Course materials

- Reference books
  - List is being developed
- Home Page
  - Under development
  - Lecture powerpoint presentations
  - Supplemental readings
  - Links for topics/crops etc.

Tropical Horticulture - Texas A&M University

LECTURE # | DATE | TOPIC
--- | --- | ---
1 | Sept. 1 | Course Overview and Introduction to the Tropics
2 | Sept. 3 | Tropical Climates, Soils and Agro-ecosystems
3 | Sept. 8 | Beverage Crops: Cacao
4 | Sept. 10 | Coffee
5 | Sept. 15 | Tea
6 | Sept. 17 | Fruits and their importance in tropical horticulture
7 | Sept. 22 | Musa: Banana and plantain
8 | Sept. 24 | Musa: Banana and plantain
9 | Sept. 29 | Pineapple
10 | Oct. 1 | EXAM
11 | Oct. 8 | Sapodilla, Breadfruit, and Jackfruit
12 | Oct. 13 | Tamarind, Sapote, Guava, and Guanabana (Annona species)
13 | Oct. 15 | Flamboyant, Cassava, Mango, and Durian
14 | Oct. 20 | Nut Crops: Cashews and Brazil nuts
15 | Oct. 22 | Macadamia
16 | Oct. 27 | Palm: Date and Areca
17 | Oct. 29 | African oil palm
18 | Nov. 3 | Rubber and Neem
19 | Nov. 5 | Roosting Crops
20 | Nov. 10 | EXAM
21 | Nov. 12 | Yam, Taro, and Jicama
22 | Nov. 17 | Vegetable Crops: Amaranth, Vegetable Soybean, Mung beans
23 | Nov. 19 | Tropical Horticulture - Texas A&M University
Grading:

<table>
<thead>
<tr>
<th>Task</th>
<th>Points</th>
<th>Due Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>In Class examination</td>
<td>20%</td>
<td>200 points</td>
</tr>
<tr>
<td>Class demonstration</td>
<td>15%</td>
<td>30 points</td>
</tr>
<tr>
<td>Paper</td>
<td>25%</td>
<td>250 points</td>
</tr>
<tr>
<td>TOTAL</td>
<td>100%</td>
<td>1000 points</td>
</tr>
</tbody>
</table>

- **Class Demonstration**
  - Tropical
  - Plant
    - Plant parts (root, tuber, stem, fruit, seed etc.)
    - Plant product
  - Need to fill out Demonstration Sheet
  - 30 points, need to schedule and get approval
  - Can do one additional one for 30 extra points

Grading of the paper in progress:

<table>
<thead>
<tr>
<th>Task</th>
<th>Points</th>
<th>Due Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial topic choice</td>
<td>15%</td>
<td>20 Sept.</td>
</tr>
<tr>
<td>Detailed outline</td>
<td>35%</td>
<td>20 Oct.</td>
</tr>
<tr>
<td>Powerpoint presentation</td>
<td>30%</td>
<td>20 Nov.</td>
</tr>
<tr>
<td>TOTAL</td>
<td>100%</td>
<td>250 points</td>
</tr>
</tbody>
</table>

- **Requirements of paper**
  - Reference:
    - Minimum of 3 from internet and 3 from scientific literature
  - Length, 7-20 pages
    - Format, follow ASHS guidelines for Feature article
  - Extra credit, 4-7 oral presentation of topic
What is the Tropics?

- Land area that is defined by position of the sun
- Highest latitude where sun is directly overhead

- 38% land mass is in the Tropical Zone

Land Use in the Tropics

<table>
<thead>
<tr>
<th>Region</th>
<th>Arable crops</th>
<th>Perennial crops</th>
<th>Pasture</th>
<th>Woodlands</th>
</tr>
</thead>
<tbody>
<tr>
<td>World</td>
<td>1373</td>
<td>102</td>
<td>3212</td>
<td>4049</td>
</tr>
<tr>
<td>Developed</td>
<td>652</td>
<td>22</td>
<td>1250</td>
<td>1867</td>
</tr>
<tr>
<td>Developing</td>
<td>233</td>
<td>22</td>
<td>794</td>
<td>277</td>
</tr>
<tr>
<td>Tropical</td>
<td>488</td>
<td>58</td>
<td>1168</td>
<td>1905</td>
</tr>
</tbody>
</table>

