

---

# Carbon Forestry Workshop

---

## Introduction

---

# Purpose of this workshop

- Cover opportunities to participate in the ETS (forestry) and related climate change programmes with
  - Existing post-1989 forests
  - New forests
    - Land already owned
    - Land to be purchased or rented

---

# Focus for this workshop

- Provide potential participants (and their advisors) with
  - Information about the ETS (& AGS & PFSI)
  - Factors they should consider in deciding
    - Whether they should participate
    - How they should participate
- Advice given is general – should seek specific advice before making decision

---

# Programme for the day

- 9.00 Introduction
- 10.00 Morning tea
- 10.30 NZ carbon markets
- 11.15 Species, sites & silviculture
- 12.00 Lunch
- 12.40 Scenarios
- 1.30 Managing risk
- 2.10 Questions & Summary
  
- 2.30 MAF – Process

---

# Session 1: Introduction

- Introduction to the available schemes
- ETS - Opportunities & risks
- Lookup table vs measurement
- Framework for decision-making

---

What are the  
available schemes?

---

## There are 3 schemes

- Afforestation Grants Scheme (AGS)
- Permanent Forest Sink Initiative (PFSI)
- Emissions Trading Scheme (ETS)

---

# Afforestation Grant Scheme (AGS)

- Contestable fund to encourage the establishment of new forests
- Minimum area of 5 ha
- Priority given to afforestation proposals that also
  - Have environmental benefits
    - Reduce the risk of soil erosion
    - Improve water quality
    - Improve indigenous biodiversity
  - Have least risk and cost to the Crown

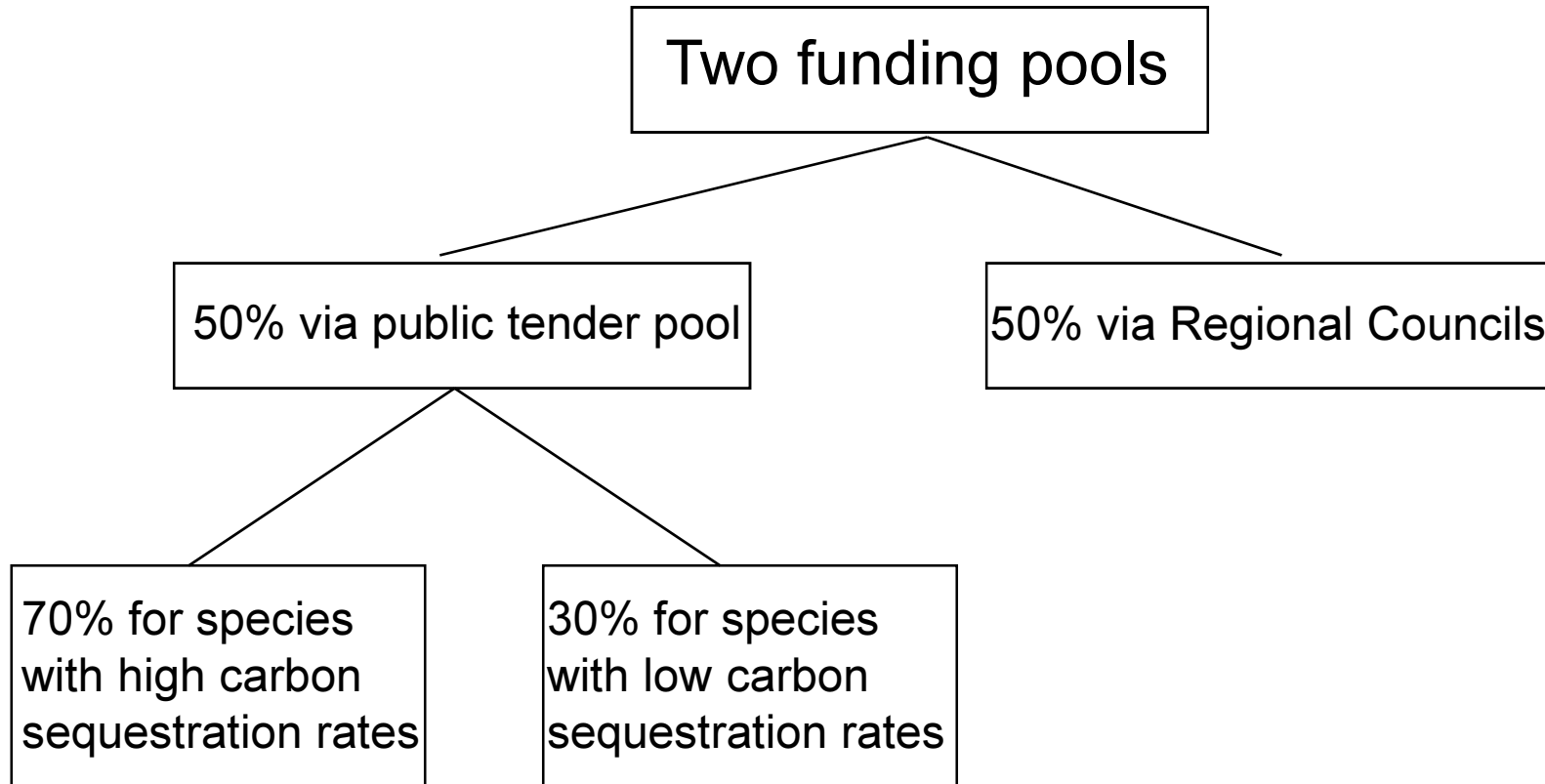
---

# Afforestation Grant Scheme (AGS)

- Applicants can tender for a Government grant for the planting of new forests
- Grantee
  - Must establish forest to a minimum establishment standard
  - Maintains forest
  - Owns the forest
- Crown
  - Retains units for carbon on these forests for first 10 years
  - Responsible for any carbon liabilities

---

# Afforestation Grant Scheme (AGS)



---

# Afforestation Grant Scheme (AGS)

Date	Grants	Area	\$/ha
Apr 2008	9	447	1829
Oct 2008	26	1429	2029 (fast C) 625 (slow C)
Apr 2009	42	2688	1789 (fast C) 650 (slow C)

---

# Afforestation Grant Scheme (AGS)

- Contestable
- Low risk
- Retain carbon ownership after age 10
  - Potential to opt into ETS or PFSI

---

# Permanent Forest Sink Initiative (PFSI)

- Promotes the establishment of permanent forests on land unforested as at 31 December 1989
- Land owners receive carbon units for carbon sequestered.
- Forest must be “direct human induced ..... through planting, seeding and/or the human-induced promotion of natural seed sources”

---

# Permanent Forest Sink Initiative (PFSI)

- Limited harvesting is allowed
- Covenant registered against land title for a minimum of 50 years
- Carbon stocks determined in same way as ETS

---

# Permanent Forest Sink Initiative (PFSI)

- Main differences from ETS
  - ❑ Covenanted process
  - ❑ Harvesting restrictions
  - ❑ Participants automatically get units that can be internationally traded (AAUs)
  - ❑ Units are associated with a permanent forest
  
- Later we look at a PFSI example
  - ❑ Native forest regeneration

---

# Emissions Trading Scheme (ETS)

- Participants have full rights to carbon
  - Benefits
  - Liabilities
  
- Concerned with change in carbon stocks
  - Can claim units for any increase in carbon stocks
  - Must surrender units for any decrease in carbon stocks.  
For example, to cover emissions associated with
    - Harvesting
    - Catastrophic loss

---

Start with an example

---

# Clearwood regime

- Plant 800 stems/ha
- Prune to 5.5 m in 2 lifts
- Thin at height 12 m to 250 stems/ha
  
