Native Forest Management will Increase Farm Incomes and the Resilience of Rural Communities in Queensland

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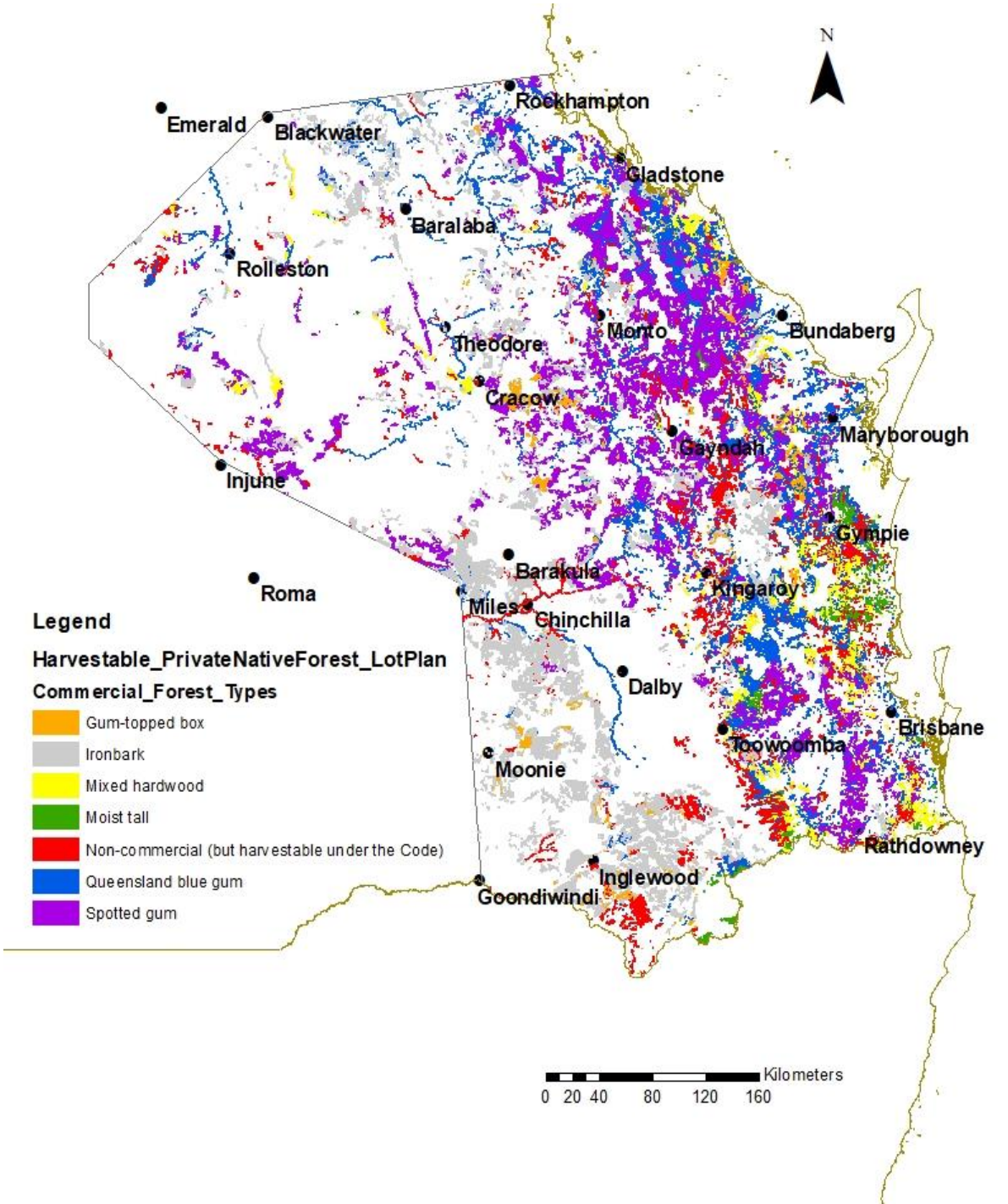
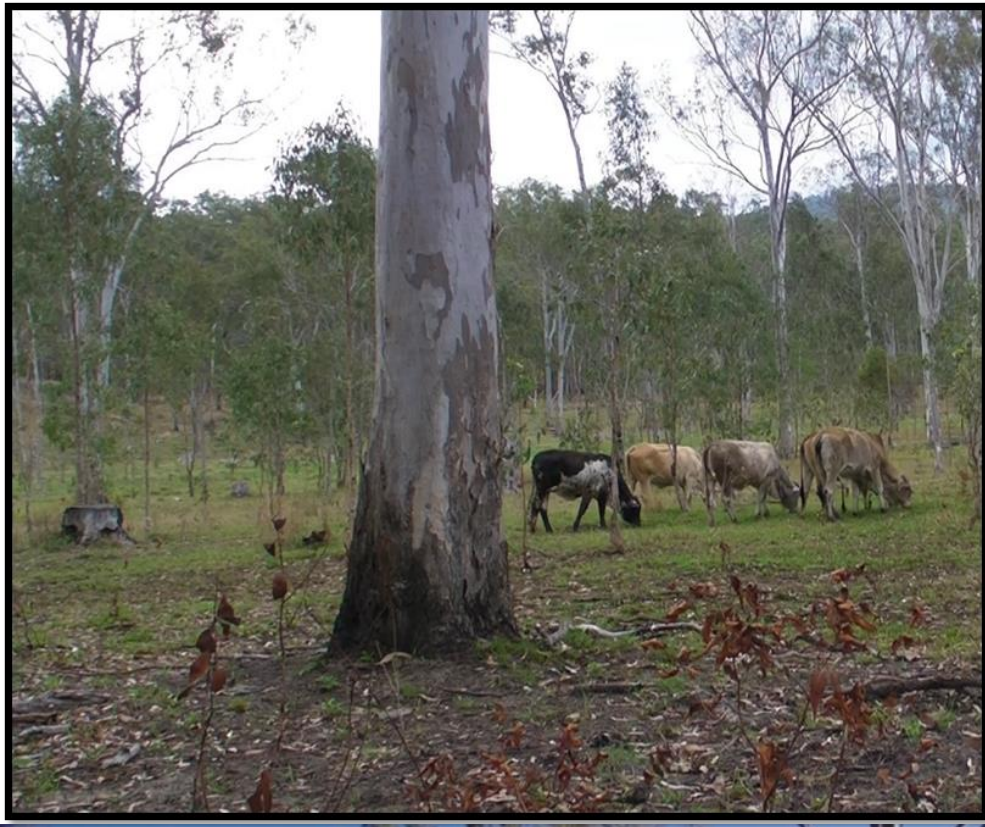
The Opportunity

