Landscaping Study 1:
A systems view of information needs, a landscape of opportunity

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Landscaping Study aims

Conceptual review and synthesis study...

• Identify entry points in agro-information systems where remote sensing can help to transform smallholder development and alleviate poverty
  o Look at the full gamut of stakeholders and technological offerings

• Identify current constraints and potential use of remote sensing in rationalizing the design of information chains, supply chains, and value chains
  o Examine challenges and opportunities for institutions to deliver on technological potential
Context

• Agricultural development goal of Bill & Melinda Gates Foundation
  o Our goal is to reduce hunger and poverty for millions of farming families in Sub-Saharan Africa and South Asia by increasing agricultural productivity in a sustainable way

• Malabo Declaration on Accelerated Agricultural Growth and Transformation for Shared Prosperity and Improved Livelihoods
  o Greater financial investment into agriculture, more effective policies and institutions, and a doubling of agricultural productivity within the next decade
  o Recognition of the dire situation with regard to capacity for information to facilitate evidence-based policy development and tracking of progress of implementation
Landscaping study structure

Three elements:

1. Systems context for understanding information use within agricultural development (“demand”)
2. Recent advances in remote sensing and geospatial technologies relevant to agricultural development (“supply”)
3. Ten broad opportunities for remote sensing to support agricultural development and poverty alleviation (meeting of supply and demand)
Romanticism and realism
Making the pathway to impact explicit
Theory of Change

• Being explicit about hypothesis of how change will come about as a result of intervention

• Desired/intended outcome:
  o Beneficiary (group)
  o Benefit (type) ➔ by when?

• Causal pathway
  o Intermediate actors
  o Intermediate outcomes
  o Additional requirements
    ~ sequential or parallel events

• Limit of project/intervention influence

• Assumptions at all steps

26-27 July 2016
STARS results sharing workshop, Arusha, Tanzania
Beneficiary and benefit
Intended beneficiary:
Smallholder producer/family
Desired benefit = “stepping up”:
Subsistence ➔ viable commercial family farming

Performance (well-being)

Resources (natural, social, human)

Urban livelihood, cultural farming
Type 5

Stepping out

Crashing out

Hanging in

Type 1

Type 2

Type 3

Type 4

Commercial family farming

Transformation across threshold

Subsistence farming, incremental increasing trading

Dorward 2009; Tittonell 2014
Information for risk reduction

The value of remote sensing for decision-making depends entirely on reducing uncertainty and perceptions of risk about the impacts of different management strategies

- What types of risk?
- Perceived by whom?
The food system
Actor classes

- Producers
- Farm advisors
- Input sellers
- Produce buyers – wholesalers, distributors, retailers, consumers
- Researchers
- Policymakers and planners
## Risk classes

<table>
<thead>
<tr>
<th>Risk Class</th>
<th>Consequences and Responses</th>
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<tbody>
<tr>
<td>Land Risks</td>
<td>Uncertainty of land tenure, lease or access</td>
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<td>Uncertainty of shared land use arrangements e.g. grazing by transhumant stock</td>
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<tr>
<td>Human or Personal Risks</td>
<td>Uncertainty of enterprise workforceDeath or illness of farmer or trader, and/or members of family</td>
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<tr>
<td>Production Risks</td>
<td>Uncertain rainfall amount, season start, season duration, storm intensity, flood &amp; erosion potential</td>
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<td>Uncertainty of outbreaks of disease and pests</td>
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<tr>
<td>Relationship or Trading Risks</td>
<td>Markets are not well informed and market confidence is low.</td>
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<tr>
<td>Political Risks</td>
<td>Institutions fail or systems of patronage prevail and agriculture cannot develop</td>
</tr>
<tr>
<td>Sovereign Risks</td>
<td>Markets fail, agricultural development is ineffective and poverty is not alleviated</td>
</tr>
<tr>
<td>Financial Risks</td>
<td>Insufficient capital to enable production.</td>
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</tbody>
</table>
### Producers – Production risks:
- Inability to predict best planting time
- Unreliable genetic material (seeds, breeding stock)
- Erratic, ineffective management of pests and diseases
- Inability to protect the crop, pasture or livestock from other threats
- Inability to harvest in a timely way that avoids crop loss

### Policymakers – Financial risks:
- Price volatility leads to social volatility
- Reactive policies (e.g. protectionism) have adverse consequences
- Inability to harvest in a timely way that avoids crop loss
Decision-making and action: direct and indirect pathways to benefit
Basic principles of decision-making

