



Genressoursernes anvendelse i danske skove
Use of genetic resources in the Danish forests
- or genetically appropriate reproductive
material for forest restoration and
production in Denmark

Lars Graudal & Erik Kjær
March 2010



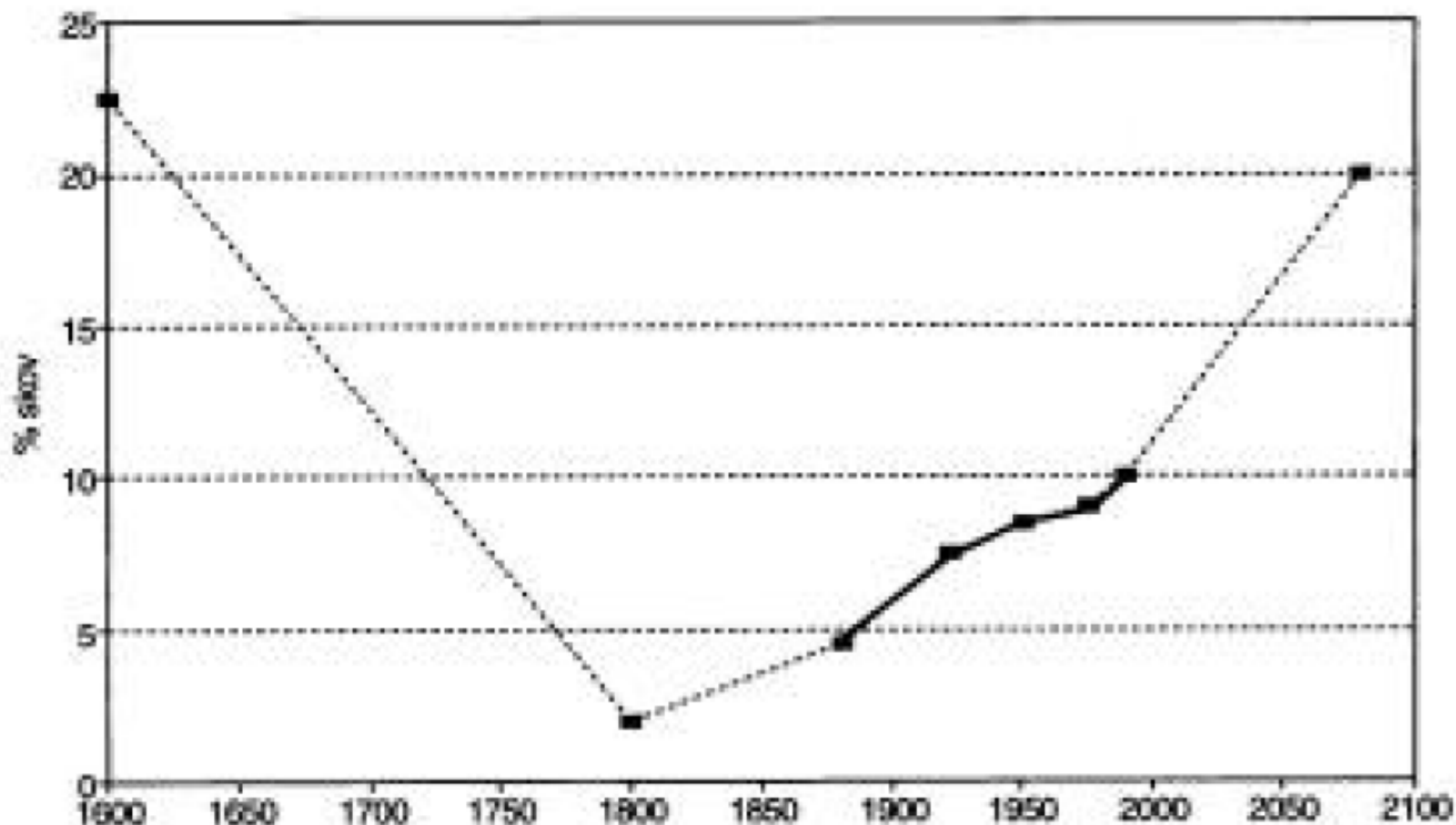
Outline

- The time perspective: Development of forests and forestry in Denmark
- Use of genetic resources: what is appropriate?
 - The traditional forestry perspective
 - The wider 'environmental economy perspective'
 - Implications of climate change: can the current forests adapt? And contribute to mitigation?
 - Examples of appropriate seed sources
- Use of genetic resources: how to get the appropriate stuff?
 - Organisation and cost effectiveness
 - Technology
 - Market intelligence
- Current guide for choice of species and planting material
- Conclusions





Development of the forest area in Denmark

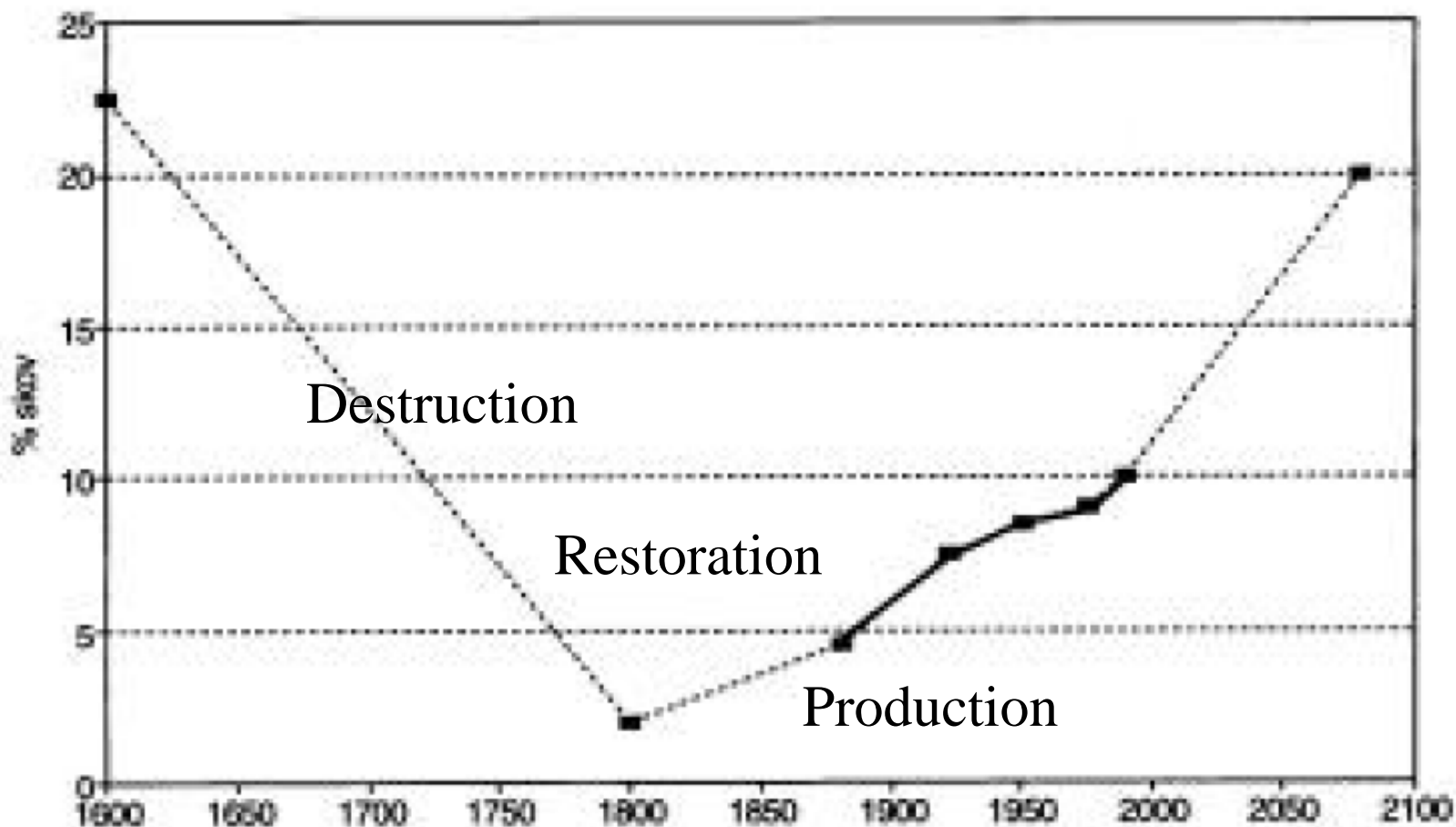


Brug af frøkilder 1997 (Graudal et al.)



