How Competitive are Fast-Growing Plantations in South China?

By Christian Cossalter, CIFOR

A Workshop Presenting Outputs from a Collaborative Research Project: Feeding China’s Expanding Demand for Wood Pulp

Beijing, November 22, 2005

Partially funded by EC Asia Pro Eco Program
The Context

China’s Government is promoting domestic wood pulp production.

However, many observers – especially financial analysts – estimate that the supply of wood raw material is the weak part of this strategy.

<table>
<thead>
<tr>
<th>Low Cost Advantage</th>
<th>Source: Merrill Lynch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw materials</td>
<td>Assets</td>
</tr>
<tr>
<td>China</td>
<td>X</td>
</tr>
<tr>
<td>SE Asia</td>
<td>X</td>
</tr>
<tr>
<td>Latin America</td>
<td>XX</td>
</tr>
<tr>
<td>Russia</td>
<td>X</td>
</tr>
</tbody>
</table>

Source: Merrill Lynch

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The Context

China’s imports of hardwood wood chips are growing exponentially

June 2002
Rizhao, Shandong
(220,000 ADT of pulp) came on stream

March 2005
APP, Hainan
(1.2 million ADT of pulp) started production

In 2004, 99.53% of tonnage imported from:

- Australia: 56.80% (56% of USD value)
- Thailand: 19.90% (16.3% of USD value)
- Vietnam: 17.36% (16% of USD value)
- Malaysia: 5.47% (5.6% of USD value)

Data source: China’s Custom Administration

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The Context

... and this trend is due to continue and even increase sharply with new wood pulp expansions

The additional pulp line on the Rizhao site (1 million ADT per year) will require between 1 and 2 million Bone Dry tonnes of hardwood wood chips, depending on the pulp process which will be adopted.

A recently approved joint venture of APRIL (90% of the share) with Shandong Rizhao SSYMB Pulp & Paper Co. Ltd

100% of the wood supply will come by sea transport:

▪ Purchase of wood chips from Southern China will continue;

▪ APRIL’s plantations in Indonesia will provide most of the new demand;

▪ In the medium term wood chips from own plantations in Meizhou (North East Guangdong). Area established so far is still limited (13,000 ha)

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The Context

China’s Government is also promoting the development of fast-growing tree plantations

Overall target area:
13.1 million ha to be planted
Pulpwood plantations will account for:
5.9 million ha (45%)
period 2001-2015

4 Priority Regions

- Northeast/Inner Mongolia: 7.2 million ha / 2.4 million ha
- Middle/Lower Yellow River: 1.0 million ha / 0.8 million ha
- Middle/Lower Yangtze: 3.0 million ha / 1.3 million ha
- South Coastal: 1.9 million ha / 1.4 million ha

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Challenges

Secure Adequate Wood Supply & Contain Wood Costs

In southern China local market prices for export-quality wood chips are well above the rest-of-world mean prices ....

Between 1991 and 2004 the price paid by Japanese importers for each Bone Dry Metric Ton of wood chips was, in average, 2.4 times the Rest-of-World mean delivered cost.
Challenges

Secure Adequate Wood Supply & Contain Wood Costs

…. and continue to raise

Global Weighted Mean Cost of Pulpwood

Mill gate prices for debarked eucalypt green round wood in Southern China

- (RMB 340 / tonne) equivalent to USD 41.4 / tonne) during third quarter 2004;

- (RMB 380 / tonne) equivalent to USD 47 / tonne) during third quarter 2005

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Challenges

Secure Adequate Wood Supply & Contain Wood Costs

Incidence of local market prices on the weighted mean cost of wood at mill gate

**USD/green tonne**

<table>
<thead>
<tr>
<th>Source of wood supplies</th>
<th>Self Managed</th>
<th>Out-grower Scheme</th>
<th>Local Market</th>
</tr>
</thead>
<tbody>
<tr>
<td>30%</td>
<td>8%</td>
<td>62%</td>
<td></td>
</tr>
<tr>
<td>35%</td>
<td>10%</td>
<td>55%</td>
<td></td>
</tr>
<tr>
<td>40%</td>
<td>12.5%</td>
<td>47.5%</td>
<td></td>
</tr>
</tbody>
</table>

The more a pulp company has to rely on outside wood purchases the less the possibility to contain prices.

