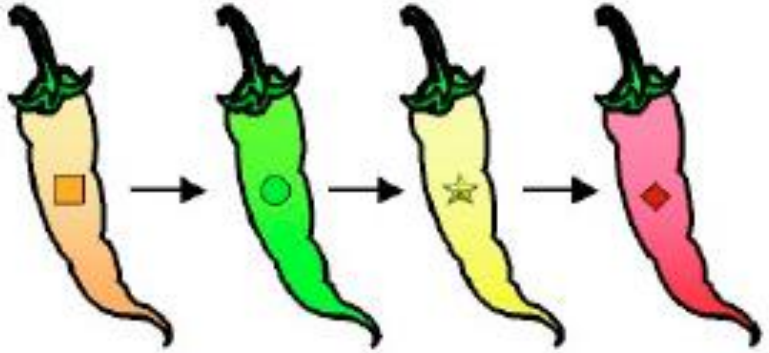
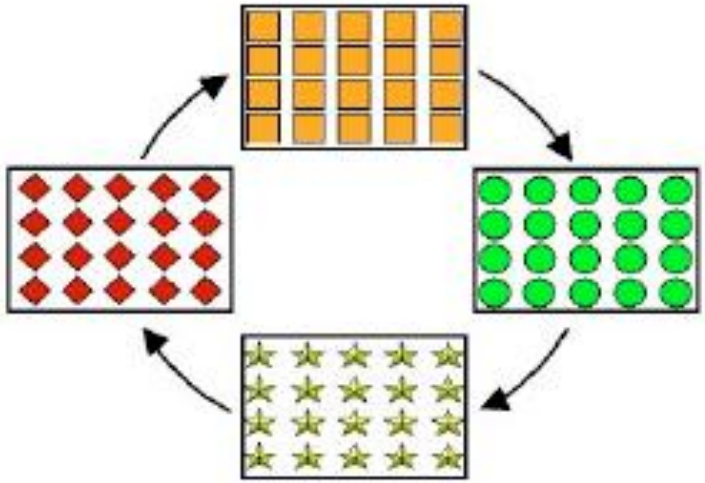
Alternative approaches to deploying disease resistance genes: enablers and barriers

Project background

- CSIRO and INRA have been modelling strategies for disease control in wheat and canola using a simulation model they've developed.
- These strategies consist of combinations of genetic technologies and alternative spatial patterns for planting the crops across the growing landscapes.
- The aim of these strategies is to reduce the ability of the diseases to evolve to overcome the disease resistance genes in the crops.
- We'd like to consult plant breeders, wheat growers, canola growers, and other relevant stakeholders to get a better understanding of the context and some of the barriers and enablers to the adoption of these strategies.

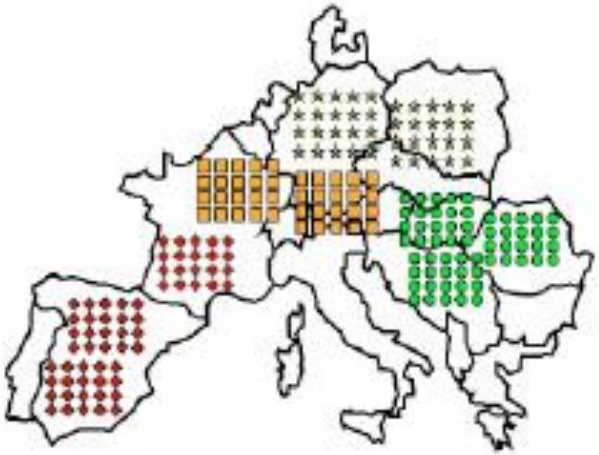


Turn-over (traditional approach)