- Plant in 2008

---

# Assumed site

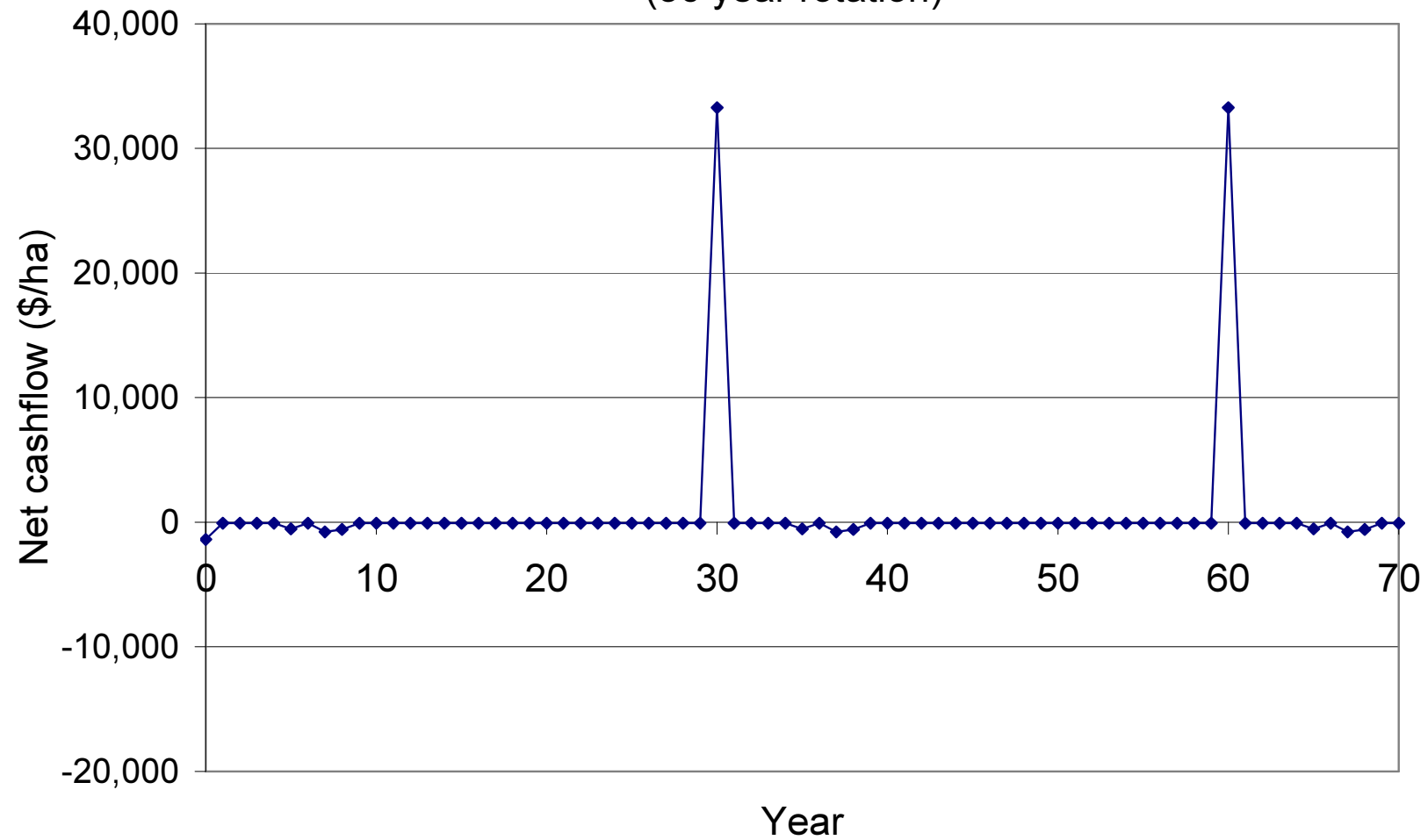
- Medium = average NZ ex-farm site
  - 300 Index = 29.0 m<sup>3</sup>/ha/year
  - Site index = 30.2 m

---

What if we consider  
growing for logs only ?

# Forestry cashflows

Forestry net cashflows  
(30 year rotation)



---

How do we bring  
cashflows in different years  
to a common basis?

---

# Discounted cashflow analysis

- Bring all future cashflows back to a “Present Value” by discounting using a discount (or interest) rate
- Net Present Value (NPV) is the sum of these discounted values
- We use NPV as our financial criterion

---

# LEV is a special case of NPV

- Land Expectation Value (\$/ha)
- Discounted value of future revenues and costs:
  - The land currently bare of trees
  - Forestry on the land in perpetuity
  - No cost included for land rental
- The maximum that can be paid for land to achieve a given rate of return from forestry.

---

# LEV is not Land Market Value

- More a measure of forest profitability
- But it is an indicator of land affordability
- We use it here as a ranking tool
  - We assume a real (net of inflation) rate of return of 8%

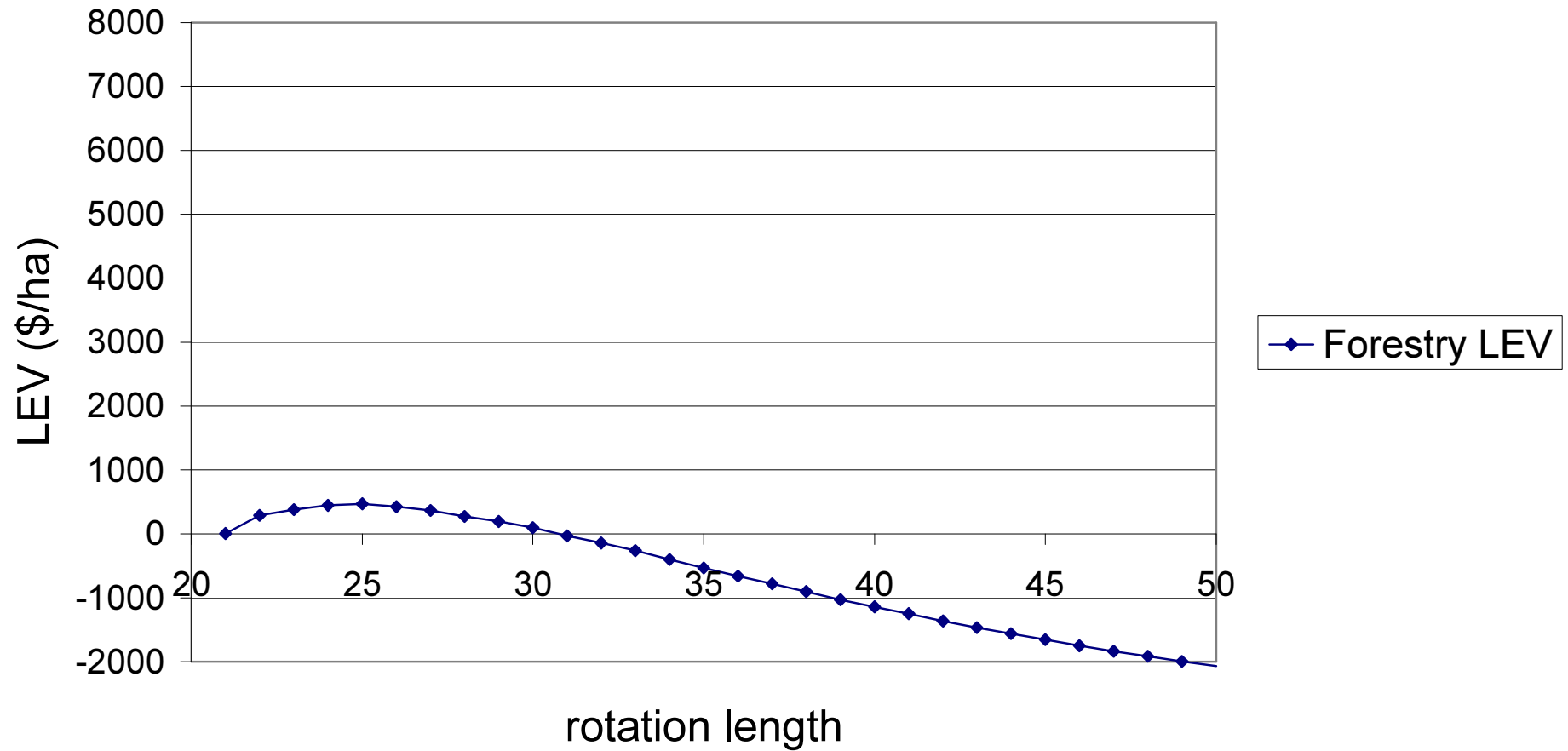
---

## Example– What is the LEV of agriculture?

- National average sheep & beef farm (705 ha)
- Economic farm surplus
  - Farm surplus \$38 896
  - Per hectare \$55
  - Per stock unit \$8.68
- LEV of agriculture
  - \$1303/ha if require 8% rate of return
  - \$2606/ha if require 4% rate of return

# Forestry LEV – logs only

Radiata pine clearwood regime  
(2008 planting)

