

Modelling C sequestration following afforestation/reforestation

Preliminary simulations using GRC3

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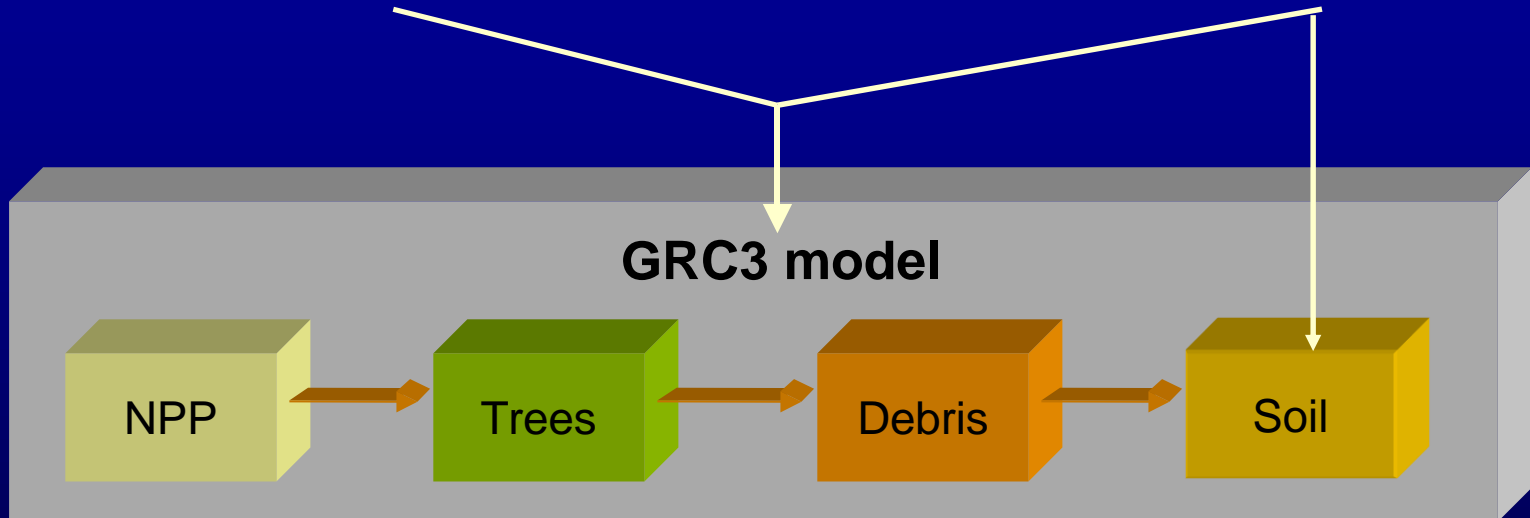
FORESTRY AND FOREST PRODUCTS

NATIONAL CARBON ACCOUNTING SYSTEM

Background

Australian Greenhouse Office, NCAS

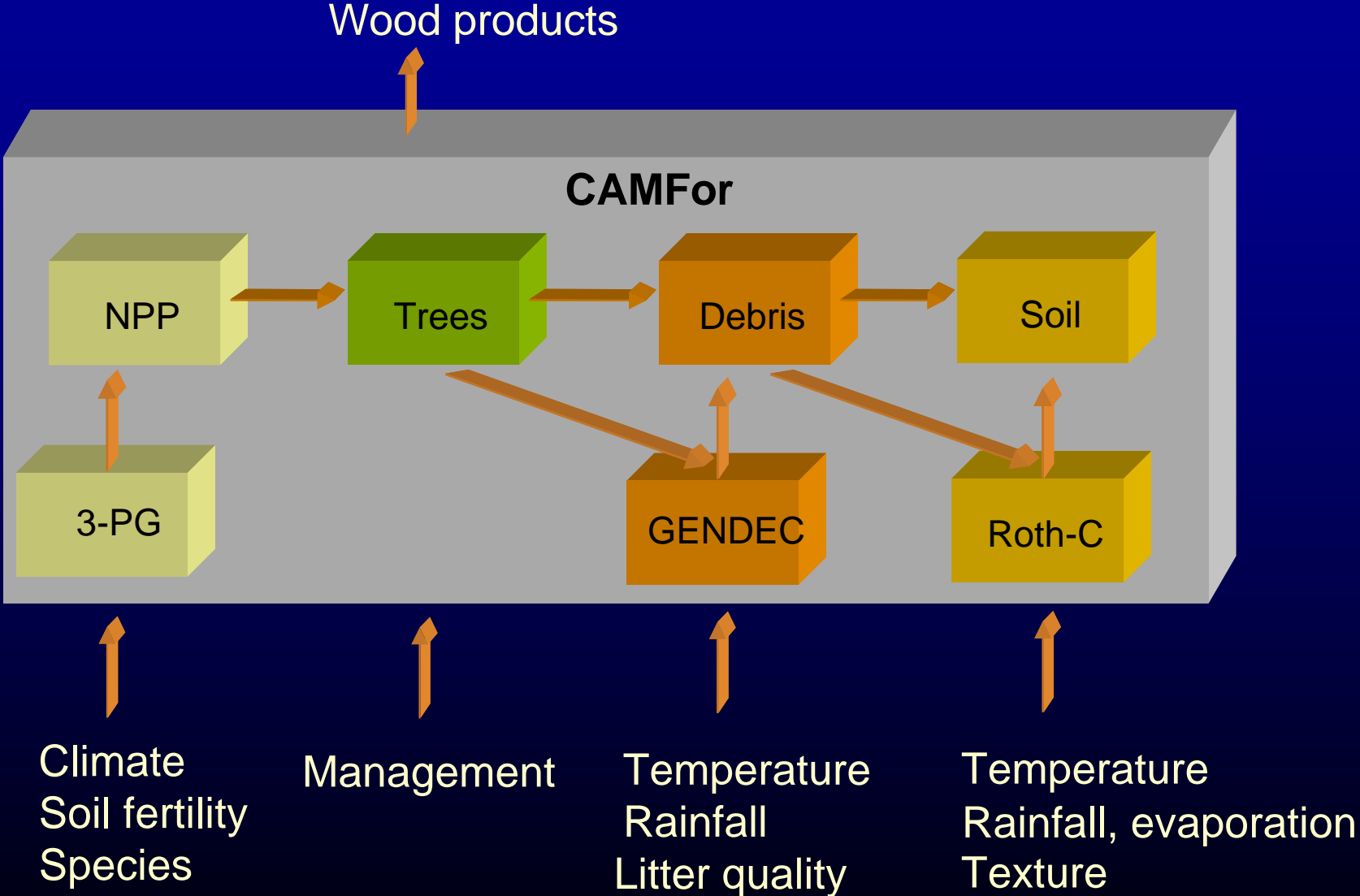
CSIRO FFP



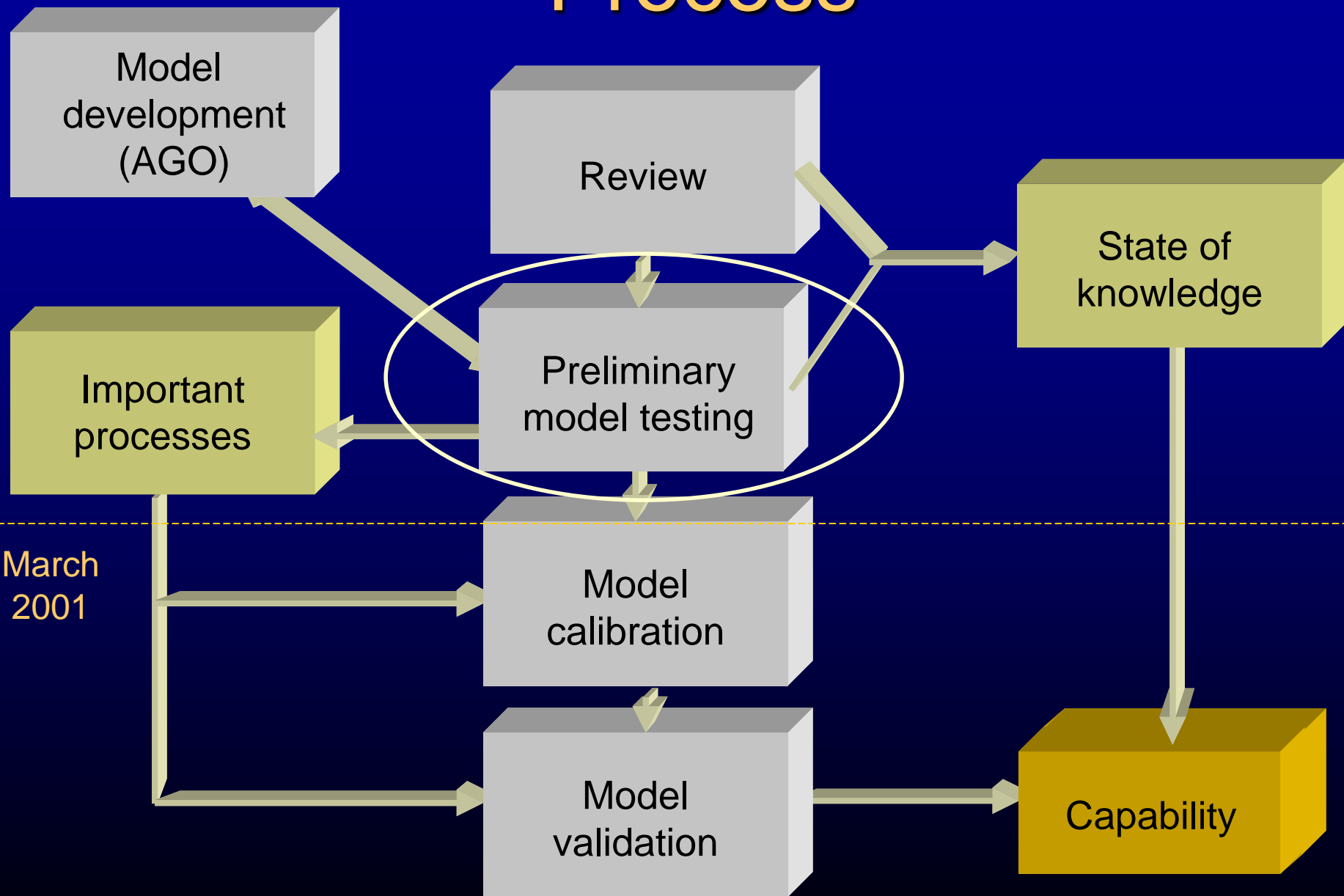
FullCAM model

1. Soil carbon change after afforestation
2. National Carbon Accounting System
3. Project level accounting (i.e. toolkit)