- Majority of private native forest (PNF) in Queensland is on cattle country
- Beef production is Queensland's largest ag industry $3.5 B/y to $5.0 B/y
- 2 M ha of commercial PNF in southern Queensland



The Opportunity

- QLD government trying to sure-up hardwood timber supplies
- IPCC: forests managed for a range of wood products have the largest, sustained climate change risk mitigation benefits (Metz et al. 2007)
- Meat and Livestock Australia goal: carbon neutrality by 2030
- Australian construction sector (accounts for 18.1% of national emissions): substantial emissions reductions possible by increasing use of wood products (Yu et al. 2017) .



Valuable products

- **Poles**
- Landholder stumpage: $250 to $600 each

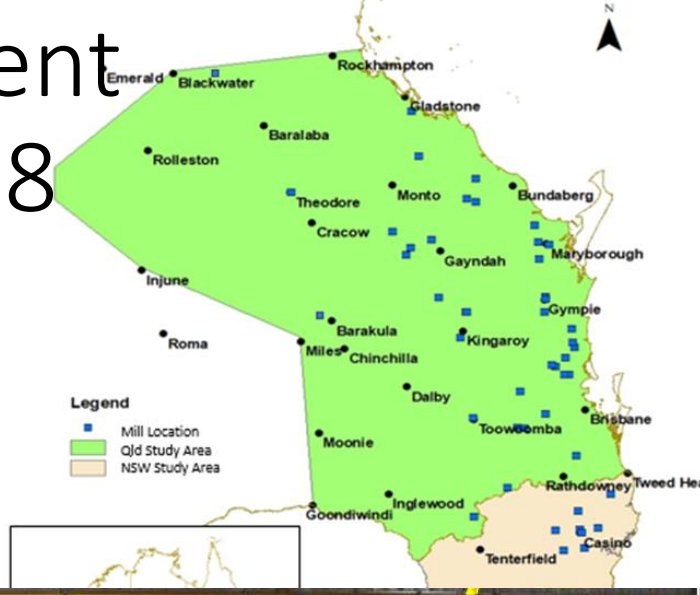
Valuable Products

- **A-grade sawlogs**
- Landholder stumpage: $120/$m^3$
- 1 m^3 = 50 cm centre diameter 5.1 m long log


• Low opportunity cost
• Resilient agriculture strategy (QFF and DAF)

Rural hardwood employment in southern Queensland ‘18

- 40 hardwood sawmills
- 890 FTEs
- $200 million in mill-gate value




Biggenden


Nanango


Rathdowney


Ironpot


Taroom

Why a century of poor management?

