NATIONAL FOREST INVENTORY DATA MANAGEMENT PROTOCOL

**FOREST RESOURCES MANAGEMENT DIVISION
DEPARTMENT OF FORESTS AND PARK SERVICES
MINISTRY OF AGRICULTURE AND FORESTS**

Developed and drafted by;

                        Dorji Wangdi, Deputy Chief Forestry officer
                        Kinley Dem, Dy. Chief Forestry Officer
                        Dr. Norbu Wangdi, Chief Forestry Officer
                        Younten Phuntsho, Deputy Chief Forestry Officer

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Contents

1. Background

The first National Forest Inventory (NFI) has collected massive amounts of data and information from the 1685 cluster plots for generating the quantitative and qualitative information of the forests of Bhutan, reported in NFI Volume I and Volume II. Out of 2424 cluster plots, 739 cluster plots could not be accessed owing to various reasons such as difficult terrain, security concerns and unfavorable weather conditions. Forest Resources Management Division (FRMD) adopted Open Foris Collect for NFI data management. Open Foris Collect is an open source software developed by the Food and Agriculture Organization of the United Nations (UN-FAO). It is capable of storing, processing and generating preliminary summaries of data in a very efficient manner using Saiku database.

This protocol named NFI DATA MANAGEMENT PROTOCOL is developed to help NFI Data Managers both at field and FRMD in organizing and managing the NFI data in Open Foris Collect, hereafter referred interchangeably as Collect. The protocol also provides overall guidance on data security, sharing and storage. It will be revised as and when required in future.

2. Objectives

The objectives of this protocol are to;
- ✓ systematically manage the data collected from the field in work station computers, google drives and Collect, both at Field Offices and FRMD
- ✓ store data in a suitable format for archiving and retrieval as well as analysis
- ✓ maintain data back-up and ensure data security in the event of loss and theft
- ✓ ensure physical integrity of files and help to preserve them
- ✓ ensure safety of content (data protection, ethics, morality, etc.)

3. Data Collection, Data Formats and Storage

The NFI data shall be collected using Data logger (Tablet for NFI) with an android based data collection application, called as Collect Mobile (with survey forms uploaded on it) and paper field forms for those plots where the data collection on android is not possible in the field owing to unavoidable reasons. The data collected in the Collect Mobile comes in collect-*format* and it is readable only in Collect (a data management software). From the Collect, data can be exported in Collect-format or csv/excel format as desired.

The data collected from the field shall be stored in a dedicated google drive folders specially created for the concerned office. In addition to google drive, each field office or data manager shall ensure that backup data is stored and managed in folders in computers set up at each field for NFI.

4. Data Collection, Transfer and Management and Responsibility

The NFI Data will be collected using android based tablet and can be easily exported and uploaded into Collect using Collect Mobile application. Table 1 shows a step wise data collection, transfer and management responsibility assigned against each task for clarity and efficiency.

Table 1: Data Collection Process and submission

Sl. No	Task	Responsibility
1	Collect data using Collect Mobile	In the field by NFI Crew
2	Export data from Collect Mobile Submit data submission form	In the field by NFI Crew
3	Upload Data in PC/Google Drive	In the field by NFI Crew
4	Send the data to data center/data manager via email or share file via google drive.	In the field by NFI Crew
5	Download/open shared file from email or google drive Maintain a copy of the data in PC hard drive	NFI data manager
6	Upload/import data into Collect	NFI Data Manager
7	Verify whether all data shared by field crew are imported into collect	NFI Data Manager
8	Export NFI data in Collect format and .csv format and store in a folder called raw_data	NFI Data Manager
9	Inform Crew leader for any missing data	NFI Data Manager
10	Submit a copy of back-up data of step 5 and 8 to FRMD for record	NFI Data Manager
11	Perform preliminary data cleaning in Collect	NFI Data Manager
12	Export cleansed data into Collect and .csv format and store in PC as cleaned data	NFI data Manager
13	Submit a cleansed data both in Collect and .csv format to FRMD via email or google drive. Copy of the data should be stored in dedicated google drive of the respective offices	NFI data manager
14	Download the data submitted by field office/data managers Store data in respective field office folders created in PC set up at FRMD	FRMD NFI Data Manager

15	Upload/Import data into Collect	FRMD NFI Data Manager
16	Verify if all the data are imported properly and completely	FRMD NFI Data Manager
17	Perform further data cleaning	FRMD NFI Data Manager
18	Export cleansed data in Collect and .csv format and store in PC as cleaned data	FRMD NFI Data Manager
19	Export data as Collect format for data analysis in Calc	FRMD NFI Data Manager
20	Analyze the data and generate estimate	FRMD
21	Alternatively, data can be analyzed using other software packages such as R, Python	FRMD

5. Data Flow

The broad overview of data flow is provided in figure 5.1. Broadly it involves two layers – by Field Crews (Layer I) and by Data Managers at Field Offices and FRMD (Layer II).

Layer I- By Field Crews

- Collect the data using Collect Mobile installed in android based tablet
- Export the data from tablet
- Upload the data into google drive
- Inform the data manager that the data from the survey has been uploaded and is available for download
- Field crew should all take the photograph of each plant which could not be identified in the field and name it using naming protocol defined in this document.
- The step-wise guidance on taking photographs, naming it, exporting, downloading, and overlaying it on the google earth is provided in step 12.6

Layer II – Data Managers

- The data manager shall login into Collect desktop and google account
- Download the data from the google drive
- Upload the data into collect desktop
- Store the kmz file in the dedicated file and upload into google map to see whether the data are collected from the desired location
- Verify whether all data are uploaded
- Back up the data
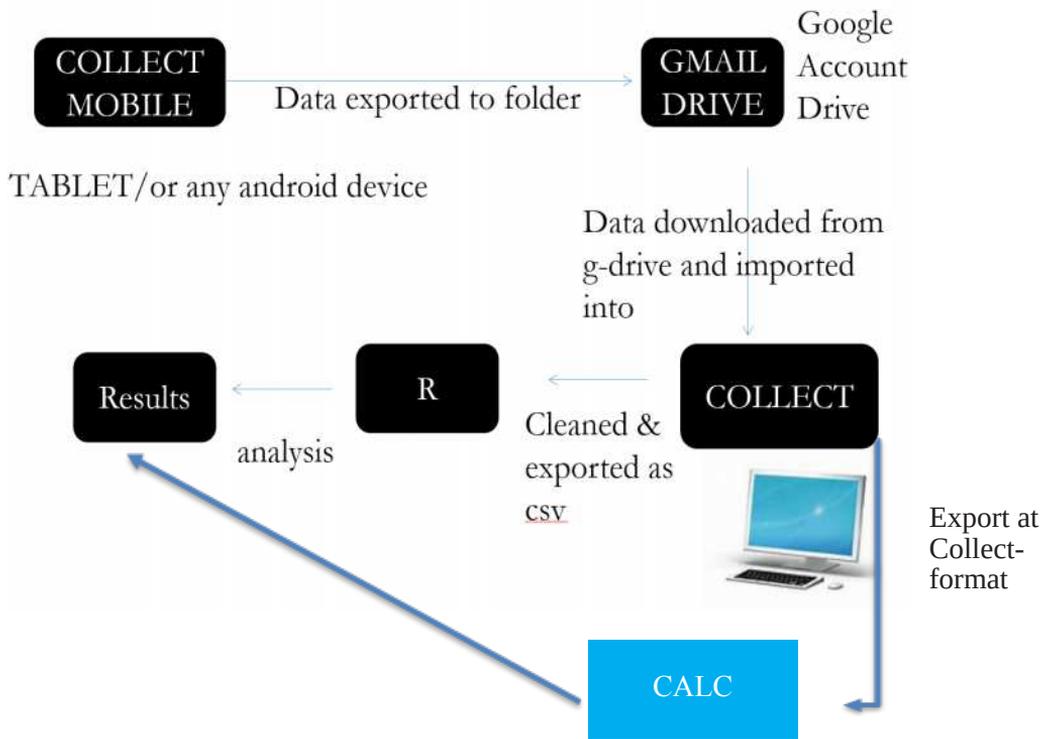
Figure 5.1: Overview of NFI Data Flow

6. Step-wise Guide to Download and Import Data on Collect

This section provides a step-wise approach to download the data from Google Drive, upload or import the data into Collect and clean or carry out preliminary processing of the data.

Step 6.1. Opening Google drive

Once field crew exports the data from Collect Mobile and upload the data into designated folder in Google Drive, the Data Manager will download it from the google drive.

