Reducing soil erosion on grazing land in catchments adjacent to the Great Barrier Reef

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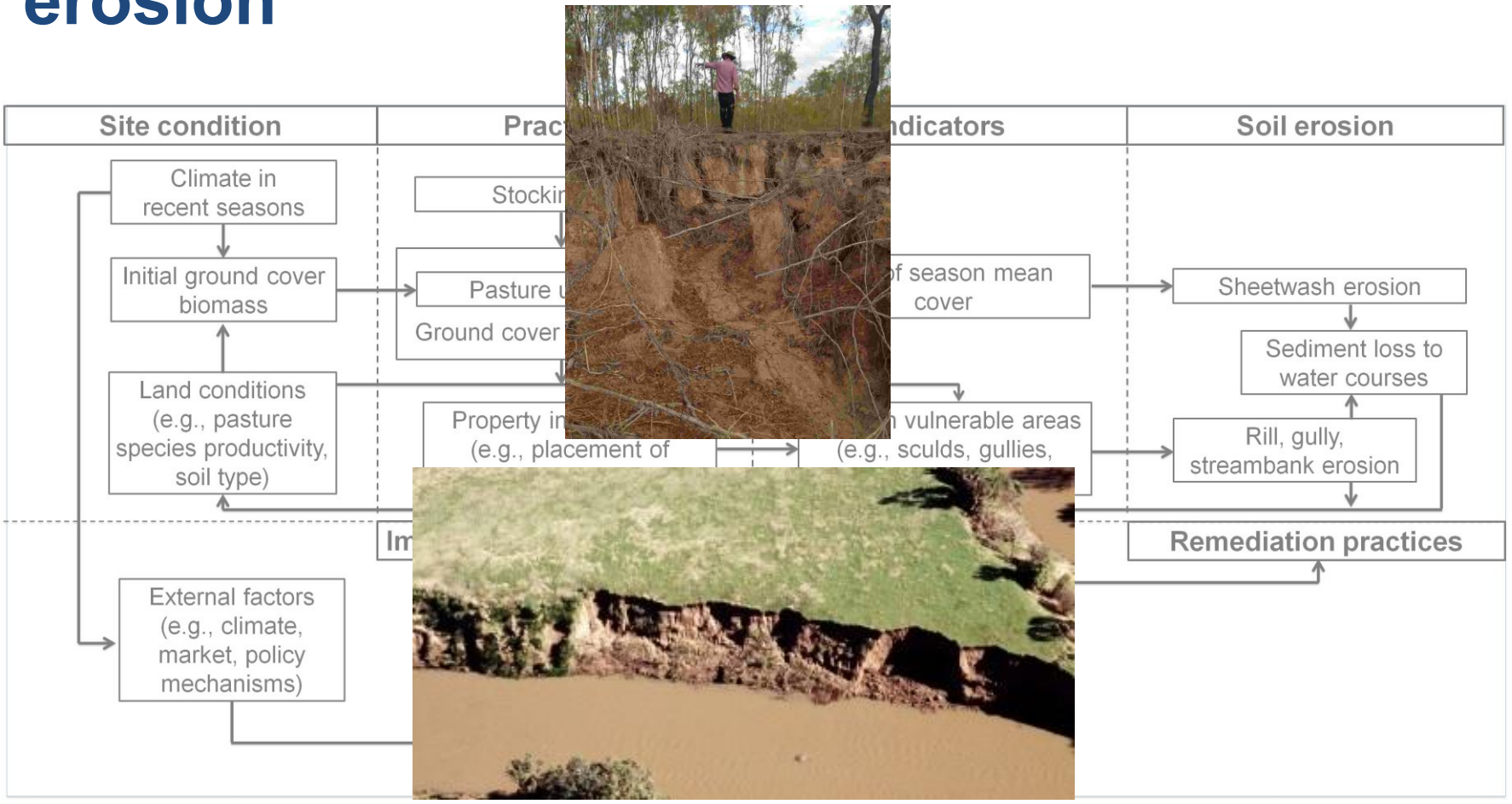
Queensland Government

Economics of soil erosion

- Poor management practices on grazing land lead to soil erosion
- On-site effect: loss of productive land and infrastructure
- Fine sediments run-off from grazing land to waterways
- Externality: sediment run-off has damaging effect on Great Barrier Reef

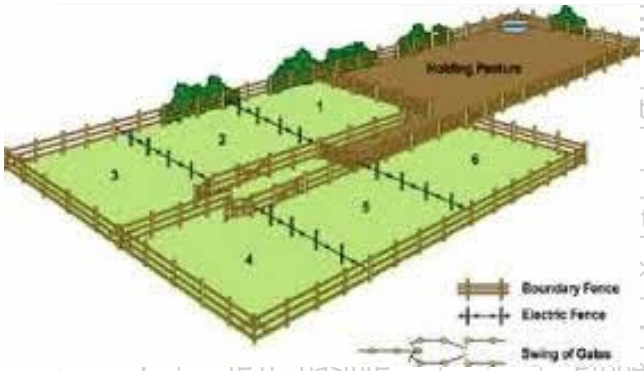
Burdekin River sediment plume
Source: Queensland Department of Natural Resources and Mines

Grazing land management practices & soil erosion



Adapted from Thorburn, P.J. & Wilkinson, S.N. (2013), *Agriculture, Ecosystems & Environment*, 180, 192-209

Grazing land management practices & soil erosion



species productivity, soil type)

(e.g., placement of fences, water points)

(e.g., sculds, gullies, riparian zone)

streambank erosion

Improved grazing practices

Remediation practices

External factors (e.g., climate, market, policy mechanisms)

Adoption decision (private net benefit)

Internal factors (e.g., attitude, financial position)

Private costs vs. private benefits

Adapted from Thorburn, P.J. & Wilkinson, S.N. (2013), *Agriculture, Ecosystems & Environment*, 180, 192-209

Aim

Identify knowledge gaps about the adoption of improved grazing land management practices and erosion remediation by landholders.

