WITHIN-SEASON PREDICTIONS OF DURUM WHEAT YIELD OVER THE MEDITERRANEAN BASIN

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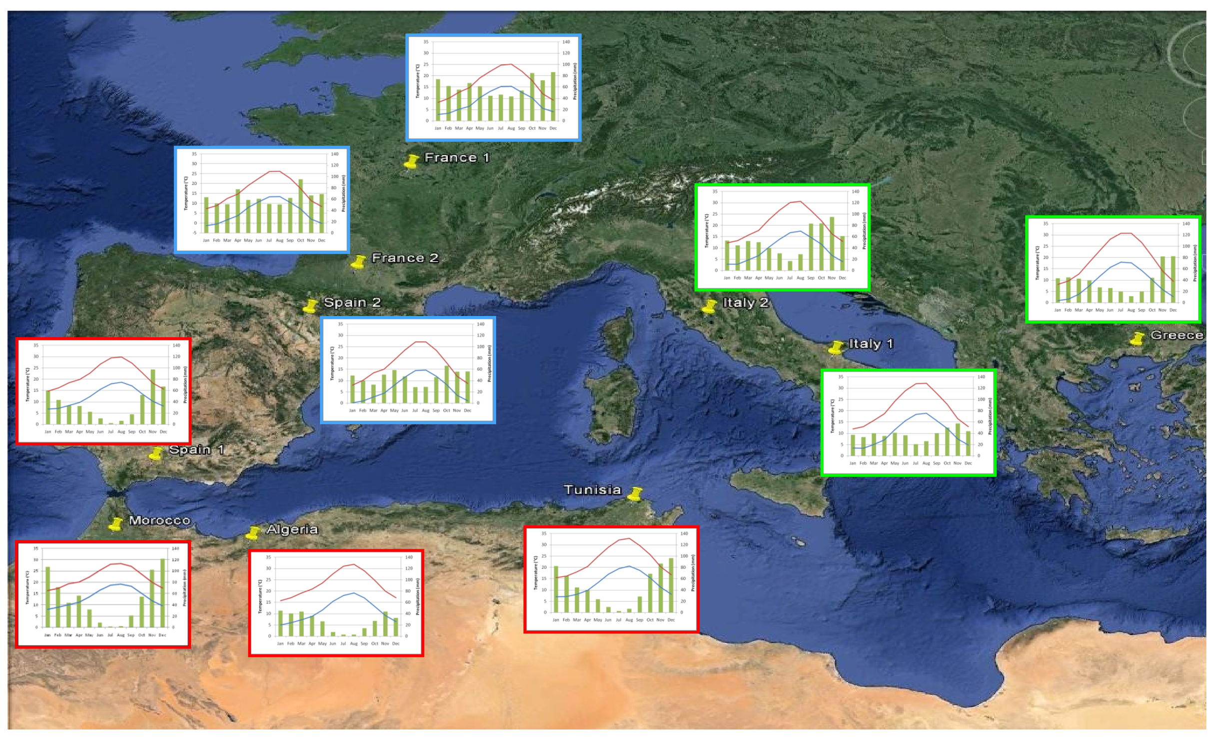
◆ Introduction & Objective

Crop yield is the result of the interactions between weather in the incoming season and how farmers decide to manage and protect their crops. Uncertainties in the weather of the forthcoming season leads farmers to lose some productivity by taking management decisions based on their own experience of the climate or by adopting conservative strategies aimed at reducing the risks (Jones et al. 2000). Accordingly, predicting crop yield in advance, in response to different managements, environments and weathers would assist farm-management decisions (Lawless and Semenov, 2005).

Following the approach described by Semenov and Doblas-Reyes (2007), this study aimed at assessing the effectiveness of different seasonal forecasting methodologies in predicting durum wheat yield at 10 different sites across the Mediterranean Basin.



