

Supplementary materials to the manuscript

Pedoclimatic, knowledge and management factors drive European soybean and faba bean yields

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Table S1. Overview of survey questions. The answering options associated with the multiple choice questions can be seen in Table 1.

Question	Retrieved variable
Questions about the farm	
1. How much land are you farming in a typical year (owned and leased)? - Hectares of arable land - Hectares of pasture land	Arable land Arable land/ Total land
2. What is your farm specialization?	Farm specialization
3. What is your production orientation?	Farm production orientation
4. Where is your farm located?	Agroclimatic zone, Country, NUTS II region
5. For how many years have you been farming?	Years of farming
6. What is the area share of your farm devoted to grain legumes in a typical year?	Area of legumes
7. Are soils on your farm generally fertile?	Perceived soil fertility
8. How likely are you to try out new crops, new management practices or new machinery/technology on your farm in the coming 5 years?	New management
Questions on previous experience with legume growing	
9. How often do you grow grain legumes (harvested for grain) on your farm?	Frequency of growing legumes
10. For how many years have you grown grain legumes (harvested for grain) in total?	Years of growing legumes
11. Which grain legumes have you grown in the past (harvested for grain)?	Previously grown legumes
12. How do you rate your knowledge and skills about growing grain legumes?	Perceived knowledge on legume growing
13. Where do you mainly acquire information about growing grain legumes?	Information sources
14. For which aspects of growing grain legumes would you like to have more information?	Required information
Soybean/Faba bean questions (sections active only for soybean/faba bean growers)	
15. For how many years have you grown soybean/faba bean in total (harvested for grain)?	Years of growing soybean/faba bean
16. What is your average soybean/faba bean grain yield?	Soybean/faba bean yield
17. How often do you follow each of the management practices below for growing soybean/faba bean? - Irrigation - Rhizobium inoculation - Pest management - Disease management - Weed management (chemical) - Weed management (mechanical) - Intercropping - Double cropping	Frequency of applied management practices
18. Which of the following management factors are the most important for the level of your soybean/faba bean yields in your experience?	Management yield-impacting factors
19. How important are the following factors for the level of your soybean/faba bean yields in your experience?	Diverse yield-impacting factors
20. What are the main aspects where soybean/faba bean cultivar improvement is needed?	Cultivar improvement
21. How old are you?	Age
22. What is your highest level of education?	Education level
23. What is your gender?	Gender

Table S2. Frequencies of selected variables.

Category	Soybean		Faba bean	
	N	%	N	%
Farm specialisation				
Specialist in arable crops	152	70.4	321	58.7
Mixed Cropping	10	4.6	35	6.4
Other	52	24.1	186	34.0
NA	2	0.9	5	0.9
Production orientation				
Conventional	136	63.0	356	65.1
Organic or in conversion to organic	55	25.5	153	28.0
Both	23	10.6	34	6.2
NA	2	0.9	4	0.7
Perceived soil fertility				
Fertile	83	38.4	224	41.0
Average/Not sure	115	53.2	276	50.5
Infertile	14	6.5	40	7.3
NA	4	1.9	7	1.3
Education				
No degree	0	0	3	0.5
Primary school	0	0	5	0.9
Secondary/High school	27	12.5	81	14.9
Technical/Vocational school	84	38.9	180	32.9
University	56	25.9	179	32.7
NA	49	22.7	99	18.1
Gender				
Male	147	68.1	408	74.6
Female	21	9.7	45	8.2
Other	0	0	1	0.2
I would rather not say	2	0.9	2	0.4
NA	46	21.3	91	16.6
Frequency of growing grain legumes				
Every year	177	81.9	403	73.7
Every second year	11	5.1	41	7.5
Every three or more years	28	13.0	103	18.8
Area share of the farm devoted to grain legumes				
0-25%	177	81.9	483	88.3
26-75%	36	16.7	46	8.4
NA	3	1.4	18	3.3
Perceived knowledge on growing grain legumes				
Good	143	66.2	301	55
Average/Not sure	59	27.3	200	36.6
Limited	12	5.6	42	7.7
NA	2	0.9	4	0.7
Source of information about growing gran legumes				
Farming community (own experience, other farmers)	164	75.9	442	80.8
Advisory services (state and commercial)	116	53.7	330	60.3
Research collaboration	40	18.5	64	11.7
Published info (magazines, internet)	27	12.5	51	9.3
Other	25	11.6	57	10.4

Table S3. Basic statistics on selected variables.