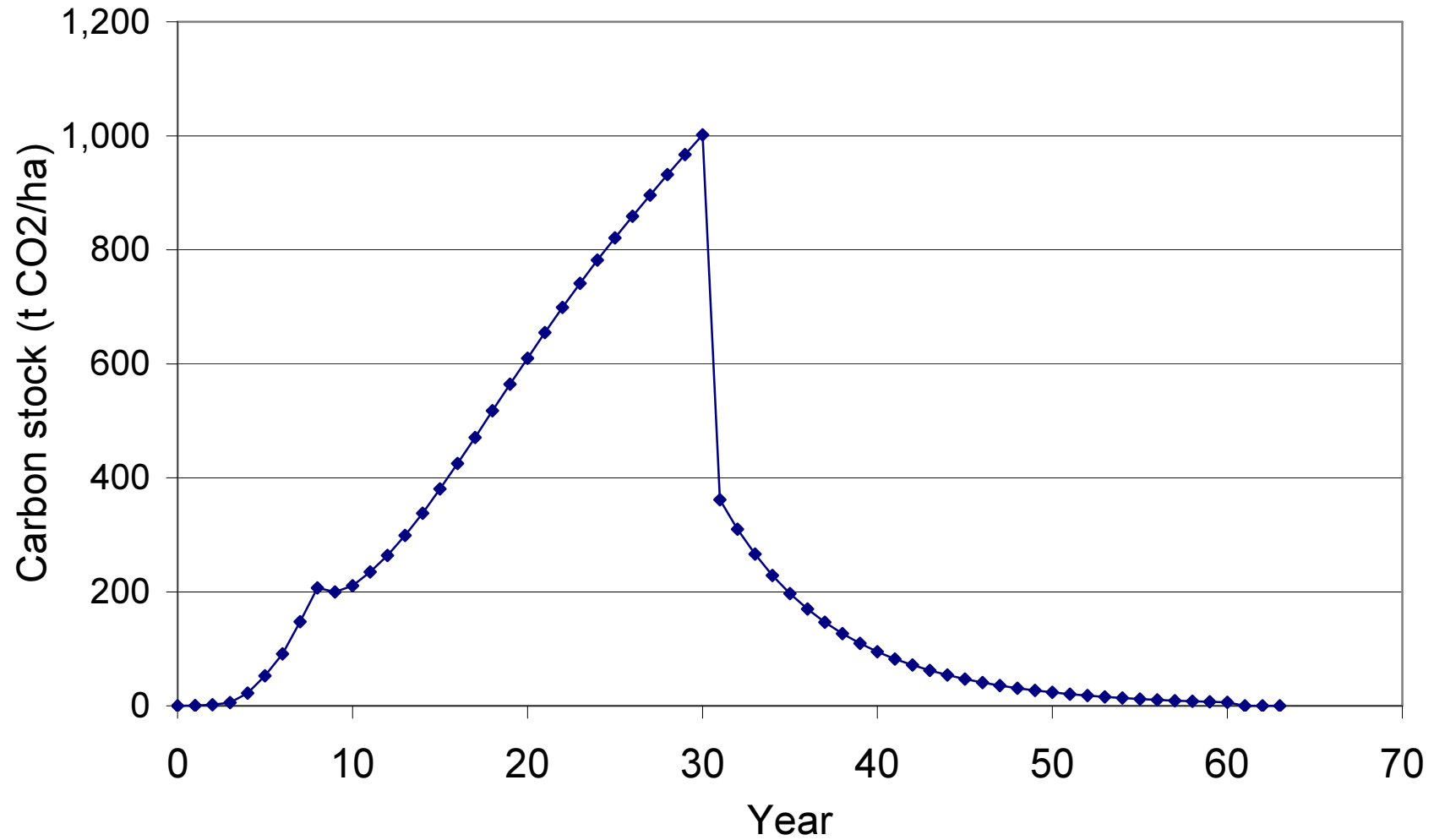


---

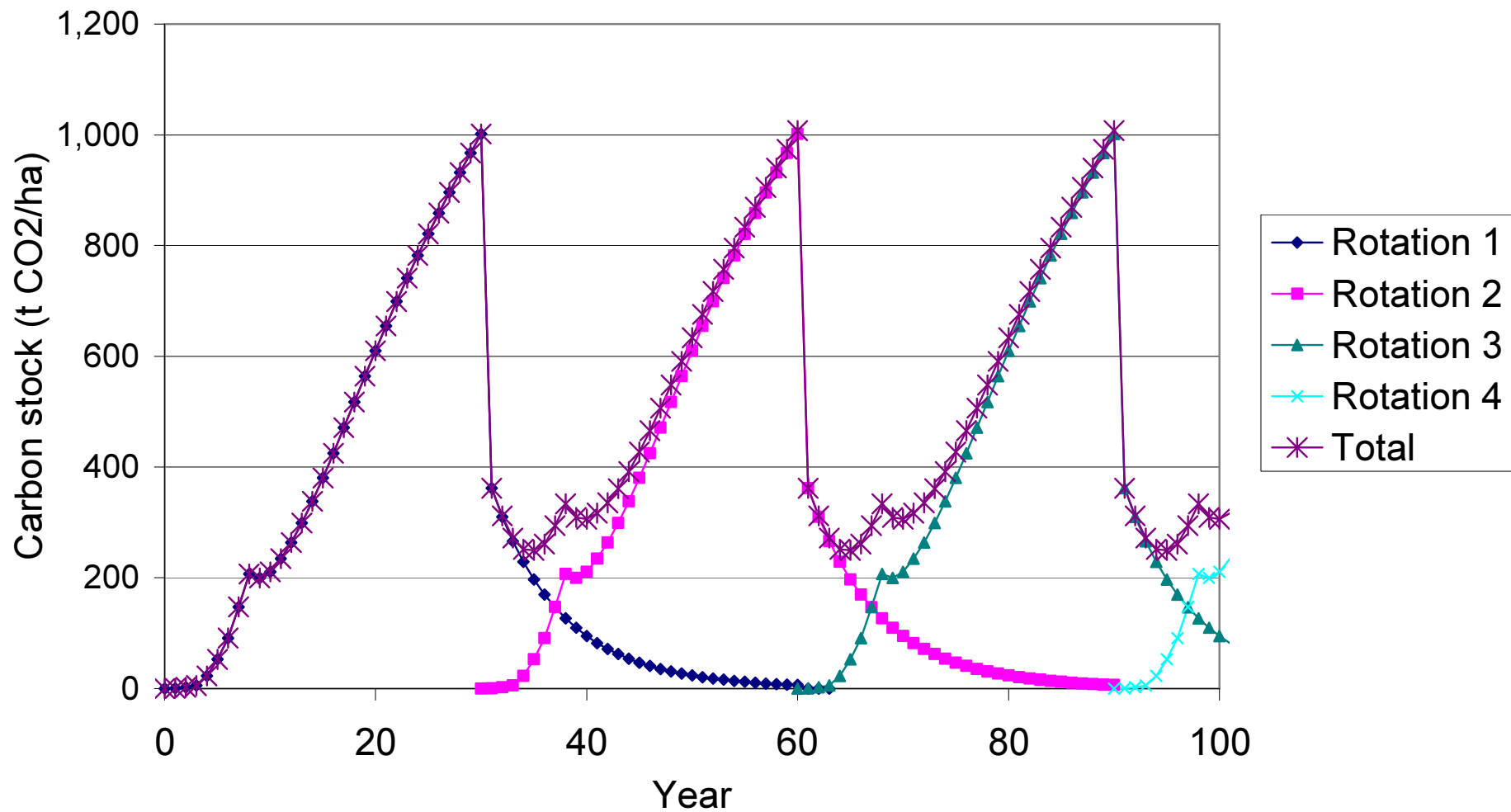
What if we consider  
growing for logs  
and carbon ?

(Assume that participate in ETS  
and sell units annually)

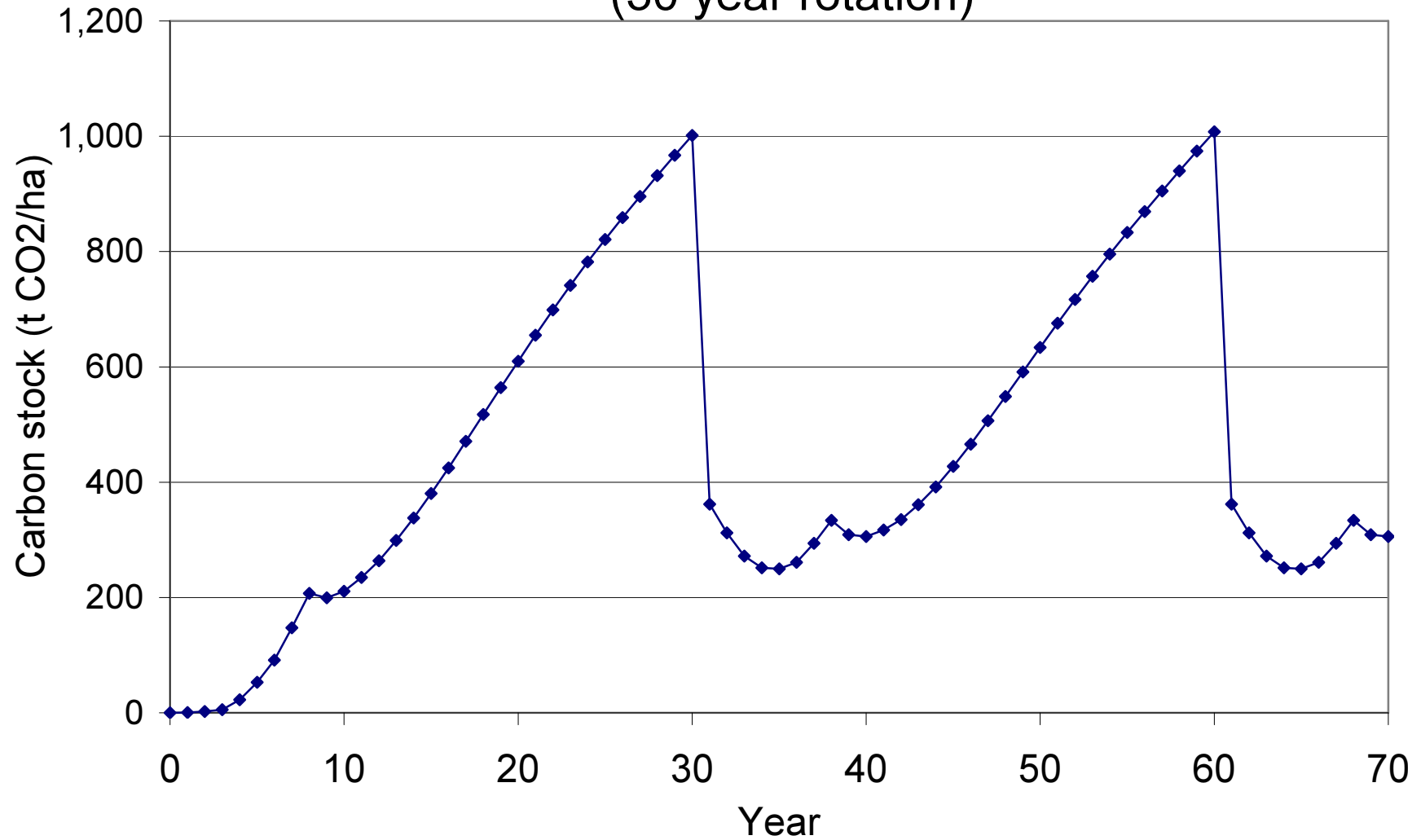
## Carbon stocks for first rotation of radiata pine clearwood regime



