COMET Tools

Application Program Interfaces (API)
for COMET-Farm™

Webinar Presentation
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COMET Farm — Whole Farm and Ranch Carbon and Greenhouse Gas Accounting System.

USDA — United States Department of Agriculture — Natural Resources Conservation Service

Colorado State University

COMET Planner — Carbon and greenhouse gas evaluation for NRCS conservation practice planning

The COMET Tools were developed at the Natural Resource Ecology Laboratory located at Colorado State University. The COMET-Tools were developed in collaboration and funding support from the ***NRCS and the Climate Change Program Office at USDA***. Additional support has come from the California Department of Food and Agriculture, the California Air Resources Board, the Farm Foundation for Agricultural Research, and private donors.

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Presentation Roadmap

- Briefly review the COMET-Farm^{TM} Application Program Interface (API)

- New API Features
  - Improved processing capacity
  - Webhooks interface
  - Error Trapping and Reporting

- Q&A

- The tool improvements described today came from customer discovery interviews and feedback from users during a January, 2020 presentation.
- ***No current features have been deprecated.***

OpenTeam Shared Mural

GitLab Repository:

https://gitlab.com/comet-api/api-docs
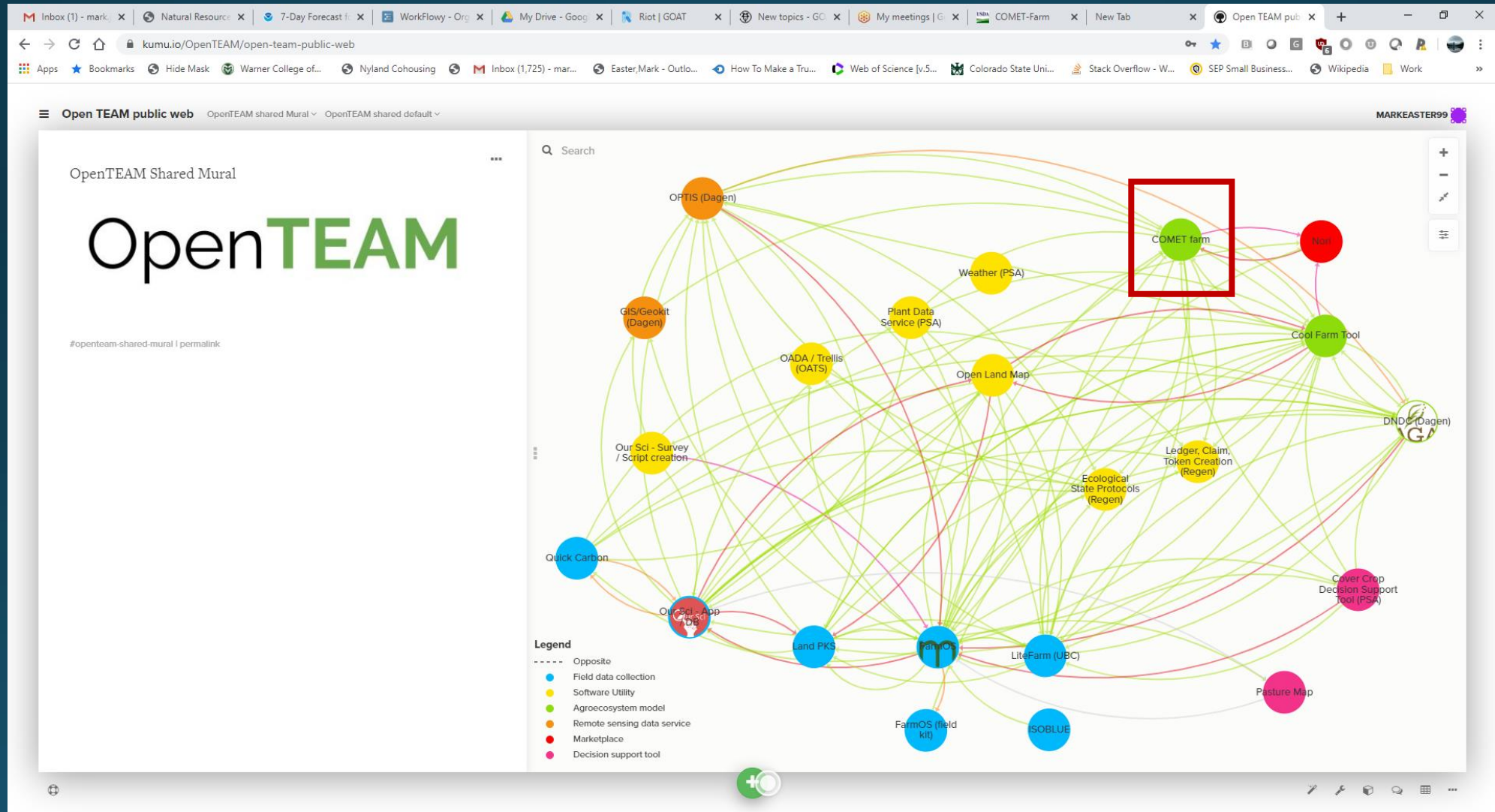
Current COMET-Farm API Access Points