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Challenges

Secure Adequate Wood Supply & Contain Wood Costs

At the time UPM took the decision to withdraw from the Zhanjiang project the local market price per delivered green tonne of debarked pulpwood was approximately USD 41.5 / tonne. The weighted mean cost of wood to the mill, was estimated to be slightly above USD 30 per metric tonne of green wood.

Since then local market prices have continued to escalade.

In April 2005 the local market price per delivered green tonne of debarked pulpwood had jumped to USD 45 and the weighted cost of a total wood delivery to the mill (approximately 3.05 million metric tonnes) would have been in the order of USD 32 to 33 per green metric tonne.

The above figures might give an idea of where the viability line stands for multinationals searching for investment opportunities in China’s wood-based pulp production sector.
Challenges

Secure Sufficient Land of Adequate Quality to Build Up an Integrated Plantation Resource Base
Challenges

Secure Sufficient Land of Adequate Quality to Build Up an Integrated Plantation Resource Base
Challenges

Secure Sufficient Land of Adequate Quality to Build Up an Integrated Plantation Resource Base

Land with limited productivity and unused land

Under State tenure

Data source: 1999 Guangxi Forest Inventory
Challenges

Secure Sufficient Land of Adequate Quality to Build Up an Integrated Plantation Resource Base

Land with limited productivity and unused land

Under Collective tenure

Data source: 1999 Guangxi Forest Inventory
Challenges

Secure Sufficient Land of Adequate Quality to Build Up an Integrated Plantation Resource Base
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Secure Sufficient Land of Adequate Quality to Build Up an Integrated Plantation Resource Base

Density and distribution of human population in China

Year 2000

Source: Deng Xiang Zheng, Chinese Center for Agricultural Policy, 2004

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Challenges

Secure Sufficient Land of Adequate Quality to Build Up an Integrated Plantation Resource Base

Per capita land availability

- In rural areas of Zhanjiang¹/: 1 mu (670 m²) of arable land and 1.08 mu (720 m²) of forestland

- Ranges of variation²/ for 7 villages of Eastern Guangxi (Pu Bei county and Bo Bai county):

<table>
<thead>
<tr>
<th>Rice field</th>
<th>Dry agricultural land</th>
<th>Hill land / Forest land</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.37 to 1 mu</td>
<td>0.1 to 0.4 mu</td>
<td>1.75 to 10.8 mu</td>
</tr>
<tr>
<td>= 250 to 670 m²</td>
<td>= 67 to 270 m²</td>
<td>= 1,170 to 7,200 m²</td>
</tr>
</tbody>
</table>

Sources:¹/ Fuxing – UPM Kymmene feasibility study, Nov. 2003
²/ CIFOR survey, March 2005
Challenges
Secure Sufficient Land of Adequate Quality to Build Up an Integrated Plantation Resource Base
Challenges
Secure Sufficient Land of Adequate Quality to Build Up an Integrated Plantation Resource Base
Challenges
Managing On-site / Bio-physical Risks

Fire
Perceived as the major risk by plantation managers

Diseases
Not enough clones for mass propagation. Turnover of clones also insufficient.

Unusual Drought
Immediately after planting season

Lower Soil Nutrients
Granites or sedimentary infertile sands

Typhoons
1 force 11-12 typhoon once every 7-8 years

Illegal logging
Challenges
Producing at Competitive Costs

Hills
Labour-intensive

Flat land
Semi-Mechanized

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Challenges
Producing at Competitive Costs

Data source

Semi-mechanized plantations in flat land
Labor-intensive plantations in hills

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## Discounted Cash Flow Analysis

<table>
<thead>
<tr>
<th>Costs in RMB/mu</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Years</strong></td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>(15.00)</td>
</tr>
</tbody>
</table>

