BIG DATA ANALYTICS FOR OFFICIAL STATISTICS

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WORKSHOP OUTLINE

1. Big Data analytics-Day #1
2. Machine Learning Tools: R Programming language and Graphical Interfaces -Day#1
3. Data Mining analytical tools-Day#2
4. Data Visualization-Day#2
5. Digital Data Collection-Day#3
6. Drone Mapping, GIS and Artificial Intelligence (AI)-Day#3

5. Digital Data Collection

As researchers today see the immense advantages of using mobile survey apps over paper-based forms

What is Mobile Data Collection?

Mobile data collection apps is a method of compiling qualitative and quantitative information with the help of a mobile device (e.g. smart mobile phone, tablet or iPad, etc.)

Data collection software/Tools is a digitalised system for the collection and storage of qualitative and quantitative data in an **electronic form** to eliminate the use of paper (for example surveys) and allow data to be quickly exported for data analysis and reporting.

The Advantages of Digital Data Collection

- Work Smarter-Capture data at real time
- Save time and money, Access anytime , anywhere
- Capturing data offline-allow researchers that are working in places with unreliable internet to store a backup of their data on their mobile device and upload it once an internet connection is available.
- Speed and Efficiency
- Data Quality
- Visibility and Tracking

Guide to Digital Data Collection

[Ultimate Guide To Mobile Data Collection](#) for how to collect field data when working offline for an in-depth view on how to successfully capture in remote areas can be found at this link:

https://www.teamscopeapp.com/mobile-data-collection-guide/how-to-capture-data-when-offline-or-without-internet-connection

1. Choose the right mobile data collection tool
2. Design your mobile survey
3. Build your mobile data collection app
4. Deploy your mobile data colelction software
5. Train your team in mobile data collection
6. Sustain your mobile data collection program

Digital Data Collection Types

Longitudinal vs Cross-sectional Data Collection

Longitudinal Data (Panel Data)

Track the same sample at different points in time. The sample can consist of individuals, households, establishments, and so on. This type of data collection saves time and improves data quality in longitudinal research because it eliminates the need to re-enter baseline data each time the same subject is assessed.

Cross-sectional Data

Recording data at a single one point in time, a so-called, snapshot of a population is a cross-sectional study. This data is only collected once. These types of studies are always observational, wherein researchers record information about their subjects without manipulating the study environment.

Ideally, we want to choose the best data collection software/tools we need to consider the following:

1. Mobile Form Builder in very short time collection and storage of qualitative and quantitative data in an electronic form.

2. Range of utility - for both cross-sectional and longitudinal studies

3. Offline Forms-Capture data securely while offline. The web-based data recording tools become useless when there is no internet, and so much of the world today remains offline. Offline forms allow researchers that are working in places with unreliable internet to store a backup of their data on their mobile device and upload it once an internet connection is available.

4. Team Management and permissions

5. Data Visualization-Instantly Visualize Data

Top Open-Source Data collection tools and research

1. KoboToolbox (Android & Web): Simple, robust, and powerful tools for data collection (https://www.kobotoolbox.org). KoBoToolbox is a free, open-source tool for mobile data gathering developed by the Harvard Humanitarian Initiative. KoBo Toolbox is widely used for data entry in humanitarian organizations like the International Rescue Committee (IRC), United Nations Office for the Coordination of Humanitarian Affairs and Save the Children.

Features: Study builder, offline forms, open source, community
Cost: Free, open source
Availability: **Android** and Web.

2. Open Data Kit (Android) (ODK) (https://opendatakit.org), a suite of tools that enable efficient and timely data collection on cell phones. ODK is designed to let users own, visualize, and share data without the difficulties of setting up and maintaining servers. The tools are easy to use, deploy, and scale. They also go beyond open source - they're based on open standards and supported by a larger community.

Features: Study builder, offline forms, community

Cost: Free, open source

Availability: Android

3. REDcap (Android, iOS & Web): REDCap is a secure electronic data capture (EDC) solution (web, smartphone, tablet and iPad) for building electronic case report forms and managing databases (https://www.project-redcap.org)

REDcap is used in over 130 countries by more than 3.600 institutions. Non-profit organizations can join the REDcap consortium and receive a free license of the software, which allows them to install and manage REDcap on their own IT infrastructure.

Features: Longitudinal data collection or panel data collection, is a data that is collected through a series of repeated observations of the same subjects over some extended time frame – and is useful for measuring change, offline forms, randomization, on-premise hosting

Cost: Free for nonprofits

Availability: Android, iOS and Web.

4. JetForm (iOS and Android): Jotforms, a reputable simple online form builder, has expanded its range with a new mobile data recording app called Jotforms mobile. Thousands of customizable form templates. Create registration forms, order forms, contact forms, surveys, and more! Over 10,000,000 Users. No Coding Needed. Free Forever. Publish Anywhere. No Trial. Powerful Integrations. (https://www.jotform.com) This app allows users to collect various types of data, such as voice recordings, barcodes, geolocations and electronic signatures and then build, view, access, sort, fill out, share, and organise all this data in a single place. The utility of using a mobile data recording app, in this case, enables it to function offline and utilise iOS and Android push notifications to alert the user of new respondents or changes in data. PDF copies of submitted information can even be downloaded or shared.One of Jotforms distinct features is **Kiosk Mode**. **Kiosk mode** turns your tablet or iPad into a fixed survey station.

Features: Mobile form builder, Offline data gathering, Kiosk Mode.
Cost: Free basic accounts, paid pro and enterprise plans available
Availability: iOS and Android

5. Google Forms (Web): Best simple and easy form builder to collect data online. it is a survey administration software included as part of the free, web-based Google Docs Editors suite offered by Google. The service also includes Google Docs, Google Sheets, Google Slides, Google Drawings, Google Sites, and Google Keep. Google Forms is only available as a web application. (https://www.google.com/intl/en-GB/forms/about/).

Case Study#1 : **Using Open Source KoBoToolbox for Digital surveys Data Collection for Gender Equity and Social Inclusion (GESI)**

https://portal.undac.org/pssuportal/portalrest/filesharing/download/public/4RvGyYd8ZaQMIIq

https://www.humanitarianresponse.info/sites/www.humanitarianresponse.info/files/documents/files/unhcr_kobo_guidelines_may2016.pdf

https://www.youtube.com/user/KoBoToolbox

النسخة العربية عن استخدام KoBoToolBox

https://drive.google.com/file/d/13pn7AeTyNz-C4RblSkLSJYa6IUtbQu62/view

What is Kobo Toolbox?

The Kobo Toolbox is a free data collection solution available for Android mobile devices. KoBoToolbox is a suite of tools for field data collection for use in challenging environments. The software is **free and open source** and **works both on and offline**.

It has been developed by the Harvard Humanitarian Initiative with support from UN OCHA This open source mobile data collection tool was designed by and for the international development and humanitarian community.

https://support.kobotoolbox.org/

What languages are supported?

You can create KoBoToolbox projects in many languages, including Arabic

Digital Surveys Applications

UPNG STUDENTS-GENDER
Gender Equity Social Inclusion (GESI) Implementation Baseline Review

5 GENDER EQUALITY

The purpose of the survey is to identify organizational strengths and limitations, attitudinal, behavioural and structural, which exist in this institution to promote or inhibit GESI practice. Individual Consent Form will be filled in for all data collection activities and all information gathered will be treated with the strictest confidence. You will not be asked to provide your name. More importantly, Ethical Clearance has been sought from institutional Research Protocols and the Department of Higher Education Research Science Technology (DHERST) for the necessary data collection methods which includes individual survey questionnaires, document analysis, observation guidelines, focus group workshop and leaders in-depth interviewing.
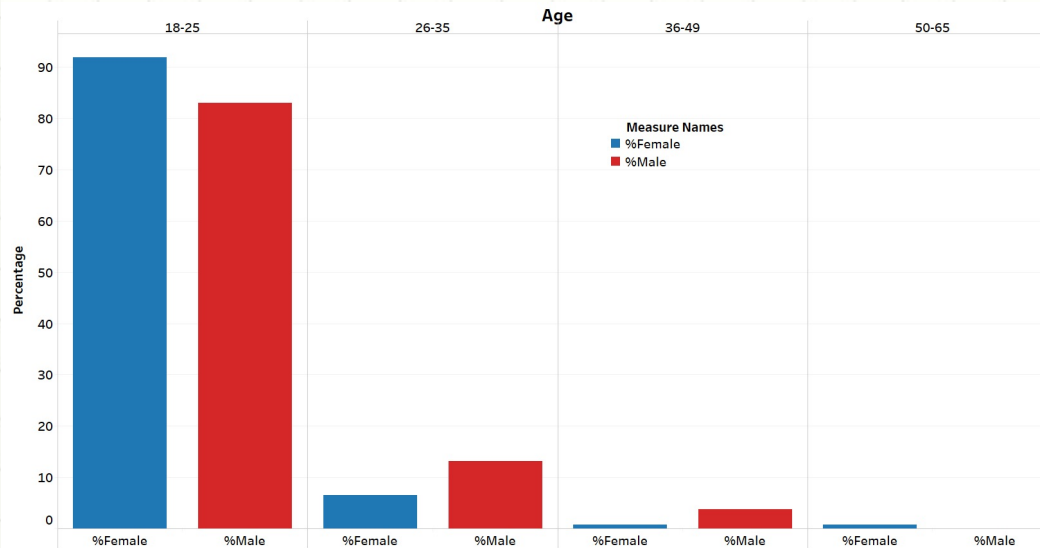
Gender Participation-UPNG

