Out of Town, Not Out of Trouble: Becoming Unconventional: Adaptation Issues for Small Agriculture

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NOTE: This set of slides is for posting; the webinar will not cover most of this. Please see “speaker’s notes” for references and additional discussion.

Warning: this is a large file and some notes sections are long.
Goals for this short presentation:

• SOIL and LAND LOSS – And food security...

• Argue that a great deal of what urban people want is at risk... and is not going to appear from current ideas of economics – but there are better ways to evaluate...

• Argue that good adaptation includes the peri-urban environment and the rich array of ecosystem services and benefits provided by small agriculture

• And since that is already far too much for the time, make the slides with references available!

• About that title: “conventional” vs “alternative” is big split in agriculture...
The Goal: Conserve inherent agricultural capacity and ecosystem services

A working definition:
Capacity of agricultural resources, including water, soils, techniques, crafts, and skills, diverse live true-breeding seeds and livestock, to produce food, feed and fiber with inputs only from local and regional agricultural and related activity.

INHERENT capacity is greater than utility as a substrate for a short-term stew of fertilization and biocides.
Where to find Basics on Conventional Unsustainability

- The excellent syntheses on agricultural issues:
  - 2009: International Assessment of Agricultural Science, Knowledge and Technology for Development (“IAASTD”)
  - 2010: U.S. National Research Council
  - 2011: United Kingdom Government Office for Science: Foresight: The Future of Food and Farming

- For global scale modeling and analyses: a small sample from Proceedings of the National Academy of Science: Special Features
  - Inter-sectoral Impact Model Intercomparison Project, Vol 111 no 9 (2014)
  - Agricultural Innovation to Protect the Environment, Vol 110 no 21 (2013)
  - Livestock and Global Change: Emerging Issues for Sustainable Food Systems Vol 100 No 52 (2013)

And see brand new: Journal of Soil and Water Conservation 69(6) (2014)

(And, also recommended: World Resources Institute, World Bank and others: Creating A Sustainable Food Future – two parts public at time of writing (Searchinger et al., 2013, and Winterbottom et al. 2013).

And in regard to climate impacts also see: Walthall et al. 2012 – USDA contribution to National Climate Assessment --
Two Sets of US Problems: Peri-urban/Irrigated “small” vs Big ag

- For the small operations: Still over 50% of farm assets, but 16% of sales... but little of net farm income: HIGH VULNERABILITY
  - Urbanization, rural residential development – tremendous land and water loss!
  - Inability to finance transition for resilience to climate and “markets”!

- For the Big conventional Ag: Sustainability VERY doubtful... see International Assessment IAASTD, 2009, National Research Council 2010, United Kingdom Office of Science 2011 in “notes”, and Rulli et al. for “land grab” elsewhere)
  - Erosion of soil, soil quality losses already very serious!
  - Herbicide and other resistance evolving fast; no till at risk!
  - Water quality concerns
  - Price volatility – harder on small and medium sized farms?

- FOR EVERYONE: CLIMATE VARIATION AND CHANGE – higher intensity precipitation events, more frequent extremes with cumulative impacts... destructive sequences... (National Climate Assessment 3, May 2014, Chaps 3 and 6; Walthall et al. 2012 USDA input report).

- “SOIL EROSION ESTIMATED TO COST IOWA $1 BILLION IN YIELD” – May 2014 Des Moines Register front page story on Dr. Cruse and EWG studies!
Climate Effects on Soils

- Higher soil temperatures alter nutrient and carbon cycling by modifying the habitat of soil biota, which in turn affects the diversity and structure of species and their abundance.

- Heavier downpours in some regions will lead to increased soil erosion. In addition, increased precipitation will result in water-logging of soils, thereby limiting oxygen supply to crop roots and increasing emissions of nitrous oxide and methane. Altered rainfall, whether through increased or decreased precipitation, will affect soil chemistry and biology.

- Soil water retention capacity will be affected by rising temperatures and by a decline in soil organic matter due to both climate change and land-management changes. Maintaining water retention capacity is important to reducing the impacts of intense rainfall and droughts, which are projected to become more frequent and severe.

- Prolonged spells of heat and drought between rainy periods may cause wilting, desiccation, and soil salinization, which may in combination reduce crop yields.

