
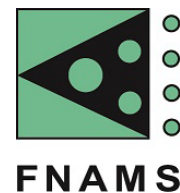




# YIELD COMPONENTS AND LIMITING FACTORS OF ALFALFA SEED CROP

Coraline RAVENEL – French Seed Growers Association (FNAMS)



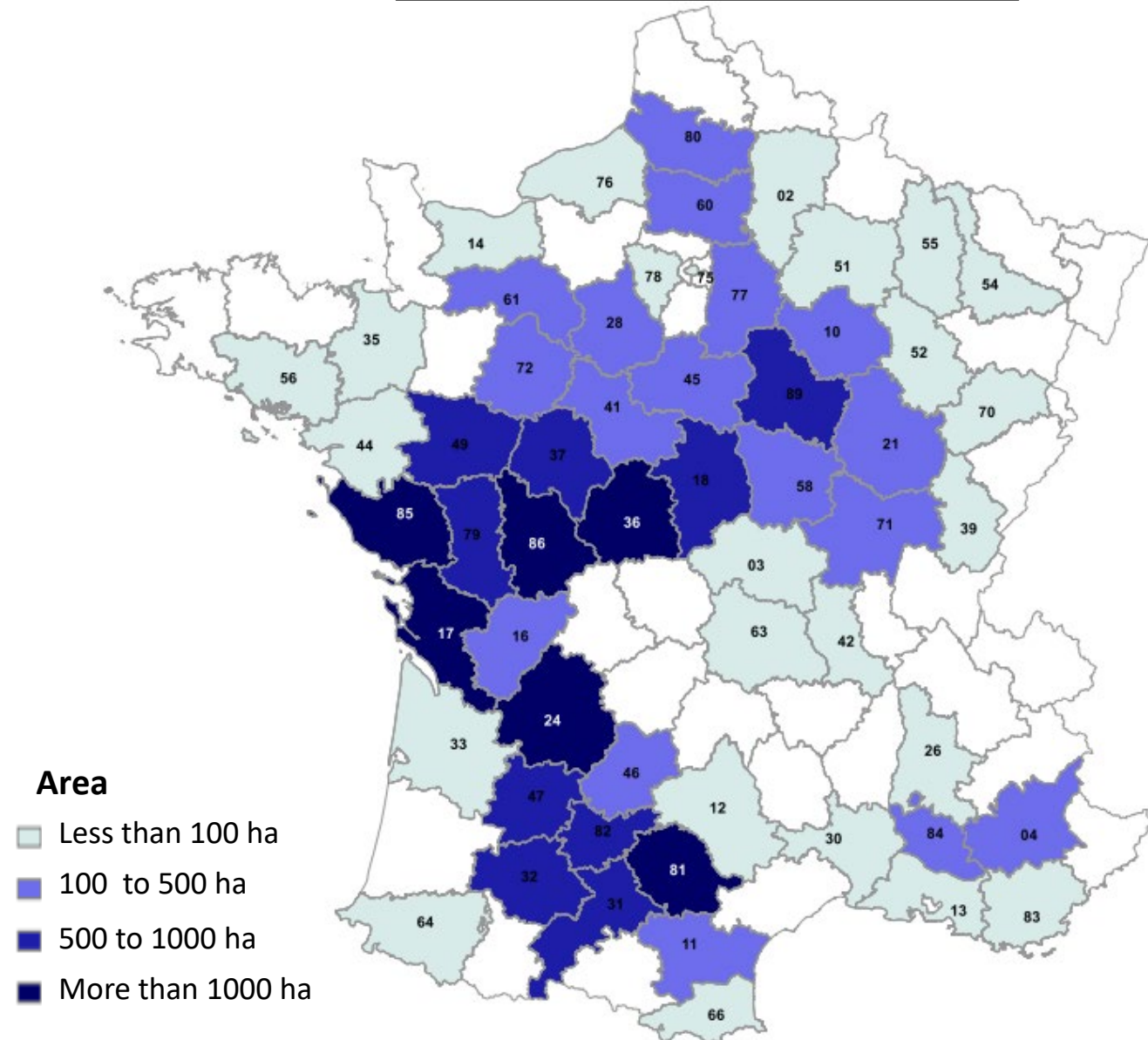
11th International Herbage Seed Group Conference Angers  
(France) - June 12, 2023