First, the Data Managers will sign in to Google account using the respective field office google account created for NFI. After signing into google account, CLICK on GOOGLE APPLICATIONS ICON, as depicted on figure 6.1.
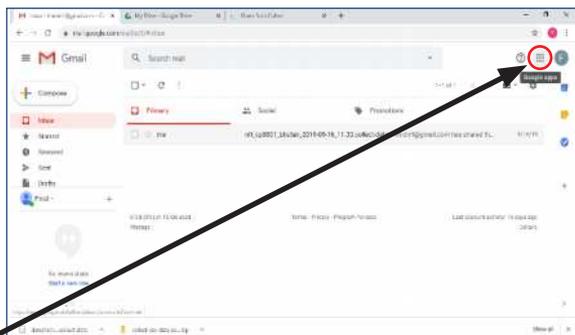
Figure 6.1: Opening Google Application
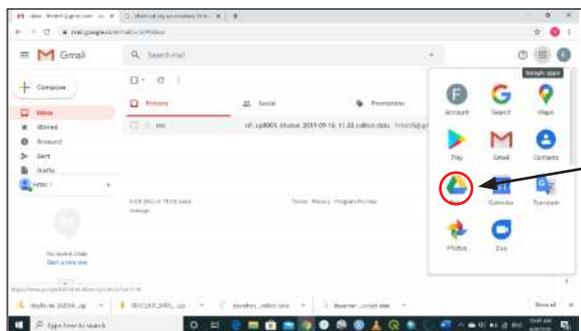
Step 6.2: Opening Google drive

Next click on DRIVE Icon to open it as shown on figure 6.2.

Figure 6.2: Opening Google drive

Step 6.3: Google drive window

On clicking the Google drive icon, it opens the Google drive window. In the google drive window click on the designated folder and you will be able to see files uploaded by the field crew as shown on figure 6.3.
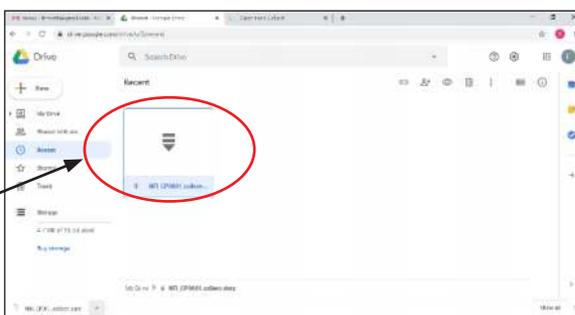
Figure 6.3: Google drive window

Step 6.4: Downloading the data
On the google drive window, the data uploaded by the field crew will be shown (example here is the data for Cluster plot number 0001, CP0001 as shown on figure 6.3. RIGHT CLICK on the data, and then go to DOWNLOAD, as shown on figure 6.4.
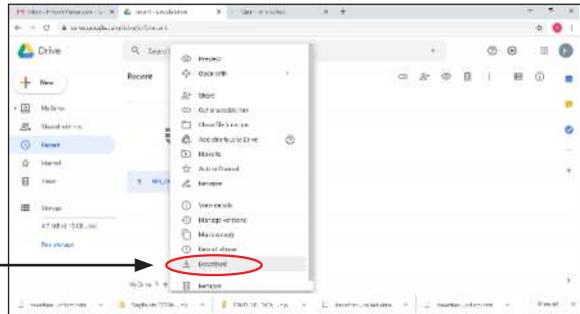
Figure 6.4: Download data option
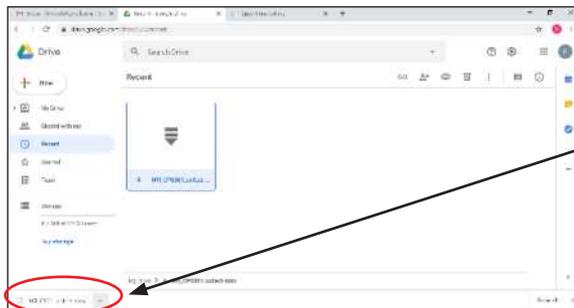
Figure 6.5: Downloading data

Step 6.5: Downloading window

As soon as you click on DOWNLOAD, it will automatically start downloading the data, as shown on figure 6.5.

Step 6.6: Downloaded data

The data that has been downloaded will be automatically saved in DOWNLOADS in your computer, as shown on figure 6.6 or you can change the download directory as may be convenient
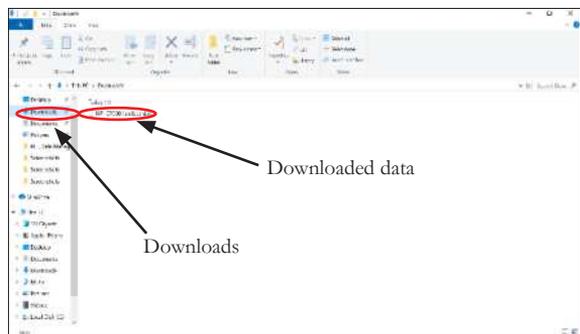
Figure 6.6: Downloaded data
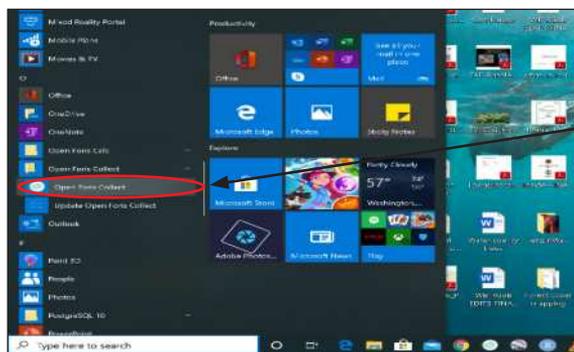
Figure 6.7: Starting Collect

Step 6.7: Starting Open Foris Collect

Go to start, CLICK on Open Foris Collect to start Collect, as shown on figure 6.7.

Step 6.8: Open Foris Collect

On double clicking the Open Foris Collect, you will notice the "Starting Collect Control Panel" pop up window, as shown on figure 6.8. (Do not close)

Figure 6.8: Starting Open Foris Collect – Control Panel

Figure 6.9: Collect window

Step 6.9: Collect window

After a few seconds, Collect Window, as shown on figure 6.9, will be opened in your default browser

Step 6.10: Importing data into Collect

On the Collect window dashboard, CLICK on 'Data Management', as shown on figure 6.10.

Figure 6.10: Data Management

Figure 6.11: Selecting Survey

Step 6.11: Select Survey – Bhutan NFI

After clicking on Data Management, SELECT "Bhutan NFI" from the dropdown option on the top right corner which says 'Published survey', as shown on figure 6.11.

Figure 6.12: Import data

Step 6.12: Import Data

Then CLICK on IMPORT to import the data into Collect, as shown on figure 6.12.

Step 6.13: File format options

On CLICKING the 'IMPORT' button, two options, namely 'from CSV/excel and from Collect format' will open. CLICK on 'from Collect format', as shown on figure 6.13.
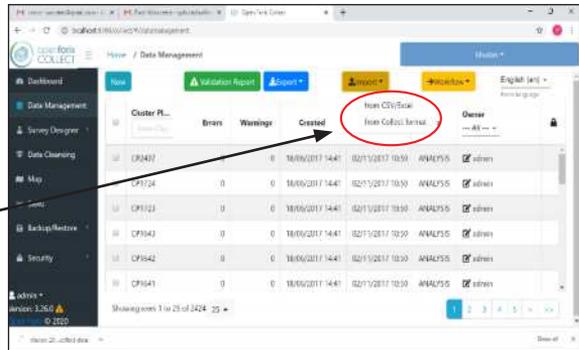
Figure 6.13: File format options
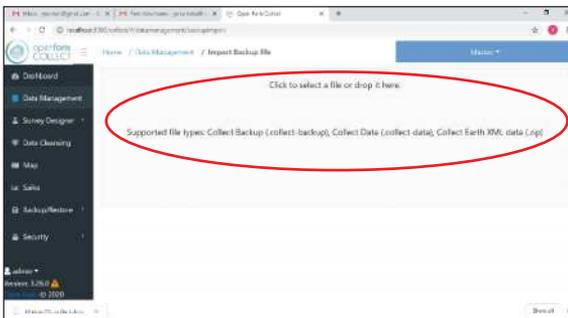
Figure 6.14: Blank import window

Step 6.14: Blank import window

On clicking, 'from Collect format', a blank import window pops up, as shown on figure 6.14.

Step 6.15: CLICK inside 'Blank import' window

Upon opening Blank import window, CLICK inside the blank pop up window. You can open the desired file from your file directory or downloads folder (downloads in this case) to choose the file/data you want to import, as shown on figure 6.15. Select the file and then CLICK 'Open'
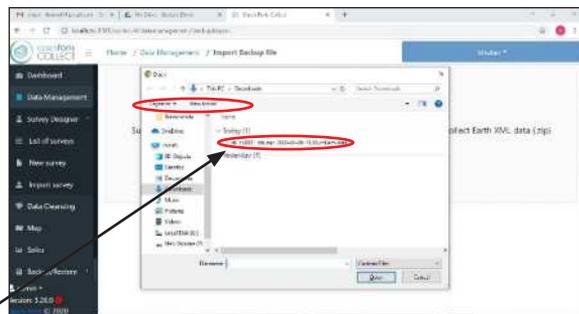
Figure 6.15: Import File

Figure 6.16: Generate import summary
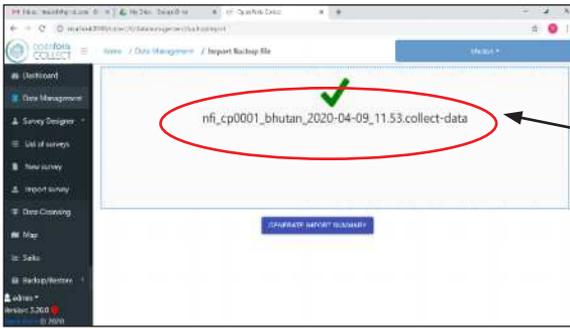
Step 6.16. Generate Summary page

When you CLICK on 'Open', the file or data (nfi_cp0001_ bhutan_2020-04-09 _11.53.collect-data in this example), opens, as shown on figure 6.16.

