Forest restoration and rehabilitation and their contributions to improving ecological and community resilience

David Lamb

Centre for Mined Land Rehabilitation and School of Agriculture and Food Science, University of Queensland

and

Tropical Forest and People Research Group
University of Sunshine Coast

Some recent (global) forest trends

- Continued loss of natural forests and a rising increase in area of 'degraded' land

- But more national <u>reforestation targets</u>

- Also increased global interest in forest restoration for <u>ecosystem services</u>
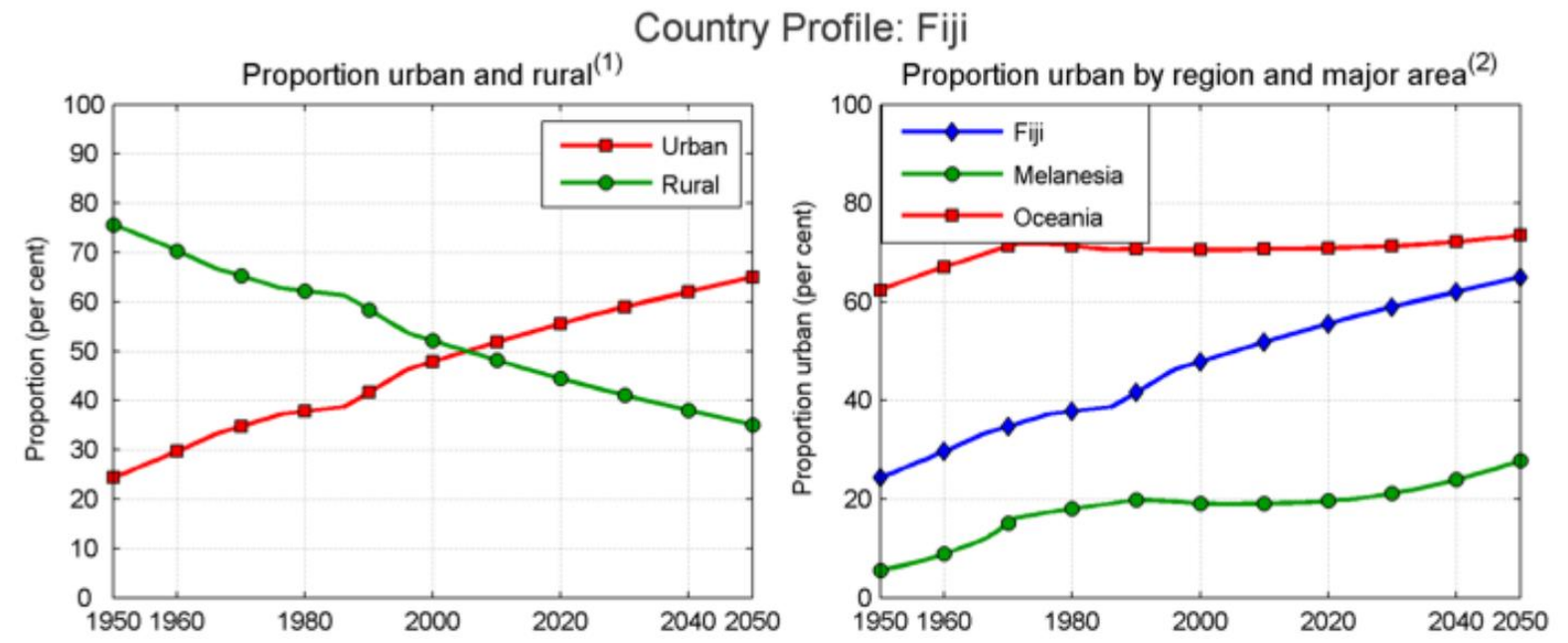 - E.g. Bonn Challenge of 350 mill ha by 2030

Recent trends
More reforestation as income rises?

