Economic and ecological implications of emerging markets for bio-sequestered carbon for the Atherton Tablelands and for the wider world

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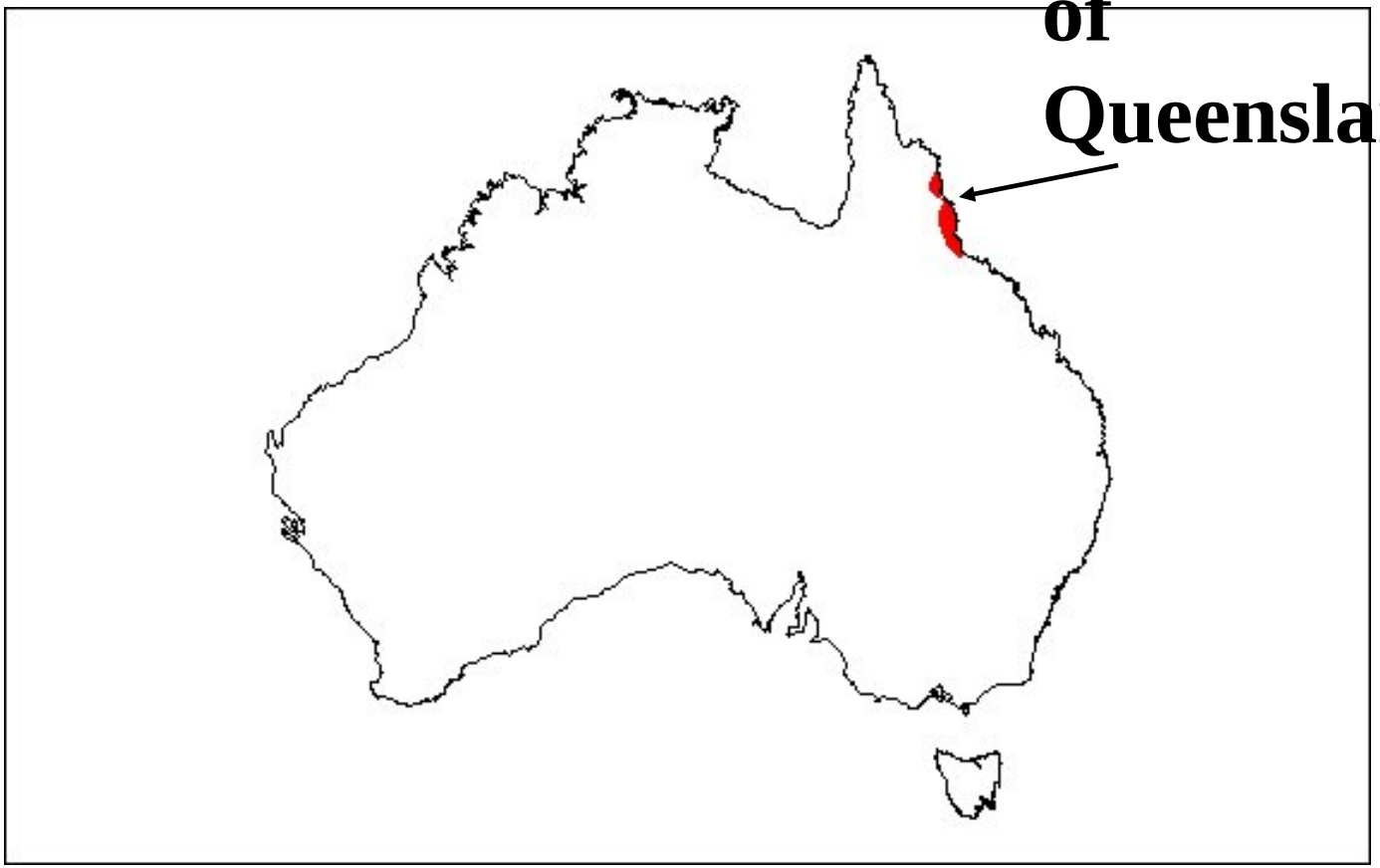
Well, it doesn't feel any hotter to me . . .

MEANWHILE, BACK ON PLANET QUACKO.....

KYOTO PROTOCOL

Wet Tropics of Queensland



NO MARKET FOR BIODIVERSITY

ENDANGERED

SOUTHERN CASSOWARY

MABI FOREST

PINE
PLANTATION

RESTORED
RAINFOREST

QUESTIONS RAISED

Caparrós, A. and Jacquemont, F., 2003. “Conflicts between biodiversity and carbon sequestration programs: economic and legal implications”, *Ecol. Econ.*, 46: 143-157.

HOW MUCH CARBON IN FORESTS?

