The Diverse Farming Practices of Rattan Collectors

Rattan collectors and artisans are typically also farmers. While young cane collectors may focus exclusively on harvesting cane for cash income for a number of years, the majority, and certainly the more responsible among them, do so as a means to purchase irrigated rice fields (sawah) or upland, rainfed parcels, and/or to construct a home and start a family. This is the general pattern in Moa, Sulawesi and Kerinci, Sumatra. In contrast, many households in San Vicente, Leyte and other villages in the Philippines do not have access to rice fields or upland farms as either owners or tenants. Land tenure concentration and inequality are extreme in the Philippines. Consequently, collecting wild rattan from the forest may be the only means of subsistence for landless poor households. In either situation, individual and household interest in and reliance upon rattan harvesting are influenced by access to land an alternative or preferred livelihood options (e.g., irrigated rice and cash crop cultivation). Appreciating local agricultural opportunities and practices is essential to understanding household livelihood strategies, dependence upon rattan and other forest resources, and opportunities and constraints to community development.
Rice: Staple Food for Half the World

can be: rainfed (Moa, Sulawesi) or irrigated (Ifugao, Philippines)
preparing rice paddies:
← manually (Kerinci)

with carabao → (San Vicente)

irrigated rice cultivation:  
- labor intensive  
- closely tied to local climatic conditions and cultural traditions  
- rattan is often collected when labor is not needed on farm

rice seedlings ready for transplanting are removed from a banana leaf bed

transplanting, San Vicente; our home is in the background

← rice maturing 25 km inside Kerinci-Seblat National Park
A swidden field one year after the harvest of upland rice. The location, size and cultivation:fallow period (1:20 yrs in the case of Moa seen here) were historically regulated by village elders to ensure long-term productivity and sustainability.

Water management is complex in irrigated rice systems and may incorporate agroforestry and managed forests above terraces. In this example from Bali, ancient cultural traditions and religious practices allocate water and regulate upland, forest uses (including rattan collecting), much as they have for centuries.
Coffee:

Coffee is one of the world’s most important and widely cultivated crops. Two species are produced commercially - *Coffea arabica* (arabica; originally an understory shrub from highland Ethiopia) and *C. canefora* (robusta; originally an understory shrub from lowland west Africa). Coffee is an important cash crop in both Moa and Kerinci where young rattan collectors save income earned from collecting cane to purchase land for the cultivation of coffee and other cash crops, or while waiting for plants to mature and commence production.

Coffee flowers are sweetly fragrant and the beans or berries are red when ripe (robusta in Kerinci).
Coffee: some facts & history

- 2nd most important legally traded international commodity
- most important agricultural commodity
- annual value $100+ billion
- world production – approx. 7 million tons on 11.5 million ha
  - Latin America – largely arabica
  - Asia & Brazil – largely robusta
  - Vietnam – rapid increase in arabica
  - price and marketing very volatile (boom & bust)

- consumption – US 1/3 of total

- production – a long & rich history
  - 15th C. Arabia,
  - 1616 to Venice,
  - 1675 – 3000 coffee houses in England
  - widespread colonial cultivation -
    - Java (1690)
    - India/Ceylon (1690)
    - Philippines (1740)
    - South America (1700’s)
    - Hawaii (1825)
Cacao:

Cacao (*Theobroma cacao*), like coffee, is an understory tropical shrub. However, cacao is native to Central and South America and was an important trade item among the Maya.

- cacao refers to the plant & fruit
- cocoa refers to the processed product

Cacao exhibits cauliflory, that is flowers and fruits are produced on plant stems or trunks. This growth form is common in tropical plants. The fruits are red when ripe; Moa.
Cacao: some facts & history

• 3rd most important agricultural crop

• production – 70% of total from 5-6 million low-intensity small farms (< 10 ha)
  - West Africa – primary producer (conflict problems)
  - Latin America – 2nd producer (disease problems)
  - SE Asia – recent expansion

• consumption – US & Europe

• price & production – volatile (boom & bust)

• cultivated/traded by ancient Maya

• colonial cultivation
  - Brazil
  - West Africa
Basic coffee & cacao agronomy

Objective: high annual yield w/o die-back or insect/disease loss

Coffee (arabica)
• deep, fertile, well-drained loamy soils
• 60-75 F. with 75” precip.
• 2-3 m. dry season
• above conditions vary with latitude - 5000-6000’ at equator
• single production flush/year

Cacao
• deep, fertile, well-drained loamy soils
• tropical lowlands: year-round warmth & moisture
• partial shade (esp. when young)
• produces +/-continuously yr round

cacao beans drying
Cacao

- higher light → rapid growth, higher yield, but stress
- heavy shade → lower yield, less stress, fungal risk

management via
- shade vs. sun
- mulch
- variety selection

drying cacao beans
Coffee & cacao production:

- commence bearing 3-4 yrs, full bearing 6-8 yrs; cacao matures/bears fruit earlier
- annual fruiting: coffee - single major flush; cacao - +/- continuous fruit production
- weeding - 2-3 times/yr, esp. when young
Coffee and cacao cultivation:

- very diverse – from rustic or shade grown without external inputs to full sun conditions with extensive fertilizer, pesticide and herbicide use

- cultivation practices vary with:
  - environmental conditions
  - labor and capital availability
  - parcel size & land tenure
  - markets
  - government policies
  - history

Coffee cultivation in Mexico; from Moguel & Toledo (1995)

Source: after Moguel and Toledo, 1995
Examples of coffee & cacao cultivation

← cacao beneath *Gliricidia sepium* (Moa)

coffee below *Leucaena leucocephala* (Bali; left below)

Nitrogen-fixing leguminous trees are often planted to provide shade and nutrients.

Coffee beneath a primary forest canopy (rustic, shade grown), Moa (below right)
Potential benefits of sun:

- early maturation
- greater yield (w. inputs)
- reduced fungal incidence
- easier harvest

* Coffea liberica; not a commercially cultivated species (Malaysia)

Potential Benefits of Shade:

- extends productive life of tree
- prevent over-bearing & die-back
- more even annual production
- moderates micro-climate -more favorable
- reduces hail, insect (?) and disease (?) losses
- reduces evaporation and transpiration
- provides mulch/humus and nutrients (N-fixation)
- reduces O.M. decomposition rate
- roots may enhance aeration and drainage
- branches $\rightarrow$ mulch
- reduces weeding (major labor demand)
- provide - firewood, timber, fruit, etc.
- provides habitat (biodiversity conservation) & connectivity
Potential disadvantages of shade:

- branch & tree fall damage
- competition for moisture
- competition for nutrients
- increased risk fungal diseases
- increased risk some insects
- reduced light → reduced yield

coffee in Kerinci (top)
cacao in Moa (bottom)
Potential disadvantages full sun/technified systems:

increased risk/losses:
- drought stress
- insects & disease
- predation
- accelerate biological processes (e.g., organic matter decomposition)
- erosion & runoff
- shortened lifespan
- biodiversity

costly external inputs

cacao eaten by forest rat, Moa
Selecting desirable shade trees:

- height
- canopy size, shape & depth
- strength (tree fall)
- nutrient inputs & water requirements
- rooting characteristics

Coffee under *Pinus caribaea* in Belize. Cultivating coffee beneath conifers is unusual and unlikely to produce high yields due to the acidic, low fertility soil conditions.
Coffee & cacao market conditions:

- increased global production
- consumption flat (recent increase in cacao demand)
- extreme price volatility & reduced price supports (particularly w. coffee)
- 2000s coffee prices lowest (real $) for 100 yrs; prices remain low (2011)

→ widespread poverty & out-migration (e.g., 25 million coffee farmers in Central America displaced/abandoned coffee farms in recent years)

- production & marketing alternatives (increase benefits to small producers):
  - Fair Trade
  - certified organic/shade grown
  - bird-friendly
  - direct producer-consumer relationships (e.g. farm to college programs)
  - above provide price premiums and/or guaranteed minimum price; can be pursued individually or in combination
Cinnamon (*Cinnamomum burmanni*) is an important perennial cash crop in Kerinci, Sumatra. The tree is typically planted in a relay-intercrop system: land is cleared from primary forest or a previous field and planted to chili peppers (a high value, nutrient demanding crop that matures in one year), cinnamon and sometimes coffee. When mature (12-20 years to reach harvestable age), the tree is cut and the inner bark removed and dried for sale in local markets. Cinnamon coppices (sprouts) and the cycle is repeated.
Agroforestry

Agroforestry is a relatively new term for age-old agricultural practices that integrate trees, annual crops and/or livestock in space and time. One early definition of agroforestry describes the practice as:

“a sustainable land management system which increases the yield of the land, combines the production of crops (including tree crops) and forest plants and/or animals simultaneously or sequentially on the same unit of land.” (Bene et al., 1977)

Agroforestry practices are as diverse as the world’s cultures and environments.

agroforestry plot with pineapple, banana, citrus, coffee, cinnamon, etc. Kerinci
homegardens/polycultures: simultaneous annual/perennial intercrop, often w. livestock