COMET-Farm API upload page

All modules or any combination
Browse... No file selected.

Enter last cropland run and first cropland run
(set as negative to do all modules)

-1   -1

Enter emailid.If you would like the results send back to a Url, please enter the Url
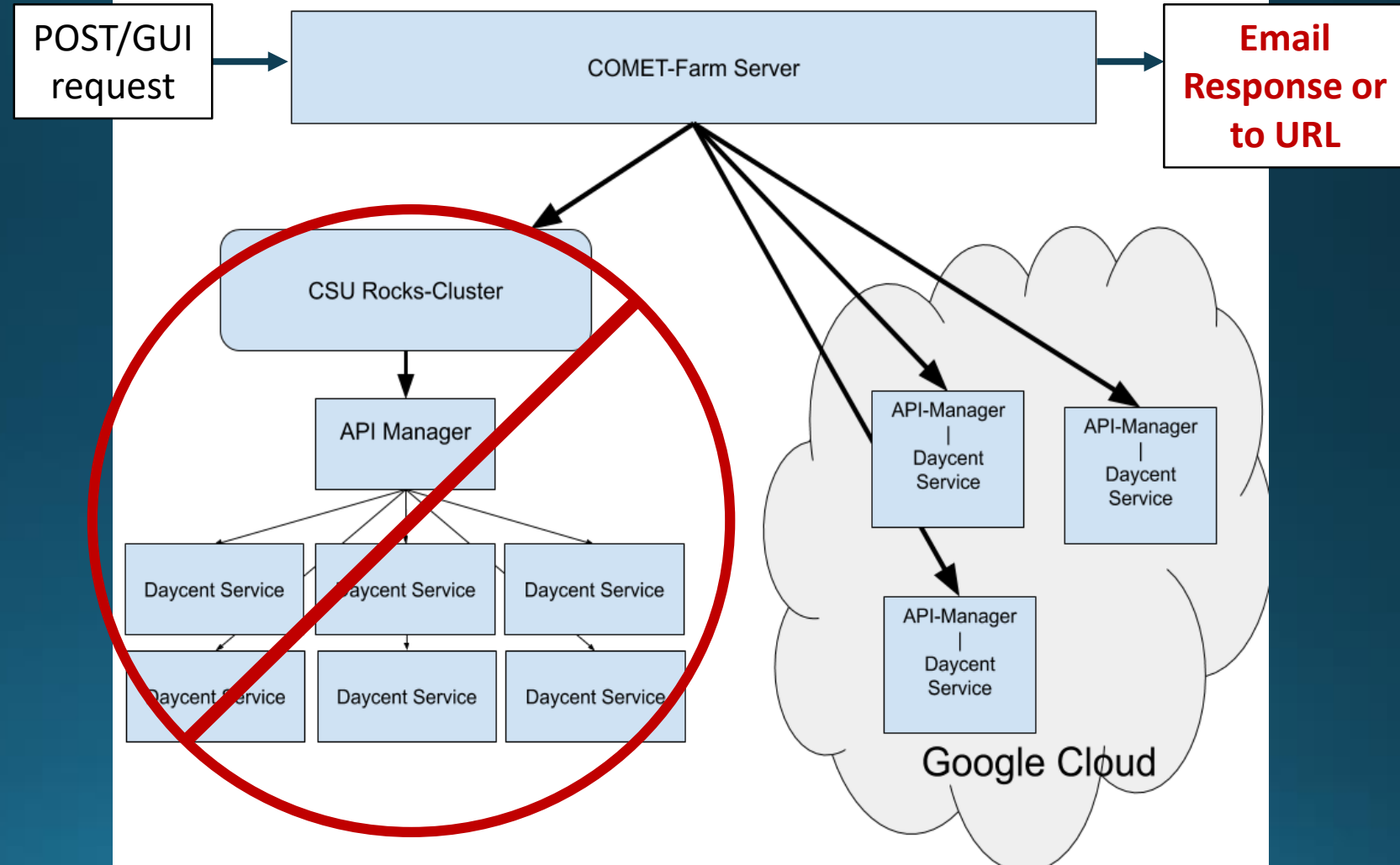
Email Id : email@emailServer.com   Url :

