Digital innovations for monitoring sustainability in food systems

Joint work with Inbal Becker-Reshef, Laurens Klerkx, Sanneke Kloppenburg, Jan Dirk Wegner, & Robert Finger.

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Photo: L. Sharma (Marchmont Communications)

Motivation

Digital monitoring approaches proliferating in food systems

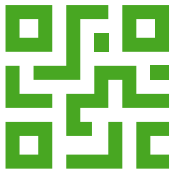
Remote sensing with drones & satellites

Smartphones

AI

Online platforms

Big data



Blockchain

Enhance transparency, fairness, open access...

...or dystopian landscape of digital surveillance, division, led by a powerful few?

Outline

1. The proliferation of digital monitoring
2. Challenges & opportunities
3. Agenda for policy and research

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Is monitoring needed?

- **Big sustainability challenges in food systems**
- **Public & private standards & initiatives to address them** (Schleifer et al. 2022; Baylis et al. 2008; Basu 2003)
- **Common challenges:** need for effective, efficient, transparent, fair **MMR** (Ehlers et al. 2021; Meemken et al. 2021)
  - **M**easurement, using indicators
  - **M**onitoring: collection, processing, analyzing data
  - **R**eporting: feedback to regulators/consumers about compliance)
- **Providing evidence key** as non-compliance is cheaper; credence goods

Problems with “conventional” approaches

- Conventional approaches: self-reported data & surveys/in-person audits
  - Inefficiencies, high costs, bureaucracy, inaccuracies, delays, subjectivity, corruption (Ansah et al. 2020; Meemken el a.. 2021; Sellare et al. 2022)

→Proliferation of digital tools
  - Further facilitated by pandemic (Castka et al. 2020; Nicorescu et al. 2019)

Agenda

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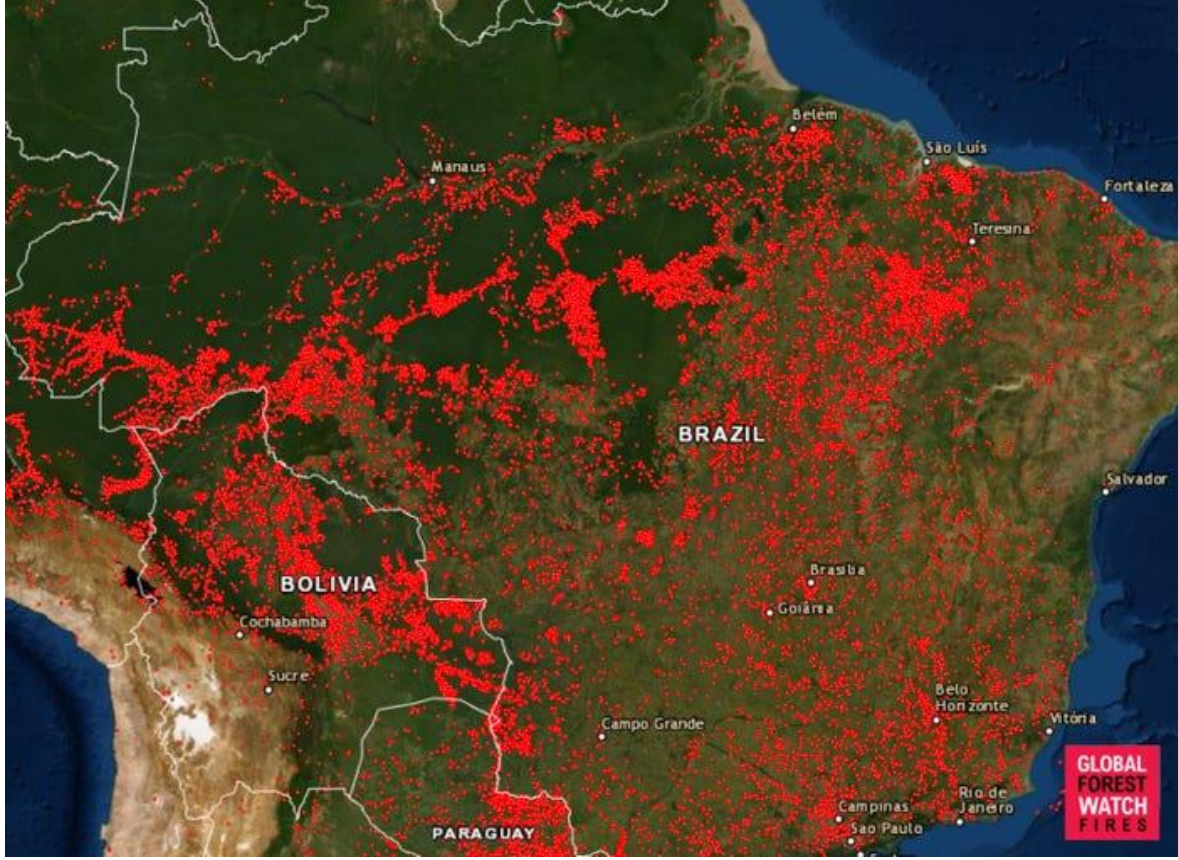
Better digital MMR?