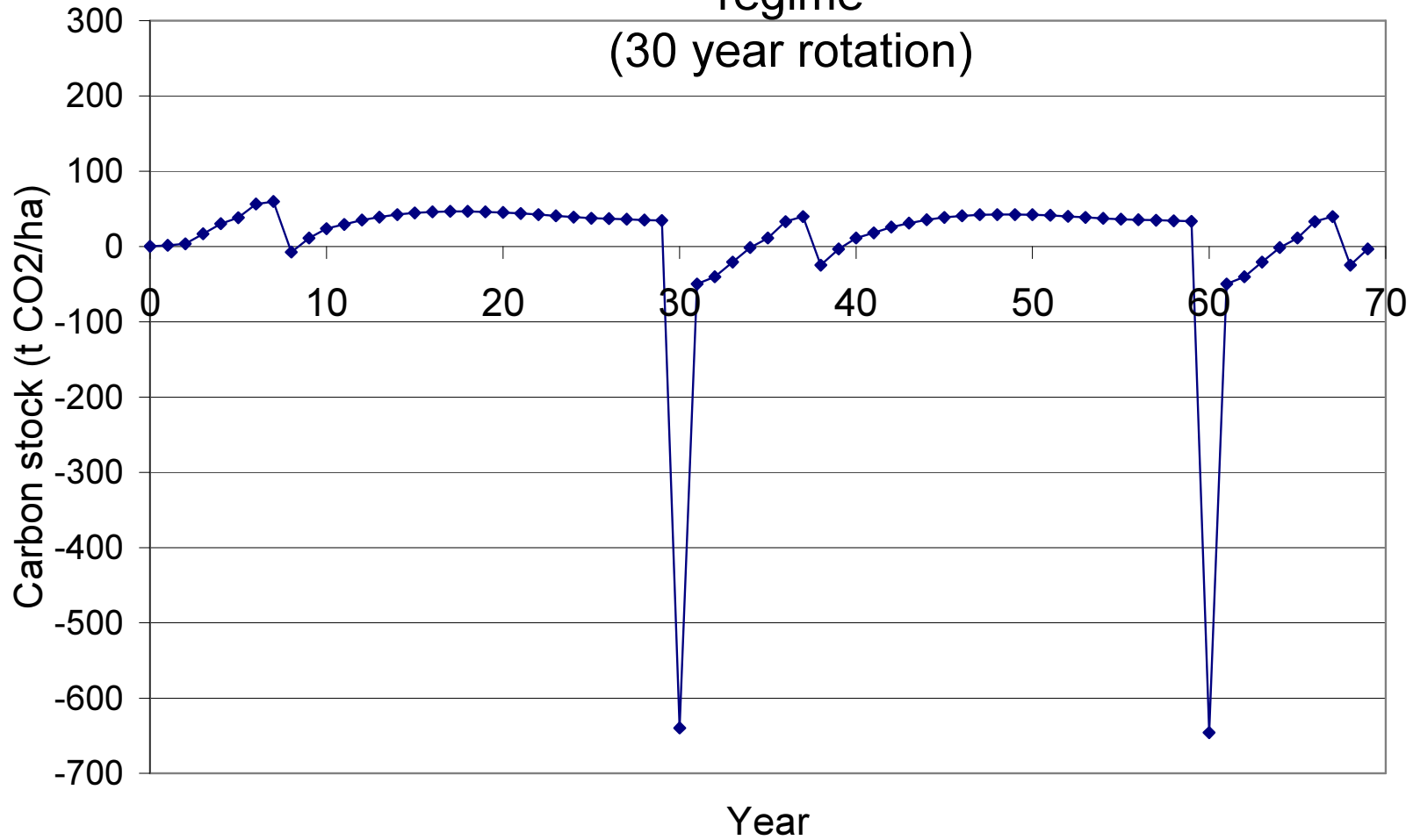
## Carbon stocks for radiata pine clearwood regime



## Carbon stocks for radiata pine clearwood regime (30 year rotation)

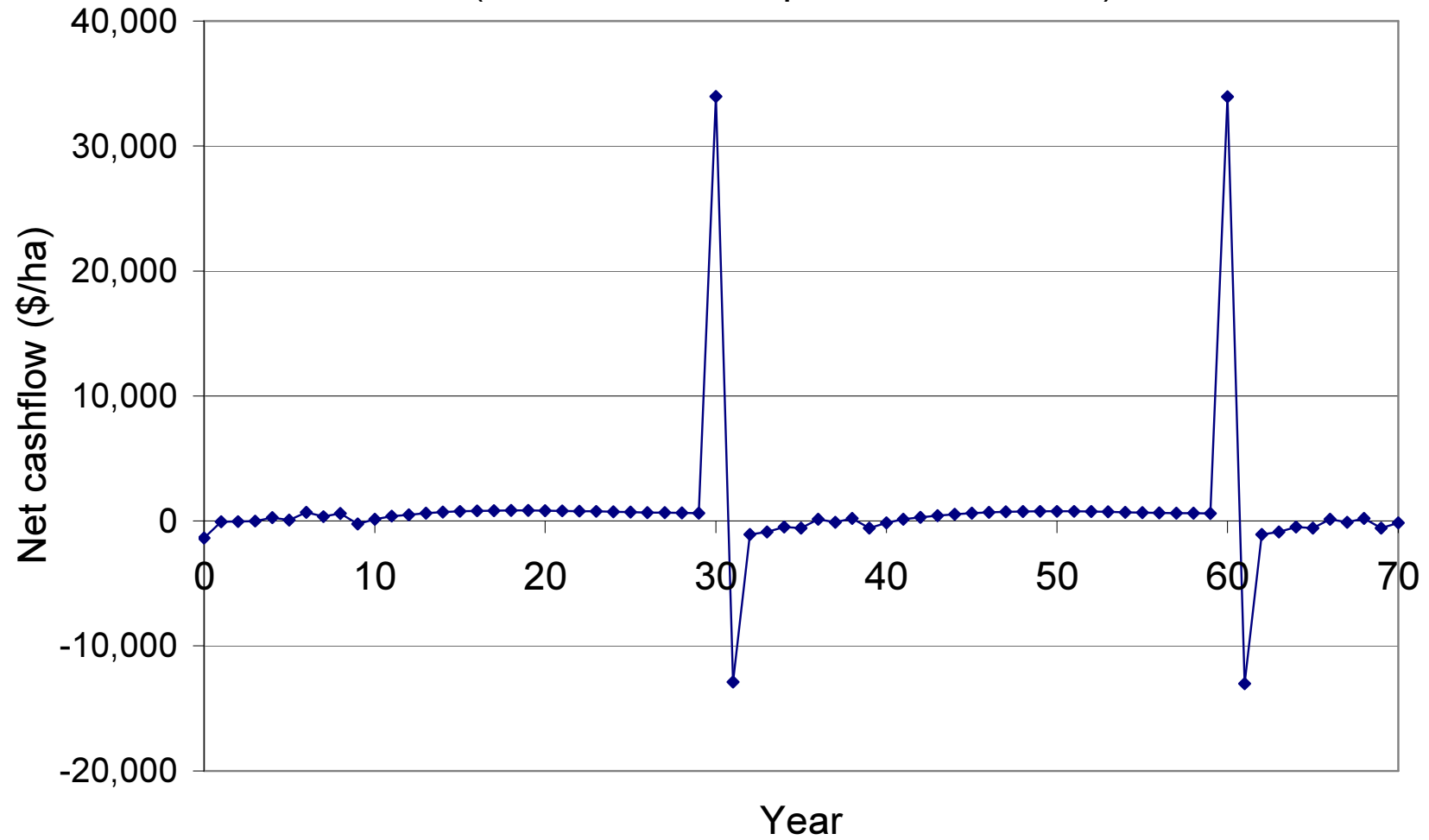


Change in carbon stocks for radiata pine clearwood regime  
(30 year rotation)



