



INVESTICE DO ROZVOJE VZDĚLÁVÁNÍ

## Konference: Maďarsko 11. – 16. 5. 2015



Inovace studijních programů AF a ZF MENDELU  
směřující k vytvoření mezioborové integrace  
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Faculty  
of Agronomy

Alps-Adria Scientific Workshop  
11<sup>th</sup> – 16<sup>th</sup> May, 2015, Neum

Pavλίνα Smutná

# VARIETAL RESPONSE OF WINTER WHEAT TO WATER LIMITED CONDITIONS

Dpt. of Crop Science, Breeding and Plant Medicine

Mendel  
University  
in Brno



MINISTRY OF EDUCATION,  
YOUTH AND SPORTS



OP Education  
for Competitiveness



INVESTMENTS  
IN EDUCATION  
DEVELOPMENT

# Introduction

Winter wheat is the most common crop in the drought-prone areas of the Czech Republic.

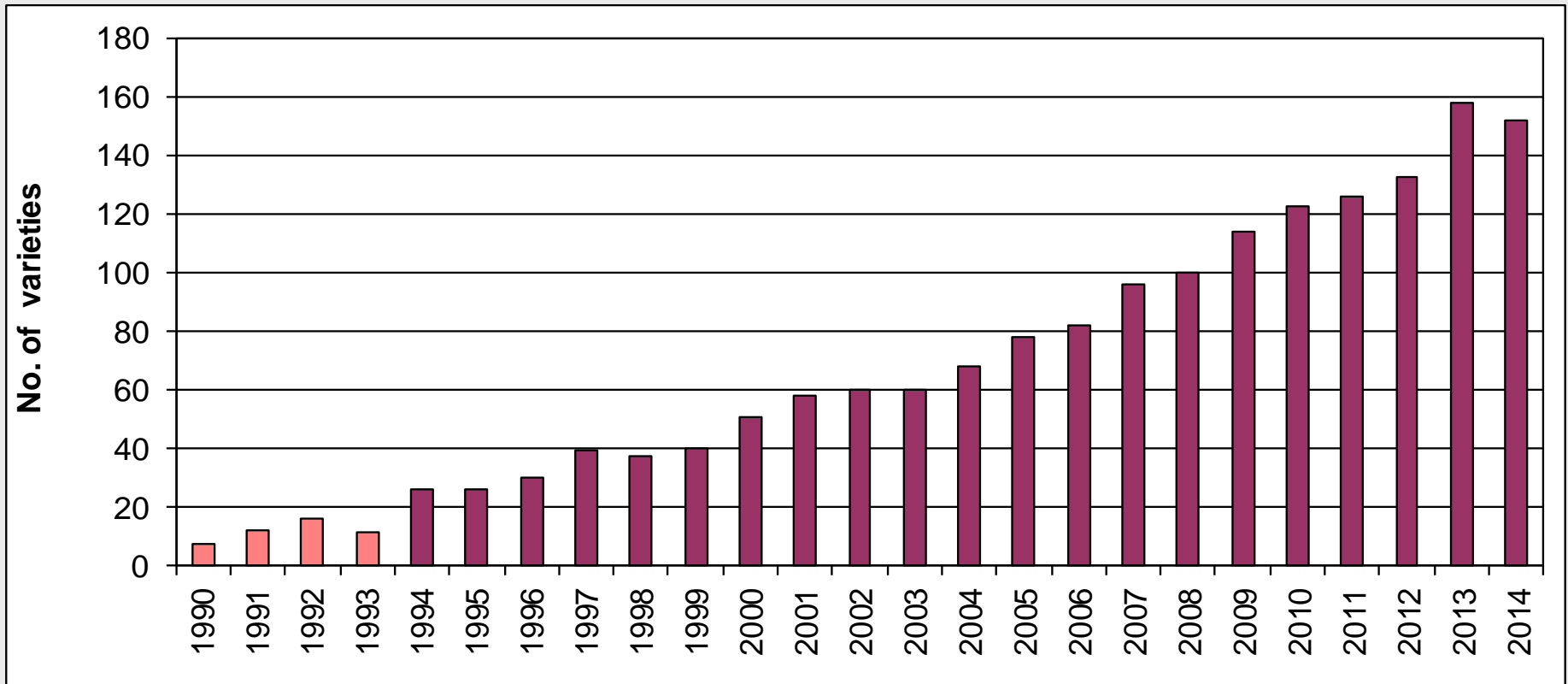
Is there any varietal difference in response to drought stress?

Can farmers get reliable information about offered varieties?