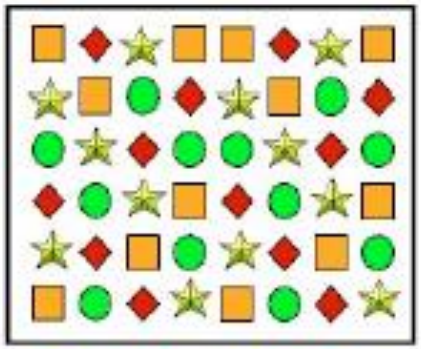


Rotations in time

Pyramids



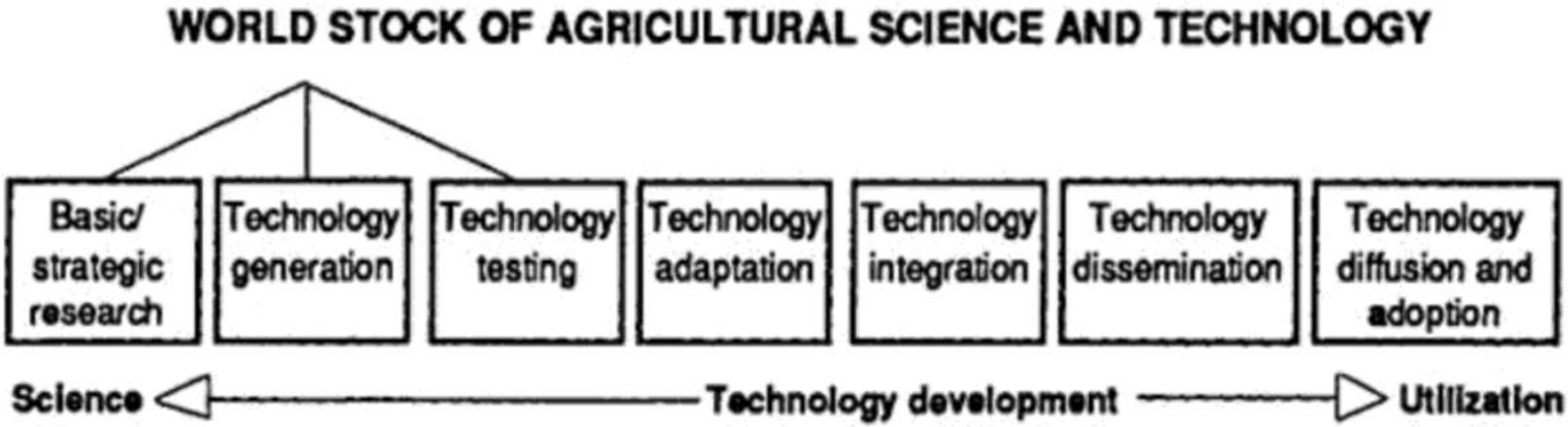
Mosaics (regional deployment)