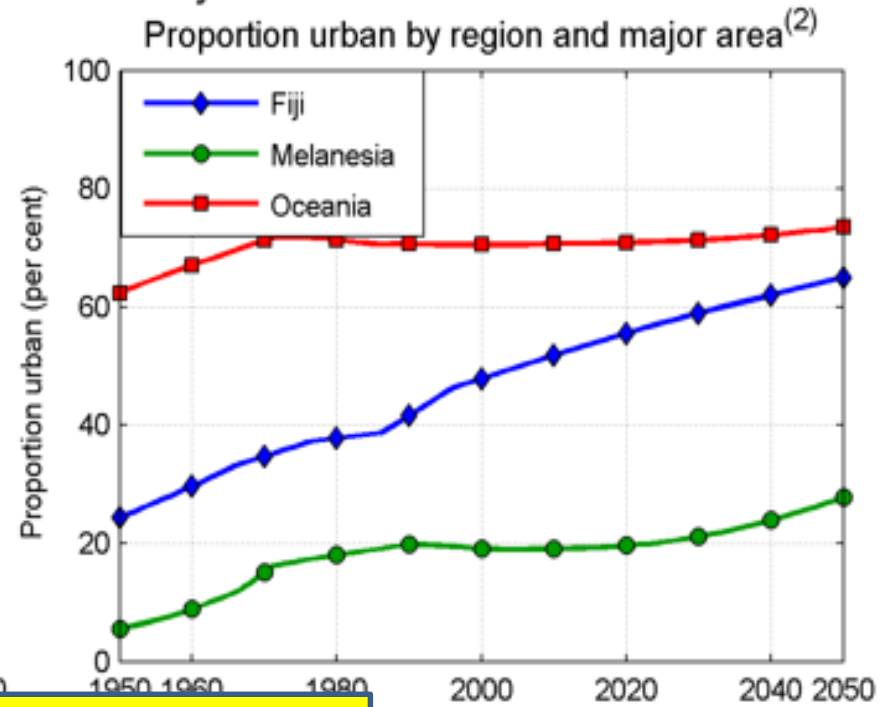GDP per person and change in forest area*
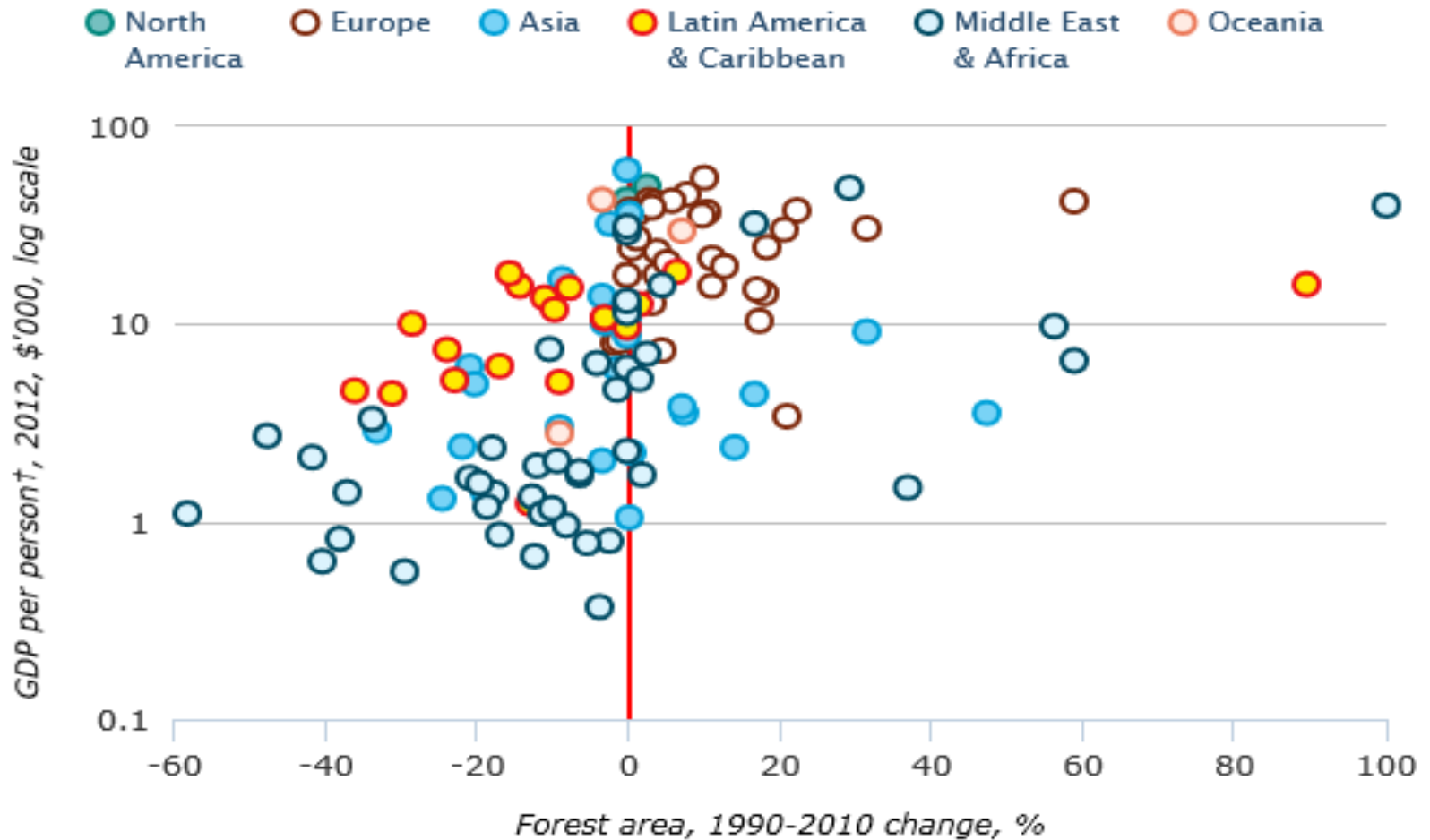
Meanwhile, in Oceania ....

