ANNEX 3
Charcoal Production
in Yee San
The variety of mangrove Plantation use in Yee San is *Rhizophora apiculata*.

Plantation methods consists of 3 types.

1. **Extensive Practice**: no land preparation
2. **Medium Practice**: with land preparation
3. **Intensive Practice**: with land preparation and cultivation management

Rotation period is 10-15 years.

Green Sale is 10,000 Baht / Rai.
Production Process
• Wood with a diameter of 4-8 centimetre will be cut for charcoal production.

• A clear cutting method is used. One “Lha” or 1.30 metre is the optimal size of wood cutting.

• Wood shell is peeled and ready to transport by boat to the charcoal production plants.
• Wood will be placed orderly into the stove.

• Fire is lighted in front of the stove for 5-10 days.

• After 10 days, stove will be closed. There is still fire inside the stove and this step takes about 8-10 days.
• After the dark or gray smoke color becomes the light blue, it indicates that charcoal production process is almost finished.

• When the smoke is colorless, it indicates that wood is fully burned to be charcoal and it requires another 7 days until the fire is completely terminated.

• Total charcoal production period takes about 20-27 days or about 1 month.
Charcoal Production

- One rai of mangrove forest (with about 1,100 trees) at average age of 15 years can produce wood with the volume of 18.65 cubic metre.

- One cubic metre of cut wood can produce 370 kilogram of charcoal.

- One rai of mangrove forest can produce 6,900 kilogram of charcoal.
Charcoal Production Costs

Direct Cost

1. Investment Cost
   1.1 Land preparation and weed clearing  500  Baht/Rai
   1.2 Weed collection and burn  400  Baht/Rai
   1.3 Root eradication  700  Baht/Rai
   1.4 Mangrove seedling  600  Baht/Rai
   1.5 Labor cost for cultivation  200  Baht/Rai

Total Investment Cost  2,400  Baht/Rai
2. Operating and Maintenance Cost

2.1 Land tax 80 Baht/Rai
2.2 Replanting in year 2 216 Baht/Rai
2.3 Maintenance cost in year 3 300 Baht/Rai
2.4 Wood cutting and peeling 7,986 Baht/Rai
2.5 Transportation cost 222 Baht/Rai
2.6 Labor cost of wood loading and taking in stove 350 Baht/Rai
2.7 Depreciation of building and stoves 266 Baht/Rai
2.8 Stove rent cost 1,165.63 Baht/Rai
2.9 Hired labor for burning 2,331.25 Baht/Rai
2.10 Labor cost of taking charcoal out from stove and packaging 350 Baht/Rai
2.11 Transportation of charcoal to shop 690 Baht/Rai

Total Operating and Maintenance Cost can be classified into 5 cases.
# Total Operating and Maintenance Cost

<table>
<thead>
<tr>
<th>Case</th>
<th>Description</th>
<th>Cost</th>
<th>Unit</th>
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</thead>
<tbody>
<tr>
<td>Case 1</td>
<td>Wood sale</td>
<td>596</td>
<td>Baht/Rai</td>
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<tr>
<td>Case 2</td>
<td>Stove Rent</td>
<td>3,000.88</td>
<td>Baht/Rai</td>
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<tr>
<td>Case 3</td>
<td>Own Stove</td>
<td>12,101.25</td>
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<tr>
<td>Case 4</td>
<td>Stove Rent and transport to the shop</td>
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<td>Baht/Rai</td>
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<td>Case 5</td>
<td>Own Stove and transport to the shop</td>
<td>12,791.25</td>
<td>Baht/Rai</td>
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</table>
### Total Direct Cost

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<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case 1</td>
<td>Wood sale</td>
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<tr>
<td>Case 2</td>
<td>Stove rent</td>
<td>15,400.88</td>
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<tr>
<td>Case 3</td>
<td>Own stove</td>
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<tr>
<td>Case 4</td>
<td>Stove rent and transport to shop</td>
<td>16,090.88</td>
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<tr>
<td>Case 5</td>
<td>Own stove and transport to shop</td>
<td>15,191.25</td>
</tr>
</tbody>
</table>
Benefit

Direct Benefit
1. Wood Sale 10,000 Baht/Rai
2. Charcoal Sale at home 48,303.50 Baht/Rai
3. Charcoal Sale at shop 55,204 Baht/Rai
4. Subsidy received 3,000 Baht/Rai
Market Channel

Charcoal producer

Big Merchant

Middle man
- domestic
- Export

Retailer villagers
Middle man

- Export 80%
- Domestic 20%

End User

- Restaurant 90%
- Household 5%
- Funeral 5%