COMET-Farm API Status

API slot 0 is running
Running file:ImportXml.cmt for user: mclayer*****
Current module: Waiting for results from the API service
Number of bundled dayent jobs: 2
Total number of dayent jobs: 4
Size of file (Crop rotation * Map units): 16
Estimated runtime (based on past performance): 00:02:32.3750000
Estimated cost: $0.069168
Original rough estimate of runtime: 00:00:00
Number of croplands threads: 1
Running for : 00:00:30.6250000
Cost so far: $0.013651
Number of seconds since the thread was updated : 23
API slot 1 is running
Running file:CA_Almonds_devdev_2.13.Comet for user: mclayer*****
Current module: Waiting for results from the API service
Number of bundled dayent jobs: 1
Total number of dayent jobs: 5
Size of file (Crop rotation * Map units): 5
Estimated runtime (based on past performance): 00:01:23.6200000
Estimated cost: $0.037769
Original rough estimate of runtime: 00:00:00
Number of croplands threads: 1
Running for : 00:00:06.6250000
Cost so far: $0.00273
Number of seconds since the thread was updated : 1
API slot 2 is not running
API slot 3 is not running
Number in queue: 0
Estimated time to finish queue: 00:00:00
Number in running: 2
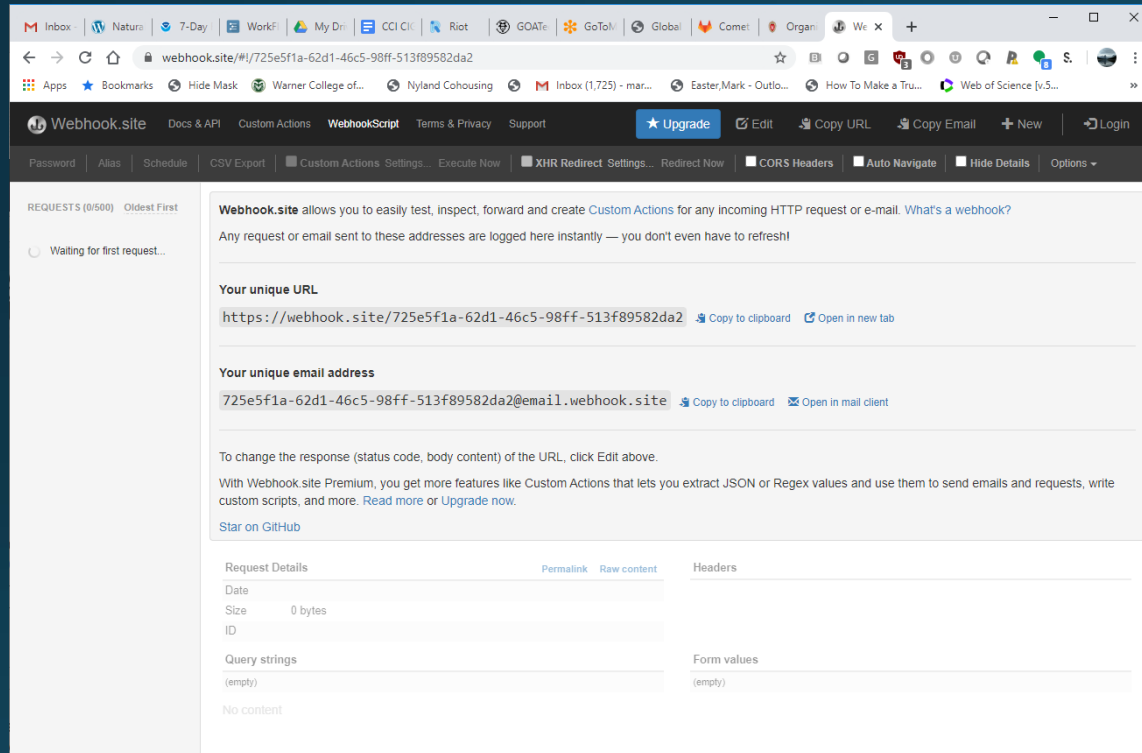Number in finished: 6695
Number in failed: 177

