

Training Report

Introduction to Google Earth Engine (GEE) Training

7 - 8 June 2017
Accra City Hotel
Accra, Ghana



submitted 30 June 2017

Table of Contents:

BACKGROUND.....	3
TRAINING OBJECTIVES AND PARTICIPANTS	3
TRAINING PROCEEDINGS	4
DAY 1: WEDNESDAY, 7 JUNE 2017	4
<i>Proceedings</i>	4
<i>Strengths</i>	4
<i>Suggestions for Improvement</i>	4
DAY 2: THURSDAY, 8 JUNE 2017	5
<i>Proceedings</i>	5
<i>Strengths</i>	5
<i>Suggestions for Improvement</i>	6
ANNEX 1: AGENDA	7
DAY 1:	7
DAY 2:	8
ANNEX 2: PRE AND POST TRAINING QUESTIONNAIRE RESULTS.....	9

Background

The SERVIR Science Coordination Office (SCO) and SERVIR-West Africa, in collaboration with AfriGEOSS, organized a training event focused on the introduction to Google Earth Engine (GEE) in Accra, Ghana, from June 7-8, 2017. GEE is a free, cloud-based, geospatial remote sensing platform that facilitates scalable and sharable image analysis, and includes an extensive, and regularly updated, data catalogue includes over 40 years of historic and current global Earth observation, such as many NASA data sets relevant to the objectives of SERVIR. To the knowledge of the trainers and participants, this was the first training in the region on this topic.



Training Objectives and Participants

The overall objective of the workshop was to provide an introduction to the capabilities of GEE. The specific objectives of the workshop included the following, with the detailed agenda provided in **Annex 1**:

- introducing the participants to the GEE code editor;
- exploring basic JavaScript and Earth Engine programming concepts
- becoming familiar with a sample of basic geospatial applications in Earth Engine
- introducing available resources for continued learning of Earth Engine concepts
- establishing a GEE users group for the West Africa region; and

- brainstorming continued applications of GEE that would be relevant to SERVIR-West Africa.

Training participants included individuals from organizations including Ghana's Centre for Remote Sensing and Geographic Information Services (CERSGIS), the African Centre of Meteorological Applications for Development (ACMAD), the Regional Centre for Mapping of Resources for Development (RCMRD), the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), the University of Energy and Natural Resources (UENR), GSSTI, the African Regional Institute for Geospatial Science and Technology (AFRIGIST), UMAT, EORIC, and the CILSS Agrometeorology, Hydrology, and Meteorology Regional Center (AGRHYMET). These included representation from the SERVIR-Eastern & Southern Africa Hub (i.e. RCMRD), and the SERVIR-West Africa consortium members (ACMAD, AFRIGIST, AGRHYMET, CERSGIS, ICRISAT), among others.

Training Proceedings

Day 1: Wednesday, 7 June 2017

Proceedings

The training began with opening remarks from Mr. Abdoulaye Ndiaye, SERVIR-West Africa Coordinator, USAID Ghana and Dr. Emil Cherrington, the Regional Science Coordination Lead for West Africa at the NASA SERVIR SCO. Immediately following, the participants were provided with an overview of the SERVIR program and introduced to GEE (GEE), its capabilities, and some example online applications that were developed on the GEE platform. The training materials were designed to be hands on, and the remainder of the agenda included exercises that were demonstrated by a trainer while the participants followed along. For the first exercise, the participants were introduced to basic concepts in the coding language required to run GEE, JavaScript. Building off of the introductory material, the next exercise introduced the participants to several image processing exercises including cloud filtering, image compositing, mosaicking, masking, and clipping. The final exercises of the day included computing several example indices useful for identifying vegetation and water bodies.

Strengths

The exercises were very well received. All of the participants were able to follow along and get the relevant outputs. The majority of participants had limited experience with GEE and were able to follow along well.

Suggestions for Improvement

There was some concern from the trainers regarding the lack of questions asked throughout the exercises. However, several enlightening conversations arose during the breaks with respect to various applications of the exercises. There was also a direct request to include additional context to the exercises with respect to potential applications. These requests were taken into account during the second day where we were able to focus more on GEE applications.