ALLOMETRICS

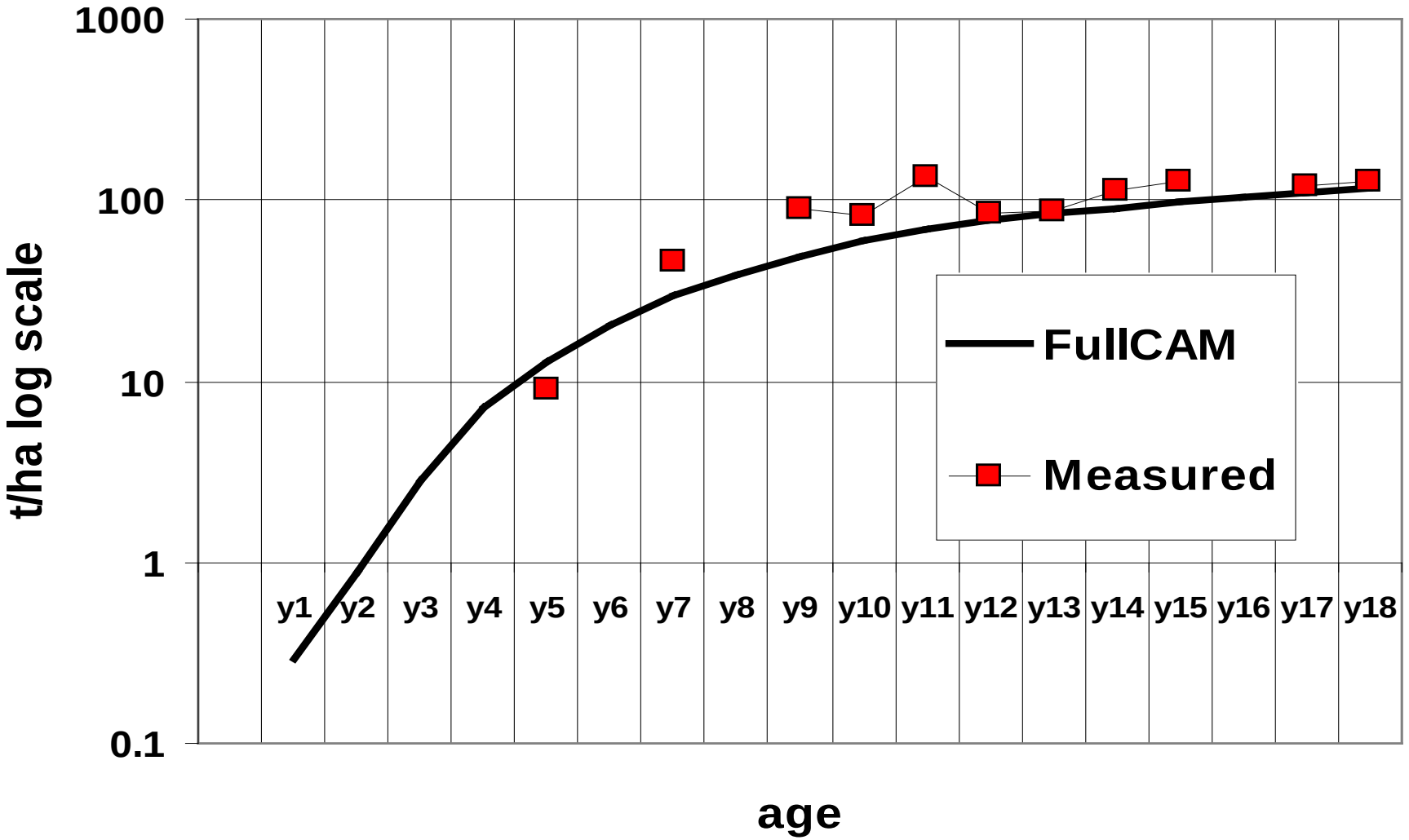
P. Snowdon *et al,* 2000. "Synthesis of allometrics, review of root biomass and design of future woody mass sampling strategies", CSIRO Forestry and Forestry Products and University of Sydney, Technical Report no.17, in *National Carbon Accounting Toolbox*, Australian Greenhouse Office, Canberra: Table 1.4, p.12.

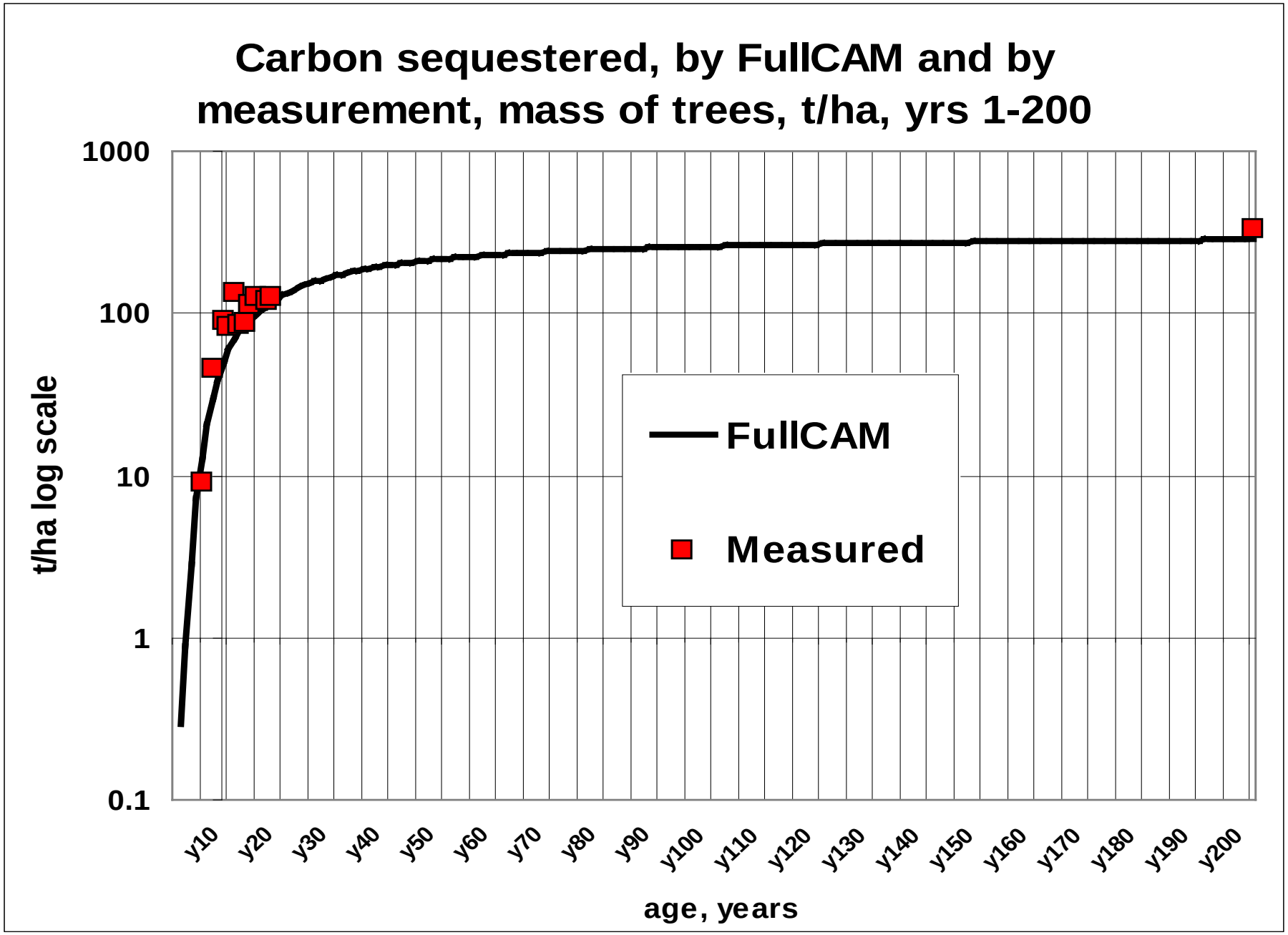
Biomass = constant + slope(lnDBH)