GRC3 structure



Process



Objective

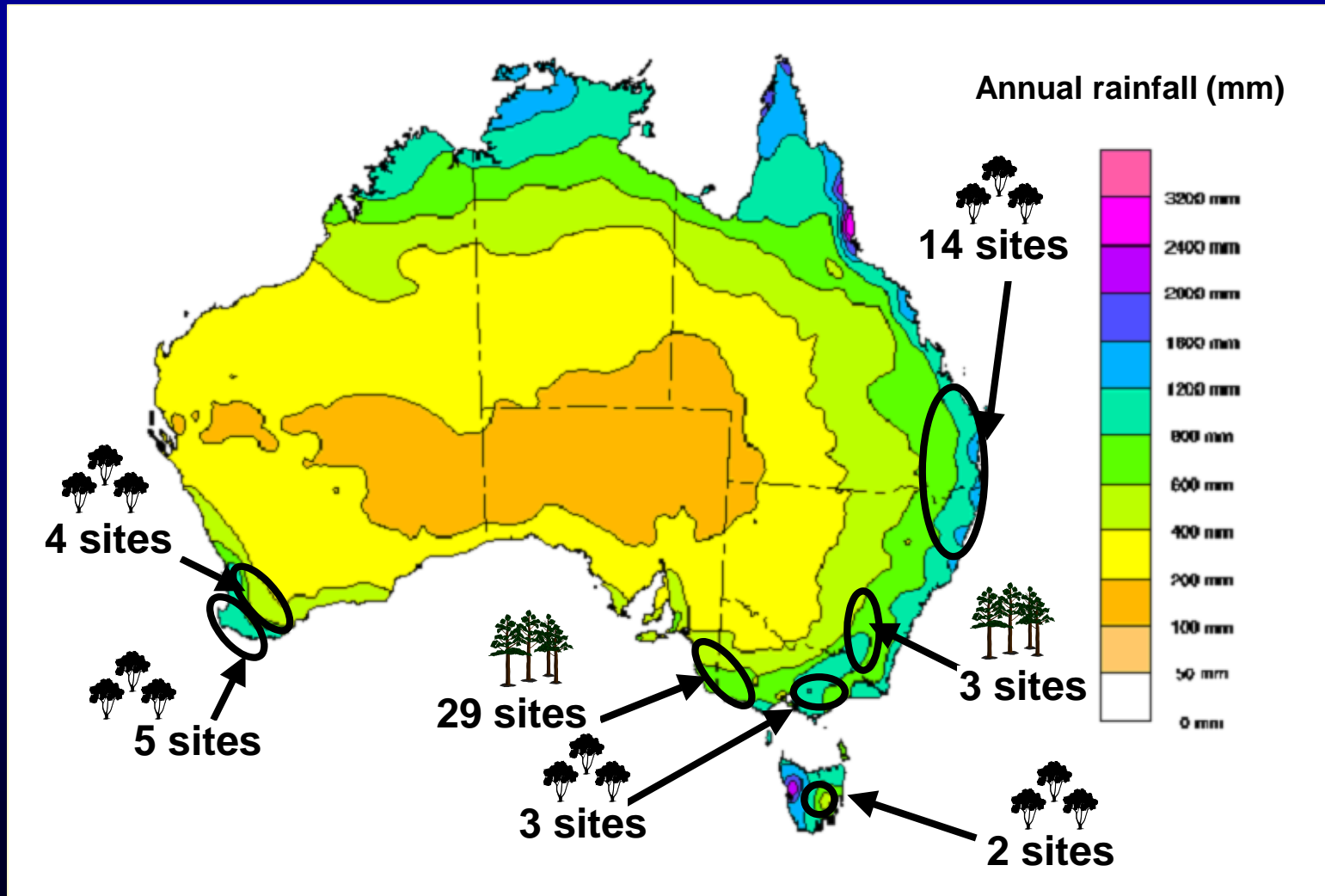
Preliminary testing of GRC3...

1. Development of model structure
2. Identify important pools for sequestration of C
3. Improved knowledge for:
 - Application of model (avoid misuse)
 - Management of plantations for C sequestration
 - Clarify expectations of the role of plantations and soil under a C trading system (set default values)

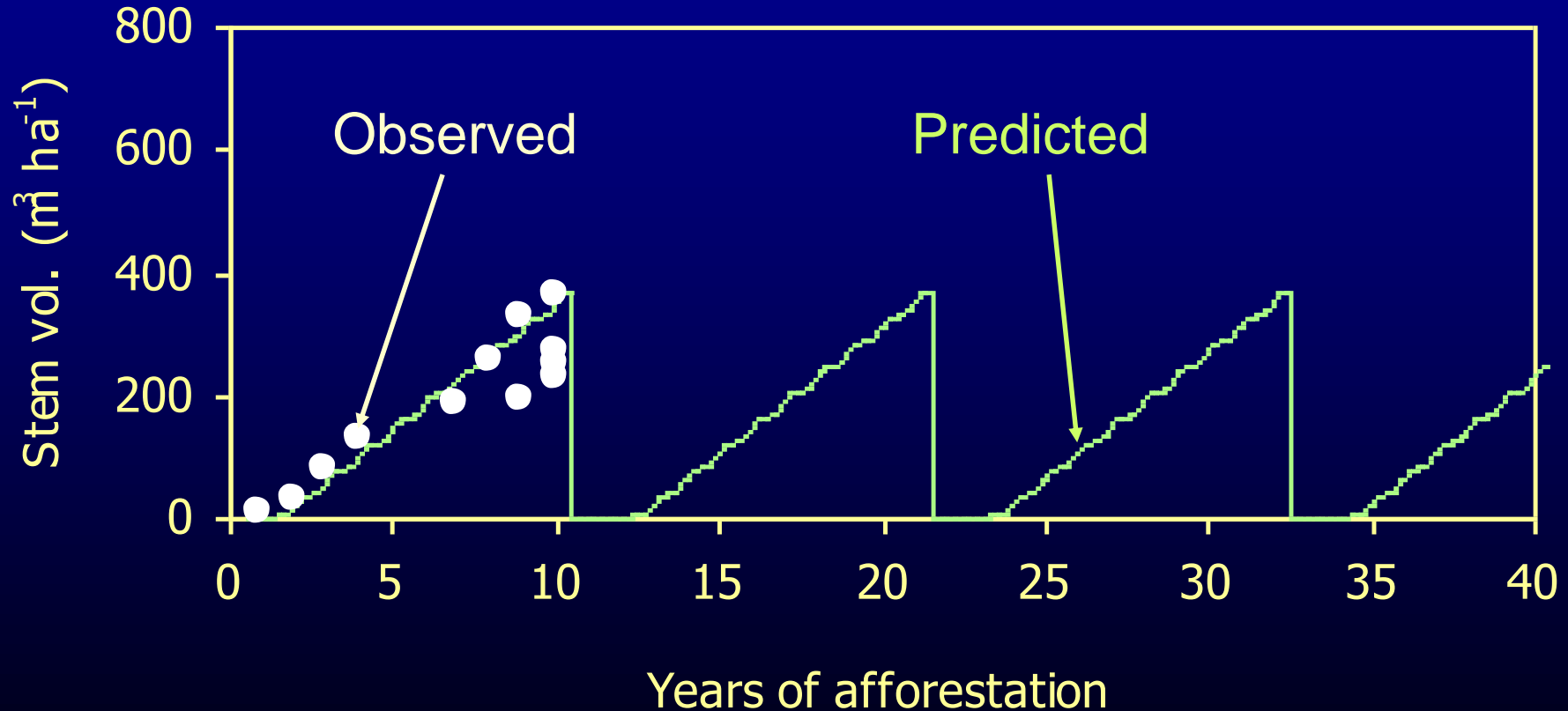
Preliminary simulations

- 7 case studies in Australia
- Model calibrated to:
 - Growth
 - Above and/or below ground biomass
 - Litter fall
 - Litter layer mass
- Model run to generate unverified outputs for soil C

