

# Dissecting lentil crop growth in contrasting environments using digital imaging and genome-wide association studies

*The Plant Phenome Journal.* (2025) 8(1): e70040.

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which is follow-up to:

- Sandesh Neupane, Derek Wright, Raul Martinez, Jakob Butler, Jim Weller, Kirstin Bett. **Focusing the GWAS Lens on days to flower using latent variable phenotypes derived from global multi-environment trials.** *The Plant Genome.* (2022) 16(1): e20269. doi.org/10.1002/tpg2.20269
  - [https://github.com/derekmichaelwright/AGILE\\_LDP\\_GWAS\\_Phenology](https://github.com/derekmichaelwright/AGILE_LDP_GWAS_Phenology)
  - Derek M Wright, Sandesh Neupane, Taryn Heidecker, Teketel A Haile, Clarice J Coyne, Rebecca J McGee, Sripada Udupa, Fatima Henkrar, Eleonora Barilli, Diego Rubiales, Tania Gioia, Giuseppina Logozzo, Stefania Marzario, Reena Mehra, Ashutosh Sarker, Rajeev Dhakal, Babul Anwar, Debashish Sarker, Albert Vandenberg, and Kirstin E. Bett. **Understanding photothermal interactions can help expand production range and increase genetic diversity of lentil (*Lens culinaris* Medik.).** *Plants, People, Planet.* (2021) 3(2): 171-181.
  - [https://github.com/derekmichaelwright/AGILE\\_LDP\\_Phenology](https://github.com/derekmichaelwright/AGILE_LDP_Phenology)
- 

## Contents

- [https://github.com/derekmichaelwright/AGILE\\_LDP\\_GWAS\\_Phenology](https://github.com/derekmichaelwright/AGILE_LDP_GWAS_Phenology)
- View as pdf
- View as HTML
- Source Code Vignette (Growth\_Rates\_Vignette.html)
- Raw Data & Growth Curve Modeling
- Figures
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- Supplemental Figures
- Additional Figures



APPLICATION OF GENOMICS  
TO INNOVATION IN THE LENTIL ECONOMY



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### Collaborators

- Department of Plant Sciences and Crop Development Centre, University of Saskatchewan, Saskatoon, Saskatchewan, Canada
- School of Agriculture, Forestry, Food and Environmental Sciences, University of Basilicata, Potenza, Italy

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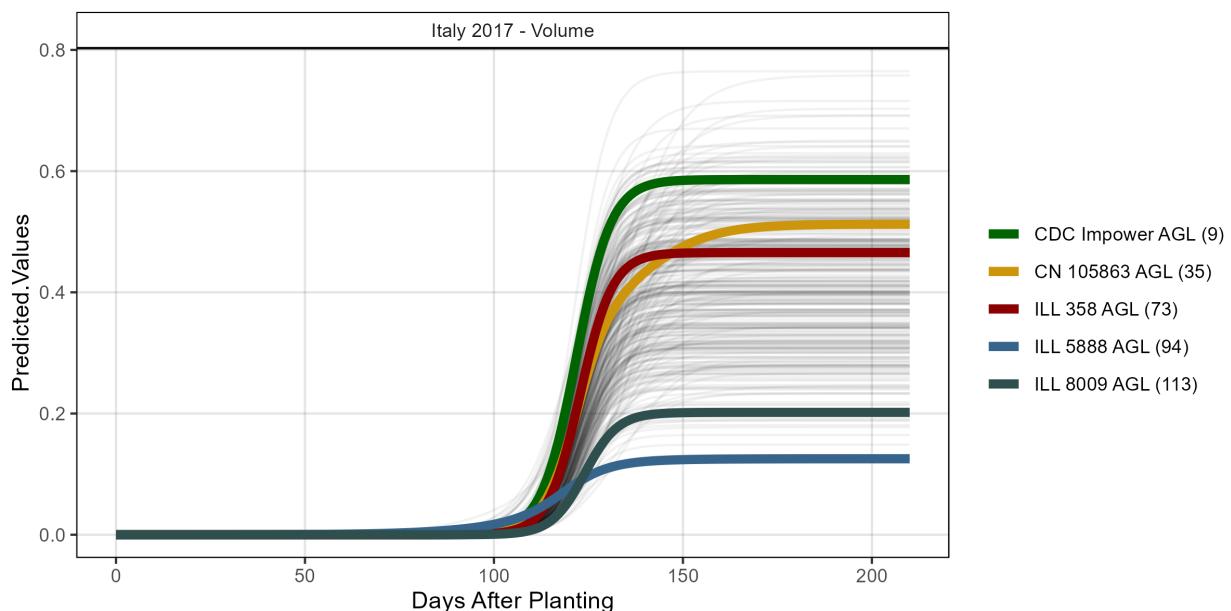
### Raw Data & Growth Curve Modeling

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- Additional/ggDroneCheck\_Ro17.pdf
- Additional/ggDroneCheck\_Su17.pdf
- Additional/ggDroneCheck\_Su18.pdf

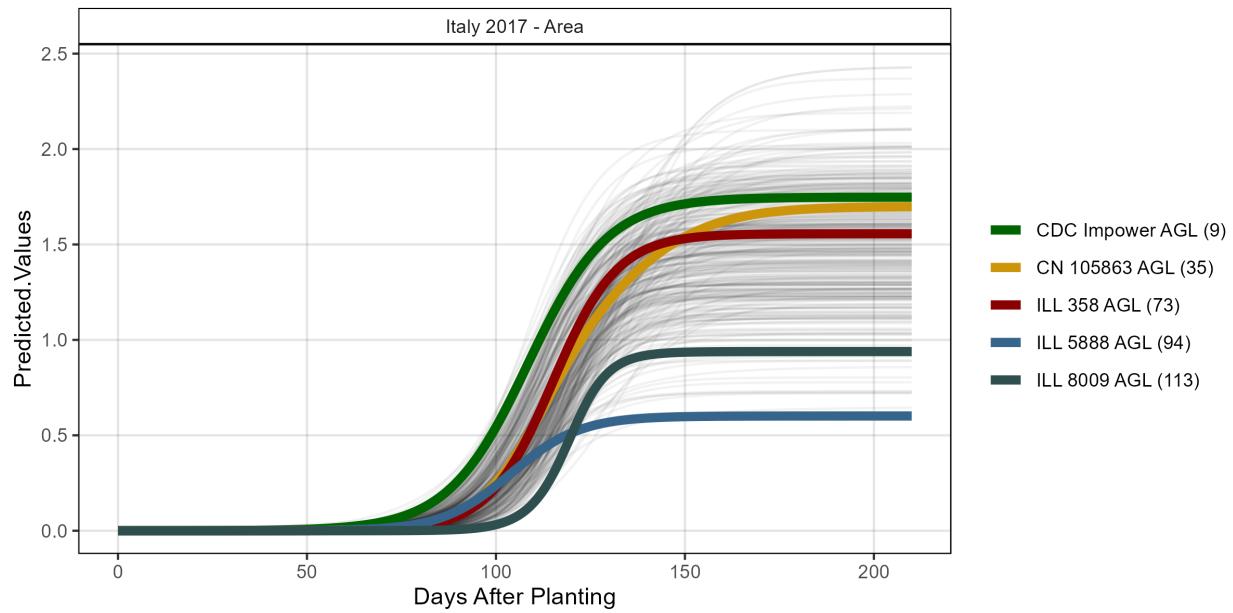
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### Metaponto, Italy 2017

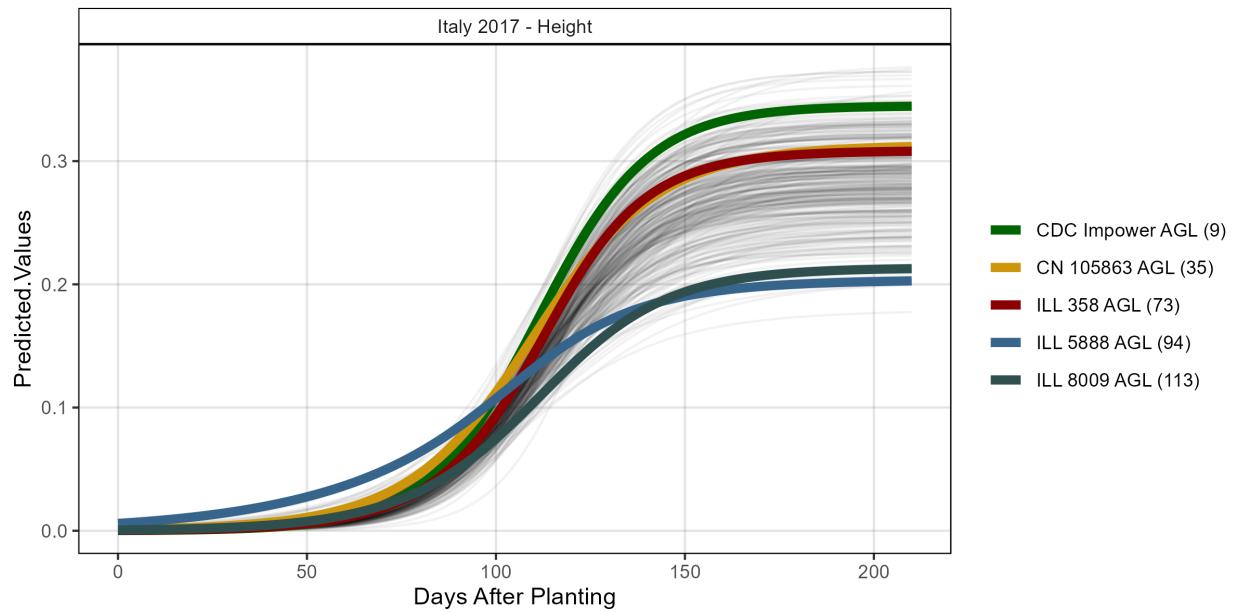
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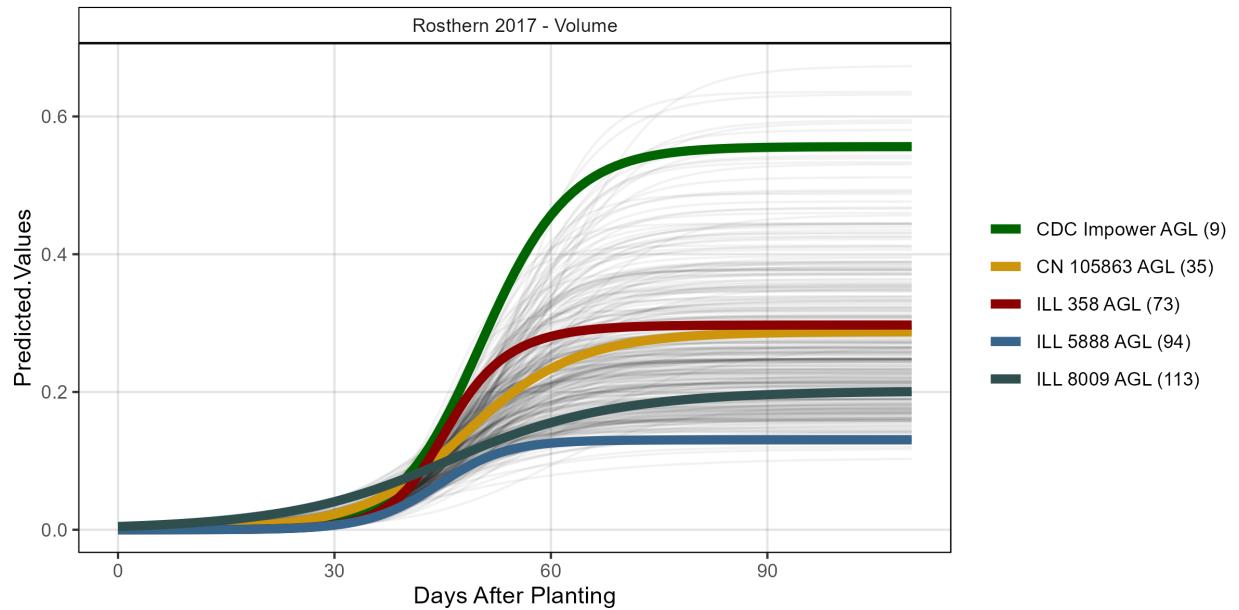


