Sensors and Sensing Practices: Shaping Farming System Strategies Toward Agricultural Sustainability

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Background & Aim

- Limited empirical studies on 'sensors-in-use' at farms
- Examine arable farmers' sensor usage & broader sensing practices in efficiency-based & ecology-based farming system strategies
- How sensors & sensing practices contribute to knowledge production & management

Concepts, Materials & Methods

- Social practice theory (meanings, materials, competences)
- 12 interviews with Dutch farmers
  - 6 efficiency-based
  - 6 ecology-based
- Observing sensing practices in the field

Results –> 86 sensing cases

SOIL (52%)

1.

Checking soil conditions against standards, guiding management decisions

2.

Understand soil dynamics & patterns to improve practices

CROP (21%)

1.

Proactive management to prevent threats

2.

Long-term understand-ing of crop health to improve practices

CLIMATE (15%)

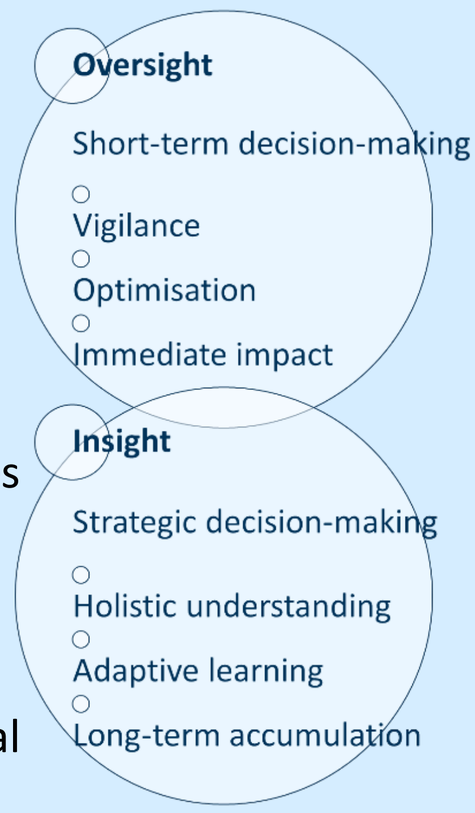
Using high-tech sensors to monitor climate conditions, enabling timely interventions

BIODIVERSITY (12%)

Focus on understand agroecosyst-em dynamics to promote sustainable & adaptive practices

Results –> 2 knowledges

- Farmers' sensing practices enable two types of knowledge: oversight & insight
- Relevant in both farming system strategies
- Prevalence (seems to) differ:
- Efficiency-based emphasizes oversight (feeds into goals of resource optimization, waste reduction, productivity enhancement & minimizing environmental impacts)
- Ecology-based emphasizes insight (offers a holistic & long-term understanding of ecological relations & how they affect production)



Conclusions & Implications

- Literature on potential of sensors for ecology-based farming emphasizes oversight (e.g. GNSS technology for precise fertilizer use; hyperspectral imaging for detecting threats)
- Yes, reducing input use is a first step toward ecology-based, but ecological interactions need to replace inputs
  - ➢ Insight-oriented knowledge is essential for managing these interactions
- Further research on insight-oriented sensing & tools necessary to avoid farmers getting 'stuck' at the efficiency-focused level due to a lack of knowledge
- To manufacturers: sensors monitoring multiple variables simultaneously (multiplexing) to reveal interconnections & dynamics could be particularly useful
- To farmers in transition: intensifying ecological interactions may benefit from adopting sensing practices & tools that focus on long-term monitoring & development of data values

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