

# Agronomic performance of guayule as alternative source of rubber and latex in Europe: genetic variation and effects of irrigations and fertilization

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# Guayule field testing in Europe

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- Near Cartagena, Spain
- Montpellier, France
- Perpignan, France
  
- Trial with > 30 guayule lines
- Fertilizer/irrigation trial with AZ2 > 3 years
- Cultivar trial with 6 lines > 2 years
- Rubber & resin determination using NIRS (Sunisat et al. in press) on basis of ASE
  
- Goal: test agronomic & economic feasibility





# Montpellier trial





# Montpellier trial



- Unexpected problems with snow cover and water logging
- Some guayule lines survived extended frost periods and snow ( $< -5$  C)
- Yield potential with water logging severely compromised
- Irrigation had negative effect on yield

# Cartagena trials



- Nursery first
- Technique like with lettuce
- Drip irrigation
- Plant density: 50,000/ha



# Cultivar trial (6 lines)





# A few months regrowth





# Fertigation trial

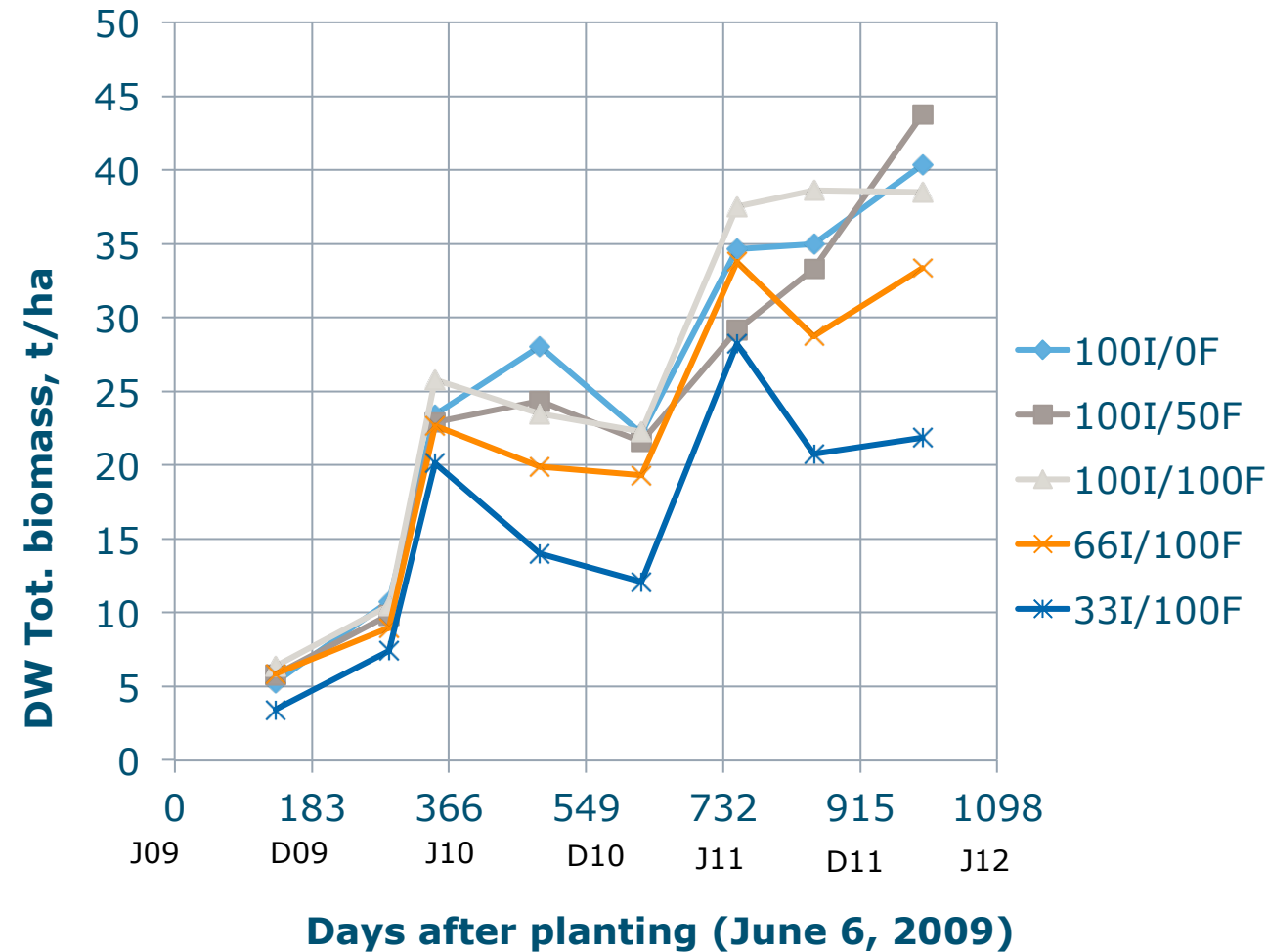
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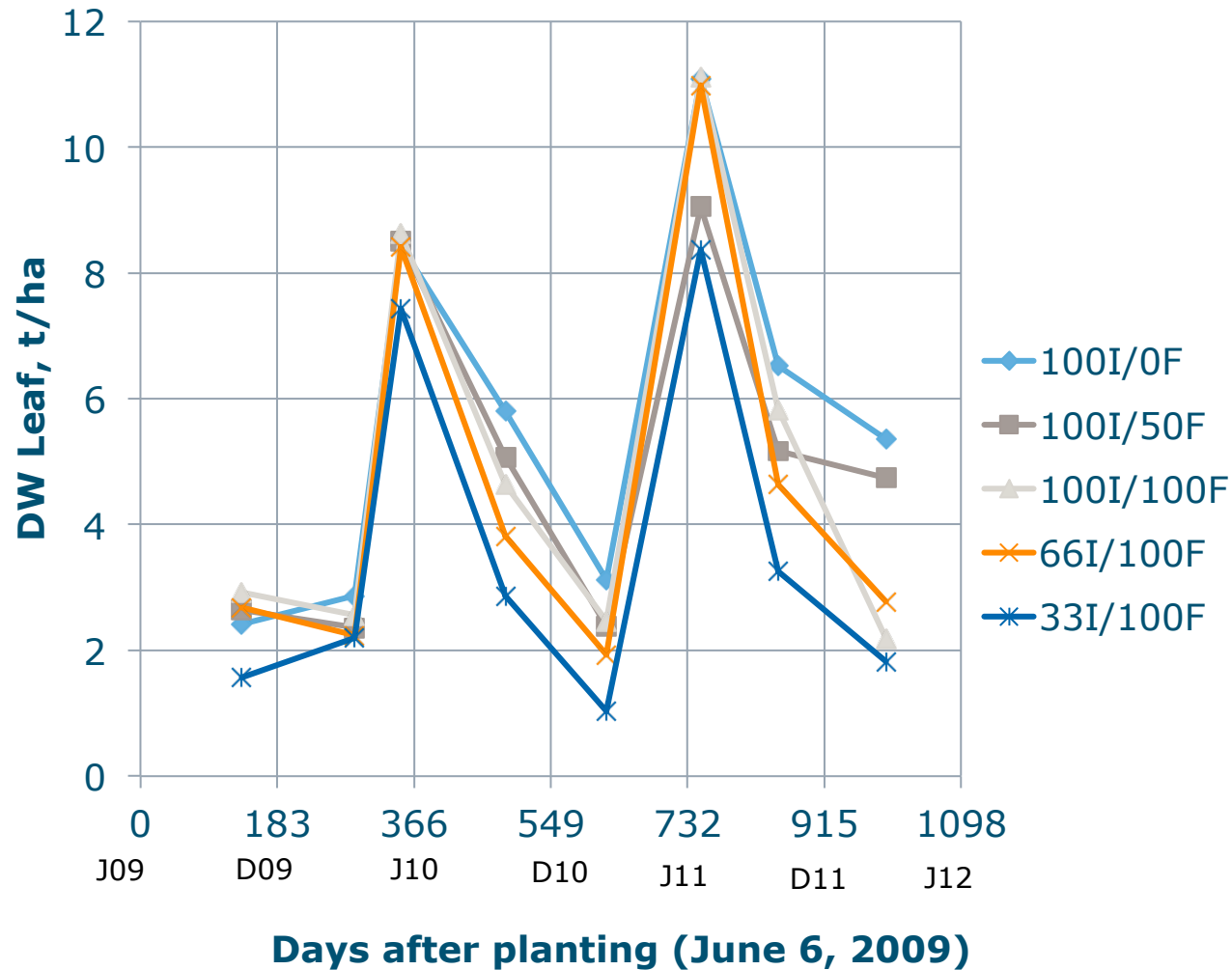
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# Fertigation trial: Total biomass