Then CLICK on 'Generate Import Summary' tab to generate summary.

Step 6.17: Import data

Upon clicking on 'Generate import summary', the summary of data or files to be imported will be generated. If there are errors or issues such as conflicting plot numbers, it will be shown on the screen. Verify the report on the screen and CLICK on 'Import' tab to complete import of data or file, as shown on figure 6.17 and figure 6.18.
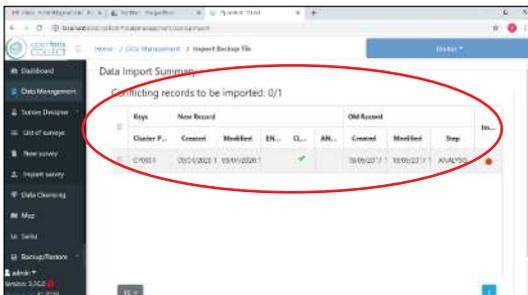
Figure 6.17: Data import summary
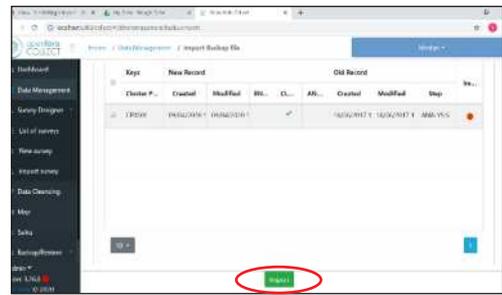
Figure 6:18: Import data

Step 6.18: Complete Import of data or file

Upon CLICKING on 'Import' tab, the Collect will import the file or data and show 'DONE' message tab to indicate that the data or file uploading or importing into Collect platform is completed, as shown in figure 6.19. With this step, data or file IMPORT into Collect is complete.
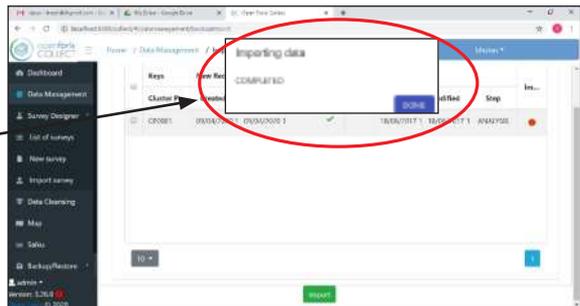
Figure 6.19: Importing complete

7. Manual Data Entry

Before proceeding to the next level of data management, the data collected in the paper forms shall be entered into Collect manually. The following steps provide guidance on manual entry of the data collected on paper forms.

Step 7.1 Start the Collect

Go to 'Start', CLICK on 'Open Foris Collect' to open it. Upon opening Collect on the Dashboard, CLICK on 'Data Management', as shown on figure 7.1.

Figure 7.1: Starting Collect

Step 7.2: Selecting published survey

SELECT the published survey (in this case Bhutan_nfi), as shown on figure 7.2 and then CLICK on 'NEW'.
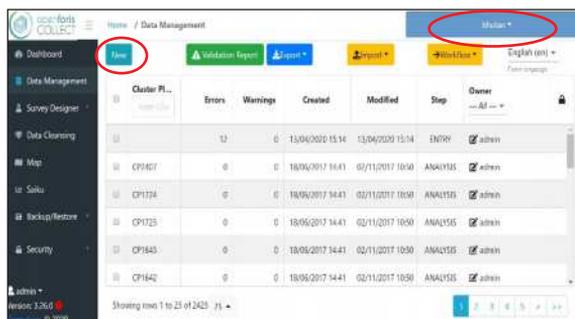
Figure 7.2: Selecting survey

Step 7.3: Enter data manually

Upon clicking 'NEW' the data entry page with different data forms will be opened.

Start ENTERING data, first with Cluster Plot form, followed by Plot form and Carbon Data form. Likewise, enter the data and complete the rest of the forms.
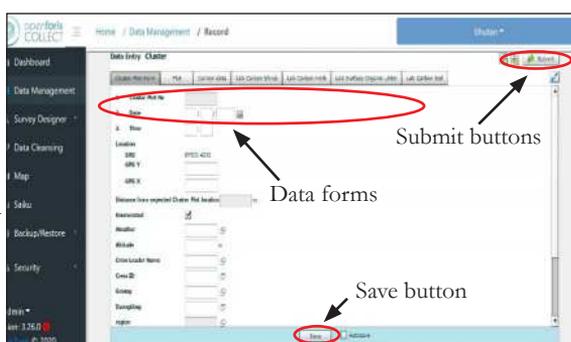
After completing entry of data for each form, SAVE it by CLICKING on 'Save' button. You can also check the 'Auto Save Option' in the Window.

Sometimes your data will be locked, in such a case, you need to click on the unlock button on the top right-hand corner in the same window. Once data entry of all

data forms are completed, SAVE the data by clicking on 'Save' button and then finally CLICK on 'Submit', to complete the manual data entry.

NOTE: Most importantly, the Data Managers should ensure that even the inaccessible plots, should be manually entered, before starting examination of data and subsequent steps of data management.

8. Preliminary Examination of Data

After importing the data or manually entering the data, preliminary examination of the data shall be done by the Data Managers. The following are a few points to carry out preliminary examination of data.

1. Check whether all cluster plots are imported into Collect or not. Verify with data submission form.
2. Verify manually if the information provided in the data submission form matches with what is imported into Collect. In the event of mis-match, inform the NFI crew leader and rectify the issue such as missing plot, missing tree information, etc.
3. Lookout for any missing information in data submission form.
4. In the tree attribute, check for any unique local names. This kind of information should be accompanied by photographs of tree trunk, leaves, flower and fruits where possible.
5. Examine the tree dbh and height. The diameter should be >= 10 cm and height should be >= 5 m.
6. In the plot attribute, check the stand height. It should be average height of 5 or more tallest trees in the plot.
7. In the CWD attribute, check the diameter at intersections, small end and large end. The diameter is in the order of small end, intersection and large end, in the order of smallest to largest. Remember that diameter at intersection should be >= 10 cm.

9. Data Processing

After importing the data or manually entering the data; and then having examined the data preliminarily; the data should be processed by carrying out a basic data cleansing. The preliminary cleansing is done by diligently following the steps reflected below;

- Open the Collect, and then CLICK on 'data management' on dashboard and SELECT the desired survey, in this case, bhutan_nfi, as was done for step 7.1.
- Then load the data into Collect by DOUBLE CLICKING on plot number for which you want to cleanse the data (example CP2407). Caveat here is that workflow should be set at 'Data Cleansing'.

- To set 'Data Cleansing' phase, go to the workflow, from the options submit your data from data entry to data cleansing.

- After that open each cluster plot manually and perform data cleansing manually for each plot and enter all missing information.

- Correct all botanical names and local names. If you encounter unknown trees or plants, try to identify the plant with photographs provided to you by field crews and enter the name.

- Upon completing the data cleaning, submit the data from cleansing stage to data analysis stage.

- Then export the data either in collect format or .csv/excel format. If you are exporting in .csv/excel format make sure that you are exporting the data from analysis phase.

10. Step-wise Guide to Export Data from Collect and Upload on Google Drive

After importing the data or file into Collect, the Data Managers of field offices will compile and validate the data. They will also carry out preliminary cleansing of the data. After preliminary cleansing of the data is done, Data Managers will export the data and upload into NFI google drive, so that Data Manager at FRMD can download and import into Collect at FRMD for further compilation, validation, cleansing and analysis. The following sections provide, a step-wise guide to export and upload data or file on FRMD NFI Google drive, so that Data Manager at FRMD can access.
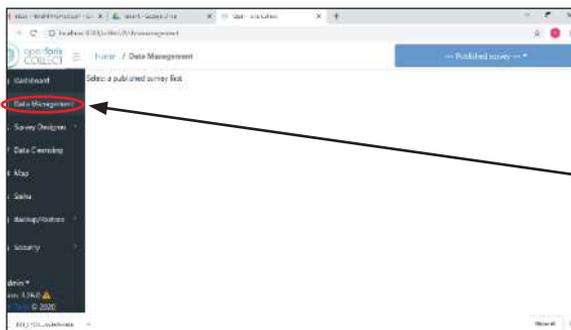
Step 10.1: Open Collect or Data Management

Open Collect (if you have not done it). If you have already opened it, CLICK on Data Management tab on dashboard, as shown on figure 10.1.

