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Swedish University of Agricultural Sciences

Institutionen för växtproduktionsekologi  
Department of Crop Production Ecology

# Predicting height of coppiced Poplars

## A comparison between a traditional and mixed effect model

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# Poplars in Sweden

- Exotic
- Average annual production on farmland:  
20-25 m<sup>3</sup> ha<sup>-1</sup> yr<sup>-1</sup> (Norway Spruce: 8-12 m<sup>3</sup> ha<sup>-1</sup> yr<sup>-1</sup>)
- Rotation periods: ≤ 20 years
- Increased interest as future bioenergy supplier
- Ca 1 000 hectares (only) of “old” plantations (15-25 year)  
FAQ: After harvest, new plantation or 2<sup>nd</sup> generation coppices ?
- Additional ca 500 hectares new established plantations



*18 years old poplar stand in Uppland  
(foto T. Johansson )*

## 2:nd generation coppiced poplars

### Low (no) cost and promising biomass production



Present Biomass model  
variable: DBH

New Biomass model (on-going pre-study)  
variables: DBH & Height

Constraint:  
Field measurements with high accuracy of diameters are easy to collect, heights not!

Shortcut: Development of Height model



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# Objective

Improvement of Biomass Estimations  
in  
2:nd Generation Coppiced Poplar Stands

# Data

- 1 research area (Skåne province)
- 5 sites, (4-8 year, after final cut)  
Variables: Area, Soil, Lat-Long, Age, Mean Height, Clone, Management, Damages
- 50 sample coppice/site, (tot 250 st)  
Variables: observed DBH and Height





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# Mixed effect height model

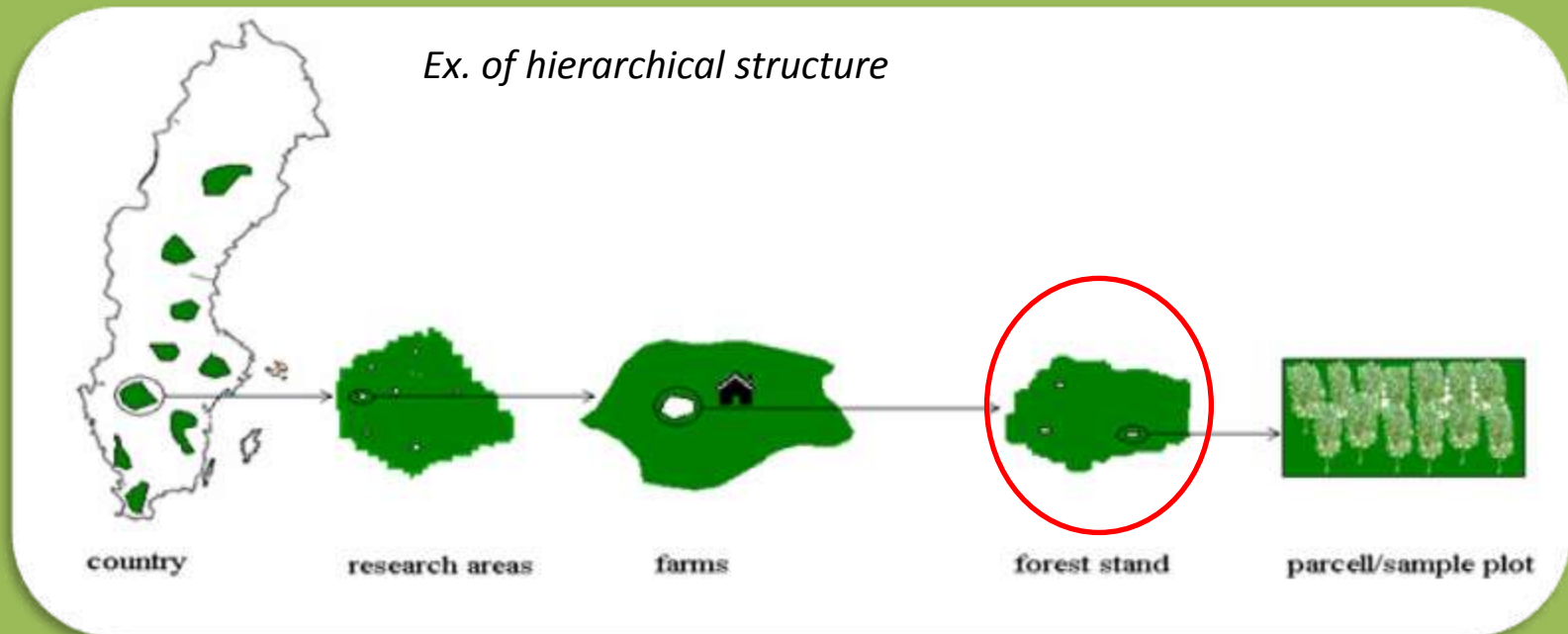
vs.

