



Guatemala

Cuauhtemallan (Mayan word): Land of forests



Faculty of Commerce

Financing environmental sustainability for small landowners in Guatemala: The potential of the Carbon Banking Approach

Fernando Garcia-Barrios

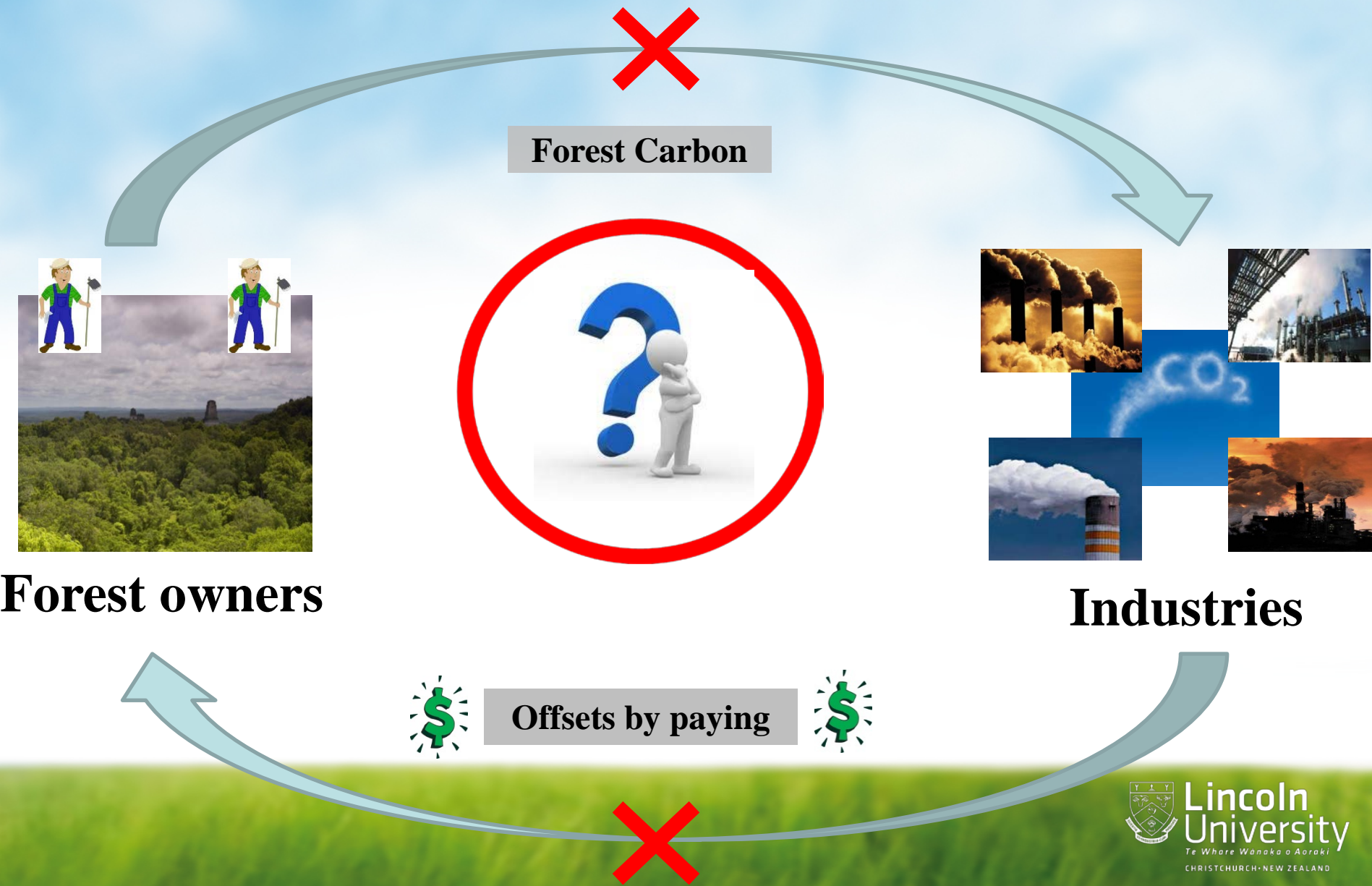
Master of Applied Science in Environmental Management

Supervisors:

Hugh Bigsby & Geoffrey Kerr

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Forest owners and carbon markets