Data from Webster and Wilson, 1998, Table 1.1

Land (%) Suitable for Rain-fed Agriculture

<table>
<thead>
<tr>
<th>Region</th>
<th>Suitable land</th>
<th>Marginal suitable</th>
<th>Land cultivated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa (less South Africa)</td>
<td>27%</td>
<td>8%</td>
<td>6%</td>
</tr>
<tr>
<td>Southeast Asia</td>
<td>33%</td>
<td>25%</td>
<td>31%</td>
</tr>
<tr>
<td>Central America</td>
<td>27%</td>
<td>6%</td>
<td>14%</td>
</tr>
<tr>
<td>South America</td>
<td>46%</td>
<td>8%</td>
<td>8%</td>
</tr>
</tbody>
</table>

Data from Webster and Wilson, 1998, Table 1.4

Land Use in the Tropics

<table>
<thead>
<tr>
<th>Region</th>
<th>Cereal yield (t/ha)</th>
<th>Fertilizer use (Kg/ha)</th>
<th>% Increase in fertilizer use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developed</td>
<td>3.0</td>
<td>3.0</td>
<td>0%</td>
</tr>
<tr>
<td>Tropical</td>
<td>1.8</td>
<td>27.3</td>
<td>123%</td>
</tr>
<tr>
<td>Africa</td>
<td>1.0</td>
<td>2.7</td>
<td>52%</td>
</tr>
<tr>
<td>Asia</td>
<td>2.1</td>
<td>46.5</td>
<td>213%</td>
</tr>
<tr>
<td>Americas</td>
<td>2.1</td>
<td>19.9</td>
<td>40%</td>
</tr>
</tbody>
</table>

Data from Webster and Wilson, 1998
What is the Tropics?

• 44% of the world’s population

Population Projections from 1975 to 2000 (millions)

<table>
<thead>
<tr>
<th>Region</th>
<th>Population 1975</th>
<th>Population projection 2000</th>
<th>Percent increase</th>
<th>Annual % increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developed world</td>
<td>1,131</td>
<td>1,323</td>
<td>17</td>
<td>0.6</td>
</tr>
<tr>
<td>Africa</td>
<td>399</td>
<td>814</td>
<td>104</td>
<td>2.9</td>
</tr>
<tr>
<td>Asia</td>
<td>2,274</td>
<td>3,630</td>
<td>60</td>
<td>1.9</td>
</tr>
<tr>
<td>Americas</td>
<td>325</td>
<td>637</td>
<td>96</td>
<td>2.7</td>
</tr>
</tbody>
</table>

Land Use Changes in the Tropics from 1975 to 1988: area in Mha and % change in (%)

<table>
<thead>
<tr>
<th>Region</th>
<th>Population increase in millions</th>
<th>% Increase in population</th>
<th>% population in agriculture</th>
<th>Population per ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developed world</td>
<td>9</td>
<td>0.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tropical</td>
<td>662 (41%)</td>
<td>58</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Africa</td>
<td>174 (59%)</td>
<td>72</td>
<td>0.2</td>
<td></td>
</tr>
<tr>
<td>Asia</td>
<td>381 (36%)</td>
<td>62</td>
<td>1.4</td>
<td></td>
</tr>
<tr>
<td>Americas</td>
<td>107 (38%)</td>
<td>29</td>
<td>0.2</td>
<td></td>
</tr>
</tbody>
</table>

Agriculture in the Tropics

• Large proportion of population involved in agriculture
  – Developed world 9%
  – Tropics 58% (29% to 72%)
• Mostly by small holders
  – Mainly for subsistence
  – May grow some cash crops
• Mainly with traditional methods

Agricultural Development in the Tropics

• Diverse cultures affect the practice of agriculture
  – Forbidden foods
    • Religious taboos on eggs, pork, and beef
    • African custom of maintaining life stock
  – Excessive numbers result in pasture degradation etc.
  – Rigid group or tribal life vs individual life
Agricultural Development in the Tropics

- Land tenure and inheritance
  - Communal tenure versus individual ownership
  - Various landlord - tenant farmer systems
    - Lack of incentives to adopt higher yielding practices
    - Lack of incentive to plant perennial crops
  - Fragmentation and decreasing size of land holdings

Agricultural Development in the Tropics

- Governmental Support and Finance
  - Land tenure reform
  - Infrastructure improvements
    - Communications, roads, irrigation systems, land drainage, flood control
  - Availability of financial services (i.e., credit)
    - Recurring farm inputs
    - Associated industries, fertilizer, processing, etc
  - Marketing support
  - Extension and Research services

What is the Tropics?

