Walking in their shoes
The social context of farmers’ decision-making

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Overview

Knowledge dissonance
- Scientists talking with farmers
- Work from western Kenya on local knowledge and communication
  - “Strengthening Folk Ecology” (2001-08)
- Household differentiation
  - Cellphones & Agrarian change (2012-13)
- Modelling & supporting farmers’ decisions
  - Work by Pablo Tittonell and others

Cognitive dissonance

- “They don’t know what they are talking about”
- A way to convince ourselves new knowledge is not implementable
- Farmers blame researchers for being “out of touch”...
- Researchers blame “lazy” farmers rather than consider our technology might be flawed

Good year: Labor constrained
Bad year: Food insecure

So why aren’t farmers adopting more of the technologies that we KNOW are labor-saving, profitable, climate smart, etc.?
Knowledge vs. visibility…

<table>
<thead>
<tr>
<th>Not of perceived importance</th>
<th>Of perceived importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Easy to observe</td>
<td>Deep knowledge</td>
</tr>
<tr>
<td>Shallow knowledge (&quot;trivia&quot;)</td>
<td>Complex, widely-held or consensual knowledges</td>
</tr>
<tr>
<td>Difficult to observe</td>
<td>Disputed, partial, or “erroneous” knowledges</td>
</tr>
</tbody>
</table>

“Absent” knowledge(s)?

Household variability

<table>
<thead>
<tr>
<th>Intra-household variation</th>
<th>Minimal</th>
<th>Major</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visible</td>
<td>Crop varieties; Rainfall (onset, duration, frequency, quantities); Temperature</td>
<td></td>
</tr>
<tr>
<td>Invisible</td>
<td>Market prices; Quality &amp; variability of purchased inputs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Labour availability &amp; bottlenecks (planting, weeding, harvest obligations; out-migration effects); Intensification &amp; extensification decisions; Inter-season and residual effects (manuring, fertiliser use, burning, land clearance); Trade-offs for manure &amp; residue use; Land tenure security; Market access (inputs, harvest)</td>
<td></td>
</tr>
</tbody>
</table>

Project: Strengthening “Folk Ecology”

- Community-based learning for integrated soil fertility management (2001 - 2008)
  - Dialogue between actors not “knowledges”
  - Farmer groups, NGOs, University Nairobi, an International Research Center (TSBF), Ministry of Agriculture
- Agro-ecological & cultural gradient (Luyia and Teso)
  - High population density (1500+/km²)
  - Out-migration common (seasonal or semi-permanent)
- Testing of technologies
- “Dynamic expertise”
- Continuous community-based studies
- Dialogue of local & outsiders’ knowledge
- Up-scaling to other communities
- “New” Technology design
- Testing of new technologies
- Knowledge sharing
- Documentation
- Project output
- Up-scaling to other communities
- “Dynamic expertise”
- Continuous community-based studies
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- Project output

A standard narrative…

“BEFORE”… land was enough, used wisely, food was plentiful…

“THEN”… colonialism brought new crops, needed money to pay taxes, sold labor, youth moved to towns…

… population pressure increased, fallows were abandoned, yields declined, soil grew tired…

“TODAY”… we “struggle to survive”
Explaining low / declining crop yields

<table>
<thead>
<tr>
<th>Scientists</th>
<th>Farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low input use / negative nutrient balances</td>
<td>Pests, diseases</td>
</tr>
<tr>
<td>Soil structure breakdown</td>
<td>Land is too small</td>
</tr>
<tr>
<td>Inappropriate germplasm</td>
<td>Climate has changed</td>
</tr>
<tr>
<td></td>
<td>Soil is “tired”</td>
</tr>
<tr>
<td></td>
<td>Market drives down prices / no money to buy food</td>
</tr>
</tbody>
</table>

(Source: Community discussion, Emuhaya, 2001)

Achieving food security...

<table>
<thead>
<tr>
<th>Official (GoK)</th>
<th>Environmental NGOs</th>
<th>Soil Researchers</th>
<th>Farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase production</td>
<td>“Best practices” (e.g. organic and/or inorganic inputs, local knowledge)</td>
<td>Nutrient replenishment</td>
<td>Multiple livelihoods, education</td>
</tr>
<tr>
<td>Maize &amp; inorganic inputs</td>
<td>Livelihood diversification</td>
<td>SWC / Erosion control</td>
<td>Respond to markets</td>
</tr>
<tr>
<td>Marketing of cash crops</td>
<td></td>
<td>Organic matter</td>
<td>(Knowledge &amp; assets downplayed)</td>
</tr>
<tr>
<td>Build local institutions</td>
<td></td>
<td>Maize (vegetables?)</td>
<td></td>
</tr>
<tr>
<td>(Terracing, SWC)</td>
<td></td>
<td>Market-led investments</td>
<td></td>
</tr>
</tbody>
</table>

(Source: Synthesis of interviews and documents, 2001-04)

Soil degradation among many problems...