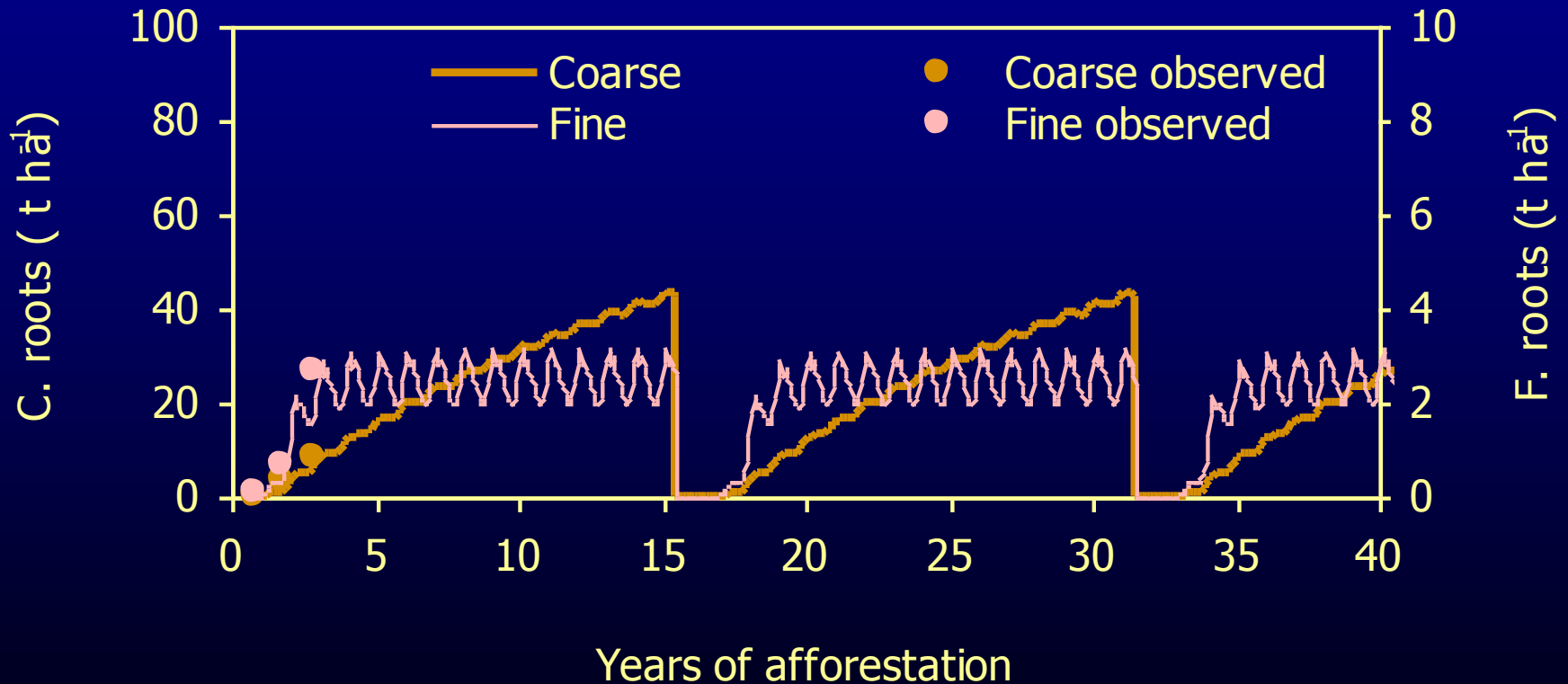
Case studies



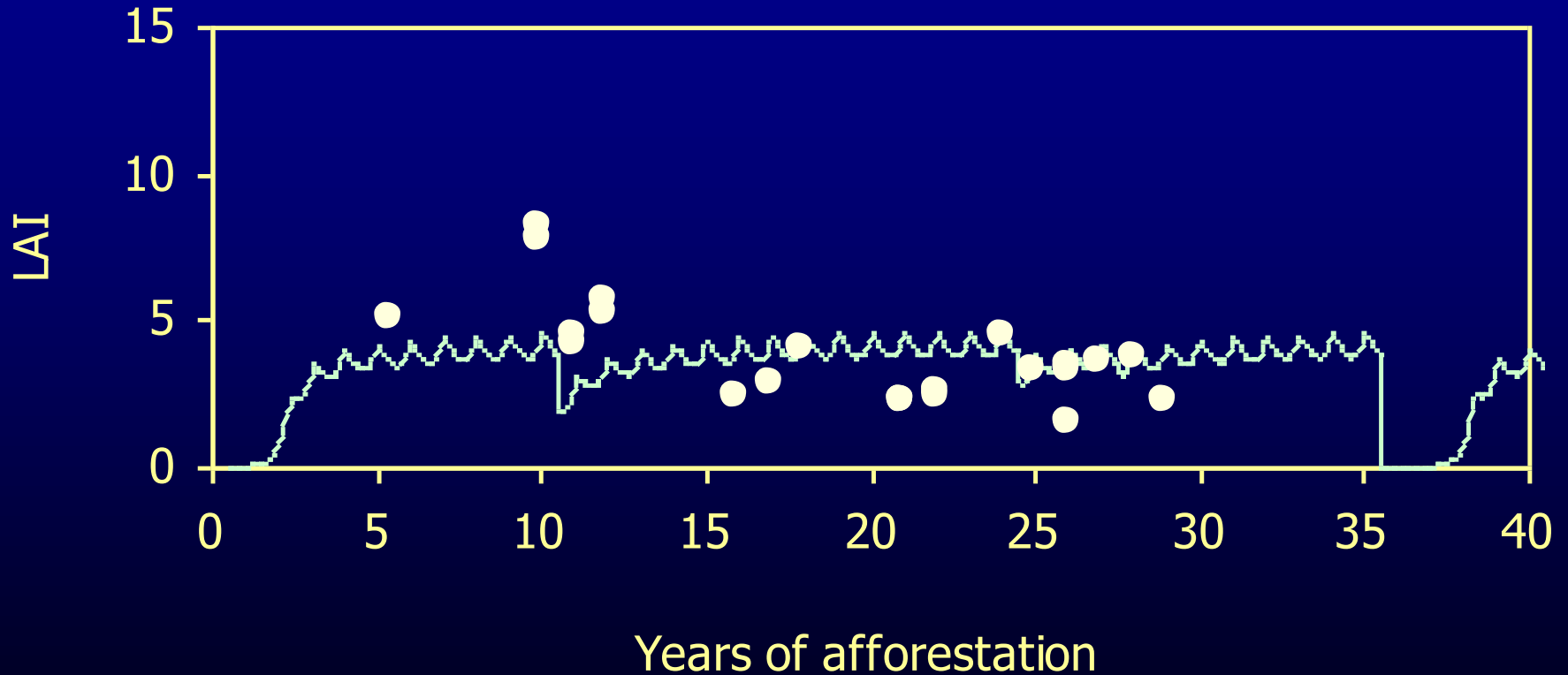
Deriving allocation of NPP to stems



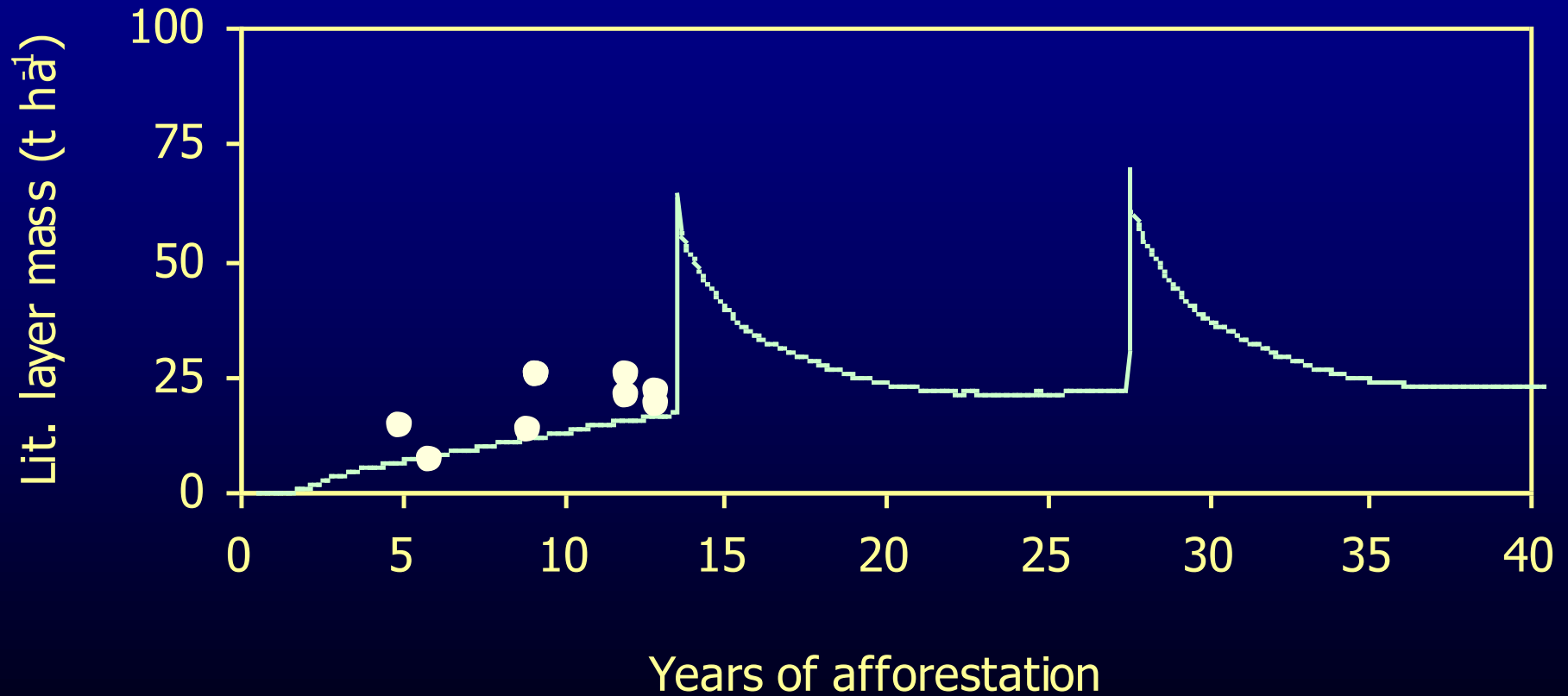
Deriving allocation of NPP to roots