### Land Lease -
- (15.00)

### Silviculture: Labor
- Survey by the Forest Technology Extension Station (5.00)
- Open a firebreak [10 m x 1.2 km]: Burn the land; clearing after burning - RMB 15 / mu (15.00)
- Open square planting holes - 40 cm at bottom; 50 cm surface; 40 cm depth: RMB 0.25/hole (27.75)
- Refilling holes, adding fertilizer, mixing fertilizer with soil: RMB 0.15/hole (16.65)
- Unloading seedling; carrying seedling to planting hole and planting - RMB 0.1/hole (11.10)
- Replace dead trees - if survival less than 98% - 8% were replanted. Cost included in planting costs -
- Cutting grasses & 20 cm deep cultivation on a 1.2 m wide strip: RMB 30/mu [222 m of strip] (30.00)
- Dig a trench 15 cm deep, 20 cm wide & 40 cm long 30 cm to the tree and distribute fertilizer (20.00)
- Cutting grass on the strip and unloading & carrying fertilizer to planting hole included in above in March: dig similar trench unload, carry and distribute fertilizer, cut grass on a 1.5 m wide strip (28.00) (28.00)

### Silviculture: Materials
- Seedling cost - RMB 0.3 / seedling; purchase of 125 seedling per mu (37.50)
- Fertilizer at time of planting delivered to planting site - 600 g/hole = 66.6 kg/mu x RMB 750/tonne; (49.95)
- Fertilizer delivered at planting site at 3-4 months of age: 600g/tree = 66.6 kg/mu x RMB 1,300/tonne (86.58)
- Fertilizer delivered at planting site cost in year 1 and 2: 500g/tree = 55.5 kg/mu x RMB 1,300/tonne (72.15) (72.15)

### Silviculture: Transport
- Harvest/Debarking/Crosscutting/Transport to road side and piling: RMB 50/m3 (275.18)

### Wood transport to mill
- Abolished in Guangxi province for FGHY plantations (157.60)

### Fees to Forestry Bureaux:
- 10% of amount of first transaction sale

### Wood sale
- (401.08) (129.55) (57.40) (29.40) (29.40) (29.40) 1,271.43

### Taxes:
- 1,733.60

### Total
- (401) (123) (52) (25) (24) (23) 949

### Present Value
- 537 165 70 34 32 31 462

### Future Value of Costs considered for calculation of stumpage value
- 537 165 70 34 32 31 29
<table>
<thead>
<tr>
<th>Parameters</th>
<th>Costs in RMB/mu</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
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<tr>
<td>Discount Rate</td>
<td>7.00%</td>
</tr>
<tr>
<td>MAI (m3/mu/y)</td>
<td>1.22</td>
</tr>
<tr>
<td>Rotation (years)</td>
<td>6</td>
</tr>
<tr>
<td>Wood Recovery</td>
<td>75%</td>
</tr>
<tr>
<td>% Commercial volume below 14 cm diameter</td>
<td>80%</td>
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<tr>
<td>% Commercial volume above 14 cm diameter</td>
<td>20%</td>
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<tr>
<td>Tonne/m3</td>
<td>1.05</td>
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<tr>
<td>Transport distance</td>
<td></td>
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<tr>
<td>Transport cost RMB/T/KM</td>
<td></td>
</tr>
<tr>
<td>Harvesting/Bucking/Debarking/transport to road side and piling RMB/m3</td>
<td>50.00</td>
</tr>
<tr>
<td>Sale Price (RMB/m3) Standing trees at end of rotation</td>
<td>250.00</td>
</tr>
<tr>
<td>Sale Price (RMB/m3) after harvest, road side: Diameter above 14 cm</td>
<td>325.00</td>
</tr>
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<td>Wood transport to mill</td>
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<td>Taxes: Abolished in Guangxi province for FGHY plantations</td>
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<tr>
<td>Fees to Forestry Bureaux: 10% of amount of first transaction sale</td>
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<tr>
<td>Wood sale</td>
<td></td>
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<tr>
<td>Total</td>
<td></td>
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<tr>
<td>Present Value</td>
<td></td>
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<tr>
<td>Future Value of Costs</td>
<td></td>
</tr>
<tr>
<td>Future Value of Costs considered for calculation of stumpage value</td>
<td>537</td>
</tr>
</tbody>
</table>
## Costs in RMB/mu

