Agriculture, NRM research and the SDG agenda: Challenges and implications for impact assessment

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Assessing the impact of research on managing natural resources for sustainable production systems
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What is different today about the challenges for international agriculture & NRM research?
To optimize for sector-specific outputs...

in transition for last few decades

Agriculture and NRM research historically in silos
Today, most agricultural land is intimately interconnected with other resource uses in the mosaic.
No longer about environmental ‘externalities’….

Agriculture is now a central feature of ecosystem management

Annual crops as % land area

Wood, Sebastian and Scherr. 2000. Agroecosystems. WRI and IFPRI
No longer about ‘sustainability’…

Agricultural production faces serious environmental threats that cannot be addressed only with improved varieties or tweaks to existing systems.

- Desertification, soil degradation
- Drought, aquifer depletion, watershed degradation
- Flooding, storm intensity, sea level rise
- Urban and industrial contamination
- Climate change in rainfall, temperature, pests, diseases
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No longer about choosing ag or environment

Production systems and landscapes need to produce both food and ecosystem services
No longer about resources for food & agriculture only

Cities and other sectors are major stakeholders for land and water
Sustainable Development Goals (including Habitat III, Paris Climate Accord)
“Leave no one behind…”

means meeting all Goals in every landscape (territory)
How can we achieve sustainable ag intensification without simplification?

- Crop genetic diversity
- Crop species diversity
- Wild species diversity
- Habitat diversity
- Landscape diversity

Diversity to benefit production, income, ecosystem services, resilience
Integrated landscape approaches are developing in diverse forms

- Integrated watershed management
- Territorial development
- Agricultural development corridors
- Biological corridors
- Socio-ecological landscapes
- Biological corridor

- Landscape restoration
- Model forests
- Ecosystem projects
- Eco-regional development
- Green growth initiatives

and 75 + others…. struggling for an agriculture that fits with other Goals
Integrated agricultural landscape initiatives are emerging around the world – natural clients for integrated ag/NRM research

• Martín-Rubí, M.G., C. Bieling, A.K. Hart and T. Plieninger (2016)
<table>
<thead>
<tr>
<th>Sector</th>
<th>Self-Reported Impacts of Landscape Initiatives</th>
<th>Sub-Saharan Africa (%) n=87</th>
<th>South and SE Asia (%) n=174</th>
<th>Latin America / Caribbean (%) n=104</th>
<th>Impacts on SDG’s #</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>Increased yields</td>
<td>40</td>
<td>46</td>
<td>38</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Increased profitability</td>
<td>29</td>
<td>53</td>
<td>37</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Reduced environmental impacts</td>
<td>39</td>
<td>57</td>
<td>56</td>
<td>6, 12, 15</td>
</tr>
<tr>
<td>Ecosystems</td>
<td>Improved biodiversity protection</td>
<td>51</td>
<td>87</td>
<td>66</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Improved water quality and regularity</td>
<td>29</td>
<td>52</td>
<td>42</td>
<td>6</td>
</tr>
<tr>
<td>Institutional</td>
<td>Greater empowerment of women</td>
<td>45</td>
<td>83</td>
<td>55</td>
<td>5, 10, 16</td>
</tr>
<tr>
<td></td>
<td>Preserved/used indigenous and local knowledge</td>
<td>37</td>
<td>88</td>
<td>67</td>
<td>10, 16</td>
</tr>
<tr>
<td>Livelihoods</td>
<td>Improved food security</td>
<td>46</td>
<td>69</td>
<td>42</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Higher income for low-income</td>
<td>46</td>
<td>96</td>
<td>52</td>
<td>8</td>
</tr>
</tbody>
</table>
Multi-stakeholder negotiation

* Joint assessment
* Agreed landscape ambitions
* Landscape Action Plan
* Implementation
* Tracking action, impacts
A portfolio of investments will be needed to meet the SDGs in agricultural landscapes

➢ Asset investments (environment-friendly, socially inclusive)
  ▪ Crop-livestock-forest-fish production
  ▪ Value chain, processing
  ▪ Industry, mining
  ▪ Green infrastructure & natural resource restoration
  ▪ Greening built & urban infrastructure

➢ Enabling investments
  ▪ Multi-stakeholder platforms
  ▪ Strategic planning and coordination
  ▪ Integrated spatial assessment & monitoring
  ▪ Farmer org’s, NGOs, govts, businesses, finance with capacities for integration
  ▪ Research and innovation systems
What are the implications of these ag & NRM challenges for international research priorities and impact assessment?
So...reflections on SPIA NRM adoption studies

- Rigorous impact studies & insights on methods highly valuable, but....
- Misplaced priorities for assessment?
  - Of 175 options—51 crop management, 27 water mgmt, 21 pest/disease control, 12 agroforestry, 8 landscape interventions, 4 forest mgmt
  - So why 8 of 9 on crop mgmt? CG definition of NRM?
- How was adoption related to ecosystem context? How dependent was adoption on companion ag & NRM innovations?
- How should methods for measuring complex new systems differ from measuring inputs?
- What are the environmental impacts of non-NRM CG innovations?

How do the other 80-95% of farmers manage environmental risks and impacts of agriculture?
Implications for genetic/breeding research

- Increase carbon sequestration and storage
- Reduce GHG emissions
- Increase resilience to extreme events
- Increase food yields + vegetative biomass
- Improve performance in biodiverse systems, polycultures, land use mosaics, under shade
- Reduce agrochemical input requirements
- Domesticate more food & agro-ind’l species
- Improve commercial traits of minor crops/breeds
- Perennialize annuals?
- Link to farmer seed-sharing networks
Implications for ag/NRM systems research

- Integrate (at least coordinate) genetic, agronomic, & NRM research
- Investigate underlying biophysiological/agroecological/landscape ecology processes in complex ‘env-friendly’ production systems
- Understand patterns of adoption of complex system innovations (field, farm, community, landscape scales)
- Establish long-term research partnerships with large multi-stakeholder landscape initiatives [use these as sentinel landscapes?]
- Incorporate environmental and institutional topics into food production and food systems policy and market research
- Find ways to accelerate and reduce cost of natural resource restoration
- Develop methods for tracking multi-outcome change in complex agricultural landscapes (for both development & research actors)
- Develop institutional solutions for continuous research, innovation, adaptation at different scales
Implications for research assessment

• Look at adoption by and through institutions, not just farmers
• Impacts (pdn, resilience, env, well-being) at landscape scale
• Impacts on interactions among landscape elements in complex mosaics
• Limited scope for randomized control trials—what alternatives?
  • Methods for field sampling/monitoring in large landscape development context
  • Great reliance on modelling complex impacts
• Incorporate ecosystem and mosaic context into adoption and impact assessments of all types of CG innovations
It’s an exciting time to be doing agricultural research!

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