Valuing Ecosystem Services to Agricultural Production

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Markets for ecosystem services (ES) are often incomplete leading to under-provision,
  thus government intervention to support provision may be welfare improving.

Agriculture is a significant producer and consumer of ES.

ES concept is a way to communicate agriculture’s dependence on the environment (Gomez-Baggethun et al., 2010)

Valuing ecosystem service flows to, from and within agriculture can help to inform efficient and equitable policy.
Project Objectives

- Provide overview of concept of ES as it applies to agriculture,
- Use economic framework to identify different ES flows and potential externalities generated,
- Introduce literature on market-based valuation of ES,
- Apply our economic framework to assess existing literature,
- Identify gaps and research priorities to inform policy.
What are ecosystem services to agriculture?

“the conditions and processes through which natural ecosystems, and the species that make them up, sustain, and fulfill human life”

(Daily, 1997)

Figure: Example ecosystem services and their contribution to agricultural production
A model of ecosystem service flows in relation to agriculture
Why Differentiate Intra-, Inter- & Extra-Agriculture Flows?

- Intra-agriculture ecosystem service flows do not involve externalities,
  - though provision may be sub-optimal due to imperfect information etc.

- Inter-agriculture flows may involve externalities, however,
  - farmers provide ES to each other,
  - relatively small groups increases possibilities for collective action,
  - thus government subsidization of inter-ag. ES flows may not be the optimal policy.

- Extra-agriculture flows do involve externalities
  - farmers provide and receive ES from RoS,
  - large and disparate interest group (whole society),
  - thus government subsidization of extra-ag. ES flows may be the optimal policy.
Why Value Different Types of Agricultural ES Flows?

- Intra, Inter- & Extra-agricultural ES flows may differ in:
  - Optimal approach to under-provision of ES,
  - ‘Fair’ distribution of costs and benefits.
- Objectively identify which types of government intervention are most likely to deliver net welfare gains, e.g.:
  - Landcare groups vs. purchase set-aside/conservation areas.
Internationally most literature and government policy focuses on extra-agriculture ES flows.

- particularly provision of services to RoS by agriculture
- non-market valuation techniques are important for these studies

Relatively small literature values ES to agricultural production.

- Market-based valuation methods are relevant to this literature.
Relevant Market-based Valuation Methods

- **Production Function Approach**
  - are based on the contribution of a given ecosystem service to the production of a commodity that is traded in existing markets.
  - Identifying ecosystem cause and agricultural effect difficult - e.g. vegetation retention endogenous.

- **Replacement cost techniques**
  - are based on estimating the costs that would be incurred by replacing ecosystem services with artificial technologies.
  - May over-estimate ecosystem values by ignoring substitution by users.

- **Hedonic pricing (HP) techniques**
  - use multiple regression analysis to estimate the relationships between land values and attributes (including ecosystem services).
  - Assume full information and unconstrained optimization by buyers.
Categorizing Studies using our Framework

- Value of intra-farm (i.e. within-farm) ecosystem service provision is relatively easy to identify
  - E.g. Miles et al. (1998) estimated the costs and benefits of maintaining remnant native vegetation to individual farmers in Victoria and New South Wales.

- Larger-scale ecosystem service provision is harder to classify as there are multiple contributors
  - E.g. pollination services, biological pest control, water quality may be provided by other farms and non-agricultural areas (e.g. conservation reserves).
  - We found no value estimates for inter-farm ES, although it would not be impossible (see. ‘landscape influences’ in Power, 2010)
Conclusion

- Inter-farm ecosystem service values are often not internalized leading to potential gains from policy intervention.
- Internationally policies supporting inter-farm ES provision are relatively rare compared to those supporting provision of ES to the RoS
  - Australia’s Landcare programmes are an exception (?)
- Difficulties in independently identifying inter-farm ES values may be responsible for relative lack of policy-attention to this area
  - “What gets measured gets managed”
- In Australia there is a lack of studies valuing inter- or extra-agriculture ES flows to Australian agriculture.
- Studies of this type could help inform policy design, however,
- some ES values desirable to fully target policy may be prohibitively difficult to separately estimate.