- High quality native forest timber ***was*** relatively abundant
- Cattle within Australia and globally ***were*** relatively scarce
- Markets and land management practices reflected these relative scarcities

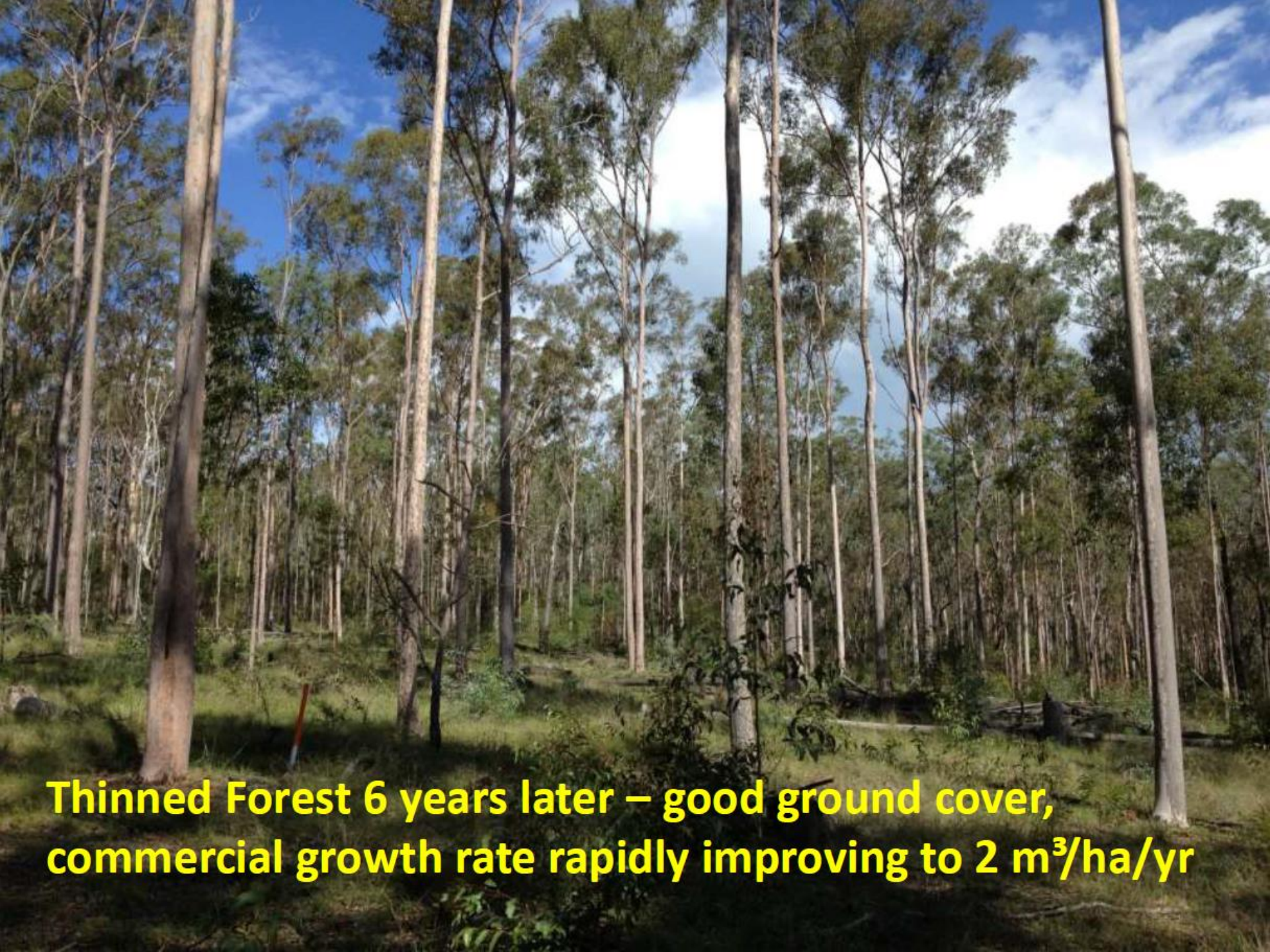
Why a century of poor management?

- **Increasingly high sovereign risk over the last 40 years**
- Need for an annual income, which is not provided by trees to the extent that it is by cattle
  - Long-term returns (20+ years) from good forest management
- ***Lack of information about the financial performance of native forest management***
- Landholders have limited knowledge about forest management and wood products


Typical overstocked unmanaged forest
1000 stems/ha, close to threshold BA
Commercial growth rate - .1m³/ha/yr
Little to no grazing value
$10/ha/y timber value growth

Silvicultural treatment


Thinned forest to 150 stems/ha
To this


Thinned Forest 6 years later – good ground cover,
commercial growth rate rapidly improving to 2 m³/ha/yr