124 Out of 230

Female
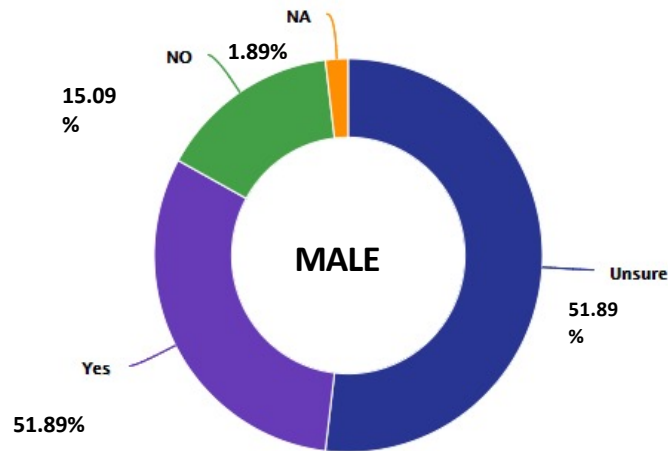
53%

Gender Participation

106 Out of 230

Male

47%
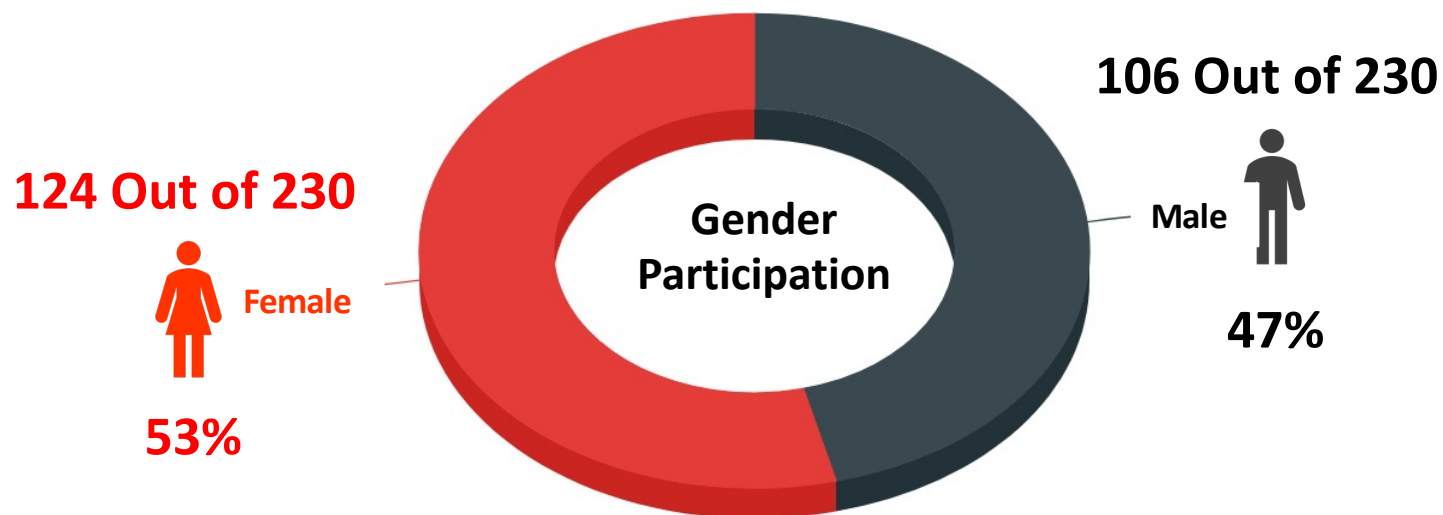
School or Discipline-UPNG

Human Resources 1.30%
Law 18.70%
Humanities 29.13%
Sciences 13.91%
Business 0.9%
Open College 20.43%
SBPP 15.7%
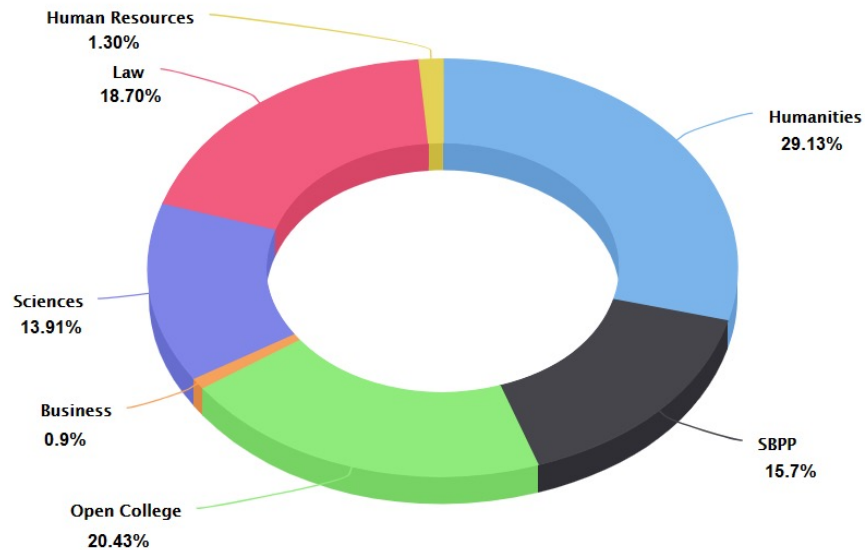
Age Range-UPNG

PC-Q3: Does this institution have a clearly stated policy on equity and diversity?

PC3Male	No	Percentage
Unsure	55	51.89
Yes	33	31.13
NO	16	15.09
NA	2	1.89

PC3Female	No	Percentage
Unsure	75	60.48
Yes	31	25.00
NO	17	13.71
NA	1	0.81
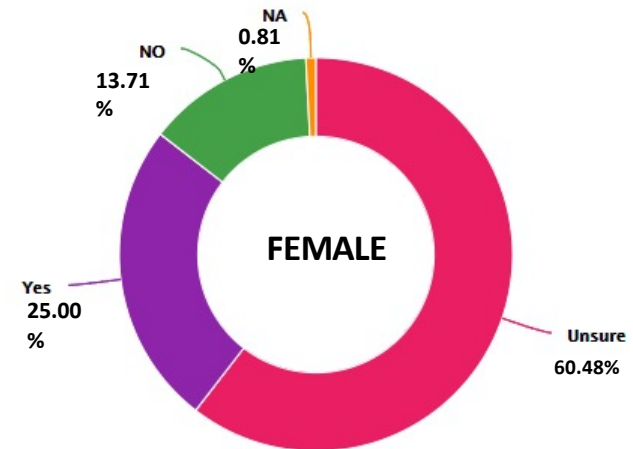
OA1: Diversity and inclusion are respected and appreciated in this institution

Strongly Agree
27.56%
86 Out of 312

Agree
25.32%
79 Out of 312

Neutral
28.53%
89 Out of 312

NA
2.24%
7 Out of 312

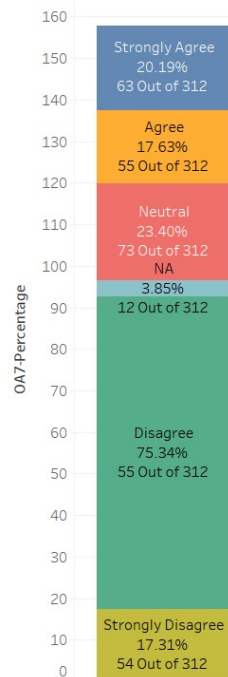Disagree
29.21%
26 Out of 312

Strongly Disagree
8.01%
25 Out of 312
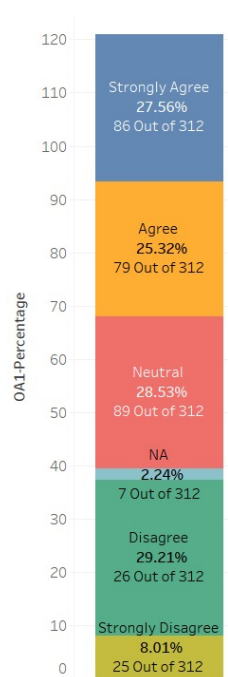
OA2: I feel safe and secure participating in extra-curricular activities on this campus in the evening and on weekends.

