Program Officer – Technology Solutions Exercise

Please complete two exercises described below and send an email with the outcome of the exercise to [bsharma@verra.org](mailto:bsharma@verra.org). Please feel free to ask any clarification questions. Please use GIT to commit the code, if you have such an ability.

The response to this exercise may be used in successive interviews.

# Digital Tools

**The objective of these exercises is to assess your ability to utilize MS Excel to quantify GHG. This exercise does not expect you to apply the principles and practice of data science, create a software solution, or assume you to be a GHG quantification expert.**

We have a methodology and would like to create a digital tool in MS Excel or other spreadsheet programs or even computer software to calculate GHG emissions reduction. Here, the objective is to illustrate how to create a simple tool to apply the quantification process described in VCS Methodologies.

For simplicity, the exercise assumes the use of MS Excel. Multiple sheets, Pivot Tables, or macros can make the calculation easier. Users should enter data to obtain results in one or more sheets. Background calculations are done in Excel using formulae, scripts, linked cells, etc. The Excel workbook must have the correct structure to estimate GHG per the methodology. You can pick any methodology, but VM0010 seems to be a straightforward methodology to get started. [*https://verra.org/wp-content/uploads/2018/03/VM0010-Methodology-for-IMF-LtPF-v1.3\_0.pdf*](https://verra.org/wp-content/uploads/2018/03/VM0010-Methodology-for-IMF-LtPF-v1.3_0.pdf).

In this methodology, sections 8 and 9 are essential for making a digital tool. Digitalizing the entire methodology could be a burden, as that is not the intention of this exercise. Therefore, please use a subsection, for example, “**8.1.1 Calculation of carbon stocks in commercial timber volumes”** in VM0010.While you can use actual inventory data and values for constants and parameters, you are encouraged to use assumed values for this exercise. You may use the following assumptions:

* Assume that inventory data is already available in the following format (to be applied in Eq 1):

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Stratum (i)** | **Plot (sp)** | **Species (j)** | **Tree (*l*)** | **Volume (V\_(l,j,I,sp))** |
| 1 | 1 | Sp1 | t1 | 3.3 |
| 1 | 1 | Sp1 | t2 | 4.8 |
| 1 | 1 | Sp1 | t3 | 4.08 |
| 1 | 2 | Sp4 | t1 | 1.5 |
| 1 | 2 | Sp4 | t2 | 1.68 |
| 2 | 1 | Sp1 | t1 | 1.38 |
| 2 | 1 | Sp2 | t2 | 3.24 |
| 2 | 1 | Sp3 | t3 | 3.72 |
| 2 | 1 | sp4 | t4 | 2.94 |
| 2 | 1 | Sp5 | t5 | 3.36 |

* Assume all species are hardwood with BCEF\_R = 0.70, CF (carbon fraction) = 0.5, and D (wood density) = 0.50 Dry Ton per Green Volume M^3)
* Assume the area of a plot (A\_sp) to be 0.1 ha across all stratum

Please use simple text rather than scientific notation when you encounter a symbol. For example, use VCU\_net|LtPF instead of VCUnet│LtPF in Excel cells. Please clearly state the assumption and instructions for using this tool in the Workbook.

The outcome of this exercise is an Excel workbook (unless you have another tool or program created) where a user enters relevant data to estimate GHG and finds the results.  Please provide all the assumptions that you made.

# Getting Forest Monitoring Data

**The purpose of these exercises is to evaluate your proficiency in utilizing scripts or programming to collect monitoring data from an external system through APIs.**

You are tasked with developing a compact program to access NASA's Fire Information for Resource Management System (FIRMS) API for fire alerts. This program can be implemented on Google Earth Engine or any compatible platform using either JavaScript or Python. The script should incorporate the following inputs (additional inputs can be included as needed):

**Spatial Boundary:** Input: A boundary defined by a Keyhole Markup Language (KML), shapefile, or Area of Interest/Region of Interest (AOI/ROI) layer. This defines the spatial extent of the analysis.

**Temporal Range:** Input: A rate range comprising two time points. This sets the temporal extent of the analysis.

The script is expected to produce output in the form of fire alerts, presented either in a tabular format or on a map. It should specifically highlight alerts that fall within the specified spatial and temporal regions. Importantly, the script should gracefully handle various inputs and, in the absence of any relevant output, provide a clear message.

To clarify, the script's primary functionality includes:

* Retrieving fire alerts from NASA FIRMS API.
* Filtering alerts based on the user-defined spatial boundary and temporal range.
* Displaying results in either a tabular format or on a map.
* Including robust error handling to communicate clearly when no relevant alerts are found.

This design ensures that the script is adaptable to diverse inputs and effectively communicates results or lack thereof.