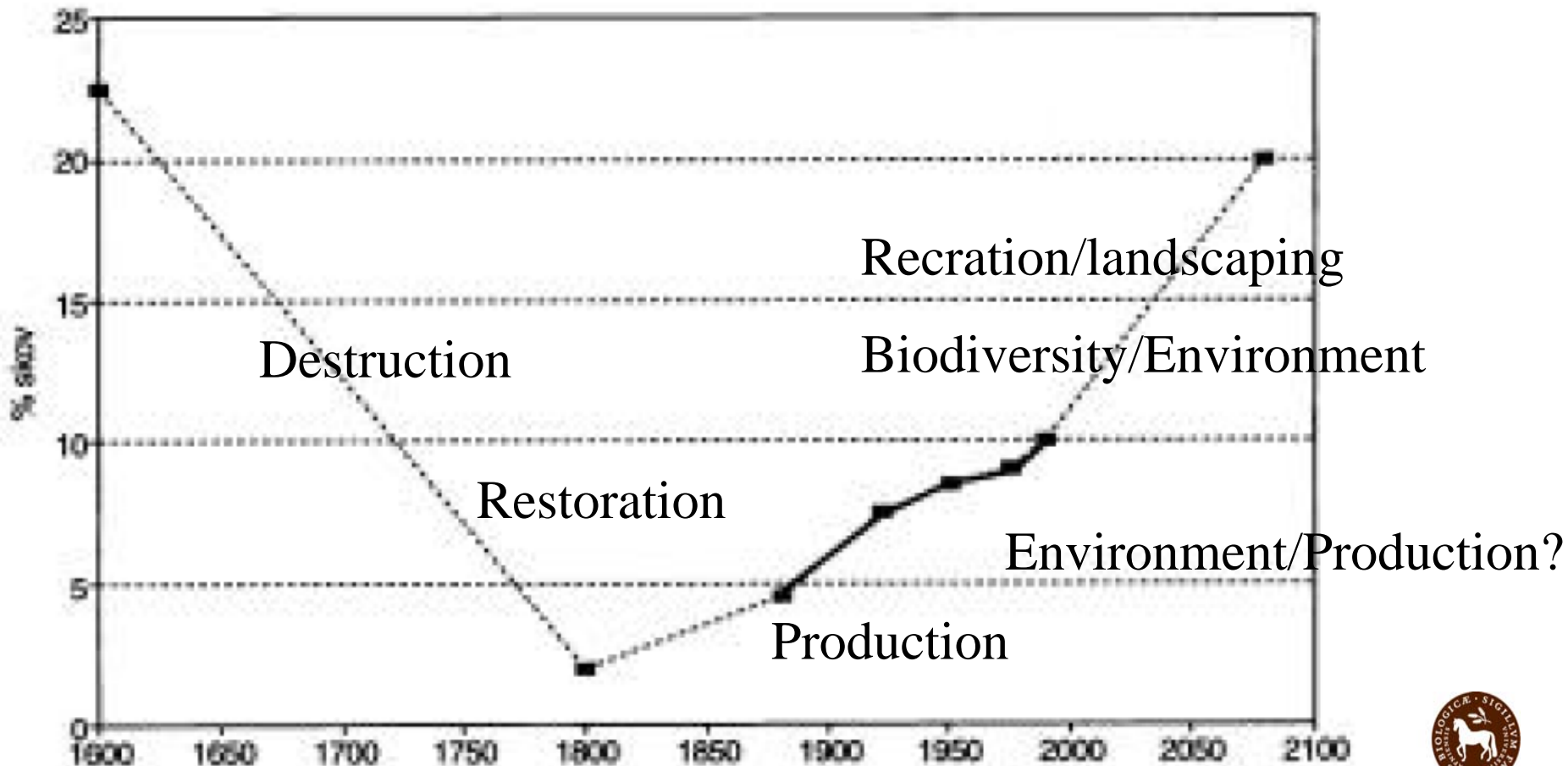


Development of the forest area in Denmark



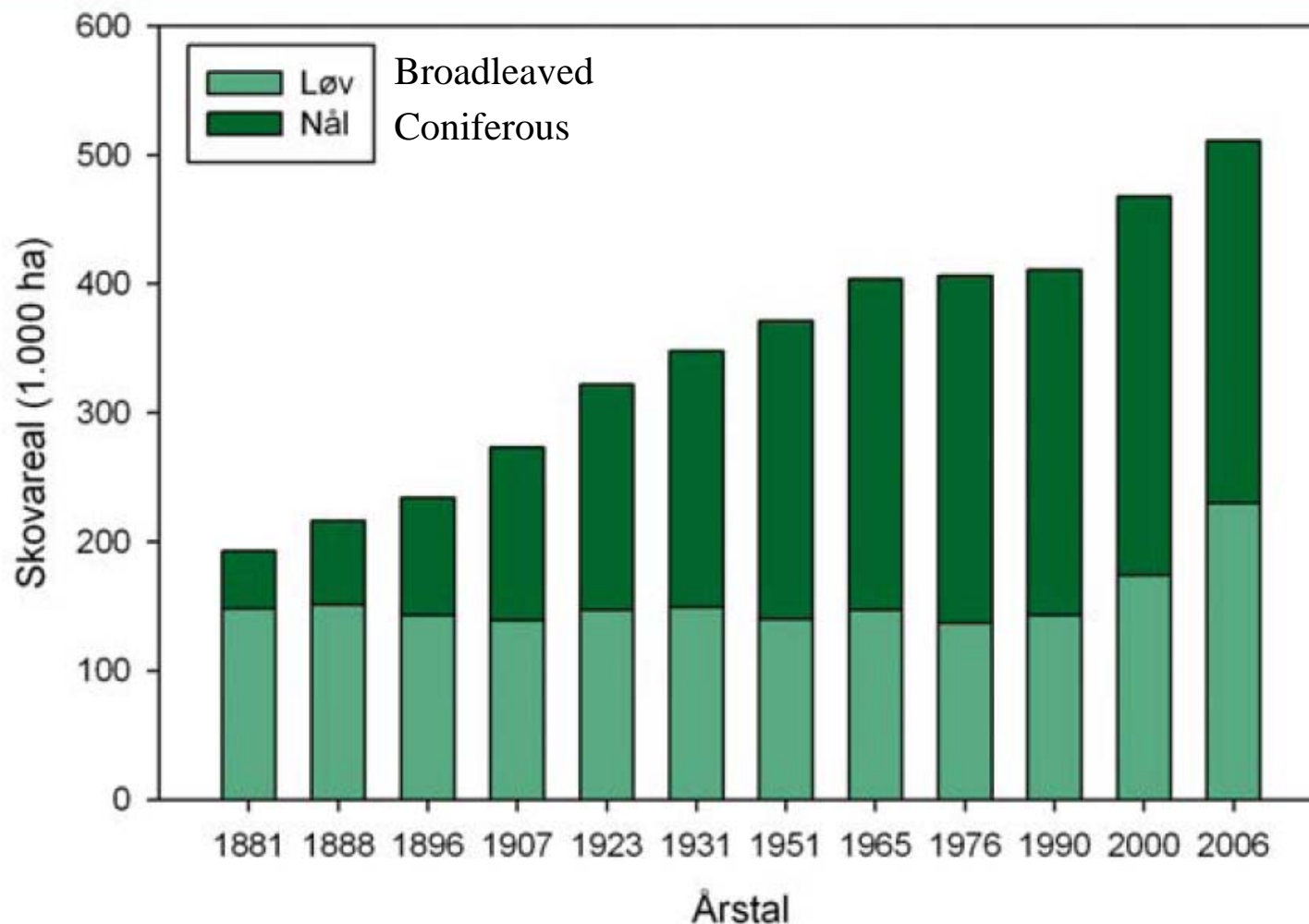


Development of the forest area in Denmark





Development of species composition

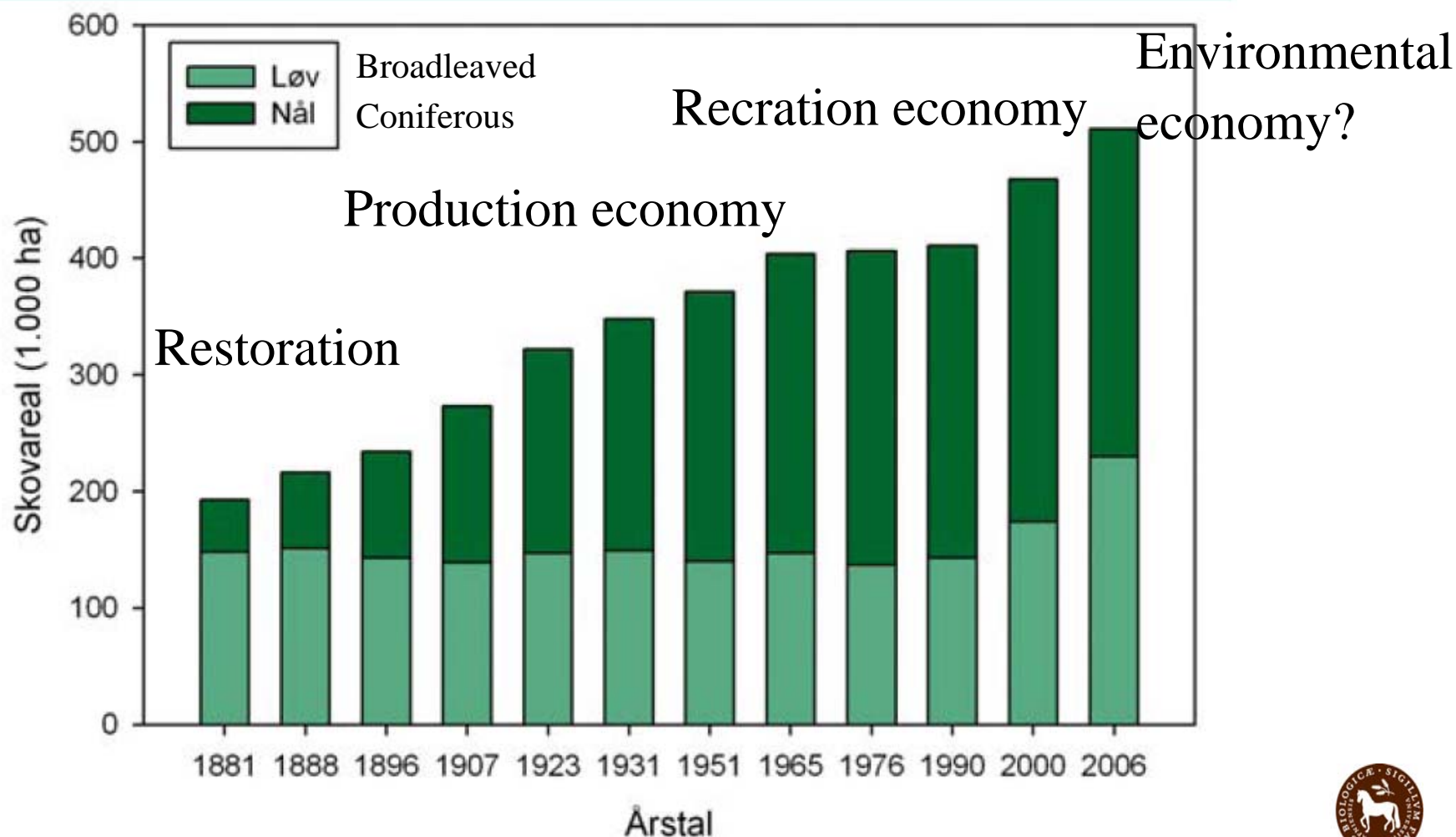


Figur 1.1. Udviklingen i det skovbevoksede areal i Danmark fra 1881 til 2006.





Development of species composition



Figur 1.1. Udviklingen i det skovbevoksede areal i Danmark fra 1881 til 2006.



Use of genetic resources in Danish forestry

Genetically appropriate material: two major questions

- What does it mean? What it is?
- How to get it?

