Supplementary Material

Article

Analysis of the Similarity between in Silico Ideotypes and Phenotypic Profiles to Support Cultivar Recommendation – A Case Study on *Phaseolus vulgaris* L.

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† Study conducted when the author was working at the University of Milan.

Table S1. Simulation units derived from the intersection of sowing time, soil type and climate features (SAM; Synthetic Agrometeorological Indicator; from -1 to 1; Confalonieri et al., 2010)

Simulation unit	Soil class[a]	Sowing[b]	SAM class
1	fine	early	B
2	fine	early	C
3	fine	early	D
4	fine	late	A
5	fine	late	B
6	fine	late	C
7	fine	late	D
8	medium	early	B
9	medium	early	C
10	medium	early	D
11	medium	late	A
12	medium	late	B
13	medium	late	C
14	medium	late	D
15	coarse	early	B
16	coarse	early	C
17	coarse	early	D
18	coarse	late	A
19	coarse	late	B
20	coarse	late	C
21	coarse	late	D

Table S2. Bean genotypes involved in the field experiment conducted in Cadriano (BO, Italy) in 2018. All genotypes are "*borlotto*" type and have a determinate bush growth habit. The name of the company who provided the seeds is also reported. For commercial cultivars, information about the registration are shown as retrieved from the EU database of registered plant varieties (2019 consolidated version) available at: https://ec.europa.eu/food/sites/food/files/plant/docs/plant-variety-catalogues_vegetable-species.pdf.