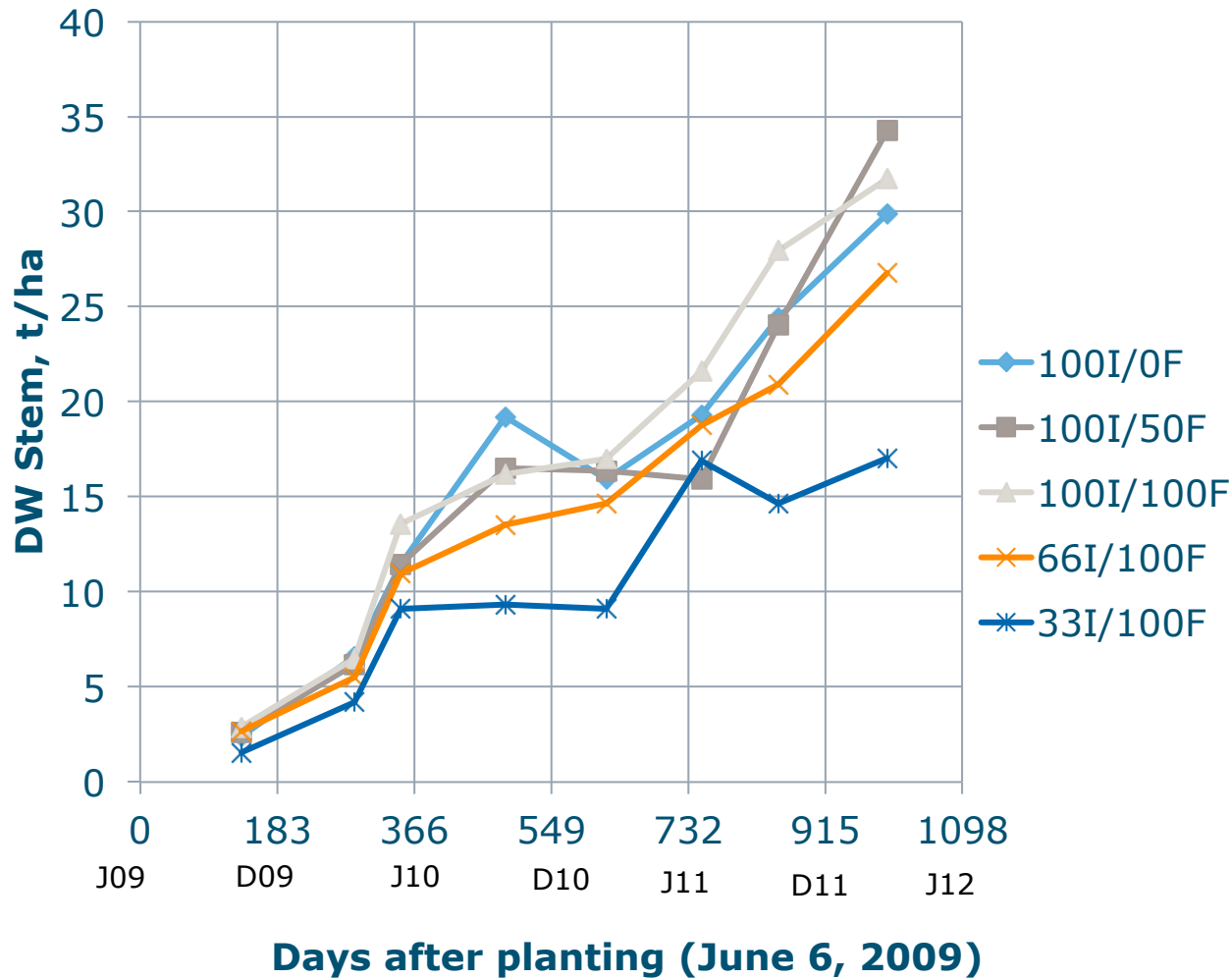


# Fertigation trial: Leaf biomass

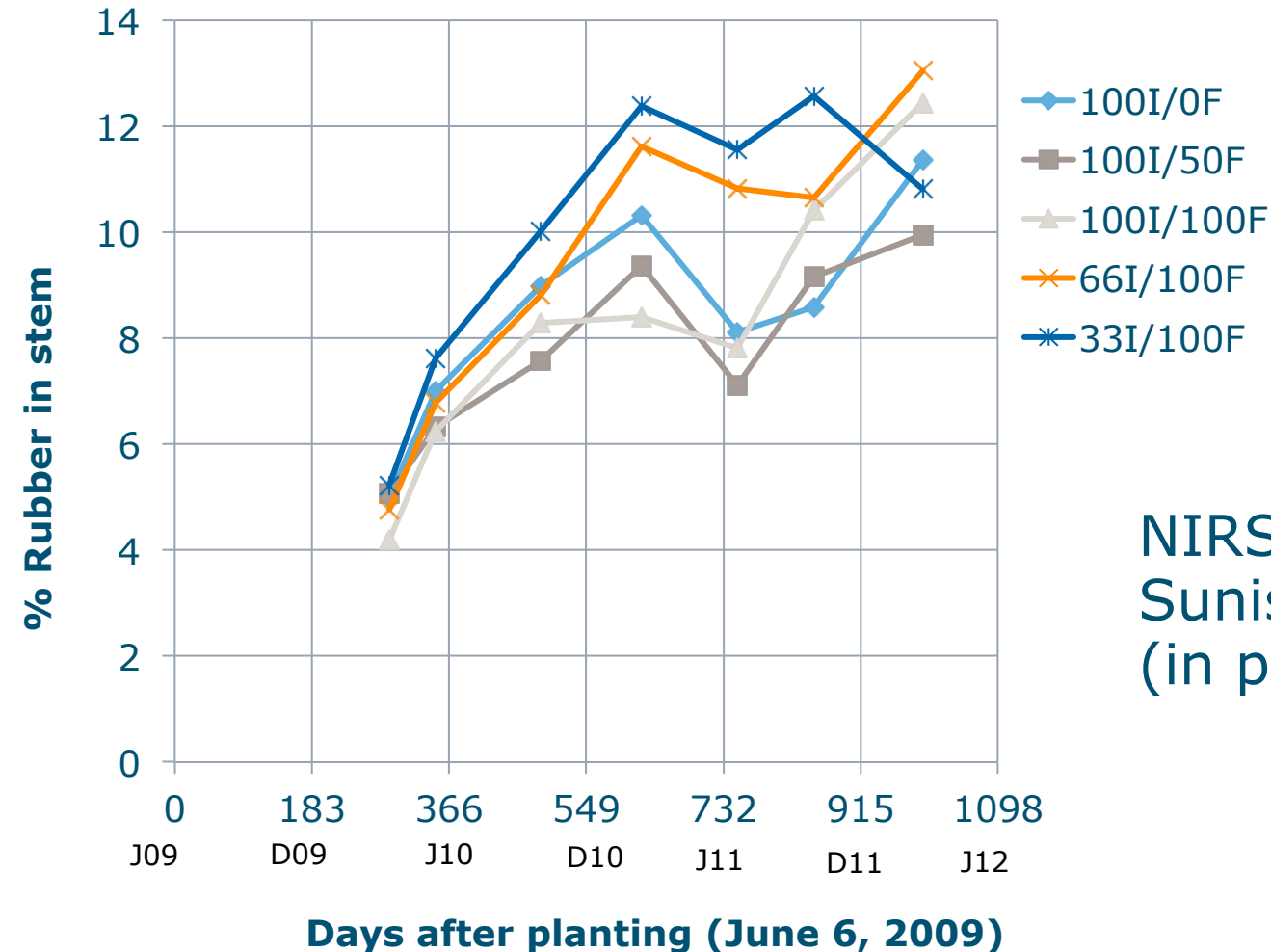




# Fertigation trial: Stem