1. Patterns of land tenure
   – Difficult for large scale reforestation??

2. Urbanisation (in larger islands)

Country Profile: Fiji

Proportion urban and rural[1]

| | Urban |
| | Rural |

Proportion (per cent)

1950 1960 1980 2000 2020 2040 2050

Proportion urban by region and major area[2]

	Fiji
	Melanesia
	Oceania

Proportion urban (per cent)

1950 1960 1980 2000 2020 2040 2050

4

Source: https://esa.un.org/unpd/wup/Country-Profiles/

Patterns of urbanisation

Increasing in Melanesia but more stable in Oceania

Country Profile: Fiji

Proportion urban and rural[1]

Legend: Urban, Rural

Y-axis: Proportion (per cent) — 0 to 100
X-axis: 1950 1960 ... 2020 2040 2050

Proportion urban by region and major area[2]

Legend: Fiji, Melanesia, Oceania

Y-axis: Proportion urban (per cent) — 0 to 100
X-axis: 1950 1960 1980 2000 2020 2040 2050
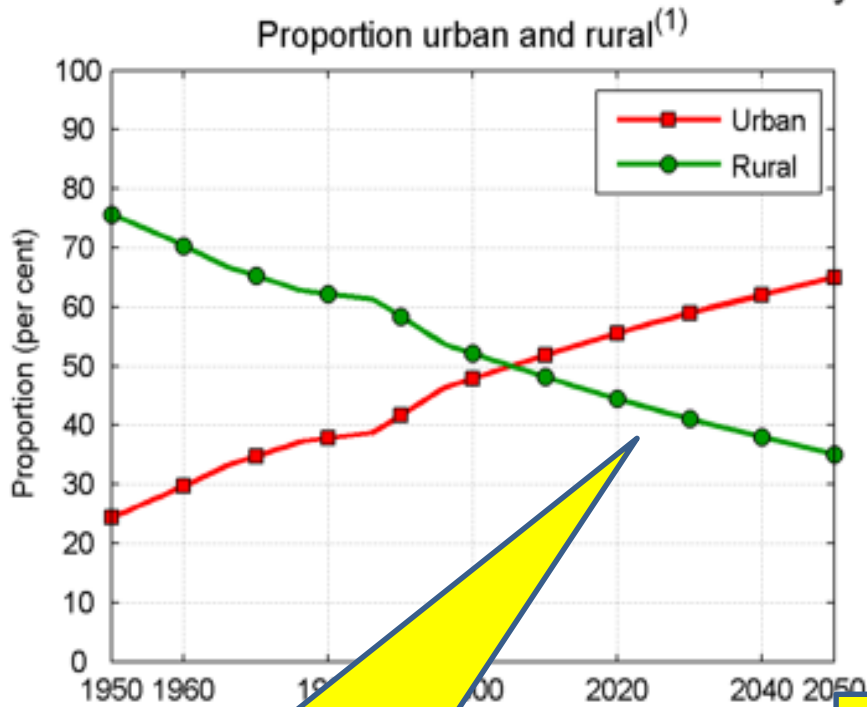
Allows forest regrowth?
OR
Causes farm consolidation?

