Lecture 8
Tropical Agricultural Systems

Classification of Agricultural Systems
D. Whittlesey Classification

1. Nomadic herding
2. Livestock ranching
3. Shifting cultivation (“dibble agriculture”)
4. Rudimentary sedentary tillage
5. Subsistence crop and subsistence stock farming
6. Intensive subsistence tillage with rice dominant
7. Intensive subsistence tillage without rice
8. Commercial plantation crop
9. Mediterranean agriculture (olive, citrus, grape, winter wheat)
10. Commercial livestock and grain farming
11. Commercial grain farming
12. Commercial dairy farming
13. Specialized horticulture

In the tropics there are two major Agricultural Systems:

Subsistence and Commercial (two ends of the continuum)

Subsistence

Shifting cultivation
Permanent field
Rice
Other crops

Commercial

Peasant: small land holder.
The growers, who are not necessarily the owner, are locked into a cash economy.

Hacienda: large land holding but undercapitalized.
A social system where the emphasis is not on high production but on high income to the owner (patron) as compared to farmers (peons).

Plantation: a highly capitalized production system often operated by extra-nationals.

Agricultural systems: A continuum of intensity

Shifting agriculture is also known as "Swidden"
(land extensive, low labor input)

Fallow

Dry or winter fallow

Annual cropping

Double cropping or "sahweh"
(land intensive, high labor input)

Other contrasts in tropical agriculture
Perennial vs. annual crops
Diversified vs. monoculture

Comparison of Tropical Agricultural Systems and Factors of Production

Factors of production	Shifting cultivation	Subsistence wet rice	Plantation
Land	Extensive	Intensive	Large scale
Labor input per unit of product	Low*	High	Variable
Capital	Nil	Intermediate	High
Energy input per unit of yield**	High return	Low return	Lowest return

*Much less total labor input as compared to subsistence wet rice. If given a choice, the wet rice farmer prefers shifting agriculture.
** Human energy plus mechanical energy.

Economic development implies a movement to mechanization, an increase in capital investment, and an increase in energy input.

In some sense, economic development provides inefficiency in terms of energy utilization.

However, in most parts of the world, and especially in the developed world, energy in the form of fossil fuels is cheap and human energy is expensive.

In shifting cultivation the system seems efficient because the forest works for humans and provides the energy

However the general economic view is that shifting cultivation is a stagnant process, non-elastic, no possibility of increase.

It depends on unlimited land and a long time frame. In many primitive societies, constant warfare is ritualized and serves to limit populations.

Classification of Shifting Cultivation on the Basis of Land Intensity

Nomadic shifting cultivation:
"residence" rotates with field

Long fallow cultivation: forest climax

Short fallow cultivation: grass climax

Semi-permanent cultivation:
fallow 3–4 years
field boundaries remain intact

Common Features of Shifting Cultivation

- Hand tools
- No draft animals
- Long rotations
- Low population density
- Practices by primitive people

Variations

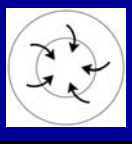
Chitemene system of shifting cultivation practiced in Zambia (Northern Rhodesia).

A greater area than necessary is cleared and all refuse is moved to garden site.

The refuse on the garden site is burned and the ash of a great area acts as fertilizer for a small area.

This system is more destructive than ordinary cultivation.

In savanna climate there is not much forest regrowth.



Shifting agriculture is now mostly practiced in the tropical world.

- South America—Amazon basin
- Africa—Congo basin, linked to animal husbandry wherever possible. Tsetse fly limits cattle production.
- SE Asia—sharp line between shifting cultivation and wet rice.

Shifting agriculture predominates in highland mountainous regions (Indochina peninsula).

In Indonesia, wet rice farming predominates in Java but shifting agriculture is found in neighboring islands and carried out by colonists.

- Java is one of the most densely populated areas.

Wet Rice Farming

- This is the classical agricultural system of monsoon climates.
- It is based on the growth of rice which can be grown as an aquatic crop.
- There are variations to wet-rice agriculture.
- This system will be discussed in more detail when we consider rice as a tropical crop.

- Classical wet rice: a system that absorbs labor, "shares the poverty" but is a dead end system.
- It is possible to continually increase yields by adding labor but returns are very low.
- Production can be increased with modern technology.
- Plant breeding produced IR 8 or "miracle rice" developed at the International Rice Research Institute in the Philippines.
- A high yielding, dwarf, day-neutral rice that is responsive to fertilizer.
- Wet rice in a modern commercial system is found in Italy, Spain, California, and Arkansas.

- Wet rice is spreading to other tropical areas such as South America and Africa.
- In Brazil for example the national diet is composed of beans and rice.
- Rice popularity is increasing in Africa but preference is still for millets and yams.
- In New Guinea the population is perfectly agreeable to a shift to rice.
- Wet-rice farming frequently increases in intensity:
  - Multicropping (two crops of rice per year)
  - Intercropping (more than one type of crop per field)

