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# CHARACTERIZING CLIMATE CHANGE SCENARIOS

## Agrometeorological Indicators for Farm Adaptation Planning

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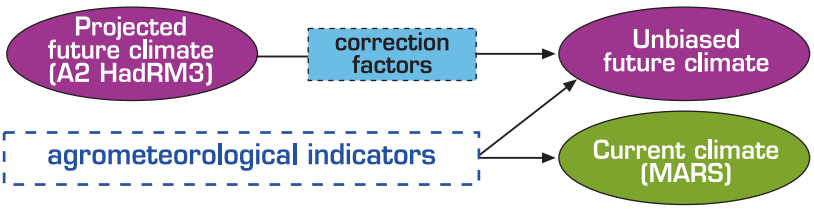
**A study was conducted at a 50x50 km grid-point of Central Italy to characterize current (1975-2005) and changed (2070-2100) climates via an array of agro-climatic indicators. The possible consequences of climate change on crop productivity were investigated to assist farm planning on a typical mixed farm of the area.**

Generation of climate scenarios, in conjunction with global circulation or regional models, provides the basis for understanding whether the demands of crops and livestock will be met by climatic change. Using agro-climatic indicators is helpful to characterize future trends, reducing risks, and to take advantage of better seasons.



## CHARACTERIZATION OF CLIMATE SERIES VIA AGRO-METEOROLOGICAL INDICATORS

- Increases in temperature will influence the site in summer, with increasing water shortage
- Higher temperatures will make crop cycles shorter, with less time available to accumulate biomass and more probability for winter-sown crops to skip over summer water shortages
- Heat-loving crops (e.g. horticultural) are expected to take benefit from higher temperatures, with the support of infrastructure building to match ever-increasing irrigation requirements (other options may include insurance systems with regards to droughts)
- With mild winters, early sowing of spring-sown crops (maize, sunflower) can be an option to avoid summer drought
- Longer growing periods may offer an opportunity for new enterprises (e.g. late summer-sowing crops)
- An extension of the season available for plant growth would assure protracted periods with vegetation covered soils, beneficial for the environment and the hydrologic management




| type of indicator | indicator | current climate (Mars) | future climate (HadRM3) |
|---|---|---|---|
| Dates | Last spring air frost (doy) | 103 | 54 |
| | First winter air frost (doy) | 324 | 344 |
| | Last spring grass frost (doy) | 131 | 103 |
| | First winter grass frost (doy) | 291 | 330 |
| | Maximum soil moisture deficit (doy) | 263 | 210 |
| | Minimum soil moisture deficit (doy) | 11 | 3 |
| | Wettest week (doy of midpoint) | 275 | 288 |
| | Start of growing season (doy) | 22 | 1 |
| | End of growing season (doy) | 352 | 365 |
| | End of field capacity (doy) | 44 | 39 |
| | Return to field capacity (doy) | 330 | 322 |
| Counts | Air frost days | 54 | 6 |
| | Grass frost days | 148 | 58 |
| | Heat stress days | 92 | 149 |
| | Growing season range days | 337 | 365 |
| | Growing season days | 302 | 359 |
| | Dry days | 285 | 298 |
| | Wet days | 80 | 68 |
| | Access period range | 289 | 288 |
| | Access period days | 271 | 255 |
| | Dry soil days | 17 | 59 |
| | Very dry soil days | 0 | 11 |
| Thermal | Accumulated air frost temperatures (°C-days) | -128 | -7 |
| | Accumulated heating (°C-days) | 1637 | 809 |
| | Accumulated growing degree days (°C-days) | 2748 | 4585 |
| Water | Wettest week amount (mm) | 102 | 232 |
| | Excess winter rainfall (mm) | 156 | 725 |
| | Maximum summer moisture deficit (mm) | 181 | 210 |
| | Minimum summer moisture deficit (mm) | 11 | 0 |
| Waves | Longest heat wave (days) | 7 | 11 |
| | Longest cold spell (days) | 7 | 5 |
| | Longest dry spell (days) | 33 | 56 |
| | Longest wet spell (days) | 6 | 6 |
| Indices | Mean precipitation intensity (mm $d^{-1}$) | 9 | 21 |
| | Rainfall seasonality index* | 0.01 | -0.47 |
| | Modified Fournier index** | 1074 | 4585 |

* negative values indicate larger precipitation amounts in winter, and vice versa
** the higher the value, the more heterogeneous is the precipitation distribution within year

Research under the auspices of project SIENA, supported by the Province of Siena (Italy) and Monte dei Paschi Foundation, in cooperation with Agrichiana Farming (Montepulciano, Italy). The Scottish Executive Environment and Rural Affairs Department is also gratefully acknowledged. More information on this research can be found at http://www.macaulay.ac.uk/climatechange