Strongly Agree
26.28 %
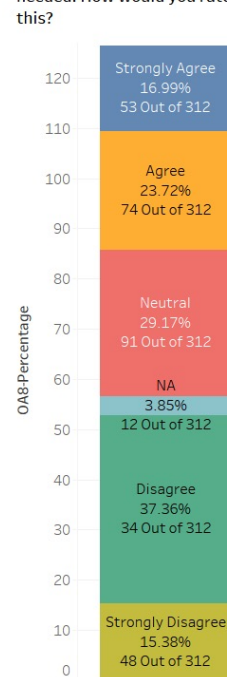82 Out of 312

Agree
24.36 %
76 Out of 312

Neutral
20.51%
64 Out of 312

NA
3.53 %
11 Out of 312

Disagree
17.31%
54 Out of 312

Strongly Disagree
8.01 %
25 Out of 312
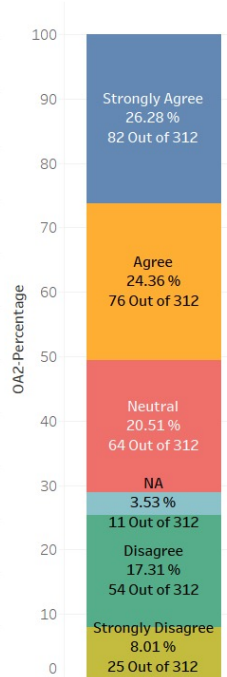
OA3: Overall, I receive fair and equitable treatment on campus

Strongly Agree
26.28 %
76 Out of 312

Agree
24.36 %
91 Out of 312

Neutral
20.51%
79 Out of 312

NA
3.53 %
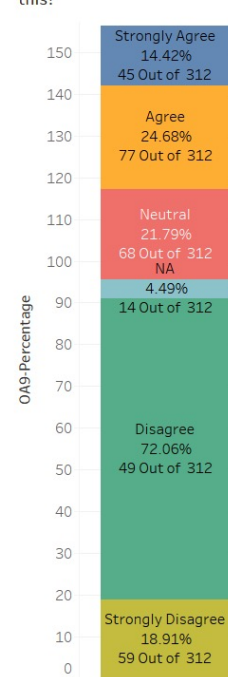6 Out of 312

Disagree
17.31 %
29 Out of 312

Strongly Disagree
8.01 %
31 Out of 312
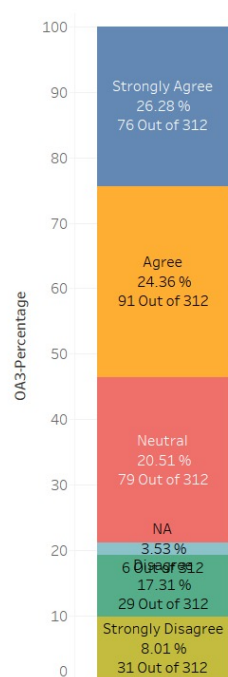
OA4: I am aware of the institutional policies and procedures meant to protect me from harassment and discrimination.

Strongly Agree
20.19%
63 Out of 312

Agree
17.63%
55 Out of 312

Neutral
23.40%
73 Out of 312

NA
3.85%
12 Out of 312

Disagree
75.34%
55 Out of 312

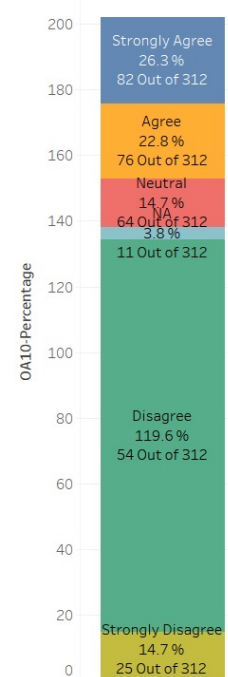Strongly Disagree
17.31%
54 Out of 312

AO5: Institutional policies provide a means for addressing complaints related to discrimination, bullying, and or harassment when needed. How would you rate this?

Strongly Agree
16.99%
53 Out of 312

Agree
23.72%
74 Out of 312

Neutral
29.17%
91 Out of 312

NA
3.85%
12 Out of 312

Disagree
37.36%
34 Out of 312

Strongly Disagree
15.38%
48 Out of 312

AO6: I know how to go about reporting an issue relating to discrimination, gender based violence, bullying and or harassment. How would rate this?

Strongly Agree
14.42%
45 Out of 312

Agree
24.68%
77 Out of 312

Neutral
21.79%
68 Out of 312

NA
4.49%
14 Out of 312

Disagree
72.06%
49 Out of 312

Strongly Disagree
18.91%
59 Out of 312

OA6: This institution provides good security on campus

Strongly Agree
26.3 %
82 Out of 312

Agree
22.8 %
76 Out of 312

Neutral
14.7 %
64 Out of 312

NA
3.8 %
11 Out of 312

Disagree
119.6 %
54 Out of 312

Strongly Disagree
14.7 %
25 Out of 312

OC-Q2: In general, how would you rate your overall experiences of this institution's environment?
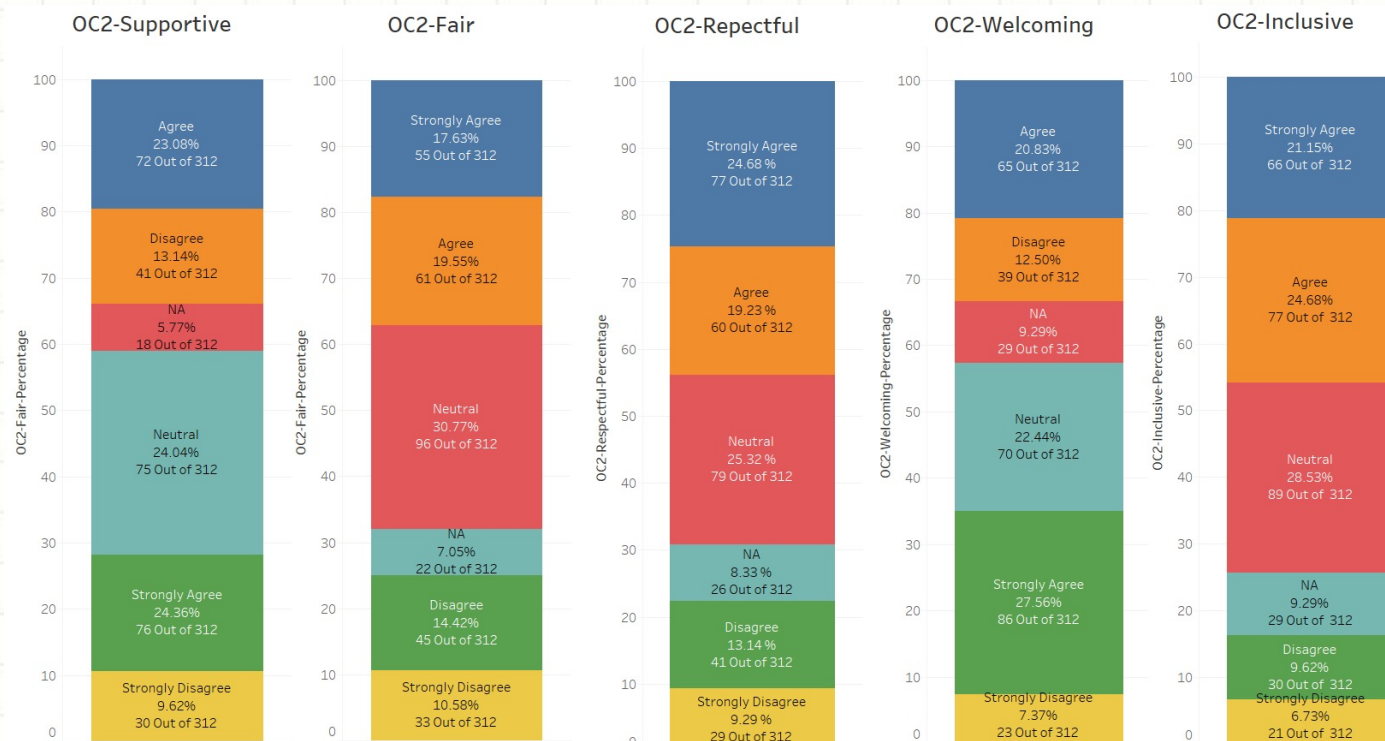
To view full results of the Gender Equity Social Inclusion (GESI) Implementation Baseline Review use the below link:

https://drive.google.com/file/d/1d1X_hLZ7An7XxdwTTUUH5TBTvp40gyP6/view

KoBo's Features

Collecting and analysing data
KoBo allows you to collect qualitative and quantitative data quickly on your phone, tablet or computer. You can also collect rich data including photo, video and audio content.