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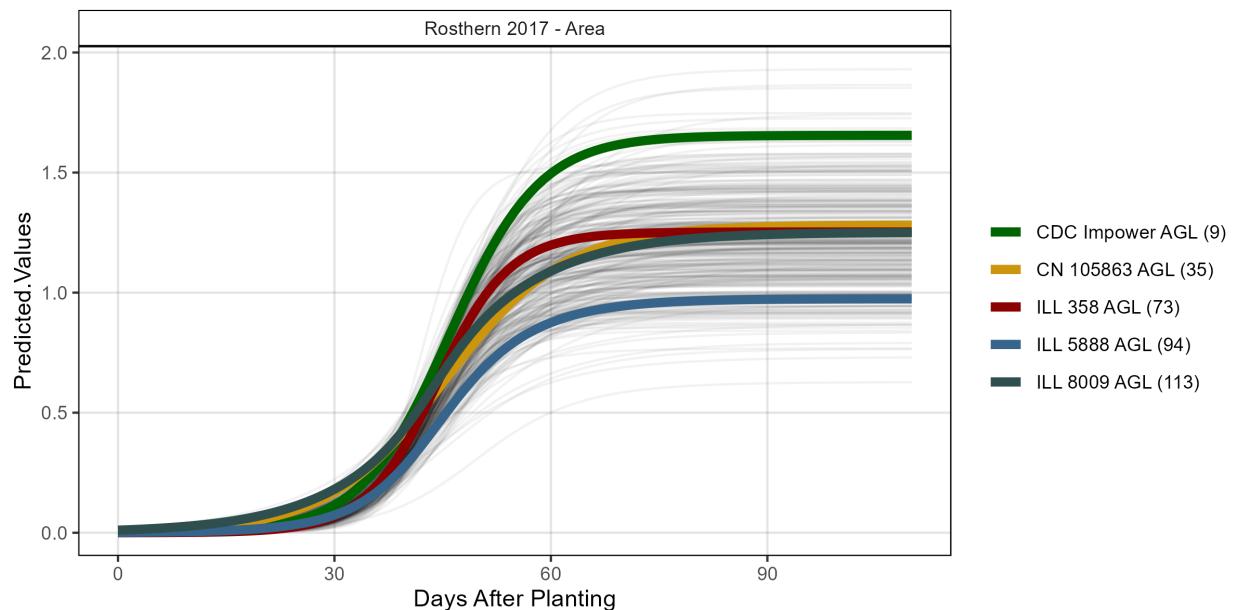


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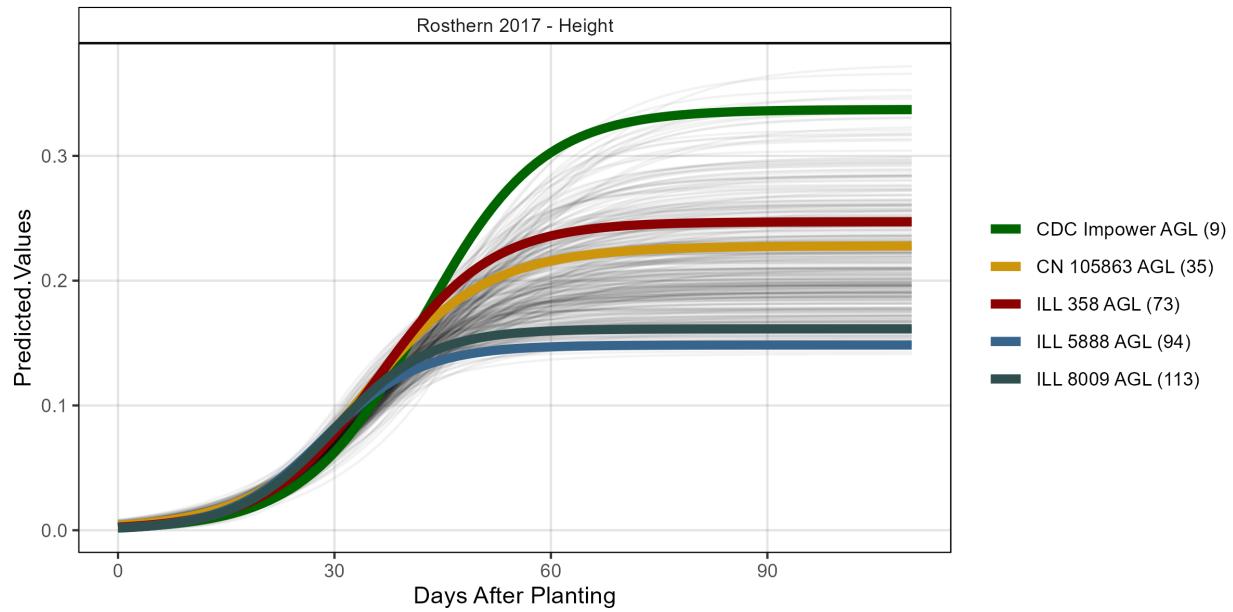
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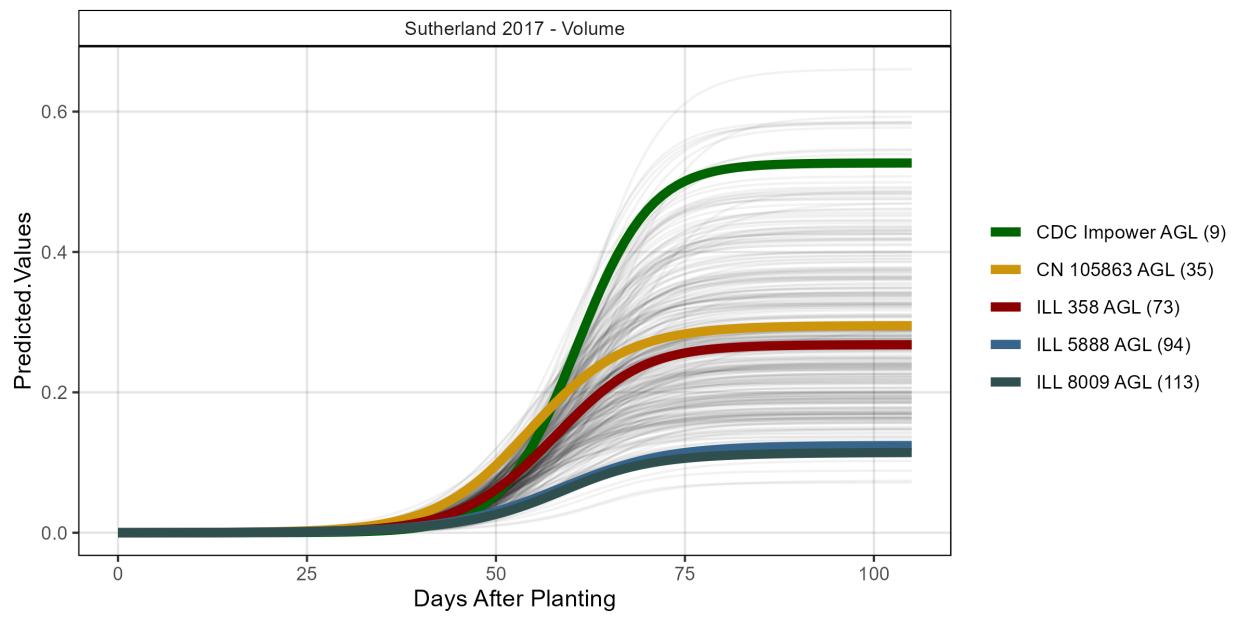


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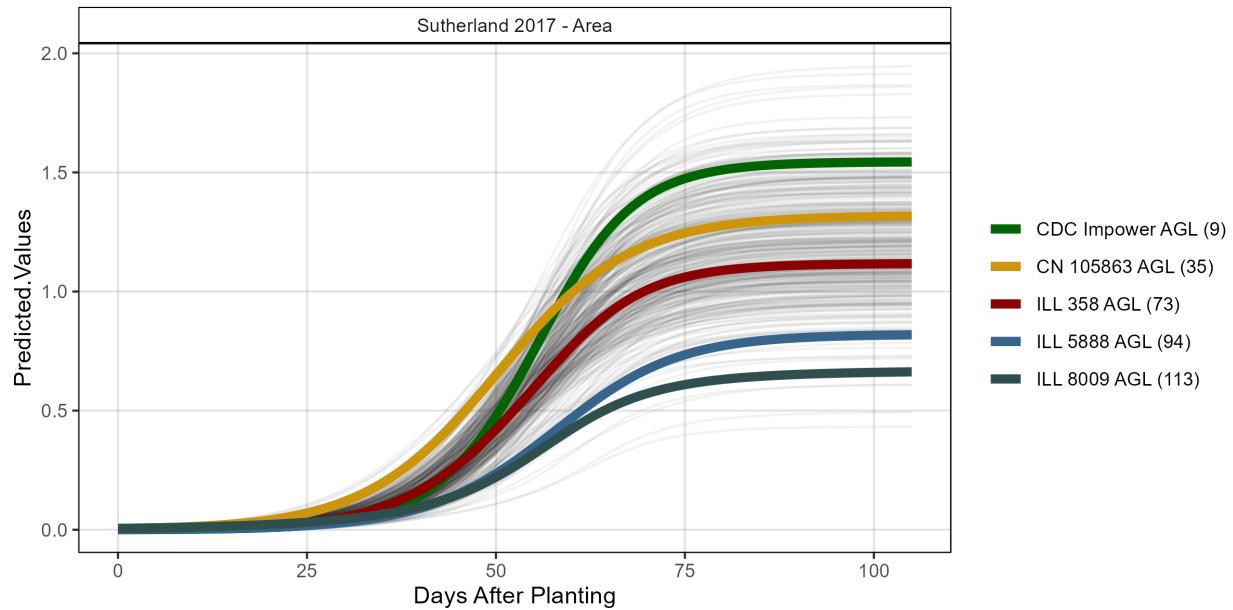


