Predicting and improving adoption of agricultural innovations

Rick Llewellyn
CSIRO, Adelaide
Sustainable Agriculture Flagship
Who is involved?

- Geoff Kuehne (CSIRO)
- Rick Llewellyn (CSIRO)
- David Pannell (UWA)
- Perry Dolling (DAFWA)
- Roger Wilkinson (VicDPI)
- Mike Ewing (CRC FFI)
Our objectives

• Make adoption and diffusion considerations more available, understandable and applicable
• Produce a tool and process to predict likely rate and level of adoption for specific practices
• Help inform Research, Development & Extension (RD&E) strategies

PREDICT. INFORM. ENGAGE.
Why does this still need doing?

- Many poor and costly adoption strategies and assumptions
- Unstructured guesswork is the most common tool
- Vast adoption literature and understanding
- Very little effort has been made to apply it ‘forward’
- Demand
ADOPT

- Future Farm Industries CRC project started 2009
- Developed with industry piloting e.g. Grains RDC
- Workshops across Australia 2010-12
- Beta version released December 2011
- New partnerships to lead to further development and adaptation e.g. ACIAR
ADOPT is designed to help users think about and analyse how an innovation will be adopted within a given population.

**Predict**

ADOPT aims to identify a likely peak extent of adoption within a specific population and the likely time for reaching that peak. It focuses on a particular innovation within a particular population and does not aim to predict adoption behaviour of individuals.

**Inform**

ADOPT encourages users to consider the influence of a structured set of factors affecting adoption. The information that it provides is helpful in informing R, D & E strategies.

**Engage**

ADOPT engages R, D & E managers and practitioners by involving them in the process and making adoptability knowledge and considerations readily available and understandable.

ADOPT incorporates sets of factors that studies have shown to commonly influence the rate and/or peak level of adoption within a population (see the Concept tab). These are structured around four aspects of adoption:

1) characteristics of the innovation
2) characteristics of the population
3) actual advantage of using the innovation
4) learning of the actual advantage of the innovation
Poll
Questions

Type your questions here at any time
Adoption as a learning process

Learning of relative advantage
Classic diffusion of an innovation

Time →

Adoption (% of potential adopters)
Different drivers at different stages

Personal characteristics; learning-related characteristics; extension/researcher information; actual relative advantage

Adoption (% of potential adopters)

Time →
Importance of actual relative advantage

Personal characteristics; learning-related characteristics; extension; \textbf{actual relative advantage}

Time $\rightarrow$
Lupin diffusion in WA

- Wongan Hills
- Wyalkatchem
- Chapman Valley
- Corrigin
- Lake Grace

Marsh et al 2000
No-till adoption in Australian cropping regions

Llewellyn et al 2012 Field Crops Research
The 4 Quadrant Framework

Learning characteristics of the population

Learnability characteristics of the innovation

Population characteristics that influence relative advantage

Relative advantage characteristics of the innovation

Innovation characteristics

Learning-related characteristics

Population characteristics
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What ADOPT does

- Deals with populations (diffusion)
- Not pretending to predict decisions of individuals
- Not attempting to include all factors – consistent, predictable and readily attainable
ADOPT conceptual framework

**Population-specific influences on the ability to learn about the Innovation**

- Advisory support
- Group involvement
- Relevant existing skills and knowledge
- Innovation awareness
- Networks
- Farmers networks & skills

**Learnability Characteristics of the Innovation**

- Trialling ease
- Trialability of Innovation
- Innovation complexity
- Observability
- Time to Peak Adoption

**Relative Advantage for the Population**

- Environmental orientation
- Profit orientation
- Risk orientation
- Management horizon
- Short-term constraints
- Enterprise scale
- Time for profit benefits to be realised
- Profit in years used
- Profit in Future
- Environment
- Ease & convenience
- Risk

**Relative Advantage of the Innovation**

- Relative upfront cost of innovation
- Reversibility of innovation
- Investment cost
- Relative Advantage
- Learning of Relative Advantage
- Time to Peak Adoption Level
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- Reversibility of innovation
  - Reversibility of cost
- Investment cost
  - Investment cost
- Relative advantage
  - Profit orientation
  - Risk orientation

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- Experimentation & convenience
- Risk