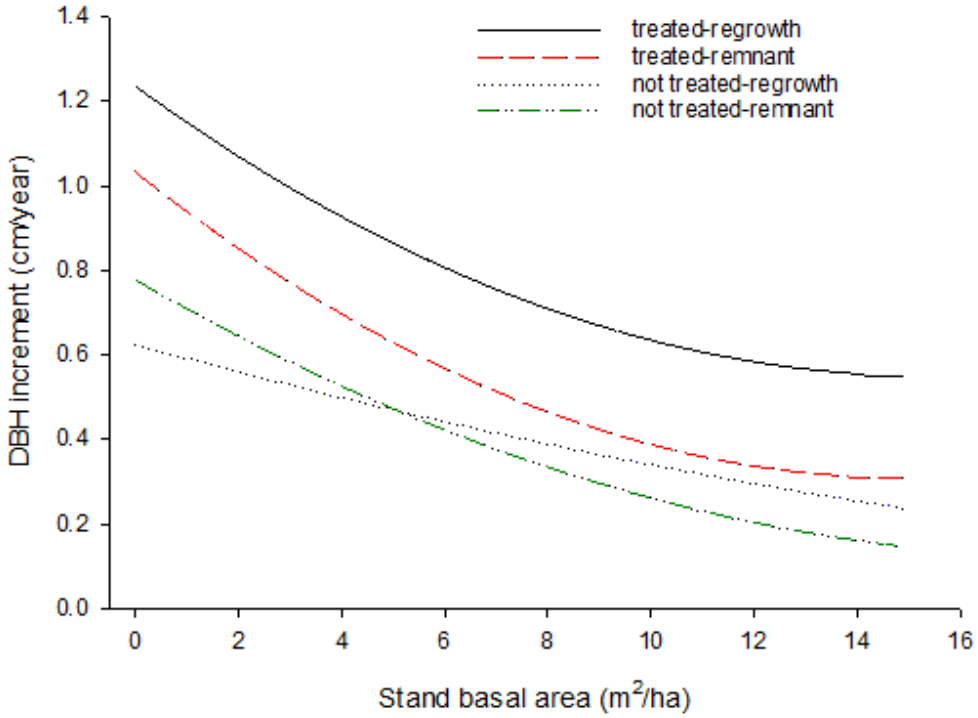
Research Methods to estimate financial performance of silviculture

- Dearth of tree growth response and financial performance information

1. Growth plot data
2. Develop tree growth response models
3. Time and motion studies to collect silvicultural treatment cost data
4. Estimate the financial performance of silviculture
5. Used GRASP to model pasture growth
6. Estimated the financial performance of silvopastoral systems on 4 case study properties

Growth response models

- 203 permanent plots at 19 sites, covering a range of management scenarios
- Thousands of individual trees measured at least twice
- Growth data up to 12 years; mean time between measures is 7.8 years
- Many geographic, climate and site variables fitted to the data
- Three most important:
  - Basal area (53%)
  - Wetness index (11%)
  - Max. daily temp (7%)