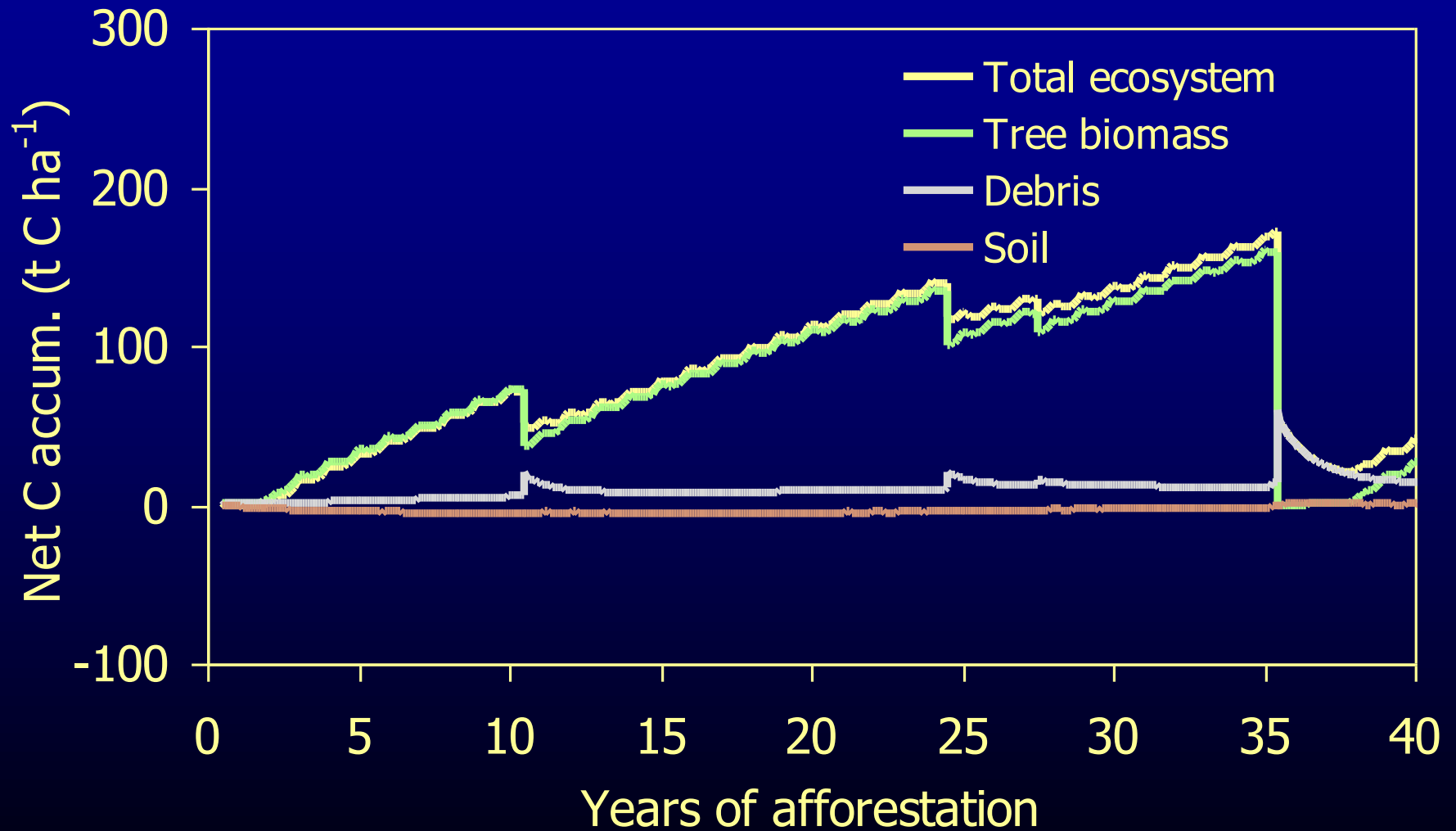
Deriving allocation of NPP to foliage



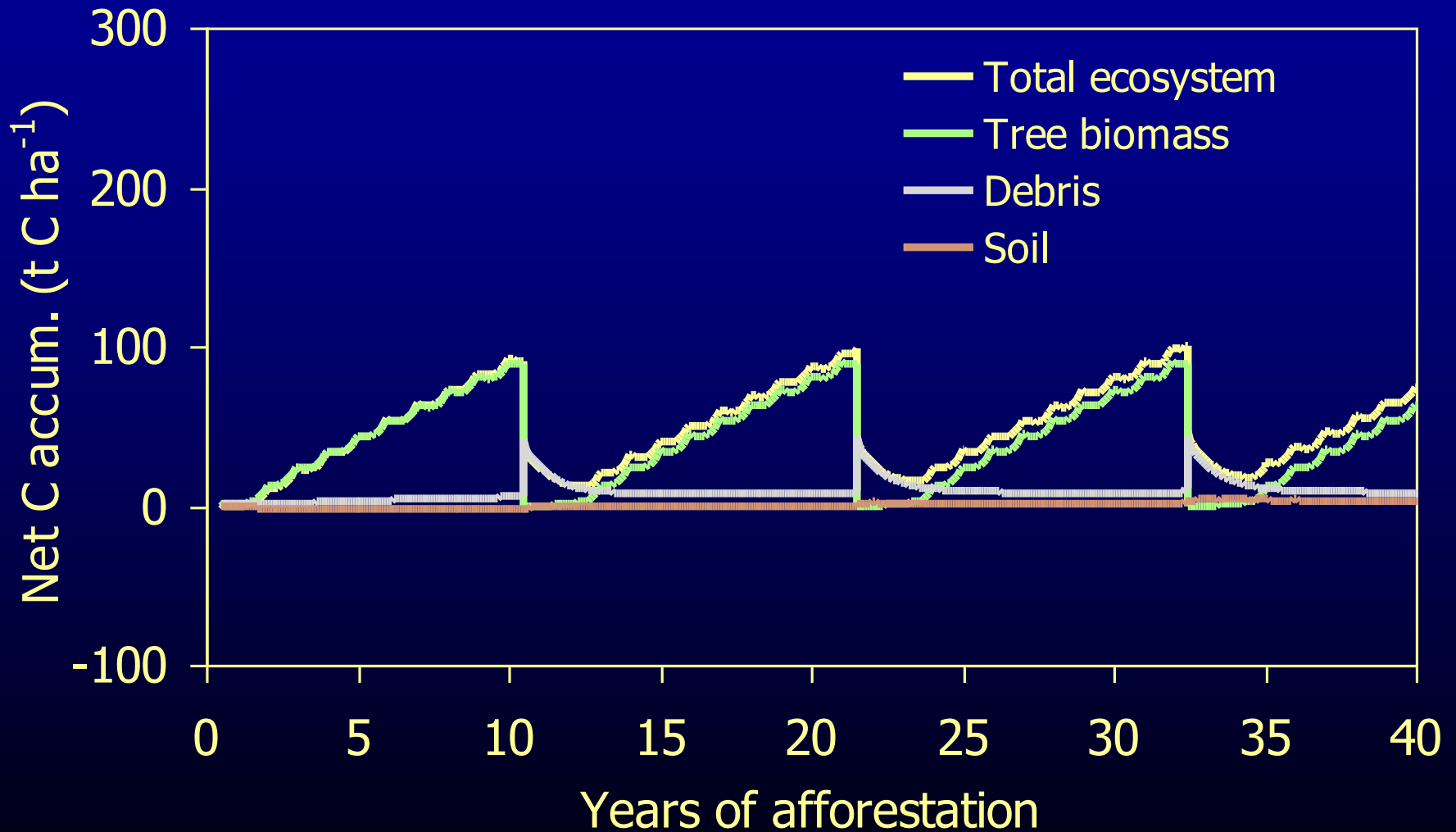
Deriving allocation of NPP to foliage & litter decomposition



