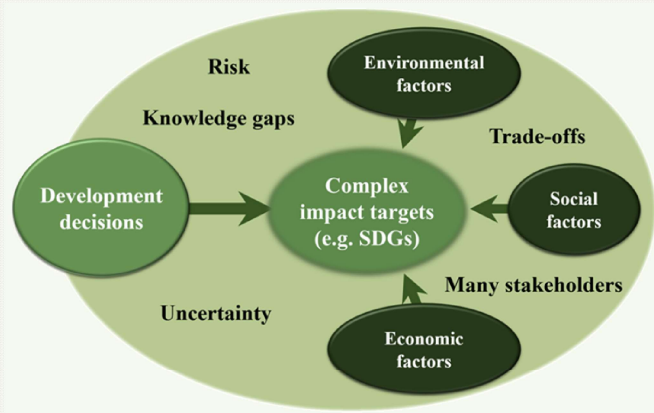


# Decision-oriented research for development – making best use of existing information and closing critical knowledge gaps

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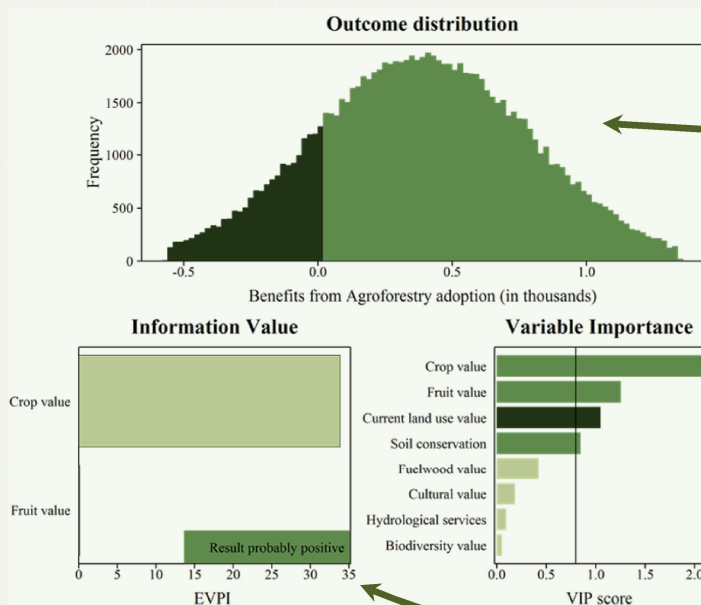
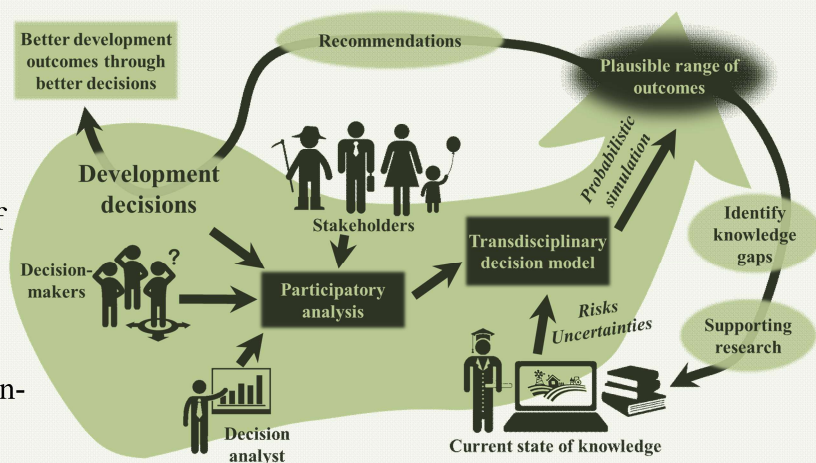


## Decision-making in agricultural research is complex

- Systems are affected by many drivers
- There are tradeoffs between competing objectives
- There are many stakeholders
- There is often little reliable information
- Decision-makers have to consider all of these, but research has struggled with such complexity and uncertainty
- But decision-makers are looking to science for support, and improving decisions is scientists' best chance to generate impact

## Holistic decision analysis

- Decision science approach to Research for Development
- Include decision-makers and subject-matter experts in participatory model development
- Consider everything that matters, regardless of ease of measurement
- Use Bayesian approach – start with 'prior knowledge' → refine when information becomes available
- Use Value of Information analysis to highlight decision-critical knowledge gaps
- Account for risks and uncertainties



## Decision analysis outputs

**Probabilistic decision outcome projection**, considering risks and uncertainty – *quantified as monetary values or in natural units*

**Important variables**, to which outcomes are most sensitive – *quantified by the 'Variable Importance in the projection' statistic (VIP) of Partial Least Squares regression*

**High-value variables**, on which measurements might change the decision recommendation – *quantified as the amount of money a rational decision-maker should be willing to pay for perfect information – the Expected Value of Perfect Information (EVPI)*

## Key references:

- Luedeling E, Shepherd K, 2016. Solutions, September-October 2016, 46-54
- Yet B, Constantinou A, Fenton N, Neil M, Luedeling E, Shepherd K, 2016. Expert Systems with Applications 60, 141-155.
- Shepherd K, Hubbard D, Fenton N, Claxton K, Luedeling E, De Leeuw J, 2015. Nature 523, 152-154.
- Luedeling E, Oord A, Kiteme B, Ogalleh S, Malesu M, Shepherd K, De Leeuw J, 2015. Frontiers in Environmental Science 3, 16.

## Resources for Decision Analysis

- ICRAF's Decision Analysis website
- E.luedeling@cgiar.org
- K.shepherd@cgiar.org
- decisionSupport package for R