## Sutherland, Canada 2017

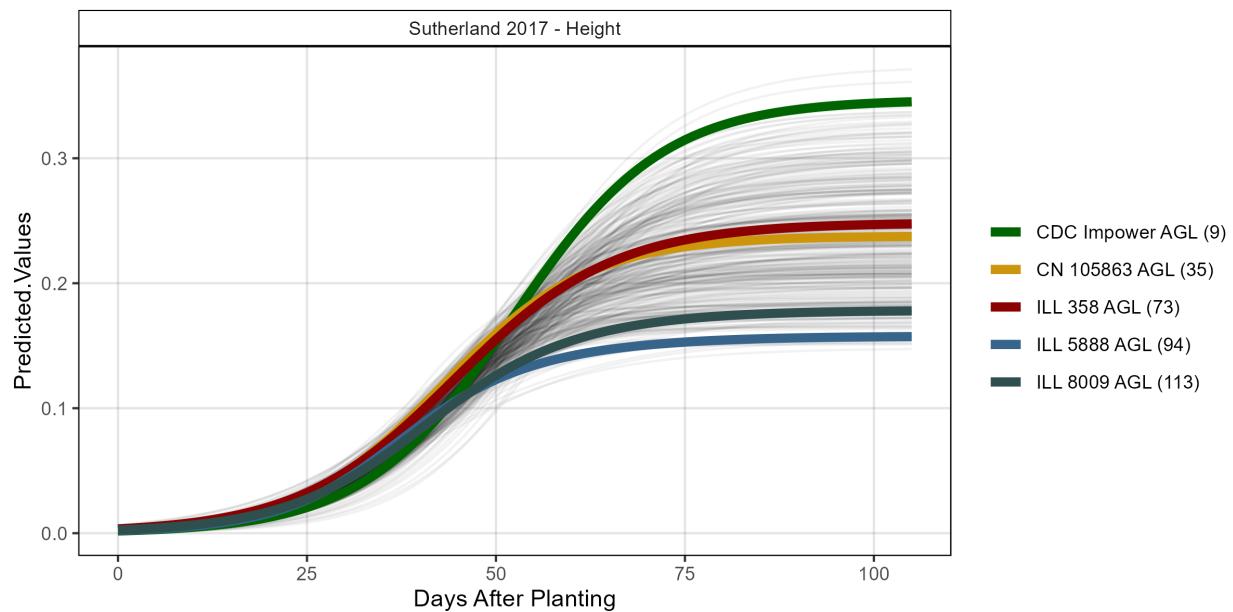
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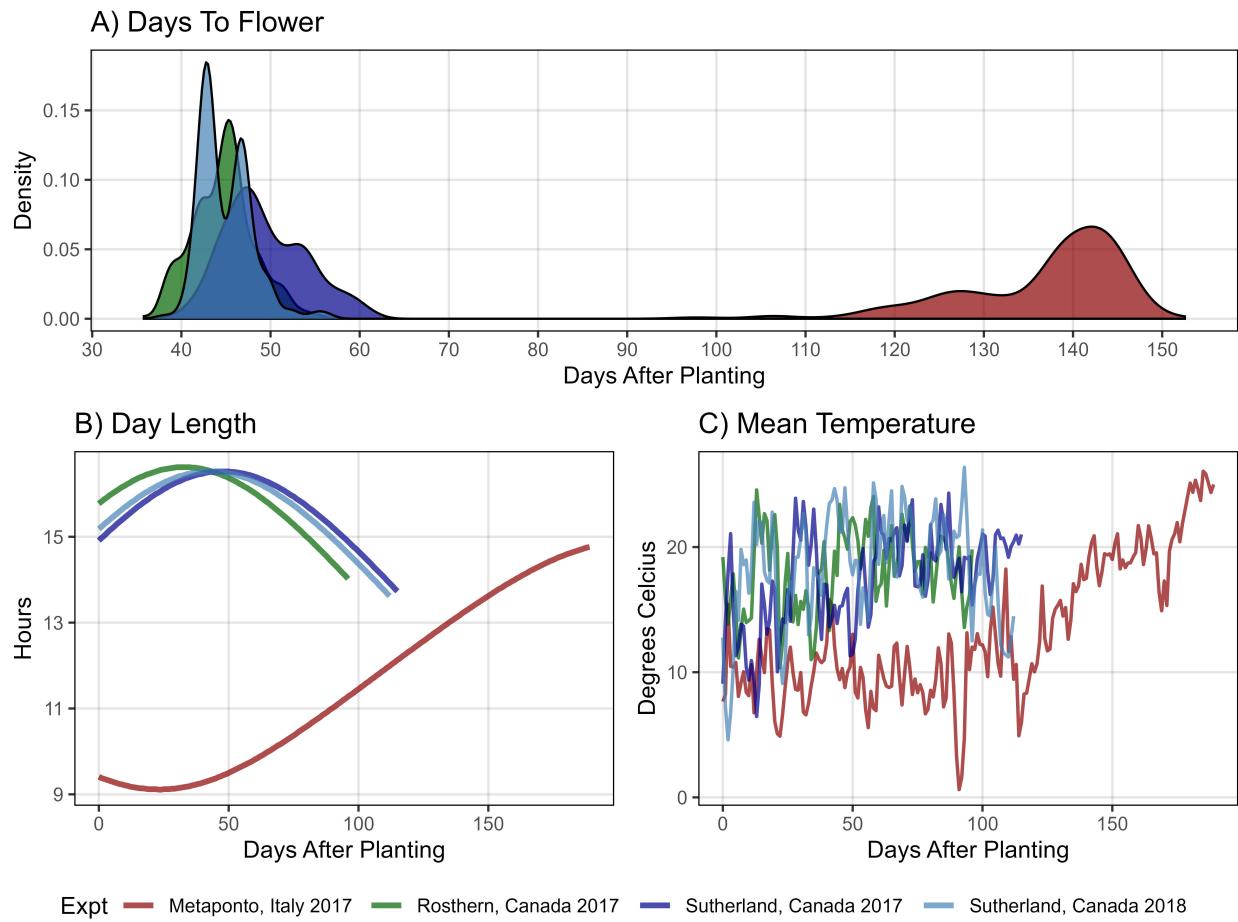
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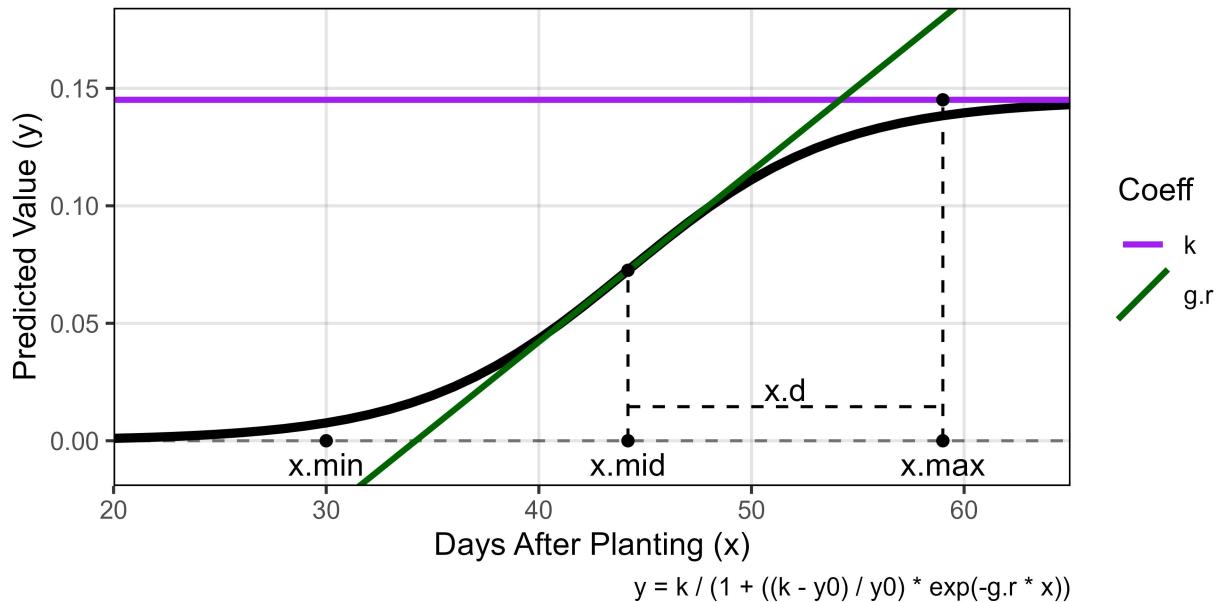
Sutherland, Canada 2018