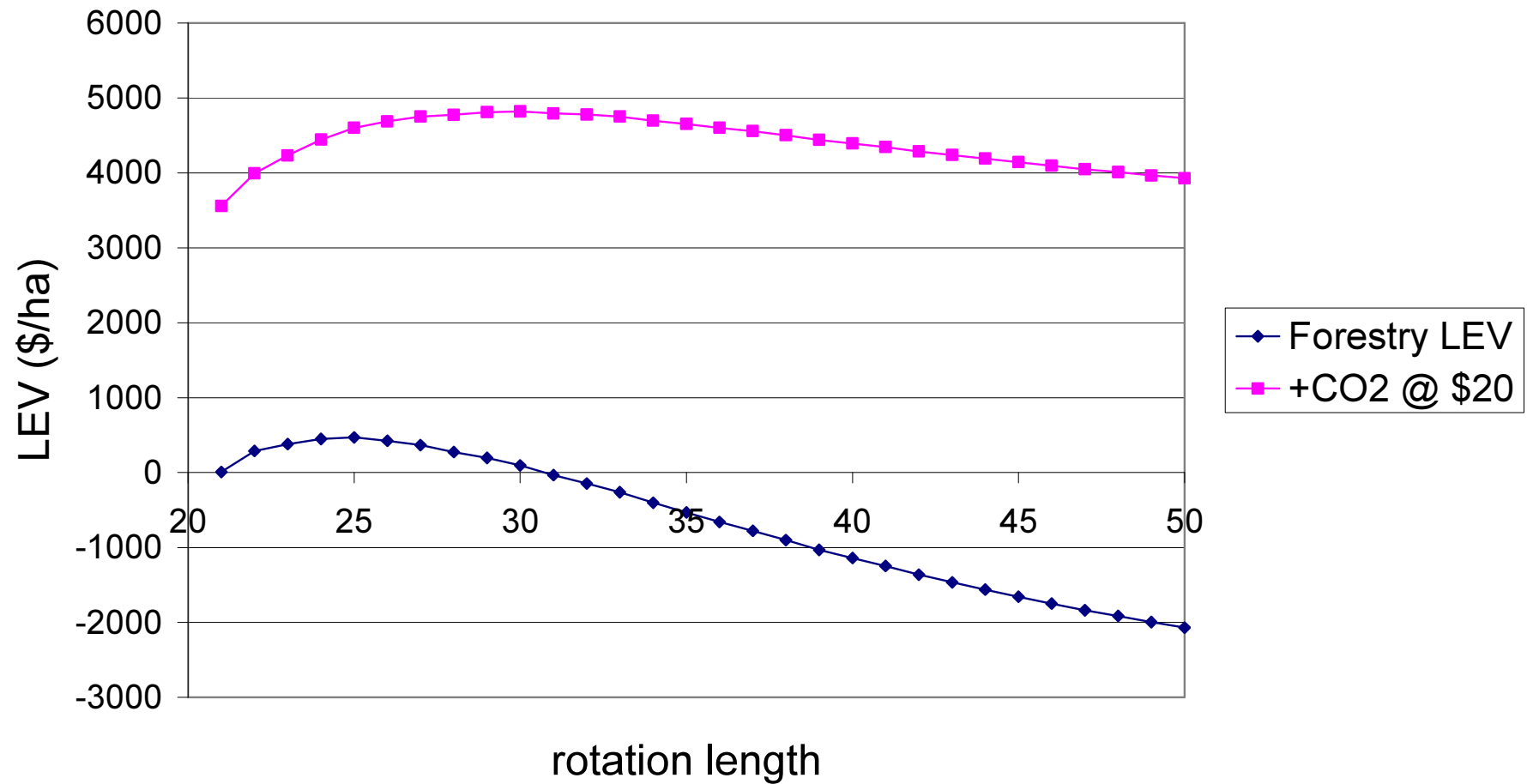
14

## Forestry + Carbon net cashflows (Constant carbon price of \$20/t CO<sub>2</sub>)



# LEV: logs + carbon

Radiata pine clearwood regime



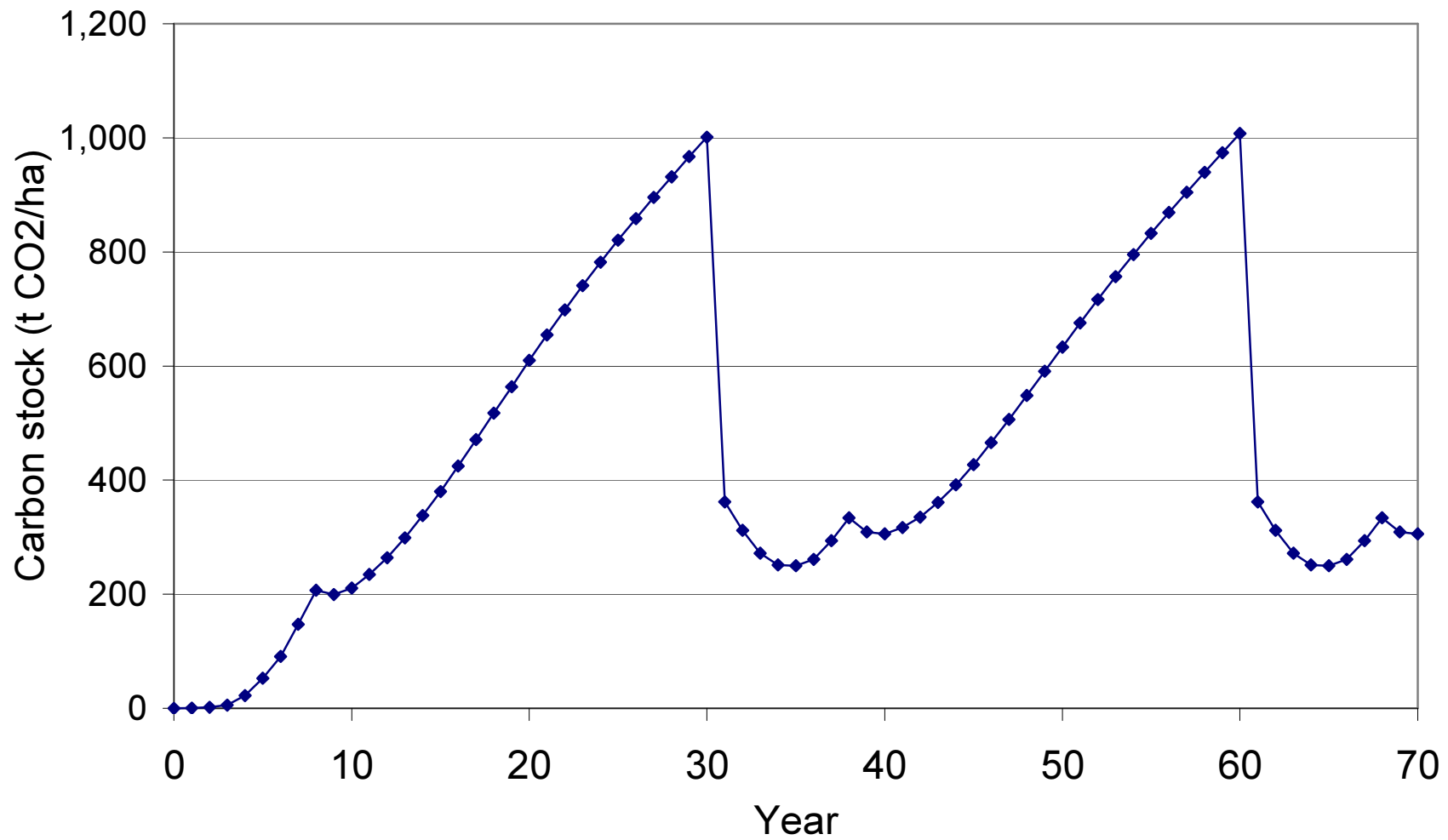
---

# Benefits arise from carbon trading

- Time value of money
  - Get units during the rotation – cashflow every year
  - Surrender units when harvest
- Don't have to surrender all units (for new planting or very young stands)
  - Leaving some carbon on site after harvesting
  - Decays gradually

