PRT3006
PRINCIPLES OF SUSTAINABLE AGRICULTURE

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OBJECTIVES OF THIS COURSE

By the end of this course, students should be able to:

1. Correlate production factors in sustainable agriculture system.
2. Elaborate the main issues and agro-ecosystem mitigation steps in sustainable agriculture practice framework.
3. Explain the components of environment, economic and social in agriculture production system, marketing, and policy in facing challenges and role/position of sustainable agriculture in the future.
Course evaluation

- Mid term Test.....................30%
- Individual Assignment
  i. Written report .............20%
  ii. Oral presentation ......10%
- Final Examination.............40%

Agricultural Practices/Systems

1. Subsistence Farming
2. Commercialised Farming
Subsistence Farming

Characters:
1. Low input & Low yield
2. Inter-cropping
3. Slash and burn (nomadic)
4. Low external input
5. Enough food to feed family
6. No surplus to sell or storage for long term

Example:
**Shifting agriculture/slash and burn**
- clear forest area to grow crops
- land abandoned in a few years after soil fertility declined
As in 2006, still practiced in:
• Africa – Benin, Botswana, Congo, Guinea, Rwanda, Madagascar, Sierra Leone and Zambia
• Central and South America – Mexico, Ecuador and Bolivia
• Europe – Yugoslavia and Albania
• Polynesia – Papua New Guinea, Vanuatu
• SE Asia – Sarawak, Indonesian Borneo, Laos, Cambodia
Subsistence farming in Europe (Albania)  

Subsistence farming in Papua New Guinea  
(picture source: http://epress.anu.edu.au/title/food_agriculture_citation)

Subsistence farming in Malaysian Borneo  
(picture source: http://ramblingspoon.com/blog/?p=4183)

Subsistence farming in Siem Reap Cambodia  
(picture source: http://ramblingspoon.com/blog/?p=4183)
Increase of population since 1950

Green revolution
(1940s - 1970s)

Increase in agriculture production to feed increasing population through

i. high yielding varieties
ii. irrigation
iii. mechanization
iv. synthetic chemicals
   (fertilizers & pesticides)

Subsistence farming →
commercialized farming
2. Commercialised Farming

Character:
1. Monoculture or combination of a few crops
2. Use of high yielding modern varieties
3. Large chemicals input (Pesticides & fertilizers)
4. High use of technology and machineries

Tropical Plantation Agriculture

Aquaculture

New products and future industries

Poultry and Animal Farming

Vegetable Farming

COMMERCIALISED FARMING
Farming Techniques

Two important categories:

1. Industrial/Conventional
   - direct derivative of the Green Revolution
   - GMO, synthetic fertilizer and pesticides

2. Organic
   - farming practices that may be agroecological, sustainable, or ecological; utilizing natural (non-synthetic) nutrient-cycling processes; exclude or rarely use synthetic pesticides; and sustain or regenerate soil quality” (Badgley, 2006)
- Organic yields match conventional yields.
- Organic outperforms conventional in years of drought.
- Organic farming systems build rather than deplete soil organic matter, making it a more sustainable system.
- Organic farming uses 45% less energy and is more efficient.
- Conventional systems produce 40% more greenhouse gases.
- Organic farming systems are more profitable than conventional.

**COMPARISON OF FST ORGANIC AND CONVENTIONAL SYSTEMS**

- **Yields (bu/ac)**
  - Organic: 6,479
  - Conventional: 1,482

- **Profit ($/ac)**
  - Organic: 858
  - Conventional: 190

- **Energy Input (MWh/yr)**
  - Organic: 3,504
  - Conventional: 1,456

- **Greenhouse Gases (lbs CO2/yr)**
  - Organic: 925
  - Conventional: 1,400

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**Average economic returns (2006-2010)**

- **Returns ($/acre)**
  - Corn (Organic): 650
  - Soybean (Organic): 450
  - Entire rotation - average (Organic): 400
  - Corn (Conventional): 350
  - Soybean (Conventional): 250
  - Entire rotation - average (Conventional): 200
Average yields (1998-2010)

- **Conventional corn-soybean (2 year)**
- **Organic corn-soybean-oat/alfalfa (3 year)**
- **Organic corn-soybean-oat/alfalfa-alfalfa (4 year)**
- **Organic soybean-wheat/red clover (2 year)**
The Himalayan kingdom of Bhutan is known for a high level of citizen happiness, but it is doing something even more noteworthy in the near future.

It’s called the National Organic Policy, and it is fueled by the simple concept that working in harmony with nature will yield the most powerful results—all without sacrificing human health or the environment. What this comes down to is no GMO, no pesticides, no herbicides, no fluoride-based spray products, no Monsanto intrusion at all, and a whole lot of high quality food available for the 700,000 citizens of Bhutan.

Some lands in Bhutan have not even been touched with harsh chemicals of any kind, and traditional techniques are utilized to produce high yields without Monsanto dipping into the pockets of family farmers. This is in sharp contrast to India’s farming community, which has been shafted by Monsanto and subsequently nicknamed the suicide belt due to the rampant suicides that can be blamed in part by Monsanto-induced financial ruin.
To be continued in Tutorial 1..........................