Rainforest:

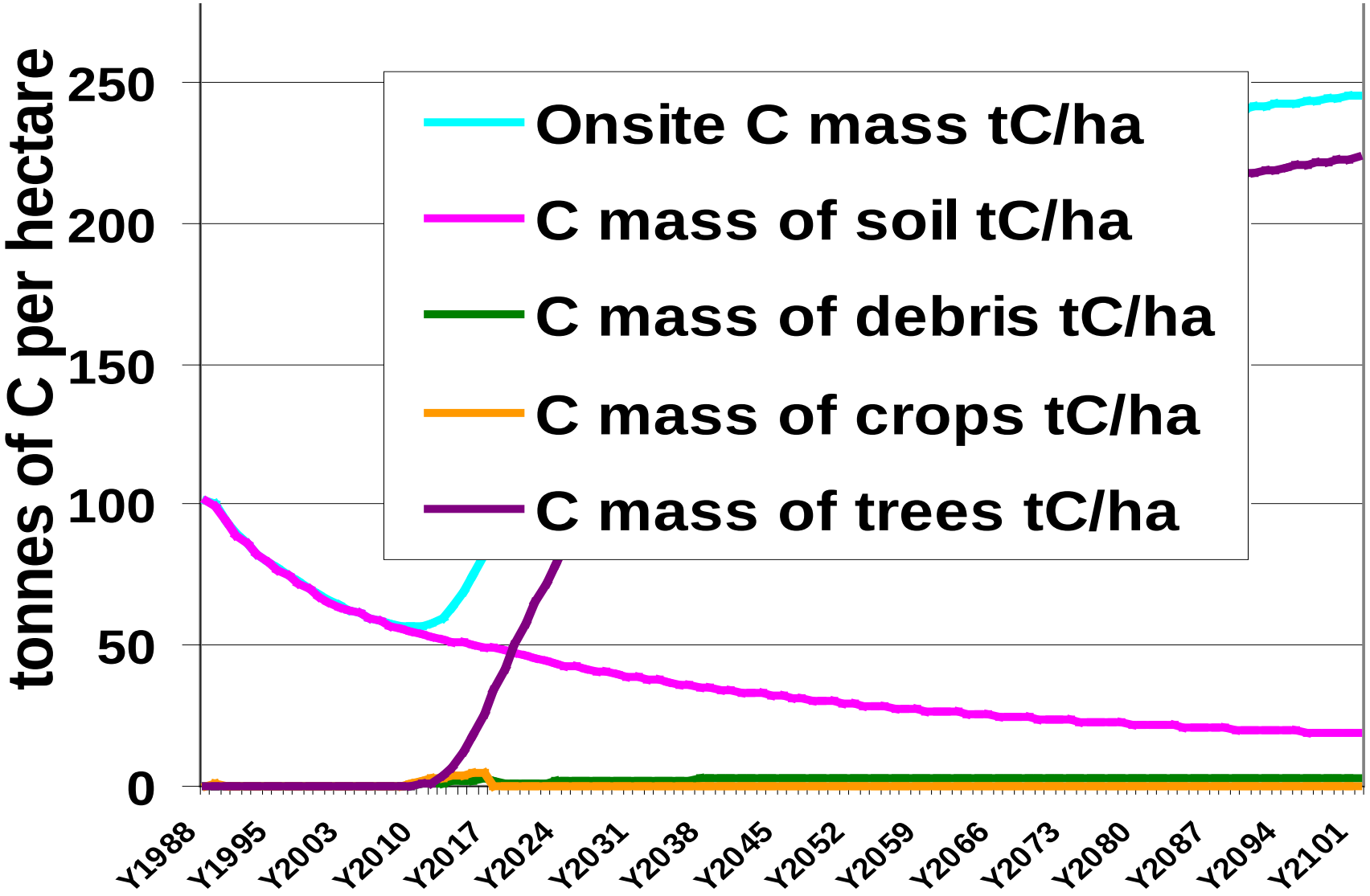
Biomass = -1.8967 + 2.36989(lnDBH)