Figure 10.1: Data management

Step 10.2: Select appropriate survey

After clicking on data management tab, SELECT appropriate survey (Bhutan NFI in this case), as shown on figure 10.2, as we did for importing the data in step 6.11.
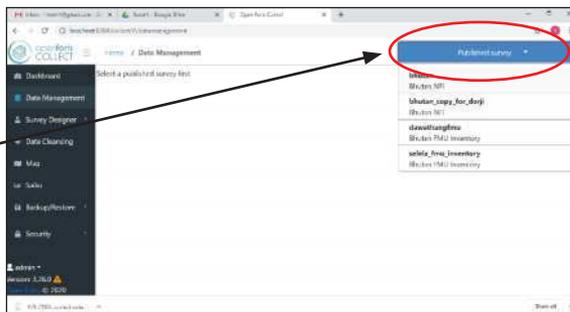
Figure 10.2: Selecting Survey

Step 10.3: Export options

Then CLICK on 'EXPORT', there will be two options for file format, as shown on figure 10.3. Export the data in both file formats. Collect format should be uploaded on Google drive and the .csv/excel format and a copy of Collect format should be emailed to Data Manager at FRMD.
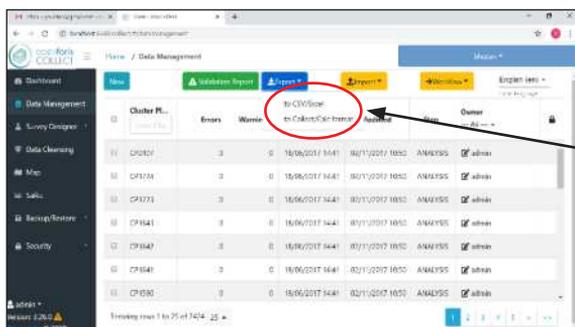
Figure 10.3: Export file format options

Step 10.4: Export window opens

On selecting appropriate file or data format (from Collect format in this example), the Collect will automatically start exporting the data, as shown on figure 10.4.
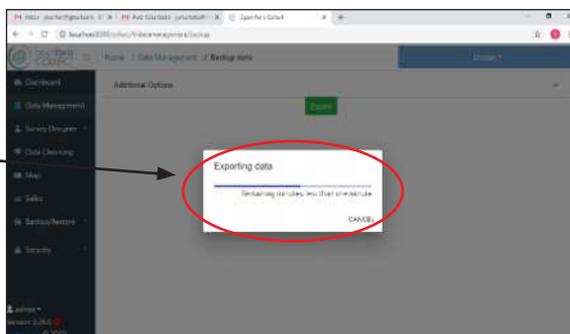
Figure 10.4: Exporting data or file

Step 10.5: Export complete

After completing the export, a window, as shown in Figure 10.5, with 'download' tab opens.
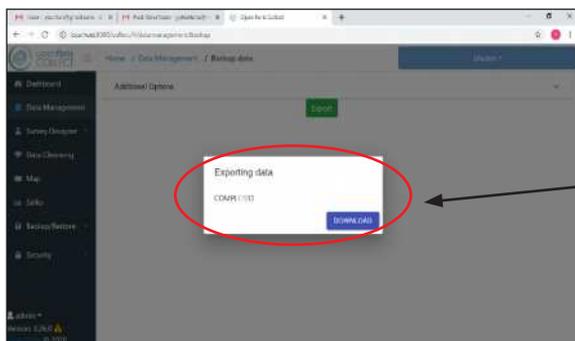
Figure 10.5: Downloading exported data or file

13

Step 10.6: Downloading the exported data or file

On CLICKING 'download' tab, the exported data or file is automatically downloaded, as shown on figure 10.6. The downloaded file or data will be stored in 'downloads'.
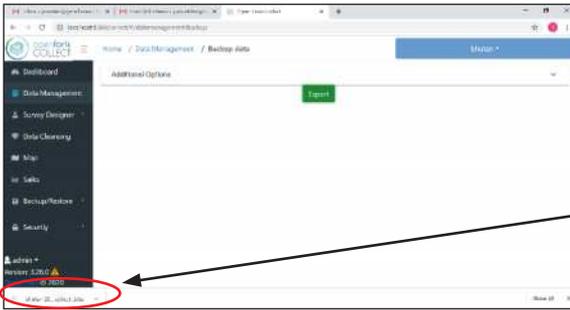
Figure 10.6: Downloading export data or file

Step 10.7: Opening Google drive

Sign in to designated google account provided to your office email account (e.g. bumthangdivisionnfi@gmail.com) and then open the google drive, as was done in steps 6.1 and 6.2.

Step 10.8: National NFI Data Folder for field offices

After opening the google drive, CLICK on "Shared with me" and open the folder name after your respective office (Bumthang Division for Divisional Forest Office (DFO), Bumthang) as shown on figure 10.7.
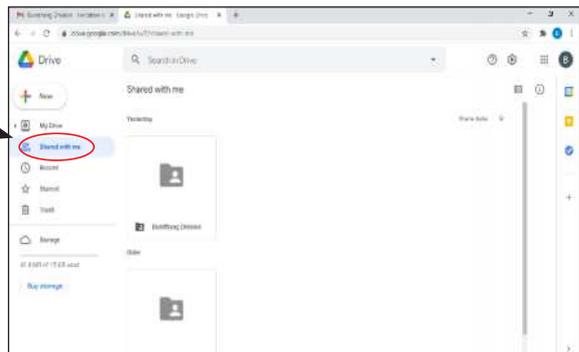
Figure 10.7 Opening the NFI data folder for the field office

Step 10.9 Opening folders shared with each field offices

After the opening the folder, there will be different folder for all Dzongkhags falling within the respective field office. There will be two folders named *Bumthang Dzongkhag and Trongsa Dzongkhag* incase of DFO, Bumthang as shown in figure 10.8.
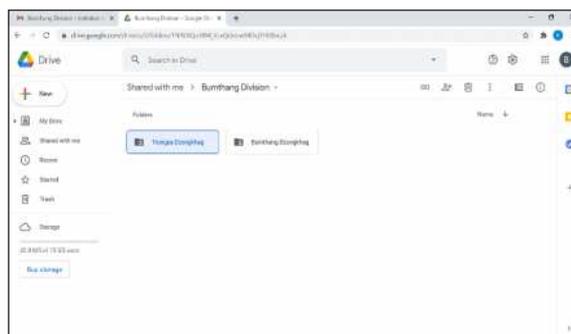
Figure 10.8 Folders for different Dzongkhag under the field office

Step 10.10 Upload new data or file

DOUBLE CLICK on the Dzongkhag folder for which you want to upload the data. After opening the folder, RIGHT CLICK on the blank space, which will show options to upload file, as shown on figure 10.9.
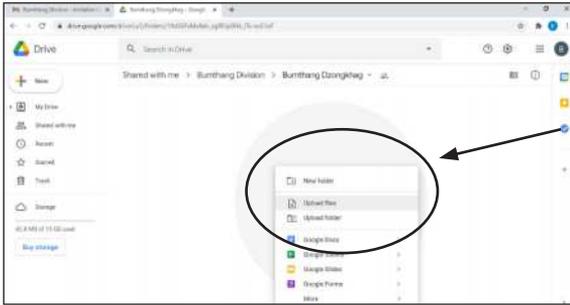
Figure 10.9 Opening folders for the Dzongkhag under the field office

Step 10.11: Downloaded data in the downloads

On clicking 'Upload files', another dialogue box with file that has been downloaded will pop up, as shown on figure 10.10.
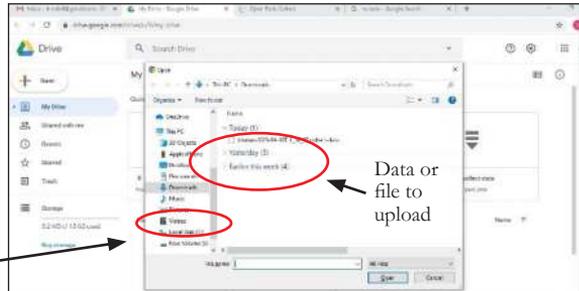
Data or file location

Figure 10.10: Downloaded data or file
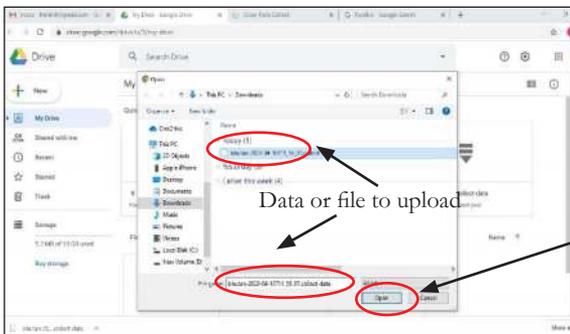
Step 10.12: Select the data or file

Then SELECT 'data or file, that you want to upload on drive, and CLICK on 'Open' tab.

Figure 10.11: Selecting data or file

Step 10.13: Uploading data

Upon clicking 'Open', the data or file will be uploaded and the status is shown on figure 10.12.
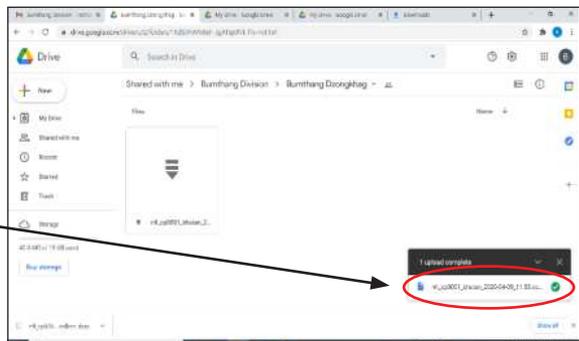
Figure 10.12: Data or file upload status

Step 10.14: Uploaded data or file

After successfully uploading the data or file, the google drive will appear as shown on figure 10.13.