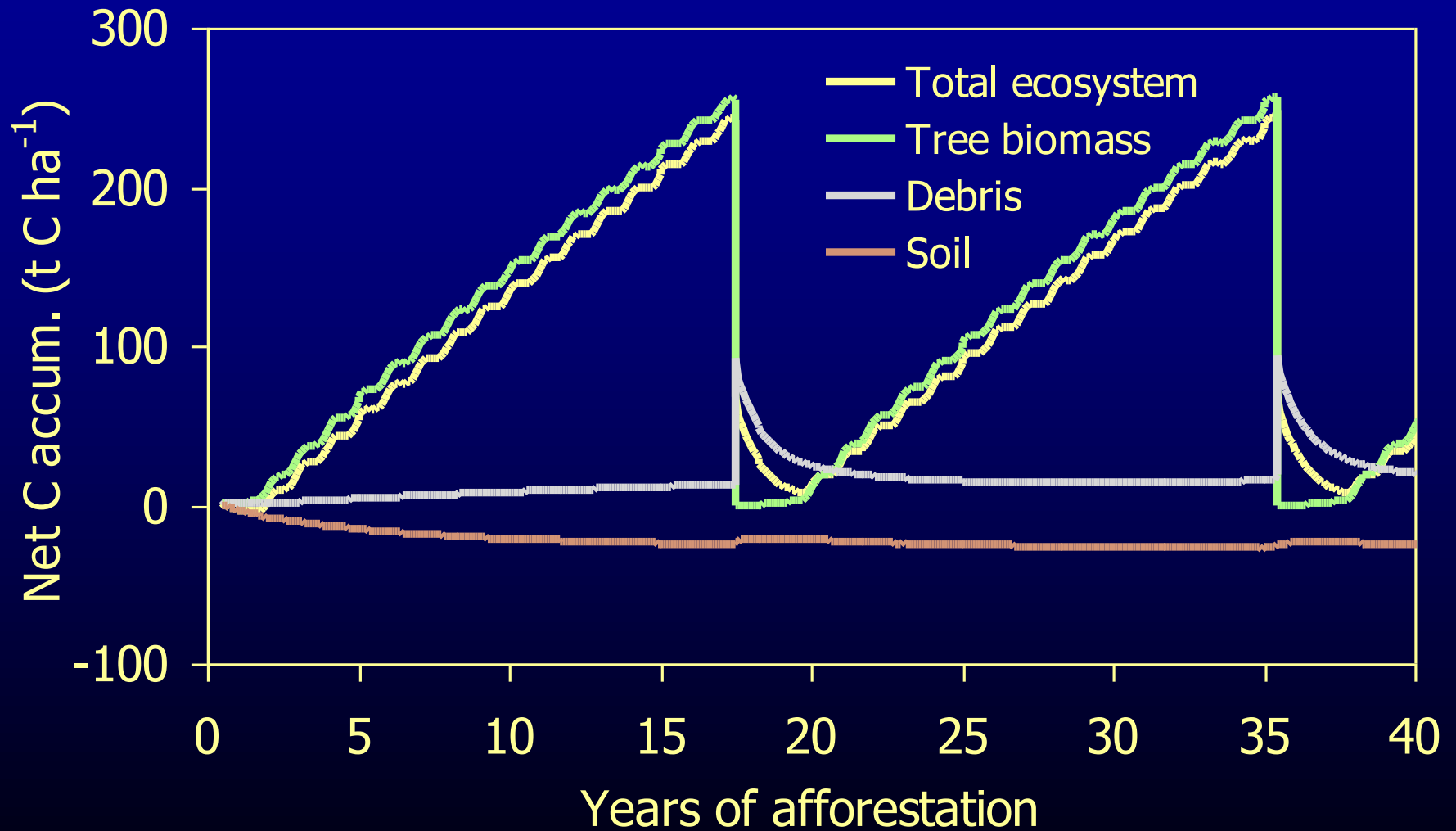
Pinus radiata, SA



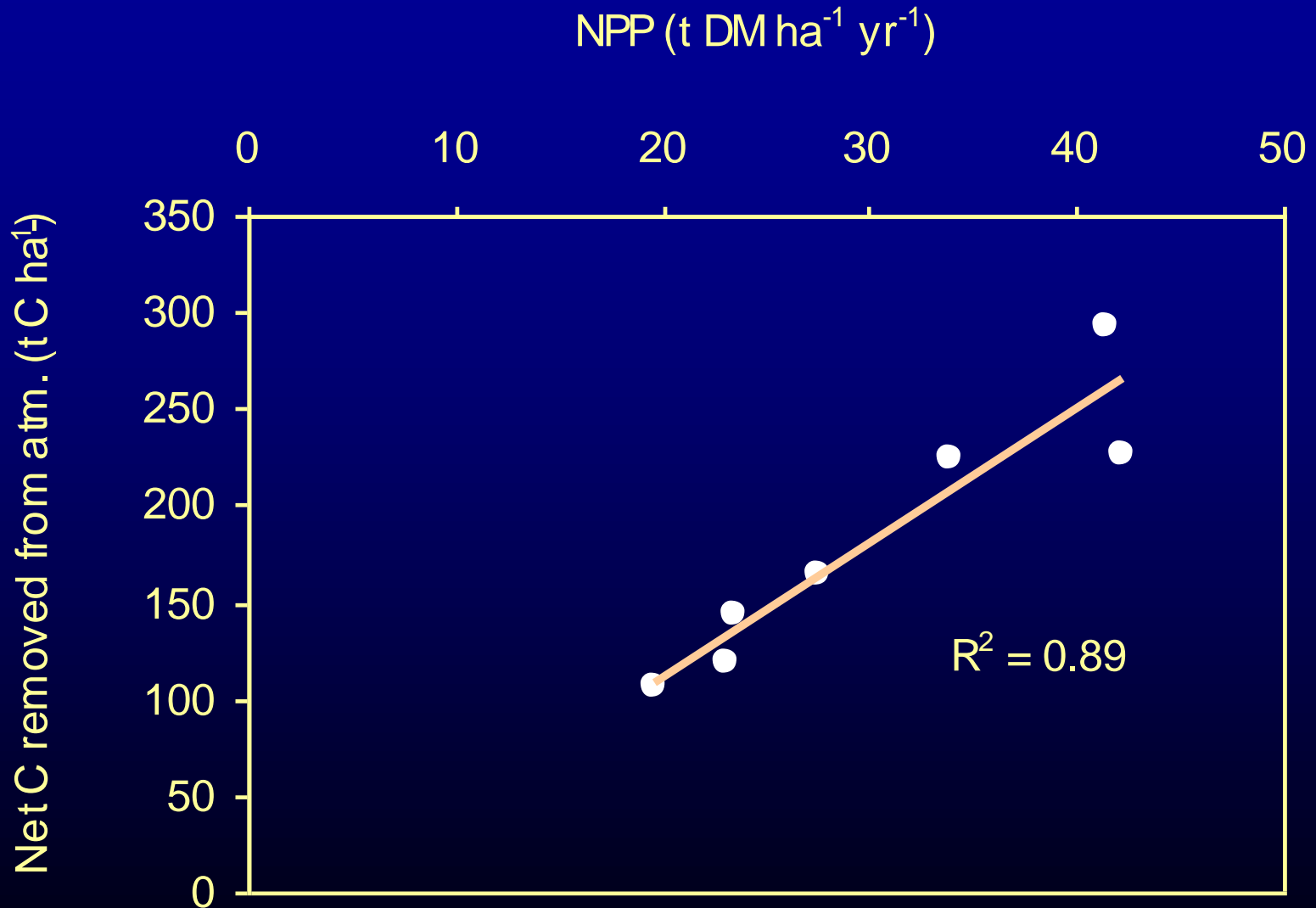
E. globulus, low rainfall WA



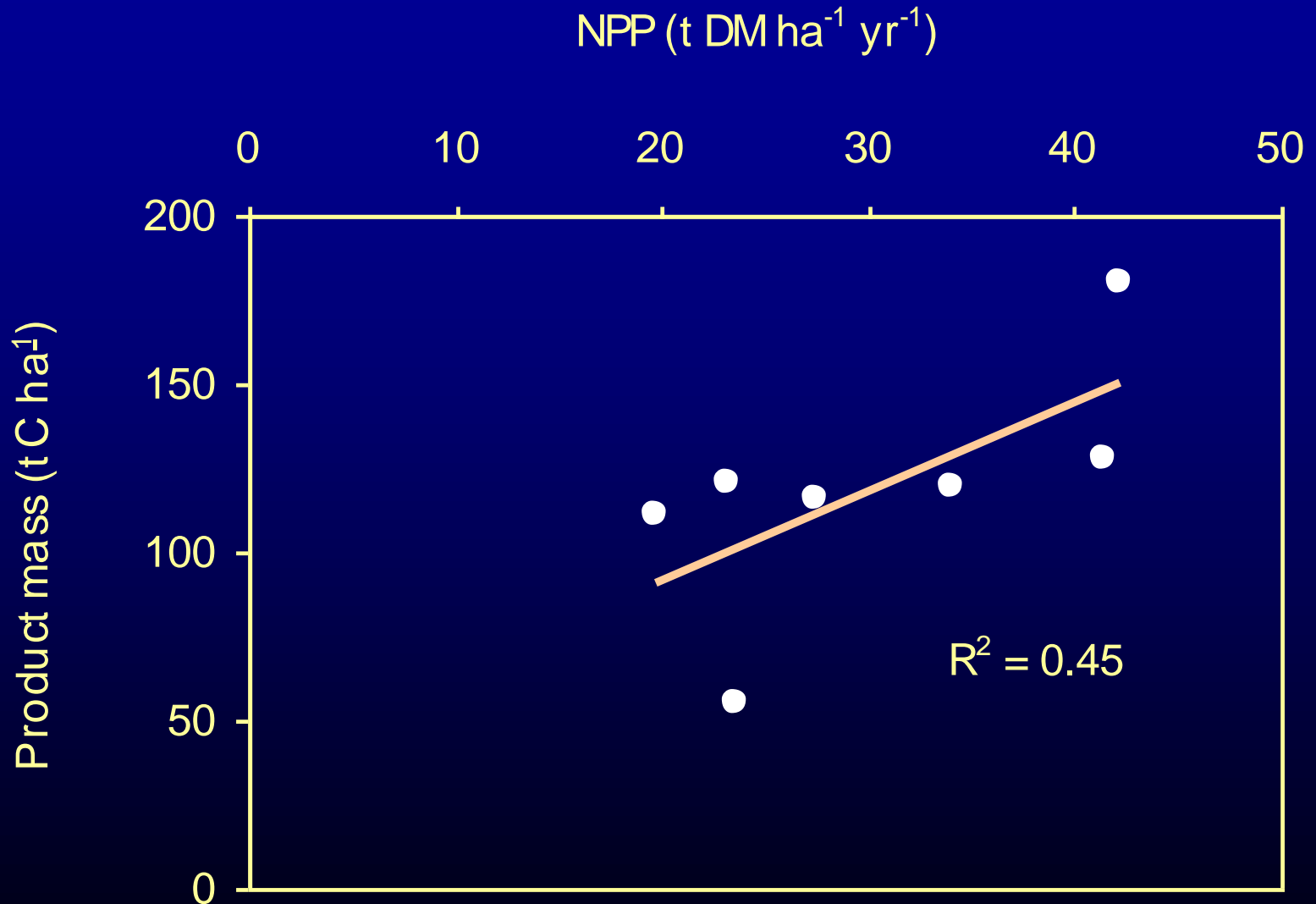
E. globulus, SE Vic.



C removed from atmosphere



C removed in products

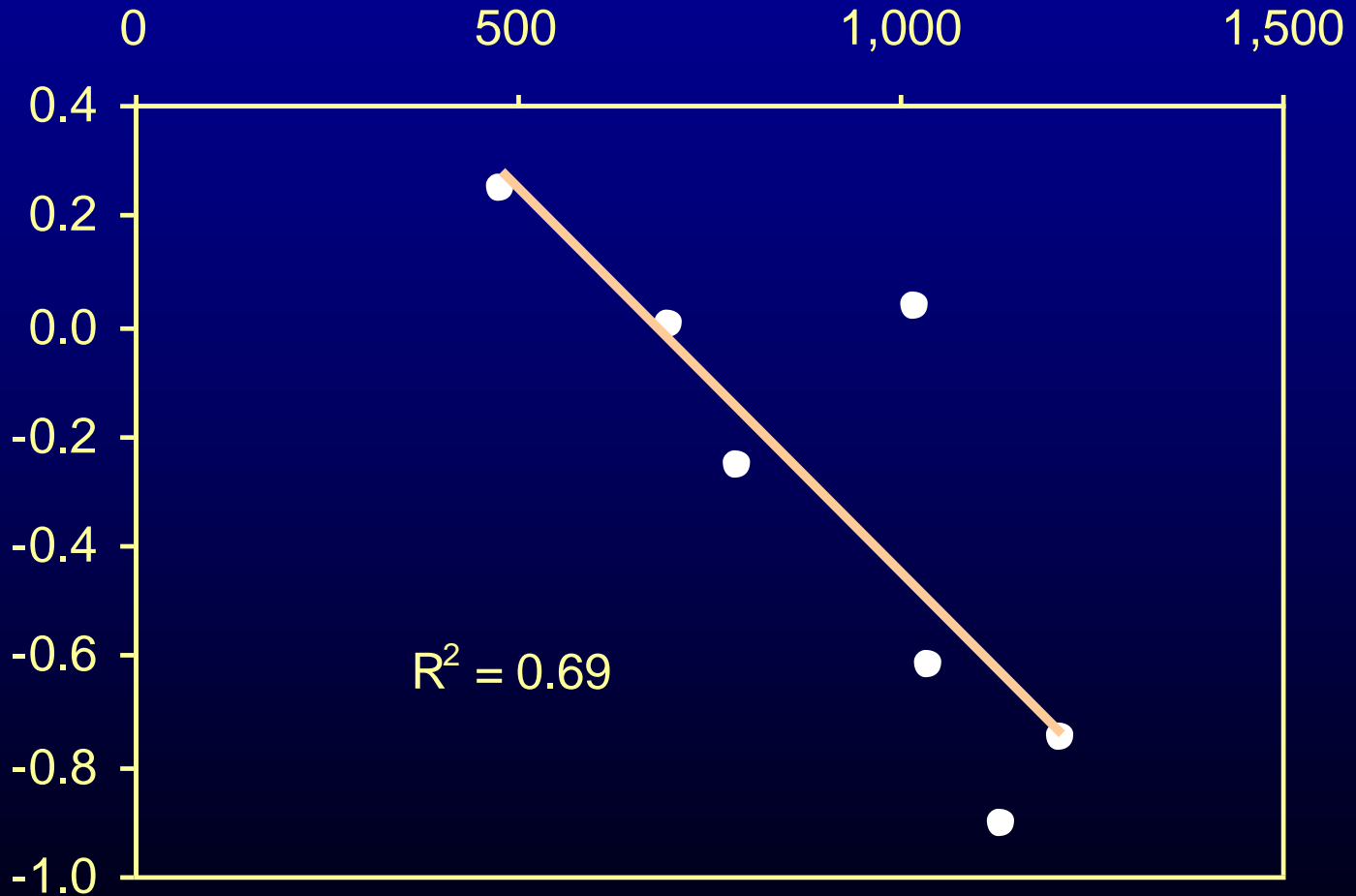


Change in soil C

Annual rainfall (mm)