- Health
- Weeds, pests, diseases
- Declining land holdings per capita
- Imperfect markets
- Under-employment
- Declining land holdings per capita

The myth of “community”

- Gendered differences in interests & needs
- Greater difference in farm size within villages than between them
- Subsistence vs. market orientation
- Knowledge generation and sharing vs. withholding
Knowledge & practices

a) Local logic of basic practices
b) Beyond “ethno-pedology”
c) Household & knowledge differentiation

Compost preparation or waste collection
Home garden creation / management
Necessity of planting staple crops even on poor lands

a) “Common sense” of local logics
b) Beyond “ethno-pedology”

Farmers see their existing practices constantly criticized, under-valued
- Slash-and-burn
- Local varieties vs. hybrid maize (vs. sorghum / millet)
- Broadcast vs. row planting
- Farmyard manure vs. inorganics

From local names → concepts of soil origin, changes, fertility maintenance
Indicators of soil quality status, change (local & technical)
b) Local concepts of soil and land

- Soil (*elilova*) and land (*eligunda*)
  - Fertility like tasty, fatty meat (*obunulu*)
  - Vs. *Omugumba* (barren-ness)
- Indicators of soil **fertility** but also of how “good” a **season** this will be (i.e.: will investments in soil be worthwhile?)
  - Strong incentives to plant every season regardless of low fertility

b) Pests / diseases > fertility?

- *Striga* endemic
- Nematodes
- Stem borers & cut worms
- Wilts
- Mosaic virus
- Root rots
- (Agroforestry species as “weeds”)

b) Different perceptions of crops

E.g. Cassava:
- “Increases fertility”
- “Suppresses weeds”
- “Acts as a fallow”
- “Manufactures its own food, doesn’t compete”

E.g. Common beans:
- “Companion” to maize (or other cereal)
- Spreads risk over season
- Leaves burnt to make local salts
- “Manufactures its own food, doesn’t compete”
Domesticating each other?

C) Household differentiation

- Extreme socio-economic variation within and between communities (Jayne et al 2003)
  - ~25% households virtually landless (<0.10 ha per capita)
  - Largest variation in land per capita is within-village not between villages
- Growing role for non-farm income (40%)
  - Massive rural under-employment
  - Long history of out-migration

Multi-locational households?

- Increased linkages between rural homes and migrants (cellphone)
  - More Kenyans have access to cellphones (72%) than to clean water (65%) or electricity (34%)
- Phones & transport transforming household structures (Ramisch, 2014)
  - 52% remit money 1-2x / month
  - 46% spoke 1-2x / week
  - Fewer returns home (once every 377 days in 2013 vs. 117 in 1986)

Knowledge & livelihood impacts

- More than ever, migrants think they are involved in rural home
  - Greater demands on rural family, constraining women’s limited autonomy?
  - Only hearing about “crises”, less continuity in observing environmental changes
- Impacts vary with wealth & knowledge
  - “Stepping up” or “stepping out” for better resourced households
  - Just coping “hanging in” for less well off (Dorward et al., 2004)
c) Not all “farmers” are farming

Tittonell et al. (2005)

<table>
<thead>
<tr>
<th>Type</th>
<th>Wealth</th>
<th>Production</th>
<th>Constraints</th>
<th>Household</th>
<th>Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mainly high, some medium</td>
<td>Self-subsistence</td>
<td>Land (labour)</td>
<td>Small</td>
<td>Salary, pension</td>
</tr>
<tr>
<td>2</td>
<td>High</td>
<td>Market-oriented</td>
<td>(Labour)</td>
<td>Old, big</td>
<td>Cash crops &amp; farm</td>
</tr>
<tr>
<td>3</td>
<td>Medium</td>
<td>Self-subs. &amp; some market</td>
<td>Capital, some labour</td>
<td>Young, small</td>
<td>Farm, other enterprises</td>
</tr>
<tr>
<td>4</td>
<td>Mainly low, some medium</td>
<td>Self-subsistence</td>
<td>Land, capital</td>
<td>Young-mid</td>
<td>Services</td>
</tr>
<tr>
<td>5</td>
<td>Low</td>
<td>Self-subsistence</td>
<td>Land, capital, labour</td>
<td>Big, many ♀-head</td>
<td>Selling labour</td>
</tr>
</tbody>
</table>

c) Practices and outcomes

Food production (t field⁻¹)

Biomass yield (t ha⁻¹)

Inorganic fertilisers (kg ha⁻¹)

Organic fertilisers (kg ha⁻¹)

K.L. Giller et al./Agricultural Systems 104 (2011) 191-203

Gap 1 = due to Labor shortages
Gap 2 = Nutrient management

Average maize grain yields (t/ha)

Distance from the homesteads
Beyond economic models

- Rational choice models downplay social factors and “overall” utility
- Market failures (de Janvry et al. 1991)
  - Won’t sell in a market if the costs of participation exceed its possible benefits
- People may be price responsive but in many cases no market or no price exists
  - Poor infrastructure, lack of information, transaction costs

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Classification & regression tree (CART)

- E.g. Maize grain yield variability as a function of variables representing agronomic management decisions

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Household management

Livelihood options (on/off-farm; subsistence vs. commercial, etc.)

Labor allocation (gender, age)

Investments (education, farm, business, other capital, etc.)