- **Measurement:** objective measures
  - Environment: e.g., forest fires
  - Social issues: difficult (Hatanaka et al. 2022)
- **Monitoring:** speed, frequency, scale, scope (satellite data, predictive analytics)
  - Tracking of land use, yields, management & deforestation (Curtis et al. 2018; Lobell et al. 2020)
  - Market activity, informal settlements (Blackstone et al. 2021, Progga et al. 2020; Henderson et. Al. 2012; Kougkoulos et al. 2018)



(Global Forest Watch/businessinsider.com Link)

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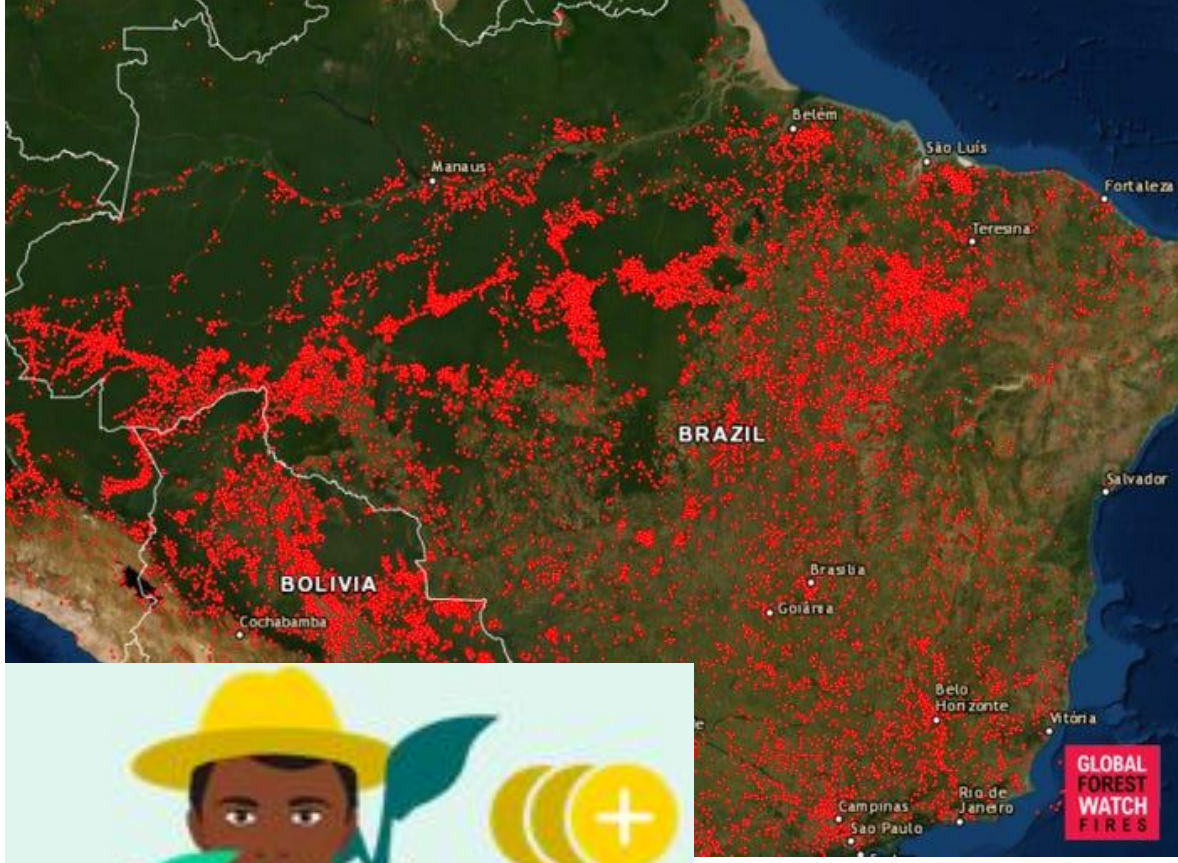
- **Reporting:** e.g., blockchain
  - Many applications but limitations (Niknejad et al. 2021; Lee et al. 2022)