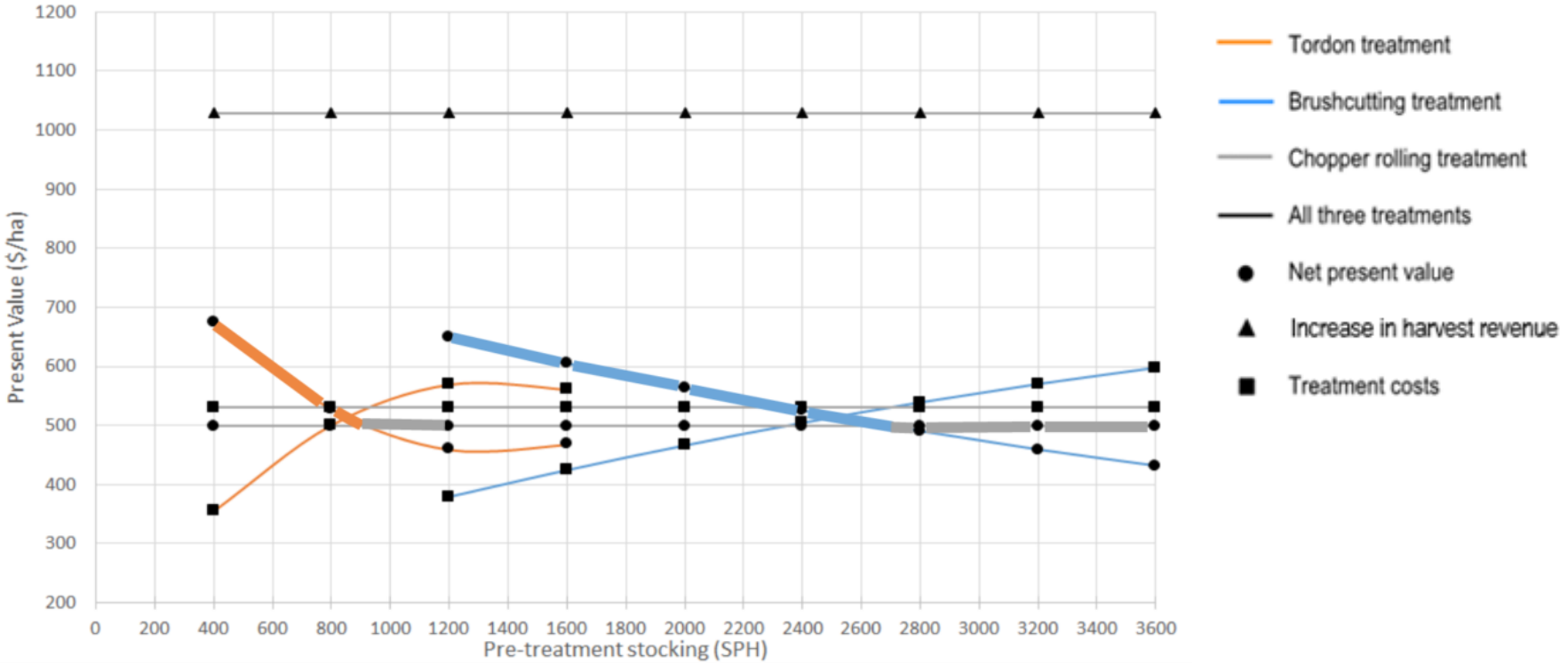


Time and motion studies

- 8 brushcutting (pictured) and tordoning plots with different tree stocking and diameter distributions
- Measured tree cutting/poisoning time per tree by tree size class, chemical consumption, fuel consumption, and other time (e.g. hang-ups, time spent walking, maintenance of equipment).

Financial performance of silviculture

- 5% discount rate
- Treat in year zero reduce stocking to 250 stems per hectare
- Re-treat in year 10
- Harvest in year 20
- Mean increase in growth rate (over no treatment) projected by treatment response model = 1.3 m^3/y of merchantable wood

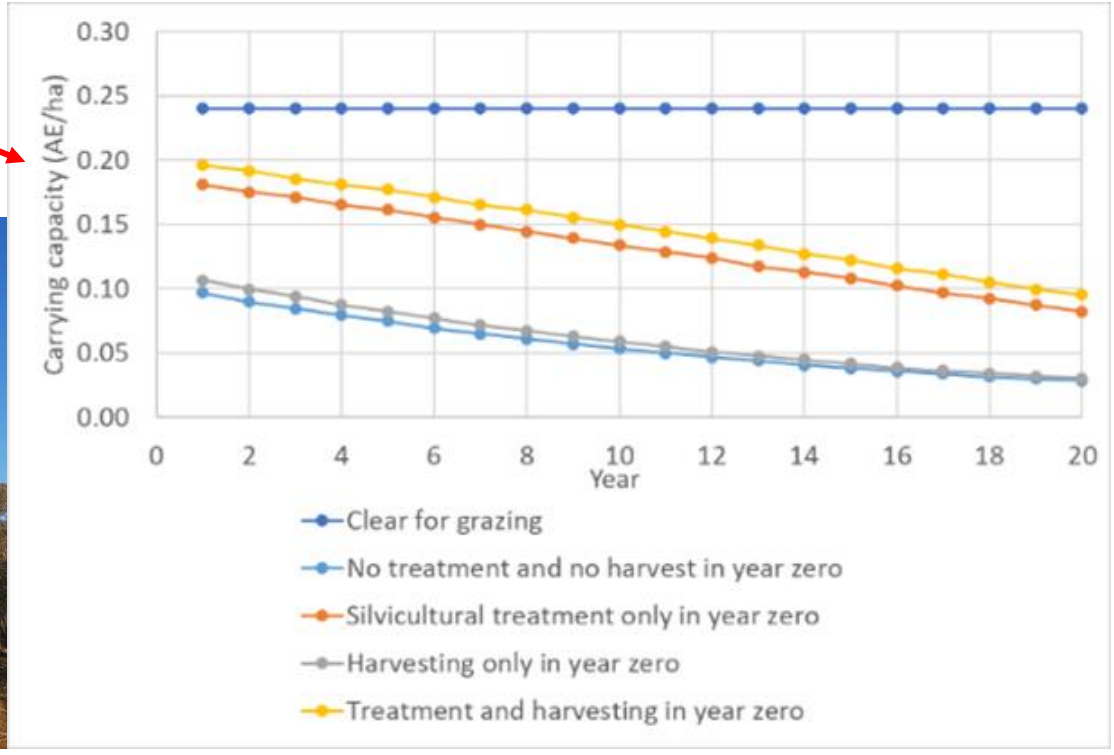


Pasture growth

- Pasture growth with the GRASP model (Littleboy and McKeon 1997)
- Utilised existing relationships between tree basal area and grass biomass growth to determine the utilisable pasture available
- Relationships available for a 135 land types in Queensland
- Model assumes an average daily intake throughout the year of 10 kg (this is a standard value for an adult equivalent, AE).
- Different annual live-weight gains (kg/AE/year) associated with each land type.