Implication for reforestation?

5

Meanwhile, in Oceania ….

1. Patterns of land tenure

2. Urbanisation (in larger islands)

3. Growing concerns about impacts of climate change
    – More variable rainfall (Power et al 2017. Nature Comm.)
    – More severe cyclones (Sugi et al. 2016. Climate Dynamics)
    – Implications for food security?

4. Extensive and poorly managed logging of natural forests – loss of future income and ecosystem services?

Isobel
Solomons
March 2010

Why undertake reforestation in Oceania*?

- Traditional reason: To supply timber markets
  - But limited local timber market (?)
  - Export market requires high value species
  - Also need large areas to have regular (i.e. not episodic) supply

- New Reason: To supply ecosystem services
  - But ES market(s) poorly developed?

- New Reason: To enhance ecological resilience
  - But resilience to storms? Or fires? Or droughts? Or pests? Or ?

- New Reason: To enhance economic resilience
  - Diversity of goods for a variety of markets?

*Excluding Aust. And NZ

But some issues

- Reforestation – but on whose land?

- Relationship with agriculture? Who decides?

- Reforestation for what purpose?
  - Private benefit?
  - Public benefit?

- Reforestation – but who pays?

- Reforestation – but what kind?
  - Timber?
  - Ecosystem services?
  - Resilience?

Option 1 - Natural regrowth

1. Advantages
   – Cheap
   – Source of NTFPs
   – Generates many ecosystem services
   – Resilience high?

2. Disadvantages
   – Who owns or manages it (perhaps across several land owners – or households)?
   – Might not always develop (or is patchy)
   – Dominated by only a few species?
   – Not always valued by community? (little immediate benefit to landowners – seem as 'wasteland'?)

Option 2 – Simple plantations

Species	
Pinus (Fiji)	Economic: Low value; Best (only?) if grown by industrial growers Resilience: Sensitive to pest, fires and storms
Whitewood (*Endospermum*) (Vanuatu)	Economic: Good market Potential for smallholders (but need minimum number?) Resilience: Tolerant of high winds
Mahogany (*Swietenia*) (Fiji)	Economic: High value Resilience: Borers? Sensitive to fires and storms?
Teak	Economic: High value Resilience: Sensitive to fires and storms?

Option 3 – multi-species plantings

- Sandal wood (needs host plant) – some advantages
  - Very high value product
  - Extensively researched
  - Good for smallholders

- Other mixed-species plantations – some advantages
  - Ecological resilience
  - Economic resilience

Example of a multi-species farm forestry plantation used in Philippines

Product	Time (y)	Number of species	Tree density
Firewood	6 - 10	3 - 5	450
Poles	8 - 12	2 -3	200
Fast growing timber	14 - 18	3 - 5	250
Slow growing timber	20+	3 -10	200
TOTAL		11 - 23	1100

Example of a multi-species farm forestry plantation used in Philippines

Product	Time (y)	Number of species	Tree density
Firewood	6 - 10		
Poles	8 - 12		
Fast growing timber	14 - 18		
Slow growing timber	20+	3 -10	200
TOTAL		11 - 23	1100

> RESILIENT because
> - Diversity of species
> - Variety of goods
> - Several markets
> - Cash-flow timing varies