- Access the API using POST requests or through the API GUI:
https://comet-farm.com/home/apiview

- View status of requests and view the queue length:
https://comet-farm.com/home/apistatus

COMET-Farm API Structure

- Requests are partitioned and distributed for maximum throughput

- Runs in the Google Cloud

- ~~Can also use our local CSU Rocks Cluster~~

POST/GUI request → COMET-Farm Server → **Email Response or to URL**

CSU Rocks-Cluster → API Manager → Daycent Service (×6)

Google Cloud: API-Manager | Daycent Service (×3)

COMET-Farm API Webhooks Access

webhook.site

- WebhookScript is an easy to use scripting language designed for executing Web-related actions on incoming requests.
- While the other actions like Extract Regex and Send Email allows you to create flows in a visual editor, WebhookScript makes it quicker to create more advanced logic.
- WebhookScript can be combined with other Custom Actions as data can be shared between them using Variables. Syntax is similar to PHP and JavaScript.
- https://docs.webhook.site/webhookscript

webhook.script

COMET-Farm™ API – I/O Specifications

COMET-Farm API – Input and Output XML File Format

- COMET-Farm inputs in XML format for easy tool integration

- Rapid bulk processing (hundreds of locations, thousands of scenarios)

- Submitted using POST request to the COMET-Farm website. Results emailed back to the user account's email when complete, or to URL.

COMET-Farm API Error Trapping Classes

- Input File Initial Processing Errors
- Web Soil Survey Issues
- Input File Error Checking and Trapping
- DayCent Processing Errors
- Classes of returned .xml files:
  - COMET-Farm Results
  - DayCent Input Files
  - Error Files *(New)*

COMET-Farm API Error Trapping: Input File Processing

- Input File Processing Errors:
  - .xml tag not closed
  - Input file not in .xml format
  - Email address not authorized (file will not process)
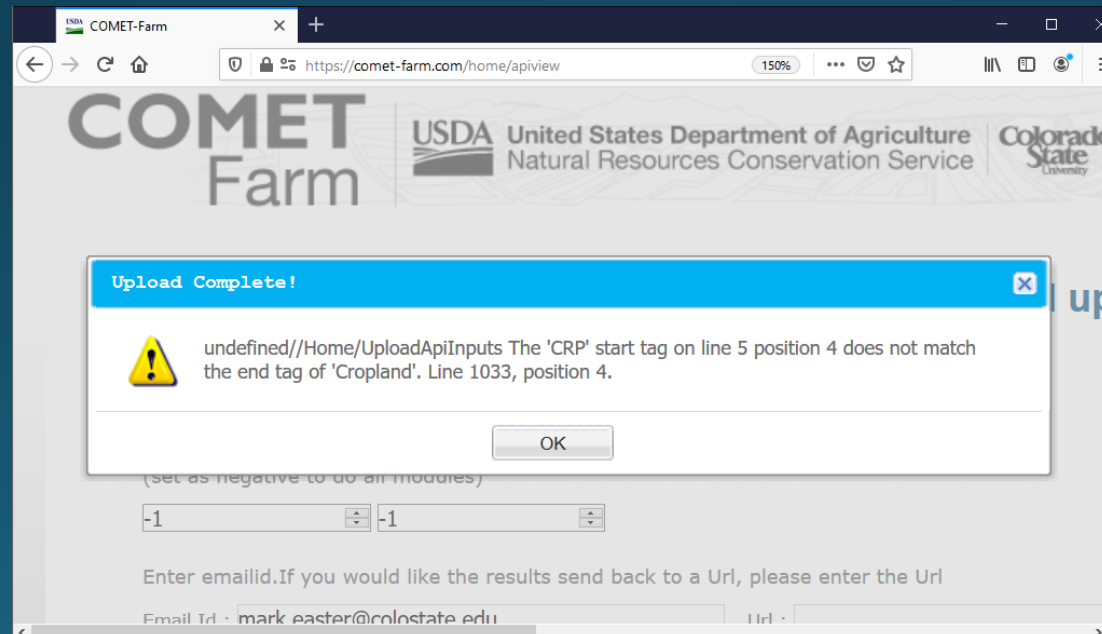
COMET-Farm API Error Trapping: Web Soil Survey