Day 2: Thursday, 8 June 2017

Proceedings

The morning activities began with a continuation of the computation of indices for different applications. This was followed by an exercise to demonstrate how to use GEE to produce a supervised land cover map using Landsat data, including the collection of the reference data. The final exercises highlighted the use time series data. The trainings ended with a discussion on what GEE topics the participants would like to learn more about as well as a discussion on an African GEE users group facilitated by SERVIR-West Africa.

Strengths

Similar to the first day, the participants were able to interact with the activities and produce the outputs for each exercise. The participants were appreciative of the exercises that were catered towards applications. After the hands on exercises we had a very interesting discussion of relevant next steps to take, which included creating a GEE users group for Africa to be led by the SERVIR-West Africa Project Coordination Unit.

Suggestions for Improvement

There were direct requests from the participants to demonstrate how to upload personal data and shapefiles into GEE. These requests were noted and additional resources were provided to the participants via a small tutorial.

A pre training and post training questionnaire was distributed to the participants to gain an understanding of the baseline capacities and expectations for the training, followed by capacity gained to use GEE, a call for suggestions for improvement of the current materials, and a call for suggestions for future trainings. The most frequent critical feedback received by the questionnaires was regarding the length of the training. The majority of respondents indicated that they would have preferred the training to have been longer. For a detailed analysis of the questionnaire responses, please see **Annex 2**.



Annex 1: Agenda

Day 1:

Time:	Activity:
8:00 – 8:30	Registration
8:30 – 10:00	Introductions and Objective Overview <ul style="list-style-type: none">• Participant introductions• Introduction to SERVIR• Objectives overview
10:00 – 10:30	Presentation: Introduction to GEE
10:30 – 11:00	Break
11:00 – 12:00	Exercise: Introduction to GEE <ul style="list-style-type: none">• Introduction to JavaScript ('Hello World')• Objects, strings, and lists• GEE objects, strings, and lists• Visualizing satellite images• Computations using satellite images• Satellite Image collections
12:00 – 13:30	Lunch
13:30 – 15:00	Exercise: Image Processing <ul style="list-style-type: none">• Filtering• Compositing• Masking• Mosaicking
15:00 – 15:30	Break
15:30 – 16:45	Exercise: Calculating Indices <ul style="list-style-type: none">• Normalized Difference Vegetation Index (NDVI)• Normalized Difference Water Index (NDWI)• Burned Area Index (BAI)
16:45 – 17:00	Summary of the day

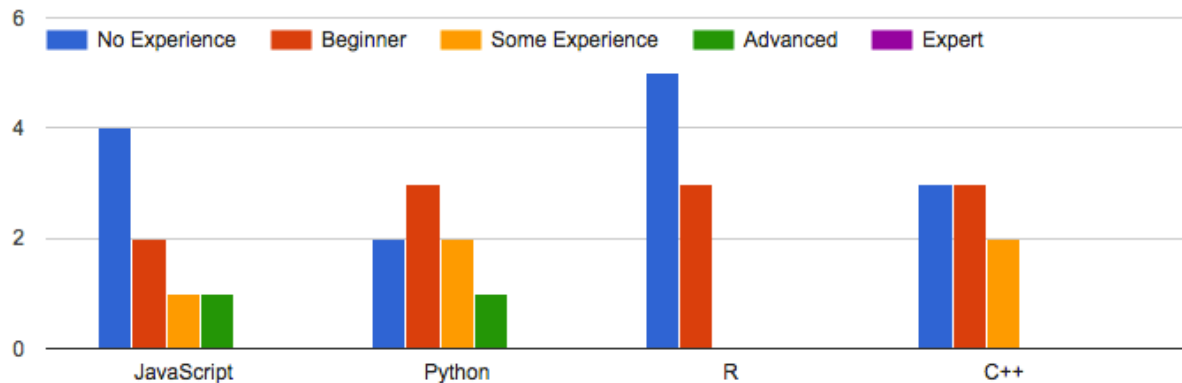
Day 2:

Time:	Activity:
8:00 – 8:30	Registration
8:30 – 8:45	Presentation: Overview of Day 1
8:45 – 9:15	Presentation: Using GEE for Image Classification
9:15 – 10:30	Exercise: Image Classification
10:30 – 11:00	Break
11:00 – 12:00	Exercise: Image Classification, con't...
12:00 – 12:10	Group photo
12:10 – 13:30	Lunch
13:30 – 14:00	Presentation: Using GEE for Time Series Analysis
14:00 – 15:00	Exercise: Time Series Analysis
15:00 – 15:30	Break
15:30 – 16:15	Presentation: Additional Resources, Next Steps, Summary of the Training
16:15 – 16:30	Closing Ceremony

Annex 2: Pre and Post Training Questionnaire Results

In total 8 individuals completed the pre training questionnaire. The questions and responses are listed below:

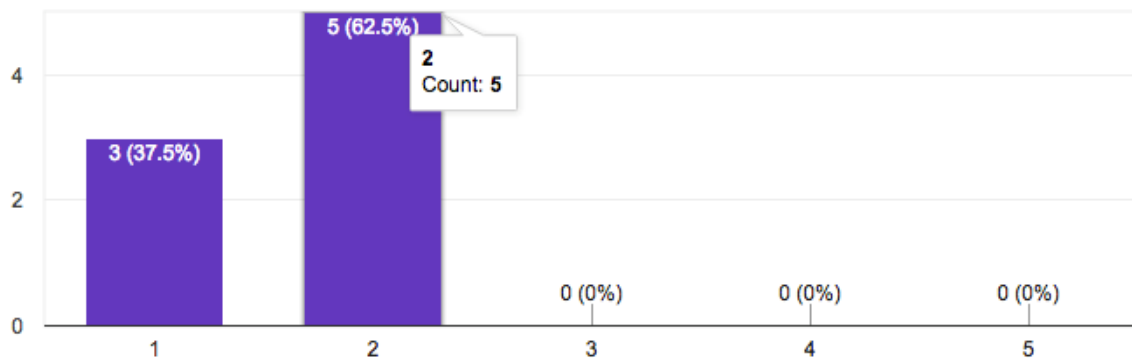
1. What is your level of coding experience in the following languages?



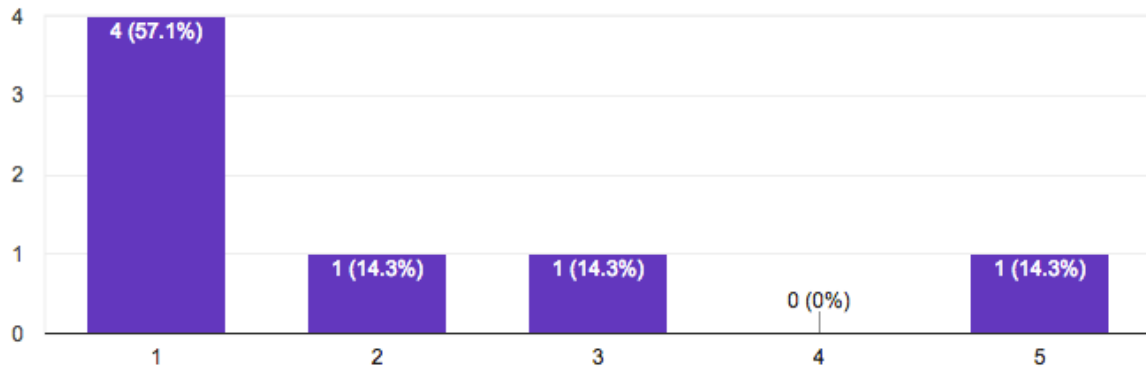
If other, please describe below:

- C (2 responses)
- Fortran, (1 response)
- Pascal (1 response)
- Unix Shell (1 response)
- Git (1 response)
- HTML/CSS (1 response)
- Visual Basic (1 response)