The background of the slide is a dense, close-up photograph of numerous snakes. The snakes have a mottled pattern of green and brown scales, typical of certain species found in tropical or subtropical environments. They are coiled and overlapping, filling the entire frame.

What it is depends on the context

Restoration

Production

Biodiversity

Recreation

Landscaping

Environment and climate

Context...

The traditional forestry perspective

- NWFPs

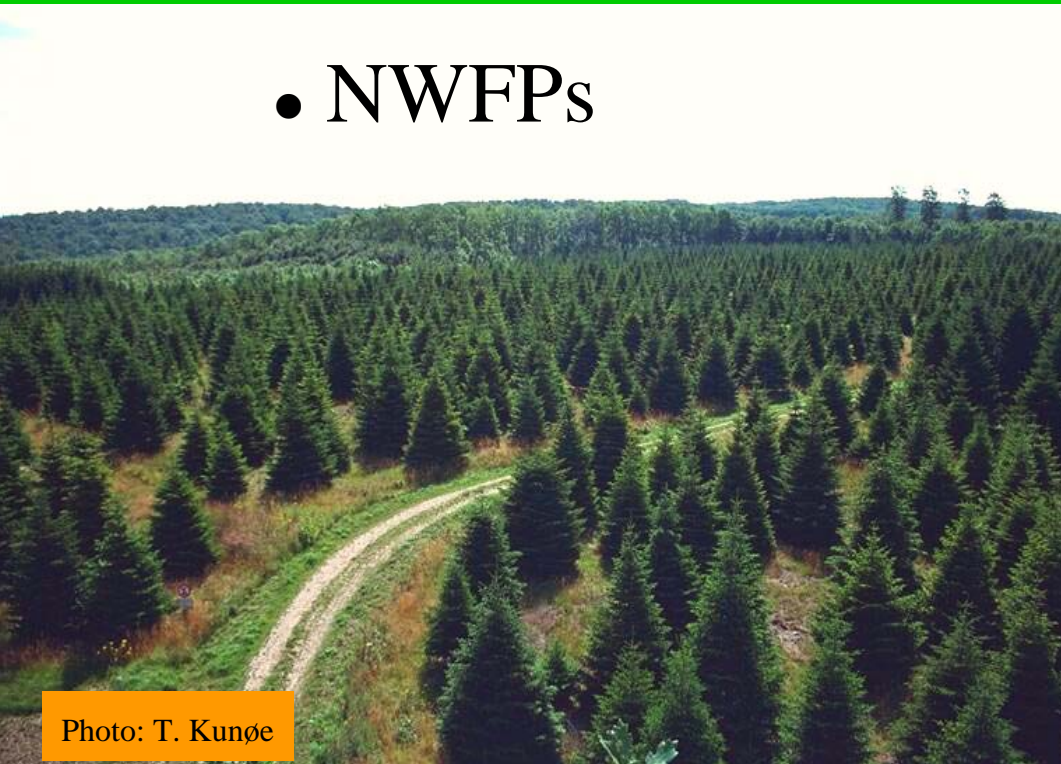


Photo: T. Kunøe



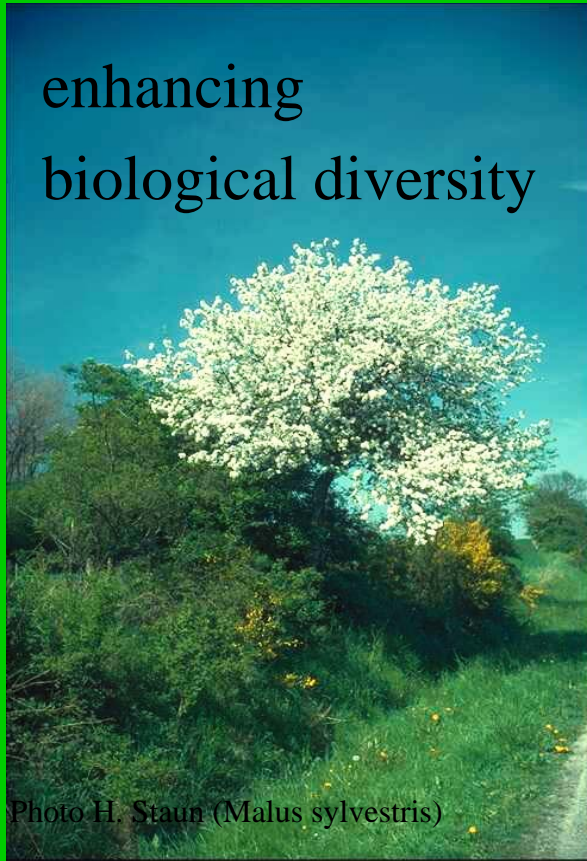
Photo: B. Ditlevsen

- wood production

Context...