Web Soil Survey Processing Errors:
- Web Soil Survey provides no response (WSS service down)
- No map units available in the Web Soil Survey database
- Map unit mismatch between Web Soil Survey and COMET-Farm database

```
<Errors>
<ModelRun name="id:99999|farm: Carbon Farm">
<Error index="8" message="location has zero soil map units. Can not create sites to do Daycent Runs." />
</ModelRun>
</Errors>
```

COMET-Farm API Error Trapping: Pre-Processing Input Check

- Input File Error Checking and Trapping
  - Incorrect .xml tag or tag syntax error
  - Date strings in incorrect format
    - Out of range
    - Incorrect date: example May 32, 2020 (05/32/2020)
    - Harvest dates or cover crop kill dates must be after planting dates
    - Tillage, fertilizer, irrigation must be in the current year cycle
    - Etc.
  - Check input strings against list contents
  - Input numbers within expected range

```
<Errors>
 <ModelRun name="id:99999|farm:Carbon Farm">
   <ErrorMessage>You entered 06/01/2016 in tag 'HarvestDate' for CropYear: 2016 and CropScenario: Current . All harvest
dates must be after crop planting date.</ErrorMessage>
 </ModelRun>

<Errors>
 <ModelRun name="id:99999|farm:Carbon Farm">
   <ErrorMessage>You entered Non-Irrigated: Corn-Soybean Incorrect Rotation Name in tag 'Year1980-2000'.This is not an
acceptable value for this tag.</ErrorMessage>
  </ModelRun>

  <ModelRun name="module:cropland|id:99999|farm:Carbon Farm">
   <ErrorMessage>You entered 05/35/2000 in tag 'PlantingDate' for CropYear: 2000 and CropScenario: Current . This is not
a valid date. The expected date format for date tag is 'MM/DD/YYYY'</ErrorMessage>
  </ModelRun>

</Errors>
```

COMET-Farm API Error Trapping: DayCent Modeling Error

- Classes of errors:
  - Fortran compiler exceptions
  - IEEE errors
  - Model run fails for unknown reasons
- These comprise ~< 1% of errors
- The error file will include a nondescript DayCent Model Run Error
- Notify CSU Team (appnrel@colostate.edu) for assistance

COMET-Farm API: Next Step Improvements

- Add uncertainty estimates to the output
- Add other API modules (Livestock, Agroforestry, Forestry)
- Allow requesting proxy history (e.g. like drag n' drop) and conservation practices
- Publish a common javascript library of acceptable input values.
- More possible error trapping use cases:
  - Spatial WKT Definition problems: Field boundary validation, multipolygon check, unclosed/invalid vector def'n, overlapping boundaries, holes within vector.
  - Missed crop year (e.g. had data for 2001, 2002, 2004, but no 2003)
  - Multiple crop years (e.g. had data for 2001 twice)
- Continually Improve API documentation
- *<Your Suggestions Here>*

Further Resources

On-Demand Training Videos available on   covering all COMET-Farm™ modules and the COMET-Planner™ tool.