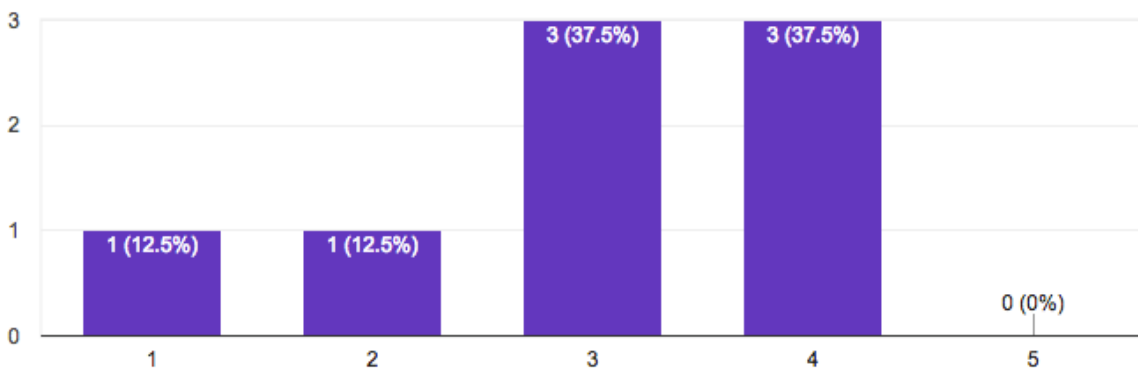
2. What is your experience with GEE? (1 = first time hearing about it, 5 = expert)



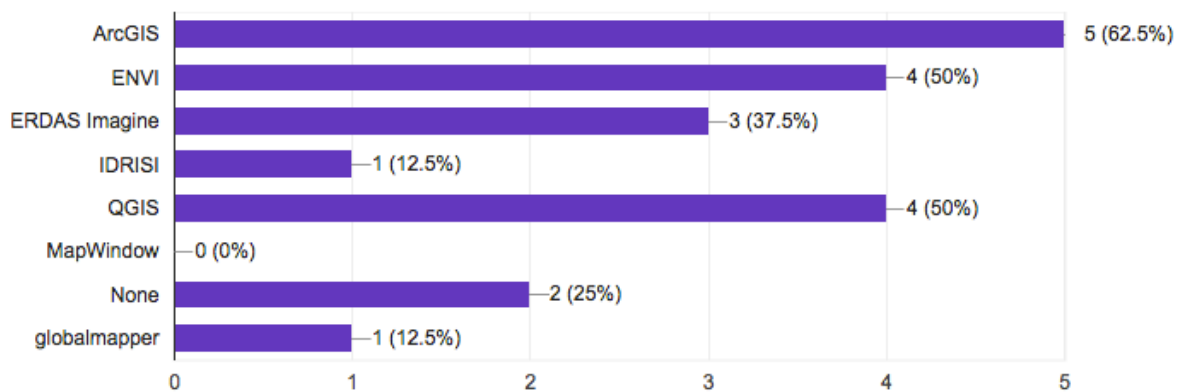
3. If applicable, do you feel confident in using GEE? (1 = strongly disagree, 5 = strongly agree)



4. What is your experience with remote sensing? (1 = no experience, 5 = expert)



5. What software packages do you use for remote sensing and GIS applications?



6. Please describe how you typically use remote sensing. (Free response)

- Data analysis
- Accessing information for decision making related to environmental management
- I'm usually involved in identifying the problem to be addressed, and defining the parameters, but not analyzing the data or presenting it.
- Use of special processing packages to generate level 1 and 2 files from level 0 files
- For image processing, mapping, land use and land cover analysis

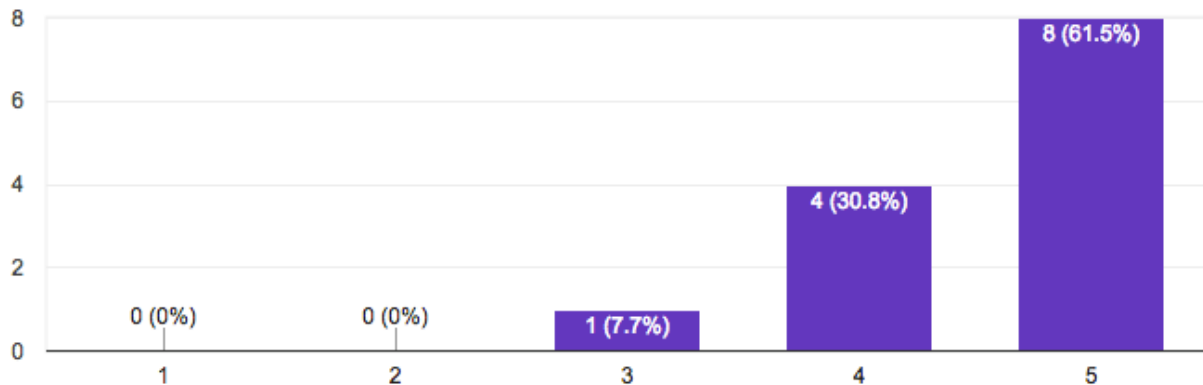
- Change detection
- NDVI
- For agriculture studies