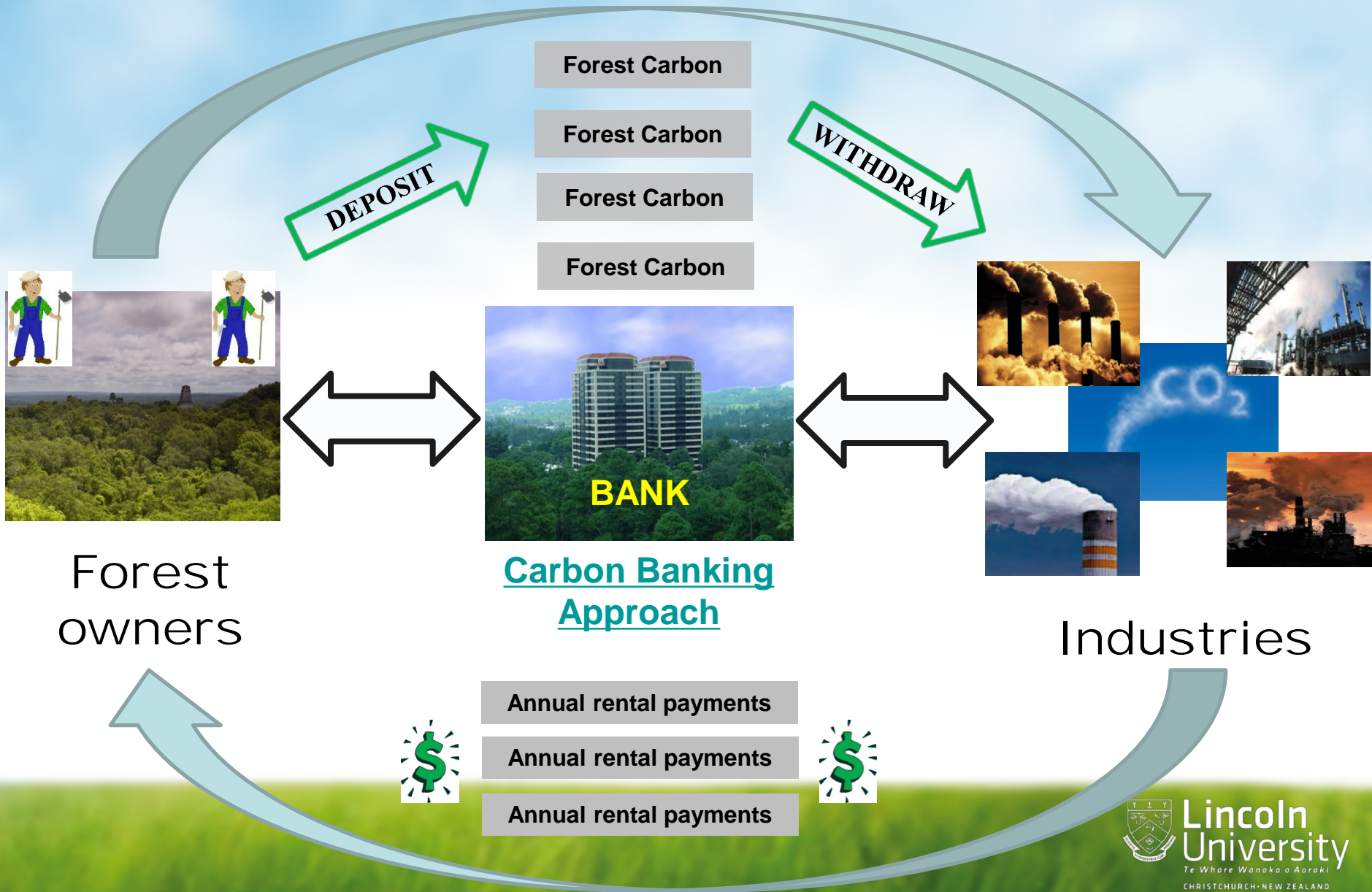


Small Landholders (?)

- **MARKET EXCLUSION:** *large land cover under management to provide a stable carbon stock over time*
- **LACK OF INFORMATION:** *Lack of access to carbon markets*
- **HIGH COSTS:** *Transaction costs tend to be high*
- **ENVIRONMENTAL RISKS:** *It could reduce carbon reservoirs*

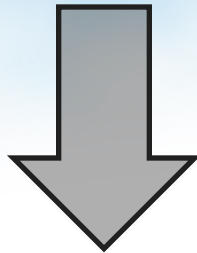
Sources: (Cacho, et al., 2005; Roshetko et al., 2006; Roncoli et al., 2007; Pfaff, et al., 2007; Bigsby, 2009; Galiok, et al., 2009; Bigsby, 2009; Milder, Scherr & Bracer, 2010; De Pinto, et al., 2010; Beddoe, 2010)

Forest owners and carbon markets

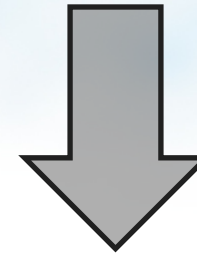


Research Questions

What is the potential of the carbon banking approach to include the forestry and agro-forestry systems of small land owners in Guatemala into the carbon trading system, and through this provide payments for retaining forest?



What is the size of the effective carbon pool provided by small landowners, accounting for forest fire risk?



How much can the carbon bank afford to pay small landowners for sequestering carbon?