# Traditional height model(s)

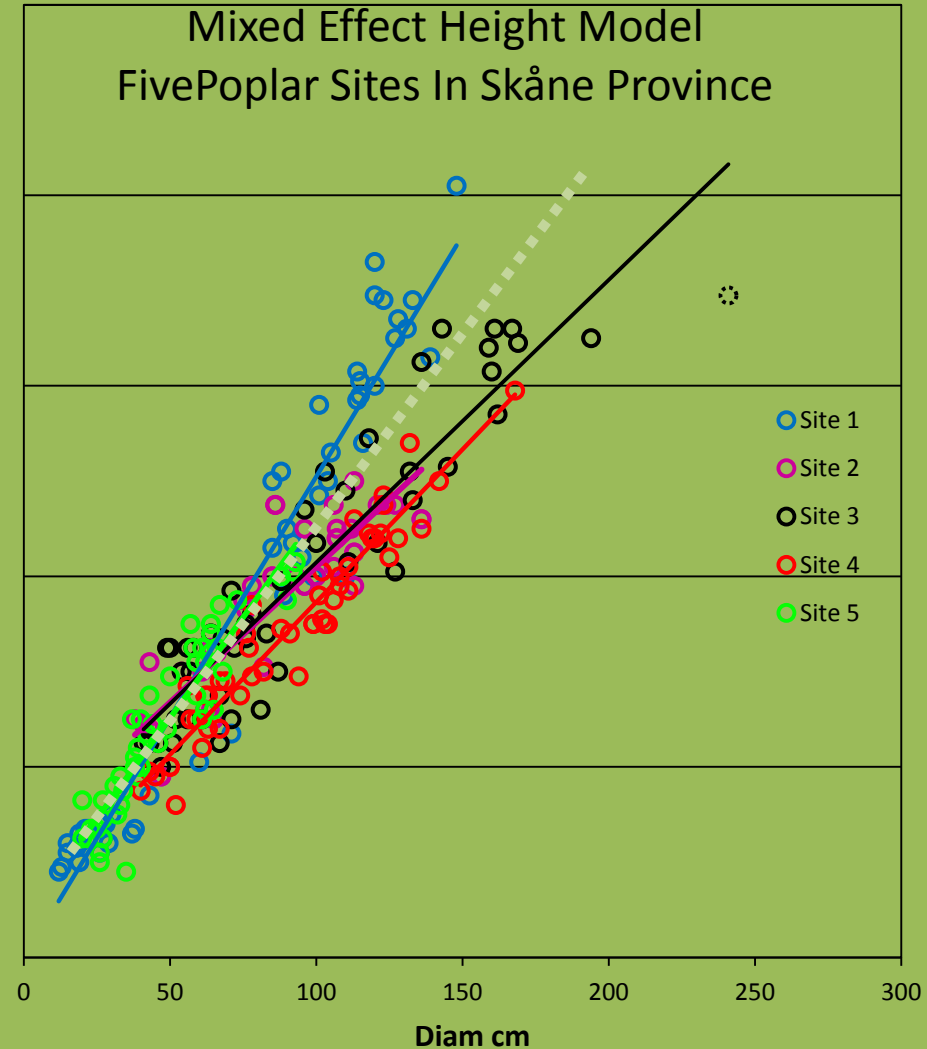
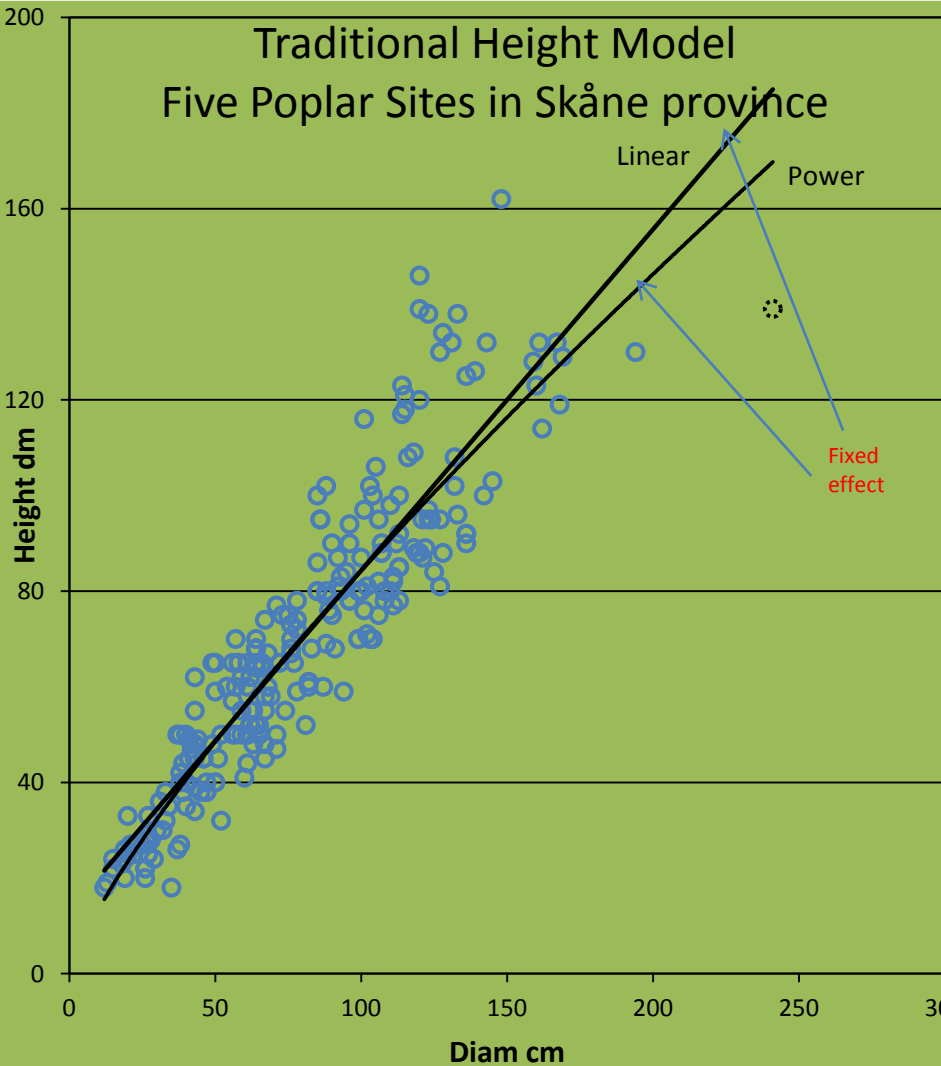
(developed on 250 sampled coppices)

