Can Organic Agriculture Feed the World?

Industrial or “Green Revolution” agriculture depends upon petroleum to manufacture and spread fertilizers, pesticides and herbicides and to power irrigation systems that act upon crops selected to increase agricultural yield. It has been criticized on the grounds that it has favored mainly rich farmers and caused serious environmental pollution. Now a second “Green Revolution” is being proposed that uses genetically engineered crops to boost agricultural yields even higher. The rationale is that such a new revolution is necessary to feed the world. However, the rising costs of petroleum may preclude this approach to feed the world.

Agriculture that relies more upon the services of nature and less upon petroleum presents an alternative. This type of agriculture promotes the activity of beneficial soil micro-organisms that tighten the nutrient cycle, the planting of leguminous crops to supply nitrogen, and the presence of beneficial insects that prey upon pest species. One term for such agriculture is “organic”, but there are other terms that capture the spirit of organic agriculture such as sustainable agriculture, alternative agriculture, ecological agriculture and regenerative agriculture. But can this type of agriculture feed the world? Only a few studies have been carried out for a long enough time to prove the potential of organic agriculture. In contrast, many studies have shown that where petroleum-derived inputs are lacking, the yield of industrial agriculture is decreasing.
Readings marked with * are to be read by everyone.

I. The Problem: World Hunger:

Any Agricultural Solution to the problem must be sustainable. Definition of “Sustainable Agriculture and Forestry:”
   a. College of Ag definition
   b. Economists definition
   c. Ecologists definition
   d. Energy as a determining factor.


Assignment of Papers for following weeks.
II. **Can Industrial Agriculture (a second “green revolution”) solve the problem sustainably?**

**Yes:**


NO

Overview:

Social and Cultural Factors:


Pollution Factors:
Food and Water Watch. 2007. Turning farms into factories: How the concentration of animal agriculture threatens human health, the environment, and rural communities. www.foodandwaterwatch.org

Resistance Factors:

Erosion
III. **Recent Case Studies of Agricultural Development:**


IUCN/WWF. 2006. Forest plantations: the good, the bad, and the ugly. Arborvitae 31(Sept. 2006). *One of the projects at Spring Valley Ecofarm is examining various types of tree plantations. We will devote one field trip to this issue. This reading gives a nice overview of the subject.*
IV. A New Challenge for Agriculture

V. The Potential of Organic Agriculture

Practical Considerations: Research needs: *what we already know, and what we need to know.*

**VI. Nutrient cycling and soil fertility**

Jordan, C.F. Systems diagrams illustrating nutrient cycling efficiency in various types of agricultural systems.


*Soil Ecology*
USDA NRCS. Soil Biology Primer.


*The Nitrogen Cycle*


*Decomposition*


*Tillage and its Effects*


USDA. Tillage. in Alternative Agriculture.

Farming Systems. CSIRO. Australia.


_Nutrient Cycling in Plantation Forests_
VII. Pest and Disease Interactions

Environmental Management

Population dynamics of pathogens

Regional Perspectives

A Few Case Studies
VIII. Interactions in Ecosystems
Entire Class: Working with Nature: 35-49

Positive Interactions:

Negative Interactions.
**Interactions in Agroecosystems**


**Tree-Crop Interactions**


IX. Diversity and Stability of populations in ecosystems, and of ecosystem function.


Development of ideas
Http://esa.sdsc.edu/issues4.htm
Moffat, A.S. 1996. Biodiversity is a boon to ecosystems, not species. Science 271:1497

Consequences of low diversity
X. Globalization

*The theory of globalization and comparative advantage.*

*The case for globalization*

*Is the World Really Flat? (Is globalization really occurring?)*

*Rethinking globalization*

*Globalization and Conservation*
XI. Synthesis

What needs to be done to transition unsustainable industrial agriculture to sustainable “organic” agriculture?

Can “organic” agriculture feed the world?

What types of agronomic and ecological research?

What are the barriers that inhibit change, and how can they be overcome?

What effect will rising prices of energy have upon the transition?

Organic agriculture is labor intensive: from where will the needed labor come?