## Figures

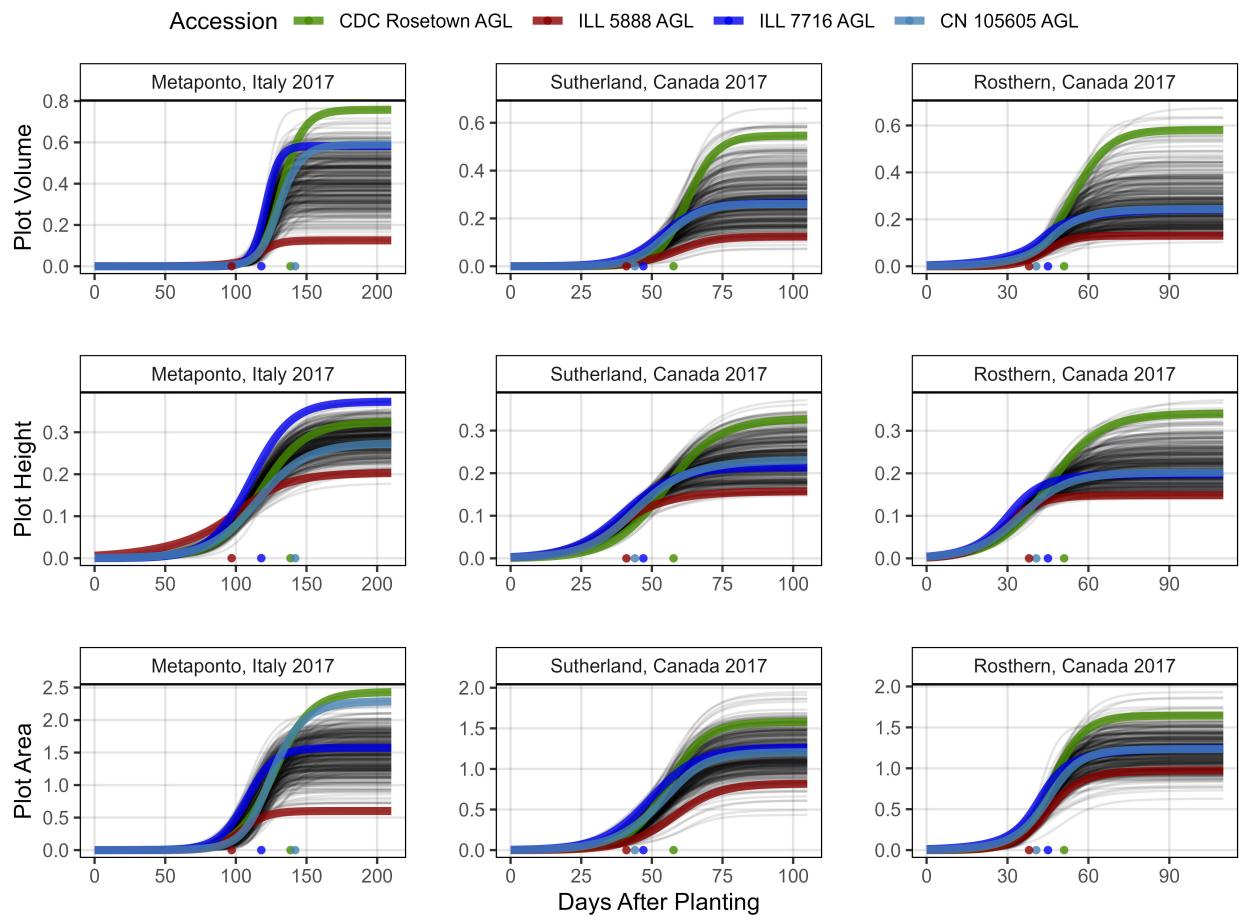
Figure 1



**Figure 2**



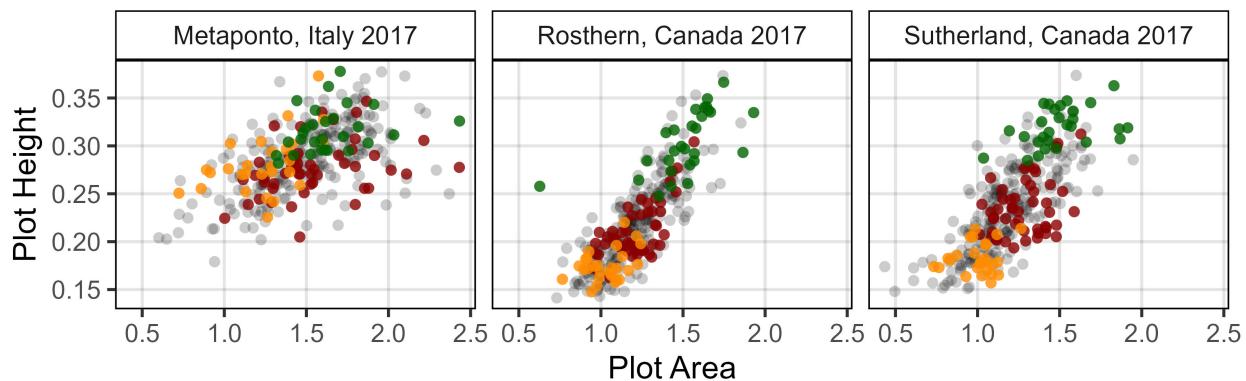
**Figure 3**



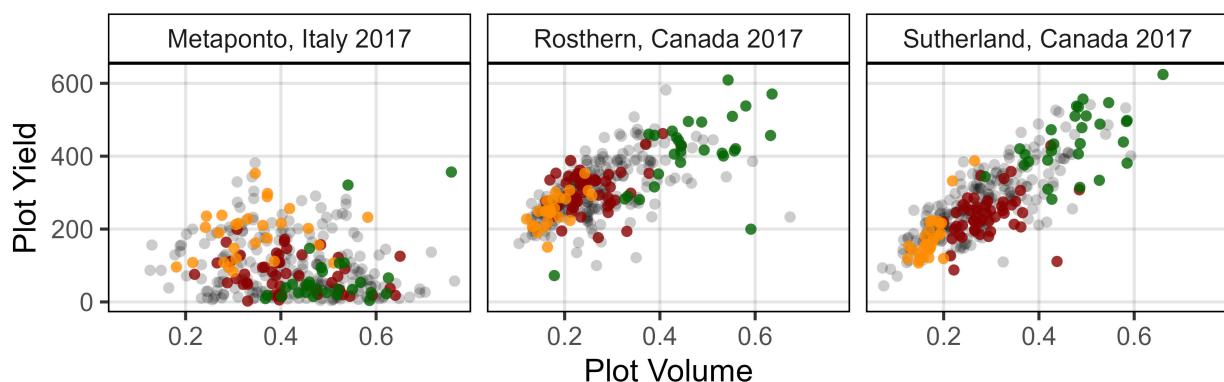
**Figure 4**

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- Additional/Figure\_04\_B.html
- Additional/Figure\_04\_C.html