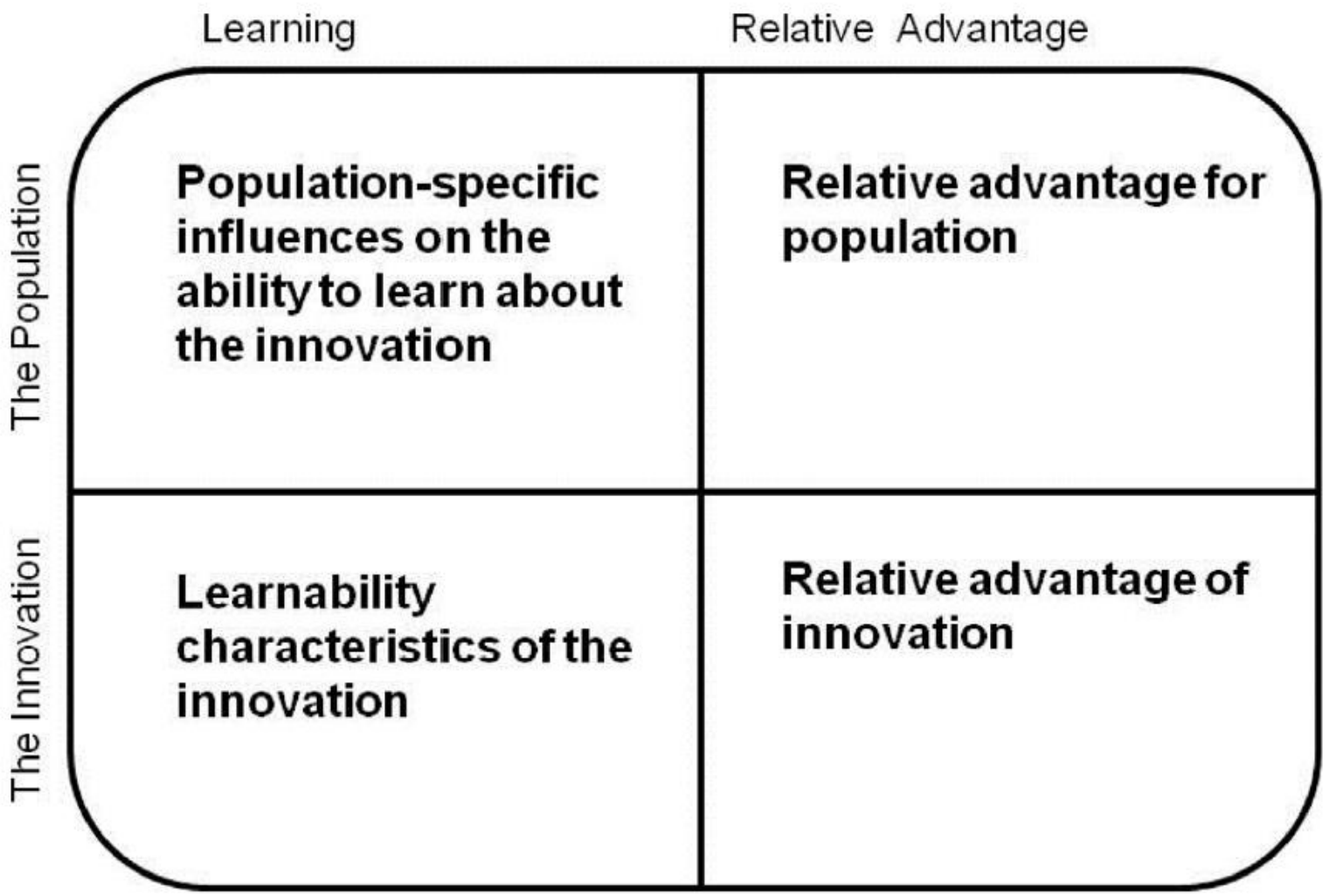
Cultivar mixtures

McDonald & Linde (2002). Annu. Rev. Phytopathol. 40:349-379

Research and development processes



McDermott's Technology Innovation Process model (McDermott, 1987)


Learning
Relative Advantage
The Population
The Innovation
Population-specific influences on the ability to learn about the innovation
Relative advantage for population
Learnability characteristics of the innovation
Relative advantage of innovation