| Genotype	Type	Growth habit	Seed Company	EU Country of admission	Responsibility for maintenance
ETNA	Borlotto	Determinate bush	Monsanto	Italy	Monsanto Agricoltura Italia S.p.A.
Taylor's horticultural	Borlotto	Determinate bush	TERA SEEDS	Netherlands	several
Meccearly	Borlotto	Determinate bush	Olter	France	Blumen Group S.p.A.
Meccano	Borlotto	Determinate bush	Olter	Italy	Blumen s.r.l.
Magico	Borlotto	Determinate bush	Olter	Italy	Blumen s.r.l.
17B916	Borlotto	Determinate bush	TERA SEEDS		
17B917	Borlotto	Determinate bush	TERA SEEDS		
17B925	Borlotto	Determinate bush	TERA SEEDS		
18B978	Borlotto	Determinate bush	TERA SEEDS		
17B927	Borlotto	Determinate bush	TERA SEEDS		
18B983	Borlotto	Determinate bush	TERA SEEDS		
18B987	Borlotto	Determinate bush	TERA SEEDS		
17B931	Borlotto	Determinate bush	TERA SEEDS		
18B989	Borlotto	Determinate bush	TERA SEEDS		
18B994	Borlotto	Determinate bush	TERA SEEDS		
18B993	Borlotto	Determinate bush	TERA SEEDS		
18B995	Borlotto	Determinate bush	TERA SEEDS		