Carbon sequestered, by FullCAM and by measurement, mass of trees, t/ha, yrs 1-18

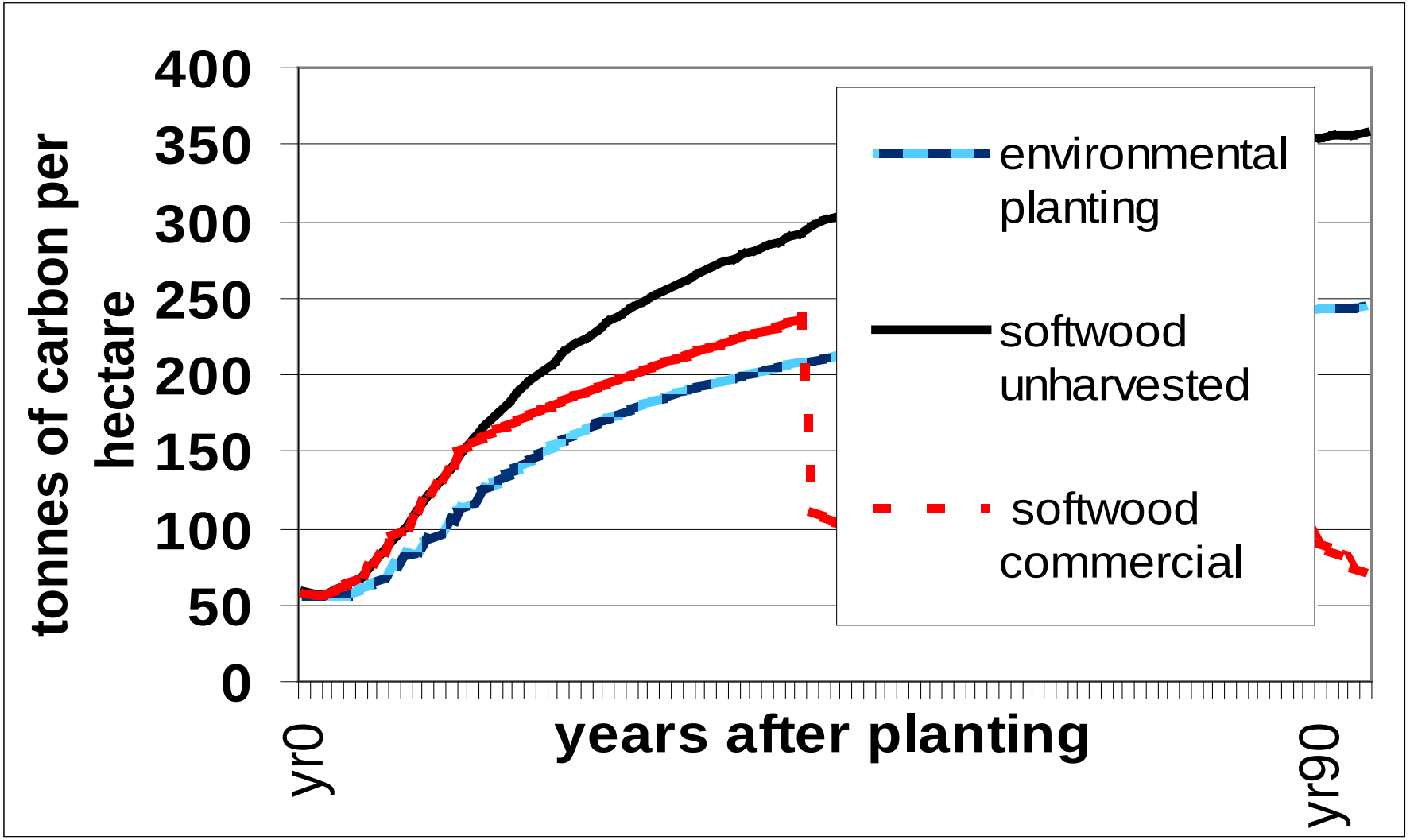



Carbon sequestered, by FullCAM and by measurement, mass of trees, t/ha, yrs 1-200
1000
100
10
1
0.1
t/ha log scale
FullCAM
Measured
y10
y20
y30
y40
y50
y60
y70
y80
y90
y100
y110
y120
y130
y140
y150
y160
y170
y180
y190
y200
age, years

FullCAM FORECAST CARBON IN ENVIRONMENTAL PLANTING



FullCAM FORECAST CARBON ENVIRONMENTAL PLANTING AND MONOCULTURE



COST OF REFORESTATION
$12,000-60,000 PER HA

COST OF PINE PLANTATIONS
$4,000-14,000 PER HA

RESEARCH QUESTIONS

- WILL PAYMENTS FOR CARBON STIMULATE RAINFOREST RESTORATION IN THE WET TROPICS?
- DOES THE WET TROPICS HAVE A COMPARATIVE ADVANTAGE IN CARBON SEQUESTRATION?
- ARE GOALS OF CARBON FOR PROFIT AND FOR REFORESTATION MUTUALLY EXCLUSIVE?

