



Can smart farming contribute to more sustainable agriculture?

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New ICT and (big) data are expected to revolutionize agriculture and contribute to a sustainable development of the agricultural sector



Ample Opportunities

- Improved basis for decision support and more efficient input use
- Lower environmental harms
- Value added for consumers
- Entrepreneurial opportunities along the entire value chain
- Enabling agricultural policy instruments with higher efficacy and efficiency

Great challenges

- Data usage and ownership
- Responsibility and accountabilities
- Costs and uncertainties as investment hurdles
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Critical scenarios and the risks of lock-in situations

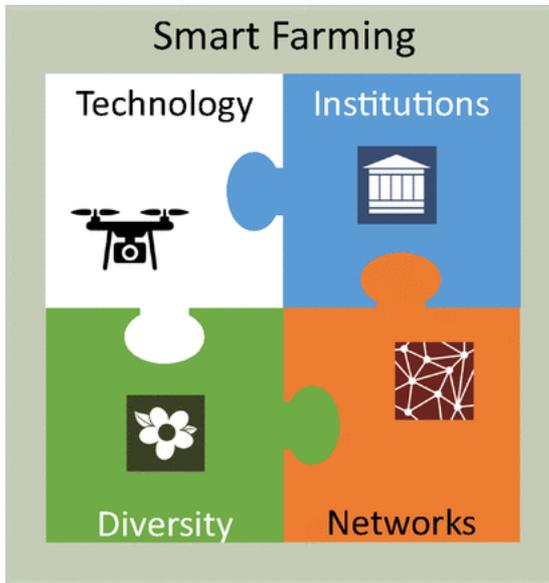
- Only few, large farms in developed countries benefit
- More uniform activities, crops and production system
- Polarization of new technologies and market segmentation



- Technology alone does not ensure sustainable agriculture
- High potential for sustainable development remain unexploited



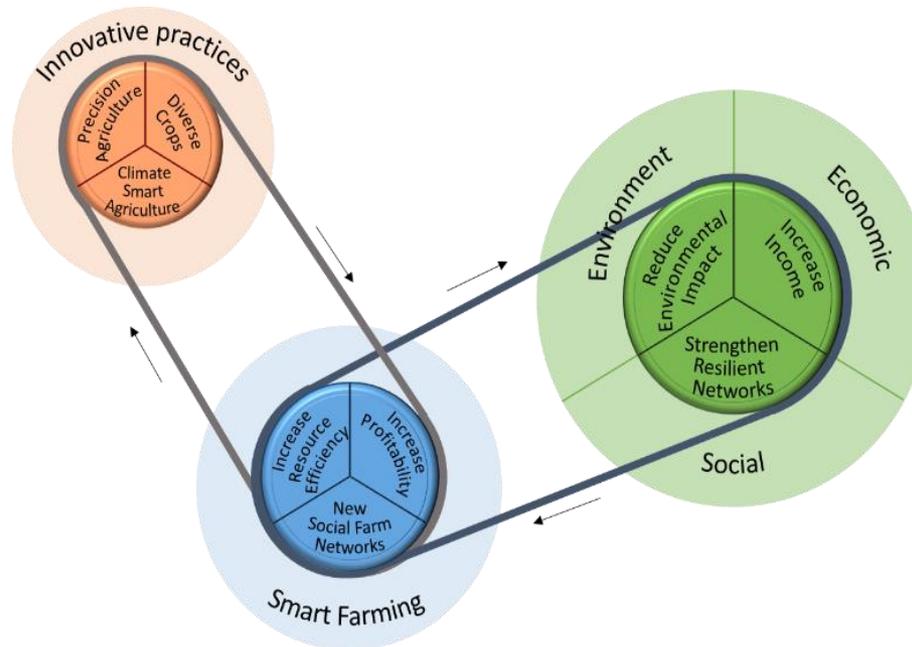
‘Smart Farming’ requires next to technology, three more components:



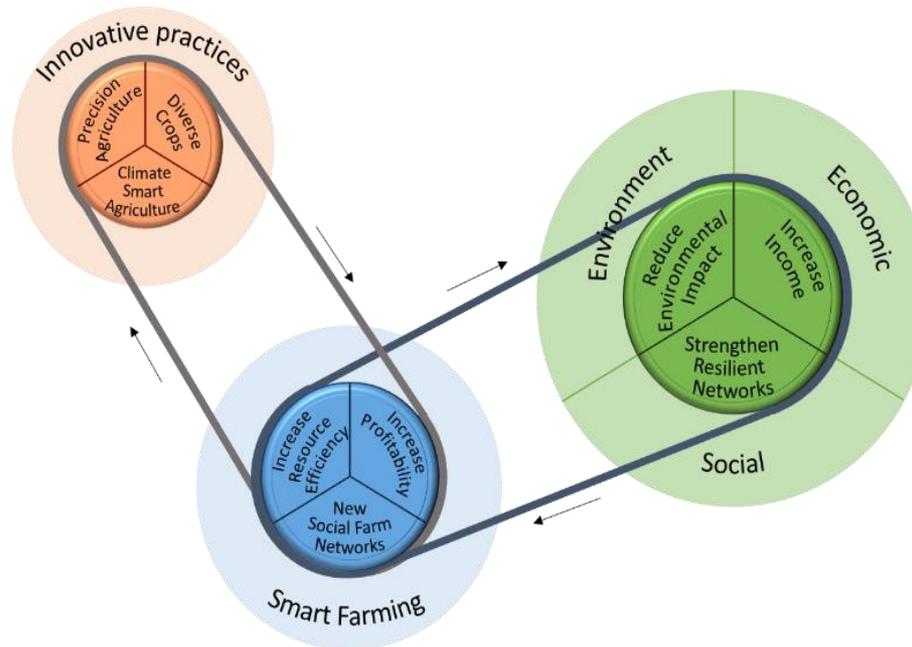
- *Diversity* of technologies, production systems, farms and actors
- *Networks* and new forms of collaboration between farmers and consumers
- *Institutions* (e.g. legal and economic boundary conditions) are crucial for the sustainable use of new technologies

Walter A, Finger R, Huber R, Buchmann N. 2017. Smart farming is key to developing sustainable agriculture. *Proceedings of the National Academy of Sciences USA (PNAS)* 114 (24) 6148-6150

Reconciling innovative farming practices and networks to enable sustainable development of smart Swiss farming systems (InnoFarm)