Dzongkhag Data Folder

Uploaded data or file
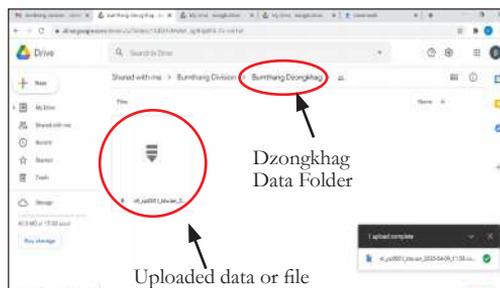
Figure 10.13: Uploaded data or file

NOTE: If a field office has TWO or more Dzongkhags' data, Data Managers will accordingly upload the data inside respective dzongkhag folder. For instance, Bumthang Division has Trongsa and Bumthang, the Data Manager will upload data from Trongsa in Trongsa dzongkhag folder; and likewise, for Bumthang.

11. A Step-wise Guide to Upload Data or File on Respective Field Office's Google Drive

ALTERNATIVELY, Field Data Managers will upload data or file in their own respective Field Office's Google Drive instead of/besides uploading on FRMD's Google Drive, as shown in the section preceding this part of the protocol. The following steps provide guidance on uploading data file on respective field office's google drive.

Step 11.1 Opening Field Office's Google Drive

To upload the data or file in their google drives, the Data Manger will first sign in to their respective field office's gmail account. After signing in, open the google drive, as shown on figure 11.1, and 'DOUBLE CLICK' on NFI_DATA_RAW_BuFD. There will be two folder each for Bumthang and Trongsa Dzongkhag falling under DFO, Bumthang, 'DOUBLE CLICK' on NFI_DATA_RAW_ BuFD_Bumthang to upload data for Bumthang Dzongkhag under DFO, Bumthang.

Indicates Bumthang Division's Google drive
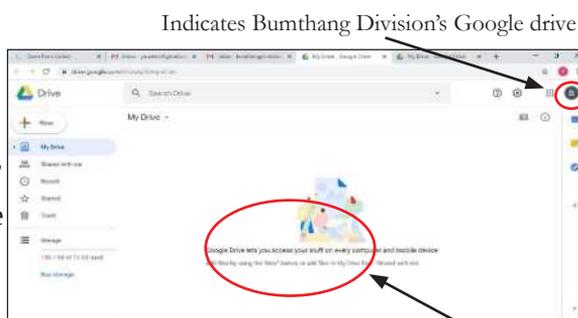
Figure 11.1: Opening google drive

Empty Google drive

Step 11.2: Uploading data options

After opening google drive, RIGHT CLICK inside the blank space, then SELECT 'upload files', as shown on figure 11.2.
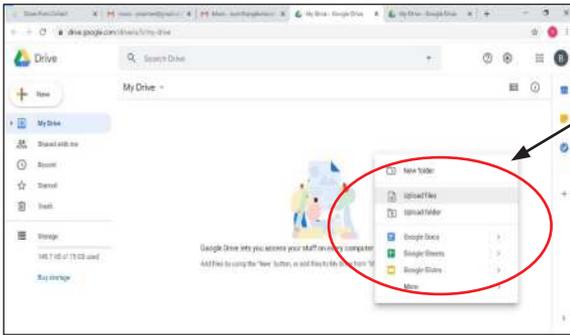
Figure 11.2: Upload data options

Data or file to be uploaded

Step 11.3: Selecting data to upload

CLICK on the 'upload file', GO to the location where the data or file to be uploaded is saved, SELECT the data or file, and then CLICK 'Open'.

For instance, in this example, data or file is saved in downloads.
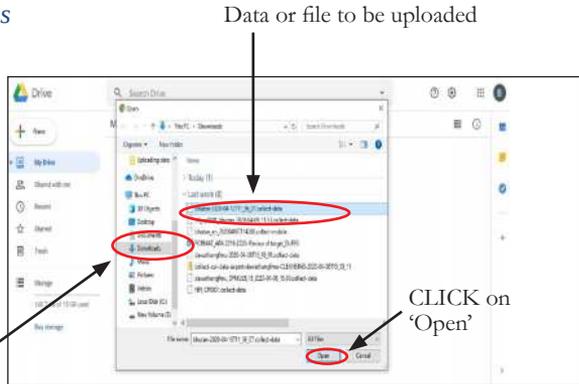
CLICK on 'Open'

File located in 'downloads'

Figure 11.3: Selecting file or data

Status of upload

Step 11.4: Uploaded file

After clicking on 'Open' the data or file will be uploaded automatically, as shown on figure 11.4.

Uploaded data or file
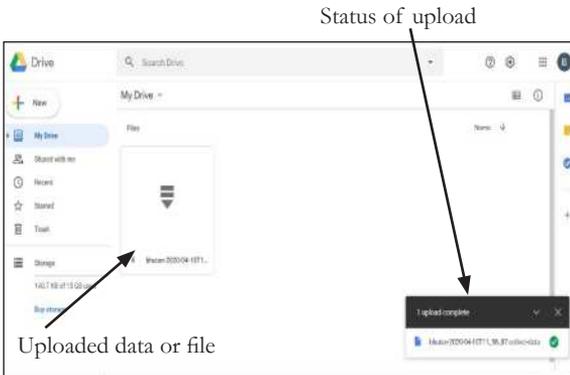
Figure 11.14: Uploaded data or file

12. Taking Photographs Using SW Maps and Exporting

This section of the protocol provides a step-wise guidance on taking photographs with SW Map tab, naming the photographs, exporting and uploading on google drive by the field crews and then downloading and overlaying on google earth to verify location by the Data Managers.

Step 12.1: Opening SW Maps

Open the SW maps by CLICKING on SW Maps on the screen, as shown on figure 12.1.
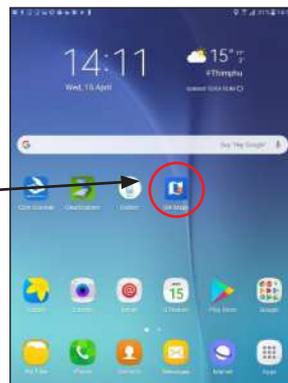
Figure 12.1: Opening SW Maps
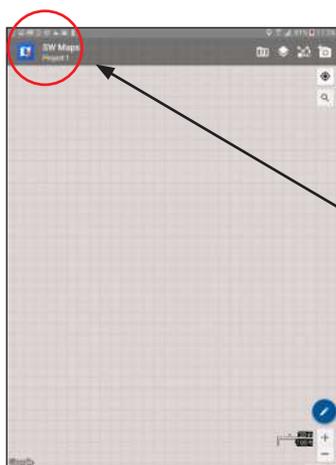
Step 12.2 SW Maps blank window opens

On clicking SW Maps icon, a blank SW Maps window pops up with default 'Project 1' as the project name, as shown on figure 12.2. Rename the project as NFI BHUTAN' by going to' project' icon and clicking on "+".

Figure 12.2: Blank SW Maps window

Step 12.3: Adding layer

Next, CLICK on 'add layer' icon, as shown on figure 12.3. On clicking 'add layer', the 'layers' window pops up.
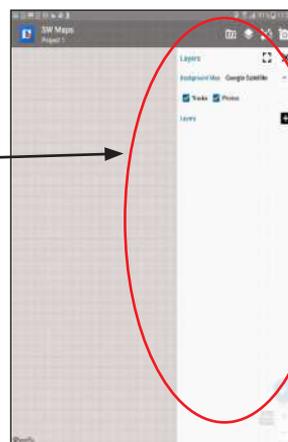
Figure 12.3: Blank layer window
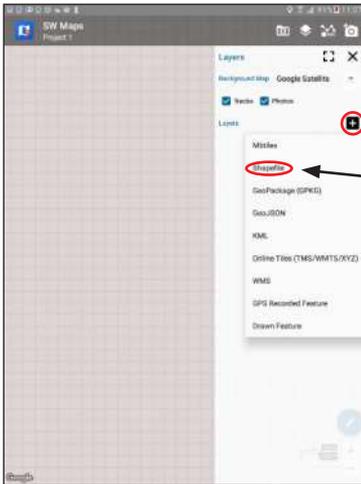
Figure 12.4: Adding shapefile

Step 12.4: Adding Shapefile

Then CLICK on '+' icon, which will provide option to add layer. In this case, you will load or add shapefile of NFI Plots. The shapefiles of NFI plots are all uploaded in your tablet.