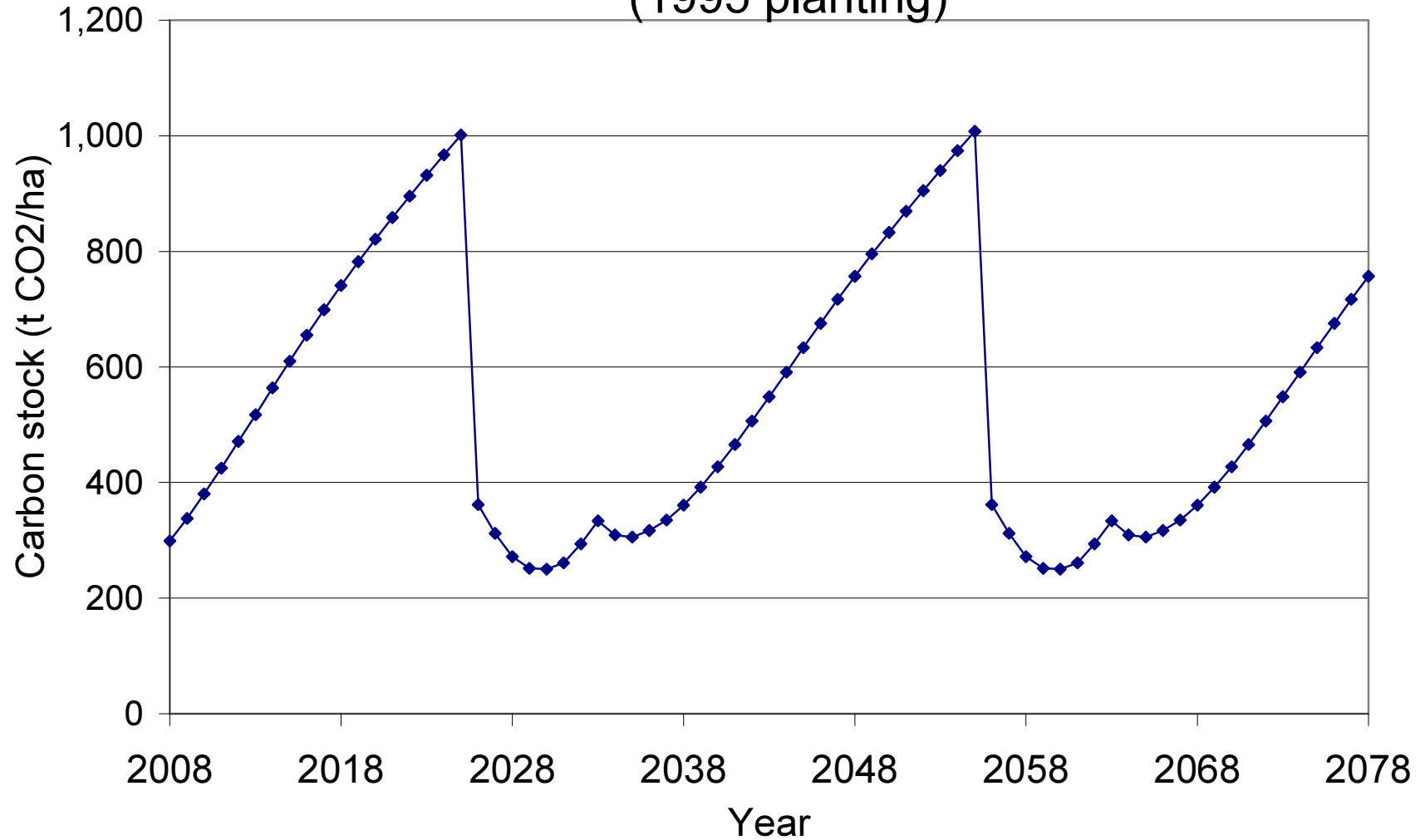
# Plant in 2008

## Carbon stocks



# Plant in 1995

Carbon stocks  
(1995 planting)



---

## 1995 planting (rotation age 30 years)

- As at 2008 carbon stock = 299 t CO<sub>2</sub>/ha
- Can claim units up until 1002 t CO<sub>2</sub>/ha
  - Receive 703 units
- After harvest carbon stocks fall to a minimum of 250 t CO<sub>2</sub>/ha
  - Reduction of 752 t CO<sub>2</sub>/ha
  - Only required to surrender 703 units
- Have to surrender all units received

---

# Participation in ETS

- Positives
  - Potential early revenues
- Negatives
  - Surrender units when carbon stocks decrease
    - At time of harvest
    - After loss from wind or fire or pests & disease or ?
  - Costs of participating

---

# Participation in ETS

## ■ Costs

- Registration           \$550
- Emissions return      \$100 per return
  
- Consultants
- Transaction costs
  - Broker fees

---

# Participation in ETS

- Potential to increase forest profitability
  - Impact depends on future carbon prices
- But there is risk

---

# Participation in ETS

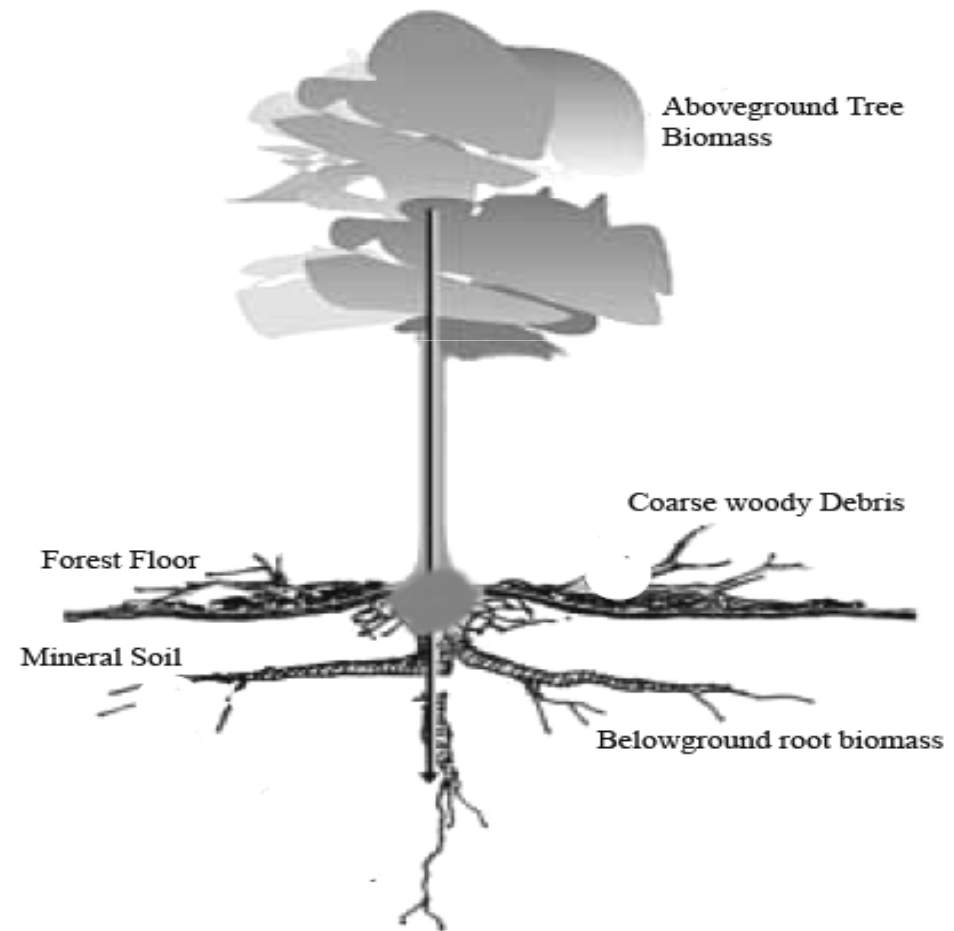
- Key risk is cashflow risk:  
The ability to pay for units needed
  - at the time of harvest
  - if have catastrophic loss (wind or fire or pests & disease or ?)
- There are ways to help manage this risk
  - But with a reduction in profitability

---

# Look-up table vs measurement

# Carbon pools to be estimated

- Five pools
  - ❑ Aboveground biomass
  - ❑ Belowground biomass
  - ❑ Dead wood (CWD)
  - ❑ Litter
  - ❑ (*Soil organic matter*)



---

# Change in carbon stocks

- Two options
  - Measurement (protocol to be developed)
  - Look-up table
    - An option if have less than 50 ha