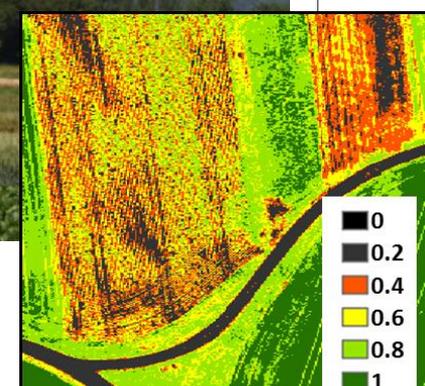
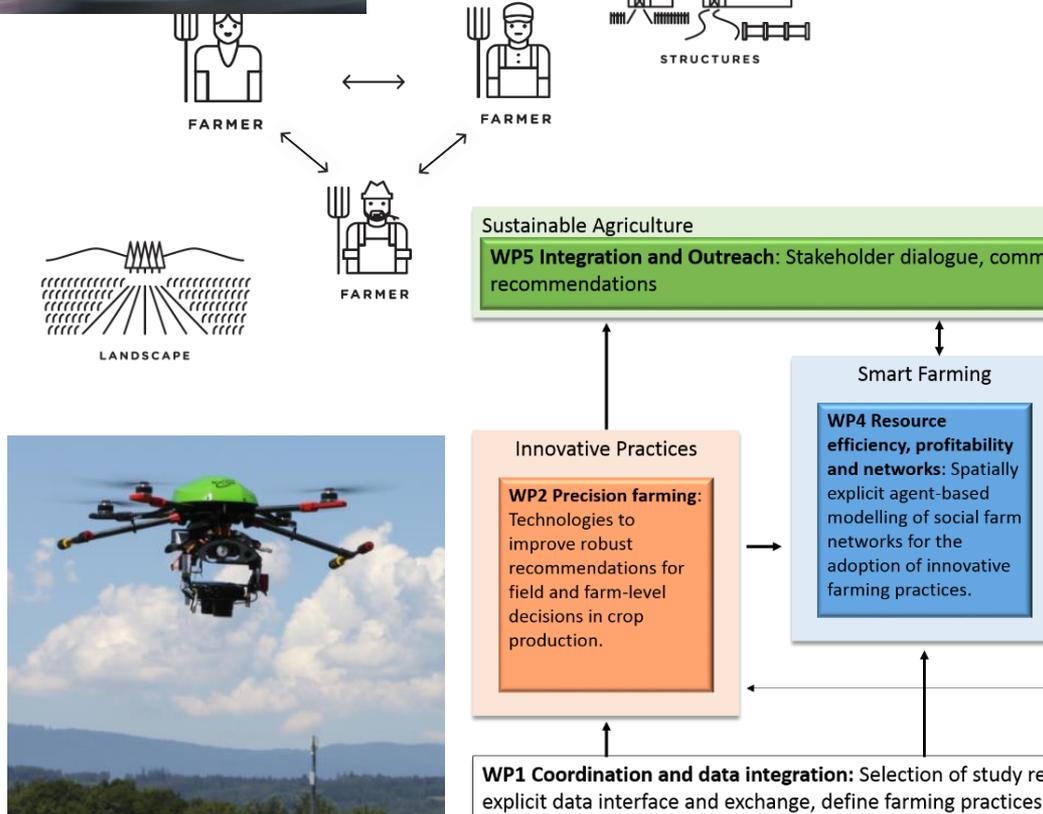


Goal: Investigate how innovative farming practices, new technologies and new data streams be aligned with new forms of networks to allow for a sustainable development of small-scale, diverse Swiss agricultural farming systems



Research questions

- Q1: How can crop traits relevant to the improvement of innovative small-scale and smart farming systems be detected in an automated, reliable way from images taken by UAVs?
- Q2: How can high-resolution data on GHG fluxes be used to assess resilience to environmental disturbances and efficient use of scarce resources in agricultural production systems and contribute to climate change mitigation strategies?
- Q3: Which innovative networks (from parcel exchange, machine sharing, monitoring networks to cooperatives and contract farming) can facilitate adoption and diffusion of innovative farming practices?
- Q4: What are costs and benefits as well as barriers and success factors for the implementation of networks that support adoption of technology in the Swiss agricultural sector?



DIGITALE TECHNOLOGIEN

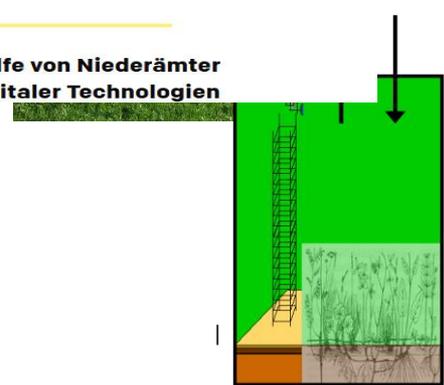
Feldversuch mit smarten Farmern: ETH testet neue Anbaumethoden im Niederamt

von Benildis Bentolila — az · 17.3.2018 um 05:00 Uhr



Während vier Jahren sollen im Niederamt innovative Anbaumethoden mit digitaler Unterstützung getestet werden.
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ETH-Forscher wollen mithilfe von Niederämter Landwirten den Nutzen digitaler Technologien



