The Design of Effective Agri-Environmental Schemes (lessons for economists)

David Pannell
Agri-environmental issues in W. Australia

- Threatened species
- Water quality
- Soil salinity
- Acidic soils
- Climate/CO$_2$
- Native vegetation on farms
Back in 1999
$1.4 billion program announced by PM
Economist puts salt on tail of big debate

SALT concerns must be addressed as a local problem, and not a catchment concern, if progress is to be made in overcoming dry-land salinity.

University of WA resource economist David Pannell has warned of the damage caused by the common “whole valley” approach to solve salinity concerns.

While acknowledging his approach as “almost heretical”, he described the whole valley approach as a national mistake, saying most salinity concerns arose on site and could be addressed on site.

He said many WA Wheatbelt valleys had very low transmission of water by soils and low slopes, meaning water salinity was generally not a problem.

Given the localised nature of salinity concerns, Mr Pannell said it was going to be difficult for the community to justify spending to solve individual on-farm problems.

He said the implications of community salt levy were extreme when there was a transfer of benefits off-farm and on-site.

He also attacked the level of spending on research for solutions, claiming it was a “grace” there was no governance in salinity tolerant industries in WA.

“There are going to be millions of hectares affected and not a policy has been prepared to go on the (salt-affected land) or even begin to scope,” he said.

Given that the new WA Government has spent $87 million on research, this is a real salinity story.

The real salinity story

Western Australia is stuck with salinity.

For 30 years, people in WA have talked and written about salinity. For the past few years, it has been a huge issue. In bringing together the real salinity story.

Big decisions called for on salinity fight

Professor Pannell said some situations it could take up to 3000 years for water to cross aquifers, while water generally only moved horizontally across the water table a few metres a year.

He gave an example in Western Australia where groups of trees planted to alleviate salinity only had an effect on the water table up to 30 or 40 metres from the trees.

He said profitable perennial crops needed to be developed so farmers could minimise salt problems and still make money.

“The core emergency thing to do is treat them (patches of salinity) on the real salinity story.

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Anger was justified

- Australian National Audit Office (2008)
  - Lack of evidence of significant progress towards preventing, stabilising and reversing trends.
  - Where there was evidence, progress was frequently less than one per cent of the longer-term target.
Anger → motivation → got deeply involved

- Collaborated with agricultural and environmental organisations to help them design and deliver AESs
- Developed tools to help
- Delivered training workshops to hundreds of agency staff
- Researched the challenges and how to address them
- Learned a lot
Lessons

- Agencies that design and deliver agri-environmental programs often lack basic economics
- They need economics to do their job well

But … our usual approach as economists is probably not sufficient
Lessons

● It’s not enough to provide criticisms, or even constructive advice

● Such advice is often ignored
  o Political constraints
  o It’s too late
  o Lack of trust/confidence
  o Offence taken
  o Doesn’t fit preconceptions
  o Don’t understand it
  o Don’t know what to do about it

● Training, support, tools can help

Millions wasted fighting salinity, says researcher

By Science Writer
MARK STEENE

THE millions of dollars spent fighting dry-land salinity was largely being wasted because it could not solve the problems, a researcher said yesterday.

Associate Professor David Pannell, of the University of Western Australia, said the current philosophy of Integrated Catchment Management was misguided.

Instead, he argues that salinity can generally be treated as an on-site problem.

Professor Pannell told a Rural Media Association lunch yesterday that water moved extremely slowly through the soils. “Professor Pannell said in some situations it could take up to 3000 years for water to cross aquifers, while water generally only moved horizontally across the water table a few metres a year.

He gave an example in Western Australia where groups of trees planted to alleviate salinity only had an effect on the water table up to 30 or 40 metres from the trees. He said profitable perennial crops needed to be developed so farmers could minimise salinity problems and still make money.

“The core emergency thing to do is treat them (patches of salinity) on site,” he said.

(Quote credit: Professor David Pannell, as reported in Rural Media Association lunch)
Lessons

- Our economic analyses take a particular (narrow) focus
- We tend to skate over some issues that are critical to success or failure of the policy
Design of projects/investments
Think through the chain

Project mechanisms → On-farm changes → Reduced emissions → Environmental changes → Benefits

- Many projects lack logical coherence
- Integrate knowledge of
  - Technical relationships
  - Behaviour change
  - Environmental values
  - Project risks
  - Costs
- Quantitative, not just story telling
- Pay attention to project design
The chain is long

Project mechanisms → On-farm changes → Reduced emissions → Environmental changes → Benefits

- May be fragile – any link could break it
- Assessment of projects should account for risk of project failure
Selection of policy mechanisms

● Mechanisms need to make sense for the particular context

● e.g. Salinity program
  o Relied on extension to promote conservation practices (zero payments)
  o For almost all farmers, the practices had private costs > private benefits
  o Adoption was minimal and temporary
Another tool

“Private net benefits” relate to the landholder making the decisions

“Public net benefits” relate to all others (externalities)
  - neighbours, downstream water users, city dwellers interested in nature
Possible projects

Each dot is a set of changes on specific pieces of land = a project.
Simple public-private framework

Positive incentives or technology change

Technology change (or no action)

No action

Positive incentives

Public net benefit

0

Private net benefit

Extension

No action (or extension or negative incentives)

No action (or flexible negative incentives)

Negative incentives
That was based on simple rules.