METHODOLOGY

- ESTABLISH COST PER TONNE OF C SEQUESTERED

  - WITH OPPORTUNITY COSTS

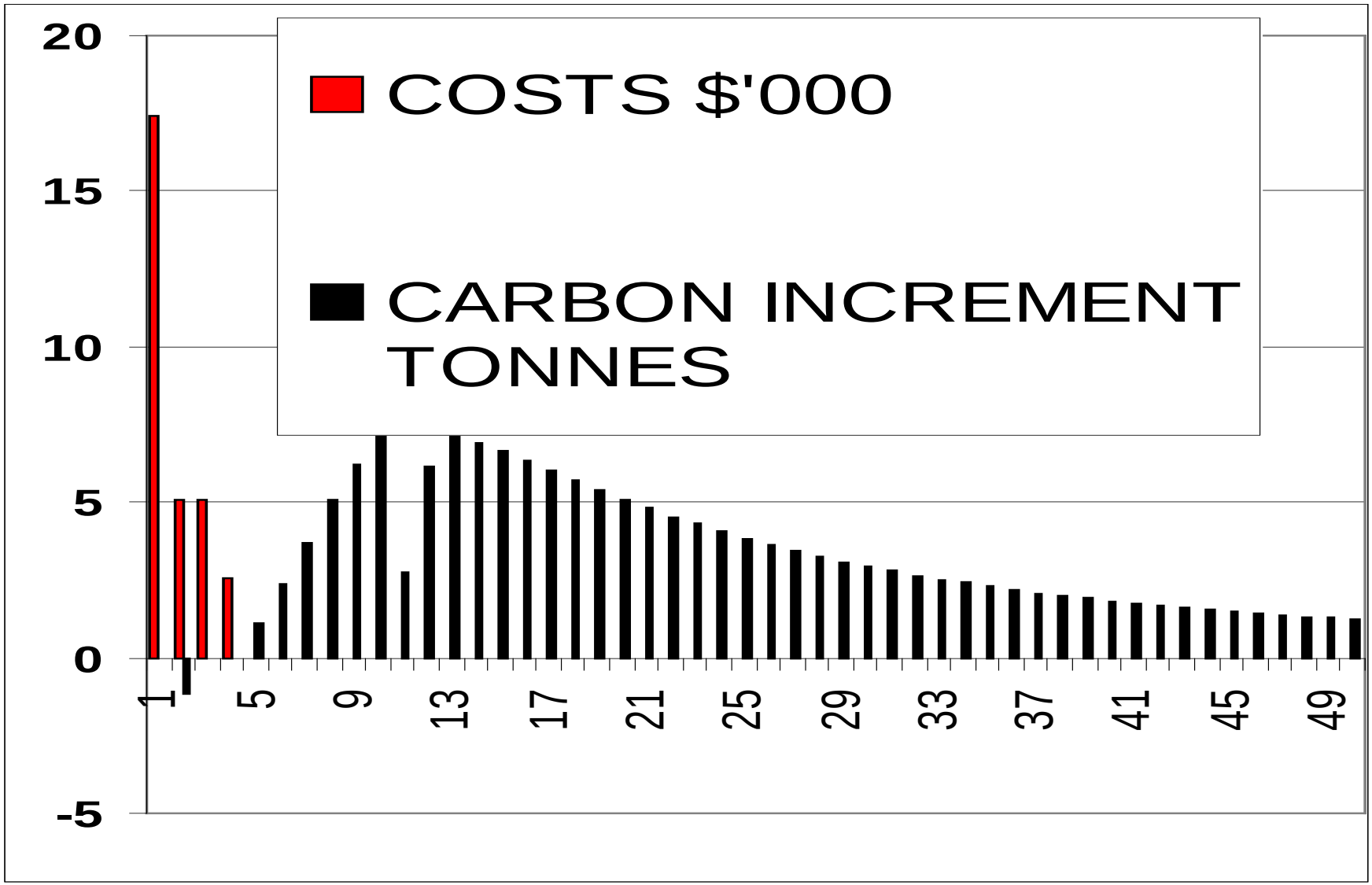
  - WITH DISCOUNTING

OPPORTUNITY COSTS

- CATTLE RAISING
- DAIRYING
- OTHER ENTERPRISES

- ECONOMIC IMPLICATIONS IGNORED IN PREVIOUSE STUDIES

MISMATCH COSTS, CARBON



TIMING COSTS, BENEFITS

Cost per tonne of carbon =

$$\frac{\sum_{i=0}^{n} \frac{\text{cost of sequestration}_i}{(1 + \text{rate of interest})^i}}{\sum_{i=1}^{n} \frac{\text{carbon sequestered}_i}{(1 + \text{rate of interest})^i}}$$

where: *i*=1-*n*

ECONOMIC MODELLING

$$PTCE = \sum_{n=0}^{94} (c_e + l_e + b_e) / (1+r)^n \Big/ \sum_{n=1}^{94} t_e / (1+r)_n$$

Where:

PTCE = present total cost of a tonne of C sequestered in environmental planting, A$