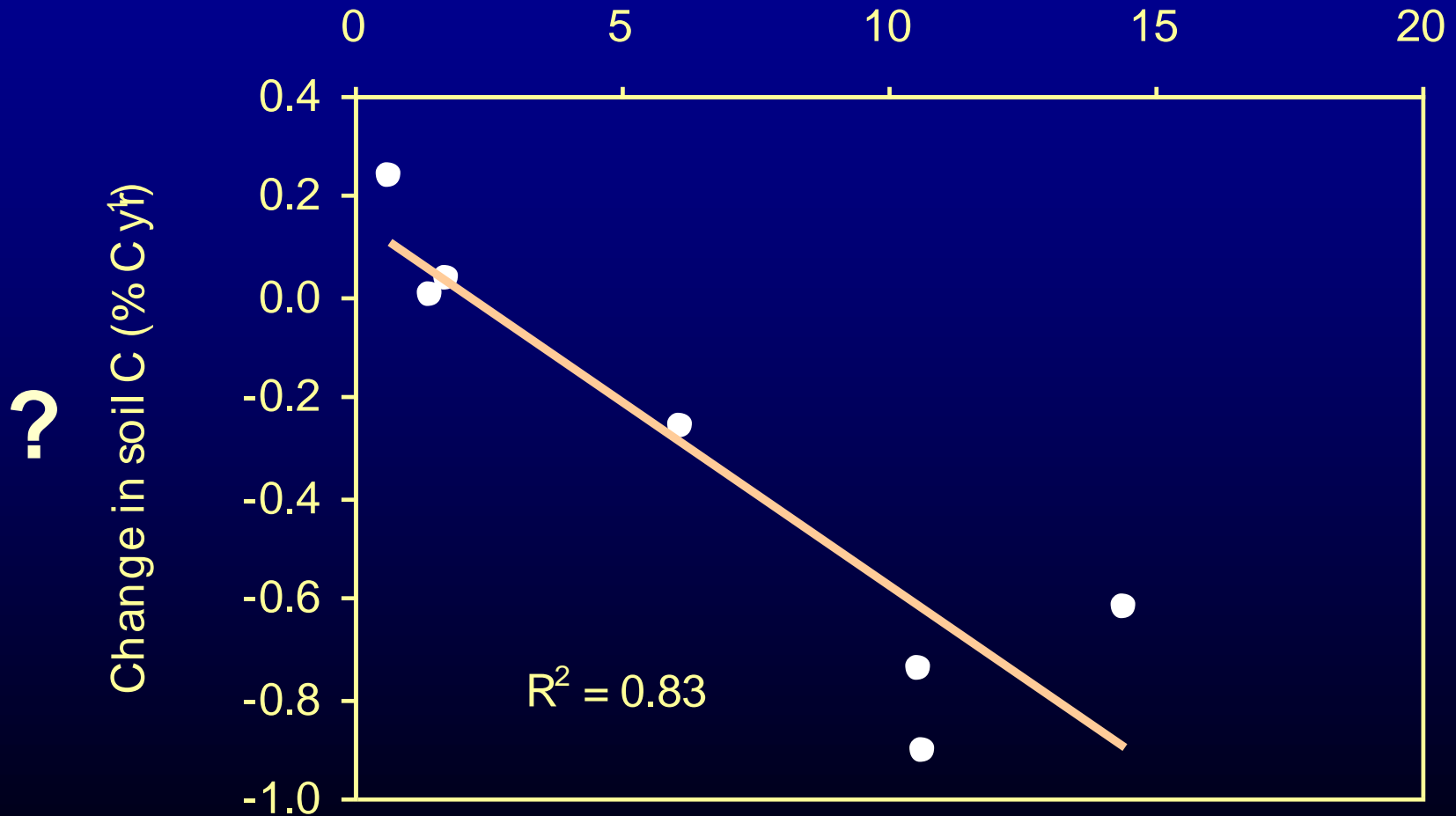
?

Change in soil C (% C yr⁻¹)



Change in soil C

Diff. in C input (pasture - plantation, t DM ha⁻¹ yr⁻¹)

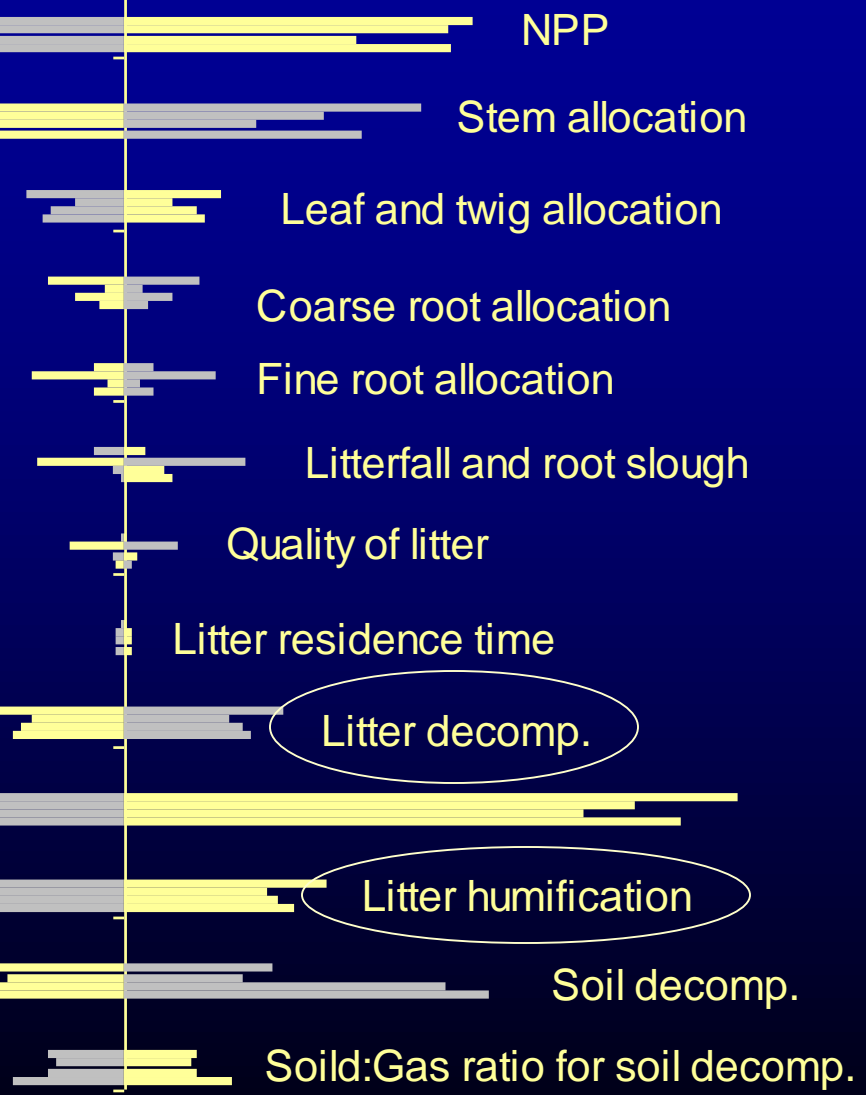


Ratio of soil C change to change in process

-4 -2 0 2 4

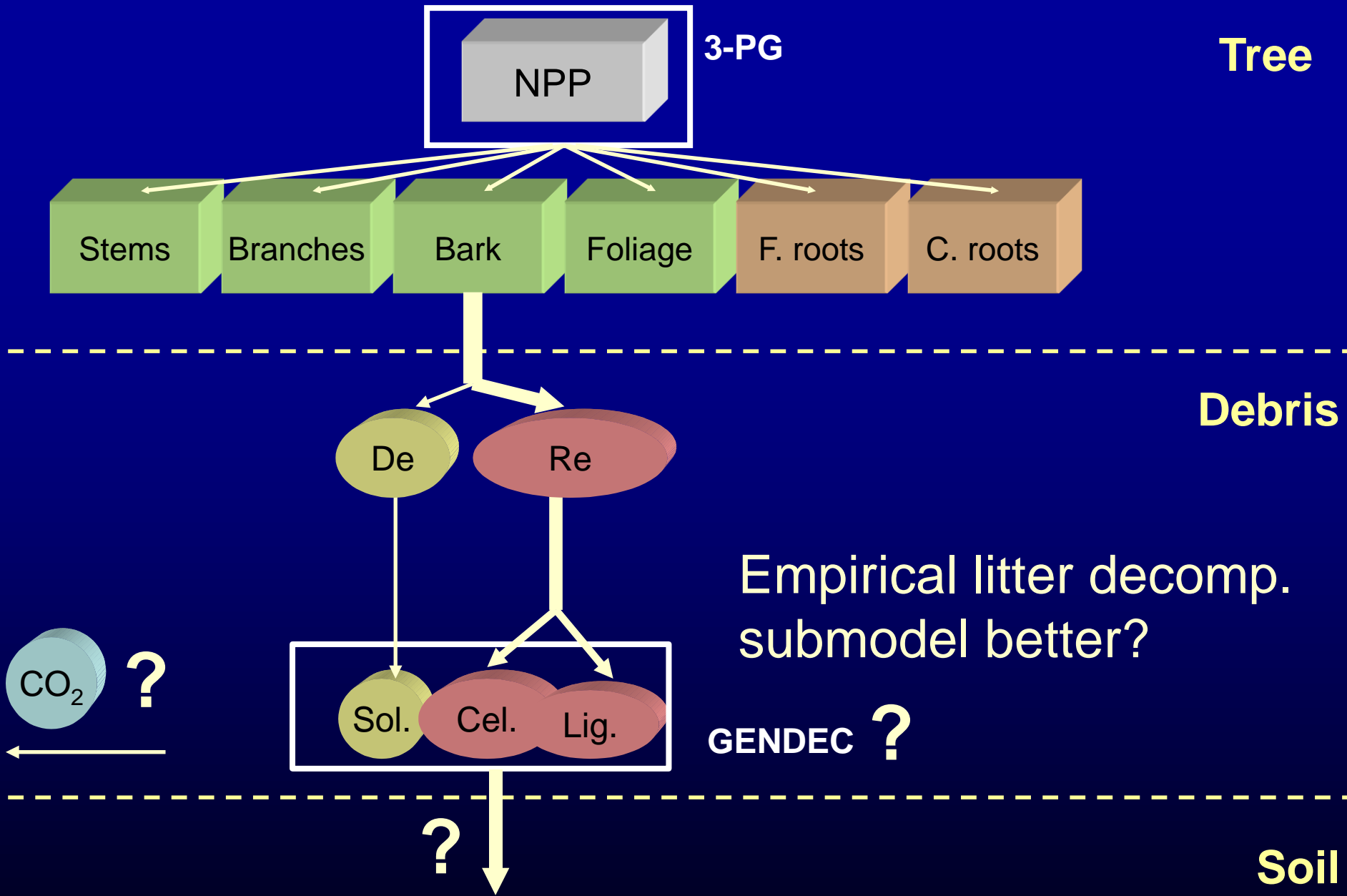
Important processes

Soil:Gas ratio for litter decomp.