- pantropical
- high diversity
  - species & varieties
  - space
  - time
- reflect local needs, interests, integration w. other livelihoods
- for market & domestic use

homegarden, Java
annual/perennial intercrops without fallow

examples of coconut-based systems in North Sulawesi (systems vary over time)

with cloves & grazing

← with bananas

with corn →

with peanuts →
live fencing & windbreaks

- temperate & tropical

- multiple uses:
  - boundaries
  - livestock forage
  - fuel
  - food & cash income
  - snow breaks

Gliricidia sepium
live fence, Kerinci
alley cropping: contour rows of annuals & perennials

- ‘modern’, scientific

- rationale – allows for replication, sampling & statistical analysis

- adoption? – rarely adopted by farmers whose practices tend to respond to microsite variation in topography, soils, water, etc. The are not “organized” or readily sampled.

contour rows of *Gliricidia sepium* on an experiment station in Leyte
Origins of agroforestry practices

- traditional/indigenous:
  - co-evolutionary development to site-specific biophysical and socioeconomic conditions
  - approaches/systems reflect local socioeconomic needs and opportunities, cultural traditions and religious practices in light of soil, climatic and other environmental conditions

- modern/scientific:
  - experimental/development response to limitations of “modern” agricultural development
  - approaches/research efforts largely reflect disciplinary backgrounds and interests of researchers in light of perceived agricultural value, needs of farmers or contribution to soil contribution efforts
### traditional & modern agroforestry systems compared (socio-economic)

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<td>productivity</td>
<td>high &amp; species diverse</td>
<td>high, lower diversity</td>
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Agricultural research and development efforts, and government policies and programs develop in a political context. As a consequence they reflect the needs and interests of those most able to exert social, economic and political influence, and are profoundly affected by international market forces and ideologies.

CAPITALISTS OF THE WORLD UNITE!
This 1966 cover from Forbes magazine perhaps inadvertently conveys one of the motivations for and effects of widespread development of green revolution agricultural technology.
Discussion topics:

1) Soil nutrient and structural conditions influence agricultural productivity, sustainability, and management and input requirements.
- What are the primary constraints to continuous cultivation of tropical soils?
- How do agroforestry and other perennial-based cropping systems ameliorate and manage soil fertility and structural constraints?
- Consider the role and importance of organic matter in agricultural production and means by which it can be maintained or increased.
- How do organic matter production and decomposition rates vary with elevation and from ever-wet to seasonally dry sites in the tropics?
- What benefits (biophysical and economic) might livestock and compost production provide and what influences their potential use by small farmers in the tropics?
- Evaluate opportunities, constraints and alternatives to the use of external inputs (e.g., fertilizers, pesticides, etc.)

2) Consider the effects of temperature and precipitation on agricultural production and how and to what extent biophysical conditions can be managed through agronomic means in tropical agroforestry systems.
- Have climatic conditions in the tropics and subtropics changed in recent decades?
- How can soil and crop management practices ameliorate temperature and precipitation constraints to crop yields?
See: Sanchez (1976), Young (1989)
3) Consider the role and importance of land and resource tenure in the development of tropical farming systems in a specific location, noting colonial legacies, post-independent state policies, etc. See: Belsky (1993), Fortmann (1985)

4) How do household conditions, specifically food security, gender, and capital and labor availability, influence interest in and the capacity to pursue agroforestry practices and cash crop cultivation? See: Belcher et al. (2005), Belsky (1993), Belsky & Siebert (2003), Burgers (2004), Fortmann (1985)

5) How have soils and water been managed in complex irrigated rice farming systems? See: Conklin (1980), Lansing (1991), Sanchez (1976)

6) Compare and contrast the potential productivity, sustainability and resilience of agroforestry systems, irrigated rice farming and intensive rainfed monocultures. See: World Agroforestry Center, IRRI and related websites


9) Compare and contrast the productivity, sustainability and resilience of rustic, shade-grown coffee and cacao farms with technified, full-sun systems. See: Belsky & Siebert (2003), Jaffe (2007), Perfecto et al. (1996), and websites such as Java Jive and Fair Trade


11) Document international commodity price fluctuations of coffee (Brazilian and Colombian) and cacao over the years (see the commodity section of The Wall Street Journal) and consider the effects of boom and bust cycles on household well-being, food security, and the viability of small-holder agriculture. See: Jaffee (2007)

12) In recent years a global grassroots movement has emerged around the concept of “food sovereignty”. Compare the different meanings and development implications associated with “food production”, “food security” and “food sovereignty”. At the most basic level, is reform of the global agricultural sector possible or is radical change the only likely way that all people can achieve secure access to nutritious food? See: McMichael (2011), Food First website and publications by M. Altieri.
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