$\sum$ = sum of

e = environmental plantation

c = cash costs per hectare, A$

l = labour cost per hectare, A$

b = beef opportunity cost per hectare, A$

t = C sequestered per hectare, tonnes

r =discount rate

n =number of years after planting

METHOD ENABLES COST COMPARISONS

1. COST/t C SEQUESTERED WITH PRICES FOR CARBON

2. COST/t C IN RESTORATIONS AND PLANTATIONS

DISCOUNT RATE AND P.V. CARBON, t/HA

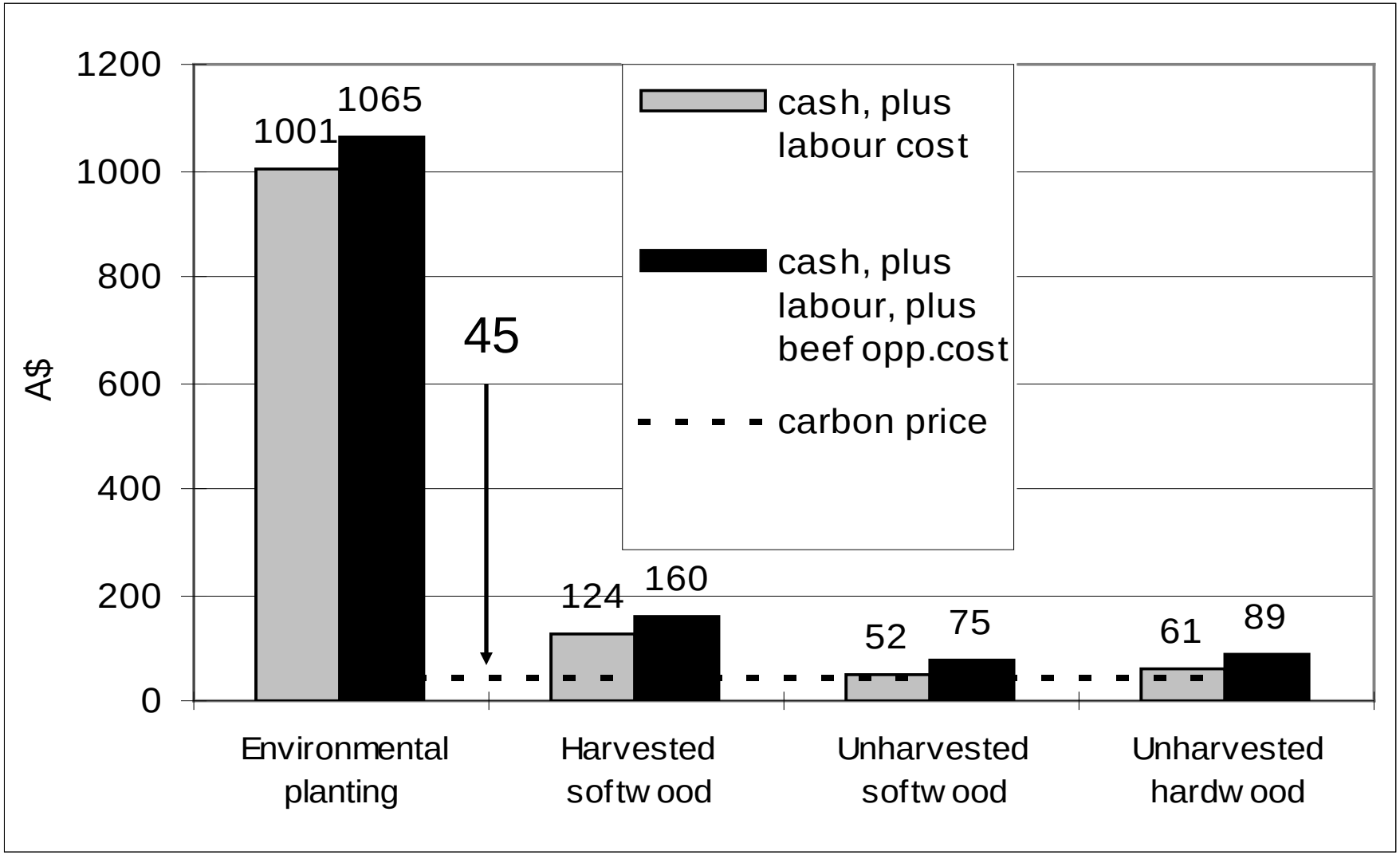
DISCOUNT RATE	r0.01	r0.025	r0.05	r0.1
HARVESTED HOOP	65	82	72	46
ENVIRONMENT P.	144	102	65	32

THE PRICE OF CARBON

TO LANDOWNERS, NSW AND VIC	$31 - $59/t of C
TO VOLUNTARY OFFSETTERS	$34 - $84/t of C

Sources: Carbon Smart, 2007, at www.carbonsmart.com.au, accessed 12 August 2007; Government of Victoria, 2007. *Carbon Tender Stage 2*, Department of Sustainability and Environment, Melbourne; Ribón, L. and Scott, H., 2007. *Carbon offset providers in Australia*, RMIT University, Melbourne.

COST AND PRICE PER TONNE OF CARBON (5%)