7. What do you expect to gain from this training? (Free response)

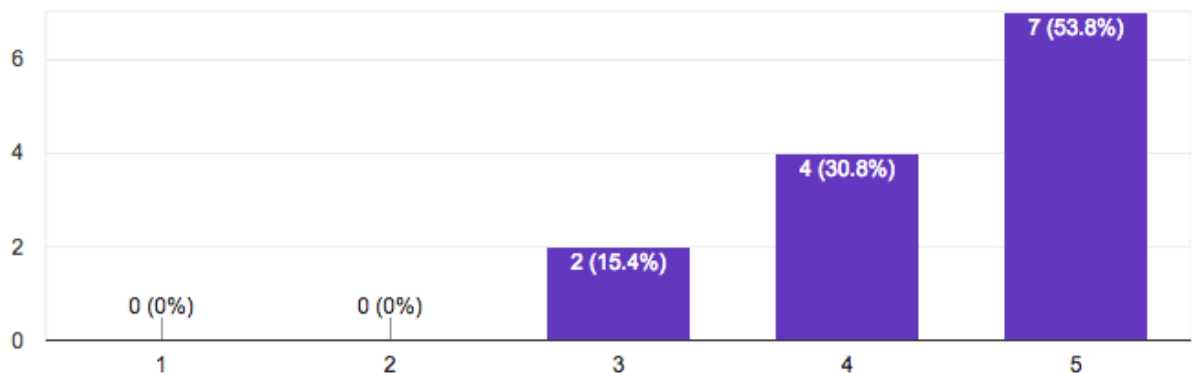
- To Use GEE effectively
- Be familiar with what GEE can do
- Familiarity, better understanding of the capabilities represented
- Knowledge about manipulating Earth Observation data
- Advanced knowledge and relevant skills on the use satellite product in my PhD research interest
- A fast and efficient way of working
- Learn how to use GEE
- Using well image analysis with earth google engine

Thirteen participants responded to the post training questionnaire. The questions and responses are listed below:

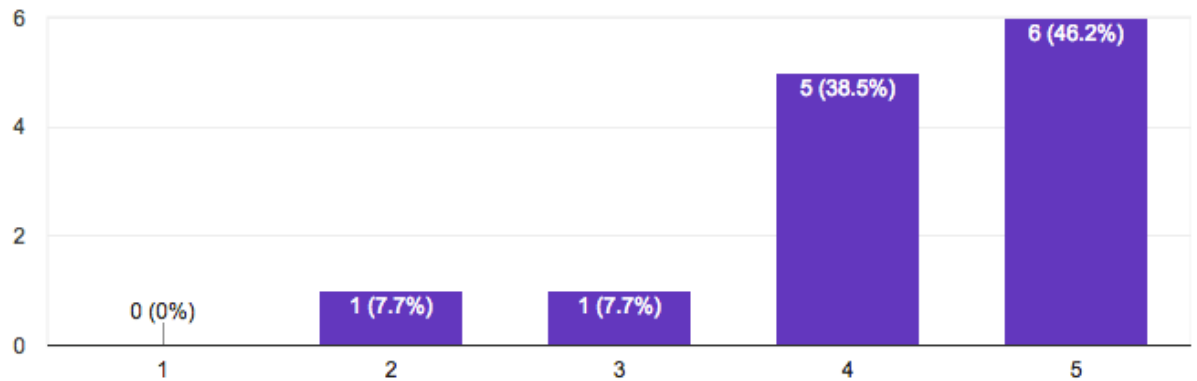
1. Following this training, would you agree your knowledge of GEE has increased? (1 = strongly disagree, 5 = strongly agree)