Analysing Data
KoBo allows you to download the data as an Excel Analyser form. This is a highly powerful data analysis tool, which enables you to quickly create charts and graphs from your data. Kobo is a very powerful tool for quantitative data analysis, but although it can collect rich data, it does not provide an easy way of analysing non-quantifiable qualitative data.

Mapping
Your project may include a one or more GPS questions in its form. KoBo Toolbox will include the GPS data (latitude, longitude, altitude, precision) in the dataset that can be downloaded as XLS or CSV. It is also possible to view the GPS coordinates on an online map and to download the points as a KML file for use in other applications.

Skip Logic
Skip logic is also sometimes referred to as 'branching' or 'relevant conditions'. By default, all questions are always visible. Skip logic controls which question should be displayed **only** if a certain condition is (or multiple conditions are) fulfilled.

Grouping Questions
Groups are collection of one or more questions inside a form, and help you break up your survey into manageable sections.

Question Library
Libraries enable you to archive and reuse frequently used questions, save question groups, create entire form templates which can be used as a starting point and save multiple choice answer sets. Libraries are uploaded in .xls format.

Collecting data offline
All data collection can take place offline. When a user enters data it is stored first on the device. KoBoCollect can be set to attempt sending the information through a network connection immediately or only at a later stage when the interviewer or supervisor wants to upload finalized forms.

Support
KoBo offers an online community support network. Questions posted on the network will be answered by other users or KoBo staff.
https://support.kobotoolbox.org/

Case Study#2 : Using JetForm (iOS and Android (Free basic accounts, paid pro and enterprise plans available) for UNDP Pacific Office data holdings survey

UNDP Pacific Office data holdings survey

Please take a few minutes to tell us about your experiences. The purpose of this survey is to build a better understanding of data held in/by your unit

Team name *

Project name *

What's your role

In the last 3 years, have you generated or gathered any primary data within your program/project? If yes indicate type of data [check all that apply]. *

	Yes	What was Immediate purpose for gathering the data	Under what thematic area does this fall?
Surveys	☐		

Title

URL

Title

URL

Title

URL

Title

URL

Upload any files here

Browse Files

Drag and drop files here

Could you please indicate if any of the listed types of data are produced within your program/project? Including output from consultants, publications, reports, audio etc [Check all that apply]. *

- [ ] Digital audio files
- [ ] Digital video files
- [ ] Fieldwork data
- [ ] Photo collection
- [ ] Video tapes
- [ ] Audio tapes
- [ ] Images, scans or x-rays
- [ ] Data collected from sensors or instruments
- [ ] Websites
- [ ] Data automatically generated from or by computer programs
- [ ] Database (e.g., MySQL, Oracle)
- [ ] Other

If you ticked other, what type is it?

[   ]

Please confirm where the data you regularly use is primarily stored?

- [ ] Hard disk drive of person who generates data
- [ ] External hard drive of person who generates data
- [ ] Other external hard drive
- [ ] Local server
- [ ] ICT server
- [ ] Third party
- [ ] CD/DVD
- [ ] Memory stick/USB/Flash drive
- [ ] On paper
- [ ] My Documents
- [ ] Shared drive (G-drive)
- [ ] Other

Please share your email address

example@example.com

Thank you for completing this survey, your contribution is very much appreciated.

Submit

Thank you for completing this survey, your contribution is very much appreciated.

Case Study#3: QUALITATIVE STUDY ON BARRIERS AND SUPPORTIVE FACTORS TO THE USE OF BIOGAS ENERGY TO IMPROVE HEALTH AND WELLBEING IN GUAMBOT VILLAGE –Naweab District

Digital Surveys Applications

QUALITATIVE STUDY ON BARRIERS AND SUPPORTIVE FACTORS TO THE USE OF BIOGAS ENERGY TO IMPROVE HEALTH AND WELLBEING IN GUAMBOT VILLAGE –Naweab District

KAL/Data Science team in partnership with C4D launched the prototype survey in one of the villages (Baruni) to gather the people's opinion on Biogas plants in the locality. The survey focussed on the general knowledge and interest in welcoming this renewable source of energy and the sustainability for a commercially viable product. Figure (1) shows example of digital survey App using Samsung tablet. The aim of using such tool to minimise the time and to present outcome of the data analytically in real time. While figure (2) shows the infographic representation of the results
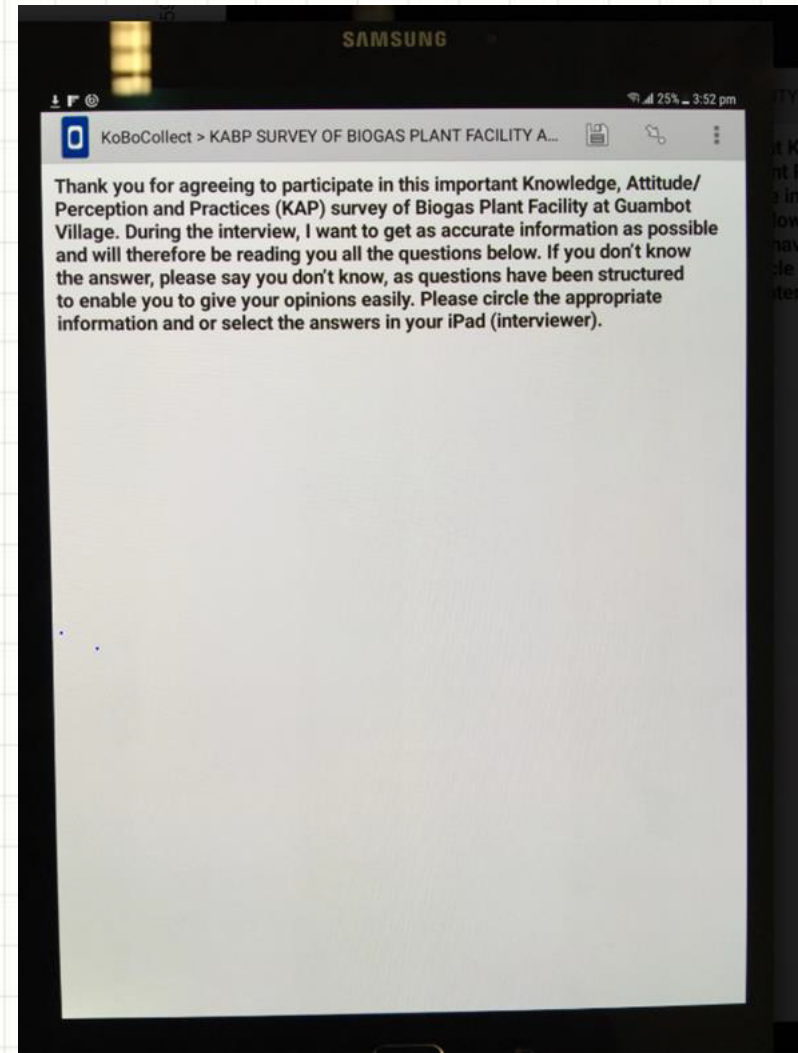
📖 OVERVIEW

Introduction:

Knowledge, Attitude/Perception and Practices (KAP) survey of Biogas Plant Facility at Guambot Village survey area is purposively selected for the production and consumption of biogas energy. This is one of provinces with a largest consumer of biomass, particularly charcoal, landfills, compost, or biomass gasifiers. Data collection have been collected to include *understanding of a behavioural KAP survey*, in-depth interviews and participatory focus group discussions with different stakeholders in this village is also performed.

The aim is to be informed by secondary review and analysis of some key policies, legislations/ acts and reports linked to biogas sector in the district.

Guambot Village Hamlets, Gusi 14 LLG, Nawaeb District,
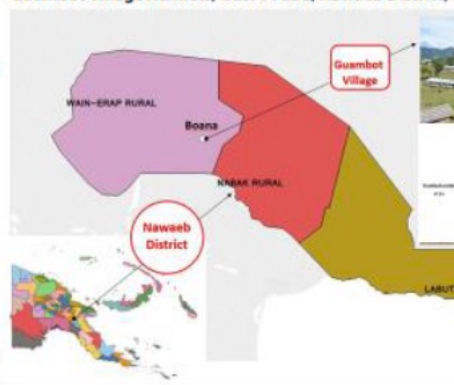
What is a Biogas?