Step 12.5: Adding layer name

After clicking on shapefile, SELECT the layer you want to add (here it is NFI_Plots_Bhutan.shp) and then provide layer name as 'NFI BHUTAN' as shown on figure 12.5. Then CLICK on 'ADD'.
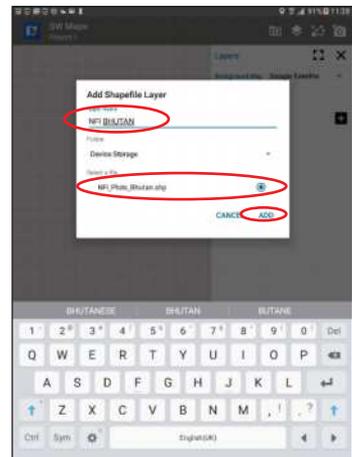
Figure 12.5: Selecting and adding layer

Step12.6: Taking photograph using SW Maps

Open the SW Maps and then tab on 'Camera Icon' on top right-hand corner of the screen to open camera, as shown on figure 12.6. Take the photograph of the tree or any unknown plants. Then CLICK on 'OK'.

Figure 12.6: Taking photograph on SW Maps

Step 12.7: Naming the photograph

Photograph will be named following this protocol
- Cluster Plot Number_Plot Type_ Unknown 1, 2, 3…...
For instance, if it is the first unknown plant in Elbow plot of Cluster plot number 0947, the name of the photograph will be CP0947_L_Unknown1, as shown on figure 12.7.

After that CLICK on 'SAVE'.

Figure 12.7: Naming the photograph

Figure 12.8: Opening 'export'
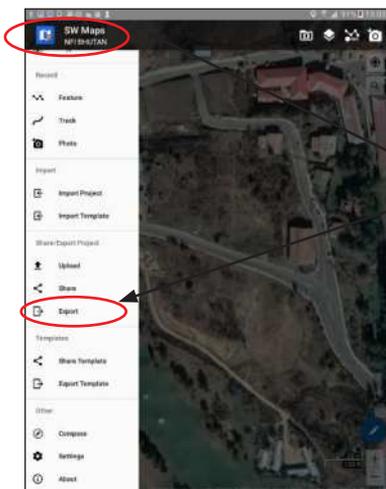
Step 12.8: Opening 'Export'

CLICK to 'SW Maps icon' on top left-hand corner, as shown on figure 12.8 and CLICK on 'Export', which will open options to export the photograph.

Step 12.9: Export options

On clicking 'export', options to export data in a number of file formats pop up, as shown on figure 12.9. SELECT 'Export KMZ' to export the file in .kmz file, so that it can be overlaid on google earth and verify location.
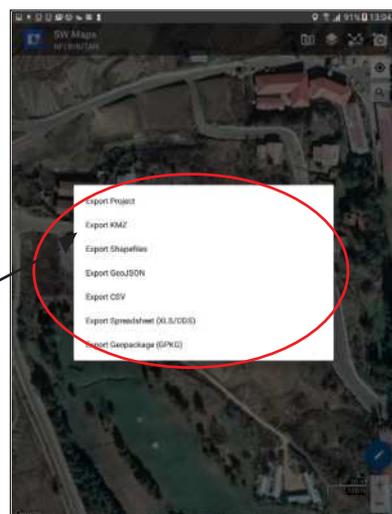
Figure 12.9: Export file format options

Figure 12.10: Naming export file
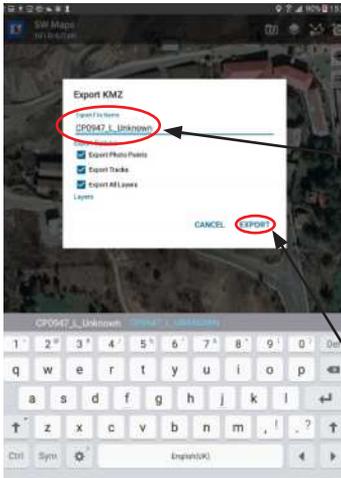
Step 12.10: Naming the export file

On clicking 'Export KMZ', file naming window pops up, as shown on figure 12.10. Use the same naming protocol, as used in 12.7, which is Cluster Plot Number_ Plot Type_Unknown 1,2,3.....

After providing the export file name, CLICK on 'EXPORT'

The exported file will be auto-saved in 'My Files' on your tablet, folders – SW Maps and EXPORT inside it.

Step 12.11: Uploading the exported file on google drive

After exporting the file, go to tablet home app screen, CLICK on 'My Files', as shown on figure 12.11
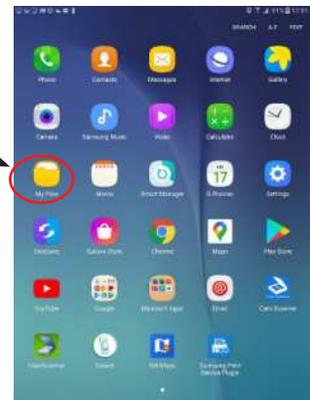
Figure 12.11: My Files
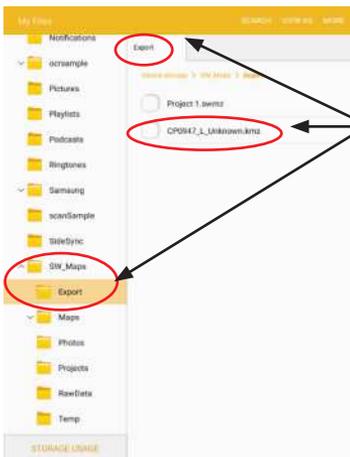
Step 12.12: Open SW Maps and EXPORT folders

Then scroll down and open 'SW Maps', followed by EXPORT folder within it, as shown on figure 12.12.

Inside the EXPORT folder, the file that has been exported (CP0947_L_Unknown 1,2,3....) will be saved.

Figure 12.12: Open SW Maps and EXPORT

Step 12.13: Uploading on google drive

After opening export folder, PRESS and HOLD on the file you want to upload on google drive (here it is CP0947_L_Unknown 1,2,3....). Then CLICK again inside the square box in front of the file name to select it. Then CLICK on 'Share'.
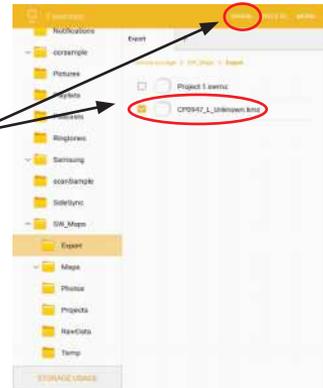
Figure 12.13: Uploading selected file
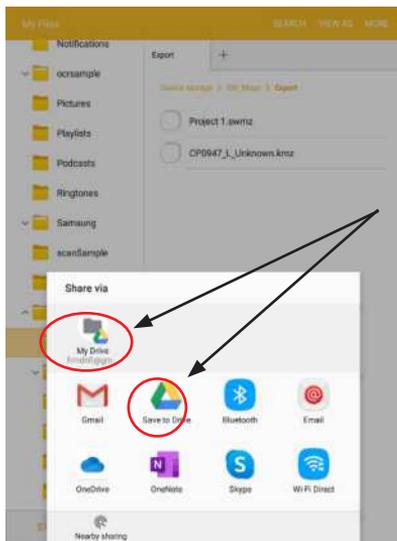
Figure 12.14: Save in google drive

Step 12.14: 'Share via' window

Upon clicking 'Share', the 'Share via' window pops up. SELECT 'Save to Drive' to upload your selected file on google drive.

But make sure you have signed in using proper gmail account. If you want to save in respective field office's google drive, then you should have signed in using respective office's gmail account and if you want to save it in FRMD's google drive, you should sign in using FRMD's gmail account.

The steps from 12.1 to 12.14 are responsibility of the field crew.

Step12.15: Accessing .kmz file

After the field crews have uploaded it, the Data Managers will access it from google drive, as it is done for data or files.
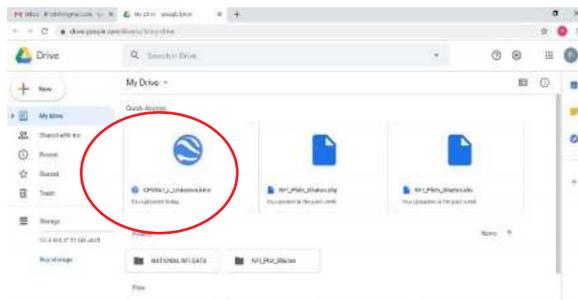
Figure 12.15: Accessing .kmz file

Step 12.16: Overlaying the kmz file on google earth

Download the .kmz file and open the Google earth; then overlay it on google earth.

After opening google earth, go to File> Open> {go to location where file is}, Select the file, then click on 'Open'. The file will be overlaid on google earth.
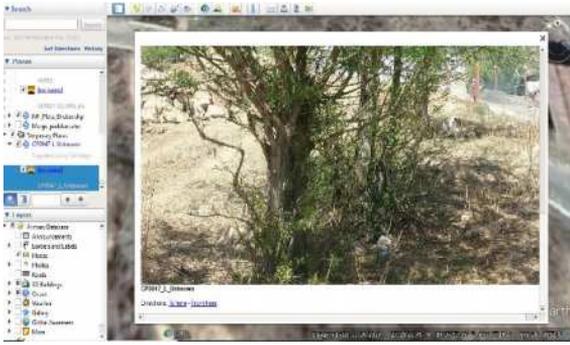
Figure 12.16: Photo overlaid on google earth

Then by clicking on picture icon on the google earth, the photograph can be opened, as shown on figure 12.16.