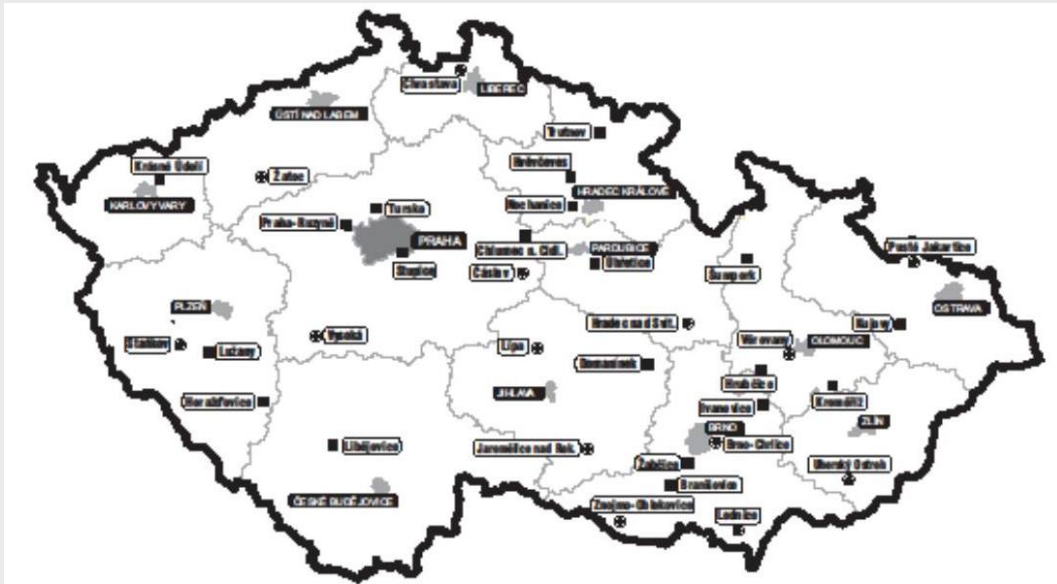
# Introduction

No. of varieties with certified seed production in the Czech Republic (1990 – 2014)



# Introduction

The results of registration and post-registration tests for recommendation are published yearly.