- Increased temperature and decreased moisture tend to accelerate the decomposition of organic material in soils, leading to a decline in soil organic carbon stocks and an increase in CO₂ emissions to the atmosphere.

From the joint statement of ASA, CSSA, SSA...

habitat of soil biota... diversity ... abundance

downpours... increased soil erosion...

affect soil chemistry and biology...

water retention capacity... soil organic matter...

impacts of intense rainfall and drought...

See also Crop Science Society of America, 2011, Position Statement on Crop Adaptation To Climate Change.

NEW: USDA Technical Information Bulletin No. 1935: Climate Change and U.S. Agriculture... Walthall et al. , 2012; National Climate Assessment, May 2014 (see references)
“Small family farms account for most U.S. farms and a majority of farm assets”
(USDA Chart of Note, 06 Feb 2013; Hoppe and Banker 2010 Family Farm Report) BUT DARN LITTLE INCOME!

Note that “value of production is NOT net income! Net for the “small” farms has been much smaller than 15 percent...
American Farmland Trust: Farming on the Edge – series of reports including 2006, Sokolow, on interactions of conservation easements and local planning; Esseks et al. 2009: Case studies if 15 urbanizing counties.
Cropland may about the same in area but IS IT THE SAME QUALITY?
Recent: Francis et al. 2012 arguing, NOT AS GOOD... KILL THE BEST FIRST ?!?!?
This is where the best land and water was... where local food was produced.
New view, 2013 – color Scheme flipped

Here, green is influence
And brown is not...

Where is “BIG Ag”? An example of UN-MIXED Farming... Industry Concentration And spatial Concentration -- USDA MAP
The Corn Belt
In 2012 – this was a drought year so not completely representative ... but shows concentration
Consumer Demand Drives Growth in the Organic Sector
(08 Feb 13 Chart of Note) -- THE RACE IS ON! Who gets what they want?
Against Sprawl and rural residential landscape perforation, huge growth in direct sales, farmers’ markets and food hubs... (Note: “local” is bigger than “organic” – (Adams and Salois 2012)

![U.S. organic food sales and annual growth, 2004-2013](chart)

What’s your account doing?

- 20011-13 values are estimates or projections.
BUT – there is a bit of good news! (newer info may be out soon!)

PEOPLE ARE BUYING LOCAL
Value of Agricultural Products Sold Directly to Individuals for Human Consumption: 2012

1 Dot = $200,000

United States Total $1,309,827,000

2012 Census of Agriculture
U.S. Department of Agriculture, National Agricultural Statistics Service
Beginning Points -- Framework for Transition

Design for **maximum economic yield** (not maximum gross output, but best return on investment of inputs)... for the long planning horizon NEED FINANCE

- **RIGHT-SIZING** – economies of scale, not consolidation and simplifying!

- **GOAL:** INTEGRATED MULTIFUNCTIONAL AGROECOLOGY – SETS of right-sized operations, resources, and projects to improve resilience... (e.g., sets of renewable energy and cooperating groups of farms/ranches). (long note!)
  - Integrated: livestock and crops and energy and all the other outputs!
  - Multifunctional: many outputs, try to design for all the outputs
  - Agroecology: use the whole environment rather than opposing it!

- **LANDSCAPE SCALES** – not little rectangles versus terrain!

- **THE BIG ASSESSMENTS:** TRANSFORMATIONAL CHANGE NEEDED!

- **WHAT WOULD YOU DO IF YOUR CITY OWNED ALL THE PIECES?**
A few points on economics – just to mention...

• Efficiency is definable on a distribution of resources; it is an adjective, not a noun.

• FIELD SCALE Vs FARM SCALE Vs LANDSCAPE SCALE Vs REGIONAL SCALE ???

• LONG-TERM ECONOMIC COMPARISONS FINALLY EMERGING...

• SHORT –TERM RATIONALITY --Clark, 1973: Economics of Extinction – Positive discount rate: reduce the future stream of values to present value:
  • A century or two out, values are trivial; not much good decades out!
  • Discount the future PLUS all that uncertainty?

• Evaluation is definable within a general equilibrium, but not transferable to a different equilibrium with reallocated resources and price structures... Norgaard & Howarth 1992, etc

• Benefit-Cost Analysis is NOT appropriate for the long term!