biomass



# Fertigation trial: Rubber % (NIRS-ASE)

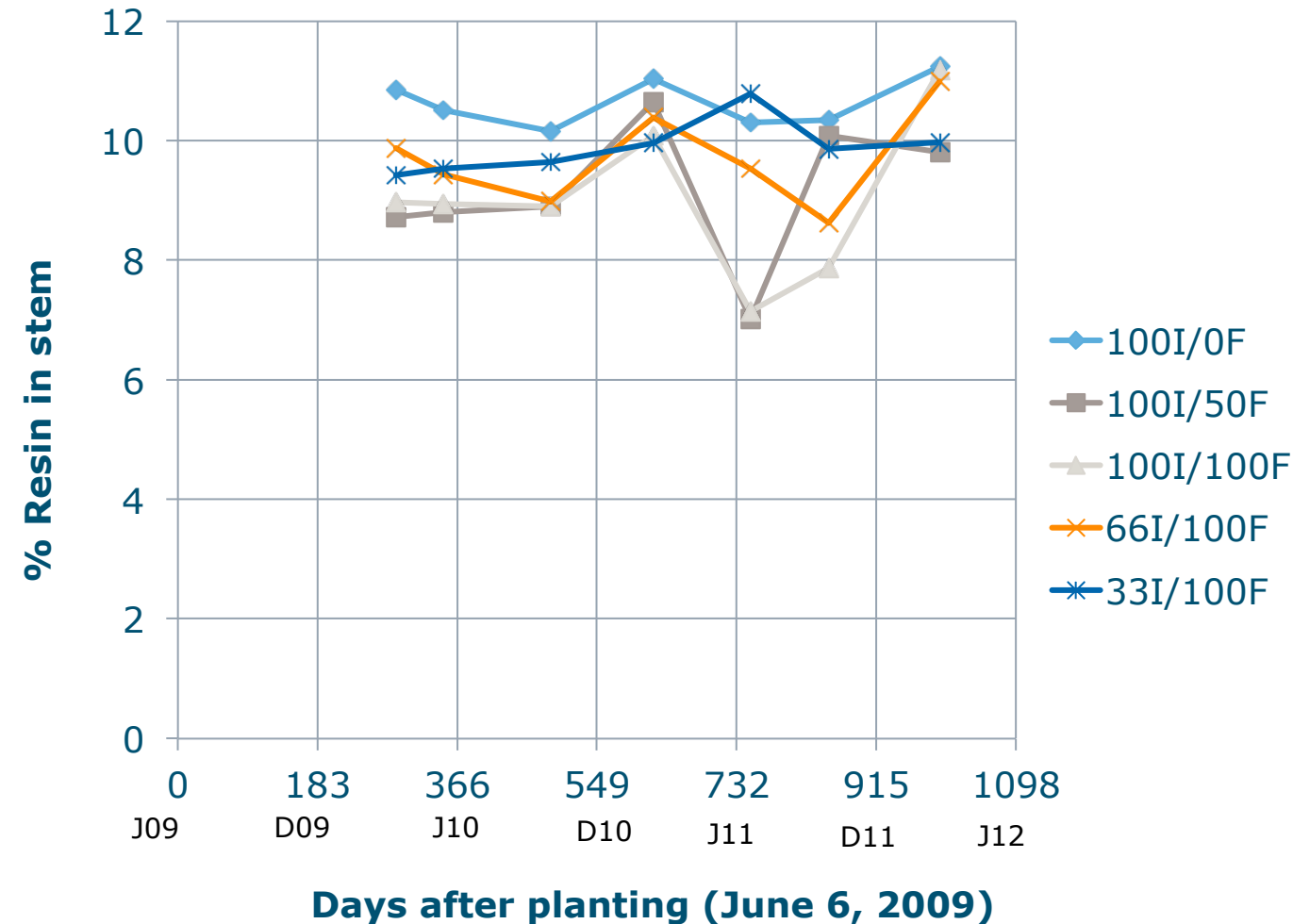


NIRS-calibration:  
Sunisat SUCHAT et al.  
(in press)