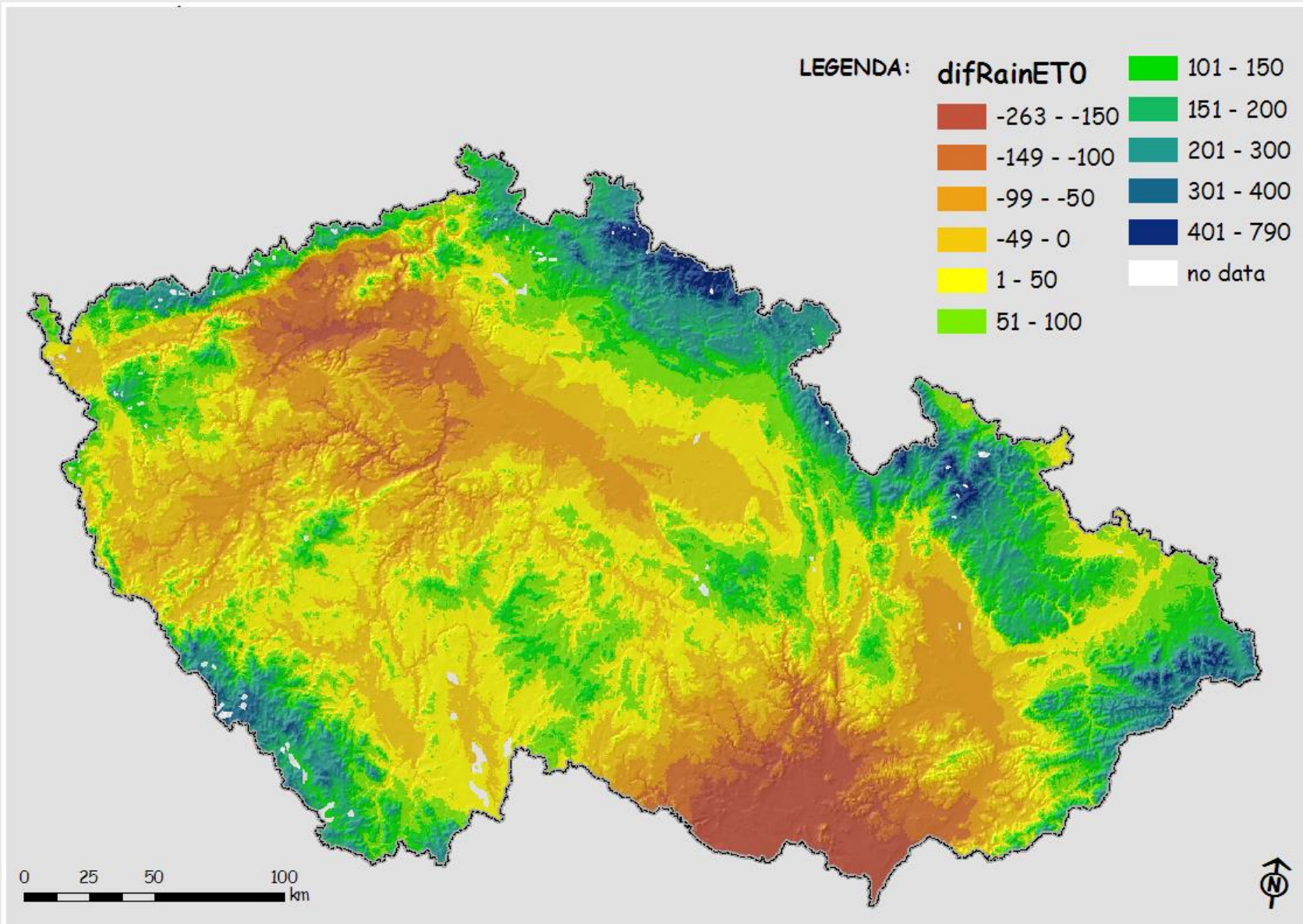


Field testing stations in the Czech Republic

The tolerance to drought is not included into the testing of the Value for Cultivation and Use (VCU tests).



# Differences between the precipitation and evapotranspiration rates



# Field experiments

- two sites, loamy x sandy soil (optimal x dry conditions)
- assortment of the most popular varieties (40 – 60),
- small plots, 10 m<sup>2</sup>, 3 – 4 replications, Alpha-design type,
- seeding rate: 4 MS per ha, planting: 1<sup>st</sup> decade of October; harvest: 2<sup>nd</sup> decade of July,
- N-fertilization: 80 – 140 kg.ha<sup>-1</sup> (2 – 3 times),
- fungicide treatment only on loamy site,
- meteorological observations, measurement of soil moisture,
- **scoring of agronomically important characters,**
- **grain yield**, specific grain weight, thousand grain weight,
- **analyses of quality parameters** (N-content, Zeleny sedimentation test, Falling number test, wet gluten content).