• We can’t just “do the math”! THINK SOIL FORMATION and WATER QUALITY/CONTAMINATION... HOW TO GET OUT OF THE SHORT-TERM BOX?
Maximum economic yield rather than maximum revenue – getting off the treadmill of maximum possible production makes sense! LONG-TERM – how to get there?
Need: Transferable Knowledge: Checkers and Translators – YOU!!!

• Not possible to be lab-like with too many variables... (Francis 2010).
• Bifurcation in “alternative” versus “conventional” knowledge
• Extension and university research constrained by funding sources (Fuglie et al. 2011, Welsh and Glenna 2006, Zadoks and Waibel 2000)
• Hard to study integrated livestock-farming (Tanaka et al. 2008, ARS)
• Enterprise budgets keep coming up as ideal if possible (Olmstead and Brummer 2008, Attwell et al. 2011) – What can be learned from Europe? (Kremen, Iles and Bacon 2012; Kremen and Miles 2012 – Ecology and Society) and demonstrations...
• Acceptability of information? What works with what? Who should a farmer believe? What will safely bridge cultural splits?
• A RESEARCH QUESTION: ? little overlap in citations : J. of Soil and Water Conservation ; Ecology and Society; Renewable Agriculture and Food Systems...
• Transferable MEANS acceptable to receiver... Reimer et al. 2014, Nowak 2013.
Thinking Adaptively – Out of the Farm Scale Box

- Who benefits from local agriculture, the ecosystem services provided, and the conservation of inherent productive capacity? Who doesn’t?
- My argument: farmers and ranchers need to use all their assets, but they cannot do it without community support...
- Cities and water managers are critical partners – the folks and the bucks
  - Where states don’t act or are self-crippled
  - Citizen have far wider interests than water rates and blah food
  - Water suppliers and cities and ADAPTERS have foresight and technical capacity
  - And cities have cheap long-term capital! 30 years vs ???

Partnerships for long term security of investments and expectations… Best way to internalize externalities
LINK TO DR. MALDONADO:

• The agroecology is pretty clear
• The soil conservation interests are pretty clear
• The landscape scale is pretty clear...
• BUT what we don’t know? HOW TO BECOME NEW TRIBES
• How to work together for long-term resource management rather than short-term market pressures...
• We need to learn from people with long track records!
The Landscape Scale – BENEFITS!!!

• Landscape scales for **ECOSYSTEM SERVICES**, habitat values, connectivity – AVOID ESA, RECOVER DIVERSITY, SUPPORT TRANSITIONS...

• Farm **INVESTMENT** “right-sizing” in equipment and purchases

• Farm output marketing – **RISK MANAGEMENT** and production sequencing to meet demands

• **STABILIZE AGRICULTURAL LANDSCAPE!** Be able to use a long-range planning horizon. *(large set of references in “speaker’s notes”)*  **Reduce landscape perforation!**

• **Resilience from flexibility of management** – organize to stop perforation and conversion of the best land -- Maybe climate info can stimulate?

• **TIME TO GET OFF THE GRID!!!** See Dosskey et al, various... design for multifunctionality, for agroecology, for diversity and **CUT LOSSES** – close the loops... **The rectangular land division is no longer sensible!**
Toward Respect for Ecosystems – what if we lived in them?

- The original analysis: Von Thunen, 1826, The Isolated State (inventor of marginal productivity economics: what is a functional region without external inputs?) What makes the most sense?

- More recent: What does sustainable farming look like? E.g. Wes Jackson’s Land Institute farm in Salina, KS: looks pretty good even with price subsidy distortions from uncharged externalities... (Baum 2009)... EcoSun North Dakota (Zilverberg et al. JSWC; Williams et al. 2013 JSWC)

- Sustainable diversified, integrated farming looks pretty good... (Kremen et al. special series in Ecology and Society (2012)). U.S. vs European traditions... (Carr et al. 2012; Renewable Ag. and Food Systems special issue; see also RAFS 23(4) 2008).

- But, big gaps in research on sustainable agriculture as a separate business... (Seufert et al. 2012)... SO, WHAT IF NOT SEPARATE? WHAT IF THESE BENEFITS WERE PAID FOR?
Ecosystem services values...