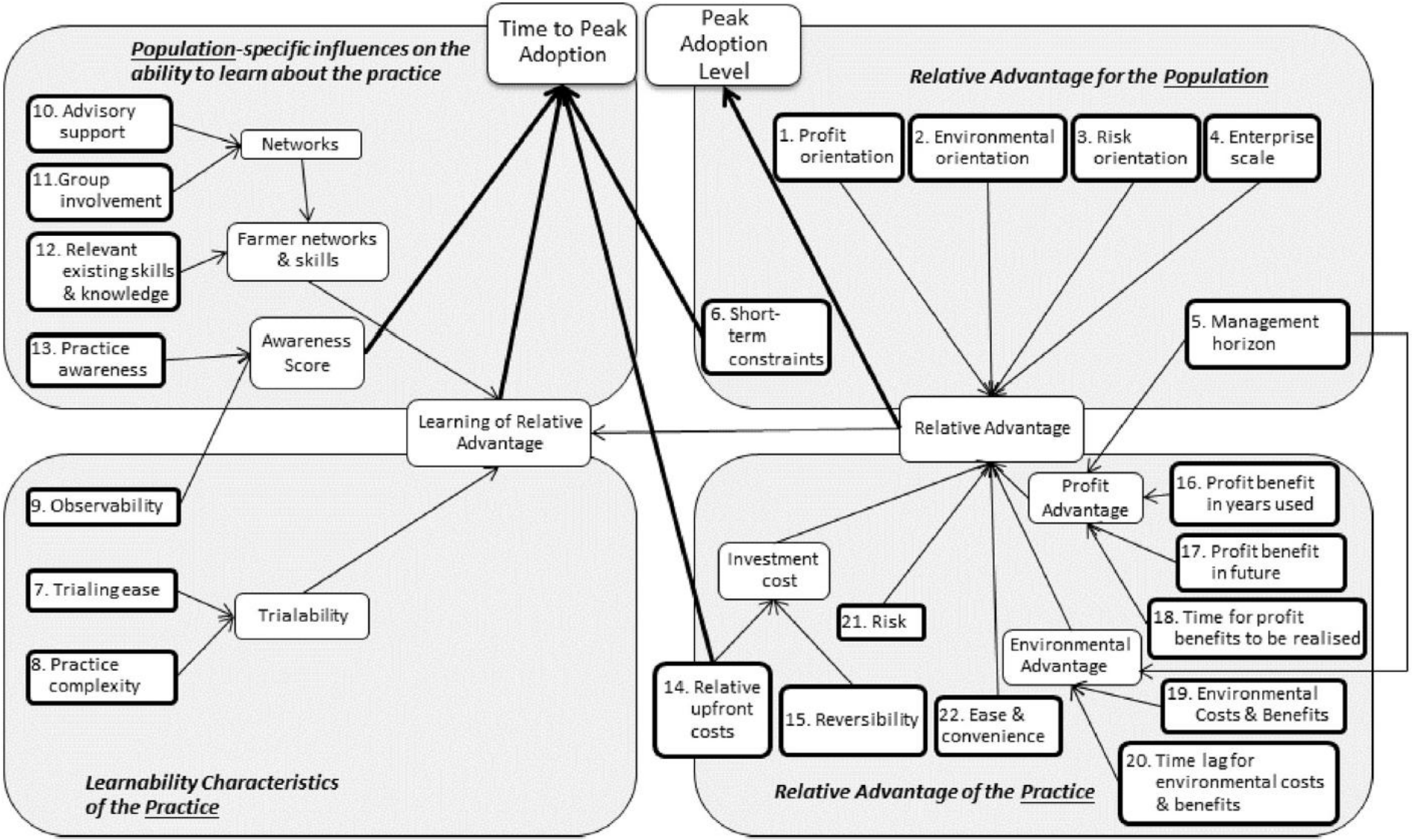


Fig. 2. The conceptual framework of influences on *Peak adoption level* and *Time to peak adoption.*