The wider 'environmental economy' perspective

enhancing
biological diversity



landscape and
recreational values



environmental protection



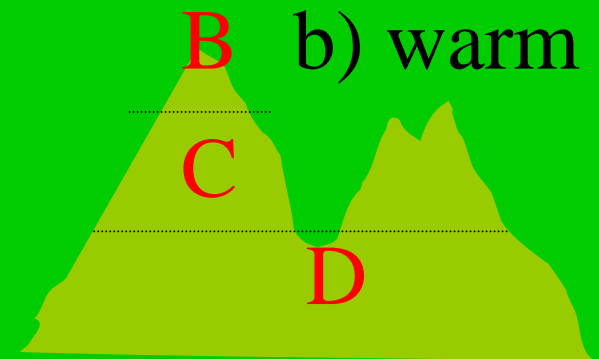
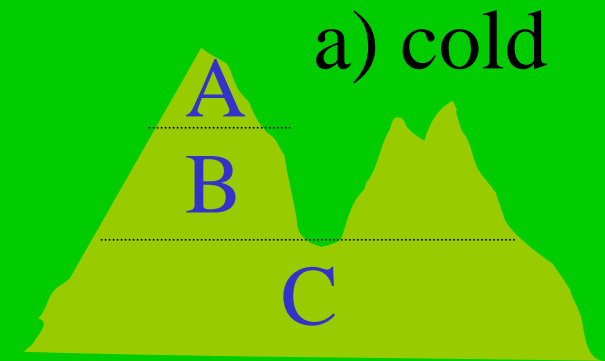
Context...

The wider
'environmental
economy' perspective



Adaptation

Buffering capacity



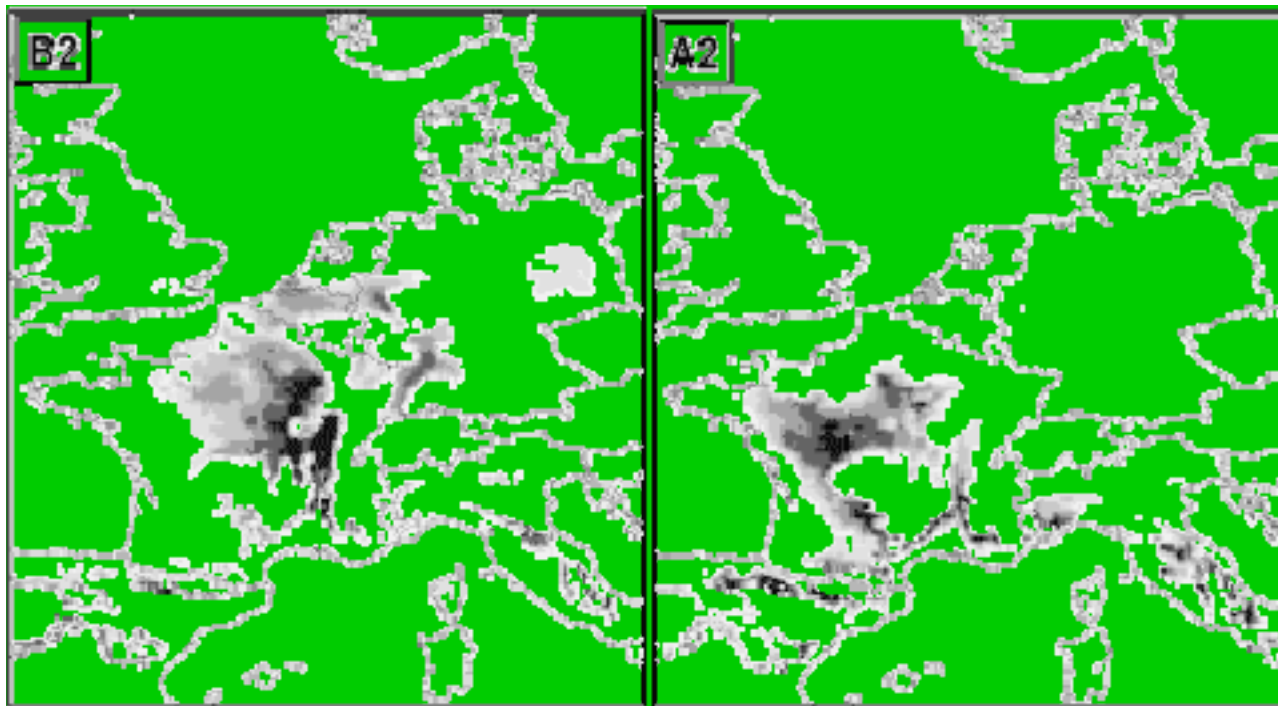
effects of climate change

Mitigation Carbon sequestration (production: storage and substitution)



Adaptation: Will the native Danish forest tree species still 'fit' ?

Geographic areas with climate corresponding to predictions for Denmark -



A2: +3-5 °C in 2100

B2: +2-3 °C in 2100

(compared to 1990)

*Source: Skov,
Svenning og
Normand 2006*

Check if such areas are within the present distribution of our native species





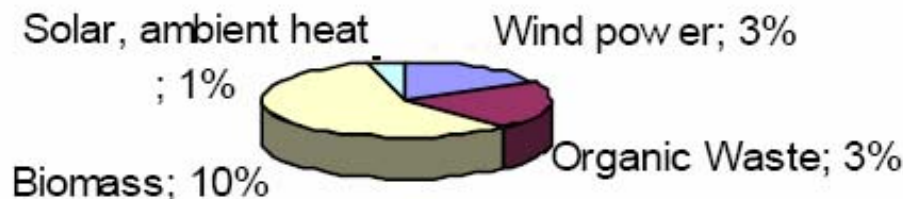
Questions of interest

1. Will our native forest tree species become non-native in the future climate?
 2. To what extent does our (native) species reveal genetic differentiation between climatic-ecological regions?
 3. What is the potential of our tree species to respond through genetic adaption?
- => How to prepare for the future?