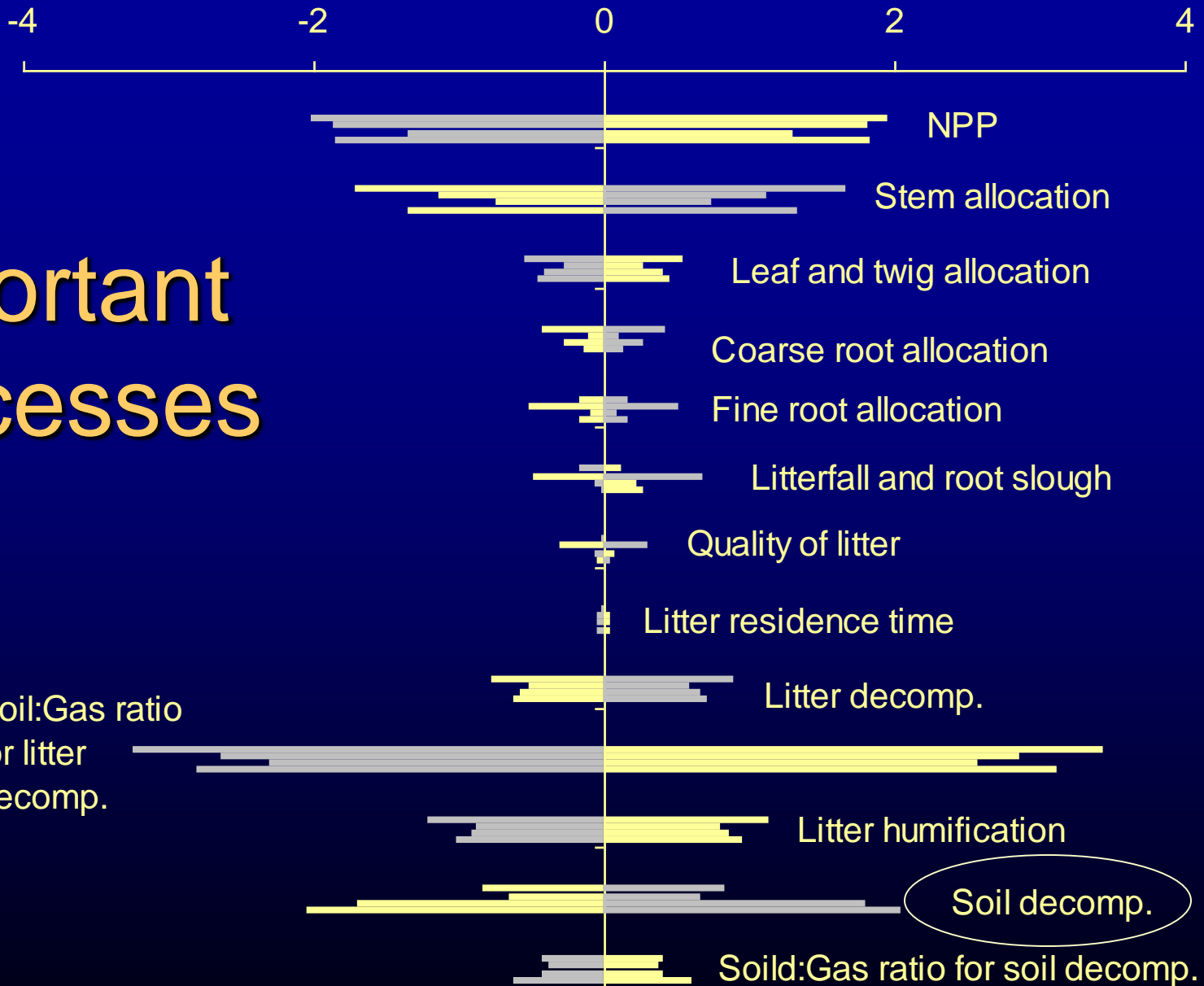


Litter decomp.