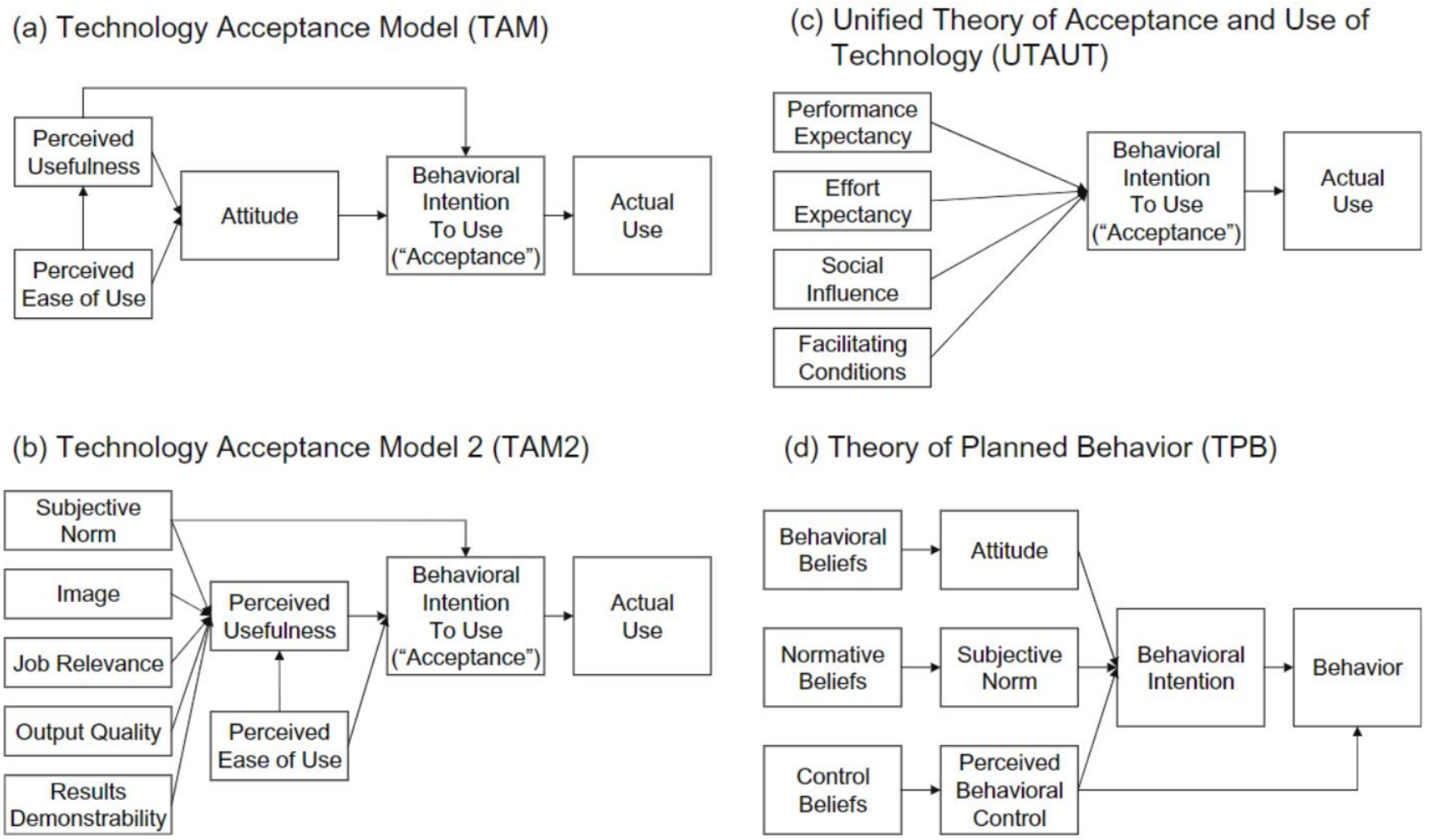
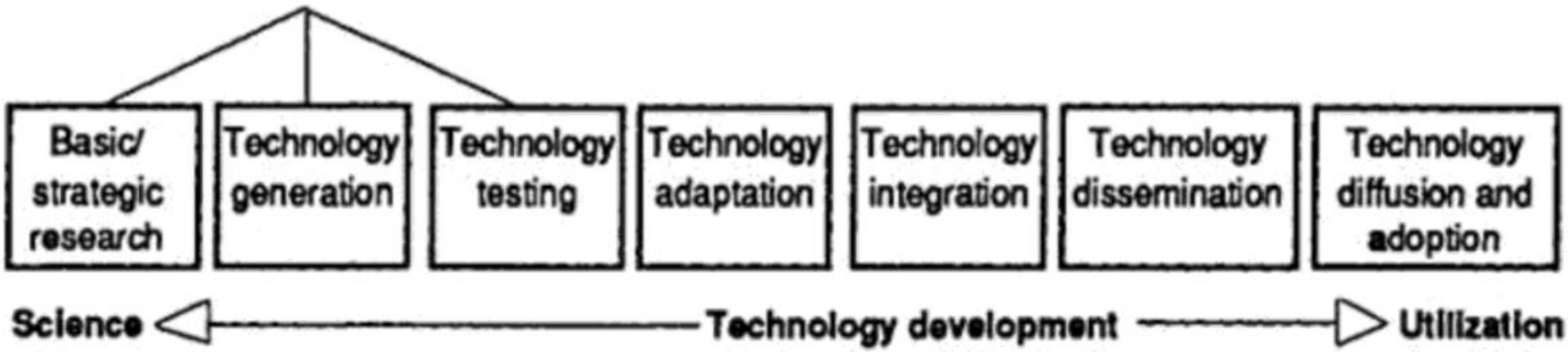
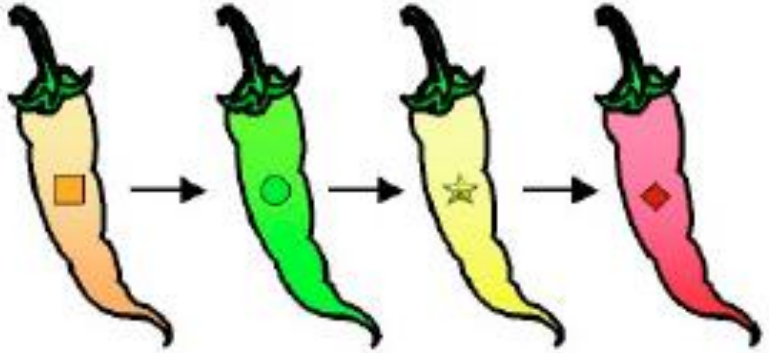


Fig. 1. Illustrations of (a) the Technology Acceptance Model (TAM), and related theories, including (b) TAM2, (c) the Unified Theory of Acceptance and Use of Technology (UTAUT), and (d) the Theory of Planned Behavior (TPB).