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**Advise support**

**Group involvement**

**Relevant existing skills and knowledge**

**Innovation awareness**

**Networks**

**Farmers networks & skills**

**Trial ease**

**Trialability of Innovation**

**Observability**

**Time to Peak Adoption**

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**Environment**

**Profit**

**Risk**

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**Time to Peak Adoption**

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Peak Adoption Level

Profit in Future

Risk

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Time for environmental benefits to be realised

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Management horizon

Enterprise scale

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Profit orientation

Environmental orientation

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Farmer networks & skills

Learning of Relative Advantage

Relative Advantage

Reversibility of innovation
Questions

Type your questions here at any time
Title: Merged Lupins

Time to 90% Peak Adoption Level: 12 years

Peak Adoption Level: 49%

Question 4: Enterprise scale

On what proportion of the target farms is there a major enterprise that could benefit from the innovation?

1. Please select one of the following responses:
   - Almost none of the target farms have a major enterprise that could benefit from
   - A minority of the target farms have a major enterprise that could benefit from
   - About half of the target farms have a major enterprise that could benefit from
   - A majority of the target farms have a major enterprise that could benefit from
   - Almost all of the target farms have a major enterprise that could benefit from

2. What is your reasoning for this answer?
   Response comes from the average of a number of projects.

- For example, this will be low if very few in the target population make large amounts of hay and the innovation is a hay-making technology.

- If the innovation will benefit farm management in general (e.g. farm finance software) then 'almost all' will benefit.
Title: Merged Lupins

Time to 90% Peak Adoption Level: 12 years
Peak Adoption Level: 49%

Project Details Questions S-Curve

Question 7: Trialable

How easily can the innovation be trialled on a limited basis before a decision is made to adopt it on a larger scale?

1. Please select one of the following responses:
   - Not triable at all
   - Difficult to trial
   - Moderately triable
   - Easy triable
   - Very easily triable

2. What is your reasoning for this answer?
   - Response comes from the average of a number of projects.

- This identifies whether the innovation can be trialled on a limited basis with low cost to allow some learning about its likely value
- A new crop variety can usually be very easily trialed
- A new rotary dairy is not triable on the farm
- A new whole-farm paddock layout cannot be easily trialed.
**Title: Merged Lupins**

**Time to 90% Peak Adoption Level:** 12 years

**Peak Adoption Level:** 49%

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**Question 13: Innovation awareness**

What proportion of the target population would be aware of the use or trialing of the innovation in their district?

1. Please select one of the following responses:
   - It has never been used or trialed in their district(s)
   - A minority are aware that it has been used or trialed in their district
   - About half are aware that it has been used or trialed in their district
   - A majority are aware that it has been used or trialed in their district
   - Almost all are aware that it has been used or trialed in their district

   - This reduces the time required for the target population to be aware that an innovation exists and that information about it may exist in their district.

2. What is your reasoning for this answer?
   - Response comes from the average of a number of projects.
Question 22: Ease and convenience

To what extent would the use of the innovation affect the ease and convenience of the management of the farm?

1. Please select one of the following responses:
   - Greatly decrease ease and convenience
   - Decrease ease and convenience
   - No net effect on ease and convenience
   - Increase ease and convenience
   - Greatly increase ease and convenience

2. What is your reasoning for this answer?
   - This measures changes to the ease, convenience and management demands on the farm that may result from adopting the innovation.
   - Some innovations that offer ease and convenience benefits are pesticide tolerant crops, tractor auto steer, irrigation sensors, while other such as intensive cell grazing greatly increase management demands and inconvenience.

More details on Q.22

< Previous Next >
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Time to 90% Peak Adoption Level: 12

12.0 years

Peak Adoption Level: 49

49%

Adoption Level S-Curve

Time (years)
Lupin diffusion in WA

Marsh et al  2000

Wongan Hils
Wyalkatchem
Chapman Valley
Corrigin
Lake Grace
Project: Merged Lupins

Sensitivity Analysis to Step Change of Response
Change In Peak Adoption Level

Chart | Questions | Detail

Peak Adoption Level

Time to Peak Adoption Level

Step Down | Step Up

Question Number

Done
Finally

- There is an ongoing need and demand to predict potential diffusion of innovations
- ADOPT is aimed at encouraging application of a structured approach based on well-established principles
  1. characteristics of the innovation
  2. characteristics of the population
  3. actual advantage of using the innovation
  4. learning of the actual advantage of the innovation

**PREDICT. INFORM. ENGAGE.**
Further information

- csiro.au/adopt
- ruralpracticechange.org

Selected references

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