13. Alternate Data Management and Storage

Besides, managing and sharing the data in Google Drives, the Data Managers of field offices will also be tasked to manage the data on their PCs and also share or send to Data Manager at FRMD through email. Such measures are put in place to ensure that the data do not get lost or there is enough back up data, considering NFI data collection is very resource intensive. The data collected investing huge resources should not get lost. The subsequent sections will provide a step-wise guidance on managing data.

NFI data will be managed in series of folders, sub-folders and files, both at Field Offices and FRMD in workstation computer, apart from google drive, as mentioned in above sections.

13.1. Data management and storage at FRMD

The complete data of NFI for whole country will be managed by FRMD in folder named **NFI_DATA_FRMD** which will contain TWO main subfolders, namely;

1. NFI_DATA_RAW
2. NFI_DATA_PROCESSED

These TWO folders will contain TWO subfolders each, namely;

1. NFI_DATA_RAW_Dzongkhag
2. NFI_DATA_RAW_Field_Office

Again, these TWO sub-folders will contain further sub-folders in them. The NFI_DATA_ RAW_Dzongkhag sub-folder will contain 20 sub-folders with names of 20 dzongkhags.

Likewise, the NFI_DATA_RAW_Field_Offices will contain TWO sub-folders, namely;
1. Divisional Forest Offices
2. Protected Area Offices

The sub-folders – Divisional Forest Offices will host FOURTEEN folders of 14 Divisional Offices and similarly, Protected Areas subfolders will host TEN folders of 10 Protected Areas.

Similarly, the 'NFI_DATA_PROCESSED' contain two subfolders, namely
1. NFI_DATA_PROCESSED_Dzongkhags
2. NFI_DATA_PROCESSED_Field_Offices

The NFI_DATA_PROCESSED_Dzongkhags will host another 20 folders, each with Dzongkhag names and NFI_DATA_PROCESSED_Field_Office will host 2 folders, which are;
1. Divisional Forest Office
2. Protected Area Office

The 'Divisional Forest Office' will host another 14 folders, one each for Divisional Forest Offices and Protected Areas will host 10 folders, each for 10 Protected Areas.

Data management and storage at FRMD
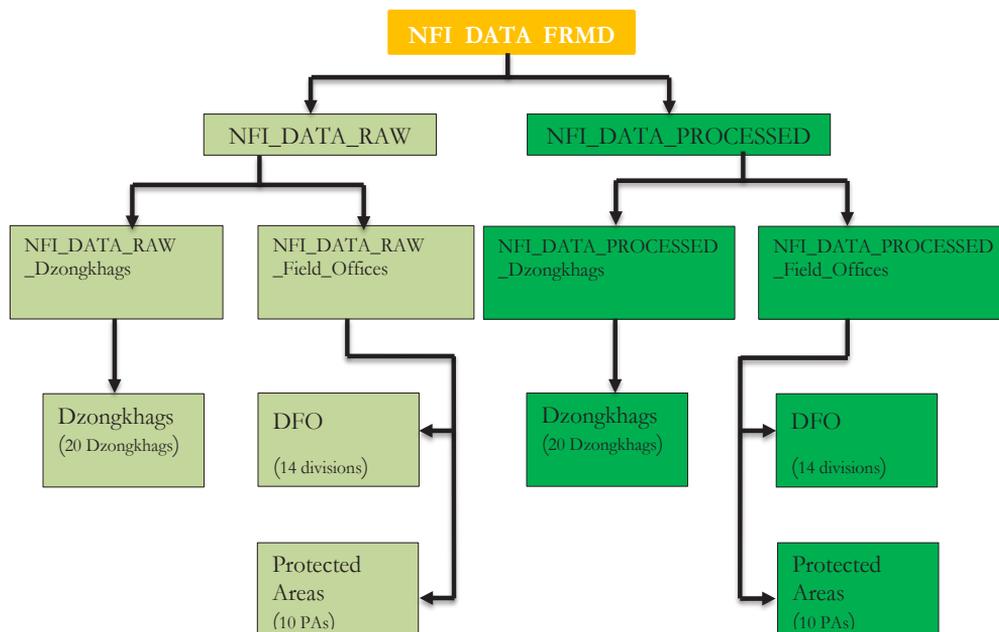
Figure 12.1: Pictorial depiction of data management at FRMD

13.2. Data Management and Storage at Field Offices

Each field office will maintain separate folders and store the data, both in Raw and semi or fully cleansed data copy, for security of NFI data.

Each field office will store the data in the folder named 'NFI_DATA_Field_Office_ Name' (For example, for Bumdeling Wildlife Sanctuary, it will be named as 'NFI_ DATA_BWS') and then under this folder, it will host TWO subfolders with following folder names, namely;

1. NFI_DATA_RAW_Field_Office_Name
2. NFI_DATA_PROCESSED_Field_Office_Name

The 'PROCESSED' folder will host partially or fully cleansed copy of data, whereas 'RAW' data folder will host raw data, as received from the field crews.

Under each of the above subfolder, if the Field Office is covering two or more dzongkhags, further subfolders will be created with 'Dzongkhag names' inside the above two folders. For instance, Bumdeling Wildlife Sanctuary (BWS being code of Bumdeling Wildlife Sanctuary for purpose of NFI data management) covers THREE dzongkhags, namely; Lhuntse, Mongar and Trashiyangtse. Therefore, within the above folder NFI_DATA_ RAW_BWS, THREE Folders will be created for each Dzongkhags, which are;

1. NFI_DATA_RAW_BWS_Lhuntse
2. NFI_DATA_RAW_BWS_Mongar
3. NFI_DATA_RAW_BWS_Trashiyangtse

Similarly, within the folder, NFI_DATA_PROCESSED, following folders will be created;

1. NFI_DATA_PROCESSED_BWS_Lhuntse
2. NFI_DATA_PROCESSED_BWS_Mongar
3. NFI_DATA_PROCESSED_BWS_Trashiyangtse

For instance, for Divisional Forest Office, Bumthang Division ('BuFD' being its code for NFI data management) it will have following folders inside the NFI_DATA_RAW_BuFD, namely;

1. NFI_DATA_RAW_BuFD_Bumthang
2. NFI_DATA_RAW_BuFD_Trongsa

Likewise, inside the folder NFI_DATA_PROCESSED_BuFD, it will host following folders, namely;

1. NFI_DATA_PROCESSED_BuFD_Bumthang
2. NFI_DATA_PROCESSED_BuFD_Trongsa

Whereas, Bumdeling Wildlife Sanctuary (BWS) covers three dzongkhags – Lhuntse, Mongar and Trashiyangtse, the Bumthang division covers two dzongkhags – Bumthang and Trongsa.

However, if a Division or Park covers only one dzongkhag, it will have ONE subfolder inside both RAW and PROCESSED folders.

Data management and storage in field offices
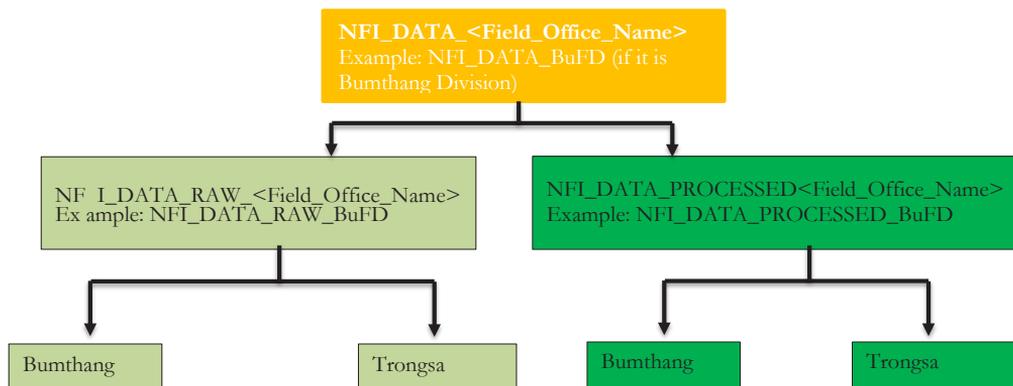
Figure 12.2: Pictorial depiction of data management at Field Offices (example of DFO, Bumthang)

14. Office Name and Corresponding Codes

For convenience of naming folder for data management, each office will be assigned a code name. These codes assigned for data management are consistent with the codes assigned for NFI crew in the Collect Survey Form. The list of names of office and corresponding codes are described in Table 2.