<table>
<thead>
<tr>
<th>Year</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Lease</td>
<td>(15.00)</td>
<td>(15.00)</td>
<td>(15.00)</td>
<td>(15.00)</td>
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<td>(15.00)</td>
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<tr>
<td>Silviculture: Labor</td>
<td>(5.00)</td>
<td>(5.00)</td>
<td>(5.00)</td>
<td>(5.00)</td>
<td>(5.00)</td>
<td>(5.00)</td>
<td>(5.00)</td>
</tr>
<tr>
<td>Open firebreak [10 m x 1.2 km]; Burn the land; clearing after burning</td>
<td>15.00</td>
<td>15.00</td>
<td>15.00</td>
<td>15.00</td>
<td>15.00</td>
<td>15.00</td>
<td>15.00</td>
</tr>
<tr>
<td>Open square planting holes - 40 cm at bottom; 50 cm surface; 40 cm depth</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
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<tr>
<td>Refilling holes, adding fertilizer, mixing fertilizer with soil</td>
<td>0.15</td>
<td>0.15</td>
<td>0.15</td>
<td>0.15</td>
<td>0.15</td>
<td>0.15</td>
<td>0.15</td>
</tr>
<tr>
<td>Unloading seedling; carrying seedling to planting hole and planting</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
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<tr>
<td>Replace dead trees - if survival less than 98%</td>
<td>8%</td>
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</tr>
<tr>
<td>Cutting grasses &amp; 20 cm deep cultivation on a 1.2 m wide strip</td>
<td>30.00</td>
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<td>Dig a trench 15 cm deep, 20 cm wide &amp; 40 cm long 30 cm to the tree and distribute fertilizer</td>
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<td>20.00</td>
<td>20.00</td>
<td>20.00</td>
<td>20.00</td>
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<tr>
<td>Supervision / Protection: 2 guards for 500 mu</td>
<td>300/month</td>
<td>300/month</td>
<td>300/month</td>
<td>300/month</td>
<td>300/month</td>
<td>300/month</td>
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<tr>
<td>Silviculture: Materials</td>
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<tr>
<td>Seedling cost - RMB 0.3 / seedling; purchase of 125 seedling per mu</td>
<td>37.50</td>
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</tr>
<tr>
<td>Fertilizer delivered at planting site at 3-4 months of age: 600g/tree = 66.6 kg/mu x RMB 1300/tonne</td>
<td>86.58</td>
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<td>72.15</td>
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<td>Harvest/Debarking/Crosscutting/Transport to road side and piling</td>
<td>50.00</td>
<td>50.00</td>
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<td>325.00</td>
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<td>325.00</td>
</tr>
<tr>
<td>Sale Price (RMB/m3) after harvest, road side: Diameter below 14 cm</td>
<td>275.00</td>
<td>275.00</td>
<td>275.00</td>
<td>275.00</td>
<td>275.00</td>
<td>275.00</td>
<td>275.00</td>
</tr>
<tr>
<td>Sale Price (RMB/m3) after, harvest road side</td>
<td>(37.50)</td>
<td>(37.50)</td>
<td>(37.50)</td>
<td>(37.50)</td>
<td>(37.50)</td>
<td>(37.50)</td>
<td>(37.50)</td>
</tr>
</tbody>
</table>

### Parameters

- **Discount Rate**: 7.00%
- **MAI (m3/mu/y)**: 1.22
- **Rotation (years)**: 6
- **Wood Recovery**: 75%
- **% Commercial volume below 14 cm diameter**: 80%
- **% Commercial volume above 14 cm diameter**: 20%
- **Tonne/m3**: 1.05
- **Transport distance**: -
- **Transport cost RMB/T/KM**: -
- **Silviculture: Transport**
  - Harvest/Debarking/Crosscutting/Transport to road side and piling: RMB 50/m3
- **Wood transport to mill**: -
- **Fees to Forestry Bureaux**: 10% of amount of first transaction sale
- **Taxes**: Abolished in Guangxi province for FGHY plantations
- **Temperature**: 25°C
- **Soil type**: Deep loam
- **Silviculture: Materials**
  - Seedling cost - RMB 0.3 / seedling; purchase of 125 seedling per mu
  - Fertilizer at time of planting delivered to planting site - 600 g/hole = 66.6 kg/mu x RMB 750/tonne;
  - Fertilizer delivered at planting site at 3-4 months of age: 600g/tree = 66.6 kg/mu x RMB 1300/tonne