18B996	Borlotto	Determinate bush	TERA SEEDS		
18B998	Borlotto	Determinate bush	TERA SEEDS		
18B999	Borlotto	Determinate bush	TERA SEEDS		
18B1002	Borlotto	Determinate bush	TERA SEEDS		
18B988	Borlotto	Determinate bush	TERA SEEDS		
18B997	Borlotto	Determinate bush	TERA SEEDS		
18B1000	Borlotto	Determinate bush	TERA SEEDS		
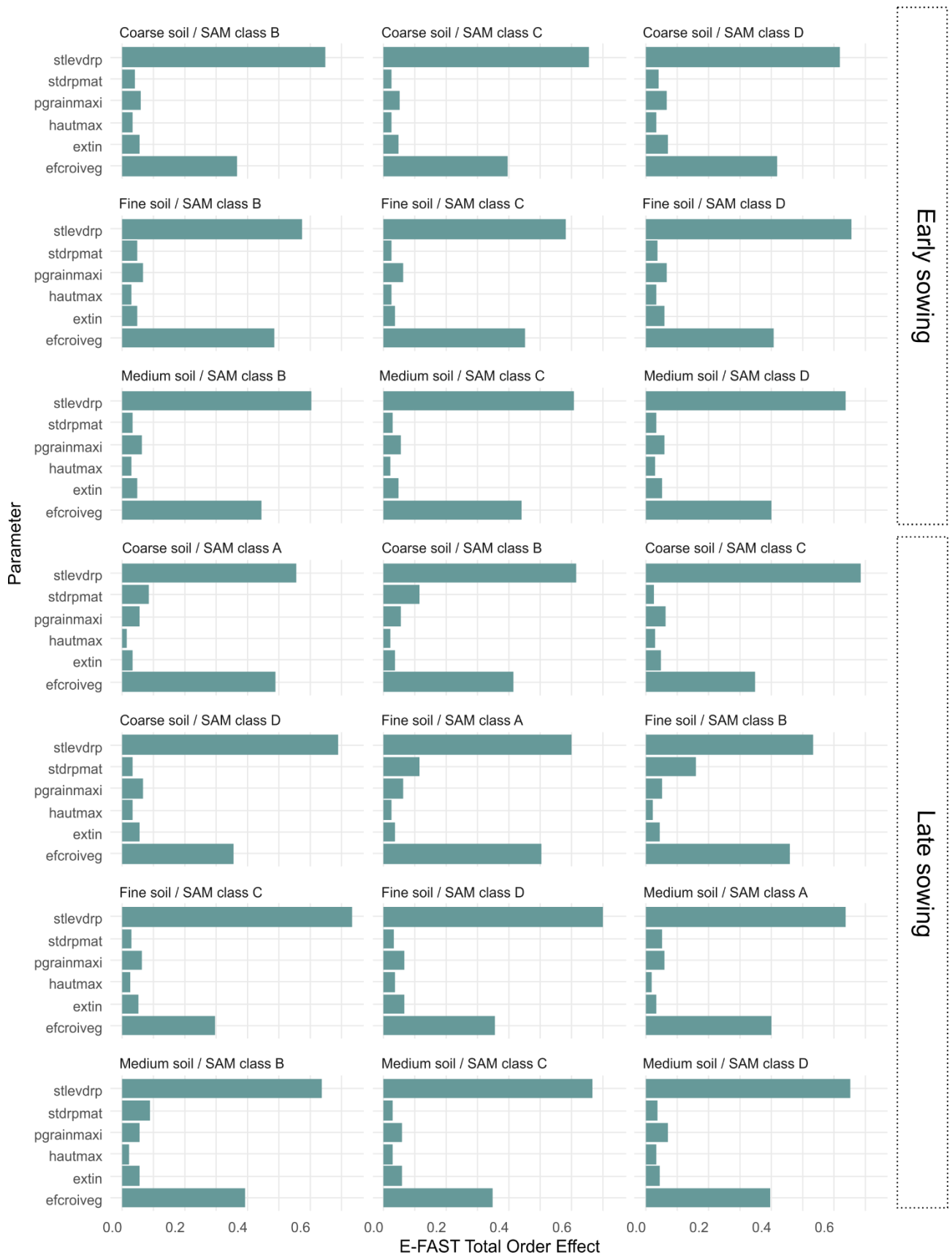
Figure S1. Sensitivity analysis results. E-FAST Total Order effect for all the combinations of sowing (early and late), soil (coarse, fine, and medium texture), and climate (SAM: Synthetic Agroclimatic Indicator). See Table 1 for details about the traits represented by the model parameters reported on the y-axis.
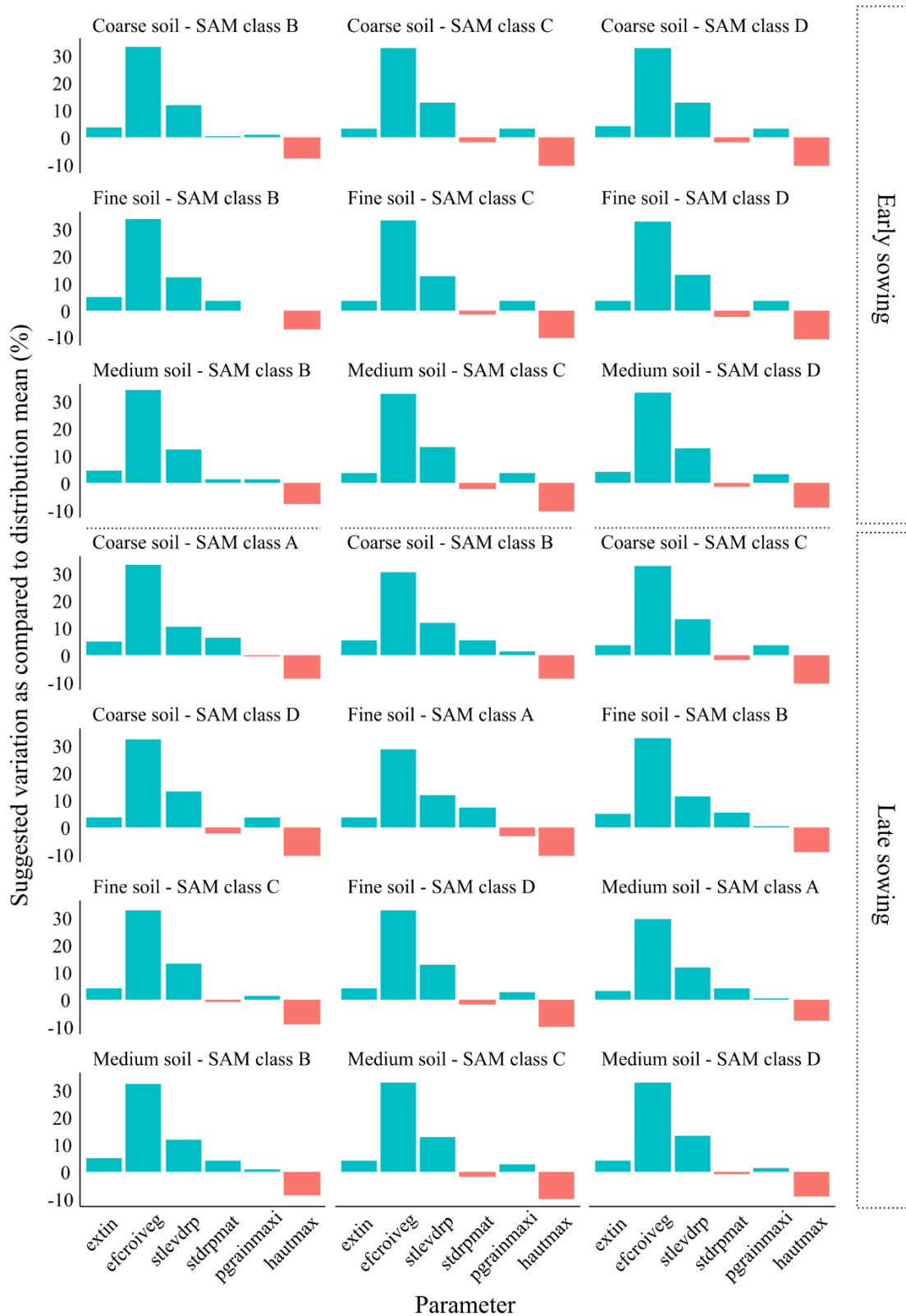
Figure S2. Ideotypes derived for early sowing (a) and late sowing (b) for each combination of soil (coarse, fine, and medium texture) and climate factors (SAM, Synthetic Agrometeorological Indicator). Ideotypes are reported as percentage variation