Technology, usage, risks

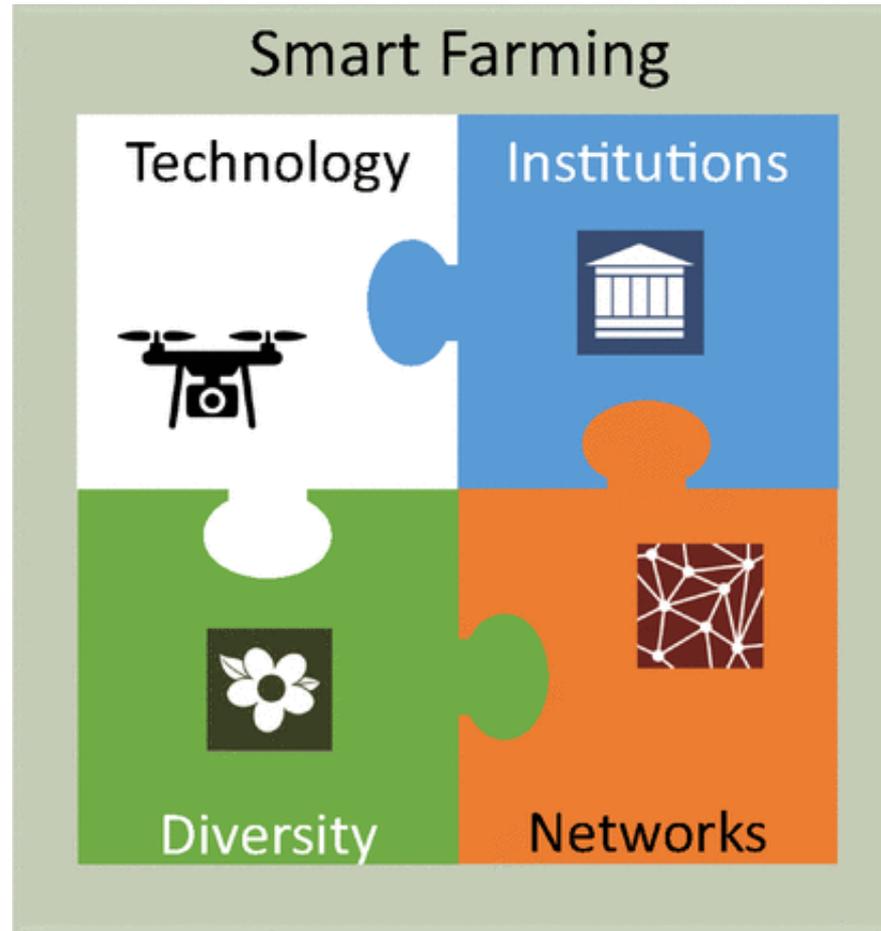


Economic considerations on adoption & diffusion of new technologies

- Investment decisions (technology, human capital) under high uncertainties (technological development, institutional risks) with partial irreversibility → Real Options Theory as underlying concept e.g. Spiegel et al., 2018)
- High level of uncertainties related to technologies: ‘basis risk’ of technology based advice (e.g. Dalhaus et al., 2018) and unknown unknowns → risk and risk preferences as important element in technology uptake
- Heterogeneity of farm and farmers characteristics
- Technology adoption might take place in different forms: i) individually, ii) jointly (cooperation, machinery ring), iii) via contractor → need to integrate aspects of cooperation and non-farm actors → Agent based model (Huber et al., 2018)
- Heterogeneity of preferences (risk, time etc.), attitudes and perceptions will drive adoption → elicitation of individual preferences using experiments (e.g. Meraner et al., 2018)
- Policies can contribute to ensure sustainable usage of new technologies → test and propose policies

Thank you very much for your attention

AgriTech Day ETH
Zürich, Eschikon,
June 30 2018



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