		Number	Mean	St Error	Min	Median	Max
Structural and demographic variables							
Arable land (ha)	Soy	212	194.2	15.18	0.7	130	1500
	Faba	539	262.7	18.36	0.3	150	5000
Relative arable land (% arable/pasture)	Soy	185	90.6	1.07	24.2	97.6	100
	Faba	479	89.2	0.67	14.3	95	100
Age	Soy	168	46	0.98	22	46.5	75
	Faba	447	48.3	0.58	19	49	77
Knowledge variables							
Years of farming	Soy	213	21.2	0.82	1	20	55
	Faba	540	23.7	0.56	0	25	59
Years of growing legumes	Soy	215	13	0.72	1	10	50
	Faba	546	14.6	0.49	0	10	60
Years of growing soy/faba	Soy	213	7.8	0.56	0	5	40
	Faba	536	8.9	0.35	0	6	58

Table S4. Basic statistics on soybean yields measured in $t\ ha^{-1}$.

	N	Mean	St Error	Min	Median	Max
Boreal-Nemoral zone	10	0.88	0.23	0.01	0.7	2.5
Central France	35	2.27	0.164	0.4	2	4
Germany	59	2.94	0.11	1	3	4.7
Netherlands	12	2.89	0.19	1.5	3	4
Northwestern France, UK	14	2.01	0.16	1	1.9	3
Poland	29	2.64	0.12	1	2.9	3.8
Southern France, Spain	57	2.99	0.1	0.8	3	4.5

Table S5. Basic statistics on faba bean yields measured in $t\ ha^{-1}$.

	N	Mean	St Error	Min	Median	Max
Central France	35	2.39	0.14	1	2.5	5
Finland	49	2.49	0.12	0.5	2.5	5
Germany	54	3.73	0.16	1	3.5	6.5
Latvia	28	3.39	0.26	1	3	6
Netherlands	32	4.65	0.21	2.8	4.5	7
Northwestern France	49	2.83	0.16	0.5	3	5
Poland	12	3.44	0.16	2.7	3.45	4.5
Southern France	33	2.3	0.18	0.5	2	4.9
Spain	13	2.38	0.24	1.5	2	4
Sweden	214	3.6	0.08	1	3.5	7.5
UK	28	4.16	0.16	1.8	4	6