Live Webinars on COMET-Farm™ and COMET-Planner™ available. The training schedule can be found on the COMET-Farm™ 'Help" page.

If you would like to request a training for you or your group contact Haley Nagle:
Haley.Nagle@colostate.edu

Stay updated by following us on   & Find us on

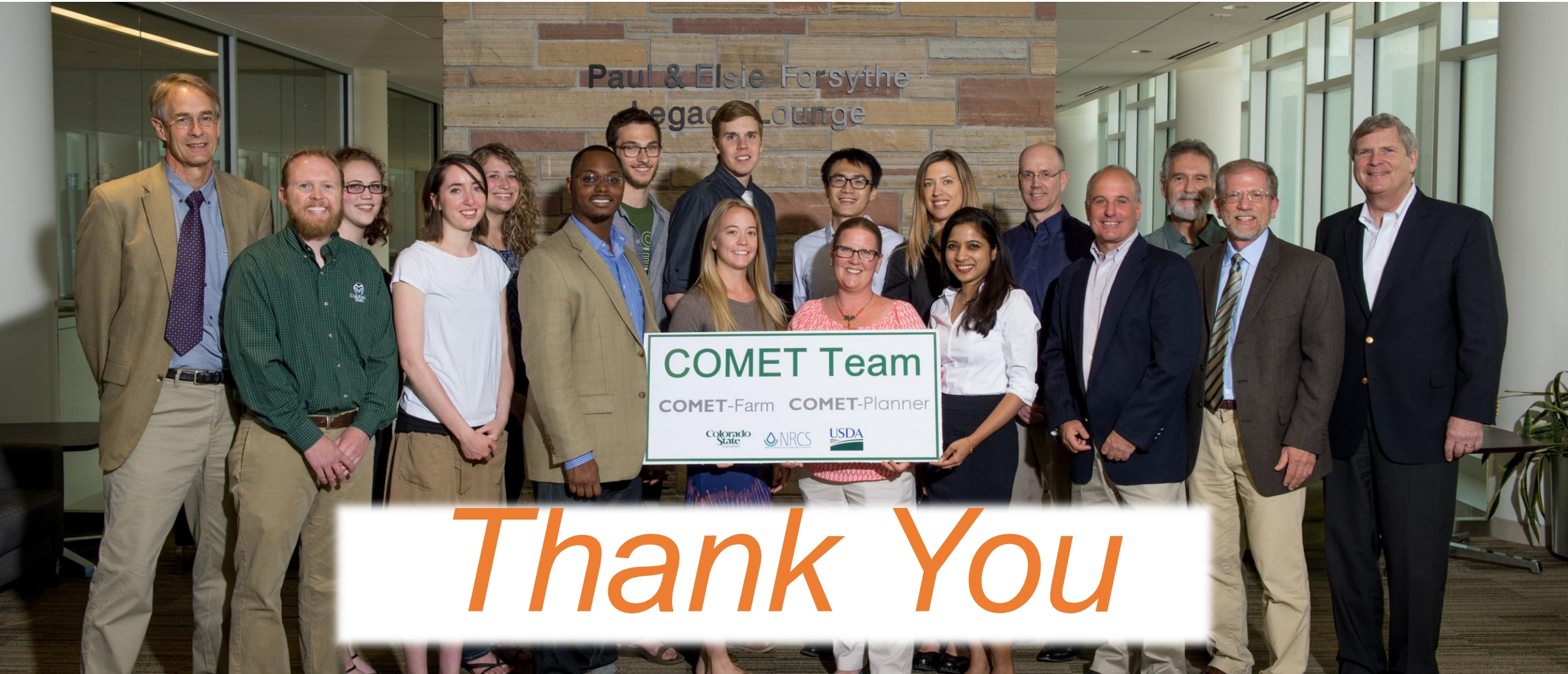COMET Farm — Whole Farm and Ranch Carbon and Greenhouse Gas Accounting System.

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Thank You

www.comet-farm.com   www.comet-planner.com