- 50% of the world’s biota

Land Use Changes in the Tropics from 1975 to 1988: area in Mha and % change in ( )

<table>
<thead>
<tr>
<th>Region</th>
<th>Agriculture (Mha)</th>
<th>Woodlands (Mha)</th>
<th>% change in woodlands</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tropical</td>
<td>67</td>
<td>-121</td>
<td>-6%</td>
</tr>
<tr>
<td>Africa</td>
<td>15</td>
<td>-36</td>
<td>-5%</td>
</tr>
<tr>
<td>Asia</td>
<td>7</td>
<td>-23</td>
<td>-7%</td>
</tr>
<tr>
<td>Americas</td>
<td>45</td>
<td>-61</td>
<td>-6%</td>
</tr>
</tbody>
</table>

Data from Webster and Wilson, 1998, Table 1.1

Forest Lands in the World (area in million of hectares)

<table>
<thead>
<tr>
<th>Region</th>
<th>1980</th>
<th>1990</th>
<th>Total</th>
<th>% lost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>650</td>
<td>600</td>
<td>50</td>
<td>7.7%</td>
</tr>
<tr>
<td>Asia</td>
<td>311</td>
<td>275</td>
<td>36</td>
<td>11.5%</td>
</tr>
<tr>
<td>Latin America</td>
<td>923</td>
<td>840</td>
<td>83</td>
<td>9.0%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1,884</td>
<td>1,715</td>
<td>149</td>
<td>9.8%</td>
</tr>
</tbody>
</table>

Lyke and Fletcher, 1992

Why is the Forest being cut?

- Expansion of Agriculture
  - 60%
  - Pasture, Perennial Crops, Annual Crops
- Forestry
  - Roads make accessible to others
  - Clear cut and selective cut approaches
- Other Developments
  - Industry, towns, cities
Deforestation in the Tropics

- The rate of loss is increasing
- 1981
  - 11 million ha per year
- 1990
  - 17 million ha per year
  - Area the size of the state of Washington

Lyke and Fletcher, 1992

Deforestation in Southeast Asia

Deforestation in Brazil

High level of plant and animal diversity

- Tropical forests
  - 7 - 8% of land
  - 50% of world’s species
- Center of origin of many of the world’s most important crops
  - Food - grains, legumes, vegetables, fruits
  - Fiber
  - Medicinal
  - Ornamentals

Origins of Common Domestic Plants
**Local Effects of Deforestation**
- Livelihood/cultural integrity of forest dwellers
- Soil degradation
  - Erosion
  - Loss of fertility
- Watershed flows of surface and ground water
- Local climate changes due to removal of natural vegetation
  - Less evaporation
  - Greater heat absorption

**Global Effects of Deforestation**
- Carbon cycle of the world
- Upon burning forests
  - Carbon dioxide is released to atmosphere
  - Enhances the greenhouse effect
  - May increase rate of global warming

**50% of World’s Biota**
- Other Related Issues
  - Conservation of unique ecosystems and plant diversity
  - Intellectual Property Rights of plant biodiversity
  - Sustainable Agricultural Development

**What is the Tropics?**
- Warm
- Humid
- Rainy
- Jungle

**What is the Tropics?**
- Warm to cool
- Dry
- Deserts
What is the Tropics?

- Cool to cold
- Wet to Dry
- Highlands

3° F/1000 feet
5.6°C/1000 m

Ground Cover in the Tropics

<table>
<thead>
<tr>
<th>Ground Cover</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rainforest</td>
<td>15 %</td>
</tr>
<tr>
<td>Dry season forest</td>
<td>7 %</td>
</tr>
<tr>
<td>Wet savanna</td>
<td>18 %</td>
</tr>
<tr>
<td>Dry savanna</td>
<td>29 %</td>
</tr>
<tr>
<td>Desert</td>
<td>29 %</td>
</tr>
</tbody>
</table>

From Table 2.1, Agriculture in the Tropics, Webster and Wilson, 1988

Any Questions?