Trees in rice-production landscape

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Rice, the main staple food of Asia, covering 10% of land in SEA, provides 30-70% of dietary needs in Asia, is threatened by climate change.

Climate threats: 1) rising sea-levels, 2) reduced river flow, 3) water scarcity, 4) salinity and seawater intrusion, 5) \( \uparrow \) CO2 and temperatures, 6) pests, diseases and weeds, and 7) prolonged droughts.

Water!!!
Agroforestation of rice landscapes

- ↑ farmers’ resilience to climate change
- diversifying production and income
- reducing risks associated with market fluctuations and varying crop yields
- ↑ resilience to pests, diseases, etc.
- Products / income safety net for post-storm/post-disaster periods.
- Trees on boundaries & other areas ↑ productivity with little-to-no impact on rice
- Benefits of trees in rice-production landscapes include the production of food and medicines; fuelwood; large and small timbers, poles and stakes; fodder and green manure; and income from the sale of those products
Trees in rice-production landscapes also provide Environmental / ecosystem services

Four types of services

• **Supporting services** - soil formation, soil conservation; fallow improvement; nitrogen fixation and nutrient cycling

• **Provisioning services** – food production (rice, other crops, wild plants, fish, wild game); timber, poles, fuel (wood & others), organic matter, green manure, fodder, straw; genetic resources conservation; water; medicinals & spices, ornamentals

• **Regulating services** - windbreaks; shade and micro-site enhancement; water regulation; habitat for wildlife, including insects and fish, which have an intrinsic value of their own but may also serve as predators of pests; carbon storage & sequestration; dyke consolidation, boundary demarcation, and accessible straw storage.

• **Cultural services** – rice farming and rice landscapes are important cultural values in Asia. Other cultural values (public values) – include spiritual and historical; recreational; education (scientific); and therapeutic.
Disadvantages to trees in rice-production landscapes

- impediments to mechanization
- habitat for pests and diseases of rice
- competition for light, nutrients and water
- shade reduces sunlight levels, plant growth, vigour and grain yields
- shade humidity favour pests and diseases

Reducing trees’ competition with rice:
1) Trees should be planted in lines perpendicular to the sun’s path to minimize shade;
2) Trees should be pruned to maximize sunlight and rainfall for the understory rice crop;
3) Species selection should favour thin canopies, fix nitrogen, respond to management ... to reduce competition and provide nitrogen-rich green manure.
## Short list of selected trees species for rice-production landscapes

<table>
<thead>
<tr>
<th>No.</th>
<th>Species</th>
<th>Common name</th>
<th>Location and main uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><em>Artocarpus heterophyllus</em></td>
<td>Jackfruit</td>
<td>Adjacent to rice fields. Windbreak, shade, fodder and fruit production</td>
</tr>
<tr>
<td>2</td>
<td><em>Azadirachta indica</em></td>
<td>Neem</td>
<td>Adjacent to rice fields. Windbreak, vegetables, medicine, pesticide and fodder (minor)</td>
</tr>
<tr>
<td>3</td>
<td>Bamboo (many species)</td>
<td>Bamboo</td>
<td>Adjacent to rice fields. Windbreak and building material</td>
</tr>
<tr>
<td>4</td>
<td><em>Durio zibethinus</em></td>
<td>Durian</td>
<td>Adjacent to rice fields. Windbreak, shade, fuelwood and fruit production</td>
</tr>
<tr>
<td>5</td>
<td><em>Garcinia mangostana</em></td>
<td>Mangosteen</td>
<td>Adjacent to rice fields. Windbreak, fruit production, and shade</td>
</tr>
<tr>
<td>6</td>
<td><em>Gliciridia sepium</em></td>
<td>Gliricidia</td>
<td>Adjacent to rice fields. Fodder, green manure, soil improvement, fuelwood</td>
</tr>
<tr>
<td>7</td>
<td><em>Mangifera indica</em></td>
<td>Mango</td>
<td>In or adjacent to rice fields. Fruit production and windbreak</td>
</tr>
<tr>
<td>8</td>
<td><em>Moringa oleifera</em></td>
<td>Moringa</td>
<td>Adjacent to rice fields. Food, fodder, medicine and cultural uses</td>
</tr>
<tr>
<td>9</td>
<td><em>Nypa fruticans</em></td>
<td>Nypa palm</td>
<td>In or adjacent to rice fields. Biofuel, roofing, alcohol, sap used as livestock feed</td>
</tr>
<tr>
<td>10</td>
<td><em>Paraserianthes falcataria</em></td>
<td>Albizia, falcataria</td>
<td>Adjacent to rice fields. Windbreak, shade, green manure and timber</td>
</tr>
<tr>
<td>11</td>
<td><em>Psidium guajava</em></td>
<td>Guava</td>
<td>In or adjacent to rice fields. Fruit and fuelwood production</td>
</tr>
<tr>
<td>12</td>
<td><em>Sesbania grandiflora</em></td>
<td>Grandiflora</td>
<td>On bunds. Green manure, soil improvement, fodder, poles and fuelwood</td>
</tr>
</tbody>
</table>
Good planning & design is essential

- incl. input & objectives of farmers & all stakeholders
- utilize both scientific and local knowledge
- study local examples
- **Planning should include**
  - species (trees, annuals, ...)
  - germplasm (genetic, phys ...
  - system management
  - markets & marketing
  - tenure (land, tree, ....
  - sharing benefits
  - weather forecasts
- create new knowledge and innovations of local relevance ...testing, farmer demo trials
- planning, new knowledge, innovations ... vary by socioeconomic conditions (many options)
- nurseries, demos, on-farm management, cross-visits, information exchange farmer level
- market integration, group marketing, ....
- **KEY** – collaborative planning and implementation with farmers & stakeholders

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Farmer group approach ... facilitates

- learning & innovations
- farmer peer sharing
- farmer-advisor strong links
- focus farmers’ conditions & experience/knowledge all the aspects of planning)

Groups should be inclusive

- both men and women have unique knowledge
- youth, ethnic groups, economic classes, ...
- interested and motivated individual
- extension agents, private sector, local leaders

- organize meetings and activities according to farmers’ schedules (not schedules of the advisors, institutions, government office, ...)
- from this process ‘farmer trainers / specialists / extensionists’ will evolve
Rural advisory services & F-to-F dissemination

- facilitate technical, climate and market information & training exch
- builds farmers’ confidence and sustains momentum
- builds self-sufficient - *exit plan!!*

- **KEY** – external services frequently not accessible/timely/reliable
- F-to-F dissemination ....to the point, transferable, cost-effective, sustainable
- specialized training farmer trainers – technical & training approaches
- rural resource centers - *exit plan!!*
- technical material – manuals & fact sheets – support self-learning (after formal events)
- links to activities of the previous two slides
Integrating trees in rice landscapes

- Diversify farm production / income
- Reduce risks – market fluctuation and varying cop yields
- Resilience to pests, diseases, etc
- Strengthen farmers resilience to cc
- ↑ optimize use of natural, human, financial resources
- ↑ products and env. services

However, this advantages & potential currently under-recognized and should be prioritized for further research and support to contribute to regional livelihood & conservation goals.

Wider adoption (adaption): Scaling up plan, transparency, finance, shifting direction (focus) to local priorities & enabling environments, R&D in context ..... farmer focus & farmer involvement (farmer field schools, FDTs, ....)

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Manual
https://www.cabdirect.org/cabdirect/abstract/20173290122

Policy brief
Thank you!

Terima kasih!