# Background

- The French alfalfa seed production:
  - 1<sup>st</sup> forage seed production multiplied in France
  - 2<sup>nd</sup> producer in Europe (after Italy)

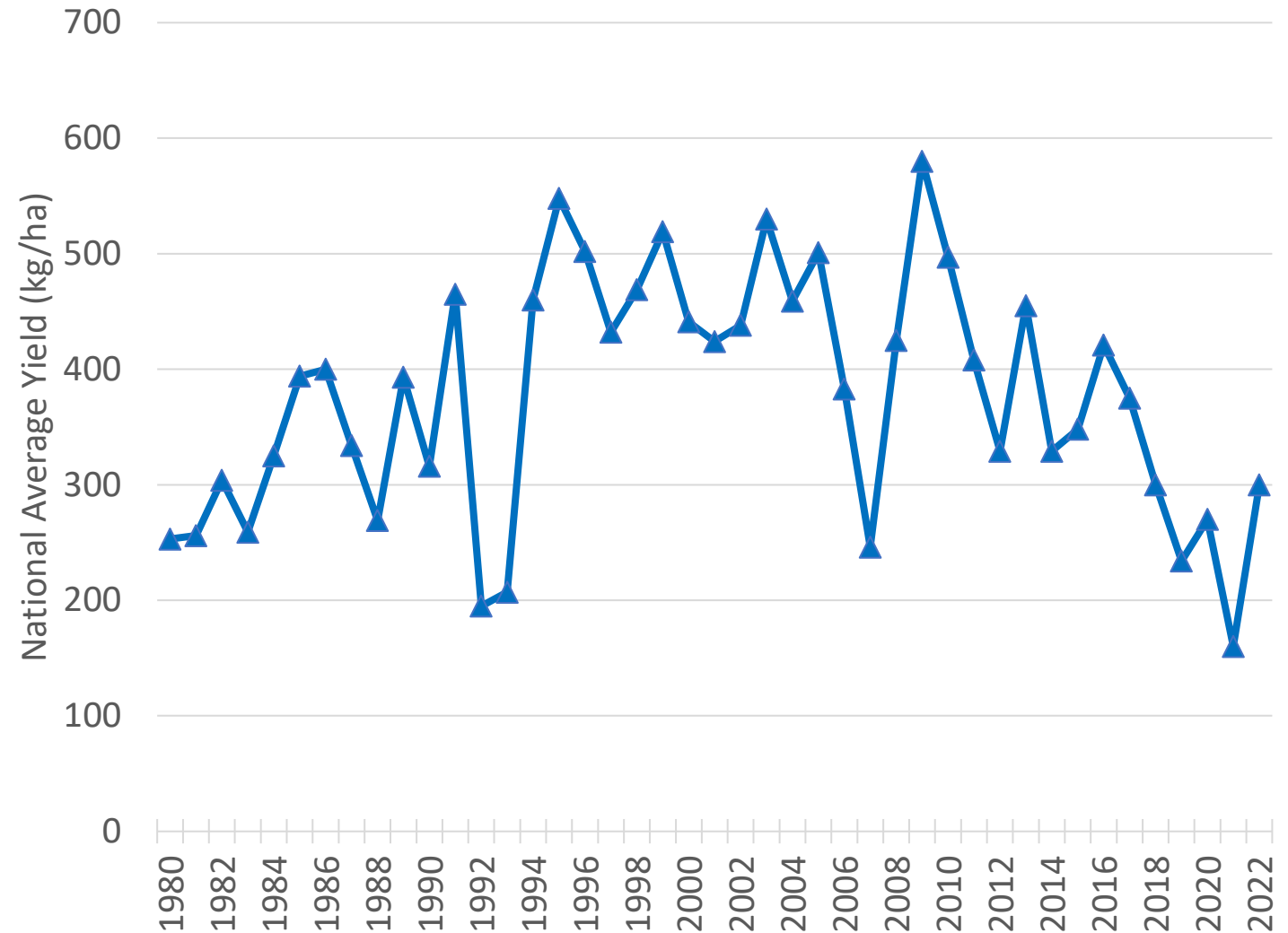


Alfalfa seed crop in France  
17910 ha in 2022



# Background

- The French alfalfa seed production:
  - 1<sup>st</sup> forage seed production multiplied in France
  - 2<sup>nd</sup> producer in Europe (behind Italy)
- Irregularity of performance in time and space



Source SEMAE

# Objectives :

What are the most important yield components?