Table 2: Office Name Code

SN	Name of office	Office Name Code	SN	Name of office	Office Name Code
1	Forest Resources Management Division	FRMD	14	DFO, Wangduephodrang	WPFD
2	DFO, Bumthang	BuFD	15	DFO, Zhemgang	ZhFD
3	DFO, Gedu	GeFD	16	Bumdeling Wildlife Sanctuary	BWS
4	DFO, Dagana	DaFD	17	Jigme Dorji National Park	JDNP
5	DFO, Mongar	MoFD	18	Jigme Singye Wangchuck National Park	JSWNP
6	DFO, Paro	PaFD	19	Jomotshangkha Wildlife Sanctuary	JWS
7	DFO,Pemagatshel	PGFD	20	Phipsoo Wildlife Sanctuary	PWS

8	DFO, Samdrup Jongkhar	SJFD	21	Royal Manas National Park	RMNP
9	DFO, Samtse	SaFD	22	Sakteng Wildlife Sanctuary	SWS
10	DFO, Sarpang	SrFD	23	Phrumsengla National Park	PNP
11	DFO, Thimphu	ThFD	24	Jigme Khesar Strict Nature Reserve	JKSNR
12	DFO, Trashigang Division	TGFD	25	Wangchuck Centennial National Park	WCNP
13	DFO, Tsirang Division	TsFD			

15. Use of Google Email Account and Drive

Twenty-four individual google email accounts have been created for 24 field offices for the purpose of managing NFI data in google drive (Table 3). The concerned field office will be provided with password to access the email and google drive of respective field office. However, the office shall not be allowed to change the password to make the email accessible to FRMD. The password shall not be shared with any other offices. In case of loss of password, FRMD shall reset the password and share with respective field office. The copy of the data in all folders must be uploaded into google drive in appropriate folder or file as and when it becomes available. When a new data is uploaded, the data manager shall inform FRMD in written.

Table 3: Google Account for field offices

SN	Name of office	User Name	Password
1	DFO, Bumthang	bumthangdivisionnfi@gmail.com	To be provided individually
2	DFO, Gedu	gedudivisionnfi@gmail.com	To be provided individually
3	DFO, Dagana	daganadivisionnfi@gmail.com	To be provided individually
4	DFO, Mongar	mongardivisionnfi@gmail.com	To be provided individually
5	DFO, Paro	parodivisionnfi@gmail.com	To be provided individually
6	DFO,Pemagatshel	pemagatsheldivisionnfi@gmail.com	To be provided individually
7	DFO, Samdrup Jongkhar	sjongkhardivnfi@gmail.com	To be provided individually
8	DFO, Samtse	samtsedivisionnfi@gmail.com	To be provided individually
9	DFO, Sarpang	sarpangdivisionnfi@gmail.com	To be provided individually

10	DFO, Thimphu	thimphudivisionnfi@gmail.com	To be provided individually
11	DFO, Trashigang Division	trashigangdivisionnfi@gmail.com	To be provided individually
12	DFO, Tsirang Division	tsirangdivisionnfi@gmail.com	To be provided individually
13	DFO, Wangduephodrang	wangduedivisionnfi2@gmail.com	To be provided individually
14	DFO, Zhemgang	zhemgangdivisionnfi@gmail.com	To be provided individually
15	Bumdeling Wildlife Sanctuary	bwsnfi2@gmail.com	To be provided individually
16	Jigme Dorji National Park	jdnpnfi@gmail.com	To be provided individually
17	Jigme Singye Wangchuck National Park	jswnpnfi@gmail.com	To be provided individually
18	Jomotshangkha Wildlife Sanctuary	jwsnfi@gmail.com	To be provided individually
19	Phipsoo Wildlife Sanctuary	pwsnfi@gmail.com	To be provided individually
20	Royal Manas National Park	rmnpnfi@gmail.com	To be provided individually
21	Sakteng Wildlife Sanctuary	swsnfi@gmail.com	To be provided individually
22	Phrumsengla National Park	pnpnfi2@gmail.com	To be provided individually
23	Jigme Khesar Strict Nature Reserve	jksnrnfi@gmail.com	To be provided individually
24	Wangchuck Centennial National Park	wcnpnfi1@gmail.com	To be provided individually

16. Data Transfer Guidelines

1. NFI Crew Leaders will complete the Data Submission Form and submit the form while submitting the data (electronic and hard) (Annexure I).

2. The Data Submission Form will contain details of Cluster plots completed; inaccessible plots and Cluster plots denied access that will be filled up by the respective crew leader.

3. Also Crew Leaders will complete the Sample Submission Form and submit the form too, for those Carbon Plots assigned to them (Annexure II).

4. A file will be maintained for these two forms for each dzongkhag, which will also hold any paper field forms completed for that dzongkhag.

5. The electronic data from each crew leader will be transferred into the NFI Database and maintained under NFI_RAW_DATA.

6. Export the data collected in the *Collect Mobile* and Save in the file managers and/or google drive as may be appropriate. Then upload the data into google drive only when connected to the internet.

7. The field Data Managers will inform FRMD Data Manager after uploading the data on google drive, besides sharing the data through emails.

17. Data Security and Custodianship

- No data manager shall share whole or in part of the NFI data collected during NFI before publishing results of NFI at national level.

- After publishing the national report, the data may be shared as per NFI data sharing protocol developed by the FRMD and approved by the Department.

- It is recommended not to change or transfer the NFI Data Managers for entire duration of the NFI.

- However, if the NFI Data Manager is transferred, there should be proper handing taking of the NFI data, the workstation computer and user name, including knowledge transfer.

- The new user should immediately contact FRMD to change user password to access google account and google drive.

- The outgoing NFI Data Manager shall not share the whole or any part of NFI data under any circumstances to any individual or organization. The data may only be shared as per data sharing protocol.

- Both NFI field crews as well as Data Managers, will not share the NFI plot coordinates. Absolute confidentiality of coordinates shall be maintained by all involved in NFI.

18. Protocol for Sharing and Storage of NFI Data

The terms and conditions for data sharing has been drawn in view of increasing number of applicants seeking to use NFI data. This section on data sharing protocol will facilitate and make better-use of huge data collated through NFI for addressing various policies and decisions. It has been approved by the Technical Advisory Committee of the DoFPS. The specific terms and conditions for sharing the data are as hereunder;

1. The entire data collected by NFI crews is centrally stored and managed at FRMD

2. These data are property of the government.

3. The data will be shared only after achieving intended purpose for which the data was collected.

4. The data in only cleaned form will be shared with the stakeholders subject to clause 4 above.

5. No stakeholder or individual will be allowed to make use of NFI data for commercial purposes.

6. NFI data in entirety shall not be shared with any agency outside of the department or an individual.

7. The FRMD will be the sole authority to share the data with any agency or individual.

8. Any agency or individual seeking to make use of NFI data will officially write to the FRMD, which in turn will facilitate approval from the department. The application must clearly state the following;
   a. Objective and purpose of the study
   b. Specifics of the data required including extent (Example: Tree data for entire country or wildlife data for southern dzongkhgs etc)

9. The NFI data may be shared with non-Bhutanese, provided the study or use of NFI data involves the collaboration with Bhutanese counterparts.

10. The agency or individual with whom the NFI data has been shared will not further share the data with other users.

11. Agency or individual using the NFI data will clearly acknowledge the department for use of data.

12. Any agency or individual with whom the NFI data has been shared will use the data only for the purpose stated in the application and shall not use for any other purpose or conduct further studies.

13. The individual or benefactor of data shall share the final output/report with the Department.

14. Applicants shall submit an undertaking that clearly reflects all aforementioned terms and conditions of this protocol. Format of application letter and undertaking are attached in this protocol as Annexure III.

15. However, NFI plot coordinates shall not be shared. Only coordinates of local neighborhood plot or dummy plot will be generated and shared.

Annexure I

NFI Data Submission Form

To,

The NFI Coordinator/Data Manager

FRMD, Thimphu/……………….(Field Office Name)

Subject**: Submission of NFI Data for** ………………………………**Dzongkhag.**

Sir/madam,

I would like to submit the (electronic/paper forms) NFI data for the following cluster plots assigned to me and my crew.

Cluster plots assigned	Dzongkhag	Gewog	Enumerated(Y/N)	Remarks(reasons)

Submitted by :

Crew Leader:

Crew Name:

Date of submission (dd/mm/yy): ………………………………………………………………

NFI Data Submission Form

Summary of National Forest Inventory Data Submitted

Enumeration Start date(dd/mm/yy)	Enumeration End date(dd/mm/yy)	Dzongkhag	Gewog	No. of Cluster plots assigned	No. of Cluster plots enumerated	Cluster plots not enumerated

Submitted by:

Crew Leader:

Crew Name:

Date of submission (dd/mm/yy):…………………/……………………/……………………

Received,

NFI Coordinator:

Date of receipt:…………/……………/……………

Annexure II

NFI Sample Submission Form

To,
The NFI Coordinator/Data Manager
FRMD, Thimphu/…………….(Field Office Name)

Subject**: Submission of NFI Sample (Tree Core and Carbon) for ………………………………Dzongkhag.**

Sir/madam,

I would like to submit the samples for the following cluster plots assigned to me and my crew.

Carbon Cluster plots assigned (CP No)	Dzongkhag	Gewog	No of Samples						Remarks (reasons)
			Tree Core	Shrub	Herb	Litter	Bulk Density	Soil Carbon	

Submitted by :

Crew Leader: ……………………………………………………………………

Name: …………………………………………………………………………

Date of submission (dd/mm/yy): ……………………………………………

NFI Sample Submission Form

Summary of National Forest Inventory Samples Submitted (This may be filled up at the end of the field work)

Enumeration Start date (dd/mm/yy)	Enumeration End date (dd/mm/yy)	Dzongkhag	Gewog	No. of Carbon Cluster plots assigned

Submitted by:

Crew Leader:
Crew Name:
Date of submission (dd/mm/yy):……………/……………………/……………………

Received,

NFI Coordinator:
Date of receipt:……………/……………………/……………………