Amazon Excursions

View of Sao Luis, Brazil

View of Sao Luis Harbor from hotel

Sao Luis

Forum—Sao Luis

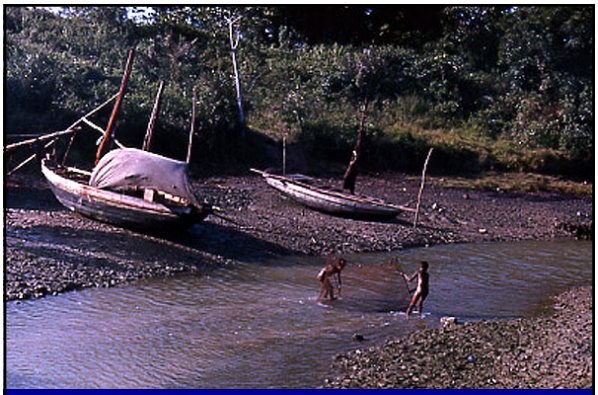
Praca in Sao Luis

Sao Luis harbor at twilight—sailboat

View of Sao Luis

Sailing vessels, Sao Luis

Sailor, Sao Luis



Seining fish

Sudene plane at Sao Luis

Lowlands near Sao Luis 20 feet high

Sudene plane at Ze-Doca

Caboclo house on B-22

B-22 near Turi

Colonization on the sides of B-22

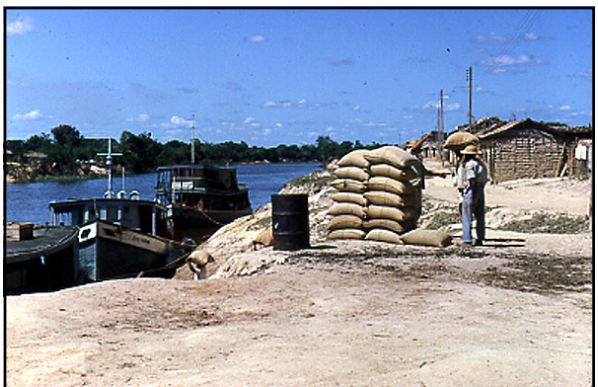
Araguana

Cleared Forest for rice near Ze-Doca

Upland rice clearing in forest for rice, Maranhao

Carrying rice

Carrying rice harvest, Maranhao



Moving cleaned rice on Rio Pindere, Maranhao

Alexandre, Mother & Sister, Turi

Turi camp of Sudene

Horta at Turi in the morning

Turi

Turi

Turi

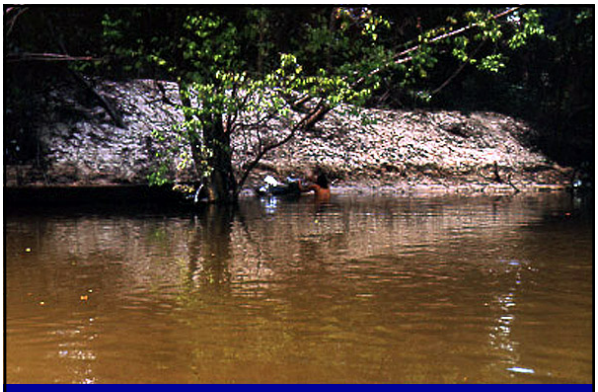
Washing clothes in stream

Jules & Arara, Turi

Turi

Alexandre, sister & mother, Turi

Fishing in Turi river



Woman bathing in Turi river

Rice boat in Turi River

Poste dos Indis

Truck transport

Bus agency, Ze-Doca

"Mixto" Bus

Sudene girls, Ze-Doca

Air strip

Leper house, Ze-Doca

Boys carrying pig, Ze-Doca

Caboclo & monkey

Caboclo house

Caboclo, cutting log for timber

Construction at Ze-Doca

House Construction, Ze-Doca

House Construction, Ze-Doca

Caboclo & family, Ze-Doca

Father & child, Ze-Doca

De-husking rice, Ze-Doca, Maranhao

Separating rice & chaff, Ze-Doca, Maranhao

Unloading Rice, Bon Jardin

Mercado & Restaurant, Bon Jardin

Restaurant, Bon Jardin

Old sugar factory, Pindire Mirim

Praca, Pindire Mirim

Pindire Mirim

Research farm shading transplants

Trip to Manaus and Amazon

Amazon Excursion

Manaus, Brazil

Manaus, Brazil

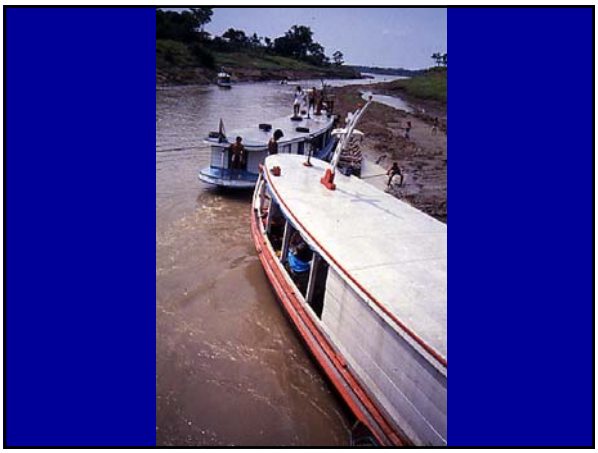
Manaus, Brazil

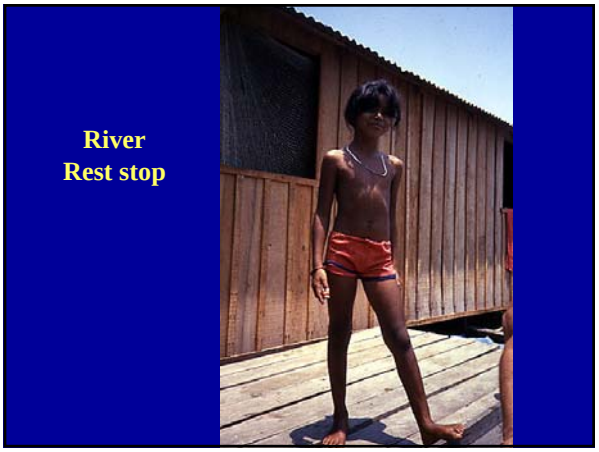
Manaus, Brazil

Manaus, Brazil

Manaus, Brazil

Manaus, Brazil




River
Rest stop

Amazon River

Amazon River

Amazon Planting

Poverty