What are the main limiting factors?



# Method

- Data sets :
  - An annual crop survey for 4 years in 2 production areas (Central – West and South-West)
  - Pluriannual experimental trials for 6 years on 3 FNAMS stations
  - A complete alfalfa seed yield history for 44 years on 1 farm in the West of France
- Measured variables
  - Plant measurements, management practices, climate data
- Data analysis

# Critical period

Correlation matrix - coefficients of determination (Pearson) – 43 seed growers plots

Variables	Average	Standard deviation	SY	TSW	SWI	SI	PI	SP	FSM	PHEF
SY	521	261	1							
TSW	2	0	0,016	1						
SWI	207	55	0,189	0,017	1					
SI	99	28	0,205	0,152	0,924	1				
PI	21	4	0,117	0,004	0,127	0,120	1			
SP	5	1	0,055	0,116	0,601	0,662	0,062	1		
FSM	158	52	0,014	0,006	0,002	0,002	0,024	0,017	1	
PHEF	67	18	0,052	0,032	0,002	0,006	0,041	0,004	0,029	1

**In green:** positive significant correlation, **in red** : negative significant correlation

**SY:** seed yield (kg/ha), **TSW:** thousand seeds weight (g), **SWI:** Seed weight per inflorescence (mg), **SI:** number of seeds per inflorescence, **PI:** number of pods per inflorescence, **SP:** number of seed per pods, **FSM:** fertile stems per m<sup>2</sup>, **PHEF:** plant height - end of flowering (cm)

# The main limiting factors

Excessive rainfall or water deficit between the cutting and the ending of flowering