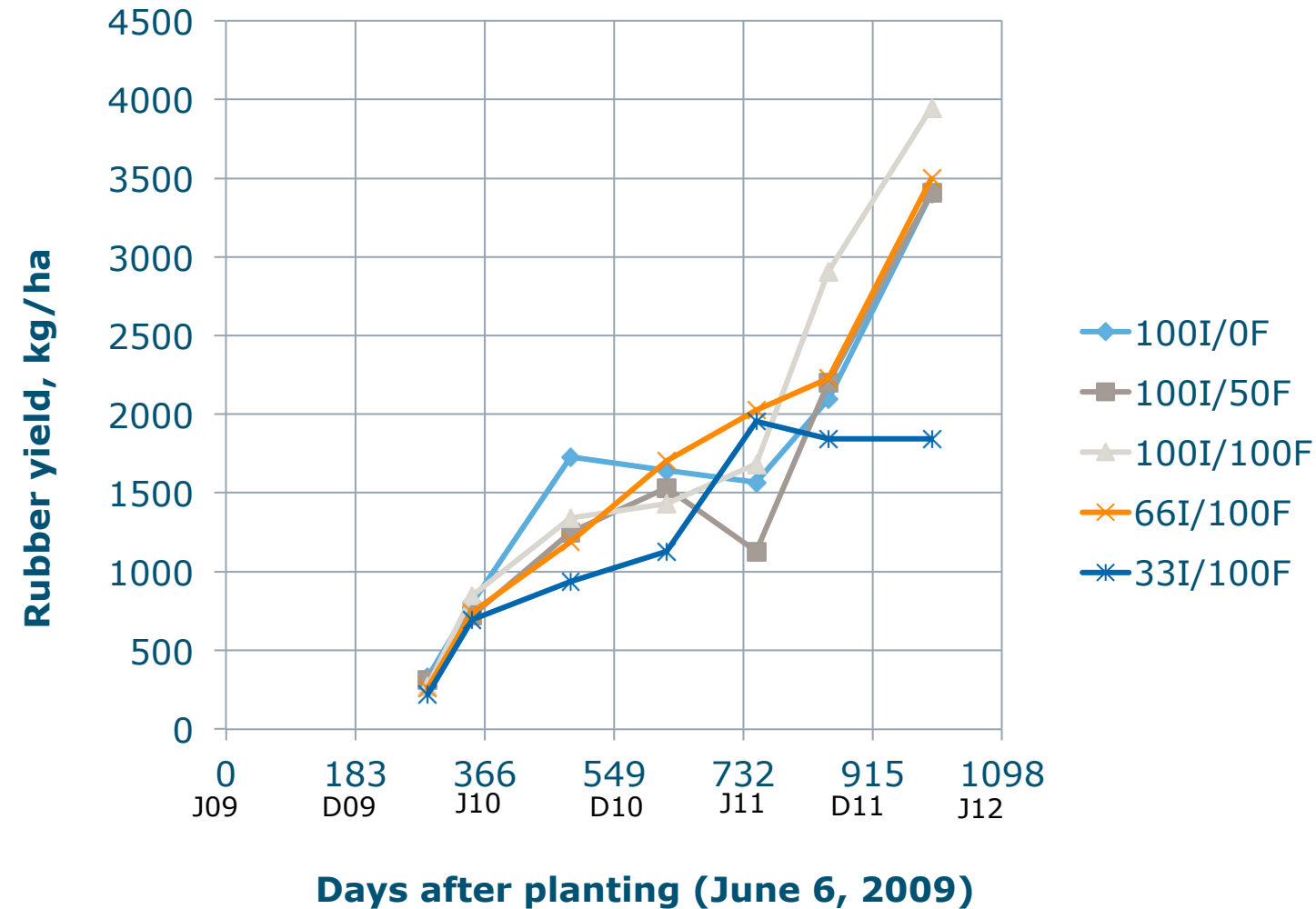




# Fertigation trial: Resin % (NIRS-ASE)

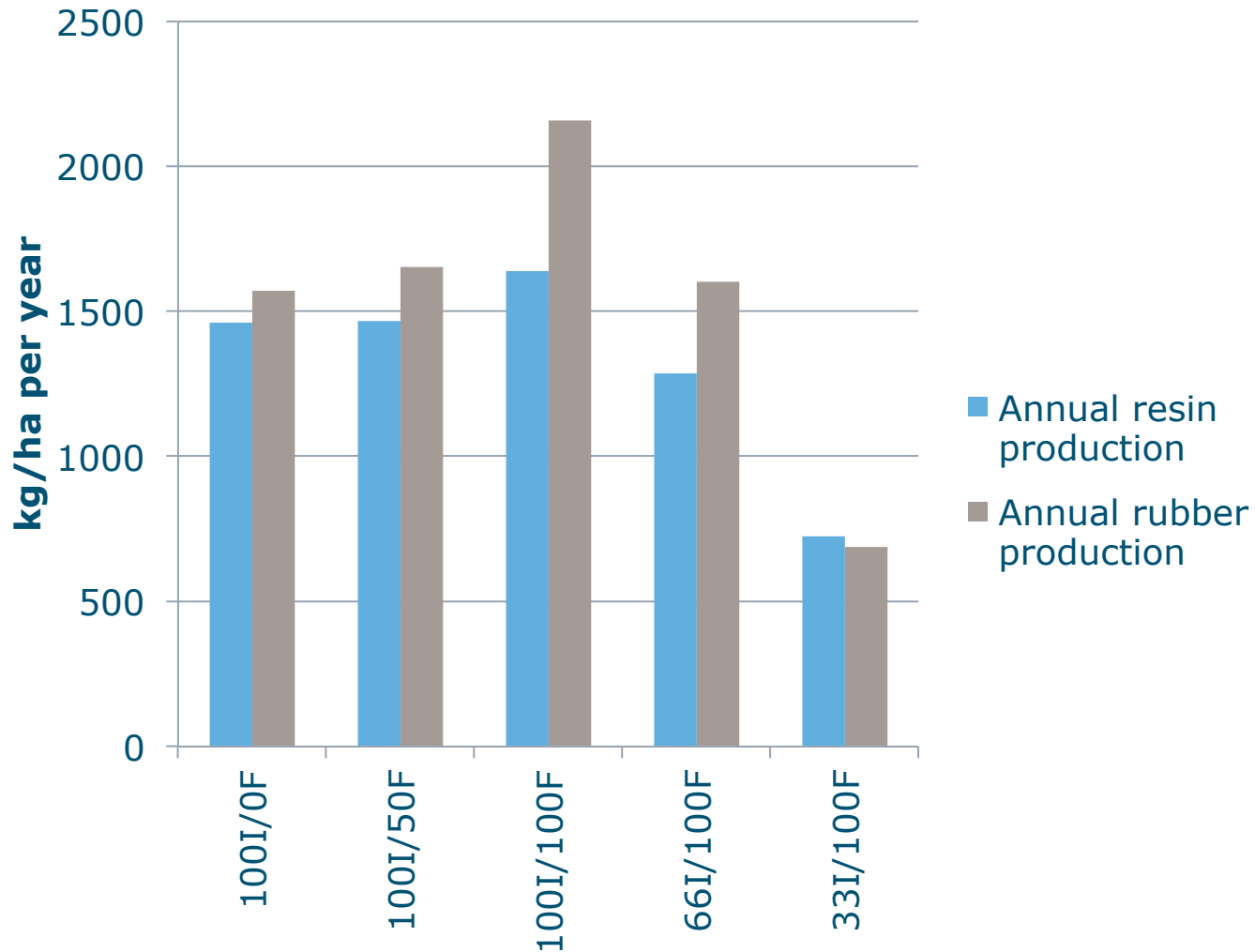


# Fertigation trial: Rubber yield

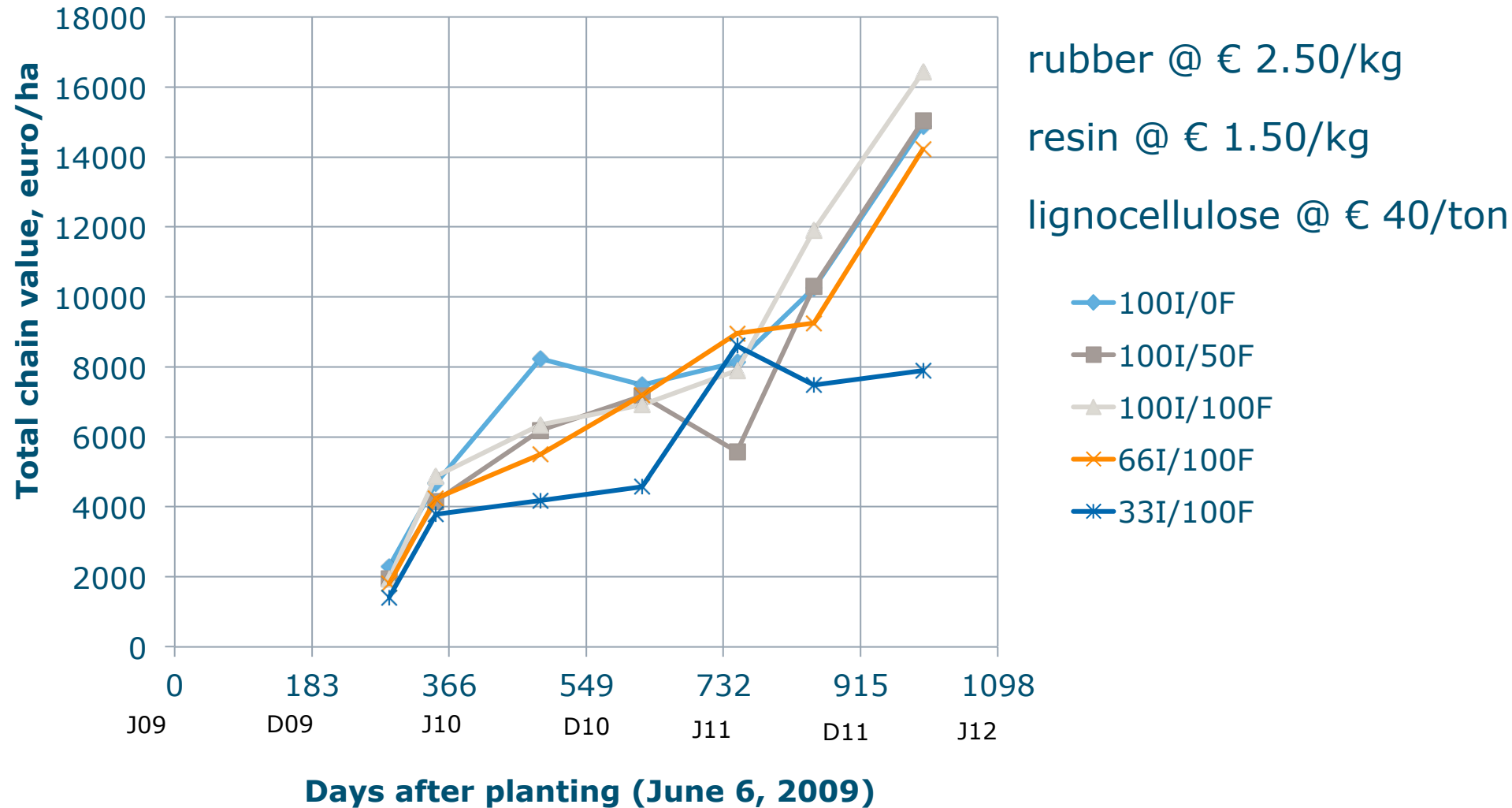




# Fertigation trial: Average annual yield



# Fertigation trial: Gross chain value

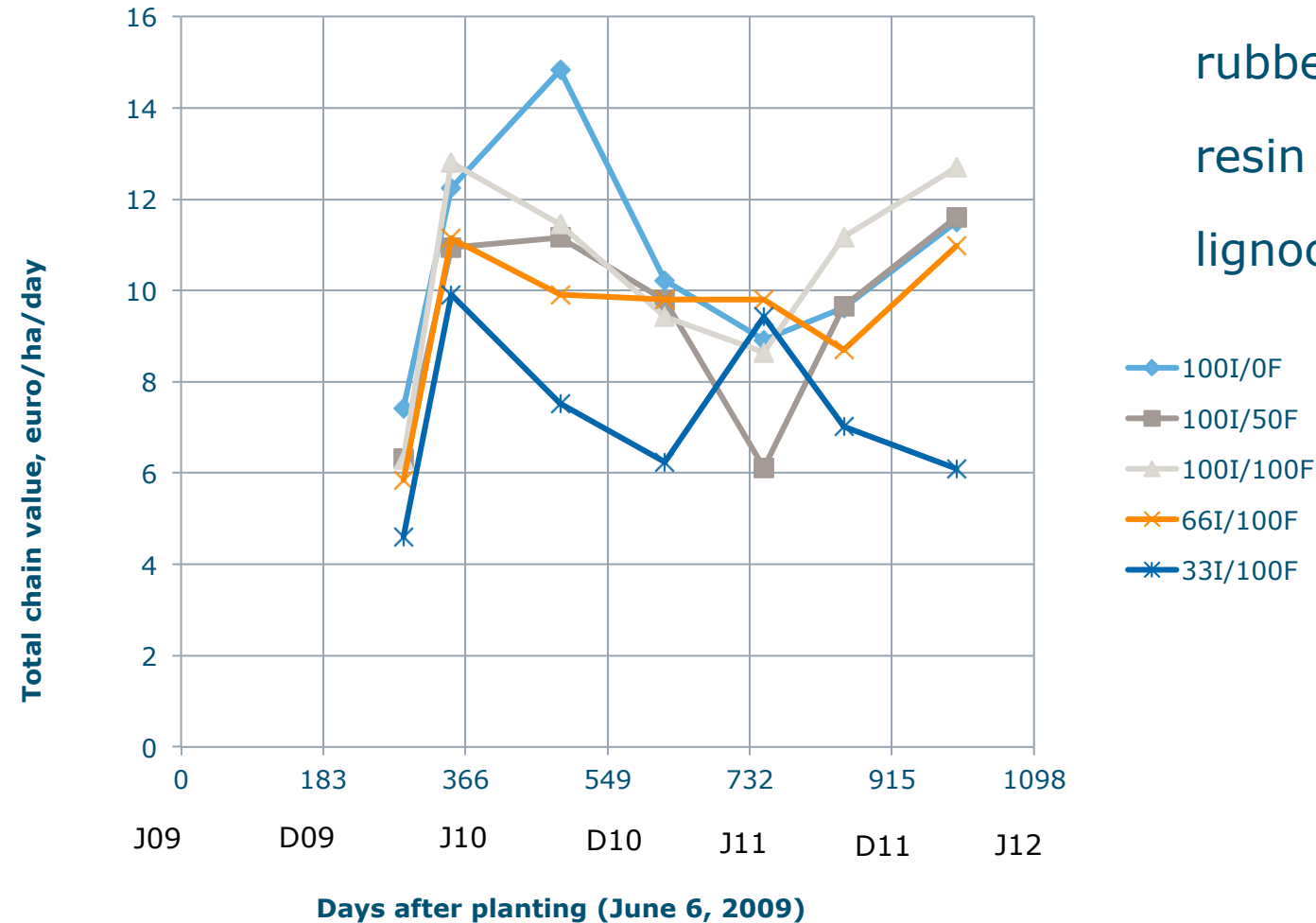


# Fertigation trial: Daily gross value/ha

rubber @ € 2.50/kg

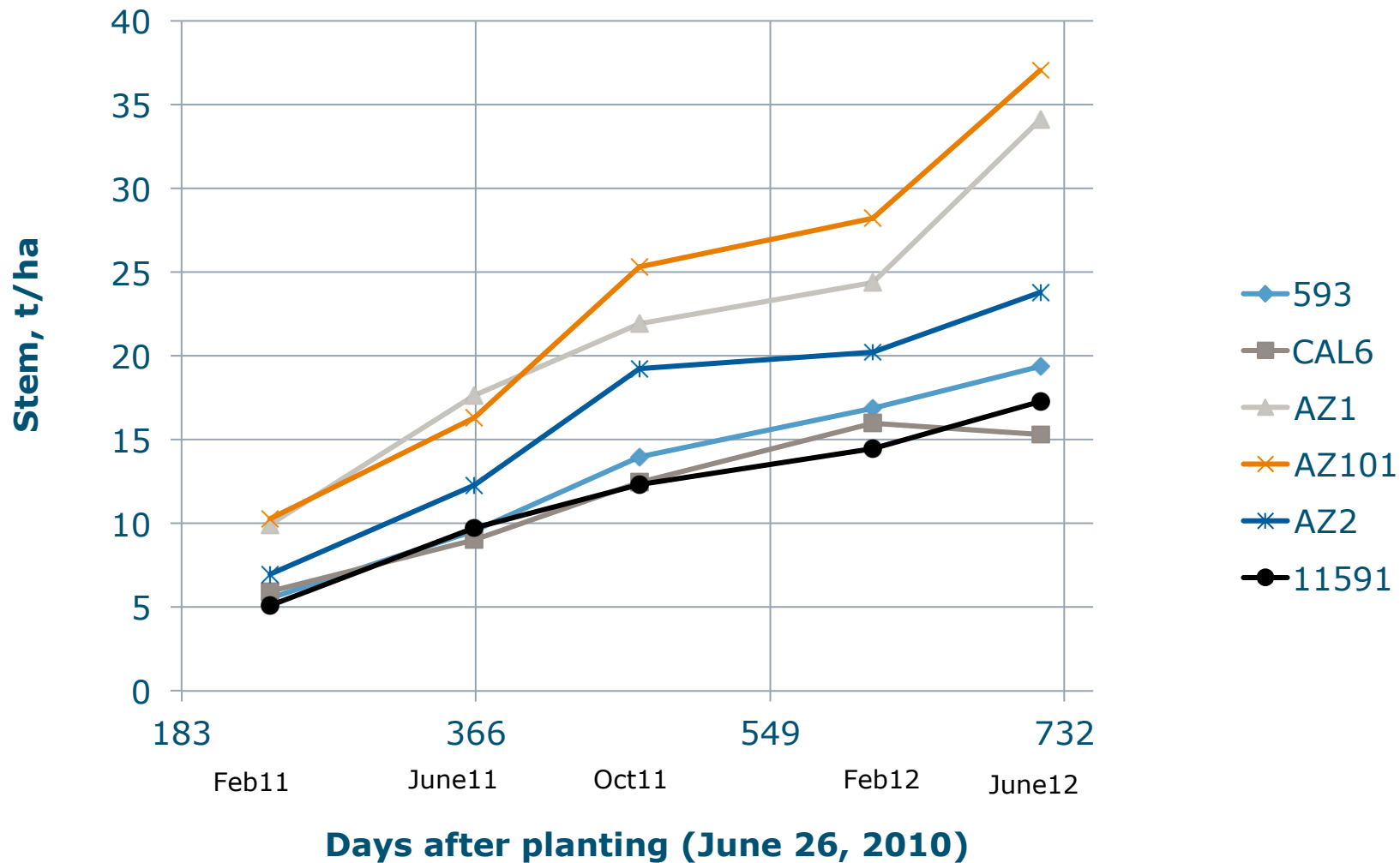
resin @ € 1.50/kg

lignocellulose @ € 40/ton

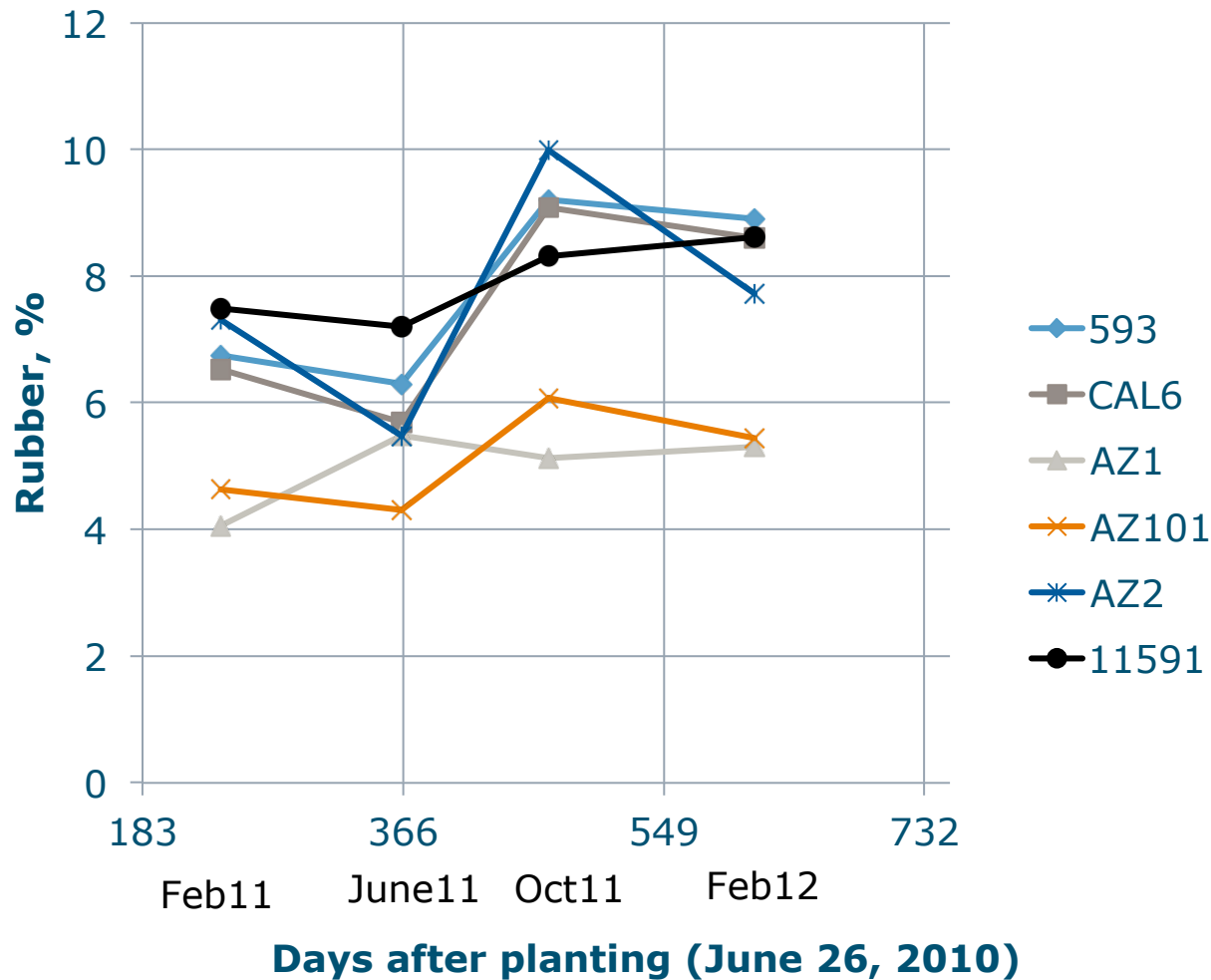




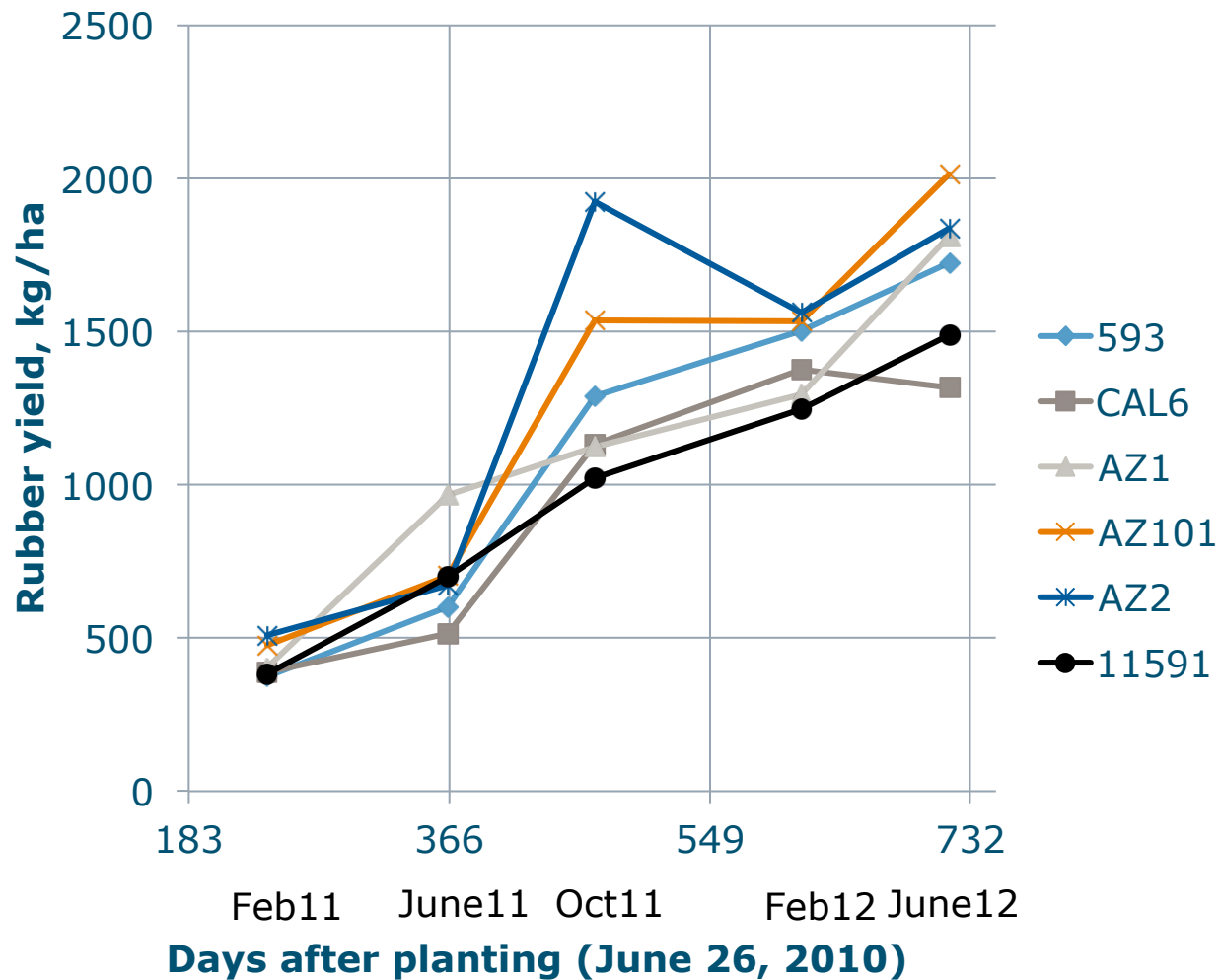