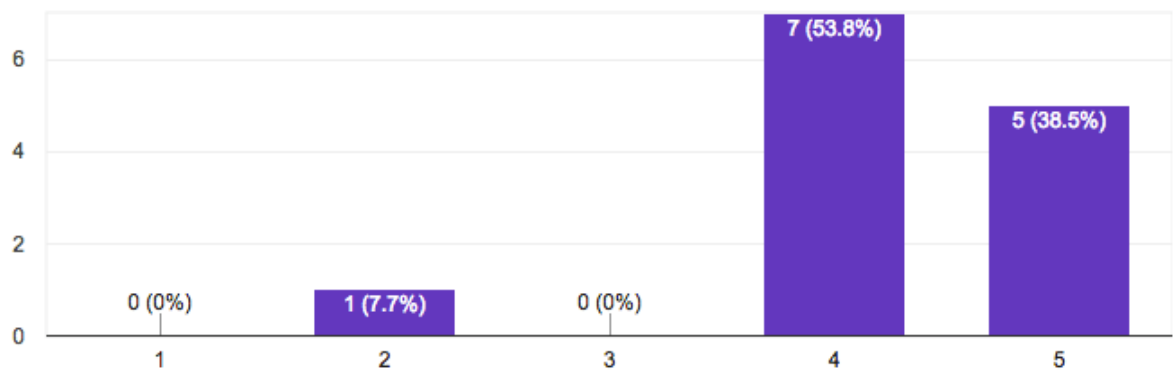
2. Following this training, would you agree your knowledge of coding has increased? (1 = strongly disagree , 5 = strongly agree)



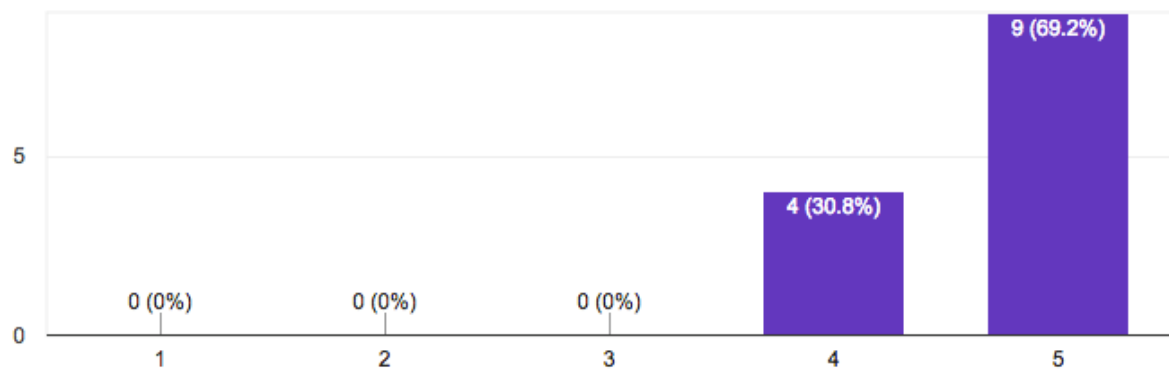
3. Do you feel you accomplished your goals going into this training? (1 = strongly disagree , 5 = strongly agree)