### Net Present Value

- **Net Present Value RMB/mu**: 207.53
- **IRR**: 12.8%
- **Compounded Costs (RMB/m3) at road side**: 258.41
- **Stumpage Value (RMB/m3)**: 179.77

### Total

- **Net Present Value USD/ha**: 378.93
- **Compounded Costs (USD/m3)**: 31.46
- **Stumpage Value (USD/m3)**: 21.88
Challenges
Producing at Competitive Costs

- Lower Plantation operational costs
- Easier logistics for field work
- Higher wood yields, in most cases

Production costs of recovered wood
USD13 to 18/m3 (standing, 1rst rotation)
USD 20 to 28 per tonne at mill gate

For land rental price below RMB 55/mu/year equiv.
to approximately USD 100 /ha/year

Usually, the best conditions for production of wood fiber at competitive costs:

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Challenges
Producing at Competitive Costs

Range of prices (USD/ha/year) for land rental

USD 70-110
USD 110-220
USD 55-125
USD 200-250
Challenges
Producing at Competitive Costs

Source: Louis Carbonnier, Jaakko Pöyry
Challenges
Producing at Competitive Costs

Range of prices (USD/ha/year) for land rental

USD 20-40 for approximately 50% of the sites

Below USD 20 and above USD 60 only in limited number of cases
Challenges
Producing at Competitive Costs

Cost structure of locally-made wood chips

Wood Chips Production Profiles

- Stumpage
- Harvest & extraction
- Transport
- Fees at harvest
- Unloading & processing into chips
- Overheads
- VAT differential & other taxes

- Pu Bei: 163 km
- Wu Ming: 30 km
- Xin Bin: 130 km
- Bo Bai: 200 km

USD per BDT of chips
Challenges
Producing at Competitive Costs

Costs of imported wood chips are 2004 averages (China’s Customs Administration)

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Challenges
Producing at Competitive Costs

Costs of imported wood chips are 2004 averages (China’s Customs Administration)

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Challenges

Producing at Competitive Costs

- Guangxi’s wood chips makers using locally-grown, 1rst-rotation eucalypt wood are able to maintain currently a cost advantage in the range of USD 40 to 50 per bone dry metric tonne of chips over imported hardwood wood chips.

- This cost advantage is more or less equal to the on-site costs (silviculture, harvesting and extraction) needed to produce the wood which is contained in one bone dry metric ton of chips.

- On-site production costs are made essentially of labor (approximately 50%), fertilizers, seedlings, supervision and transport (labor, equipment, seedlings, fertilizer, etc.). – Bringing the base daily wage of unskilled workers from current USD 3 up to USD 10 - all other parameters remaining equal – would offset the current cost advantage that Guangxi’s producers have over imported hardwood wood chips.
Challenges
Producing at Competitive Costs

Re-investment in a new cycle:
1 planted rotation followed by 1 to 2 coppice rotations

Main elements of uncertainties from an investor’s perspective:

- Labor availability?
- Land rental costs?
- Minimum daily wage for field workers?
- Cost of imported wood chips?

Conditions in 10 to 15 years from now likely to be less in favor of investors
Challenges
Producing at Competitive Costs

Several rural areas in southern China already experience shortage of manpower for seasonal unskilled jobs.

There is still room for adoption of less labor-intensive practices for certain operations.

However, the dispersion and relatively modest size of individual plantation blocks is likely to render mechanization a more expensive option.
Challenges
Producing at Competitive Costs

On the other hand, manual work will continue to be the only option for a number of other operations: terracing, planting, fertilizer application, tending.

The capacity for an enterprise to mobilize workers in adequate numbers and at the right time will - in many instances - determine the economic viability of hill plantations.
Thank you

谢谢！