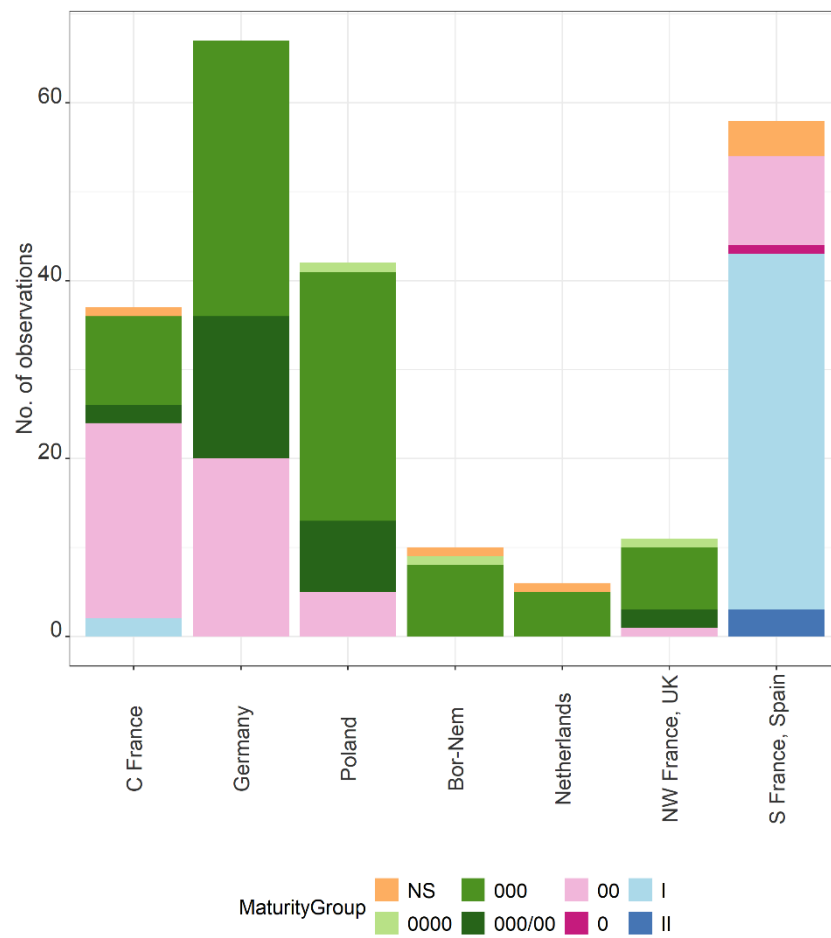


Figure S1. Soybean cultivar choice by maturity group per country segment. Farmers noted the cultivars most recently used and the project team accordingly identified the maturity groups from information provided by the breeding companies.

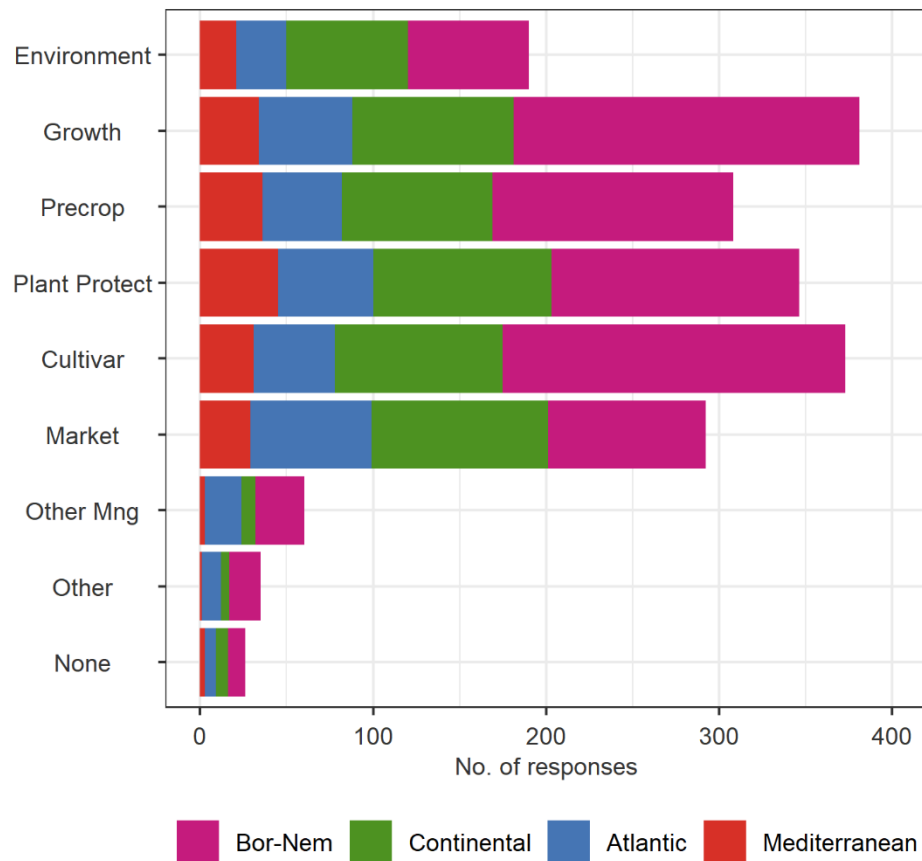


Figure S2. Aspects of grain legume production for which growers would like to have more information per agroclimatic zone. The abbreviations correspond to the following full names presented in the survey: Environment: Environmental effects; Growth: Legume growth and physiology; Precrop: Pre-crop effects; Plant Protect: Plant protection; Cultivar: Cultivar selection; Market: Market outlets; Other Mng: Other Management.