

Post-doctoral Research Associate – Process-based Crop Modeling

Modeling & Monitoring Vegetation Systems Lab (M&M-VS) <https://bit.ly/MMVS-DavidHelman>

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The M&M-VS Lab is seeking an **experienced crop modeler** to lead the modeling aspects of an ISF-funded project (*WheatDryFACE*), thereby contributing to global food security and environmental sustainability research.

Description of the Project

WheatDryFACE Project aims at studying multilevel aspects of CO₂ impacts on wheat under future climate (see, e.g., refs 1-3). *WheatDryFACE* is based on the first-ever FACE (**F**ree-**A**ir **C**arbon-dioxide **E**nrichment) experiment conducted in this region (at our Faculty's experimental farm in Israel). It combines extensive in-situ measurements with various tools, advanced remote-sensing techniques based on numerous sources (handheld spectral and thermal cameras, cameras and sensors onboard a DJI drone, satellite imagery, and PhenoCams), and numerical modeling.

Primary Purpose of the Job

The Postdoctoral Researcher will focus on integrating the combined effects of CO₂ and climate variables on wheat growth, seed production, and quality in state-of-the-art numerical models (e.g., APSIM-Wheat, CAT-Wheat, CROPSYST, DSSAT, and SALUS), as well developing our own model (M&M-CO₂-CROP, currently under development). Data collected from our FACE setting (as well as previously published data) will serve to develop and evaluate the models under elevated CO₂ and dryland conditions.

The Postdoctoral Researcher is also expected to develop modeling schemes that represent interactions between crop genetics, physiology, phenotypic traits, and the environment, evaluating crop characteristics and management practices that enhance resource use efficiency and reduce risks associated with climate change.

Terms of the Job

Immediate start (1-2 months from acceptance). The position is for an initial fixed term of 12 months, with an optional extension period of 1-2 years, depending on the applicant's performance and the continued availability of funds.

Qualifications and Required Skills

- Applicant **must** hold a Ph.D. degree (or equivalent) in a relevant subject such as mathematics, mathematical biology, plant physiology, physics, or engineering, with a graduation date not earlier than 2017 (5 years).
- Applicant **must** have demonstrated experience in using and improving process-based crop models such as APSIM, CAT, CROPSYST, WOFOST, DSSAT, and SALUS (or similar).
- Applicant **must** have experience and skills in **Fortran** and other programming languages (e.g., C++ and Python/R).
- Applicant **must** be able to access and critically assess data, including spatial data.
- Applicant **must** have a track record of high-quality scientific manuscript preparation and publication.
- Experience with High-Performance Computer parallelization **is a plus**.
- A track record in winning external funding **is a plus**.

- Hands-on experience in multivariate and spatial statistics **is a plus**.

Main Duties

- Develop and adjust equations that describe the complex interactive nature of the CO₂-climate-environment impacts on C3 and C4 plants based on experimental data (collected by us in WheatDryFACE and by others in other FACE settings)
- Incorporate such equations in our model (Fortran) and other common numerical crop models (e.g., APSIM, CAT, CROPSYST, WOFOST, DSSAT, and SALUS). Evaluate their performance using experimental data.
- Use existing HUJI High-Performance Computer parallelization capabilities to undertake large simulation runs using spatial input data and multiple climate model projections.
- Develop new research questions that address core knowledge gaps by leveraging new and emerging modeling methods, tools, and analytics.
- Write scientific manuscripts and publish them in high-impact scientific journals.
- Lead and contribute to successful research proposals writing for external funding.
- Participate in the lab's weekly group meetings (Mondays from 14:15-15:00).
- Participate in the weekly Departmental Seminars (Thursdays at 13:15-14).
- Help with field work when required.
- Be an active, communicative member of the project (and lab).
- Contribute to the agile project work in the research network.

Applications Should Include the following:

- 1) A personal statement of background and experience relevant to the position, including research activities and motivation.
- 2) A signed, dated Curriculum Vitae
- 3) 2-5 reprints of selected peer-reviewed publications
- 4) Names and addresses (including e-mail) of 3-5 references.

Applications and files should be submitted online before 15th December 2022:

<https://bit.ly/MMVS-PostDocForm> (login with Google account)

Only complete applications will be taken into consideration.

Further information on The Faculty of Agriculture, Food and Environment, HUJI can be found at <https://en.hafakulta.agri.huji.ac.il>.

References

1. Mulero Gabriel, Jiang Duo*, Bonfil J. David, Helman David. (2022) **Use of thermal imaging and the Photochemical Reflectance Index (PRI) to detect wheat response to elevated CO₂ and drought.** *Plant, Cell & Environment*. <https://onlinelibrary.wiley.com/doi/full/10.1111/pce.14472>.
2. Jiang Duo, Mulero Gabriel, Bonfil J. David, Helman David. (2022) **Early or late? The role of genotype phenology in determining wheat response to drought under future high atmospheric CO₂ levels.** *Plant, Cell & Environment*, 45 (12), 3445–3461. <https://onlinelibrary.wiley.com/doi/10.1111/pce.14430>.
3. Helman David and Bonfil David J. (2022) **Six decades of warming and drought in the world's top wheat-producing countries offset the benefits of rising CO₂ to yield.** *Scientific Reports* (Nature Group), 12(1), 1-10. <https://www.nature.com/articles/s41598-022-11423-1>.