# What is a Mixed Effect Model?

A model that callibrates for a (random) group effect/difference  
-when data has hierarchical structure









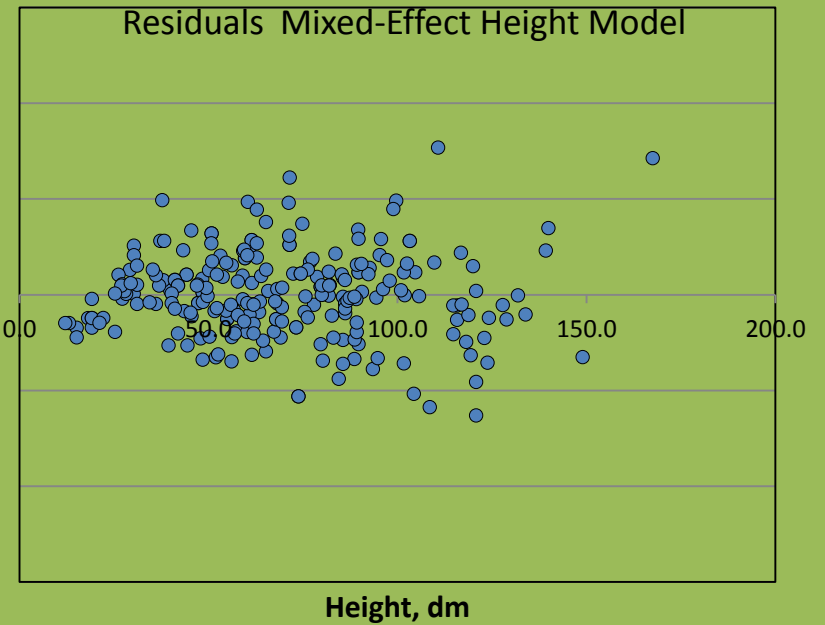
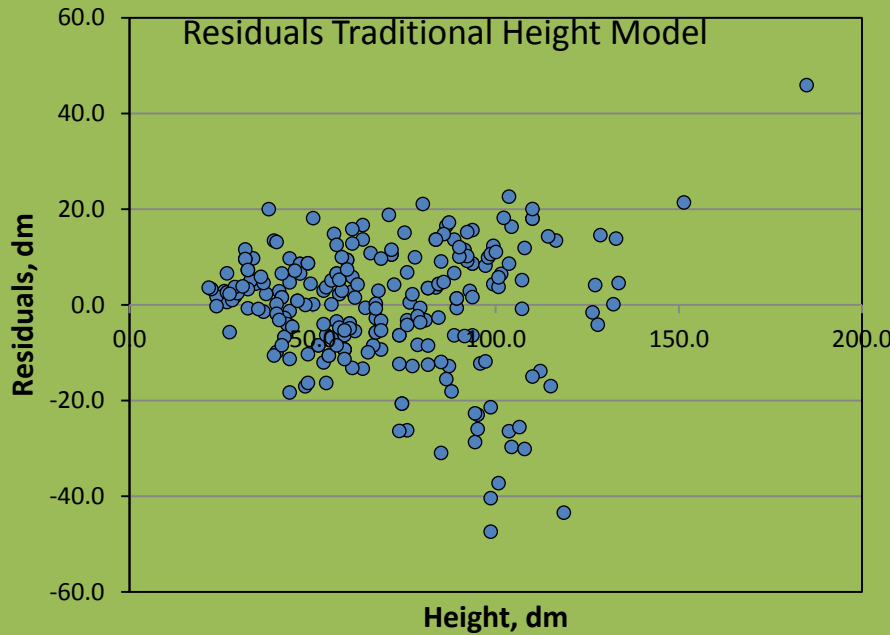
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# Results