- Nitrate REMOVAL from drinking water costs US $1.7 B/year... Remove 1% from source water, save >$120M/yr.... See also USDA CEAP summaries
- Water-related benefits of preventing sediments/erosion $1.5 to $7/ton
- Land Trust Alliance, American Farmland Trust, National Assn. Homebuilders:
  - Open space costs $0.35/ $1 in tax revenue
  - Residential development costs $1.16/$1 in tax revenue (Colorado, 2003: $1.62/$1!)
  - Consumer will to pay for trails, open space, amenity, quality of life...
- Trust for Public Land, 2010: Long Island NY: 10-fold ROI on Agricultural Conservation Easements; > 23 States now purchase... some tax credits, too
- NYC: Paying for clean watersheds; avoiding filtration plant... 1.1 BGD!
- EARTH ECONOMICS – NGO that wants to help you with this!
- Huge developments in valuation and policy impacts
- So... the right thing looks better even with BCA -- why is it rare?
This system provides more than a Billion gallons a day...
And avoids very expensive filtration and water treatment Costs by control of pollution in the watersheds.

The upper watershed in the Catskills was first “developed” by the City in 1905, now programs to maintain water quality

• Whole farm plans
• Forest Management plans
• Conservation Easements

Government program assistances; septic design, salting, economic development [smart growth!]

Payment for ecosystem services – S$$ but less than building new water treatment

An ounce of prevention is worth a pound of cure!

http://www.nycwatershed.org/aw_description.html
http://www.cwconline.org/

NEED: Templates and Models and Demonstrations

• “Send lawyers, guns and money...” (Zevon 1978) (well, not guns...)
• Templates for modification for land cooperation and equipment cooperation
  • Pros and Cons of different kinds of cooperatives, corporations, partnerships, LLCs, etc.
  • Economics of “right-sizing” kinds of equipment
  • Much of this in extension materials; much need not be state specific – tractor hours before maintenance, etc...
• Private Transferable Development Rights – Stop landscape perforation!
  • Uses private property to achieve desired outcomes, control perforation of the landscape
• Model Partnerships for agriculture and cities to secure what everyone wants
  • Payment for ecosystem services (e.g. 1.1 Billion gallons/day without filtration... NYC)
  • Long-term finance for landscape benefits, transition to stability, food security and joy!
  • Ecosystem services valuations – lots of progress; huge set of benefits from open space...
Local Preference – transition money hope?

• Sharp change in consumer preference since USDA “organic lite” standards (Adams and Salois 2012)

• Big Willingness To Pay – US wide, rural as well as urban – for Local

• Enormous increases in Community-Supported Agriculture, direct sales and Farmers’ Markets, as well as “local” with premium prices in big retail chains...

• And, big electoral support for local land preservation and open space (Trust for Public Land “conservation vote website)
## Let’s Make a Deal: COMMUNITY SUPPORTED AGRICULTURE AND ….

<table>
<thead>
<tr>
<th>OWNERSHIP (single agency)</th>
<th>PARTNERSHIP</th>
<th>LEASE</th>
<th>CONTRACT – COMMON or PES?</th>
<th>COMMUNITY SUPPORTED AGRICULTURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fee simple – total JUST BUY IT</td>
<td>As defined OWN IT BUT NOT ALONE</td>
<td>Land for long term; some places called “ground lease” for building investment</td>
<td>Crops – commonly VERY tightly controlled by Non-farm party – 40% of US AG NOW!</td>
<td>Non-farmer rights vary with deal; commonly a variable portion of mixed outputs</td>
</tr>
<tr>
<td>Permanent easement – usually RIGID land uses, especially if TAX Breaks involved (Fed Estate, State)</td>
<td>CAN BE Flexible and Contingent</td>
<td>Farming Rights – often called plain leasing, for specified duration usually a few years or less</td>
<td>Share of crops, historically tightly controlled by land owner</td>
<td>Can include obligations beyond payment or a mix; Farmers set the terms</td>
</tr>
<tr>
<td>Transferred Development Rights</td>
<td>Multiple Parties, Multiple Interests (can implement a coalition)</td>
<td>Water Banks/Etc: -- where legally allowed – wide variation, purposes may be constrained, or duration</td>
<td>Payment for Ecosystem Services can be contract or more like partnership</td>
<td>Can include access for amenity, recreation, and philanthropy</td>
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</tbody>
</table>
| E.g. TDR for Smart Growth Clustering | E.g. Water sharing permanent deal | E.g. Idaho Snake River. Working water markets | E.g. New York City watershed protection for >1 BG/day | Hundreds are florescing! Often also with direct sales such