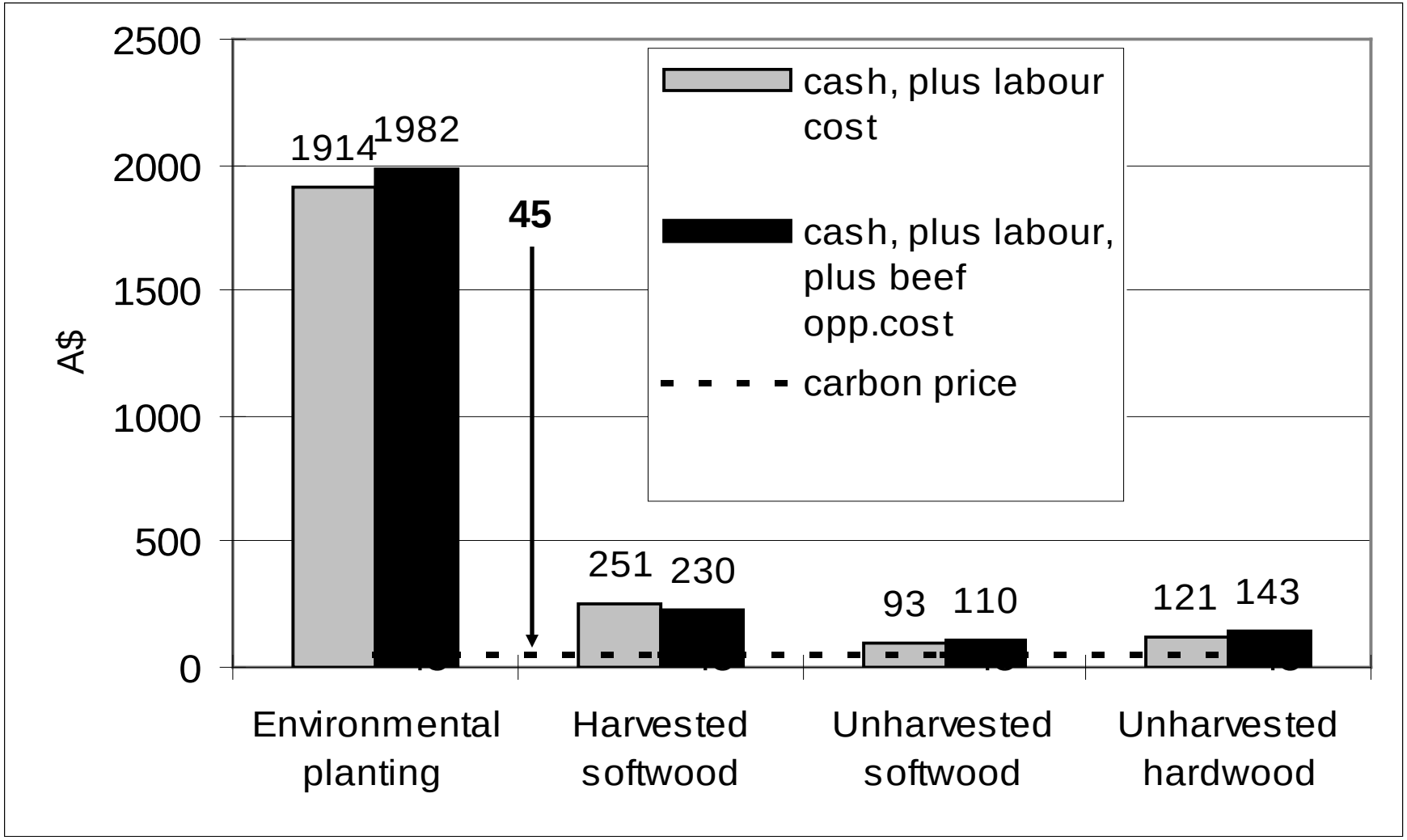


LANDOWNER RESPONSES

VULNERABILITY TO CYCLONES!

DISCOUNT RATE?

COST AND PRICE PER TONNE OF CARBON (10%)



RESPONSE BY GOVERNMENT

GOV BUDGET PROVIDED FOR COSTS OF ESTABLISHING CARBON SINK FOREST TO BE WHOLLY OFFSET AGAINST INCOME

TOP MARGINAL TAX RATE 45%

See slide 20!

RESULTS SUMMARY

1. RAINFOREST RESTORATION COSTS EXCEED CARBON RETURNS AT PRESENT PRICES FOR C

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RESULTS SUMMARY

1. RAINFOREST RESTORATION COSTS EXCEED CARBON RETURNS AT PRESENT PRICES FOR C
2. UNHARVESTED MONOCULTURES POTENTIALLY PROFITABLE, DEPENDING ON RISK AVERSION
3. WET TROPICS HAS NO COMPARATIVE ADVANTAGE IN CARBON SEQUESTRATION

ASYMETRIC INCENTIVES DO NOT RESOLVE MARKET FAILURE

	HOOP PINE	**NATIVE SPECIES**
MARKET CARBON CREDITS	**YES**	**YES**
TAX BENEFIT	**YES**	**YES**
NON-MARKET BIODIVERSITY BENEFITS	**NO**	**YES**
MARKET BIODIVERSITY CREDITS	**NO**	**NO**