"Biogas" is a naturally occurring mixture of 60 to 70% **methane** and 30 to 40% **CO2** with some **H2S** (Hydrogen Sulfide), that burns similar to so-called **"natural gas"**, which is actually a fossil fuel. Once generated and stored, *biogas is primarily used around the world for cooking and heating at the home scale*, but it also has many other important applications both domestically and industrially.

What is a Biogas Digester?

"Biogas Digester" is a simple system which produces biogas by converting *garden, animal and even human waste* into *Methane Gas* that can be used for *cooking, lighting and heating.*

The **"digestate"** (remaining within the digester after gas production) is a *brilliant compost and soil food* as all the minerals from the waste stay within the digestate after the gas has been "extracted", see figure 1 for more details

Figure 2 shows the Guambot village healthy island concept "biogas digester" under construction as a big underground hole while the shade is pigs waste collection which will be connected directly to the digester.
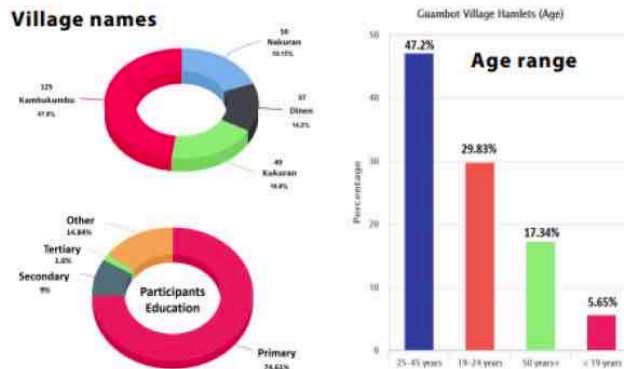

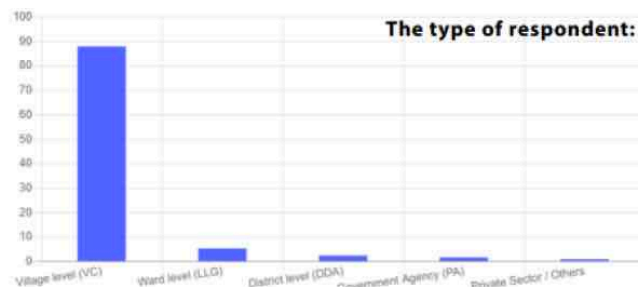**Figure 1: Healthy island concep**

Figure 2: Guambot Village bioga

🏘 COMMUNITY PARTICIPATION

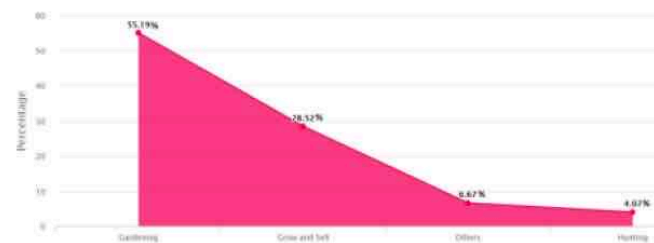**Figure 3:** Participants demografic data of the Guambot village for four hamlets

Village names

Guambot Village Hamlets (Age)

Age range

Participants Education

Gender Participation

Oversight

The type of respondent:

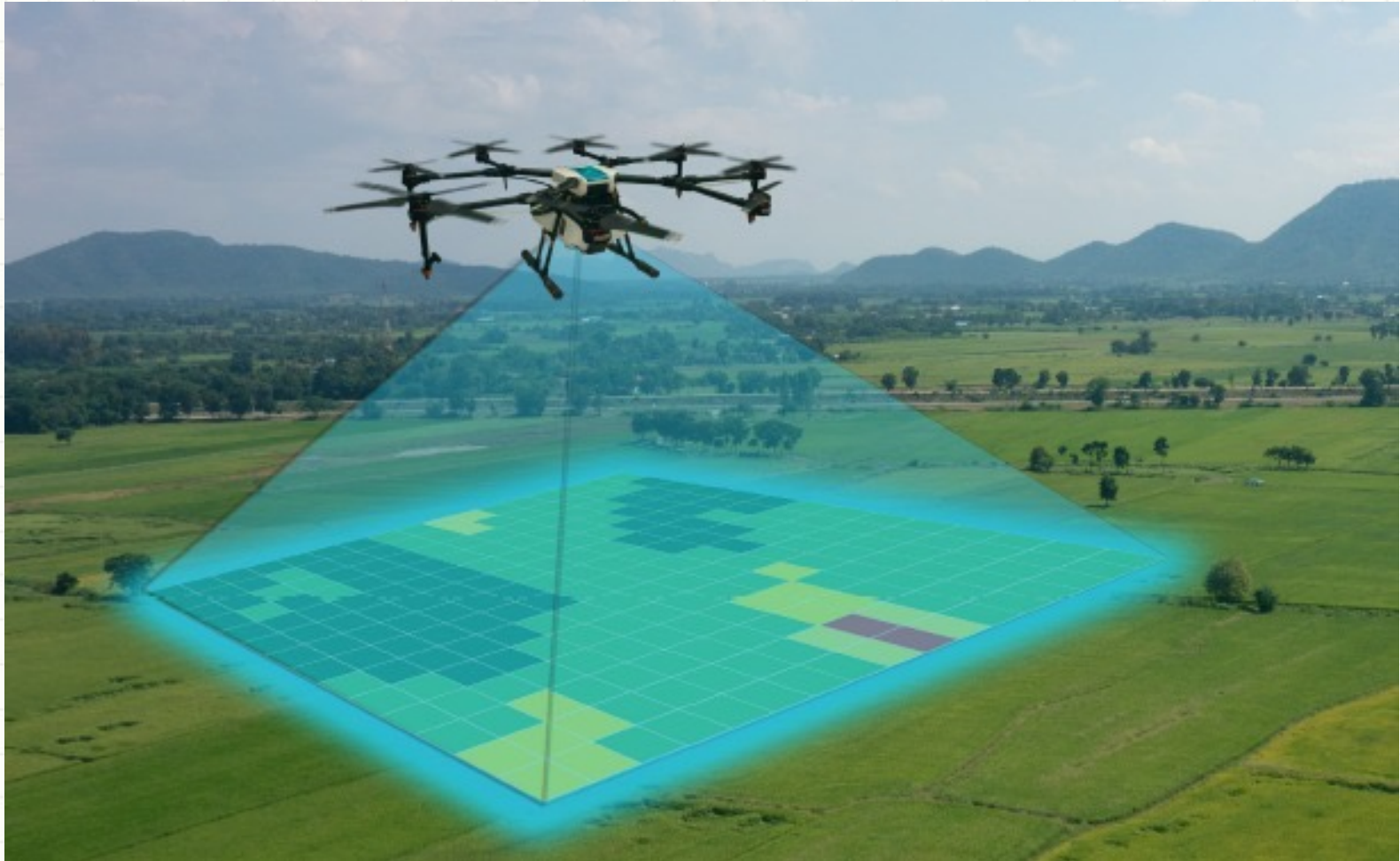**What type of work activities do you do in your villages to make a living? 255 out of 270 respondents answered this question**

6. Drone Mapping, GIS and Artificial Intelligence (AI)-Day#3

Drone Mapping, GIS and Artificial Intelligence (AI)

Drone mapping is already becoming a powerful "tool" to create 2d maps and 3d models that can be used in different types of applications from **agriculture, mapping, energy, construction, and even emergency response**.

Integrating Artificial intelligence-powered drone mapping with geographic information system (GIS) and sensors allows us to perform smart analytics on aerial insights in real time, more accurate predictions and better decision-making

Drone mapping technology and in situ fieldwork often requiring a background in drone operations, Geographic Information Systems (GIS), remote sensing and related analytical techniques.