# Field Measurement Approach



MAF's current expectation

but implementation remains subject to

- final political approval
- fiscal constraints



# Field Measurement Approach



## Key Elements of Likely Approach

- Plot-based sampling approach – mandatory above a threshold area (50 ha?)
- Number of sample plots set by total forest area (with minimum and maximum number)
- Essentially standard forest inventory: tree DBHs, heights, species and silvicultural history
- Also needs silvicultural intentions for the rotation, and may require notice of harvesting
- Sample plot data submitted to MAF for calculation of personalised look-up tables



# Field Measurement Approach



## Expected Timelines

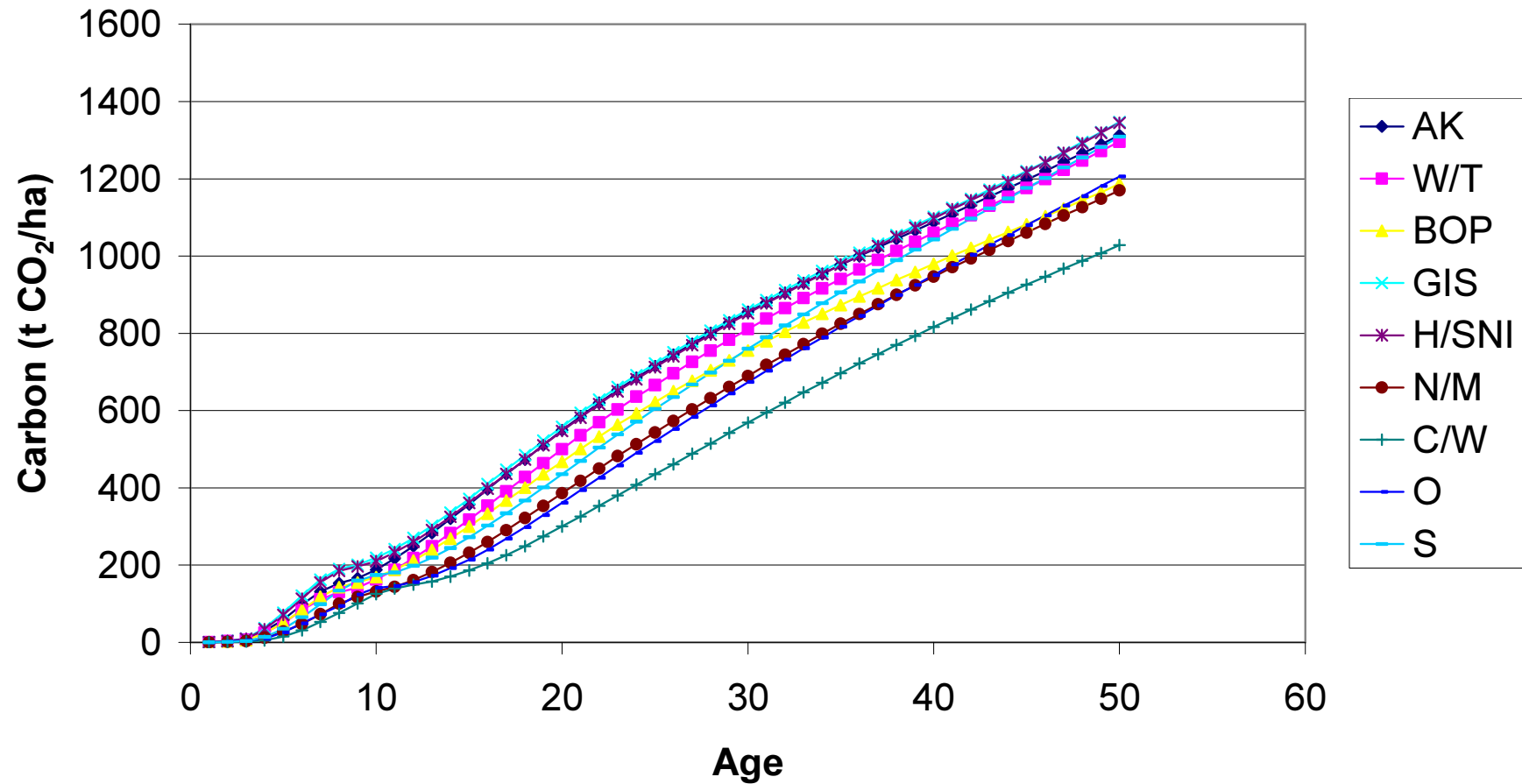
- Consultation: August/September 2010
- Apply for sample plots: May/June 2011
- Open for data processing: maybe late 2011, but more likely 2012

---

# Look-up table vs measurement

- So far have been assuming that have adopted measurement option
- Used a model (Radiata Pine Calculator) to try and mimic the measurement option
  - Caveat: MAF carbon calculation procedures may be different
  
- What if we use a look-up table?