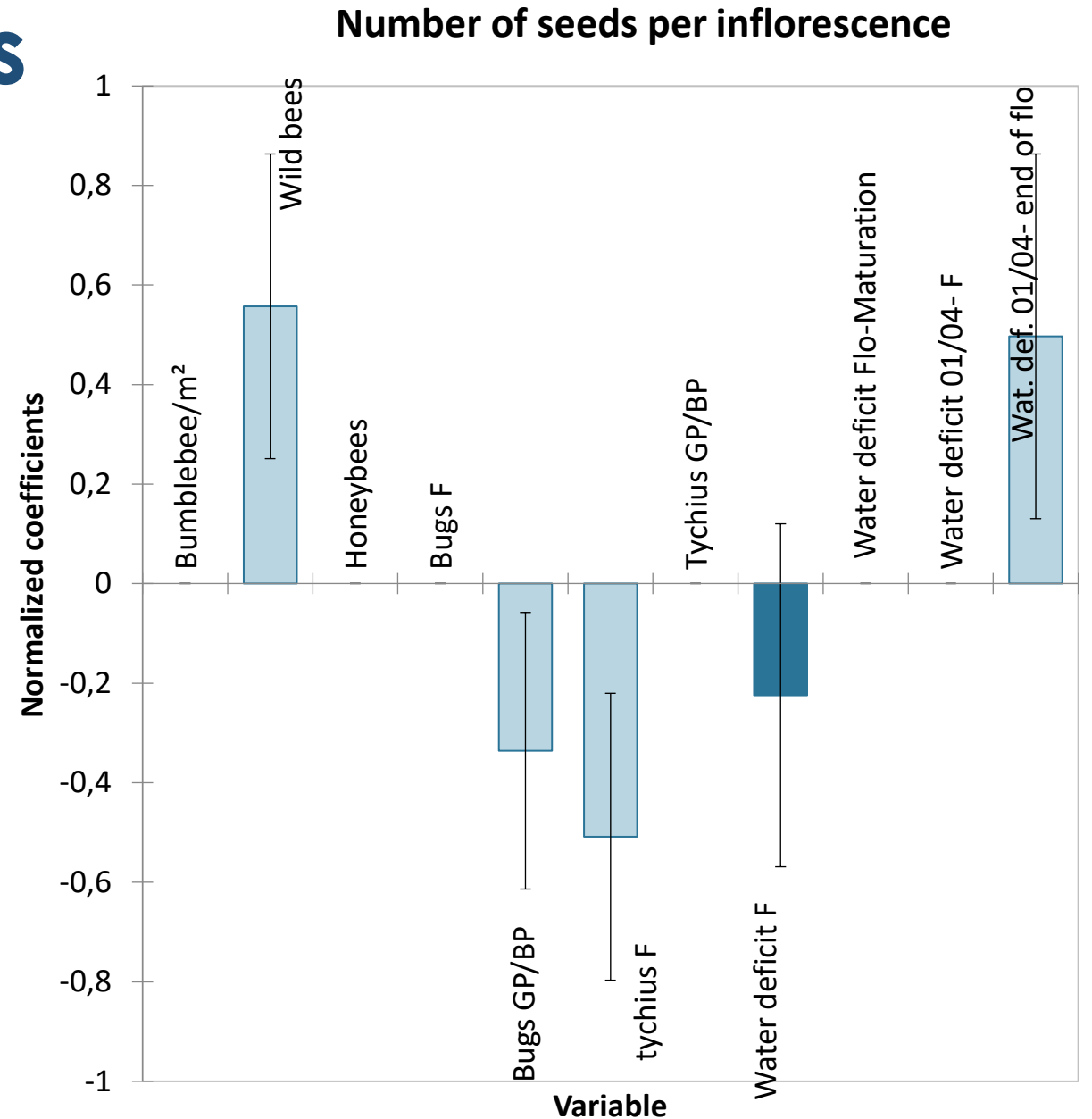
Lack of wild bees and bumblebees



Inflorescence Pests, especially the alfalfa seed weevil (in this case the *Tychius aureolus*), mirid bugs



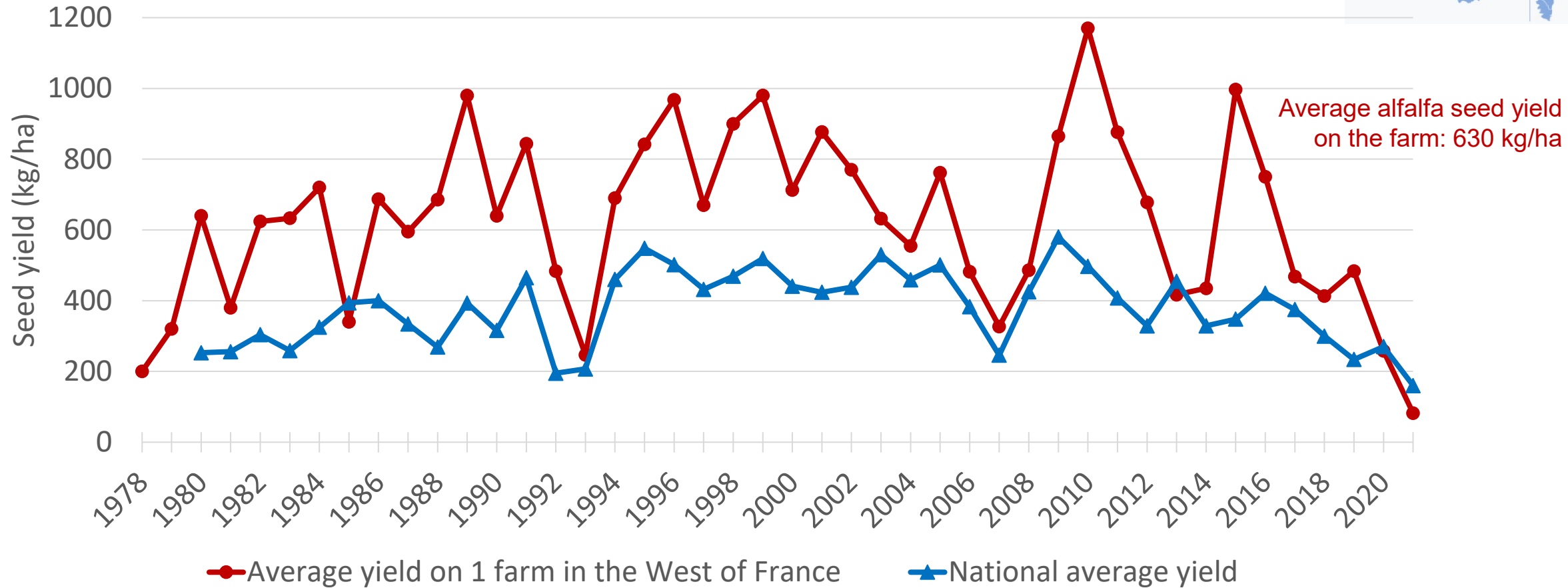
INRAE



Multiple linear regression - 29 plots - Model selection: best model -  $R^2: 0.599$