Crop husbandry

Variety, planting dates, inputs, weeding, pest management, harvest...
Farmers often know how to manage limited resources well... but need help knowing how to deal with new opportunities.

- E.g. Fertiliser subsidy in Malawi ↑ production but N use efficiency only +14 kg grain / kg N

- Recommendations = “best fits” for each socio-ecological niche (Ojiem 2006)
Thinking to higher scales?

Decision guide #1: Choosing green manure species

If you want... Then plant...

- A sole crop Lablab
- To intercrop with maize Mucuna
- To suppress weeds Canavalia
- To produce fodder
- To combat nematodes Crotalaria
- A durable mulch

Critique of guide #1

- Open-ended, good tool for discussing the relative benefits / costs of different green manures
- Effectively needs four follow-up guides for each species, its management, potential problems, etc.
- List of attributes may not reflect major preoccupations of farmers (i.e.: developed by researchers using observations of each species)
- Decisions to leave land fallow may be accidental (out of time, labour, money, etc.) not planned

Decision guide #2: Resource quality (biomass transfer)

For any given local plant...

1. Incorporate directly with annual crops
2. Mix with fertilizer or high quality OM
3. Mix with fertilizer or add to compost
4. Surface application for erosion / water control
Critique of guide #2

- Highly functional, based on process research
- Quickly identifies whether a given, unknown organic resource is HIGH or LOW quality
- Needs more detail on application rates (alone or combining with inorganics), residual effects, etc.
- Inappropriate if farmers do not consider “quality” and are applying “all organic matter available”
- Frequently reduces to two branches:
  1. Apply all available HIGH quality on its own
  2. Apply all available LOW quality with fertilizer

Maize-bean response to organic resource quality & crop nutrition

Monitoring and evaluation, Field days

Yield (Mg/ha)

Farmer experiments using Guide #2

Documentation of results

- True learning needs commitment to sharing research results, feeding back to integrated knowledge

Feedback and validation

- Find out whether Guides improved practice
- Often, farmers already know best practices but are limited by socio-economic situation
- Identify next steps for research & farmers
Guides: Conclusions

- Involve farmers in guide design and testing, not just the approval of finished products.
- Decisions steps must:
  - Reflect **real questions** that farmers would ask themselves about the technology and its management
  - Use resources that are **available**, and adoptable
- **Initial guides:**
  - **Over-estimated** resource availability (especially organic matter and labour)
  - **Under-estimated** local existing knowledge

Evolution of farmers’ experiments

- **Identify** other high quality organic materials locally
- **Response of maize-beans** to organic resource quality and inorganic inputs ($N + P$)
- **Response of local vegetables** to organic resource quality and inorganic inputs ($N + P$)
- **Experiment with cereal-legume rotations** to improve soil fertility

Experimental styles

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Conventional, researcher-managed trial</th>
<th>Jointly-managed ‘demonstration trial’</th>
<th>Individual project experiment</th>
<th>Typical western Kenyan individual experiment</th>
</tr>
</thead>
<tbody>
<tr>
<td># treatments</td>
<td>Few</td>
<td>Many</td>
<td>Few</td>
<td>Few</td>
</tr>
<tr>
<td>Randomized</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Plot husbandry</td>
<td>Row planting</td>
<td>Row planting</td>
<td>Row or broadcast planting</td>
<td>Row or broadcast planting</td>
</tr>
<tr>
<td>Plot basal spraying or fertilization</td>
<td>Yes (to isolate confounding factors)</td>
<td>No (would be considered a treatment)</td>
<td>No (would be considered a treatment)</td>
<td>No (would be considered a treatment)</td>
</tr>
<tr>
<td>Replication</td>
<td>Essential</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Numbers (Quantification)</td>
<td>Yes (essential for statistical analysis)</td>
<td>Visual analysis + quantification</td>
<td>Visual analysis with few numbers</td>
<td>Visual analysis with few numbers</td>
</tr>
<tr>
<td>Control plots</td>
<td>Yes</td>
<td>Yes</td>
<td>No (baseline ‘known’)</td>
<td>No (baseline ‘known’)</td>
</tr>
<tr>
<td>Serendipity</td>
<td>Confounding factors isolated &amp; controlled</td>
<td>Confounding factors monitored &amp; explained</td>
<td>Confounding factors monitored &amp; explained</td>
<td>Confounding factors monitored &amp; explained</td>
</tr>
<tr>
<td>Conclusions from...</td>
<td>Specific data measurements</td>
<td>Specific data measurements, observation &amp; comparisons</td>
<td>Observation, memory &amp; comparisons</td>
<td>Observation, memory &amp; comparisons</td>
</tr>
</tbody>
</table>

Networks and knowledge

- **Community-based learning:**
  - Knowledge “gaps” identified collectively
  - “Building trust” vs. staff / farmer turnover
  - Farmers wanted information > innovation, to discuss the technologies with peers
- **Implications for knowledge transfer**
  - **In-groups** (“we are ‘good’ farmers”) vs. **out-groups**
  - Shared resources improve knowledge use & buffer risks to poorest? (or not? - gender implications)
Thank you  
Merci  
Gracias  
Asante  
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