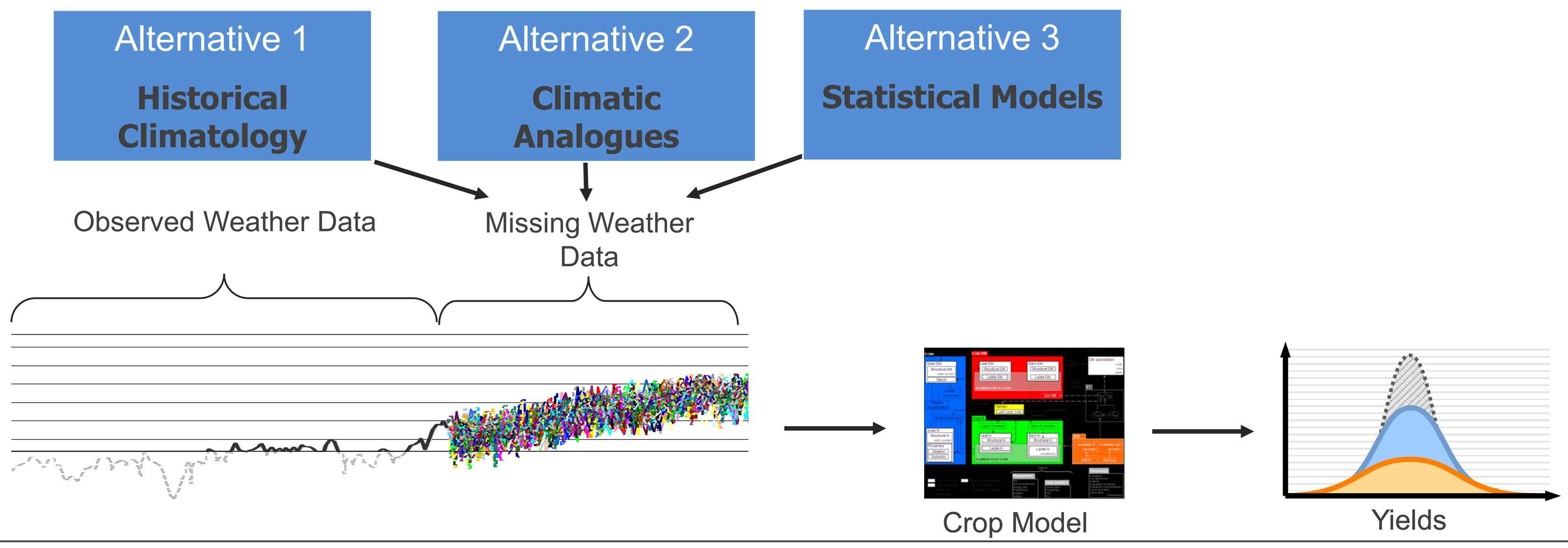
Case Study Area

◆ Materials & Methods

The crop model, SiriusQuality (Martre et al., 2006), was used to compute wheat yield over a 10-years period. First, the model was run with a set of observed weather data to calculate the reference yield distributions. Then, starting from 1st January, yield predictions were produced at a monthly time-step using seasonal forecasts. The results were compared with the reference yields to assess the efficacy of the forecasting methodologies to estimate within-season yields.

Workflow of the forecasting system

The crop simulation model was fed with observed weather data mixed with generated data from the three alternatives



The forecasting methodologies

- **Historical Climatology** A weather generator was used to produce missing data based on the climatology of the selected sites
- **Analogous Year** Observed weather in the current year is compared with those in a reference period. The year showing the major similarities is used for missing data
- **Statistical Climate Model** Based on known teleconnection mechanisms, a multi-regressive linear model is build using several observed large-scale climate indexes as predictors

The forecasting exercise

- Testing period: 2001-2010
- All the simulations were done using the same cultivar, soil and crop management
- Reference yields - the crop model was run with observed weather data for the whole growing season
- Predicted yields - dates of predictions: at the beginning of each month from January to June
- The predicted yields were compared with the reference yields to assess the accuracy of the forecasting methodologies

	Ref.	Historical			Analogous			Statistical		
	CV %	Jan	Mar	May	Jan	Mar	May	Jan	Mar	May
Morocco	22.3	8.8	8.4	1.1	19.5	4.4	1.7	9.9	7.3	1.6
Tunisia	14.1	16.4	8.2	2.2	15.5	13.6	2.0	14.4	9.6	1.9
Algeria	21.4	15.4	17.2	3.7	14.1	14.4	3.6	17.8	11.0	2.2
South Spain	12.8	13.6	5.2	3.9	26.7	19.3	7.9	13.1	11.8	2.9
South Italy	21.7	21.1	17.1	13.1	18.7	29.8	6.6	17.0	19.5	11.7
Central Italy	17.6	12.2	12.6	6.3	12.9	12.5	6.7	17.4	12.9	11.0
Greece	11.9	8.6	10.3	8.1	17.6	4.9	16.0	6.6	6.5	10.3
North Spain	19.4	17.5	10.7	12.4	16.1	14.0	8.4	13.1	16.6	17.8
South France	26.9	10.7	11.8	5.7	23.3	7.3	11.2	19.0	15.2	20.2
Central France	16.9	4.9	4.9	6.1	8.5	5.7	12.6	6.0	3.0	9.9

Tab. 1 Medians of the absolute percentage differences between predicted and reference yields. For comparison the coefficient of variation in percentage (CV%) of the reference yields is reported.

◆ Results & Conclusion

The results indicate that durum wheat phenology and yield can be accurately predicted under Mediterranean conditions well before crop maturity, although some differences between the sites and the forecasting methodologies were revealed. Useful information can be thus provided for helping farmers to reduce negative impacts or take advantage from favorable conditions.

◆ Bibliography

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