# Climate impact on alfalfa

*A case study illustration*

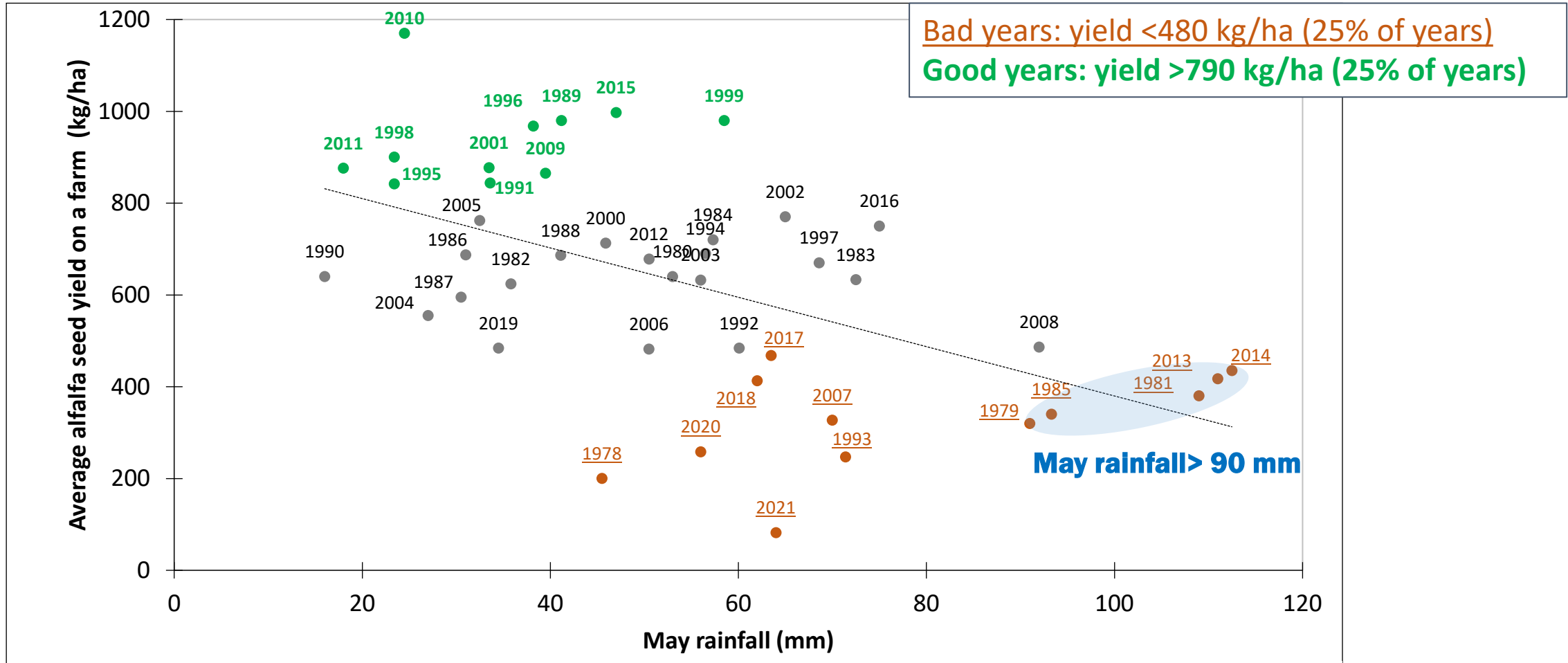


**Very high interannual variability : variation by a factor of 1 to 6**



# Climate impact on alfalfa

