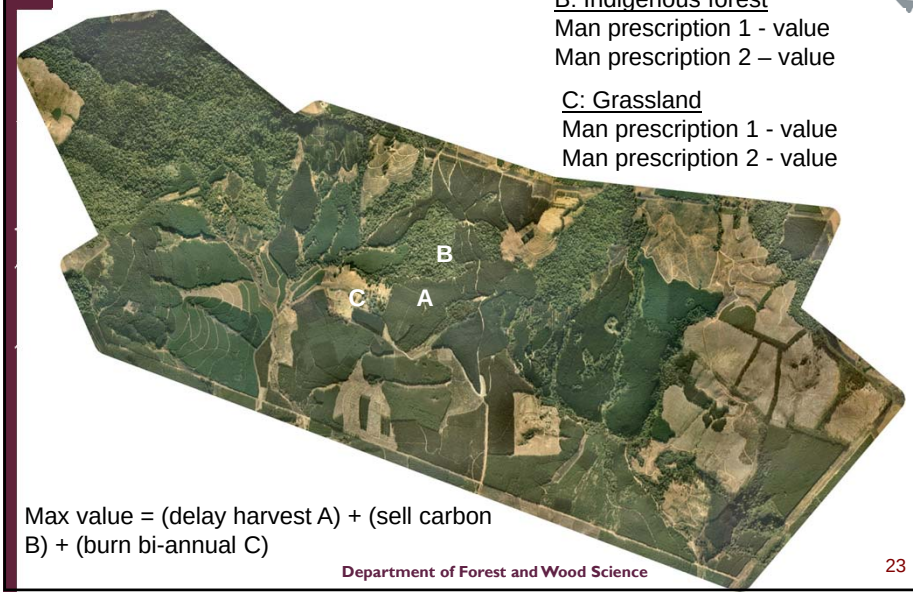
- Development and testing of dynamic decision support framework
  - Evaluated conservation areas
    - Types of services; value of services
    - Management requirements to optimise return from services
    - Consider interaction with commercial compartments
  - Develop heuristic decision support framework to guide management decision

Enon Plantation

A: Euc compartment
Man prescription 1 - value
Man prescription 2 – value

B: Indigenous forest
Man prescription 1 - value
Man prescription 2 – value

C: Grassland
Man prescription 1 - value
Man prescription 2 - value



Max value = (delay harvest A) + (sell carbon B) + (burn bi-annual C)

Conclusion

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- Conservation areas managed based on limited value
- Increase value – manage as profit center together with commercial compartments
  - Increase benefits from ES
  - Manage services in context of climate change and biodiversity conservation