FACE-IT
Framework to Advance Climate Economic and Impacts Investigations with Information Technology

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Framework to Advance Climate, Economic, and Impact Investigations with Information Technology

- A web-based workflow platform based on the Galaxy framework
- Allows researchers to chain together data and applications to allow computationally intensive simulations to be performed using cloud computing services.
- Data and workflows can be documented, published, shared, and re-used.
FACE-IT builds on Globus Galaxies platform

Globus Galaxies platform

Tool and workflow execution, publication, discovery, sharing; identity management; data management; task scheduling

Infrastructure Services

EC2, EBS, S3, SNS, Spot, Route 53, Cloud Formation

Amazon Web Services
• Actively developed in Bioinformatics community to build Next Gen Sequencing workflows
• Open source software that makes integrating your own tools and data and customizing for your own science simple
• Flexible architecture -> Customizable
• Collection of tools that reflect good practices and community insights
Powerfully Multi-tiered

Allows expert users to create workflows, apps, data types and distribute to less expert participants/collaborators

Use Case:
- FACE-IT power-users from the AgMIP IT team have created a number of template workflows
- Regional Integrated Assessment (RIA) teams will organize their regional data and rerun these published workflows
FACE-IT Basics
(the Hitchhiker’s Guide to the Galaxy)
FACE-IT: A Framework to Advance Climate, Economic, and Impact Investigations with Information Technology
Convenient and diverse data ingest mechanisms including access to local and remote data stores
The AgMIP Regional Integrated Assessment Use Case
Building a workflow
Multi-model Approach

- Easily drive multiple models in consistent ways
- Allows you to capture most difficult aspects of uncertainty
- Estimate probability distributions
- Multi-model means can give better predictions than even the best model
AgMIP Data Interoperability Tools

- Flexible data input formats
- Apply supplemental data (incomplete field observations / hypothetical scenarios)
- Translators for multiple crop models
• **Tools:**
  - QuadUI (java app with Swift wrapper)
    - Multi-model, multi-input format data translators
  - DSSAT (FORTRAN model with Swift wrapper)
  - APSIM (mixed language model with Swift wrapper)
  - AcmoUI (java app with Python wrapper)
  - Multiple regions
  - Multiple climate scenarios
  - Multiple management scenarios
Crop Modeling Simulation Sets

Detailed experiments

Calibration

Calibrated cultivars

CM0 - Historical simulation

Survey data (base year)

Integrated Assessment

CM1 - Current Climate, Current Production System

CM2 - Future Climate, Current Production Systems

CM3 - Current Climate, Adapted production system

CM4 - Current Climate, Future production system (RAP)

CM5 - Future Climate, Future production system (RAP)

CM6 - Future Climate, Future (RAP) + Adaptation
Historical simulation workflow

Survey_data-Niro-MAZ-0XFX.zip

Field_overlay-Niro-MAZ.zip

Translate to DSSAT

Run DSSAT

ACMO translator

ACMO Visualization
Historical simulation - 2 models

Survey_data-Nioro-MAZ-0XFX.zip

Field_overlay-Nioro-MAZ.zip

Translate to DSSAT
Run DSSAT
ACMO translator

Translate to APSIM
Run APSIM
ACMO translator

ACMO Visualization
Historical + Current conditions (baseline)
Historical + current + future + adaptation
Historical + current + future + adaptation + 2 models
+ another climate model
~2 million simulations!
### RIA simulations

#### RIA workflow

<table>
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<th>Factor</th>
<th>yield analysis</th>
<th>historical analysis</th>
<th>current</th>
<th>current + adaptation</th>
<th>future scenarios</th>
<th>future + adaptation</th>
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<td><strong>Total</strong></td>
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<td><strong>108,000</strong></td>
<td><strong>216,000</strong></td>
<td><strong>540,000</strong></td>
<td><strong>1,080,000</strong></td>
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</table>

**Total: 1,958,400 simulations (typical)**
- Users can create and refine publication-quality graphics
- Visualization tools in R, D3 and python are available
- Users can develop their own custom visualizations
Probability of Exceedance graphs (historical simulation)
Effects of climate change on yields
(2 crop models, 5 GCMs, with and without adaptation)
Monthly webinars for AgMIP community support

Learn FACE-IT
The place to learn about FACE-IT applications, workflows, and view demo videos

Early Access
To request early access, follow the link below to create a Globus Account. Select Groups, search for FACE-IT and join

Use FACE-IT
The place to run FACE-IT applications, workflows, and to share your work with others

faceit-portal.org
usefaceit.org
www.learnfaceit.org
youtube.com/rdcepfaceit
What’s next for FACE-IT?

- Integrate genetic data with models
- Spatial analysis and visualization tools at farm, regional, national and global scales

Scheduled / timed job execution

- Yield
- Soil type
- Images
- Pests
- Elevation
- Drainage
- Fertility
Thanks!
Questions?