What the Heck IS Sustainable Agriculture?

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Sustainable Agriculture

Meet the needs of all, forever

1. Economically Viable
2. Environmentally Sound
3. Socially Equitable
Sustainable Agriculture

- Environmental
- Economic
- Social
Sustainability – a goal, not a prescription
C.U.R.D.S.

- Cycle and recycle
- Use energy wisely
- Respect your friends
- Diversify
- Small is beautiful
Cycle and Recycle
Cycle and Recycle – it’s the law (of thermodynamics)

1. Nothing disappears
   - Matter and energy are constants, but their forms change
2. Everything spreads
   - Energy and matter disperse
3. There is value in structure
   - We do not consume energy or matter, only change their structure
Agricultural water pollution

- Feedlots
- Overgrazing
- Irrigation
- Pesticides
Nutrients, water, energy

Sunlight

Meat

Nutrients, water, energy
Use Energy Wisely
Sustainable Unsustainable
North American Ag Energy Use

B.A. Stout, 1984
Energy Use and Management in Agriculture

• Production of 1 kg of N requires 51-68 MJ (about 1.5 l of diesel fuel).
• Manure-based corn production uses 31-34% of the energy of inorganic fertilizer based production.

McLaughlin et al., 2000,
Canadian Agricultural Engineering 42:1
Individual energy consumption
Adapted from UNESCO Courier

Energy consumed in the form of food
- Domestic: Energy for cooking, heating etc.
- Services: Energy for office work, trade, teaching etc.
- Energy for industry and agriculture
- Energy for transport

Gigajoules per person per year

Today 28% of the world's population consumes 77% of the world's energy production.
Or 3/4 of the world's population uses less than 1/4 of the energy produced.
Respect Your Friends
Friends help each other

- Farm family
- Farm workers
- Consumers
- Neighbors
- Farm animals
- Beneficial organisms
- Environment
Diversify
Why diversify?

- Fewer pest / disease problems
- Beneficial habitat
- Varied income sources
- Varied work
- Niche markets, not commodity markets
- Adapt to local environment
Diversification doesn’t have to mean zucchinis and llamas

• Use field corn expertise and equipment:

  – Sweet corn
    • fresh or frozen, on or off the cob
  – Popcorn
    • shelled or on the cob for microwave popping
  – Indian corn
  – Corn on the cob for squirrel feeders
  – Cracked corn for bird feed
  – Corn nuts
  – Cornmeal for cornpone or mush
  – Broom corn
  – Corn stalks for fall decorations
  – Corn mazes
Native Ecosystem                       Low-input Agriculture                       Industrial Agriculture

Number of species

Yield

System mimics nature e.g. no-till farming, shade-grown coffee, free-range beef

System disturbs nature e.g. deforestation, routine tillage, monoculture

Small is Beautiful
Median number of species per ha

- Birds
- Plants

Modified from Belfrage et al. 2005. The Effects of Farm Size and Organic Farming on Diversity of Birds, Pollinators, and Plants in a Swedish Landscape. *Ambio* 34: 582-588
Small farms are more productive

Production per unit area:
- Mexico
- Syria
- Sudan
- Uganda
- Tanzania
- Nigeria
- Ethiopia
- Peru
- Barbados
- Bangladesh
- India
- Myanmar
- Nepal
- S. Korea
- Thailand

Farm Size Category (ha)
Small farms promote local economies

- More jobs
- More local businesses
- More civic participation

Small farms are more efficient
6 acres

8 acres

Wiediger high tunnel
Yield (Plants/m²)

- Greenhouse: 144
- High Tunnel: 27

Embodied energy (MJ/plant)

- Greenhouse: 16.9
- High Tunnel: 1.3
- Shipping from CA: 2.7

Energy extracted from a large head of lettuce by human digestion:
318 J (76 cal)

Based on:
- 3800 km (2400 miles)
- 15 MJ/km (Coleman 1992)
- 21,000 heads/truck
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