# Field experimental station in Žabčice





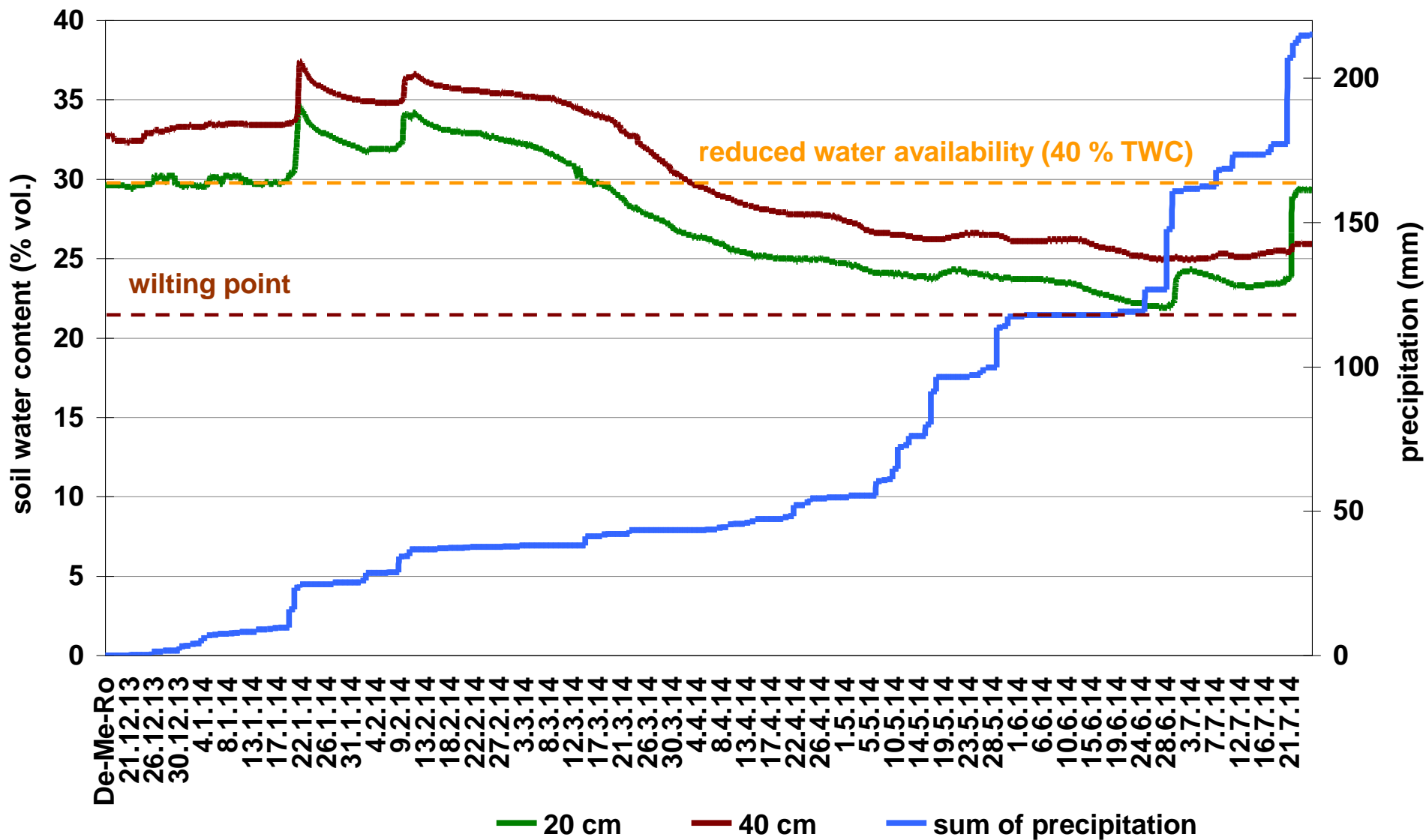
# Monitoring of weather conditions



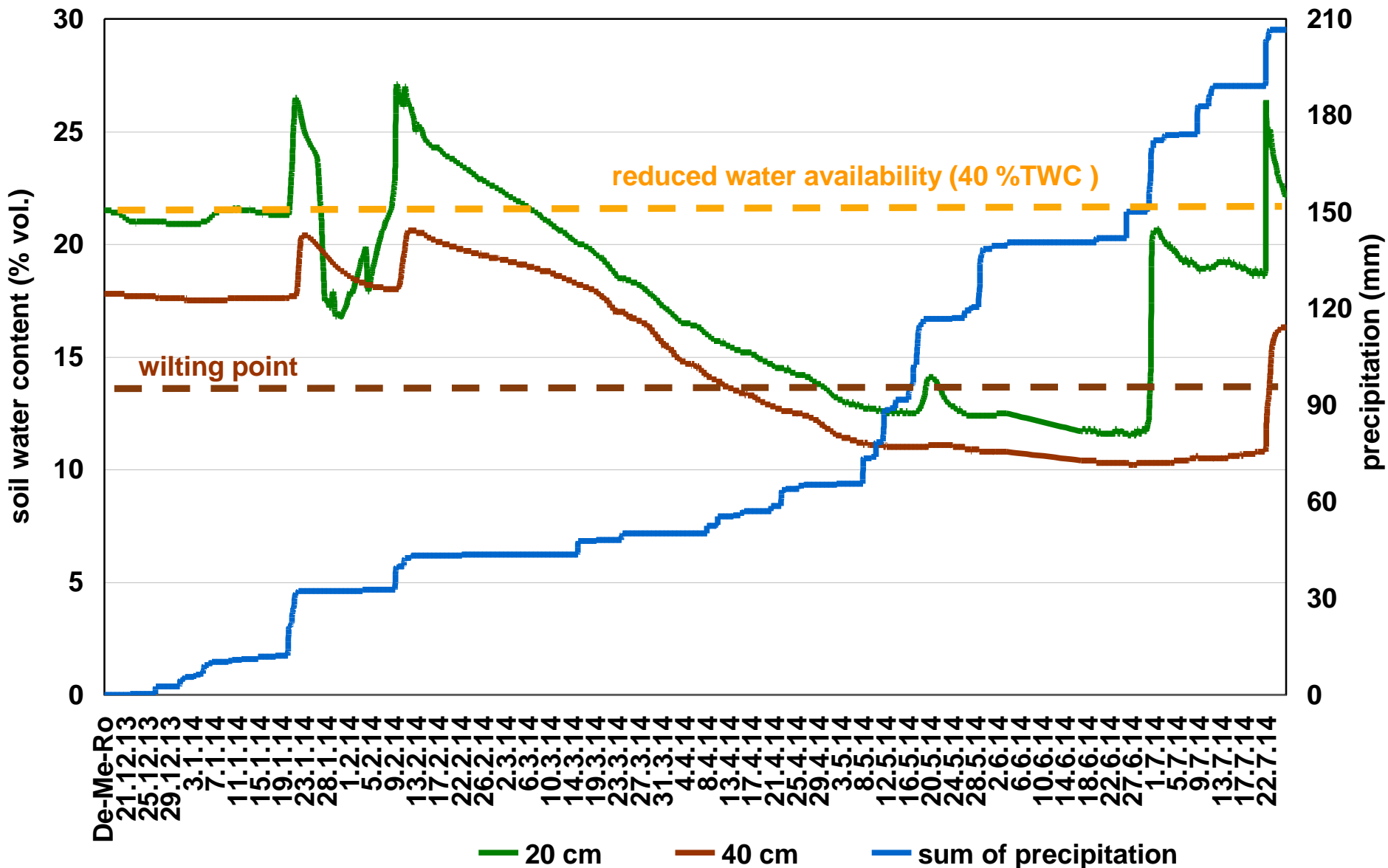
Field experimental station in Žabčice



# Soil water content measurement - optimal conditions (2014)



# Soil water content measurement - dry conditions (2014)





# Experiment on optimal site 10<sup>th</sup> June 2014