Drone Mapping, GIS and Artificial Intelligence (AI)

1. Drone aerial data collection

2. Operating Drone with multispectral sensor and using DroneDeploy leading cloud software platform for commercial drones to capture images, create maps and 3D models, and analyse data

3. Open source QGIS is cross-platform desktop geographic information system application that supports viewing, create, edit, visualise, analyse and publish of geospatial data/information on Windows, Mac, Linux, BSD and mobile devices

Drone Advantages Over Other Aerial Imaging Systems

- **Cheaper Imaging:** drones are considerably less expensive than satellites or manned aircraft surveillance.
- **Greater Precision:** drone cameras take images that reveal much more detail about a crop's condition.
- **Earlier Detection of Problems:** because drones survey more frequently, weeds, pests and other abnormalities are detected earlier.
- **Total-Field Scouting:** instead of riding an ATV around the perimeter to scout perhaps 5% of a field, now every field can be scouted 100% using drones.
- **3D/Volumetric Data:** drone images can be used to calculate the volume of piles, holes, hills and patches. These can be compared to Infrared images to detect density issues like hot spots in a crowded beet field, or to identify contour problems such as north slope shade issues.
- **More Frequent Index Reporting:** drones offer a cost-effective way to monitor crops more frequently for key indices like CCCI (canopy chlorophyll content index), CWSI (crop water stress index) and NDVI (normalized difference vegetation index).

DRONE TECHNOLOGY APPLICATION

1. Surveying and Mapping solutions
2. Agriculture
3. Sustainability solutions
4. Land Mapping
5. Environment-Aerial Mapping and
   Nature Monitoring, and Disaster Relief

E-agriculture in action: Drones for agriculture

The Drone Technology

1. Visual sensor ideal for plant counting and 3D drainage mapping
2. Multispectral sensor ideal for plant health monitoring
3. Using DataMapper to Automatically collect high quality images
4. Using DataMapper to analyse 2D/3D Orthomosaic map

Multispectral Sensor

Multispectral camera remote sensing imaging technology use Green, Red, Red-Edge and Near Infrared wavebands to capture both visible and invisible images of crops and vegetation.

This land telemetry, soil and crop data allow the grower to monitor, plan and manage the farm more effectively saving time and money along with reducing the use of pesticides.

6 Spectral Bands (RGB, Red, Red Edge, and NIR)

NIR

RED EDGE

RED

RGB
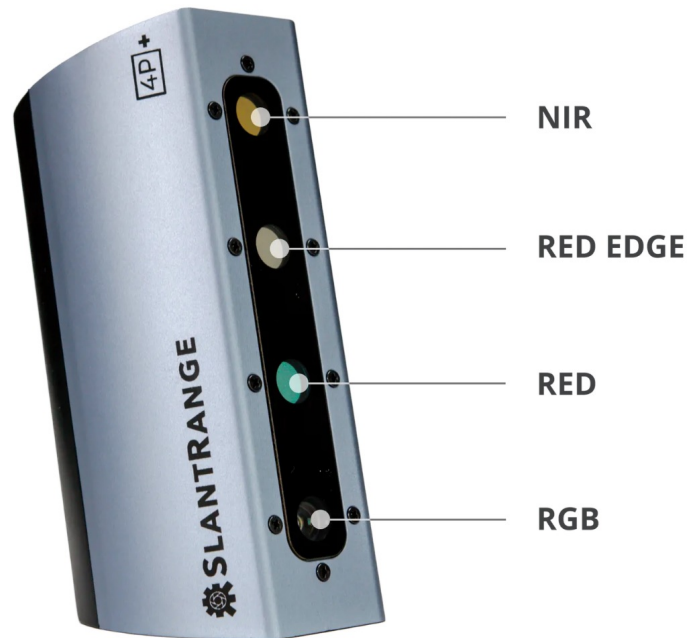
RGB: Standard RGB cameras work with the visible part of the electromagnetic spectrum. They detect the reflectance of **red, green and blue light**, in separate channels

The Drone Technology and multispectral sensor in Agriculture

1. Precise Aerial Monitoring over large Plantations
2. Identify problematic conditions for remedial plans
3. Unplanted/ Vacant points
4. Roadside planting
5. Stunted Growth
6. Unhealthy Palms/trees
7. Water Logged area
8. Inaccessible area/ Unreachable palms

Case Study #1

Drone Mapping of PAU Banana Farm

Dr. Abbas Maaroof
December 10,2018

PNGAus Partnership

Plan Flight Mode-Before the scan

- Flight Altitude 35m-Res:10cm/pc

Plan Flight Mode-After the scan

- Flight Altitude 35m-Res:10cm/pc
- Images: 294
- Hectares: 5
- Time:17:17

Final image processing Results of the Scan-All 294 Image integration

Final analytical results of the scan as a dashboard

Crop:	**Banana**	Field area:	**4.53 Hectare**
Growing stage:	**Fruit Production**	Analysis name:	**PAU Farm**

PLANTS COUNTED
4,628

AVERAGE PLANT DENSITY
1,021.6 / Hectare

PLANNED SEEDING DENSITY
1,104.0 / Hectare

The difference between the counted number of plants and the planned number of plants is

7% ⬇
UNDER NORM

which is close to   **373**   plants
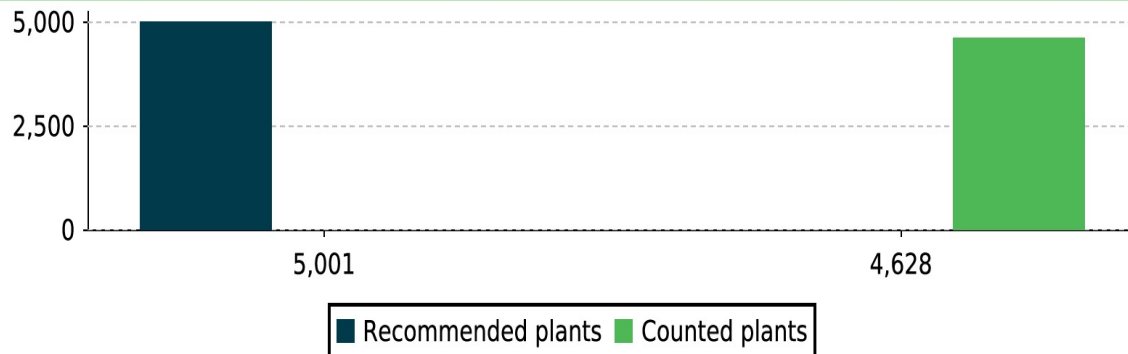
> ➤ **Drone mapping deliver a powerful Stand Count Tool**
> ➤ **If they are different Banana types can be identified using leaves structures and fruits using agriculture**
> ➤ **The difference between the counted number of plants and the planned number of plants is 7% that means 373 plants short**

Bar chart:
- 5,001 — Recommended plants
- 4,628 — Counted plants

■ Recommended plants ■ Counted plants

Additional information: (or recommendation)

Next Steps to study?

➢ Study Sigatoka disease on the Banana trees
➢ Security

Case#2

Predicating Palm Oil Yield Using Smart Technology

The Location

1°34'41.9"N 109°30'51.6"E

https://www.google.co.id/maps/place/1%C2%B034'41.9%22N+109%C2%B030'51.6%22E/@1.5783557,109.4817449,10134m/data=!3m1!1e3!4m5!3m4!1s0x0:0x0!8m2!3d1.5783045!4d109.5143299?hl=en

1,5783045002,109,5143298805
DMS: 1° 34' 41,90" N | 109° 30' 51,59" E
UTM: 334725,794E 174509,541N 49N
MGRS: 49NCB 34726 74510

Address: Santaban, Sajingan Besar, Kabupaten Sambas, Kalimantan Barat, Indonesia

1°34'41.9"N 109°30'51.6"E

1°34'41.9"N 109°30'51.6"E

1.578306, 109.514333

Directions   Save   Nearby   Send to your phone   Share

Santaban, Sajingan Besar, Sambas Regency, West Kalimantan

HGH7+8P Haur, Sagu, Sambas Regency, West Kalimantan

Add a missing place

Add your business

Map

Google

3D

Vegetation Stress(0 - 1)