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https://koa-impact.com/radical-transparency/

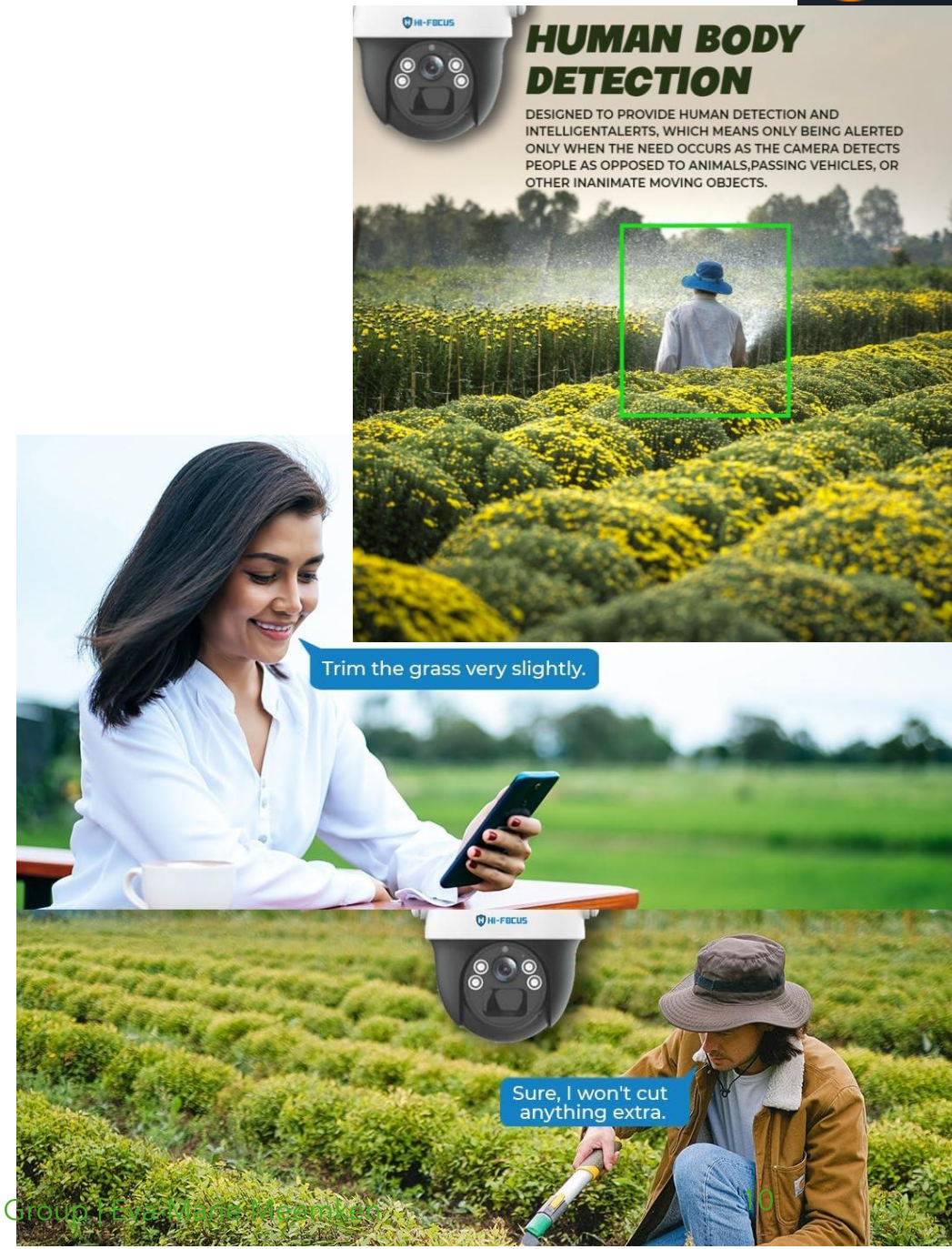
Every single payment transparently verified via blockchain.