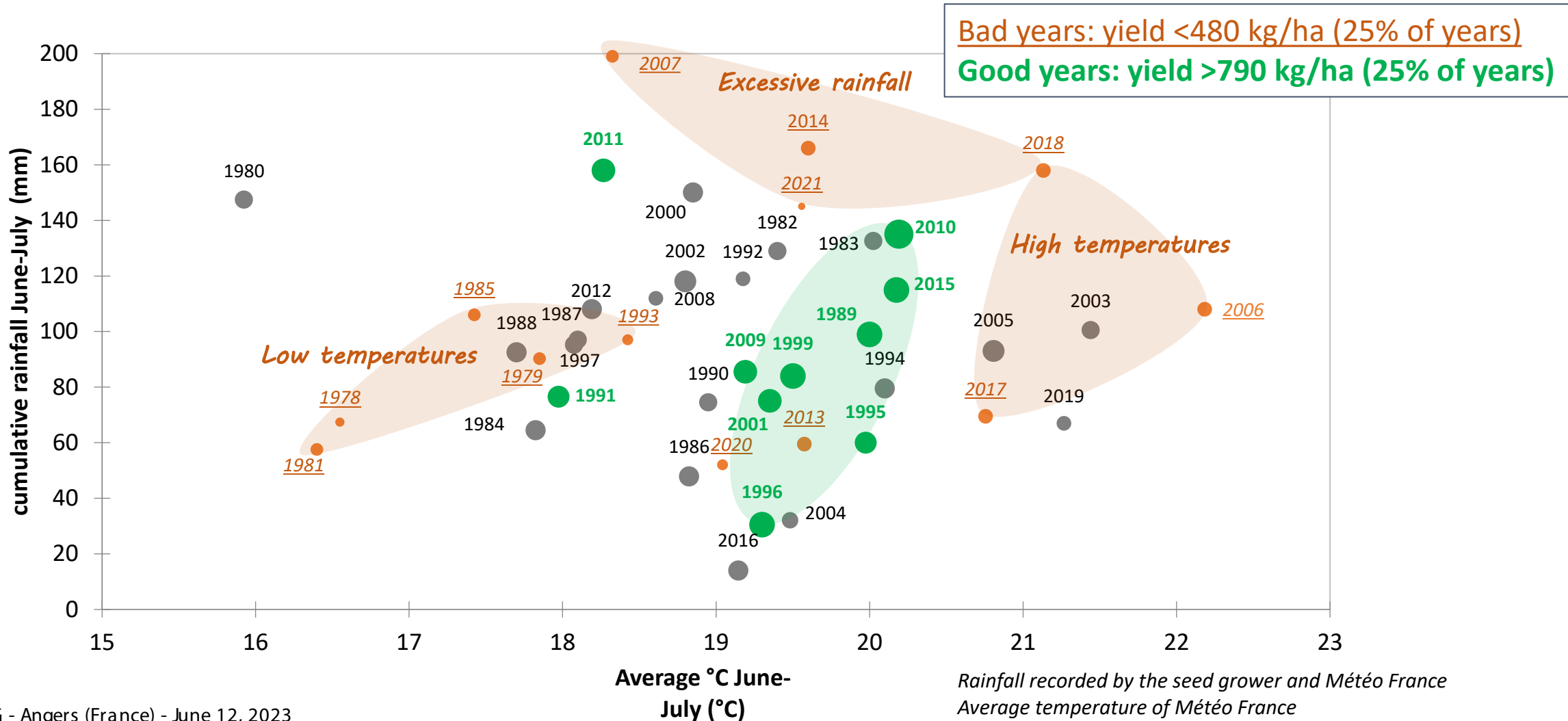
*The consequences of the May rainfall*



Rainfall Météo France

# Climate impact on alfalfa

*The consequences of climatic conditions from the flowering to the pod filling phase*