# Experiment on dry site 10<sup>th</sup> June 2014





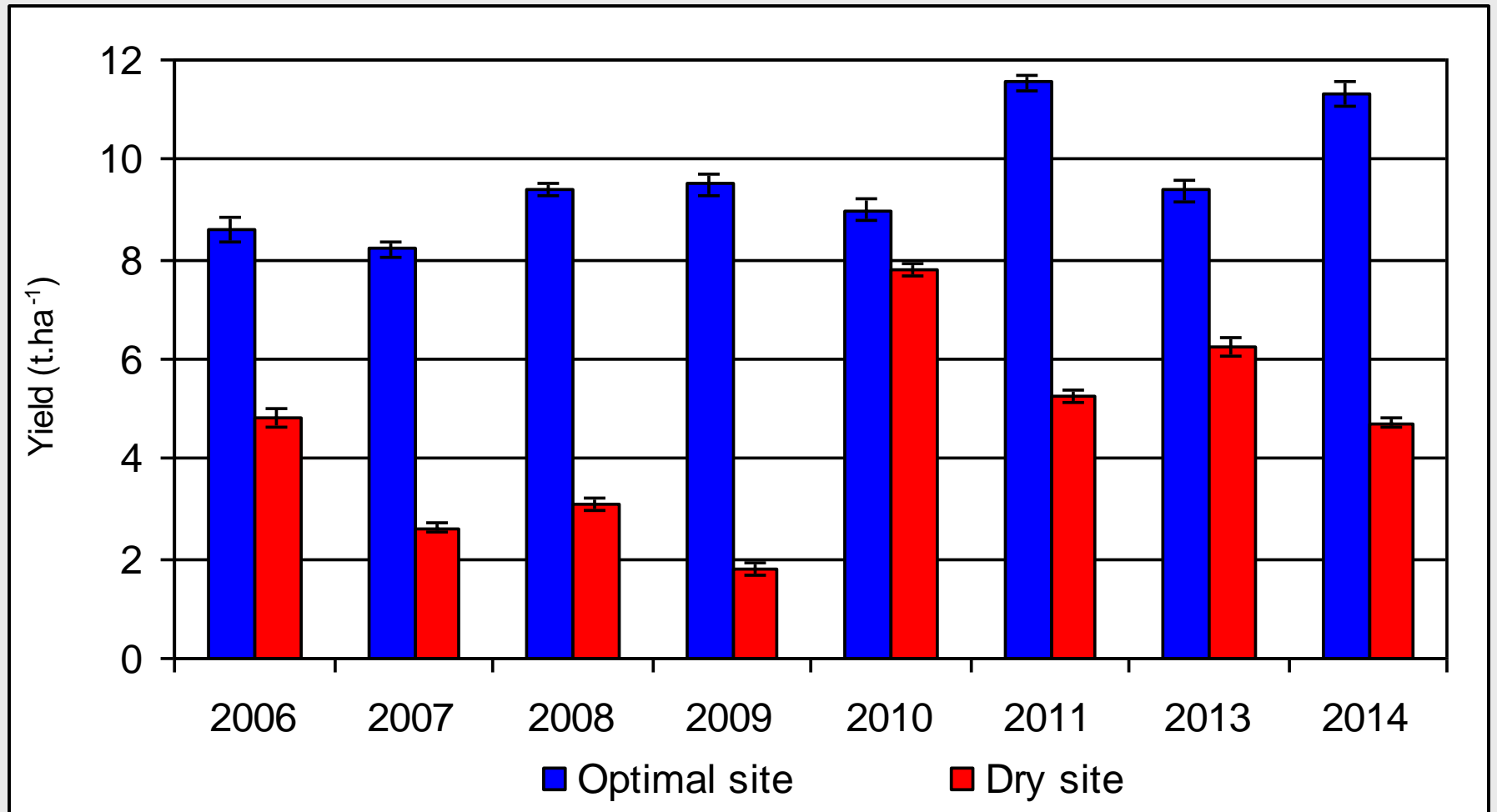
# Results

## Sum of precipitation (mm)

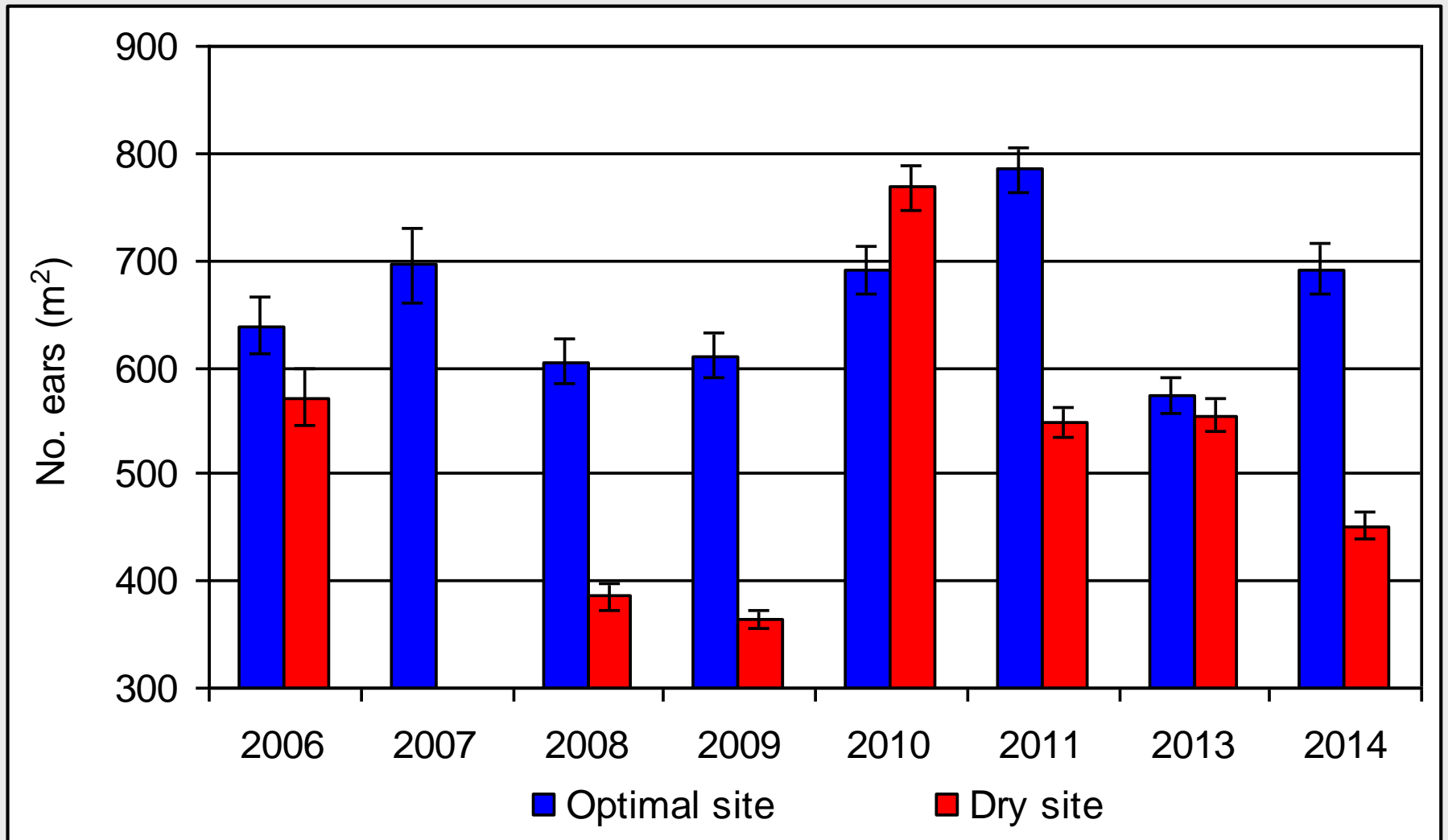
<b>Žabčice</b>	<b>1961-1990</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>
January	25	22	23	16	20	47	21	27	20	22
February	25	26	42	6	58	23	5	7	42	13
March	24	46	81	33	78	10	39	2	41	6
April	33	51	4	29	4	53	33	20	20	11