1.78 ha

5.9 ha

23 ha

Less stress

min - max , Area : ha, in %

0.050 - 0.100,   Area : 5.86,   18.96 %

0.100 - 0.150,   Area : 23.18,   75.03 %

0.150 - 0.200,   Area : 1.78,   5.76 %

0.200 - 0.250,   Area : 0.05,   0.15 %

0.250 - 0.300,   Area : 0.01,   0.04 %

0.300 - 0.350,   Area : 0.01,   0.04 %
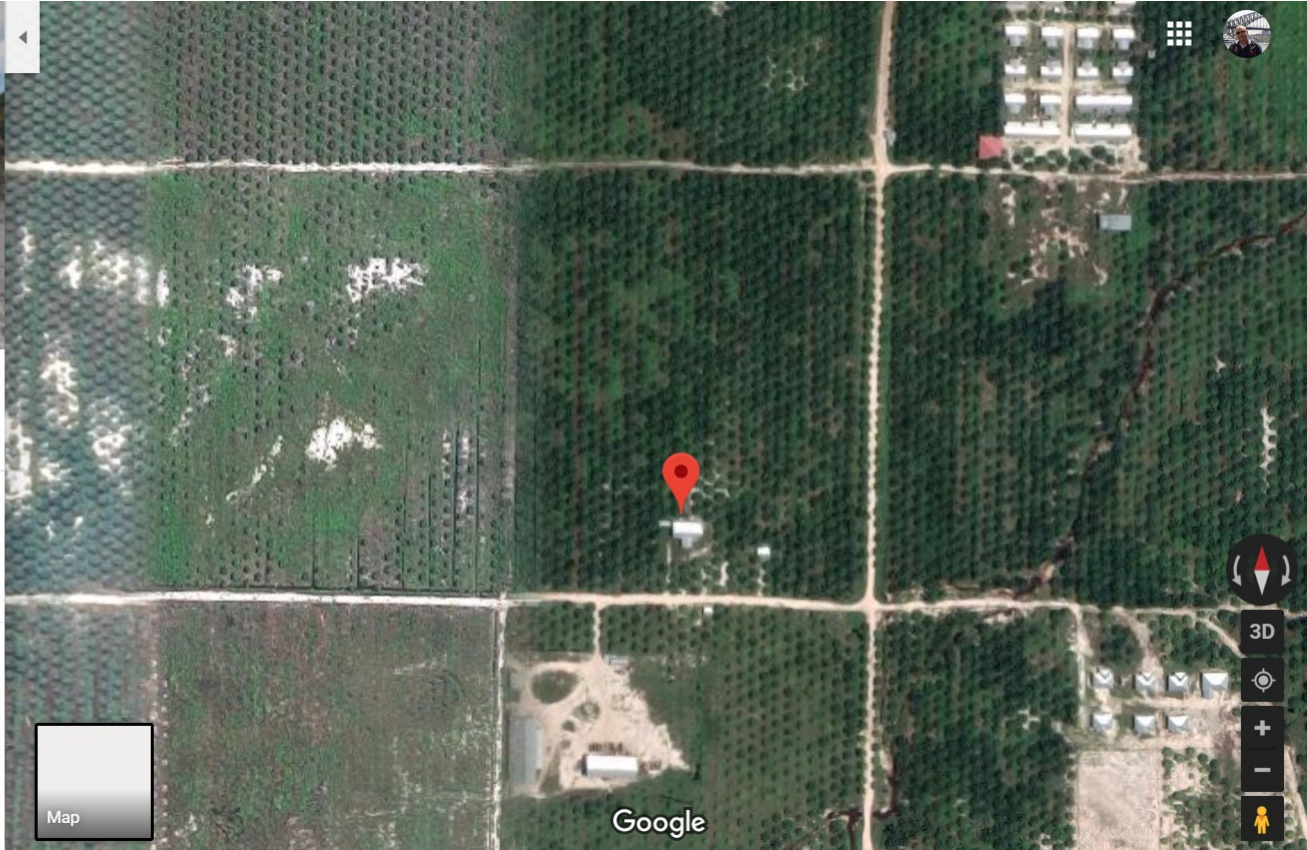
0.350 - 0.400,   Area : 0.00,   0.01 %

GPS Tracking Longitude and Latitude of the Five areas

Area	Decimal degrees (DD)	Degrees, minutes, and seconds (DMS)
Area#1 Stress=0.11	1.442064, 109.772227	1°26'31.4"N 109°46'20.0"E
Area#2 Stress=0.15	1.442552, 109.771525	1°26'33.2"N 109°46'17.5"E
Area#3 Stress=0.14	1.443203, 109.770393	1°26'35.5"N 109°46'13.4"E
Area#4 Stress=0.2	1.443014, 109.772927	1°26'34.9"N 109°46'22.5"E
Area#5 Stress=0.25	1.442363, 109.773224	1°26'32.5"N 109°46'23.6"E
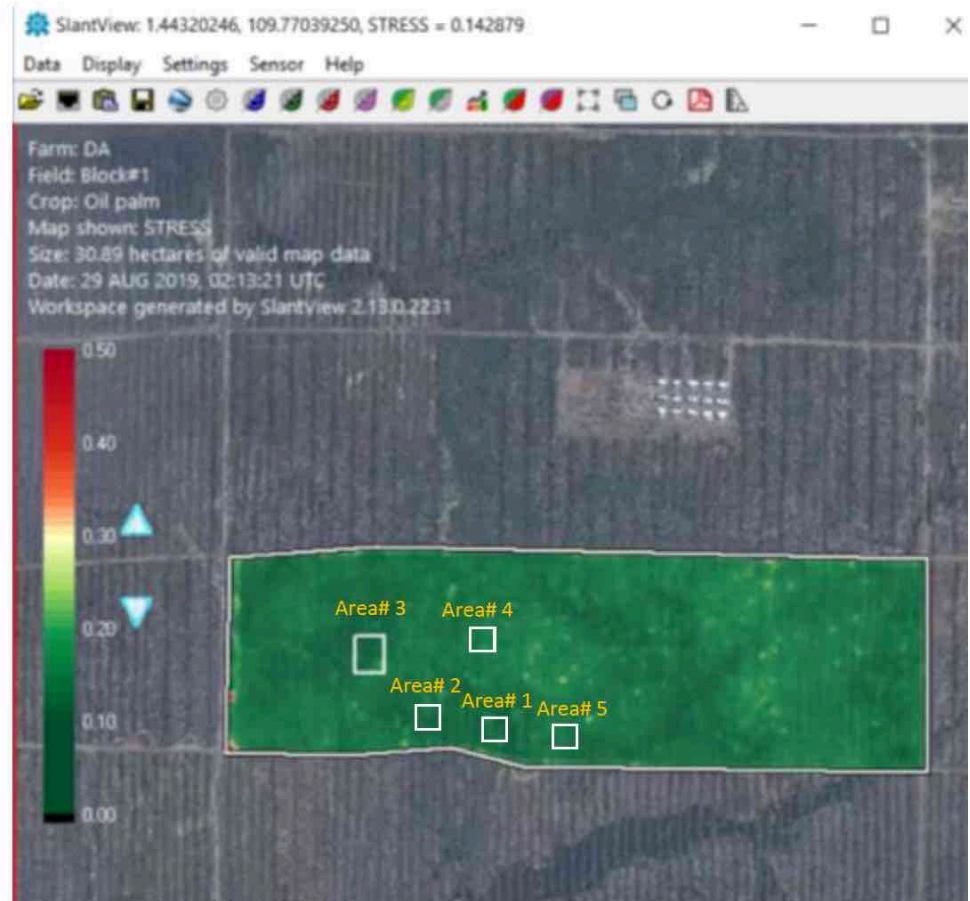
Predicting Palm Oil Yield Using Linear Regression

$$Yield \sim SAVI$$

Yield = Number of Kernels (Kg)* Number of Bunches

SAVI = Transformation of vegetation index-Measuring stress level

Transformation of Vegetation Index

Value of L factors are various depended on the vegetation density levels.

L=0   For high vegetation cover,
L=0.5 For medium vegetation cover, and
L= 1   For low vegetation cover

The existence of object above the ground will contribute as a background to the vegetation reflection, so their effect on the reflection is recorded on the imagery digital data value (DN).

$$SAVI : \frac{(Near\ Infra\ Red - Red)(1+L)}{(Near\ Infra\ Red + Red + L)}$$

The use of SAVI transformation is expected to reduce that effect on the objects background. In this case, oil palm plants are planted with a wide enough space between them so that the reflection of the soil will greatly affect the vegetation reflection, thus SAVI is needed.