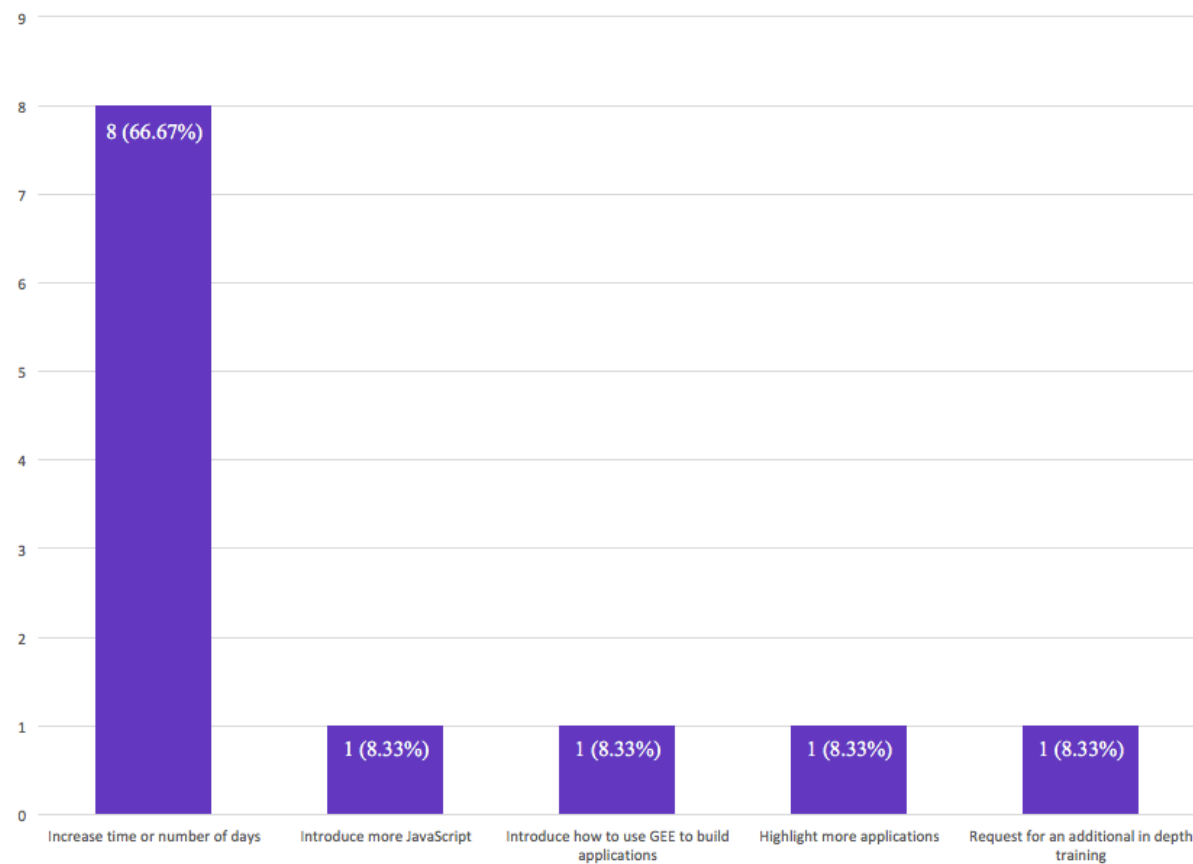
4. Do you feel confident to train others using GEE? (1 = strongly disagree , 5 = strongly agree)



5. Do you find GEE a useful platform for your line of work? (1 = strongly disagree, 5 = strongly agree)



6. What improvements would you suggest for a similar training? (Free response with answers collated by similar topics)



7. What did you like about the training? (Free Response)

- There was a hands on practical's
- Easy to follow. Relevant materials provided
- It was hands-on
- Simple and precise
- The delivery was on point and hands on
- The clarity in presentation and it practical nature
- The practicality to real issues. And the relevant exercises
- Facilitators were friendly and demonstrated knowledge of material
- All
- All
- I enjoy all aspect of the training. To me, it is advanced knowledge and relevant skills that I have just acquired
- Script and availability of online data
- The different sections (presentation) helped so much to know exactly how to solve one problem at a time

8. What topics would you like to learn about in a future advanced training? (Free Response)

- GEE webMapping

- Other earth observation products (soil moisture)
- Change detection
- Building applications on GEE
- Application development with GEE
- Developing web application with GEE
- Deforestation and Degradation monitoring using GEE
- Use of GEE for developing custom applications
- Python editor
- How to elaborate indicators to evaluate land degradation using GEE
- Application in current challenges like air pollution, climate induced disaster, food security, etc. Advanced programming experience will be useful going forward. All in all, the trainers were wonderful.
- Radar image processing
- As a model builder