of each parameter (closely linked to a plant trait, see Table 1 and the explanation here below) as compared to the distribution mean. Parameter-trait correspondence: extin: light extinction coefficient; efcroiveg: radiation use efficiency in the vegetative phase; stlevdrp: thermal time from sowing to first pod; stdrpmat: thermal time from first pod to maturity; pgrainmaxi: maximum seed weight; hautmax: maximum plant height.
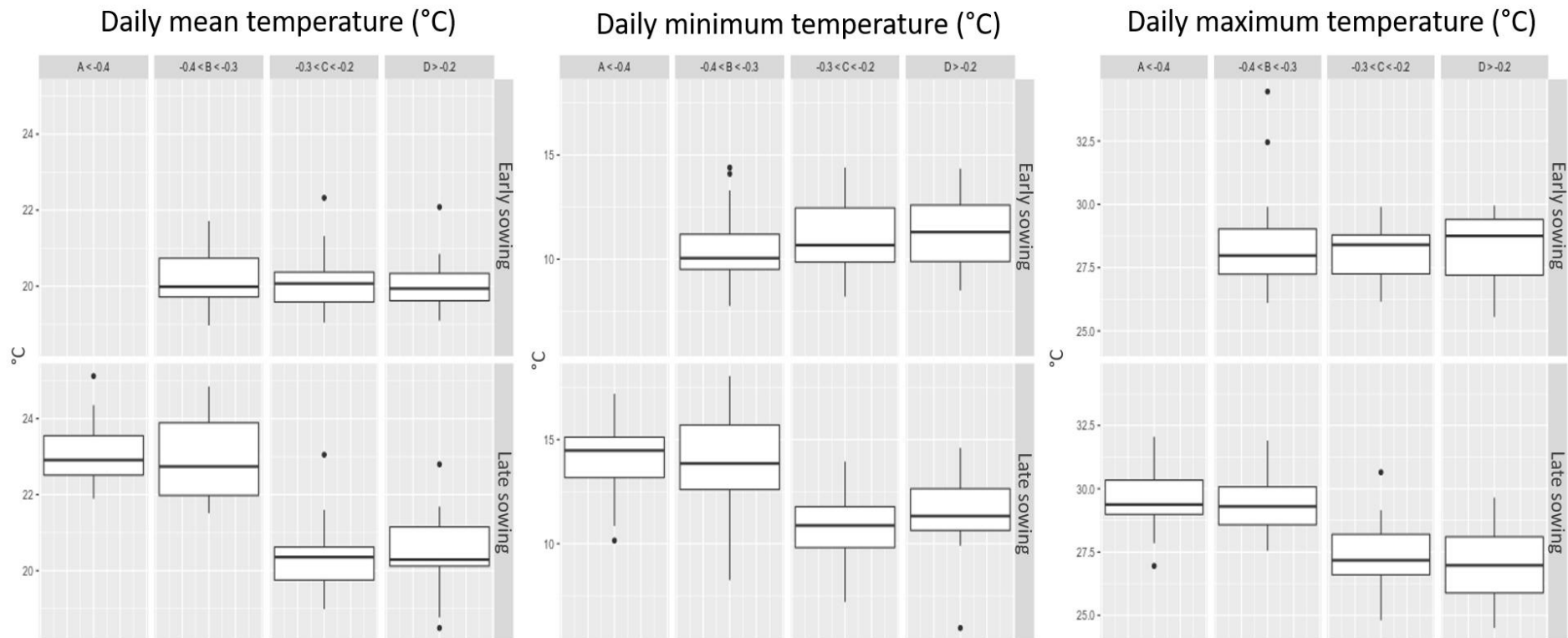
Figure S3. Boxplots of the variability observed in the 10-year time frame for daily mean, minimum and maximum temperatures (°C) in each combination of SAM class (SAM, Synthetic Agrometeorological Indicator; classes from A to D) and sowing time (early: April 15th; late: May 15th). Higher heterogeneity between SAM class can be seen in case of late sowing as compared to early ones. The soil type is not a factor included in the plot since all three soil types are present in each SAM × sowing time combination.