WORLD STOCK OF AGRICULTURAL SCIENCE AND TECHNOLOGY
Basic/ strategic research
Technology generation
Technology testing
Technology adaptation
Technology integration
Technology dissemination
Technology diffusion and adoption
Science
Technology development
Utilization

Examples of barriers and enablers

- Information
- Economic considerations
- Technical/agronomic
- Social
- Institutional
- Market/supply chain issues



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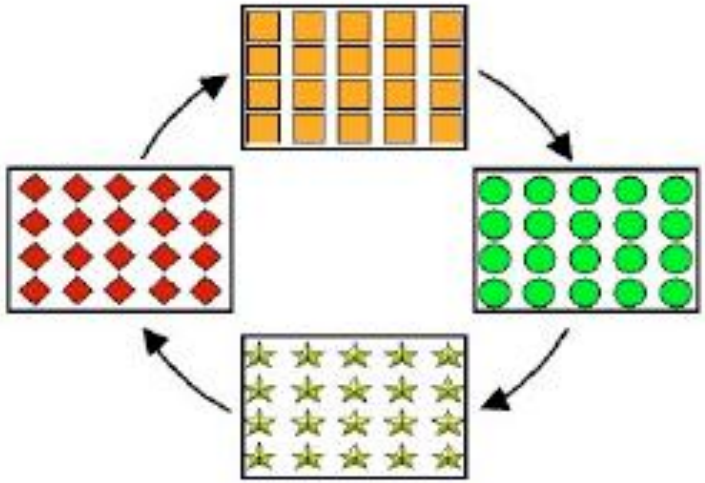

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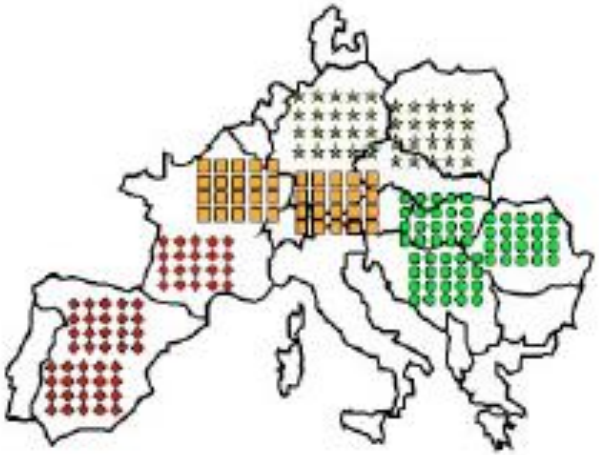

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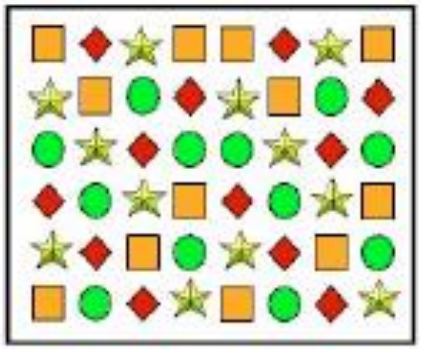