The following version accounts for additional complexities:

- Costs of learning/transition
- Lags to adoption
- Partial effectiveness of extension
- Transaction costs
- More targeted (BCR >2)
Complex version

- Don’t select a mechanism type before you understand the issue
Consider other mechanism options

- Don’t assume that the best approach is to directly pursue behaviour change
- R&D to develop technologies/practices that benefit the environment and are attractive to farmers (e.g. profitable)
- Government investment in engineering works to mitigate impacts
  - Flooding, salinity
Time frames
Time frames for project

- Often takes 10-50 years to deliver the benefits (e.g. groundwater)
- Need long-term contracts and continuity of funding to have confidence in results
- In many programs, funding is short term (e.g. 3 years)
- When assessing investments, factor in risk of non-continuity of funding
Time frames for planning

- Realistic time frames for planning are reasonably long
  - Australia: a brief burst of planning every 5 years, when new program announced

- Think ahead – start research/analysis early
- Opportunity for influence
Farmer behaviour
Adoption, participation, compliance

- Sometimes taken for granted
- Often lower and slower than people assume
- If changes are unattractive
  - Need high payments
  - High cost of monitoring and enforcement
  - Reduce likelihood of delivering benefits
There’s more to behavior than in our models

- Financial consequences, risk consequences
- Complexity vs ease and convenience, labour, off-farm work, farming systems issues, age, skill requirements, links to extension, observability of results
ADOPT (Adoption & Diffusion Outcome Prediction Tool)

- Free online tool
- Makes quantitative predictions about peak level of adoption and speed of adoption of a new agricultural practice
- Based on 22 questions about the practice, the population of farmers, the farming context, etc.
Additionality
Additionality

- Rule of thumb: Don’t pay farmers to do things they would have done anyway
- Example: Claassen et al. (2014) for US
  - Conservation tillage 50% additional
  - Nutrient management 30% additional
- Perfect additionality requires perfect price discrimination (e.g. reverse auction)
- If there is a standard price for an action, some non-additionality is unavoidable
- Optimal additionality < 100%
Additionality example

Farmers who would adopt without any payment

Additional farmers who would adopt with payment of 25 $/ha

Reasonable additionality
Additionality example

Private net benefit from adopting practice ($/ha)

Additional farmers who would adopt with payment of 25 $/ha

Farmers who would adopt without any payment

Poor additionality
Prioritising, ranking, targeting projects/investments
Why prioritising?

- 7000 environmental projects in Australia
- Huge range of benefits and costs
- Average BCR for best 5% = 330 times better than for median project

Source: Fuller et al. (2010). *Nature*
Common errors in prioritising

- Assume behaviour change will occur
- Ignore feasibility/effectiveness
- Ignore the with-versus-without principle
  - Maron et al. (2013): assessed 16 tools for prioritising environmental projects
  - Only one got the with-versus-without comparison right
Common errors in prioritising

- **Omit costs**
  - Ansell et al. (2016): of 239 journal papers evaluating AESs, 13% considered cost effectiveness

- **Subtract costs (instead of dividing) (US CRP)**

- **Add variables that should be multiplied (MCA) – e.g. project risk**

- **Prioritisation needs more of our attention – many systems in use are no better than random**
Selling prioritization

- An additional rationale to put to agencies
- To demonstrate a business-like approach
- Convince financial decision makers
Managing uncertainty
Uncertainty in AESs is always high

- Agricultural production systems and economics
- Environmental threats
- Agri-env management practices
- Effectiveness, reliability
- Costs
- Behaviour change/adoption of new practices
- Community preferences/values (NMVs)

Even if using benefit transfer, info about NMVs is often relatively good compared with ecology
Most common response to U in AESs

- Completely ignore it
Other possible responses

- Document knowledge gaps
- Score uncertainty for the project
- Invest in research instead of actions
- Seek robust strategies (sensitivity analysis)
- Feasibility study or pilot project
- Active adaptive management (monitoring)

- Emphasise importance of uncertainty, but think beyond sensitivity analysis
Managing people’s biases, preconceptions, self interest
“The Planning Fallacy”

- Identified by Daniel Kahneman
- When devising projects or programs, people often exaggerate benefits or under-estimate costs or time required
- Various reasons
  - Vested interest
  - Wishful thinking, ignore difficulties or risks
“The Planning Fallacy”

To address it, need
  o A consistent framework to assess options
  o Independent review of the assumptions
  o INFFER: BCR × 10

No point in prioritising projects if the system doesn’t address this aspect

I think this is a big issue – one of the more important insights from behavioral economics
**INFFER** (Investment Framework for Environmental Resources)

- Detailed training and support
- Simple but rigorous project screening
- Logically coherent project design
- Public: Private Benefits Framework
- A streamlined Benefit: Cost Analysis
- Detailed review of project assumptions
- Explicit strategy for uncertainty

- Some success, some failure, more lessons
Final remarks

- Engaging with AESs and related policy is an eye-opener!
- My research has never been the same
- It doesn’t mean you can’t do good research
- Demanding
- Not necessarily rewarded in universities (but increasingly it is)
- Can be frustrating but also personally rewarding
www.Resources4AES.net

- Lessons from past schemes
- Selecting policy mechanisms
- Measuring environmental values
- Ranking projects
- Metrics for ranking
- Additionality
- Understanding adoption
- Predicting adoption
- Uncertainty
- MOOC
- Blog
- INFFER