May	63	75	25	54	42	102	46	21	109	63
June	69	71	72	20	115	80	43	101	147	43
July (do 15. 7.)	29	71	17	34	42	13	19	18	5	13
<b>Jan.-Jul. (till 15. 7.)</b>	<b>267</b>	<b>363</b>	<b>264</b>	<b>192</b>	<b>359</b>	<b>328</b>	<b>207</b>	<b>197</b>	<b>384</b>	<b>170</b>
No. of varieties		41	41	46	47	52	52	48	67	46
<b>Optimal site</b>										
<b>Grain yield (t.ha<sup>-1</sup>)</b>		<b>8,6</b>	<b>8,2</b>	<b>9,4</b>	<b>9,5</b>	<b>9,0</b>	<b>11,6</b>	<b>3,9</b>	<b>9,4</b>	<b>11,3</b>
Max.- Min. (t.ha <sup>-1</sup> )		3,4	1,7	1,5	3,0	3,0	2,5	6,2	4,0	3,0
<b>Dry site</b>										
<b>Grain yield (t.ha<sup>-1</sup>)</b>		<b>4,8</b>	<b>2,6</b>	<b>3,1</b>	<b>1,8</b>	<b>7,8</b>	<b>5,3</b>	<b>1,2</b>	<b>6,3</b>	<b>4,7</b>
Max.- Min. (t.ha <sup>-1</sup> )		2,4	1,6	2,2	2,2	2,1	2,9	0,6	3,5	1,4