Methods

Risk Analysis

- Monte Carlo analysis
- Model risk of losing forest through fires in three Zones
- Probability
- 10,000 iterations

Carbon Payment Analysis

- Sensitivity analysis
- 3 scenarios

Results

Zones	Area of forest land deposited in the bank (ha)	Volume of carbon deposited (tCO ₂)	Risk-adjusted carbon available for lease (%)	Bank annual revenue (USD4.80/tCO ₂)
Dry	1,454.94	37,807.42	97.13%	8,906.70
Montane	7,593.67	1,494,996.42	98.87%	358,511.69
Wet and moist	26,100.12	4,876,684.30	96.35%	1,139,685.24
TOTAL	35,148.73	6,409,488.14		1,507,103.63

Number of small forest owners = 6,734

Cost of the Carbon Bank

Fixed costs

Operational costs	Type of cost	Units	Cost per unit (USD)	Total cost (USD)
3 carbon management experts	Administrative fee	3	40,000.00	120,000.00
Monitoring Plan	Consultancy fee	1	20,000.00	20,000.00
Monitoring at field level	Administrative fee	1	95,000.00	95,000.00
Verification of monitoring developed by third party	Auditor fee	1	45,000.00	45,000.00
Subtotal				430,000.00

Variable costs

Variable cost per land owner

Other associated costs when issuing one contract (energy, printers, paper, etc)	Administrative fee	6,734	1.00	6,734.00
Subtotal				6,734.00

Scenario 1 with USD 430,000 (USD/tCO2/yr)

		Minimum of profit margin for the bank					
		0.00%	5%	10.00%	15.00%	20.00%	25.00%
% landowners in the scheme	100%	0.167	0.143	0.132	0.120	0.108	
	90%	0.160	0.136	0.124	0.113	0.101	
	80%	0.150	0.127	0.115	0.103	0.091	
	70%	0.138	0.115	0.103	0.091	0.079	
	60%	0.122	0.111	0.099	0.087	0.075	0.063
	50%	0.100	0.088	0.076	0.065	0.053	0.041
	40%	0.066	0.055	0.043	0.031	0.019	0.008
	30%	0.010	-0.001	-0.013	-0.025	-0.037	-0.048
	20%	-0.101	-0.113	-0.125	-0.137	-0.148	-0.160

Scenario 2 reducing 25% of fixed costs (USD/tCO2/yr)

Minimum % of profit margin for the bank

		0.00%	5%	10.00%	15.00%	20.00%	25.00%
% landowners in the scheme	100%	0.184	0.159	0.160	0.148	0.137	0.125
	90%	0.178	0.159	0.155	0.143	0.131	0.119
	80%	0.171	0.159	0.148	0.136	0.124	0.112
	70%	0.162	0.159	0.139	0.127	0.115	0.103
	60%	0.150	0.159	0.127	0.115	0.103	0.091
	50%	0.133	0.122	0.110	0.098	0.086	0.075
	40%	0.108	0.097	0.085	0.073	0.061	0.050
	30%	0.066	0.055	0.043	0.031	0.019	0.008
20%	-0.017	-0.029	-0.041	-0.053	-0.065	-0.076	

Scenario 3 reducing 50% of fixed costs (USD/tCO2/yr)

Minimum of profit margin for the bank

		0.00%	5%	10.00%	15.00%	20.00%	25.00%
% landowners in the scheme	100%	0.201	0.185	0.177	0.165	0.154	0.142
	90%	0.197	0.181	0.173	0.162	0.150	0.138
	80%	0.192	0.18	0.169	0.157	0.145	0.133
	70%	0.186	0.174	0.163	0.151	0.139	0.127
	60%	0.178	0.166	0.155	0.143	0.131	0.119
	50%	0.167	0.155	0.143	0.132	0.120	0.108
	40%	0.150	0.138	0.127	0.115	0.103	0.091
	30%	0.122	0.111	0.099	0.087	0.075	0.063
	20%	0.066	0.055	0.043	0.031	0.019	0.008
	10%	-0.101	-0.113	-0.125	-0.137	-0.148	-0.160

Is it enough money per Ha/yr? (USD/tCO₂/yr)

Zones	Average of carbon sequestered (tCO ₂ e/ha/yr)	Maximum payment to small forest owners (USD/tCO ₂ e/yr)		
		0.14	0.16	0.18
		Scenario 1 (USD/ha/yr)	Scenario 2 (USD/ha/yr)	Scenario 3 (USD/ha/yr)
Dry	25.99	3.59	3.90	4.68
Montane	196.87	27.17	29.53	35.44
Wet and Moist	186.85	25.78	28.03	33.63

Conclusions

- The three zones have more than 96% of forest carbon available for leasing in carbon markets when adjusted for fire risk.
- The maximum price paid to small forest owners depends on the bank's profit rates, the level of small landowners' participation as well as how effective the bank can manage fixed costs.
- Considering 80% of participation of small landowners and 5% of profit for the bank, the best scenario for the bank is No. 3 as it can afford USD 0.18/tCO₂/yr. However, from small landowner's perspective their level of involvement into the scheme will rely on whether they have additional economic activities or not.

Thank you for your attention!