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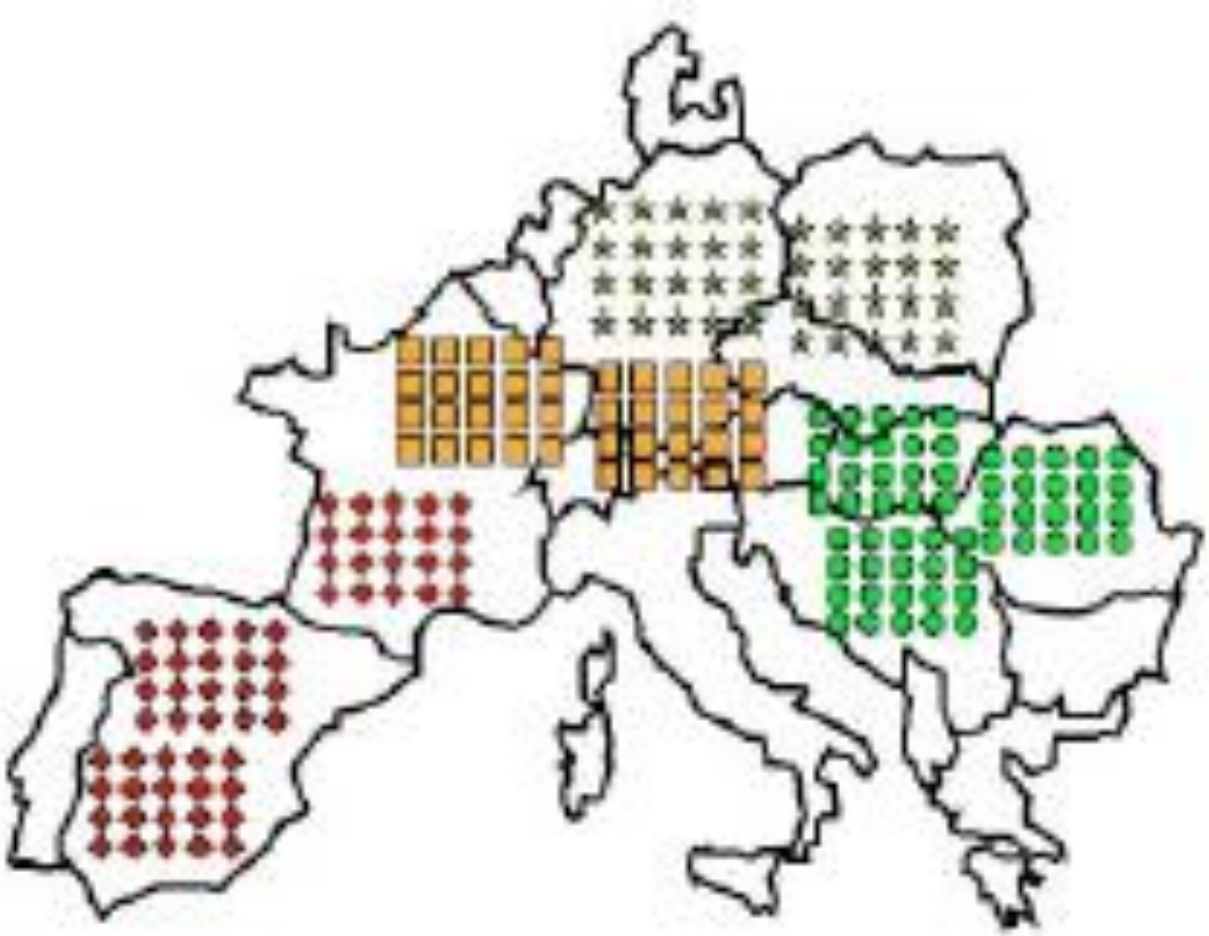
Crop Research Technology Readiness Level

Activity	Scale	Description
Preliminary Technology Solution Evaluation	1	Challenge/opportunity identified
Preliminary Technology Solution Evaluation	2	Solution or approach formulated
Experimental Testing	3	Proof of concept experiments
Experimental Testing	4	Field trials or validation experiments
Pre-Commercial Assessment	5	Validate commercial acceptance
Pre-Commercial Assessment	6	Full-Scale Production Initiated
Commercial Deployment	7	Market Availability
Commercial Deployment	8	Commercial Use Established
Commercial Deployment	9	Sustained Production Capacity Achieved

Coordination and cooperation



Discussion questions

- What are the main enablers and barriers to removing varieties that include overcome genes?
- Are these the same for varieties with single genes and R genes?
- What about removing varieties with overcome genes from affected geographic areas?
- What are the main enablers and barriers that affect the potential for cooperation amongst plant breeders?
- What are the main technological enablers and barriers for the development of mixtures?