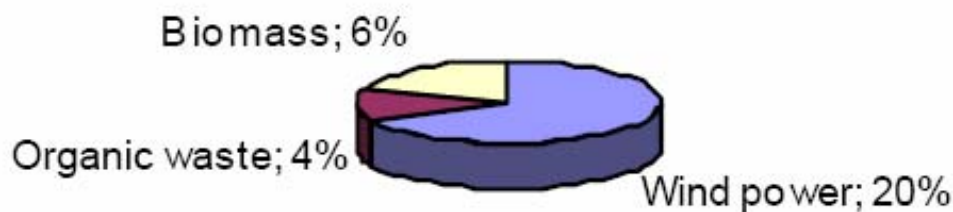


Mitigation

Types of renewables in Denmark



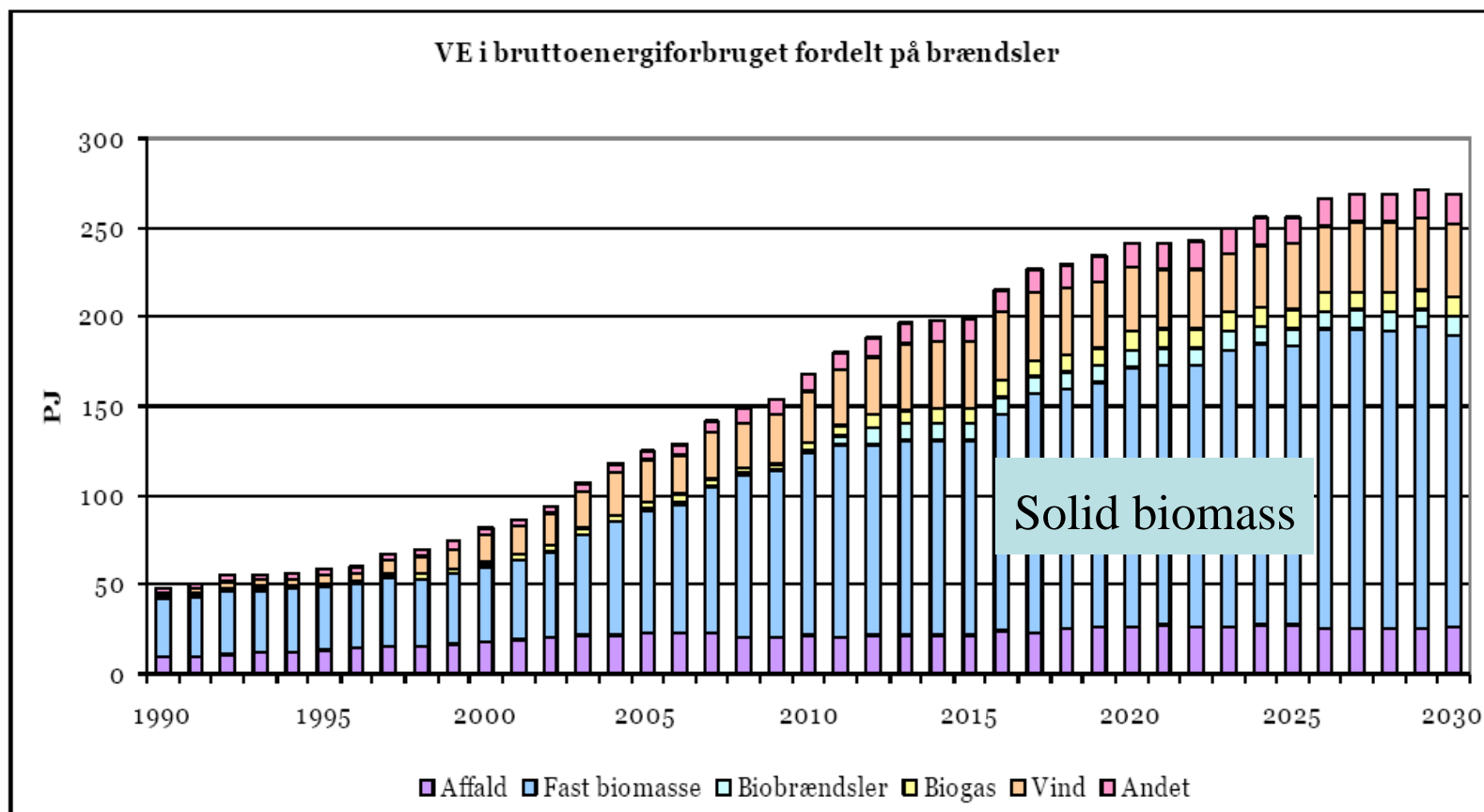
Share of Gross Energy Consumption:
17 % by 2007
(share doubled in 10 years)



Share of Electricity Supply:
29,5 % by 2007
(share tripled in 10 years)

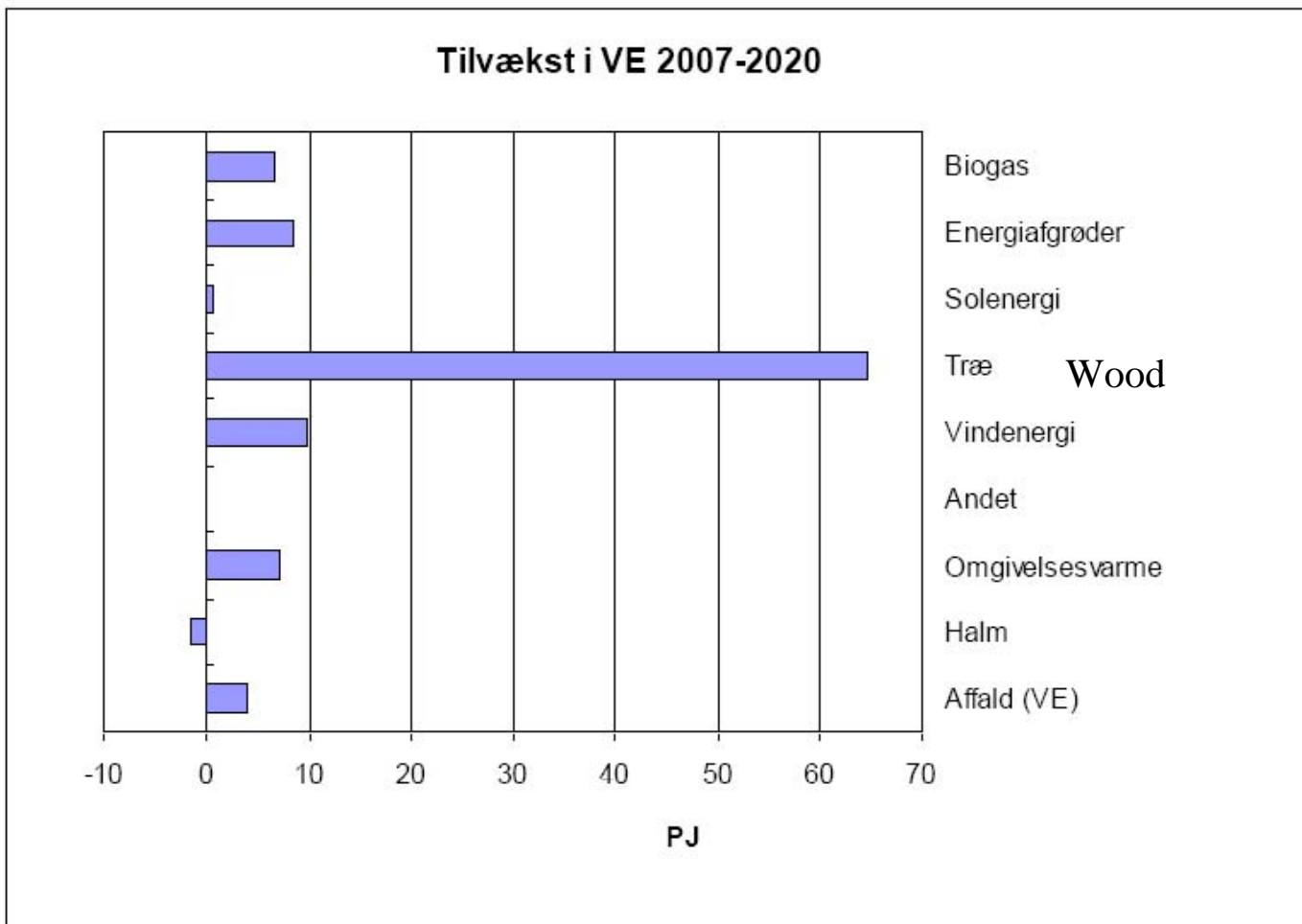


Sources of sustainable energy 1990-2030





Increase in sustainable energy 2007-2020





Some conclusions on ‘appropriateness’

- Wood supply has been losing relative importance and other values become more prominent; production may be on its way back to the age
- Diversity and flexibility increasingly important
- ➔ The concept of genetic appropriateness is now multidimensional
- ➔ Informed choice of seed source remains equally important

Example:

What is the best seed source of *Prunus padus* ?