# Cultivar trial, stem production



# Rubber % of 6 guayule lines

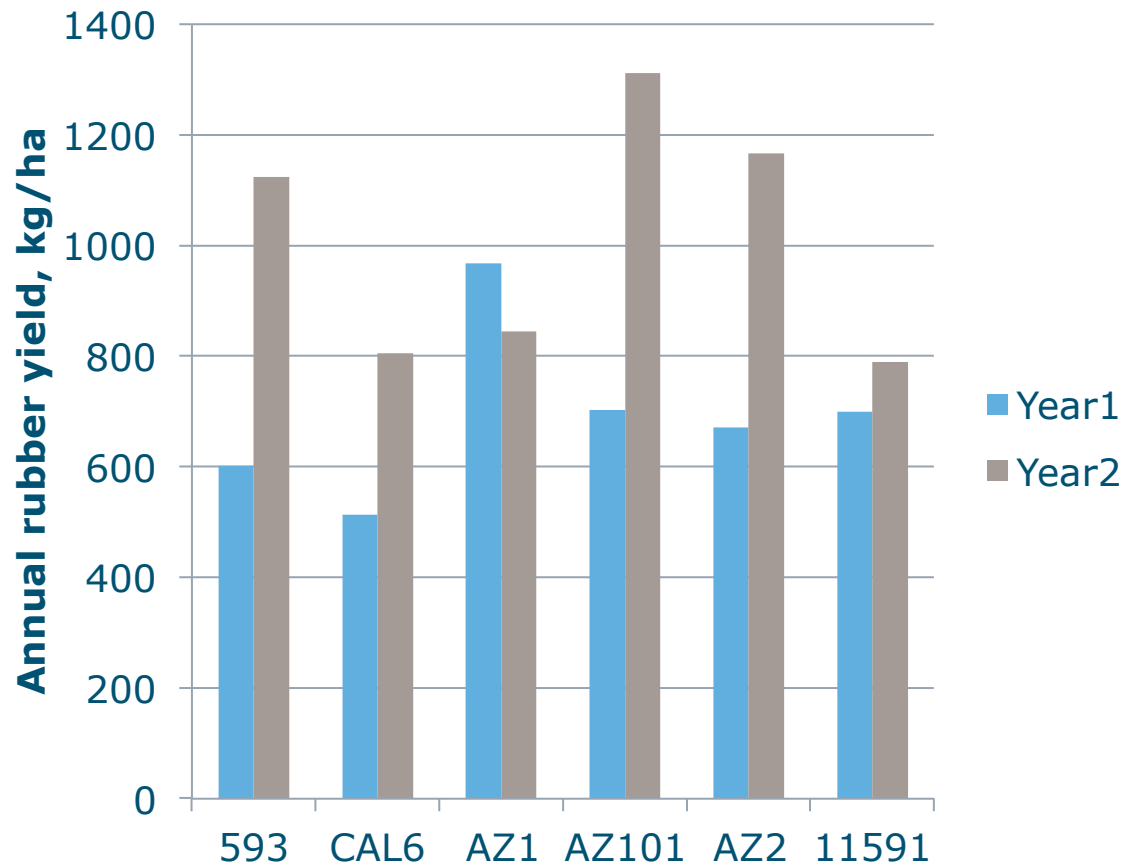


# Rubber yield development of 6 lines





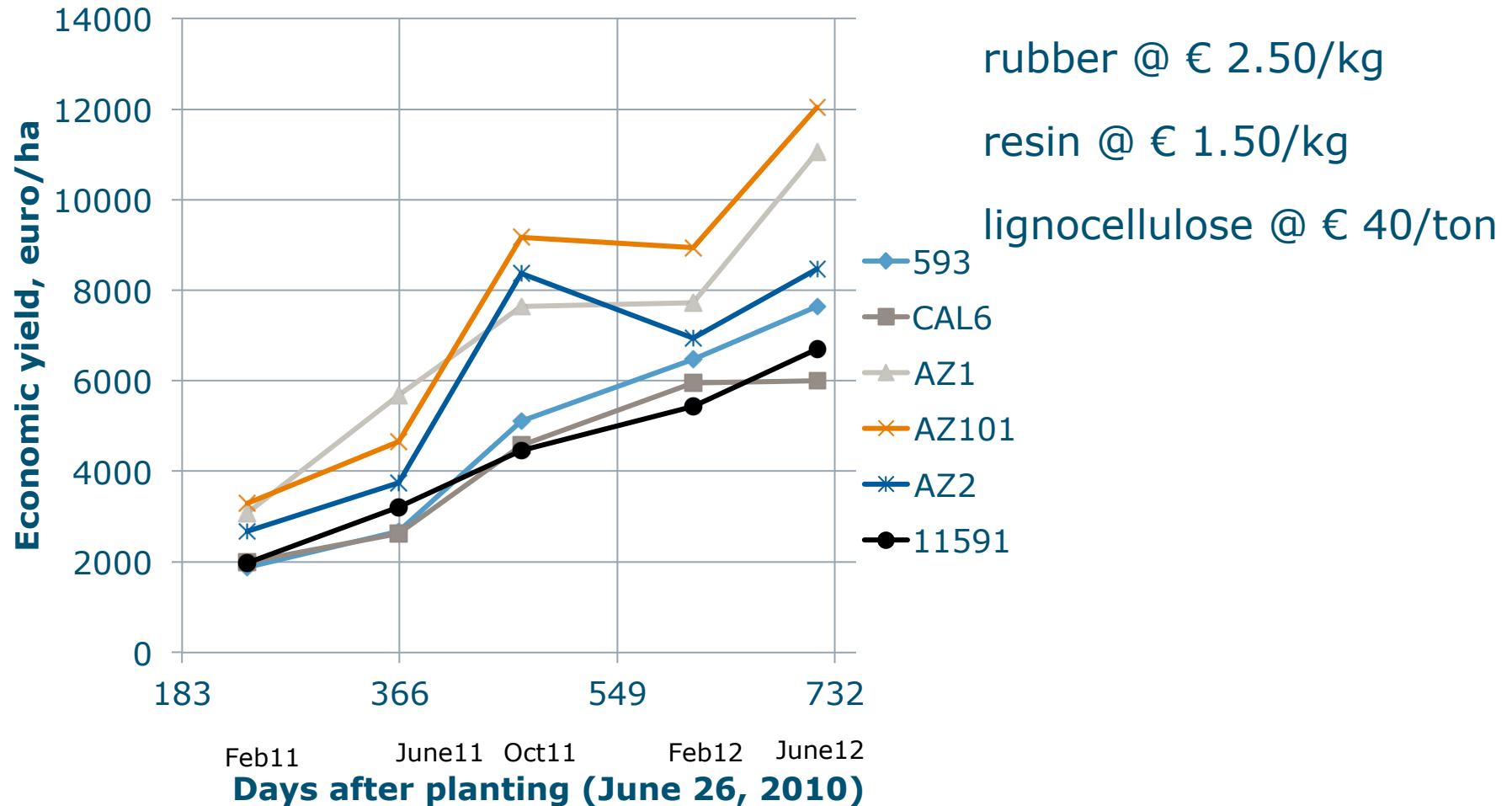
# Average annual rubber yield, kg/ha



- Only data for year 1 and year 2
- In Fertigation trial AZ2: 1300 kg/ha in year 2 and 2500 kg/ha in year 3



# Gross chain value – 6 lines



# Agronomic and economic feasibility in Europe

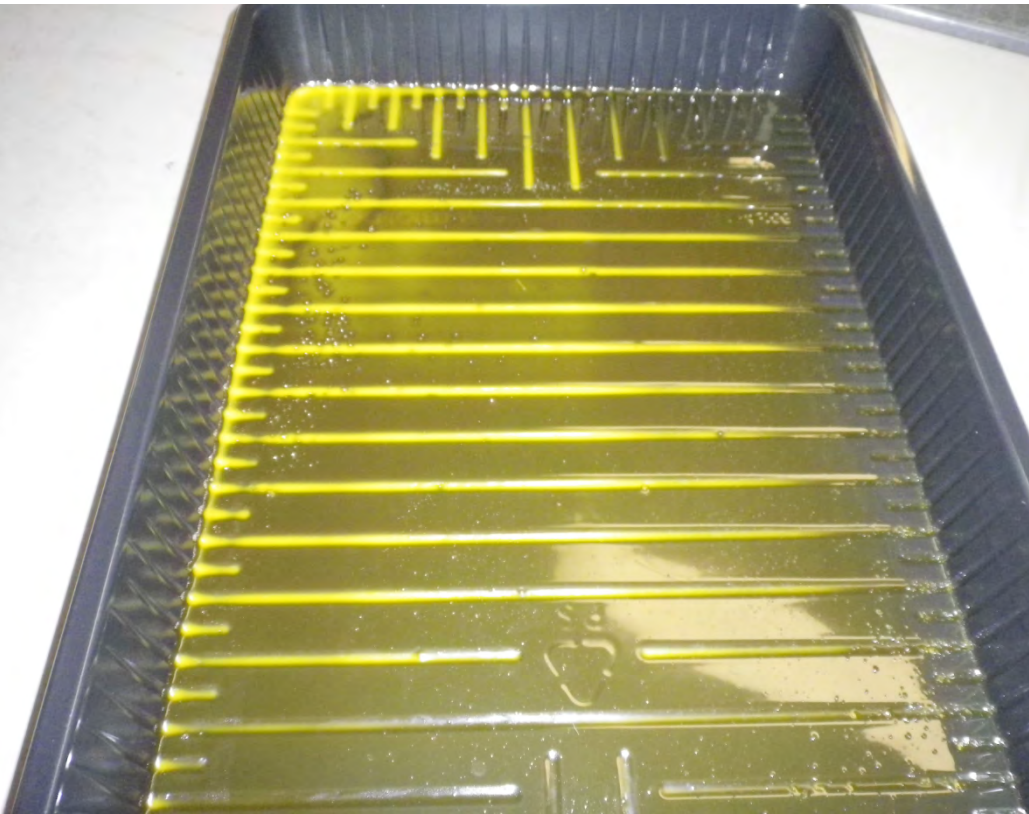