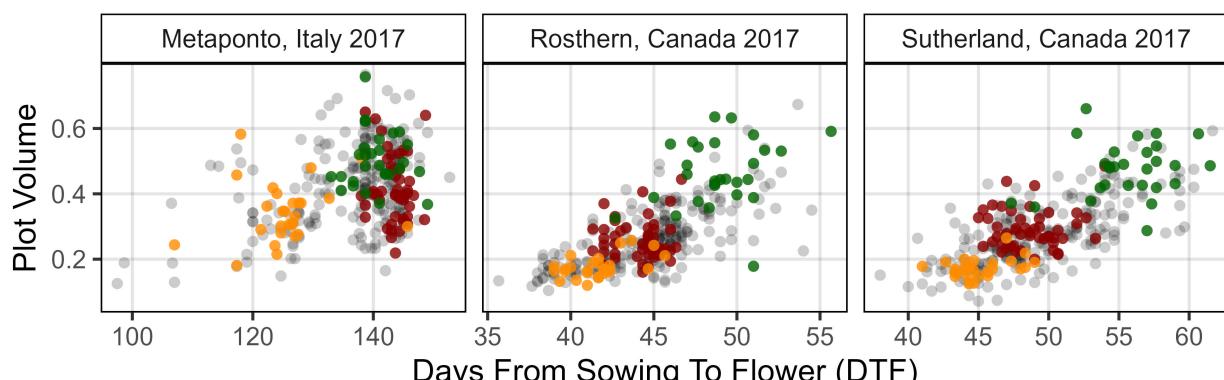
### A) Height x Area



### B) Yield x Volume

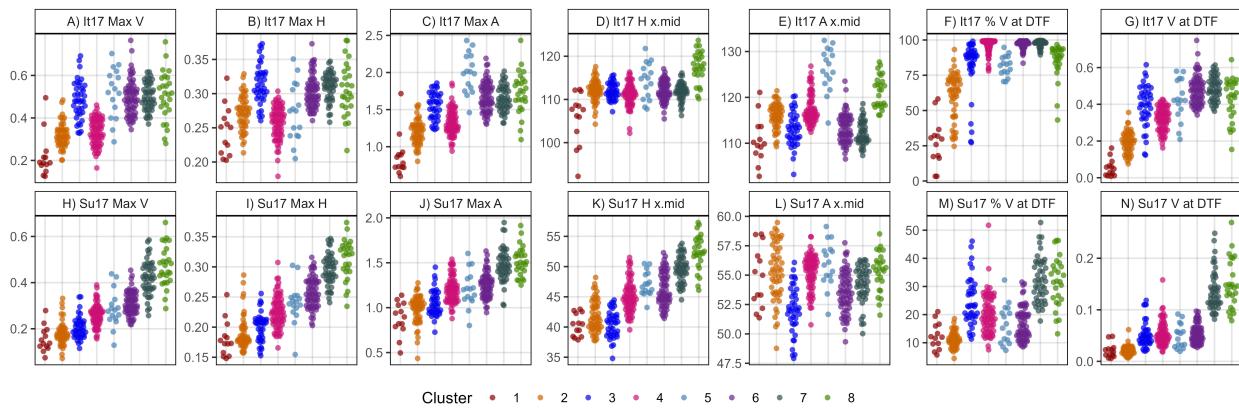


### C) Volume x DTF

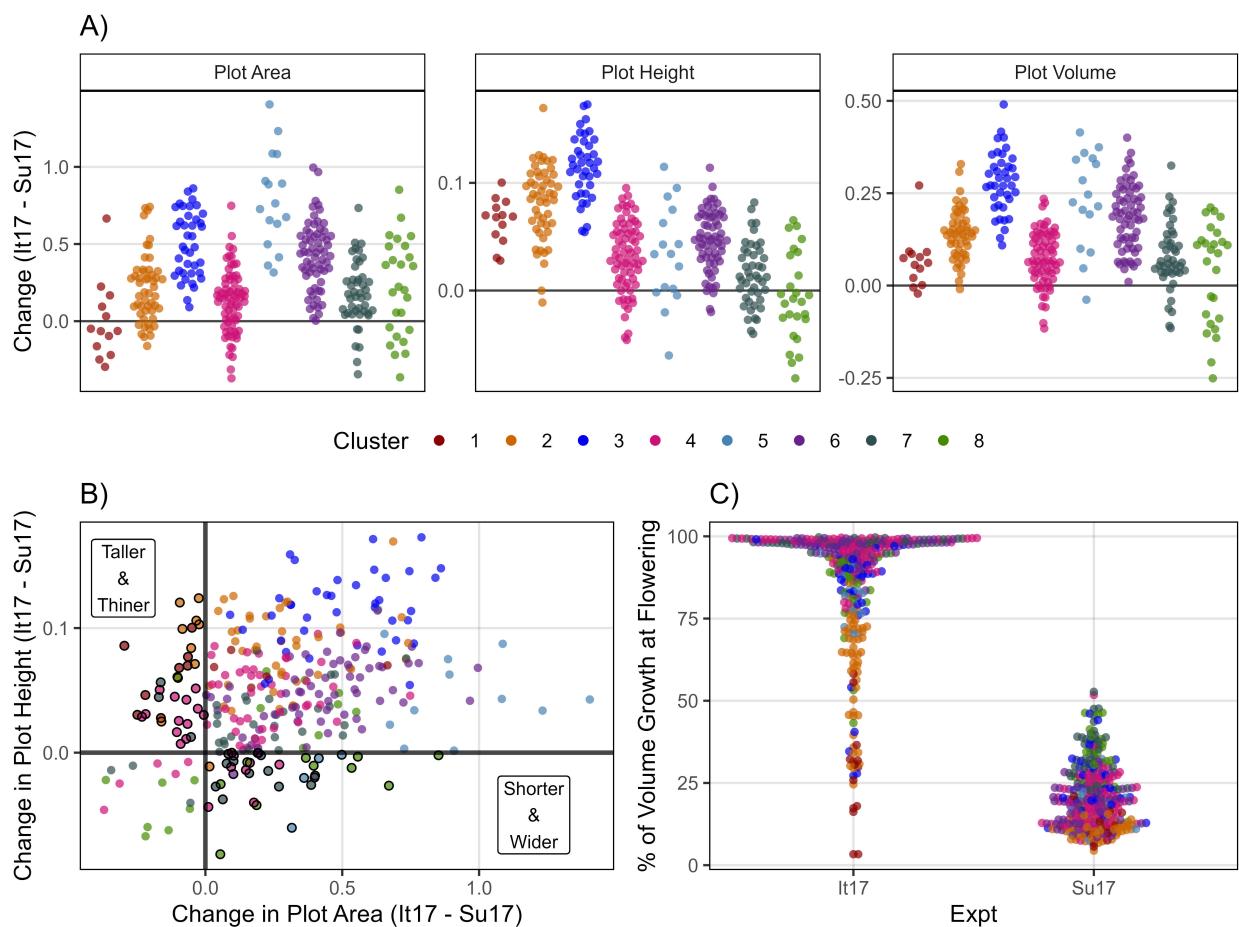


Accession Origin    ● Canada    ● India    ● Iran    ● Other

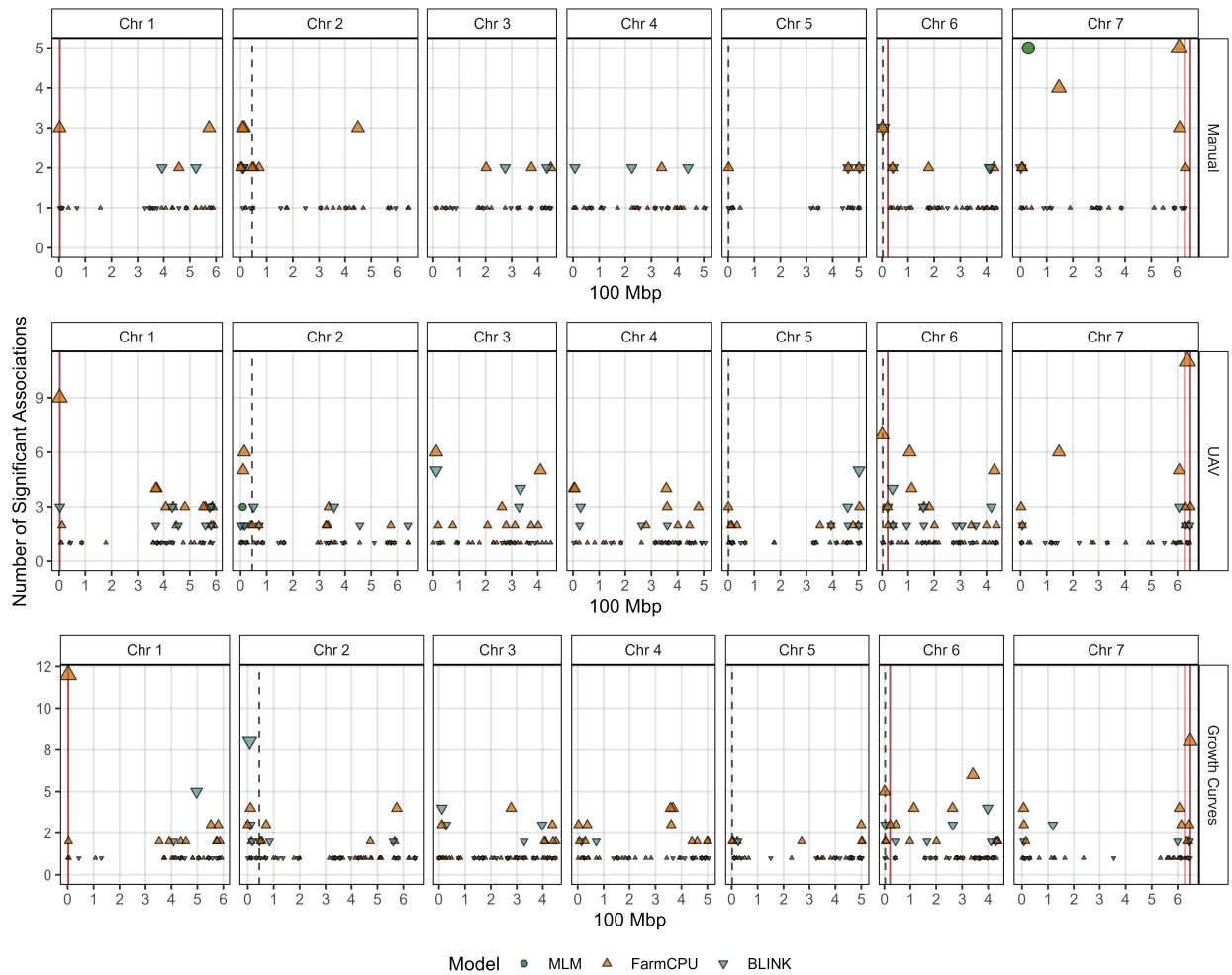
**Figure 5**



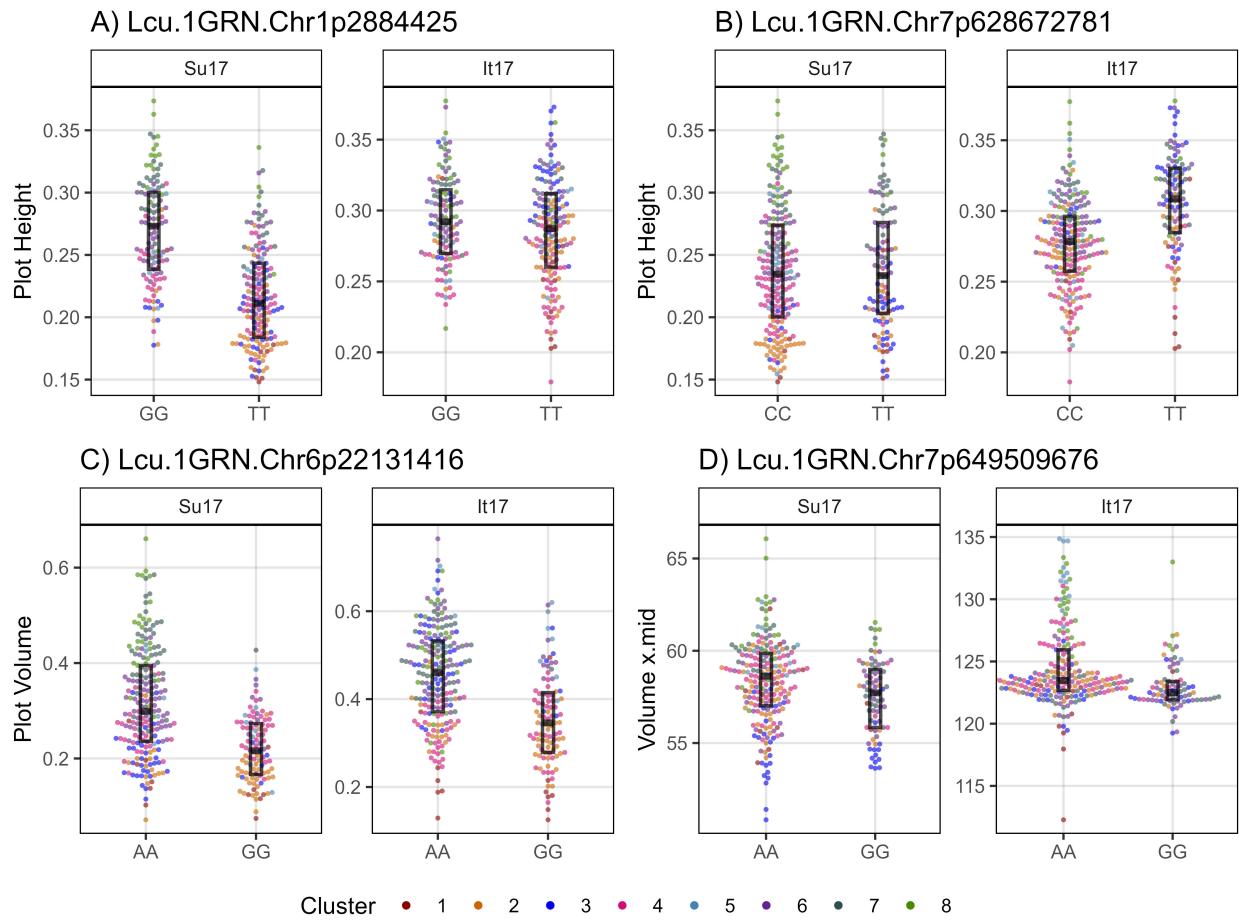
**Figure 6**



**Figure 7**



**Figure 8**



## Supplemental Tables

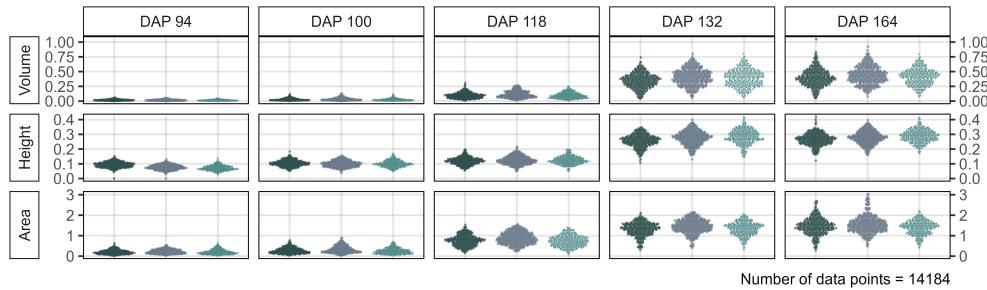
### Supplemental Table 1

- Supplemental\_Table\_01.csv

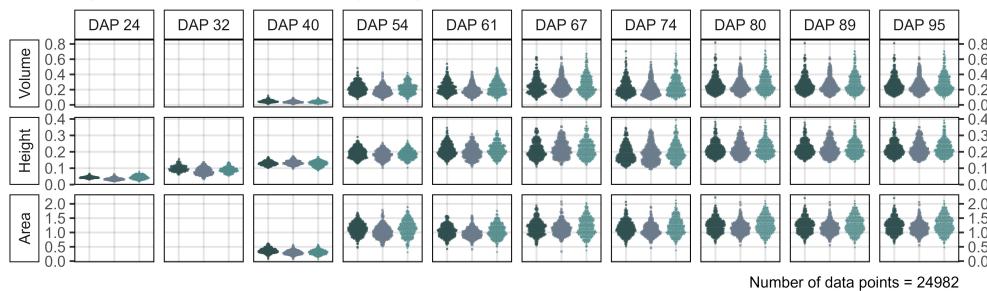