## Look-up tables for carbon stock

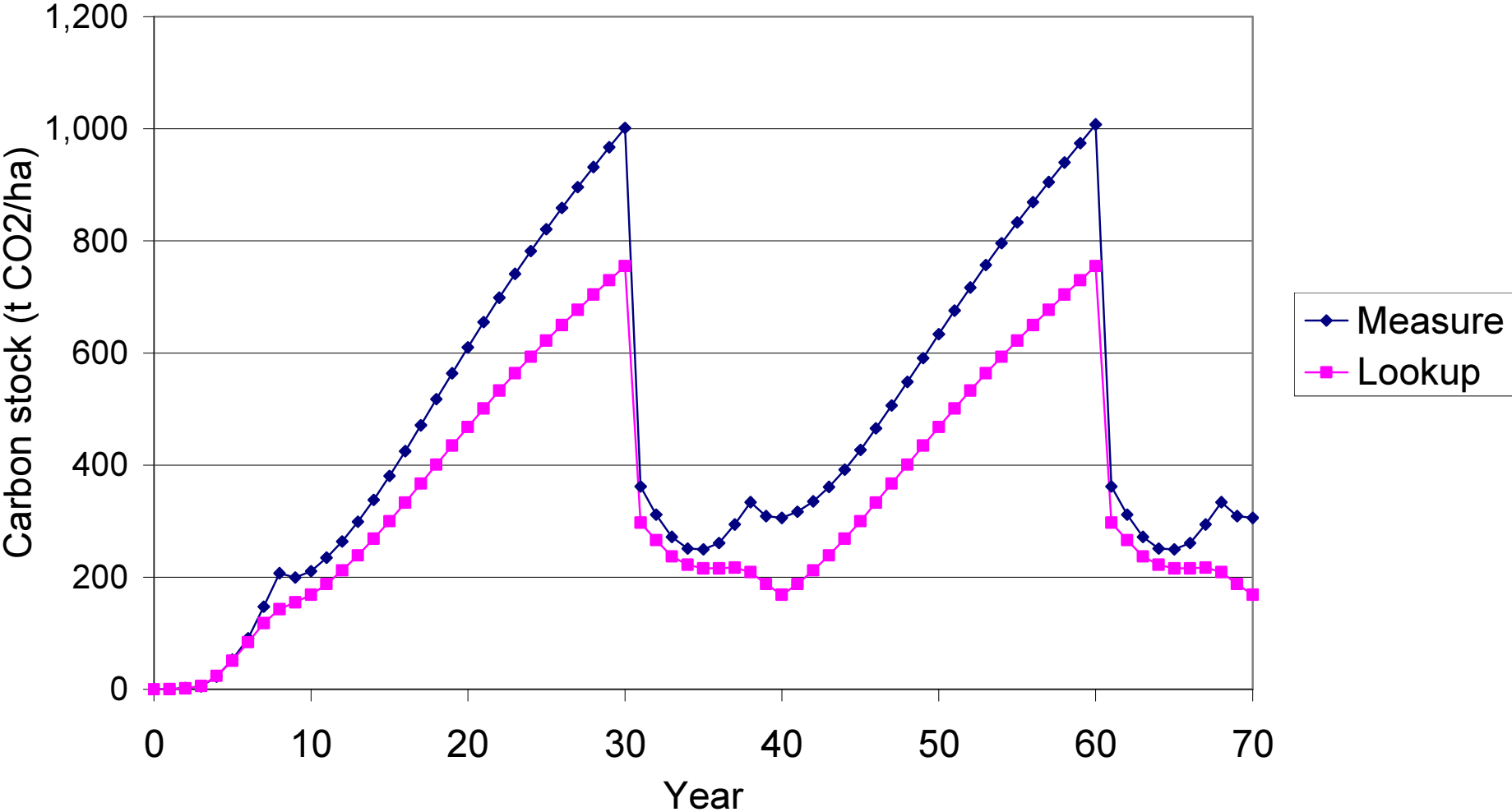


---

# Which look-up table to use?

- Our average NZ ex-farm site is in BOP

# Carbon stocks for radiata pine clearwood regime



---

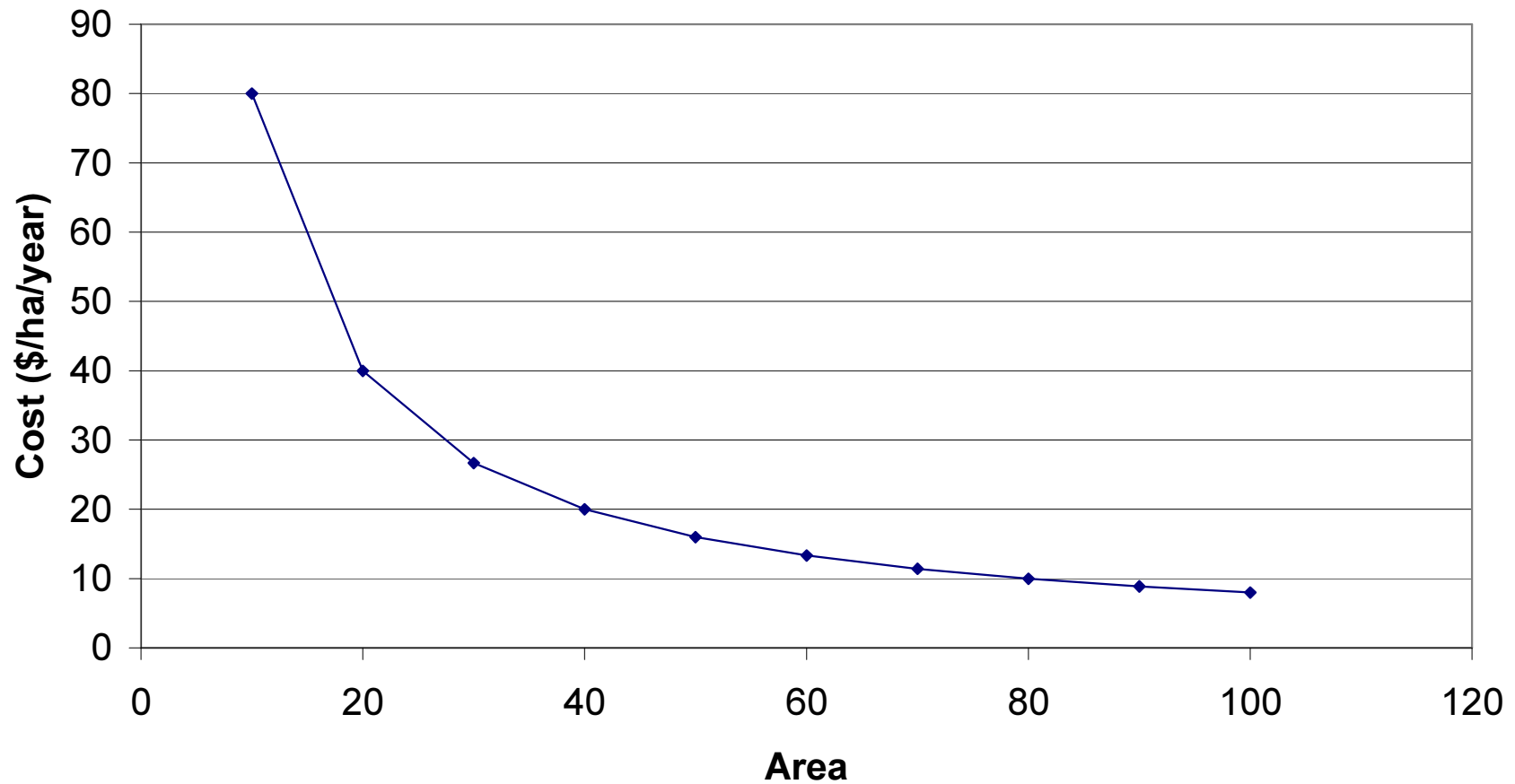
# Look-up table vs measurement

- Using look-up table may result in fewer carbon units
  - Look-up tables “reflect growth rates for typical forests in regionally averaged environments, under average forest thinning and pruning regimes”
- But it removes the cost of measurement

# Measurement cost

(20 plots per stratum, \$200/plot, measure every 5 years)

Measurement cost per hectare per year





---

# Look-up table vs measurement

- So for this example it is more profitable to adopt the measurement approach if area is over 10 ha.
- But answer will vary with
  - Site & silviculture
  - Regional lookup table

---

# Framework for decision-making

---

# Decisions

- If have an existing crop
  - Whether to opt into ETS?
- If considering a new crop
  - Whether to opt into ETS?
  - Where to establish?
  - What species?
  - What silvicultural regime?
- For both
  - Lookup table vs measurement (if <50 ha)
  - What carbon trading strategy to adopt

---

# Need to decide criteria to use

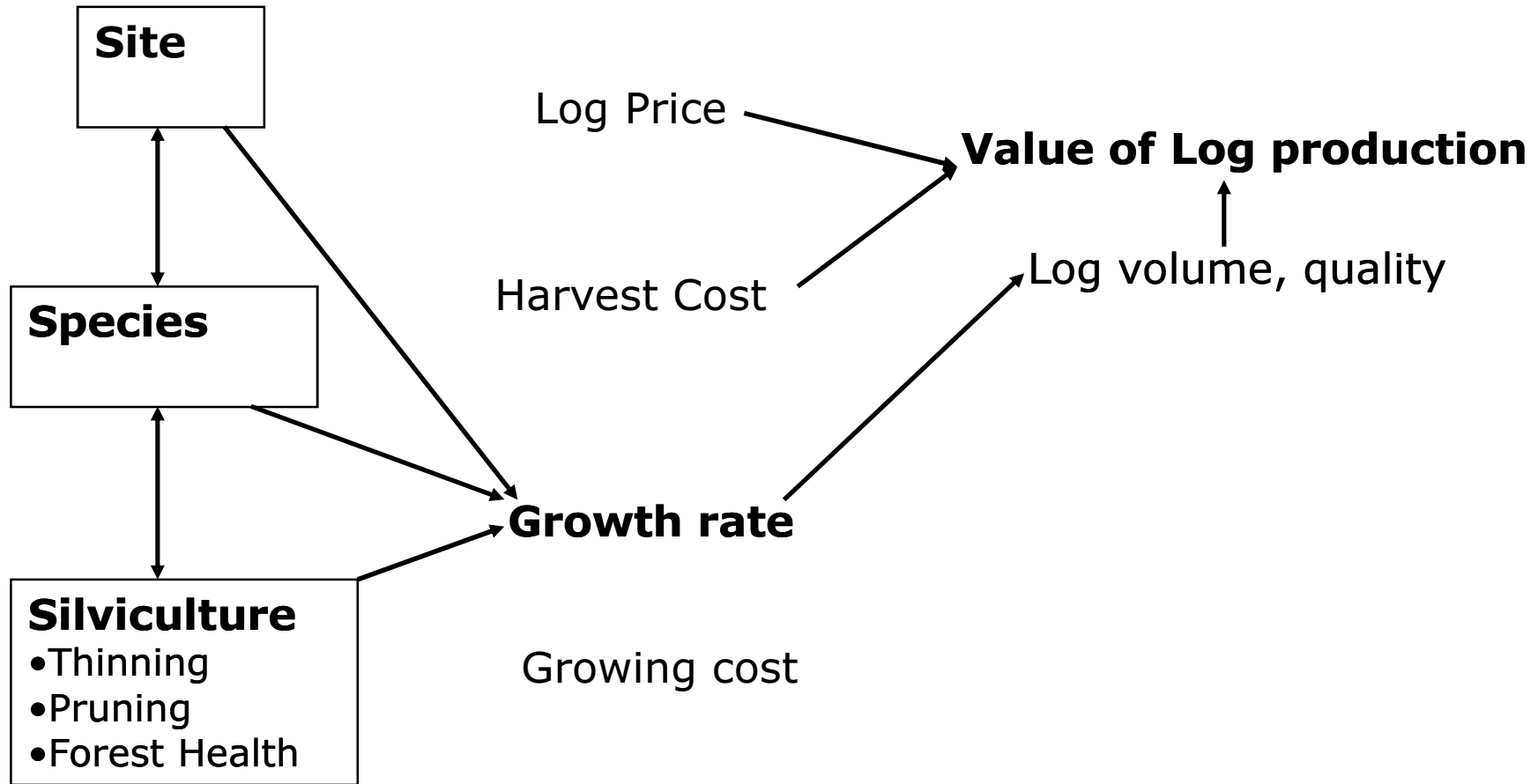
- Profitability
  - Maximise value (NPV/LEV)?
  - At what required rate of return?
- Appetite for risk
- Non-financial factors

---

# Evaluation Process

- Need to forecast
  - harvest volumes
  - carbon stocks
- Estimate future costs
- Estimate future revenues
  - Sale of logs
  - Carbon units
- Evaluate trade-offs between
  - Return
  - Risk
  - Non-financial factors

# Framework for decision-making



# Framework for decision-making