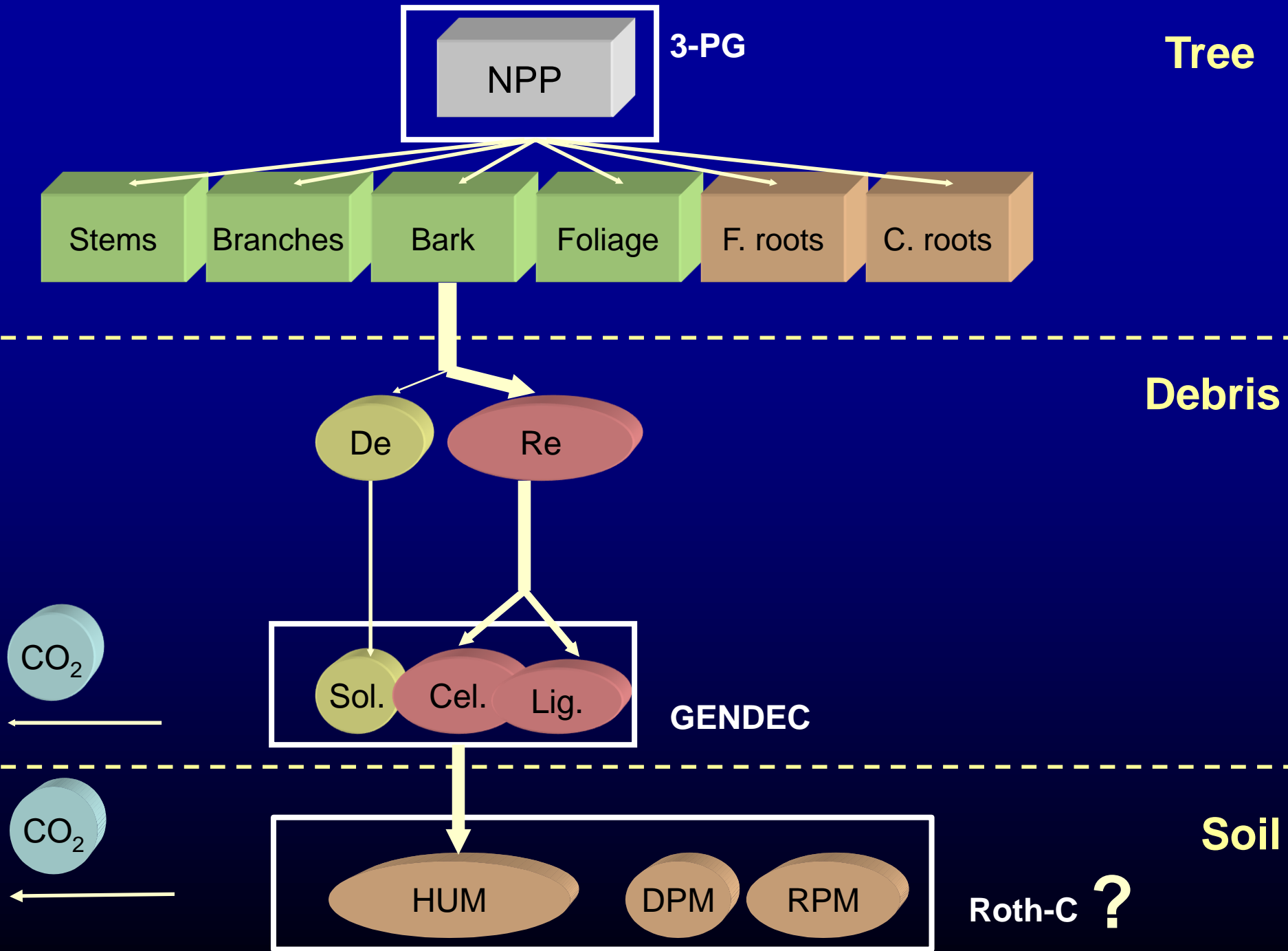
Litter humification



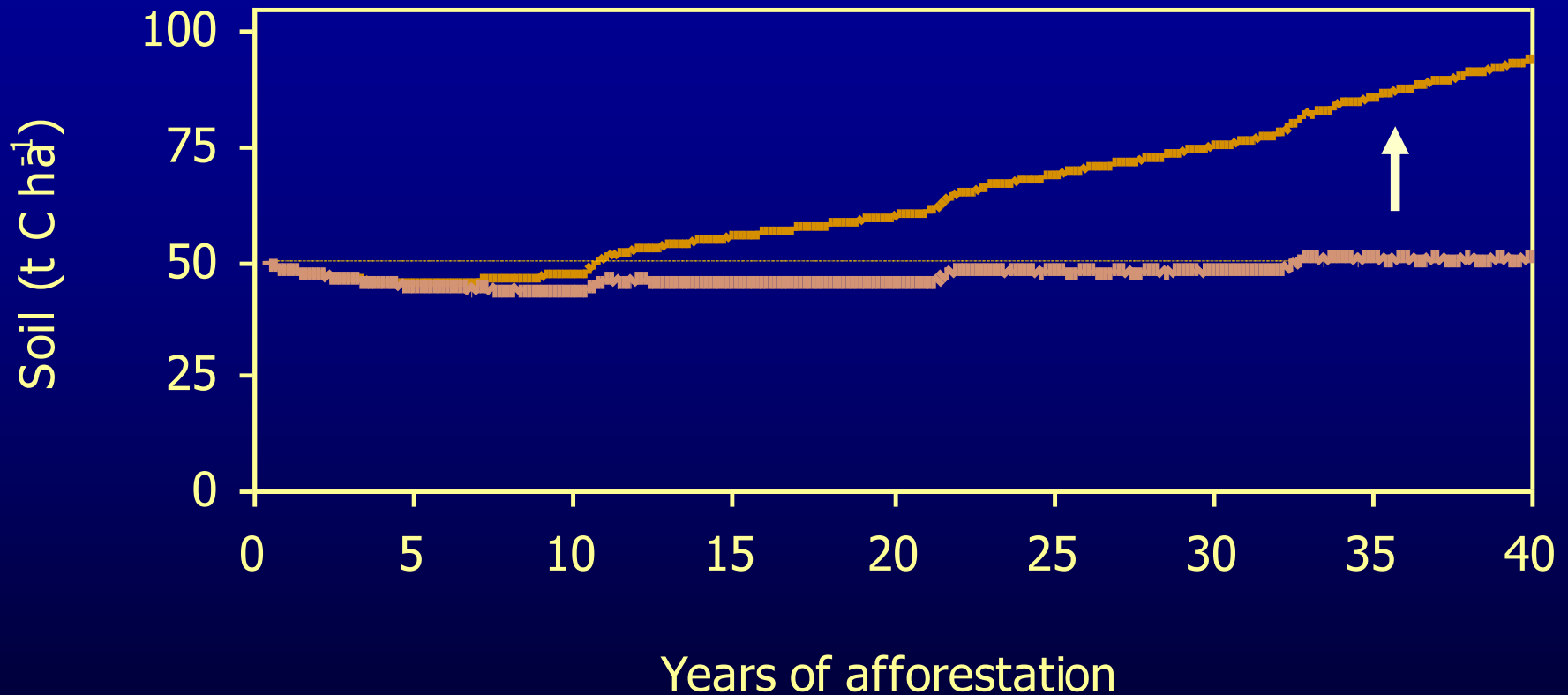
Ratio of soil C change to change in process



Important processes



↑ humification of plant cellulose and lignin pools



Little available information on change in soil C following afforestation

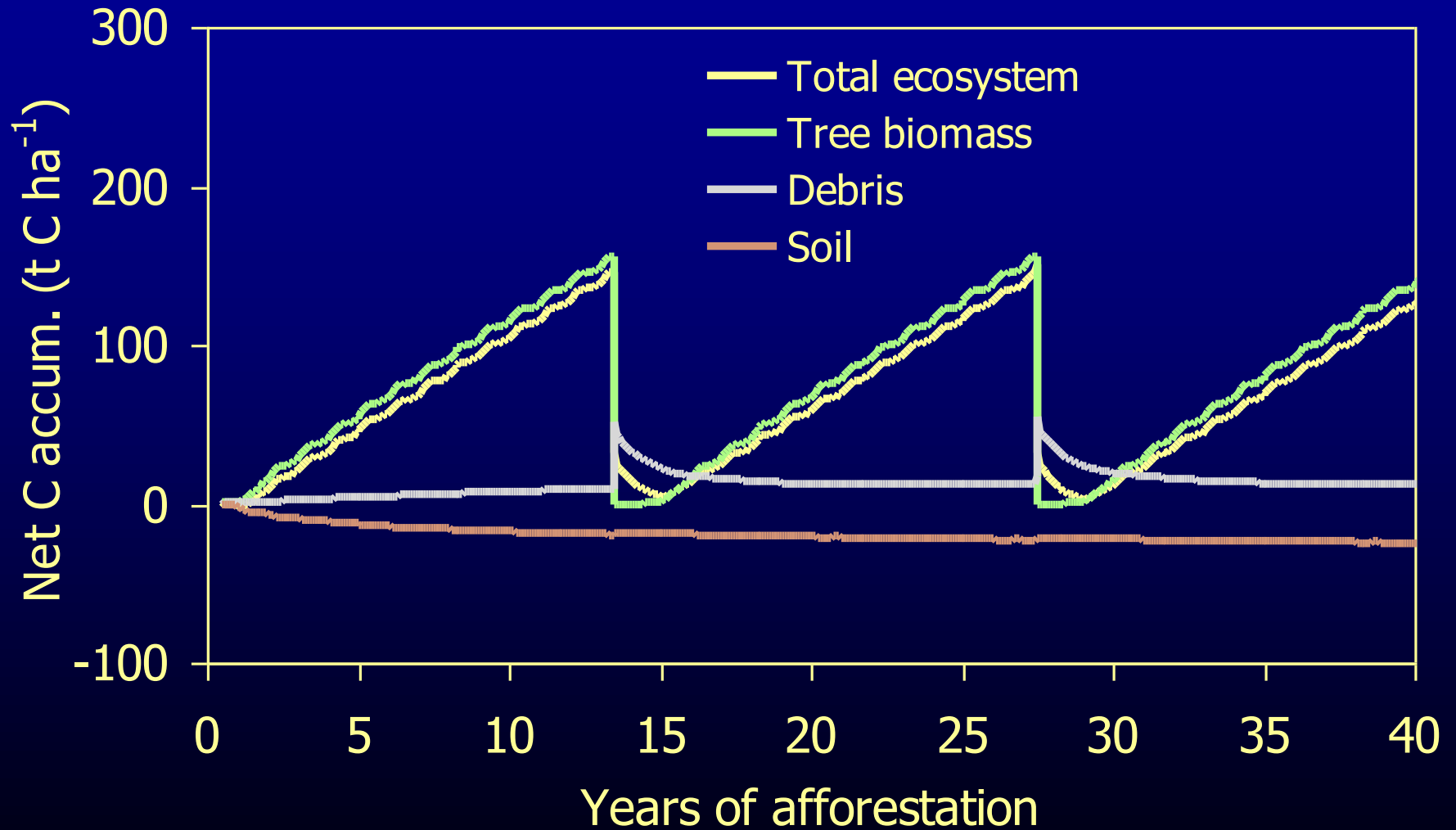
Further work...

- Development of models for decomposition and humification of litter
- Verification of soil C sub-models
 - Paired pasture/plantation sites
 - Soil fractionation

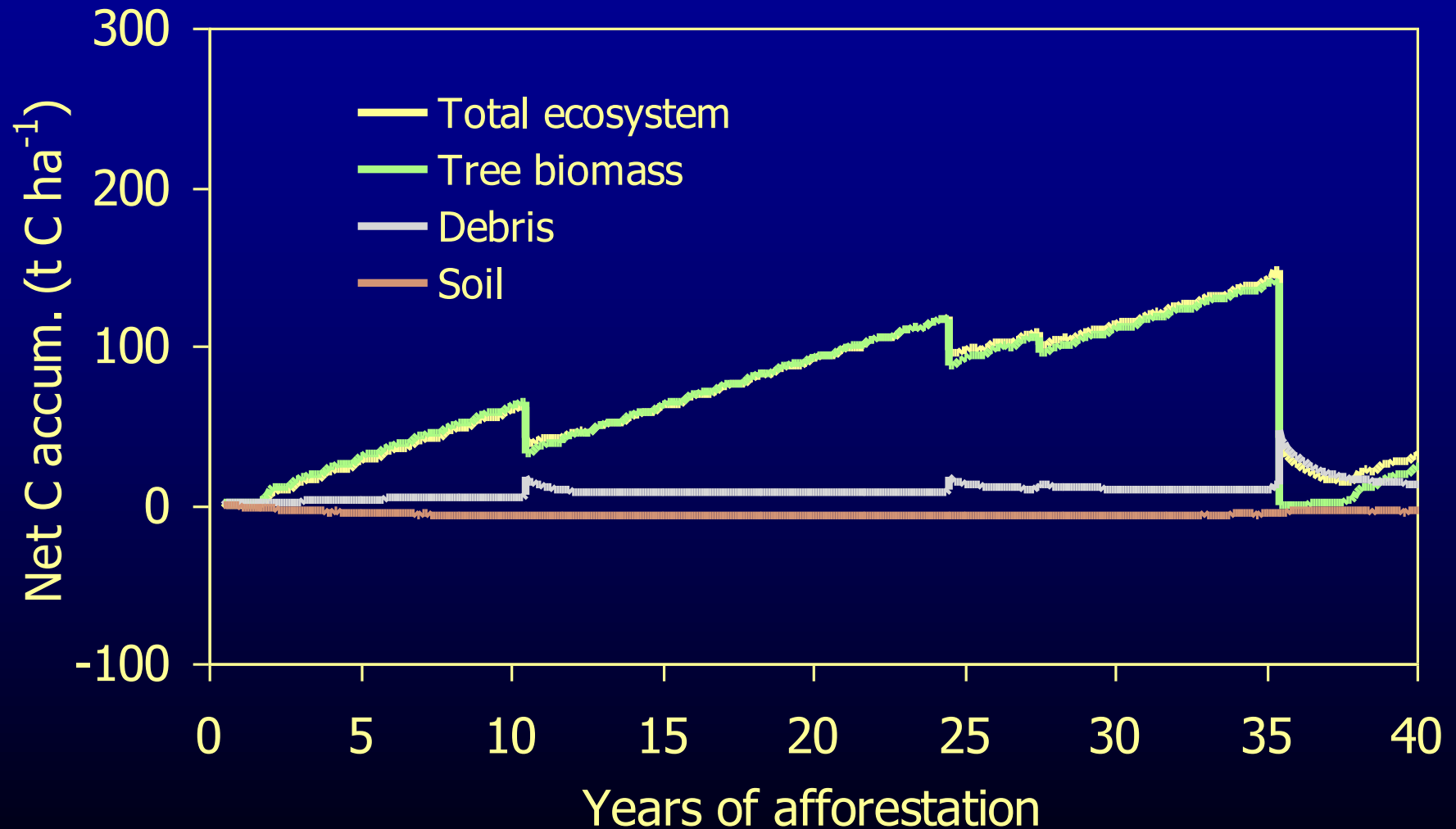
Summary

- Potentially large influences of management and climate on C sequestration following afforestation
- Most C is sequestered by tree biomass
- Changes in soil C appear to be relatively minor, but this needs to be tested

E. grandis, Q'ld



P. radiata, NSW



E. nitens, Tas