## Supplemental Figures

### Supplemental Figure 1

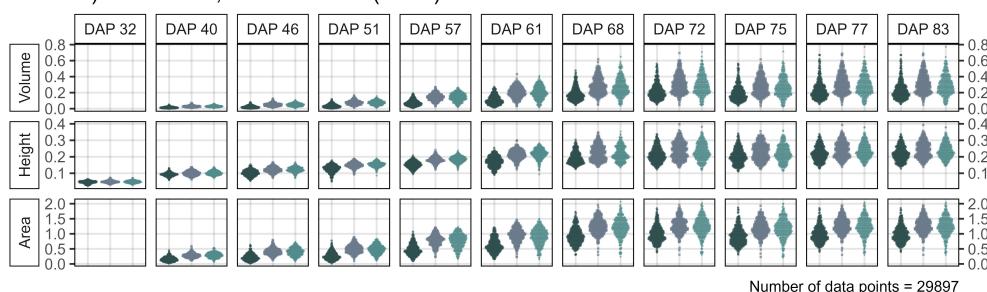
A) Metaponto, Italy 2017 (It17)



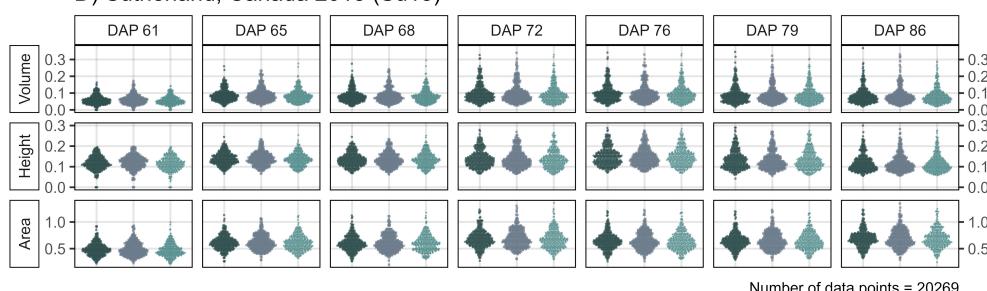
B) Rosthern, Canada 2017 (Ro17)



C) Sutherland, Canada 2017 (Su17)



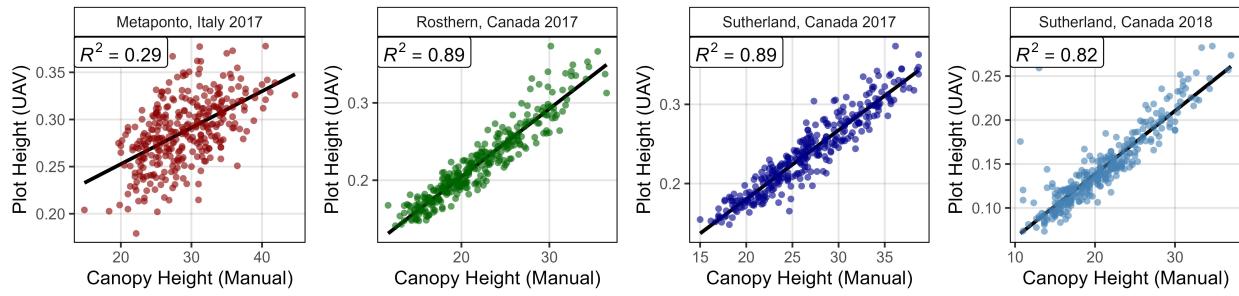
D) Sutherland, Canada 2018 (Su18)



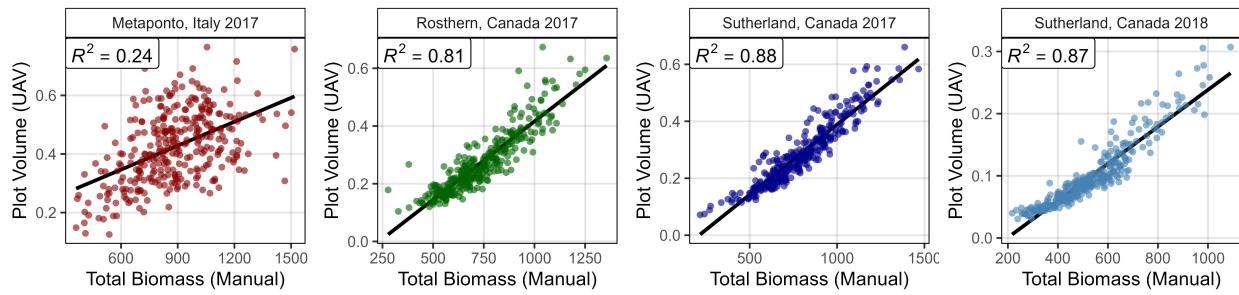
Rep ● 1 ■ 2 ◆ 3

## Supplemental Figure 2

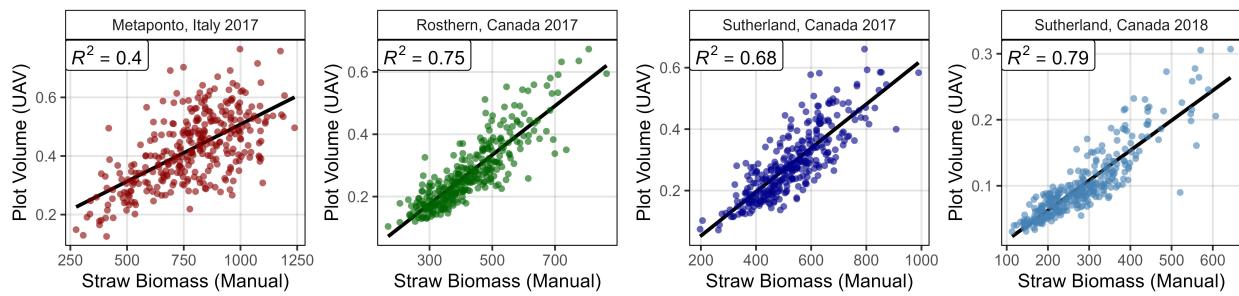
A) Plot Height (UAV) x Canopy Height (Manual)



B) Plot Volume (UAV) x Total Biomass (Manual)

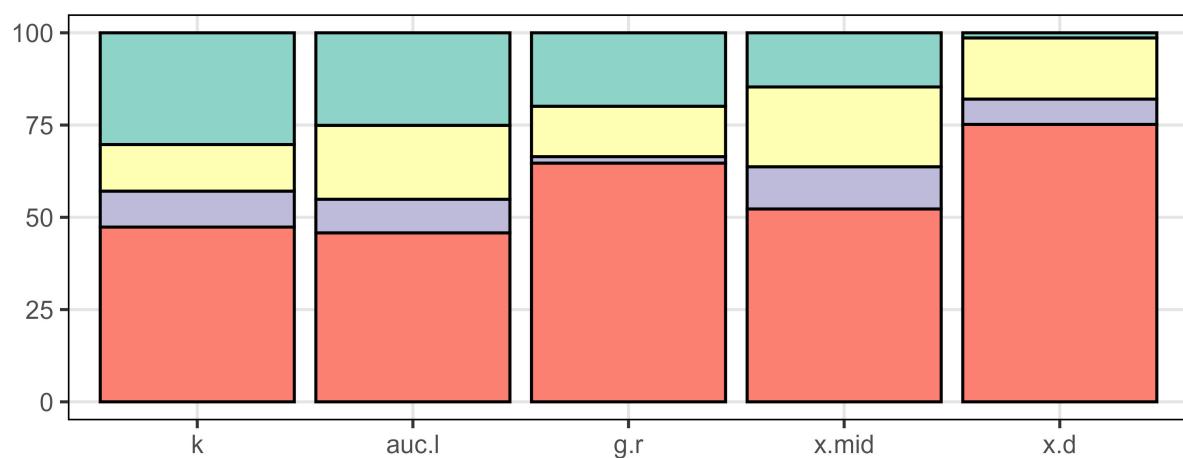


C) Plot Volume (UAV) x Straw Biomass (Manual)