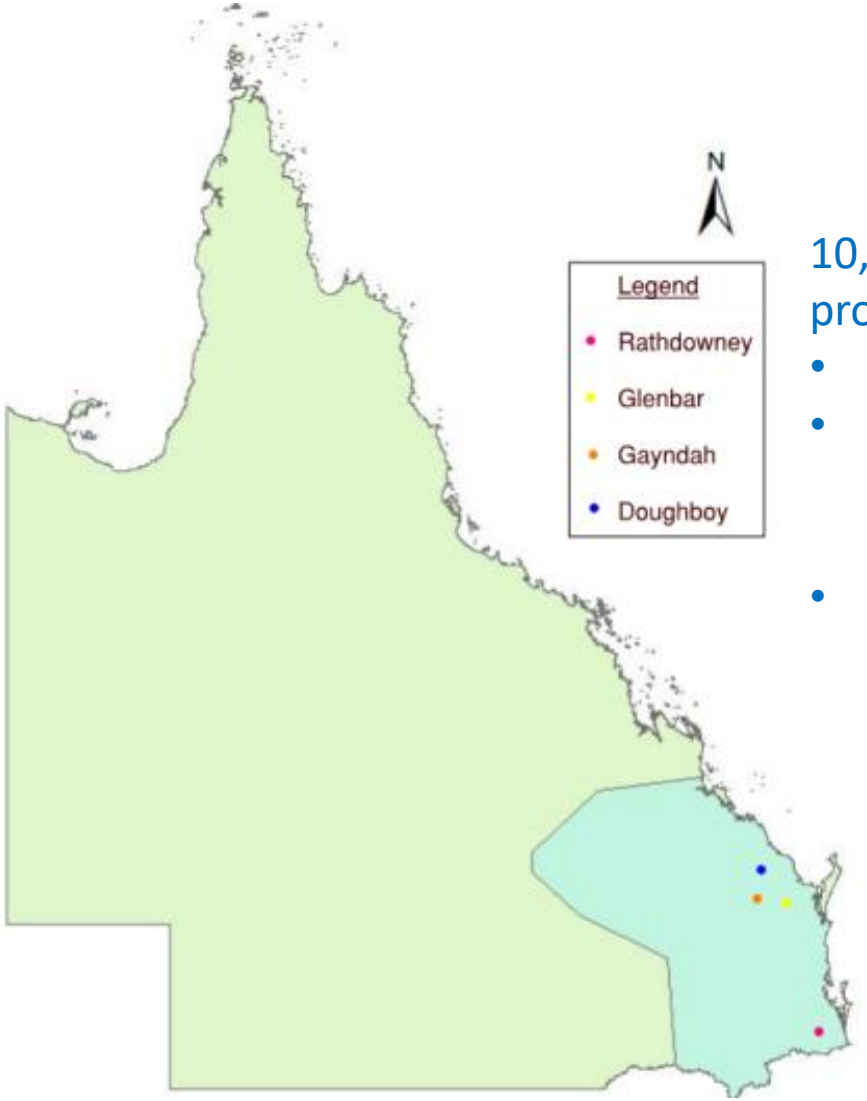
e.g. Gayndah carrying capacity

0.25 AE/ha = 4 ha/AE



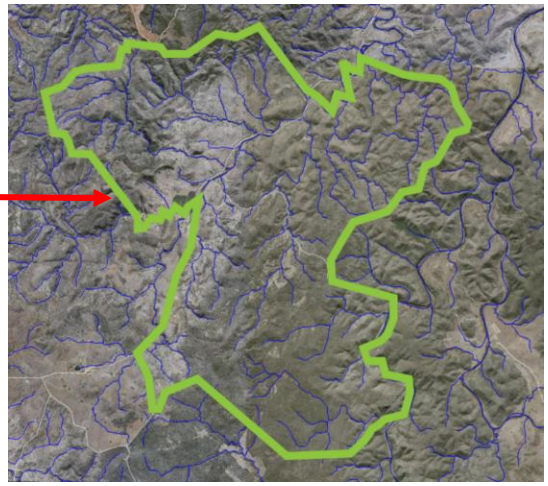
Case study properties

- 4 case study properties with forest inventory data



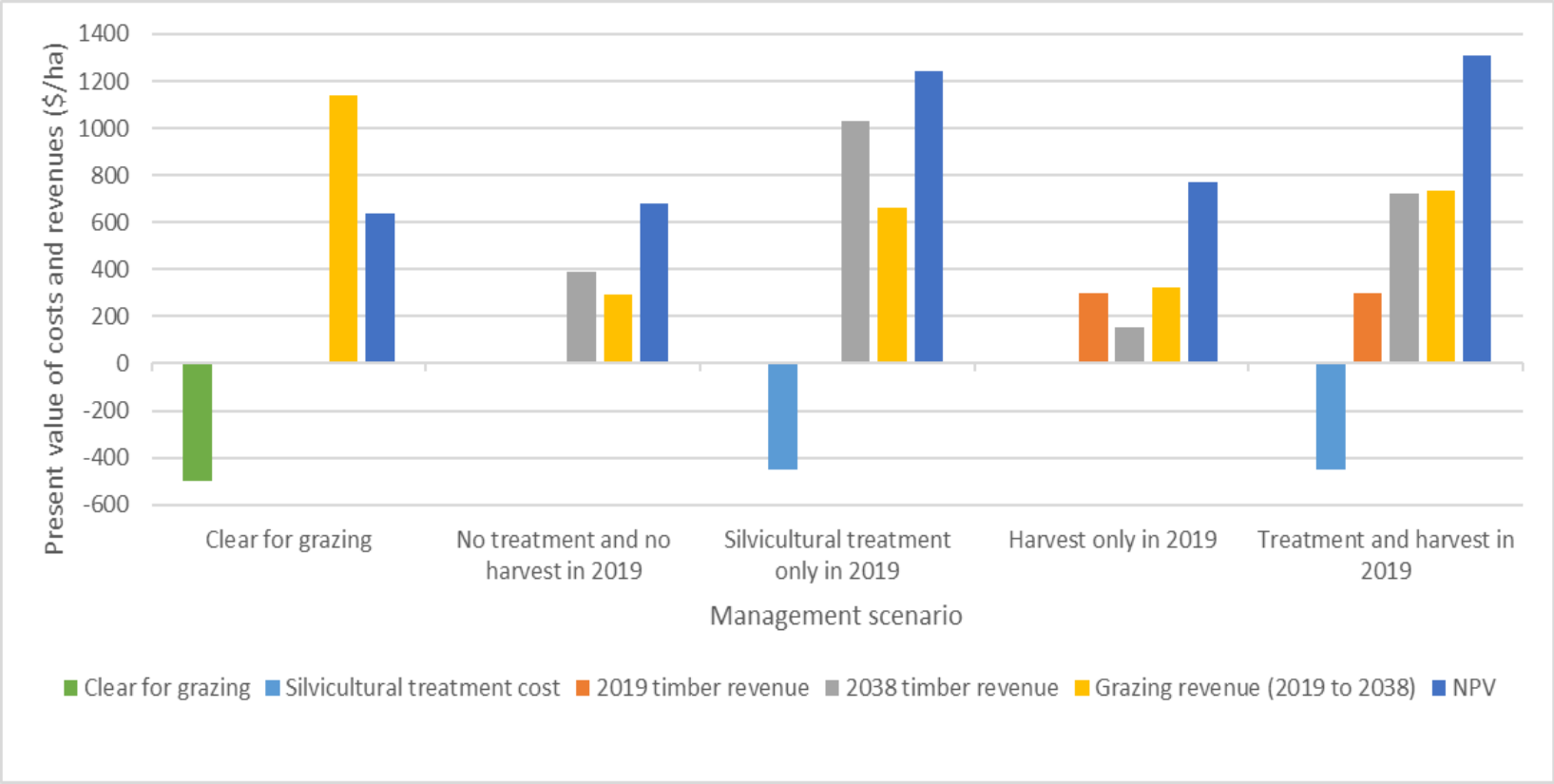
10,000 ha cattle grazing property at Gayndah.

- 450 ha cleared,
- 3050 ha regrowth forest (recovering from clearing)
- 6500 ha of remnant forest



Case study financial results

- In all four case studies:
  - Clearing for grazing performed worst (although it had the highest annual income)
  - Silvicultural treatment performed best
- Gayndah property results below



Why limited silvicultural treatment in practice?

- ***Lack of information about the financial performance of native forest management***
- Landholders have limited knowledge about forest management and wood products
- High sovereign risk
- Need annual income (as provided by cattle)

Propose ‘Category F’ vegetation under the Vegetation Management Act 1999

- Right to benefit from long-term forestry management for timber
- Subject to management constraints