Environment of Stakeholder

- Information
- Implementation
- Stakeholder
- Decision
- Improved Situation of Stakeholder

Risk Management, Reduction
- Pursuit of Opportunity

Invest capital:
- human
- social
- natural
- physical
- financial

Capacity for change:
- dependencies
- preconditions
- support
- resources

Institutions
Organisations
Infrastructure
International Treaties, Agencies & Donors (Govts and NGOs): decisions & implementation

Environment of Nation

Government

Policy Environment; Economic/Market Potential

Institutions and Organisations

Remote Sensing: Research and Business

Environment of Market

Business/Markets

Information

Decision

Implementation

Institutions Organisations Infrastructure

Environment of Farmer

Farmer

Information

Decision

Implementation

Increased Production and Profit/Well-Being

Market Environment & Profitability Potential

Institutions Organisations Infrastructure
Food system complexity and solvable problems
Development is not complicated

- Development is complex or chaotic
- Every technical opportunity is embedded in a multi-dimensional environment:
  - Social
  - Cultural
  - Economic
  - Political
  - Institutional
- Identify and avoid chaotic problems
- Deeply analyse complex problems
  - Build theories of change accordingly
  - Be clear about assumptions of intermediary actors and risks
Technology, products and customers/users
1. Product Impact Pathway = Simple to Complicated

2. Product Impact Pathway = Complicated to Complex

3. Product Impact Pathway = Complex to Chaotic

Note: Intensity of blue indicates strength of signal in information flows
Unknowing or Naive Customer

Uncertain Product Use & Value

Possible Product Options:
- Product A
- Product B
- Product C
- Product D

Natural Selection in Market

Disruption

Feedback causes changes in customers/society (behaviours, outcomes, expectations) and development of new technologies
Sustainable adoption and impact?
Feasibility

Macro-economic health

- Nature of agricultural potential
- Non-agricultural sectors
  - Non-ag policy in the environment of the food system
- Realistic development and market expectations
  - Produce demand and market price...
<table>
<thead>
<tr>
<th>Agricultural potential</th>
<th>Non-agricultural engines of growth</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Minerals</td>
<td>Manufacturing</td>
<td>Limited</td>
</tr>
<tr>
<td>High</td>
<td>Agriculture as a secondary growth sector and a means of spreading the benefits from minerals to a broad rural base</td>
<td>Agricultural growth can speed up freedom up labor and capital, reducing food costs and supplying raw materials for agriculture based industries</td>
<td>Lead sector for growth and poverty reduction</td>
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<td></td>
<td><strong>Bangladesh</strong></td>
<td><strong>Botswana</strong></td>
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<tr>
<td>Low</td>
<td>Means of spreading the benefits from minerals to a broad rural base</td>
<td>Subsistence for the rural poor for growth Subsistence for the rural poor</td>
<td>Overall prospects bleak, but exploitation of niche agricultural opportunities important for growth Subsistence for the rural poor</td>
</tr>
</tbody>
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Hazell et al. 2010
Feasibility

- Cost effectiveness
  - Total Benefits >> Total Costs

  - Differential production
    - Differential profit
    - Differential nutrition
    - Differential health
    - etc.
  - Research and system development
    - Data acquisition, checking, standardisation
    - Data analysis and synthesis
    - Data distribution
    - Training for data interpretation and decisions
    - etc.

- Actor capability to interpret data, make decisions and act
  - Appropriate education and training for all actors in food system

- Will to act
  - Change model based on learning in education...
“Development pedagogy”: Learning for change

Environment of Stakeholder

Stakeholder

Information for learning

Decision

Implementation

Improved Situation of Stakeholder

Will to change; Appetite for change
Change in knowledge; Change in understanding
Change in behaviour
Change in performance
International Treaties, Agencies & Donors (Govts and NGOs): decisions & implementation

- Political instability, corruption
  - Will change
  - Change in knowledge
  - Change in behaviour
  - Change in performance

- Power imbalances
  - Will change
  - Change in knowledge
  - Change in behaviour
  - Change in performance

- Cultural norms, conservatism
  - Will change
  - Change in knowledge
  - Change in behaviour
  - Change in performance

Environment of Market
- Business/Markets
  - Decision
  - Implementation
  - Information

Environment of Farmer
- Farmer
  - Decision
  - Implementation
  - Information
  - Increased Production and Profit/Well-Being

Remote Sensing: Research and Business
Asante sana