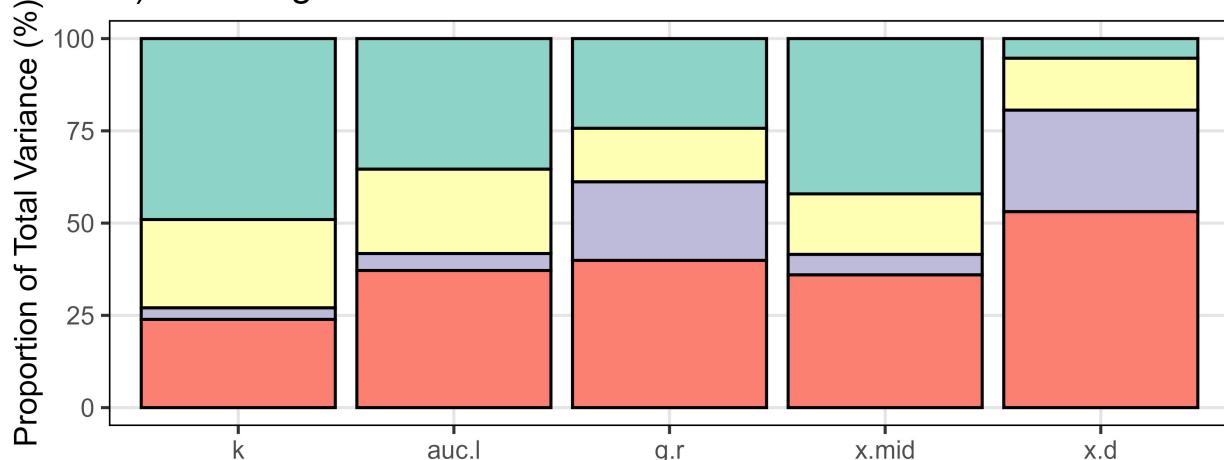


Supplemental Figure 3

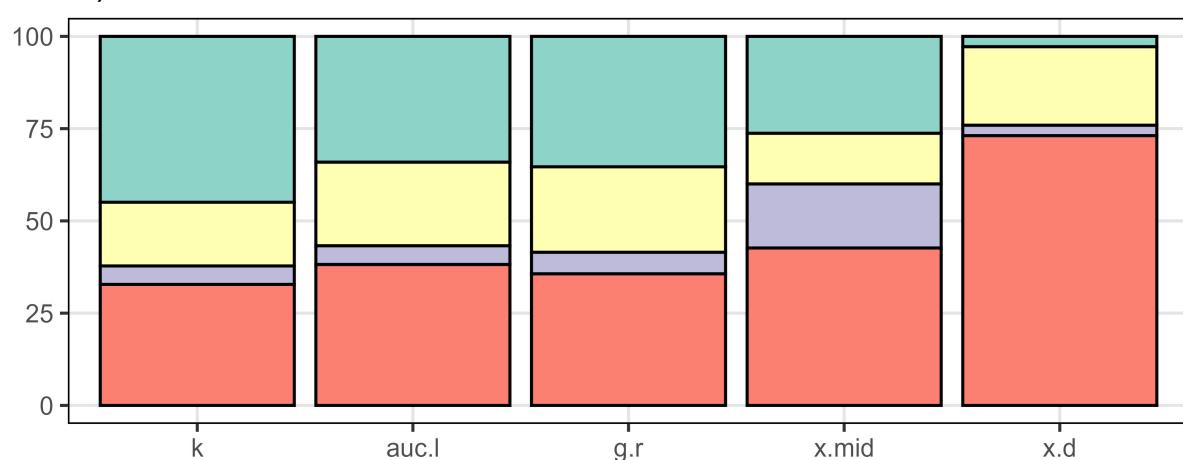
A) Plot Area Growth Curve Coefficients



B) Plot Height Growth Curve Coefficients

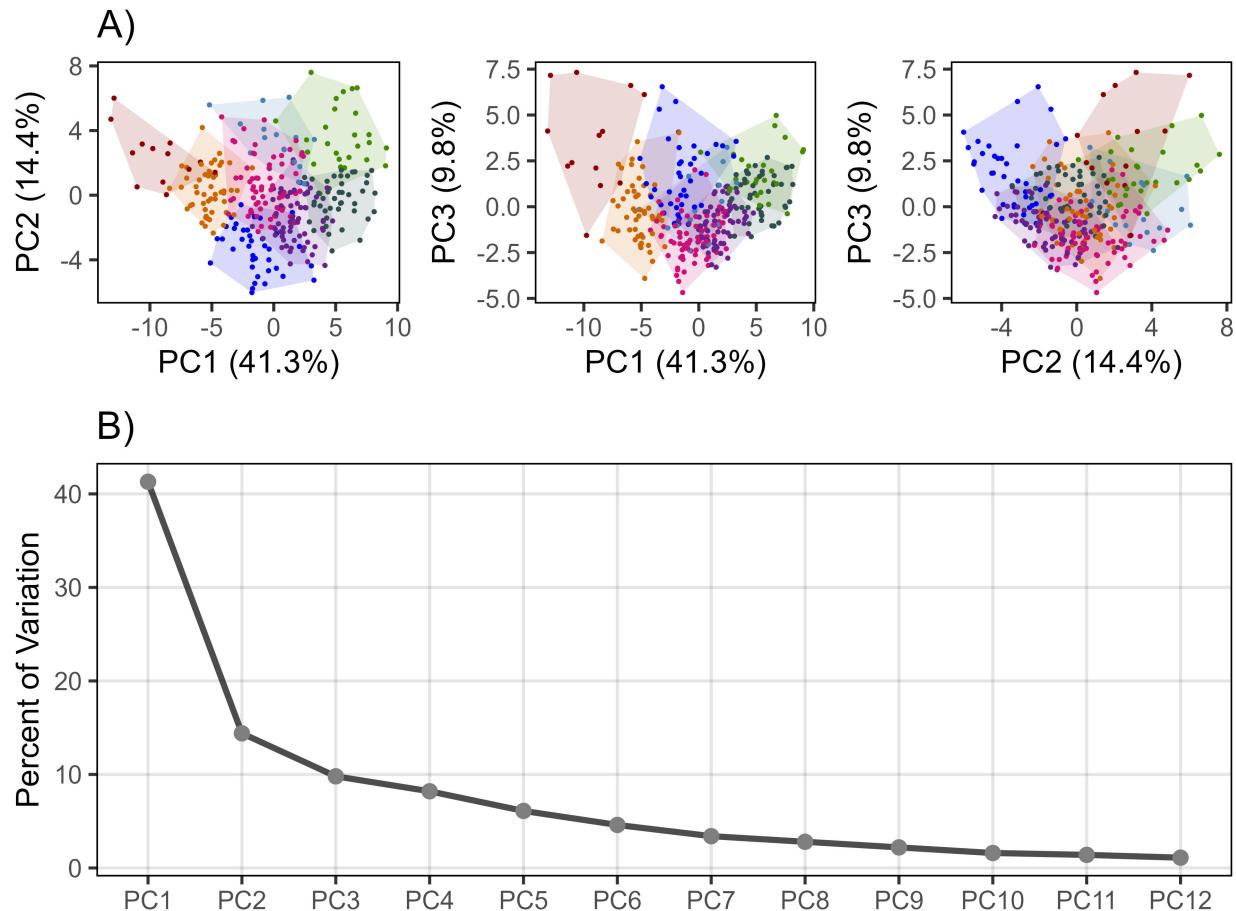


C) Plot Volume Growth Curve Coefficients

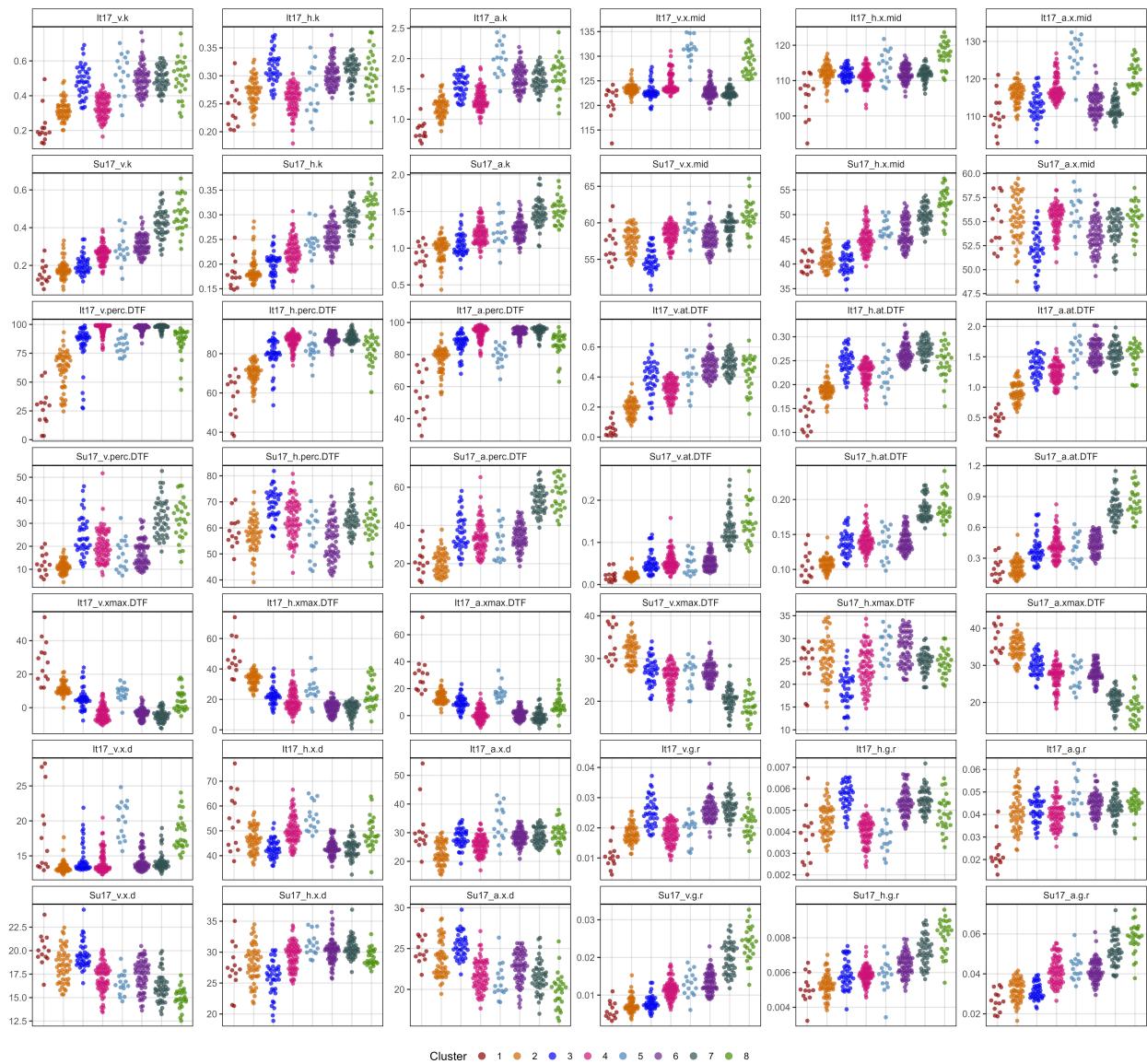