Implementation cost & upscaling

- **Potential cost reductions, with variation**
  - Trade-offs between remote sensing data resolution & costs
  - Ground data/truthing (esp. social indicators)
- **Initial investments & ongoing expenses** (Hatanaka et al. 2022)
  - Technology
  - Ground data for validation
  - Educational requirements capacity & expertise
  - Organizational learning & operations
- **Who can cover these costs?**

Socio-ethical concerns

- Exclusion, digital divide, leakage (Nikander et al. 2020; Sellare et al. 2022)
- Requiring/generating data
- High energy / labor use for e.g., AI (Galaz et al. 2021; Rijswijk et al. 2021)
- Data security, bias, privacy, ownership (Rijswijk et al. 2021; Archer 2021)
  - Dominant firms (MacPherson et al. 2022; Clapp & Ruder 2020)
  - Who & what is monitored & how data are collected, processed, analysed is not a neutral choice (Kloppenburg et al. 2022)



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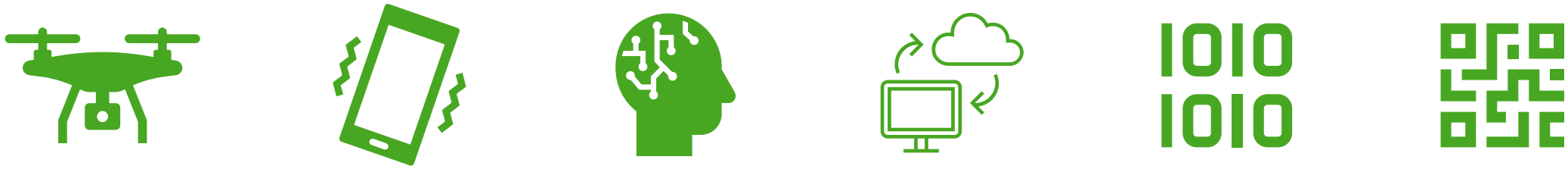
Agenda for policy & research

- **Will the digital transition lead to more sustainable food systems?**
  - More data vs. resolution of problems
  - Biased focus on what can be measured?
- **Priorities to promote fair transition:**
  - Co-design & co-development
  - Investment & financial partnerships
  - Leverage opportunities for farmers
  - Global action needed for comprehensive legal framework
  - Address the root causes of the problem

Conclusion



- **Digital MMR is here to stay!**
- Opportunities & challenges
- Addressing challenges requires:
  - Actions from different stakeholders & levels
  - Global partnerships
  - Inter/transdisciplinary research

Thank you!

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Photo: L. Sharma (Marchmont Communications)