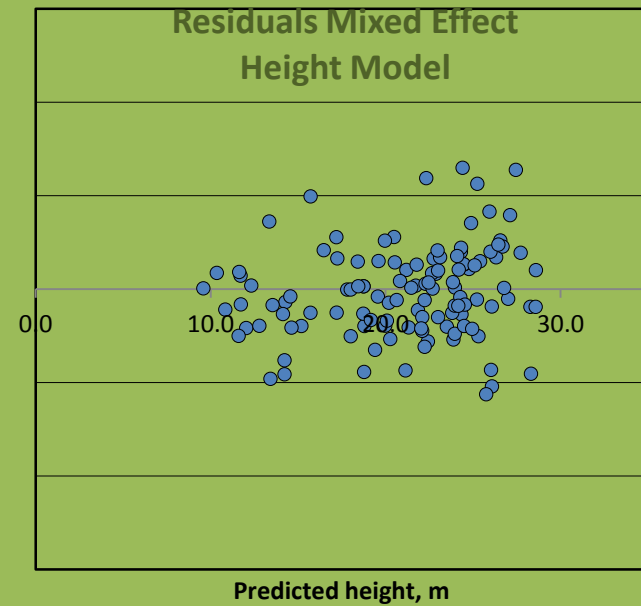
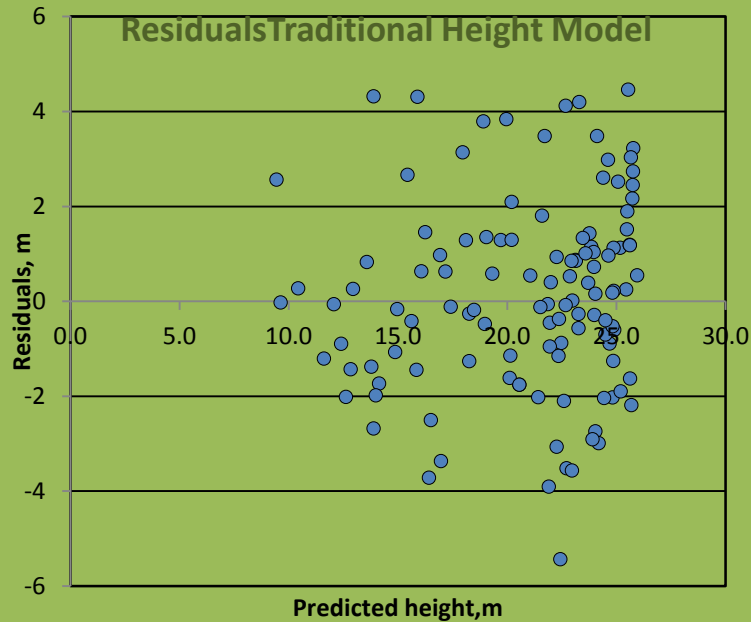
## Height Model Predictions

## Residuals and Bias (coppiced poplars)



	Absolute Bias, dm	Min Bias, dm	Max Bias, dm
Trad. Model	9.4	-45,9	47,4
Mixed Model	6.6	-30,8	25,2

## Residuals and Bias ("old" poplars)



	Absolute Bias, m	Rel Absolute Bias %
Trad. Model	1.59	8.0
Mixed eff Model	0.75	3.7



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Thank You  
for  
Your Attention



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# Volume/biomass estimations in sample plots

1. Construct stem height model, MEM, applied to trees in sample plot
2. Construct stem volume/biomass model, MEM, applied to trees in sample plot
3. Summarize the stem volumes/biomass