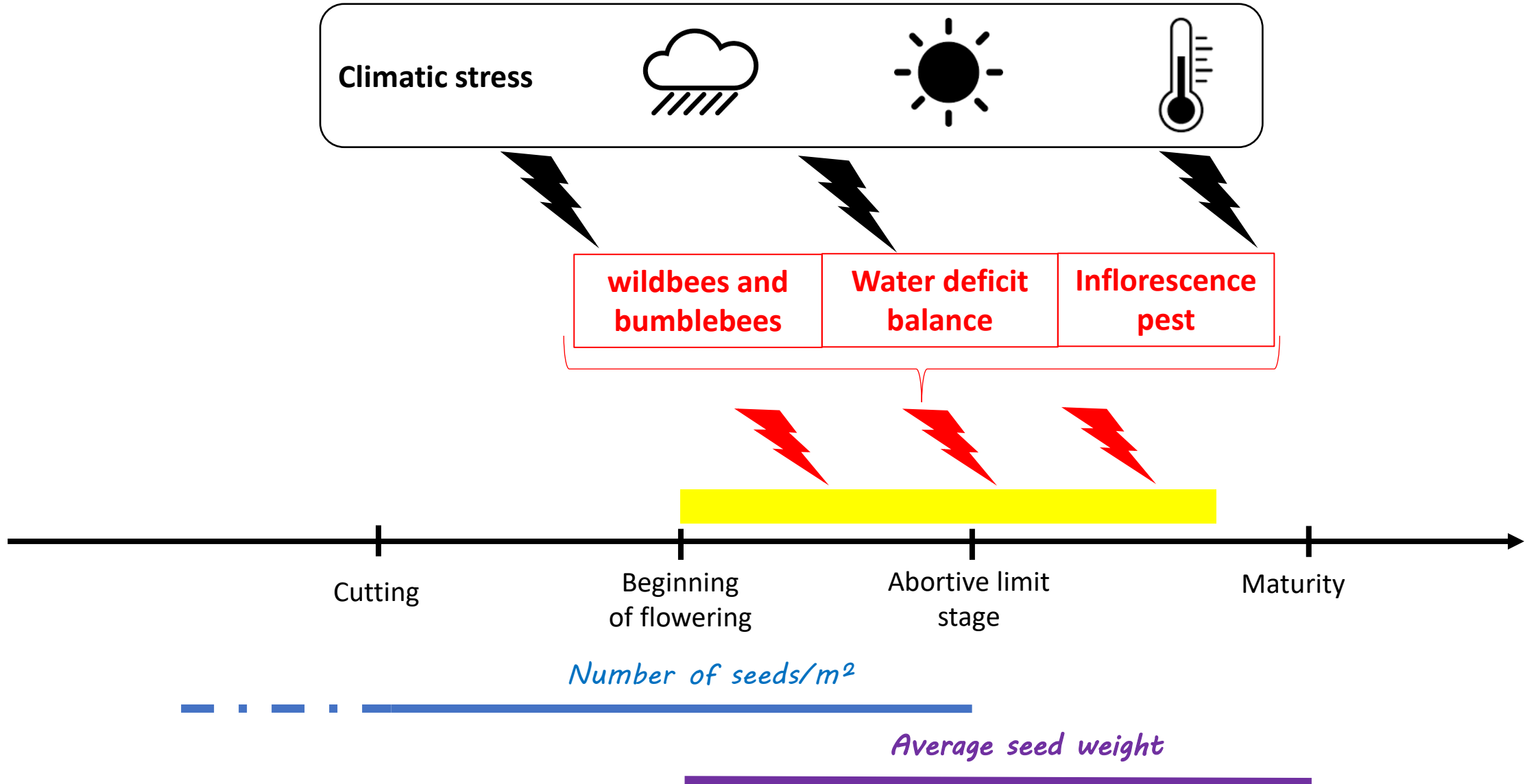


# Climate impact on alfalfa

## *Critical stages to weather conditions*

Year	Lowest average yield (kg/ha)	Vegetative growth or budding High cumulative rainfall (May)	Flowering / filling Low / high average T°C or excessive rainfall (June and July)	Maturity Wet conditions at the end of the cycle (end of August and Sept)
2021	82		X	X
1978	200		X	
1993	247		X	X
2020	258	(X) autumn		
1979	320	X	X	X
2007	327		X	X
1985	340	X	X	
1981	380	X	X	X
2018	413		X	
2013	417	X		
2014	435	X	X	
2017	468		X	
		<b>42%</b>	<b>83%</b>	<b>42%</b>

# Conclusion





# Thank you for your attention

*Thanks to growers, seed companies and staff of FNAMS*