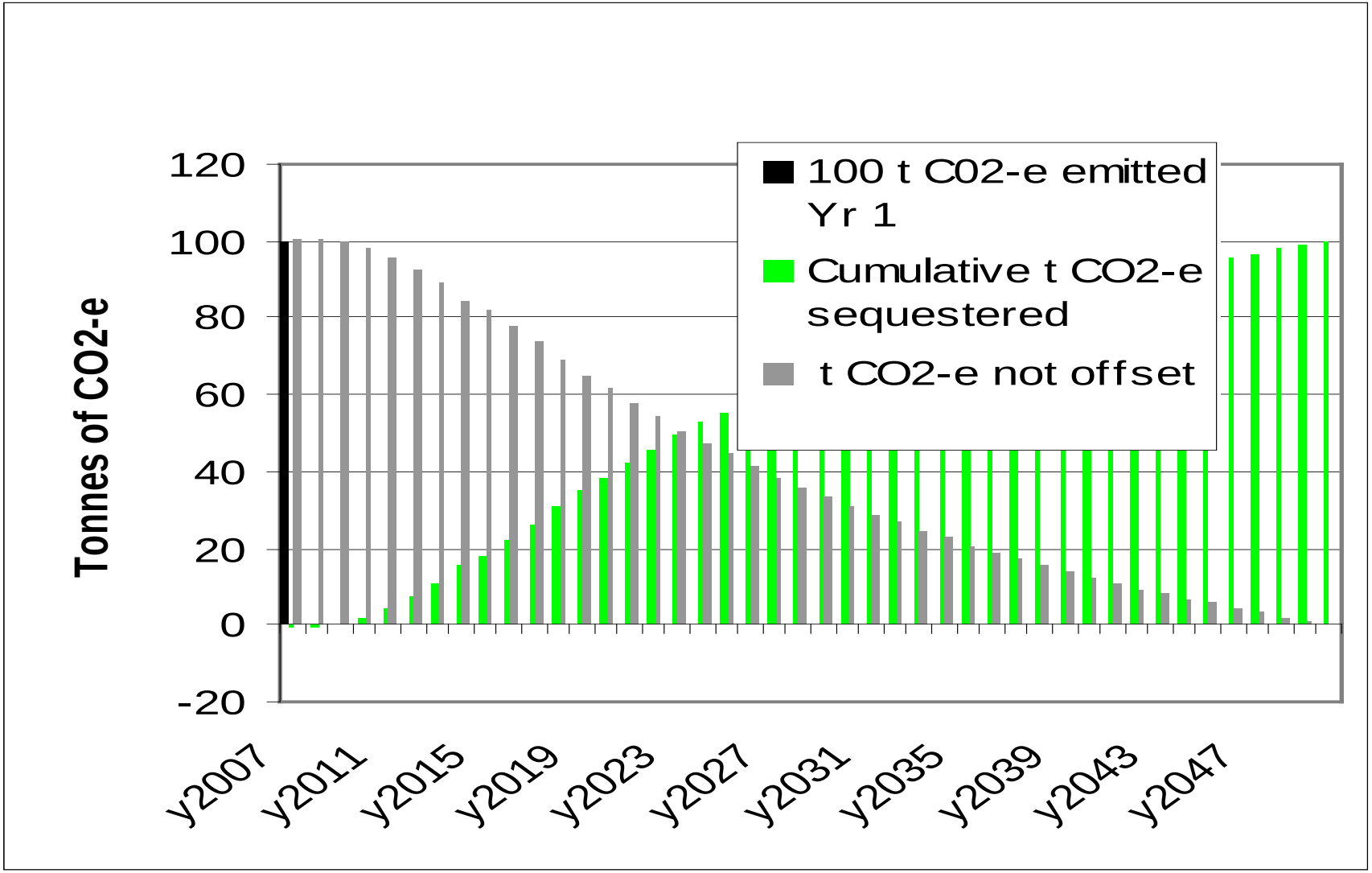
CONCLUSION

WET TROPICS COMPARATIVE ADVANTAGE IS IN BIODIVERSITY GAINS FROM REFORESTATION, RATHER THAN IN CARBON SEQUESTRATION

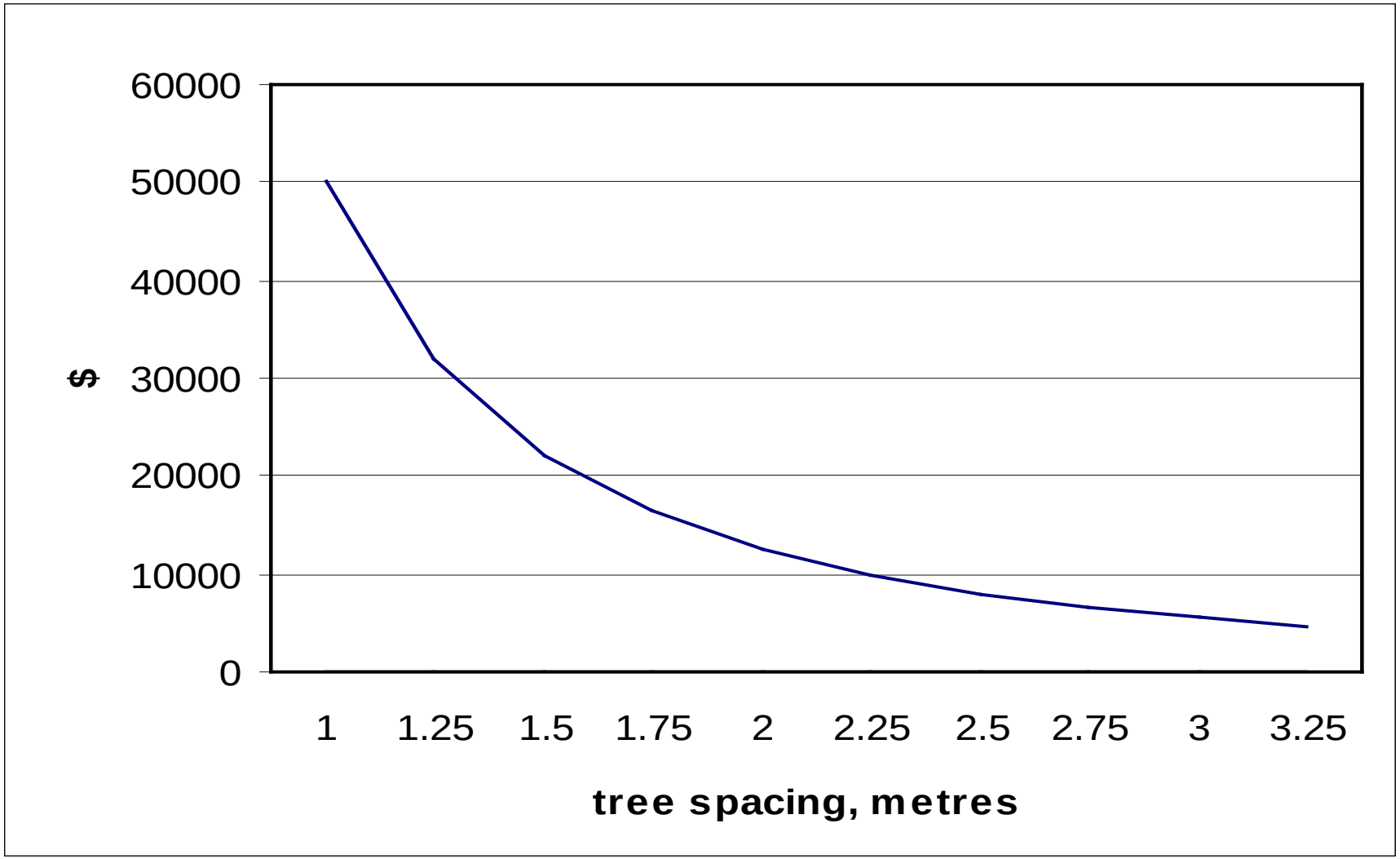
RECOMMENDATION

MARKET WET TROPICS CARBON OFFSET PACKAGES, WITH BIODIVERITY BENEFITS, IN AUSTRALIA AND INTERNATIONALLY

OFFSET OF 100 TONNES OF CO_2-e, EMITTED IN 2007, BY 2050



TREE SPACING AND COST OF TREES/Ha



TREE SPACING AND COST OF MAINTENANCE (5%)

LEAST-COST TREE SPACING