Nguyen et al 2014, PLOS One e98600. doi:10.1371

Community resilience

- Depends on reforestation generating a variety of economic goods and services

- Institutional arrangements to promote different forms of reforestation

- Institutional capacity to monitor and learn from experiences

- Institutional rules to share costs and benefits of reforestation between households and community
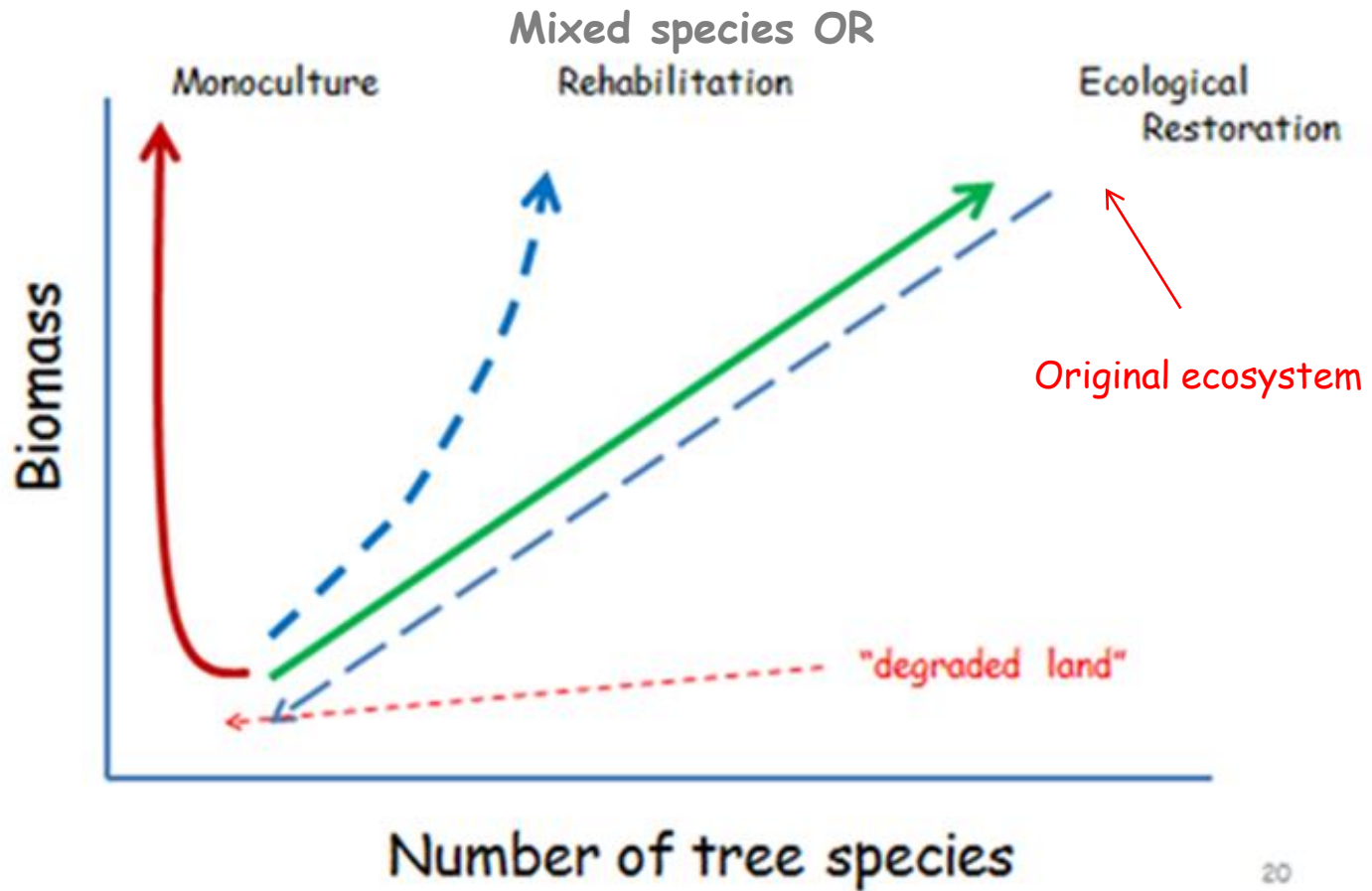
But some questions

1. How to make any kind of reforestation attractive to landholders?
    - *Convince farmers it can be profitable*
    - *Overcome perception that opportunity costs are too high*
    - *Build capacity for them to become involved*
    - *Ensure it complements and does not compete with food production*

2. How to design new <u>forests</u> and <u>landscape mosaics</u> to build resilience and ensure both landholders and wider community benefit from reforestation?
    - *Ad hoc decision making unsuitable*
    - *Some kind of coordinated land use planning needed to generate improved resilience?*
    - *Need to exceed a threshold area?*

3. How to judge <u>and measure</u> success of any new reforestation methods?
    - *What tools to use? What metrics?*
    - *Who judges?*
    - *When?*

Conclusions

- <u>Large scale</u> reforestation will be difficult (agroforestry easier?)

- Extent of ecological resilience generated will depend on type of reforestation

- Extent to which forms of resilience that benefit the community will also depend on
  – How much reforested
  – Its location

Three different types of reforestation