Long-term investment in broad-scale PNF silviculture

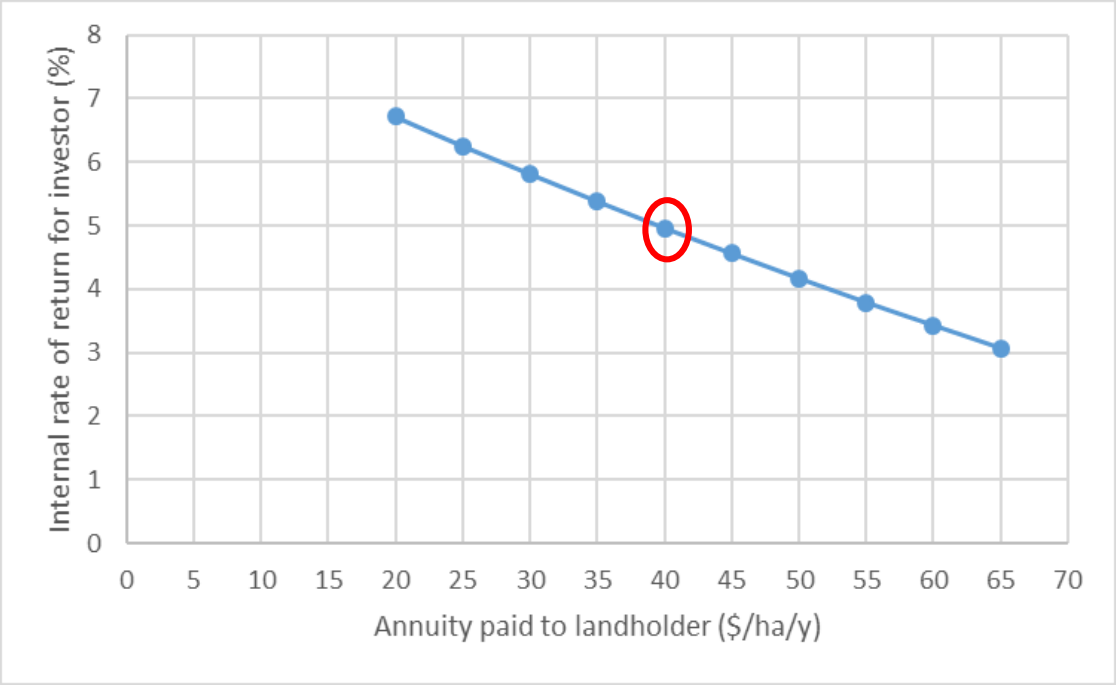
- Investor pays:
  - Silvicultural treatment costs; and
  - Annuity to landholder
- Investor receives property rights to timber (at least 20 years)
- Landholder retains rights to use timber for domestic purposes and non-timber forest uses, e.g. cattle grazing

Investment scenario parameters

Parameter	Level
Treatment area	100,000 ha (@5000 ha/y)
Treatment costs	$400/ha, plus $250/ha every 10 years
Annuity payment to landholders	$30/ha/y
Mean log stumpage	$100/$m^3$
Harvest commences in year	20
Discount rate	5%
Weighted mean MAI	1.26 m^3/ha/y
Sustainable yield	125,600 m^3/y
Net increase in sustainable yield	91,500 m^3/y

Investment performance

PV of log stumpage	$94.7 M
PV silvicultural costs	$41.8 M
PV annuity payments	$40.1 M
NPV	**$12.8 M**
IRR (net of inflation)	**5.8 %**



Sustainable regional jobs and income

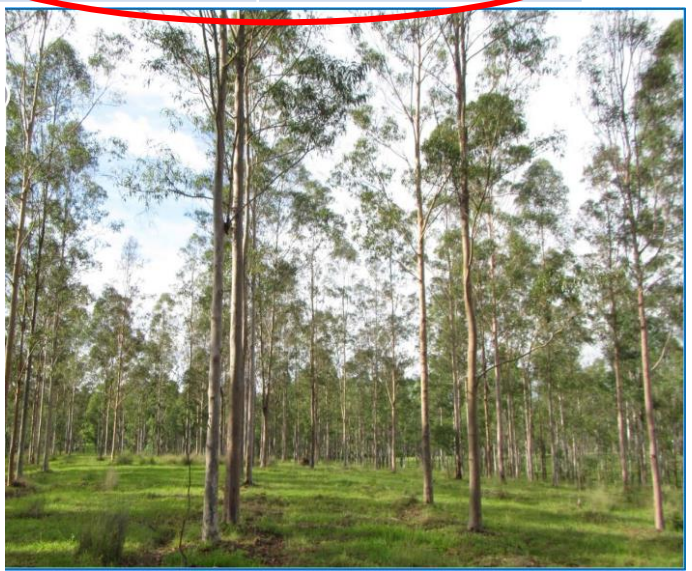
Net increase of 91,500 m^3/y due to silvicultural treatment

Item	Rate from mill survey	Total increase from 91,500 m^3/y more log volume
Regional jobs (FTEs)	2.7/1000 m^3 of log processed	244
Regional income ($ M/y)	\$590/m^3 of log processed	54

Comparison with plantations

Item	PNF silviculture (harvest Y20)	Hardwood plantations (harvest Y25)
Area (ha)	100,000	20,000
Sustained yield (m^3/y)	125,600	136,000
20-year cash management cost ($ M)	53	100
20-year cash annuity cost ($ M, @ $30/ha/y)	32	
25-year cash annuity cost ($ M, @ $50/ha/y)		16
Total cash cost ($ M)	**85**	**116**
Log growing cost ($/$m^3$)	**34**	**43 (36)**

- Investment in PNF silviculture is self-sustaining from year 20



Conclusion

- Silvicultural treatments are financially viable on the basis of returns from timber alone
- Even better when property managed as a silvopastoral system
  - Silvicultural treatment increases both cattle and timber production from forest land
- Regional forestry and milling jobs and income can be substantially increased with PNF silviculture
- Sovereign risk needs to be overcome to encourage investment in PNF management
- Overcoming the “annual income gap” is also necessary to facilitate broad-scale PNF management
- A broad-scale investment program in PNF silviculture that includes an annuity to landholders is economically efficient and cost-effective relative to investment in hardwood plantations