Key areas of interest:

- Adoption rates
- Effectiveness of changes
- Factors affecting adoption
- Public investments / incentives

Methods

- Literature review
  - Up to 2015
  - Google Scholar, Scopus & Science Direct
  - “adoption”, “grazing land management practices Queensland” “soil erosion, sedimentation Queensland”, etc.
- Review of government reports (up to 2015)
- Discussion with industry experts to verify findings

Adoption rates

- Limited information about adoption rates of improved land management practises available
  - Estimates: 54% of graziers in Burdekin catchment, 28% of graziers in Fitzroy catchment adopted improved land management practices (not robust) [2]
  - Best Management Practices Workshops (voluntary) on improved grazing land management started in 2012 (trial period to be considered)
- Limited information about adoption of remediation practices available

[2] Queensland Government (2014), Great Barrier Reef Report Card 2012 and 2013: Results

Effectiveness of changes

- Limited scientific knowledge about erosion processes (e.g., slope, soil type, rainfall, land condition)
  - Every site is different [3]
  - More trial sites needed
  - Long-term site monitoring required particularly for remediation practices (sediment loss stabilisation/reduction only over time) [4]

[3] Howley et al. (2013), Normanby Catchment Water Management Plan. [4] Wilkinson et al. (2015), Managing gully erosion as an efficient approach to improving water quality of the Great Barrier Reef

Factors affecting adoption

- A comprehensive literature is available about factors affecting landholder adoption of improved grazing practices, e.g., [5-11]
- Factors found repeatedly as barriers to adoption are:
  - Capital costs
  - Information/awareness
  - Personal characteristics of landholders

- Knowledge gaps:
  - Drought conditions in Queensland may affect adoption
  - Private costs (e.g., opportunity & transaction costs)
  - Private benefits (e.g., improved pastures)

[5] Greiner, & Gregg (2011) *Land Use Policy, 28*(1), 257-265. [6] Herr et al. (2004) *Australasian Journal of Environmental Management*, 11(4), 278-288. [7] MacLeod & McIvor (2006*) Ecological Economics*, 56(3), 386-401. [8] Moon & Cocklin (2011*) Journal of Rural Studies*, 27(3), 331-342. [9] [10] Whitten et al. (2013) *Ecosystem Services,* 6, 82-92. [11] Marshall et al. (2011) *Climatic Change*, 107(3). [12] Rolfe & Gregg, (2015) *Journal of Environmental Management*, 157, 182-193. 511-529.

Incentive mechanisms

- Addressing range of factors that may require diverse suit of incentives (affect private benefit positively) to be considered
- Incentive mechanisms need the flexibility to be tailored to specific landholder [13]
- Current mechanisms:
  - Extension
  - Workshop on best grazing land management practices (voluntary)
  - Grants for remediation work

Knowledge gaps:

- Effectiveness of current incentive mechanisms (e.g., extension)
- How to use the available knowledge promote adoption?

[13] Rolfe & Gregg, (2015) *Journal of Environmental Management*, 157, 182-193. 511-529.

Public investment

- Public investment in improving land management practices (prevention & remediation) is ongoing (e.g., Water Quality Grants), BUT:
  - Limited scientific knowledge about erosion processes restricts cost-effectiveness analyses as decision tool for allocation of public investment mechanisms [e.g., 14,15]
  - No site monitoring components included in erosion remediation funding (no data generation, assessment of effectiveness not possible)

Megan Star's presentation, Prioritising neighbourhood catchments in the Fitzroy Basin to achieve cost effective outcomes

[14] Wilkinson et al. (2015) Managing gully erosion as an efficient approach to improving water quality in the Great Barrier Reef lagoon. [15] Star et al. (2015) Prioritization of neighborhood catchments for soil erosion management in the Fitzroy Basin.

Summary of knowledge gaps

- Need to gain reliable information about adoption rates
- Develop a range of effective incentives schemes based on available knowledge
- Investigation of transaction & opportunity costs of improved grazing practices
- Need to determine cost-effectiveness of current investments based on scientific knowledge
- Scientific knowledge gaps to be addressed
- Programs to include site monitoring for long-term data collection in funding schemes

Next step: Survey

- Landholder survey (planning stage)
- Understanding the private costs (opportunity & transaction costs - potential barriers) and benefits of adopting improved grazing land management practices
- Online or telephone survey (to be determined)
- Sample of 50-100 landholders in Fitzroy Basin
- Expect information to be useful for developing effective incentives to increase adoption rates

Thank you.