Planting in semi-urban area =>

Criteria: well defined health, uniformity =>

Choice: 'Dafo' - 2-5 selected clones

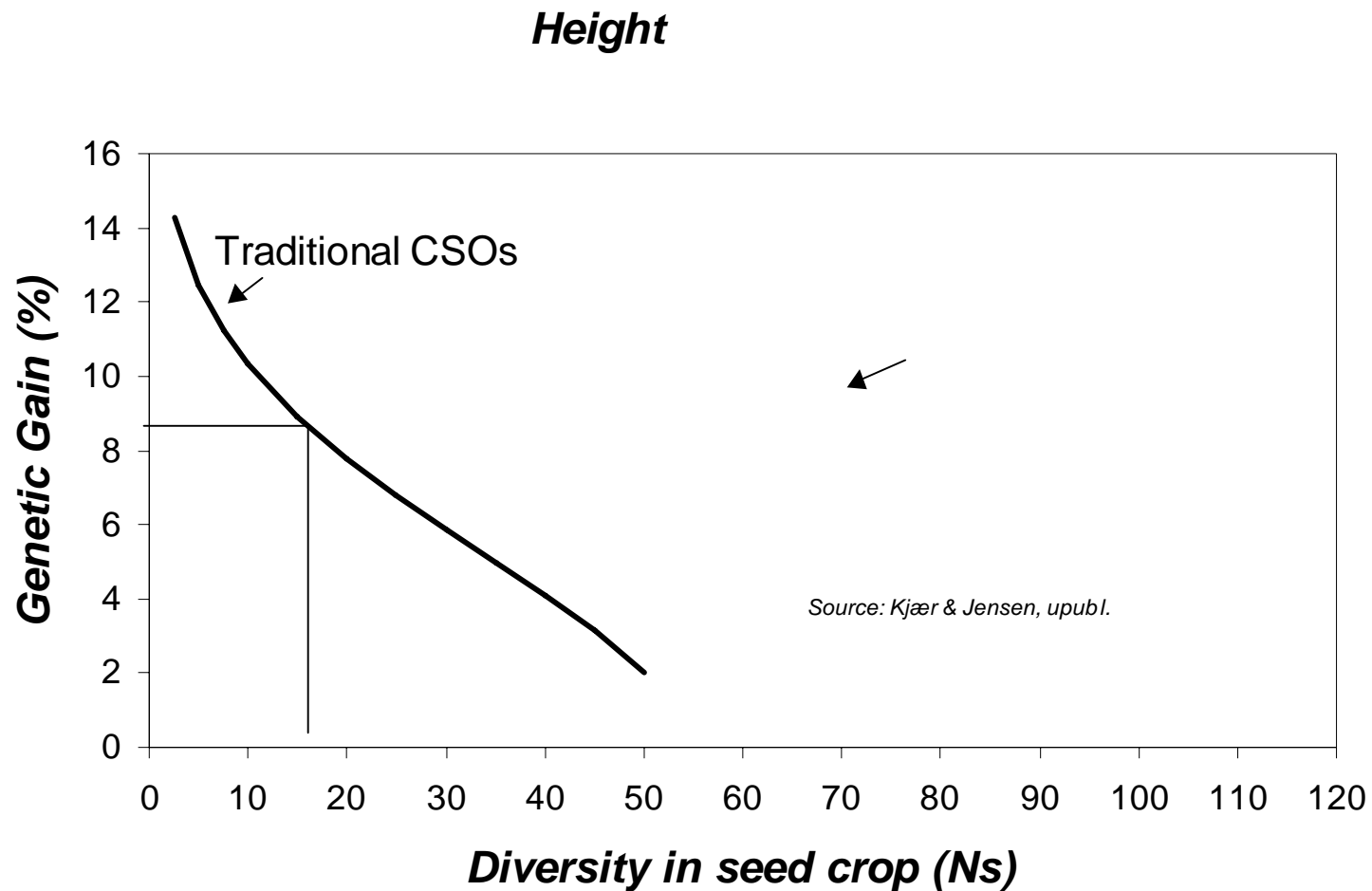


Planting in reforestation programmes

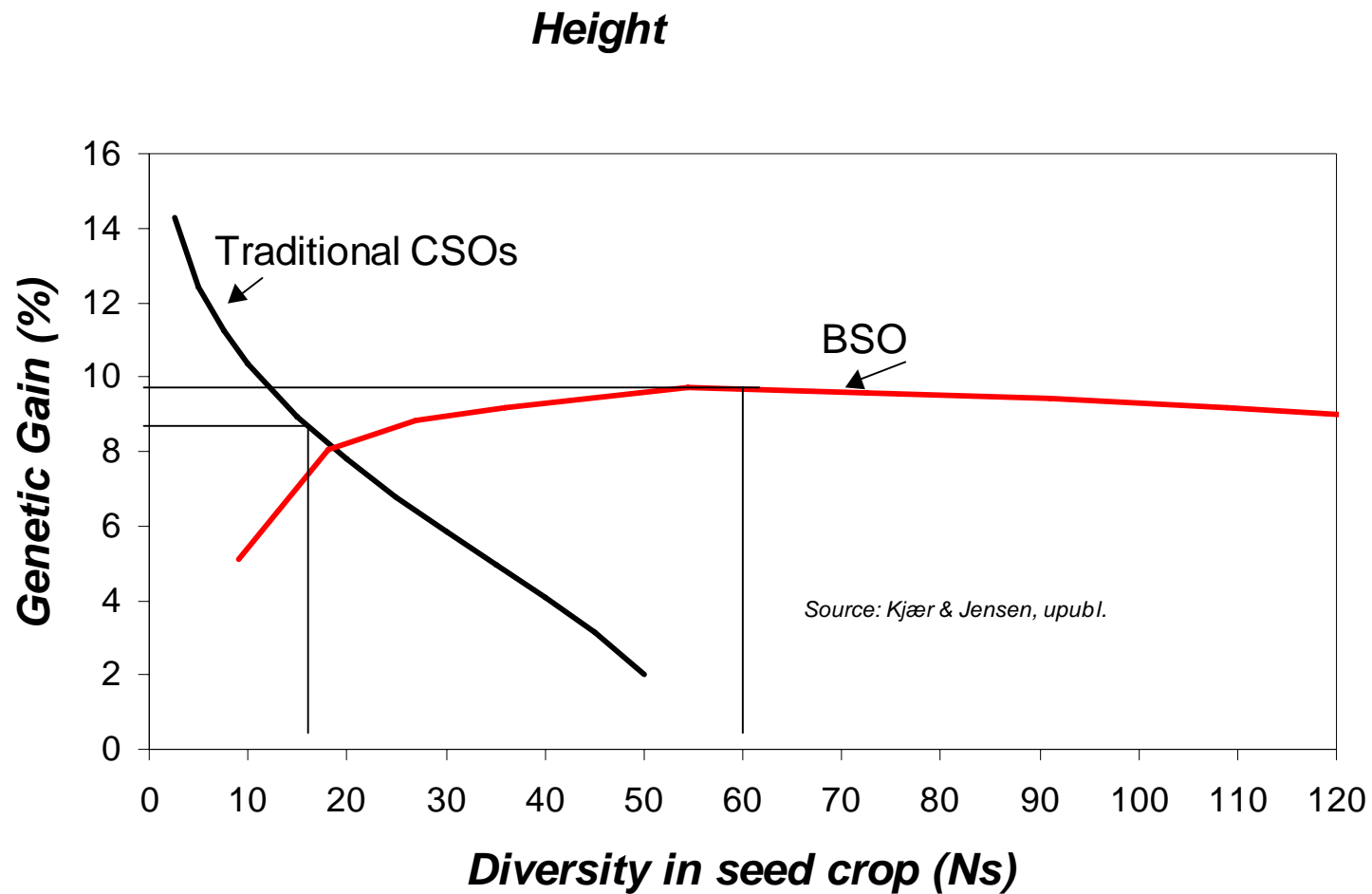
Criteria: easy establishment, long termed health and adaptability, future seed source for naturalisation, diversity

=> **Choice:** Selected natural populations, e.g
'Rådmandshaven'

Example: Oak- gain versus diversity



Example: Oak- gain versus diversity



Some consequences of the broader concept of appropriateness

- A broader range of seed sources required
- Domestication and deployment strategies need to be developed

Photo: P. Mathiasen, Seljerørn, Tilst

Use of genetic resources: How to get the right material?