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- Plenty of room for both farmers and industry to earn money and obtain good quality rubber, resin and energy!
- Large variation in rubber % between harvest dates, treatments and cultivars (4-13 %)
- Optimal water use can be analysed
- Resin % range = 7-11 %, mostly around 10 %
- Rubber and resin yields: 1500-2500 kg/ha per year (both!)
- Gross production chain value
  - after 2 years: 8000 €/ha
  - after 3 years: 15000 €/ha (annually: 5000 €/ha)





# Rubber mats from dried US latex



# Rubber tyre from the Spain guayule trial



# Conclusions

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- Agronomic feasibility
  - testing essential (guayule does not like all soils!)
  - at the right sites: excellent performance also in Europe
- Optimal cultivar choice and agronomy
  - depends on cost prices and market prices and goals
  - Didier Snoeck et al., this conference
- Experimental data available to convince European farmers and industry of the feasibility of EU guayule
- Thanks to: European Union, Dutch government  
Peter Visser (El Molinar, Spain), CIRAD team, my colleagues at PRI





# Molecular variation in CPT-genes

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- DNA sequences from cDNA and genomic, from AZ2
- CPT1 and CPT2: single genes apparently (but still not very high coverage)
- CPT3 (with a 21 nucleotide deletion compared to CPT1 and CPT2): looks like at least four alleles/loci
- RNA-samples taken from six varieties from stem and leaf
  - testing whether the varieties show sequence variation
  - testing whether expression level differences between varieties coincide with rubber % differences: set up not yet decided