Component    Genetic    G x E    Rep:Env    Residual + Env

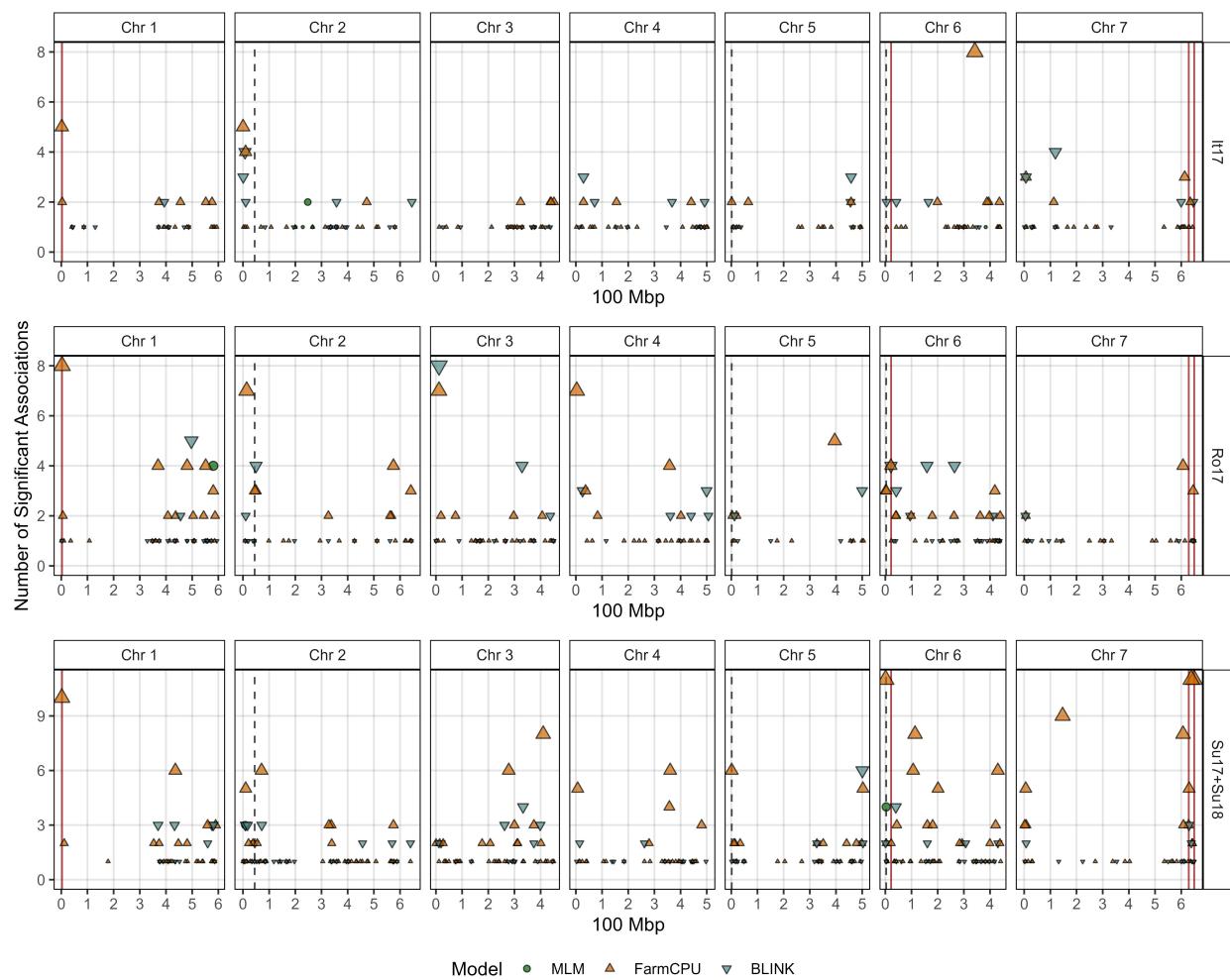
Supplemental Figure 4



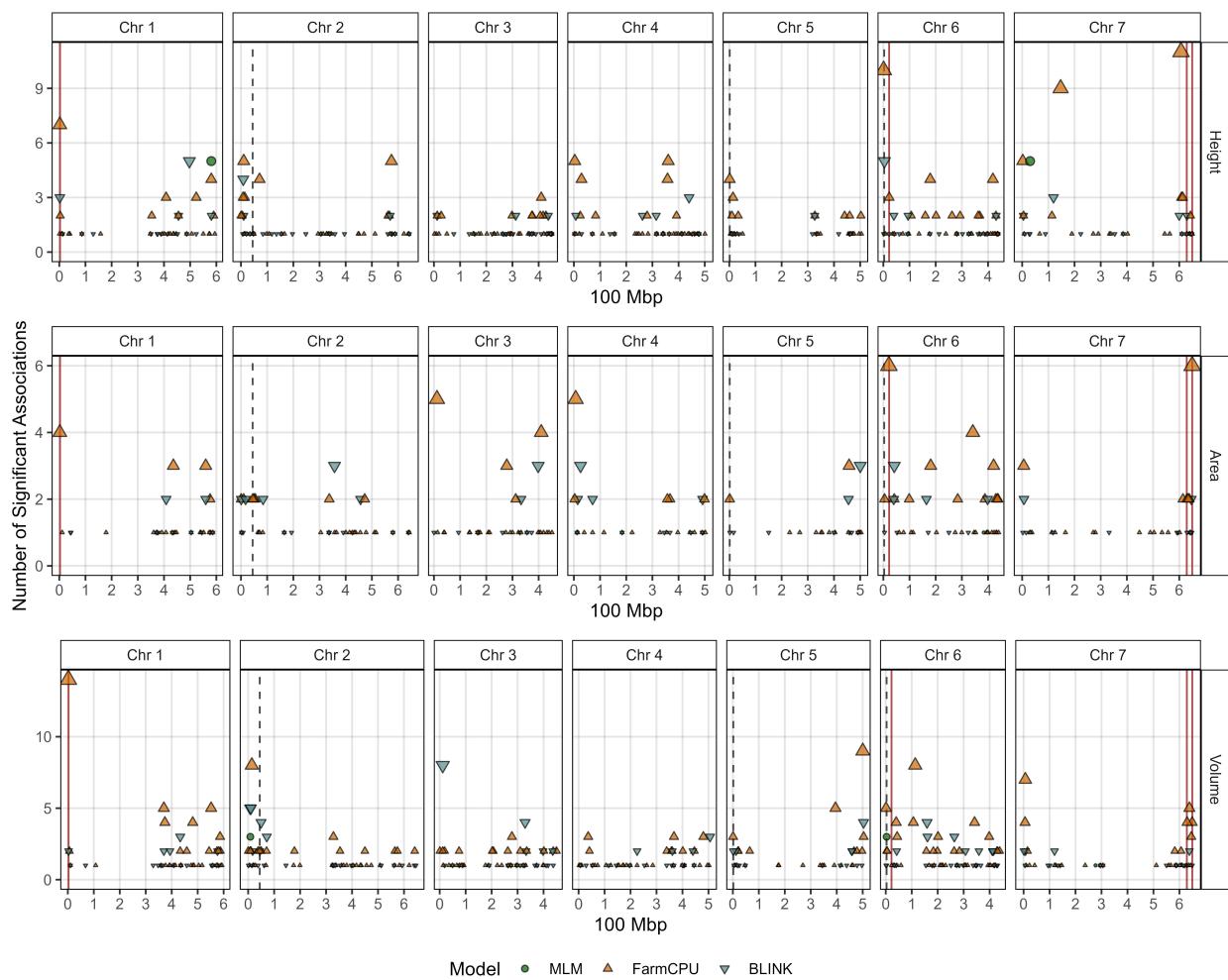
**Supplemental Figure 5**



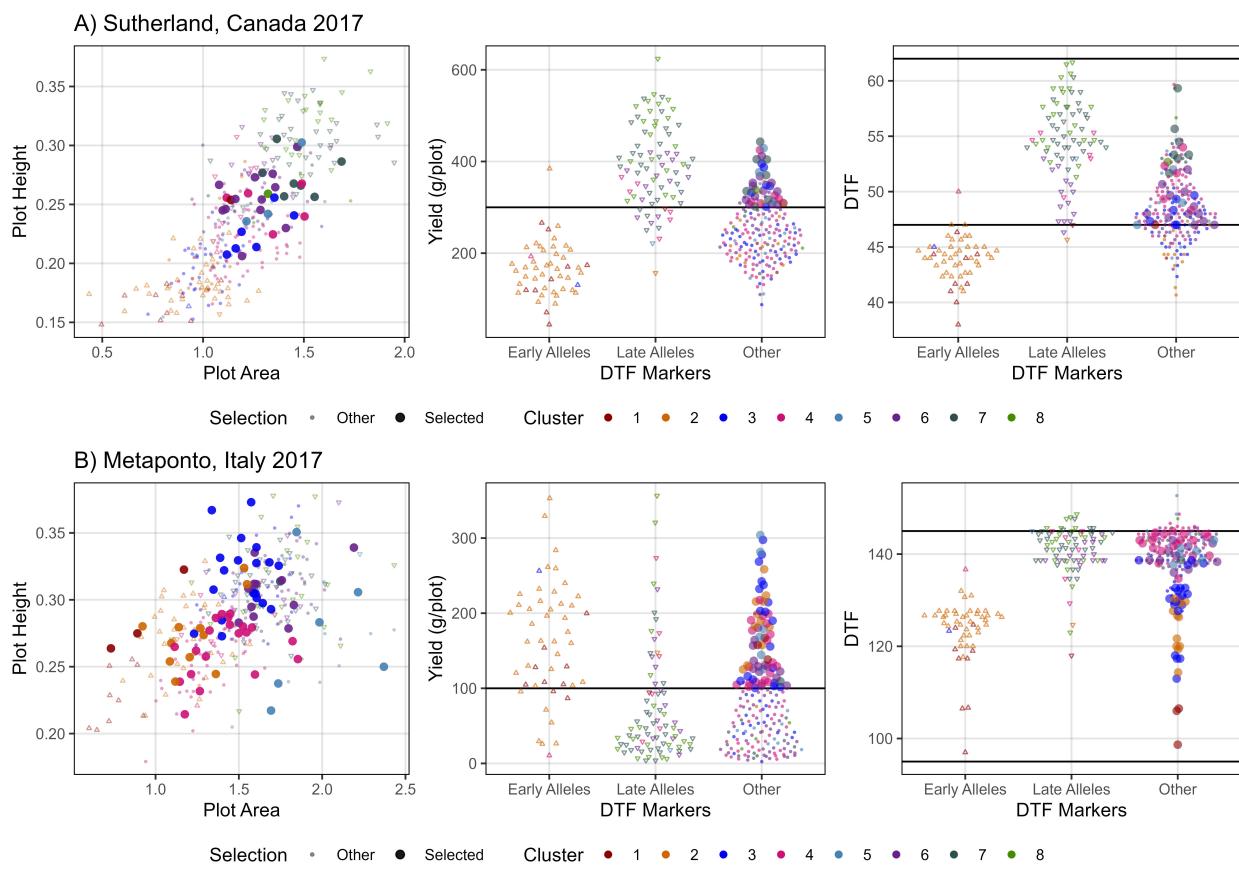
**Supplemental Figure 6**



**Supplemental Figure 7**



## Supplemental Figure 8



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