Delivery of appropriate genetic material in commercial scale: A question of organising effective seed procurement

What does an effective seed procurement system look like?

The background of the slide is a close-up photograph of numerous chestnut husks (involucres) and some fallen leaves. The husks are brown and spiky, while the leaves are a mix of green and brown, suggesting an autumn setting. The lighting is warm, highlighting the textures of the natural materials.

Adequate **quantities** and **qualities**
delivered at the right **time**

- Beneficiaries and cost effectiveness

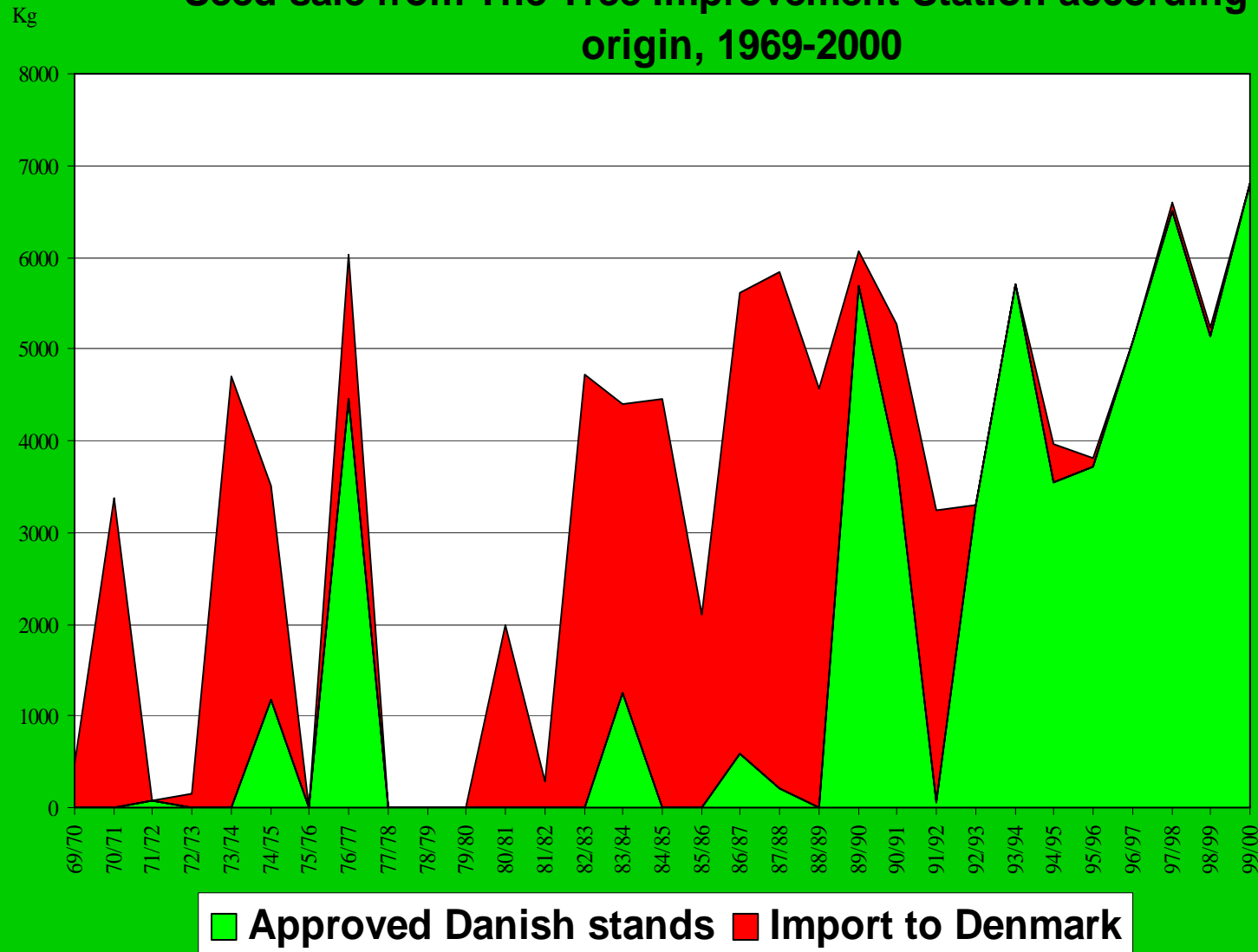
Role of market intelligence:

- Users knowledgeable about supply of species, prices, and quality
- Seed suppliers knowledgeable about users preferences

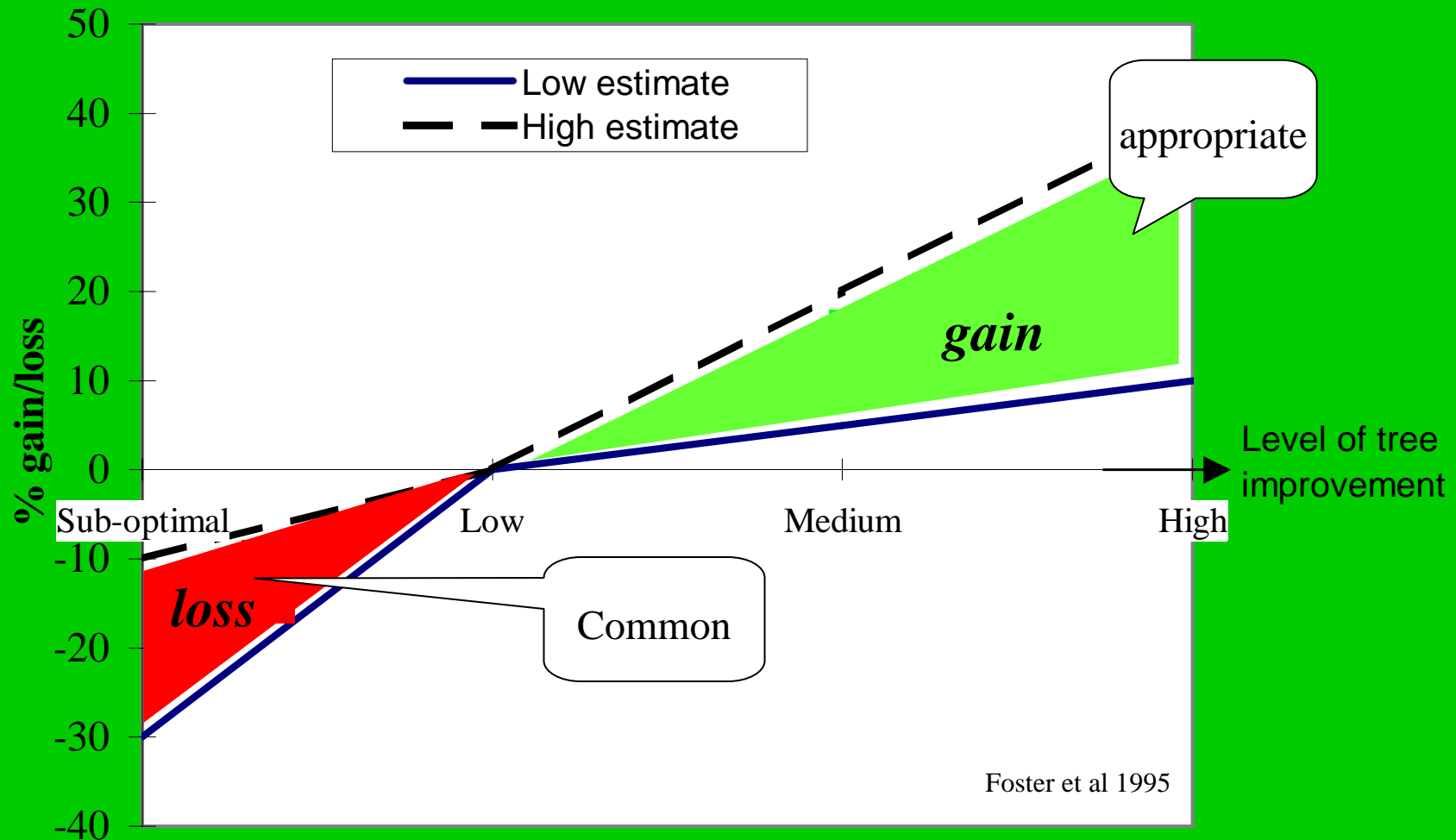
Role of technology

Importance of technology...: Example *Fagus sylvatica* in Denmark

Seed sale from The Tree Improvement Station according to origin, 1969-2000



The traditional forestry perspective



*Possible gain from the first cycle of tree improvement
based on realised experience (vol. prod.)*

Beneficiaries and cost effectiveness?