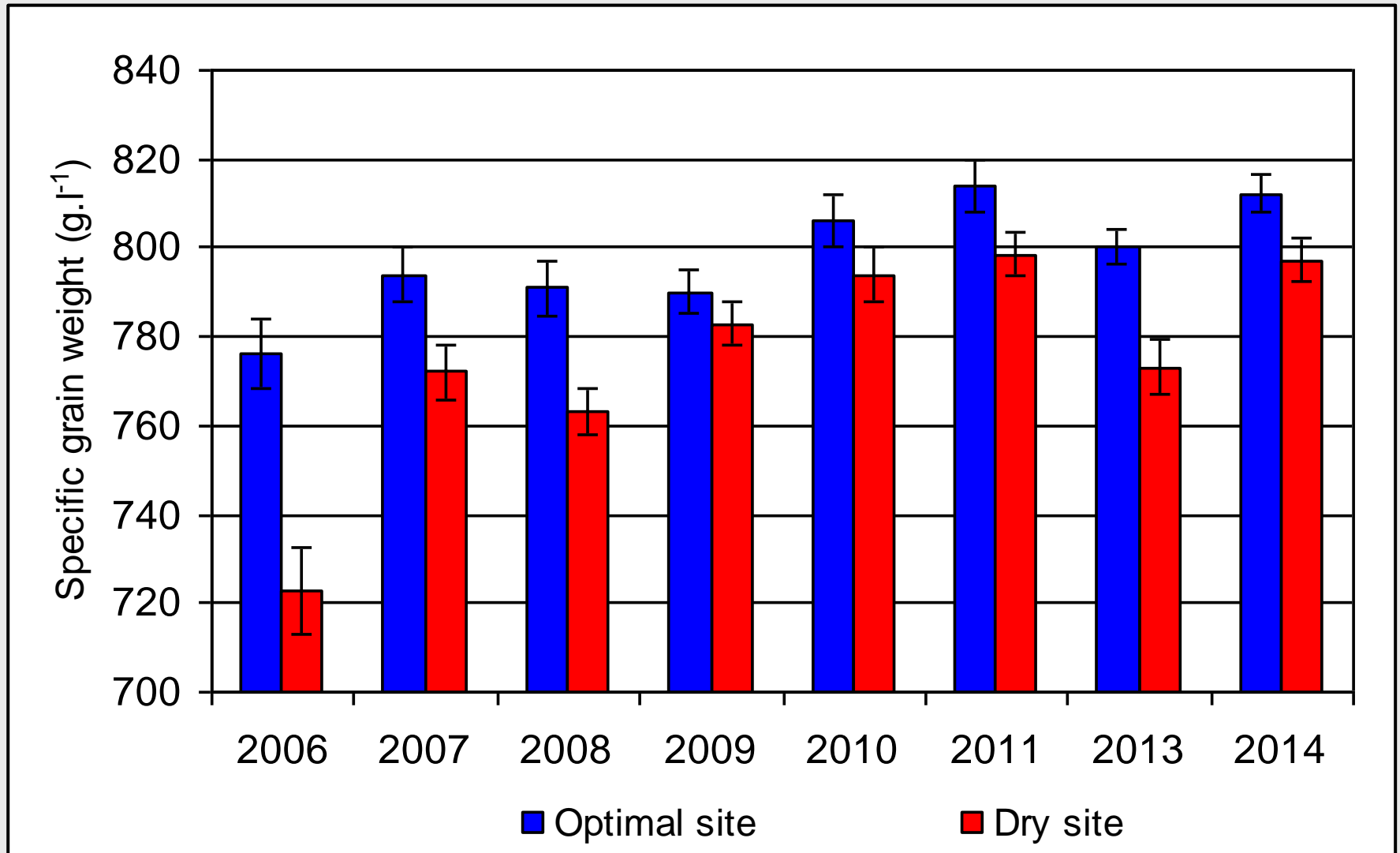
# Grain yield



# No. of ears per area



# Specific grain weight





# Comparison of quality parameters

Var.	Quality group	Protein content (%)						Falling No. (s)					
		Optimal site			Dry site			Optimal site			Dry site		
		2007	2008	2009	2007	2008	2009	2007	2008	2009	2007	2008	2009
Akteur	E	13,1	15,2	15,3	16,1	22,4	21,1	343	403	372	371	443	419
Ludwig	E	16,8	14,9	14,3	16,0	21,4	19,8	329	429	393	309	410	278
Balada	E*	10,9	13,5	14,3	17,7	18,8	17,0	366	422	367	395	407	288
Bardotka	E*	12,8	13,1	13,3	17,7	20,2	18,1	349	427	397	442	493	375
Bosorka	E-A*	10,9	14,1	14,2	18,5	20,6	19,5	304	365	341	402	374	389
Bohemia	A	14,3	15,5	15,6	19,0	22,1	21,2	377	406	380	403	445	360
Cubus	A	12,6	14,2	14,2	16,1	20,6	21,5	401	428	395	379	441	306
Eurofit	A	12,7	13,6	15,0	16,6	19,9	19,2	372	453	374	401	489	328
Mulan	A	12,2	13,3	13,1	16,0	19,8	21,0	334	390	322	369	405	248
Hedvika	B	10,8	13,4	13,4	17,6	19,6	18,3	361	405	387	380	456	329
Meritto	B	12,5	13,6	12,9	16,9	20,4	17,3	361	407	268	375	451	262
Venistar	B*	13,5	12,8	13,6	17,5	19,0	18,1	322	341	313	354	345	284
<b>Mean</b>		<b>12,0</b>	<b>13,8</b>	<b>13,9</b>	<b>16,7</b>	<b>20,3</b>	<b>18,6</b>	<b>341</b>	<b>394</b>	<b>342</b>	<b>368</b>	<b>417</b>	<b>319</b>

not acceptable as quality wheat

acceptable with price reduction

# Comparison of quality parameters

Var.	Quality group	Sedimentation test (ml)						Specific grain weight (kg.hI <sup>-1</sup> )					
		Optimal site			Dry site			Optimal site			Dry site		
		2007	2008	2009	2007	2008	2009	2007	2008	2009	2007	2008	2009
Akteur	E	35	64	63	45	73	75	84	83	84	82	78	80
Ludwig	E	47	63	48	44	68	72	83	82	81	80	77	79
Balada	E*	21	32	38	44	56	67	80	81	80	78	77	80
Bardotka	E*	38	53	50	64	71	73	81	81	81	77	77	80
Bosorka	E-A*	20	45	39	47	64	72	79	81	80	79	77	79
Bohemia	A	44	65	66	62	68	71	80	79	79	76	74	77
Cubus	A	38	56	47	50	70	67	81	79	80	80	77	78
Eurofit	A	34	60	59	51	68	73	85	83	82	81	80	81
Mulan	A	28	50	43	44	63	65	80	80	79	78	78	77
Hedvika	B	20	37	35	32	57	61	80	79	80	77	76	80
Meritto	B	22	52	34	36	60	62	80	81	80	77	77	79
Venistar	B*	20	27	26	32	66	60	80	80	80	80	80	82
<b>Mean</b>		<b>30</b>	<b>47</b>	<b>42</b>	<b>45</b>	<b>65</b>	<b>66</b>	<b>80</b>	<b>80</b>	<b>79</b>	<b>77</b>	<b>76</b>	<b>78</b>

not acceptable as quality wheat    acceptable with price reduction

# Conclusions

**Is there any varietal difference in response to drought stress?**

Yes, there are varieties with better performance under stress conditions. Differences were detected not only on yield level, but also in quality parameters, particularly the specific grain weight is the most limiting.

**Can farmers get reliable information about offered varieties?**

Official trials for registration are not yet focused on drought stress tolerance. Results from our trials are available and can be useful for farmers in South Moravia.

Appropriate variety is one important step in tailor-made wheat growing technology for specific soil-climatic conditions.



# Thank you for your attention

## Acknowledgements

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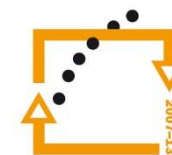
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