Beneficiaries and cost effectiveness?

Activities

A: Pays =>

A: Profits

A: Pays =>

B,C..D: Profits

A : Pays =>

Natural resources

‘profits’

Who pays and who benefits?

(seed dealer, tree grower, society)

(Often not the same organisations)

Beneficiaries and cost effectiveness?

Activities	Profit 'today'	Profit 'after some years'
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When will benefits be gained?


(Often investments that run over decades)

Beneficiaries and cost effectiveness?

Activities	Profit 'today'	Profit 'after some years'
A: Pays => A: Profits	Revenue covers costs	Future revenue cover costs (investment)
A: Pays => B,C..D: Profits	Economic and Social Benefits cover costs	Future Economic and Social Benefits cover costs
A : Pays => Natural resources 'profits'	Environmental Benefits cover costs	

=> Cost effectiveness must be evaluated at different levels
(dealer, grower, society – short and long term)

=> Need to consider institutional aspects

A background image of a forest with many trees and green foliage.

Distribution of both seed(lings) and trustworthy information - often together. Allowing users to make an informed choice

=> Match seed source to site

=> Match seed source to functions of plantings

⇒Information

⇒Legislation

The role of legislation

- Certification control: users can trust info on origin
- Trade regulation: only approved material can be used
 - Genetic bottleneck
 - may not comply with appropriateness
- Enforced deployment strategy: only appropriate material can be used
 - Hard to control
 - Genetic bottleneck

Information

**Distribution of both seed(lings)
and trustworthy information -
often together. Allowing users to
make an informed choice**



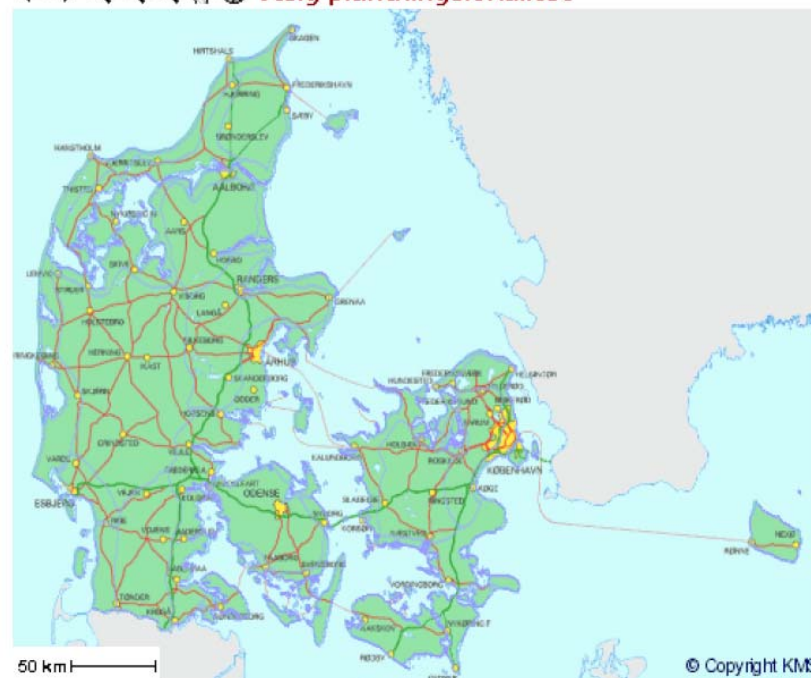
Hjælp og vejledning



Velkommen til Plantevalg.dk

Vælg **Plantningslokaliteten** ved at klikke med musen på kortet. Anvend evt. zoom funktionen for at finde den præcise lokalitet - tryk derefter på "**Vælg plantningslokalitet**", og klik på kortet med musen.

↔ 🔍 📏 📍 🌐 **Vælg plantningslokalitet**



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[Klik her for at se systembeskrivelse samt kriterier for anbefaling](#)

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Hjælp og vejledning

Plantningslokalitet

← **Ny plantningslokalitet**

VIGTIGT: Oplysninger om de lokale plantningsforhold *)

Jordbundsforhold	God / kraftig	
Dræningsproblemer	<input type="radio"/> Ja <input checked="" type="radio"/> Nej	
Særligt vindudsat	<input type="radio"/> Ja <input checked="" type="radio"/> Nej	
Særligt frostudsat	<input type="radio"/> Ja <input checked="" type="radio"/> Nej	

*) Se vejledning ved at holde musen på de enkelte linier.

Fortsæt ved at vælge et af følgende moduler: *)

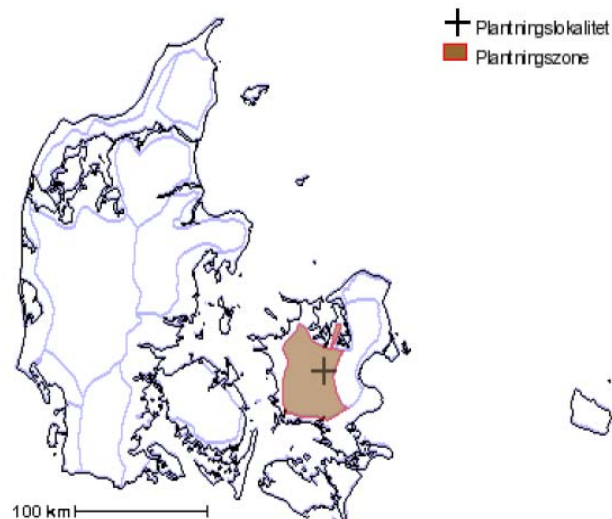
[Artsanbefalinger](#) ➔

[Frøkildeanbefalinger](#) ➔

[Plantning med tilskud](#) ➔

[Planteforsyning](#) ➔

*) Se kort beskrivelse af modulerne ved at holde musen over de enkelte linier



Hvis der er behov for oplysninger og rådgivning om artsblandinger, plantningsteknik, skovdyrkning o.l. henvises til skovbrugs- og plantningskonsulenter



Hjælp og vejledning

Artsanbefalinger

← Ny Plantningslokalitet

← Vælg nyt modul

Vælg plantningsformål

Skovproduktion



*) Anbefalingsgrupperne er: A=bedst egnet, B=næstbedst, C=mindre egnet **) Hold musen over ! for at se popuptekst

Anbef., kategori *)	Navn	Latin	Popup info **)	Arts- beskri- velse	Frø- kilde- oversigt
A	Ask	Fraxinus excelsior	!	→	→
A	Avnbøg	Carpinus betulus	!	→	→
A	Bøg	Fagus sylvatica	!	→	→
A	Cypres	Chamacyparis lawsonianae	!	→	→
A	Douglasgran	Pseudotsuga menziesii	!	→	→
A	Dunbirk	Betula pubescens	!	→	→
A	Europæisk lærk	Larix decidua	!	→	→
A	Fuglekirsebær	Prunus avium	!	→	→
A	Grandis	Abies grandis	!	→	→
A	Hybridlærk	Larix eurolepis	!	→	→
A	Japansk lærk	Larix kaempferi	!	→	→

Conclusions (use of tree genetic resources)

→ The concept of ‘appropriateness’ has changed in a multidimensional direction, but remains at least equally important

→ Success requires delivery of both seed and information (often together) in a well-functioning seed supply system

→ Success requires that ‘cost-effective’ long term activities are funded and implemented

References

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