Regression Analysis

Machine Learning Algorithms-Linear Regression is used in this study to predict POT yield using following formula:

Linear Regression

$$y = mx + c$$

$$\text{Yield (NoK (Kg)* NoB)} \sim SAVI$$

$$\text{Yield} = m(SAVI) + c$$

Description :

Y = the dependent variable (dependent) (yield);
a, b = regression coefficient
x = the independent variable (independent) (transformation of vegetation index) (SAVI)

Target Yield/ha for Block#1 is 24.43 Tonne/ha
In 2019 Potential Yield of all blocks are 26
Tonne/ha

Predicted Yield for Block#1 is 30.6 Tonne/ha

The above result has been calculated using
Python programming computer language

Example #1
Palm Oil Tree – Stand Count
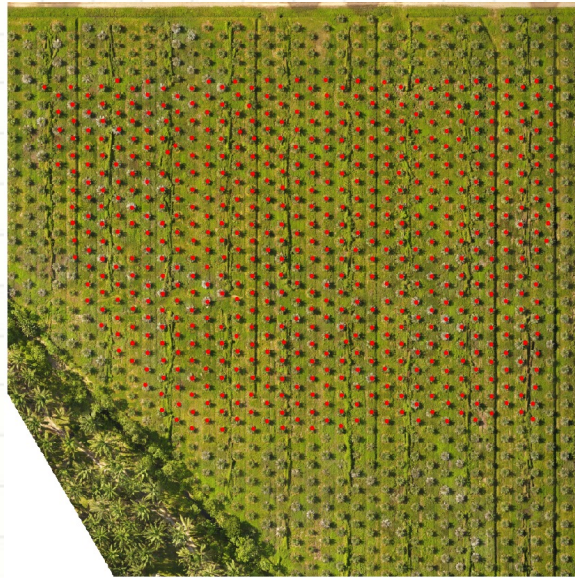
PLANT COUNTING	STAND COUNT

Crop: **palm oil tree**	Field area: **3.91 Hectare**
Growing stage: **2 Years**	Analysis name: **Stand Count**

PLANTS COUNTED
642

AVERAGE PLANT DENSITY
164.2 / Hectare

PLANNED SEEDING DENSITY
143.0 / Hectare

The difference between the counted number of plants and the planned number of plants is

15% ↑

ABOVE NORM

which is close to [83] plants

Bar chart:
- 559 — Recommended plants
- 642 — Counted plants

■ Recommended plants ■ Counted plants
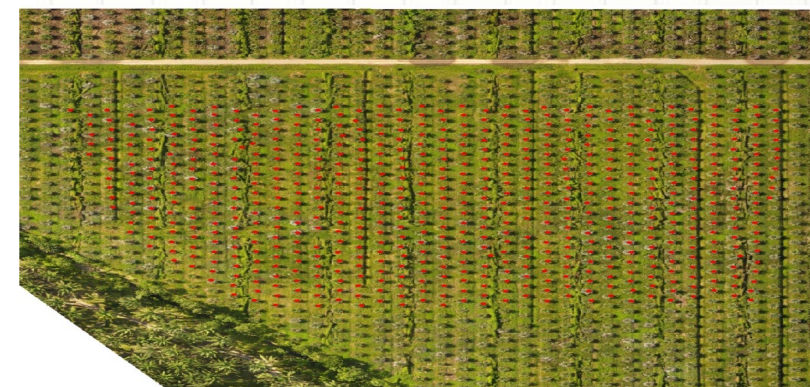
Additional information: (or recommendation)

Example #2
Palm Oil Tree – Plant Population

PLANT COUNTING	PLANT POPULATION
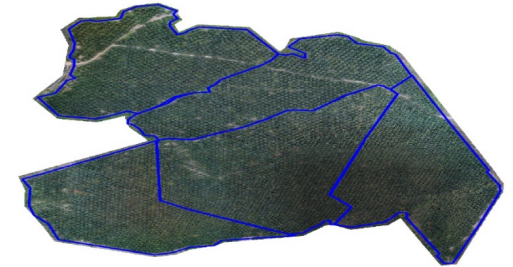
Crop:	**palm oil tree**	Field area:	**48.21 Hectare**
Growing stage:	**5 years**	Analysis name:	Plant Population

Plant number that our algorithms have counted is

7,263

Example #3
Palm Oil Tree – Plant Disease

Example #4
Palm Oil Tree – Pest Stress/Detection

PLANT HEALTH MONITORING	PEST ANALYSIS

Crop:	**palm oil tree**	Field area:	**6.35 Hectare**
Growing stage:	**Production**	Analysis name:	**Pest detection**
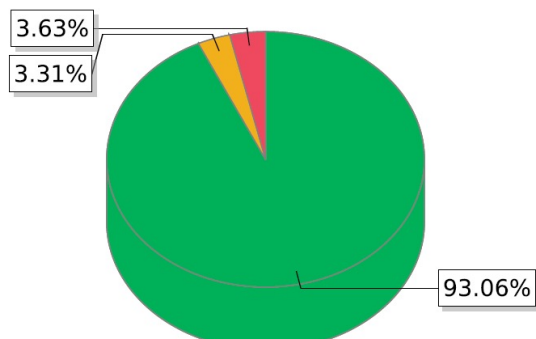
STRESS LEVEL TABLE

Stress level	%	
🟢 **Fine**	**93.06%**	
🟡 **Potential Pest Stress**	**3.31%**	**0.21**
🔴 **Pest Stress**	**3.63%**	**0.23**

3.63%

3.31%

93.06%
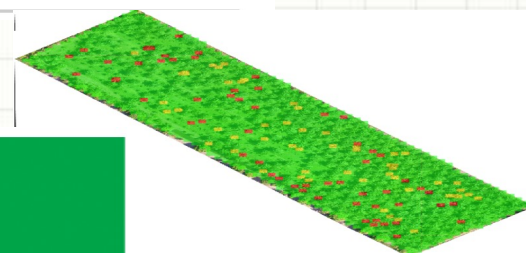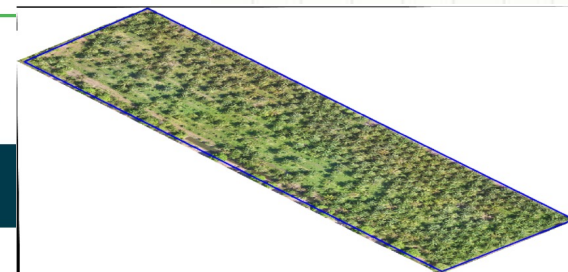
Total area PEST STRESS:

0.44 ha = 7% field

Drone Technology Applications

The African Drone and Data Academy

The Development of UNICEF's Drones and Data for good initiative

From flying dried blood spot (DBS) samples to upskilling a new technology workforce

The 4-year journey of UNICEF's drone work in Malawi

In 2016 UNICEF started testing the use of drones in Malawi to reduce waiting times for HIV testing of infants, by flying dried blood spot (DBS) samples from hard-to-reach communities directly to laboratories.

In collaboration with the Government of Malawi, UNICEF launched in 2017 the first humanitarian drone corridor to provide a controlled environment for governments, international aid organizations, private sector and universities to explore how drones can help deliver services that benefit the poorest and hardest to reach families in Malawi.

In Vanuatu--a country in the South Pacific made up of more than 80 islands that stretches over an area of 1,300 kilometers, where 20% of all children miss out on life-saving immunizations, UNICEF started using drones for vaccine delivery. The Vanuatu vaccine delivery trials clearly demonstrated that drones can safely and effectively deliver vaccines from distribution centers to remote last-mile communities, reducing a journey of several hours to just 25 minutes.

1. Generate Maps:

The global maps are constantly changing due to the effects of the weather and global warming. This is the reason why scientists deploy drones to capture recent images of the world to determine any changes to the topography, especially in the coastlines as an application. The photos taken from a certain locality will then be consolidated, generating one main mapping system. Map generation is important to obtain the actual changes observed to a specific area.

2. Aerial mapping & nature monitoring
Drones can be used to do aerial surveys of rainforests to determine where the trees have been affected by human activities and patterns can be used to achieve this. Drones can then relay data to the relevant authorities who use it to make informed decisions.

1. Map lava flows in Hawaii;
2. water reserves around the capital of Chad,
3. N'Djamena, and even an ancient peat bog in Switzerland – allowing conservationists to restore it.

3. Agricultural sustainability solutions

Drones are also now becoming an invaluable tool by farmers in other aspect of farming, such as monitoring livestock, crops and water levels. High-res images can provide detailed information on crop health, improving yield and reducing input cost. Sophisticated Drone have also been used to create 3D images of the landscape to plan for future expansions and upgrading.

4. Disaster relief

1.When Typhoon Haiyan struck the South East coast of the
senseFly drones were used to create detailed 2D base map
local boroughs and to assess typhoon damage and plan she
were provided with physical high-res maps that they could
plan reconstruction efforts based on the current, accurate
this would not have been possible.

2.The US Department of Agriculture has used UAVs to fight

3. In China monitor motorways prone to landslides for min
indicative of an imminent disaster, and alert authorities up

5. Renewable energy maintenance

1.Inspecting wind turbines

2. solar panel installation and inspection using drone-based
and analytics.

6. Protecting wildlife

Quantum Geographical Information Systems (QGIS)

QGIS

WHAT IS QGIS?

Open source QGIS is cross-platform desktop geographic information system application that supports viewing, create, edit, visualise, analyse and publish of geospatial data/information on Windows, Mac, Linux, BSD and mobile devices

QGIS is a user-friendly GIS, providing common functions and features; also a free, collaborative, cross-platform software that is constantly developing by QGIS community

QGIS

QGIS GRAPHICAL USER INTERFACE

When QGIS starts, you are presented with the GUI as shown in the figure:
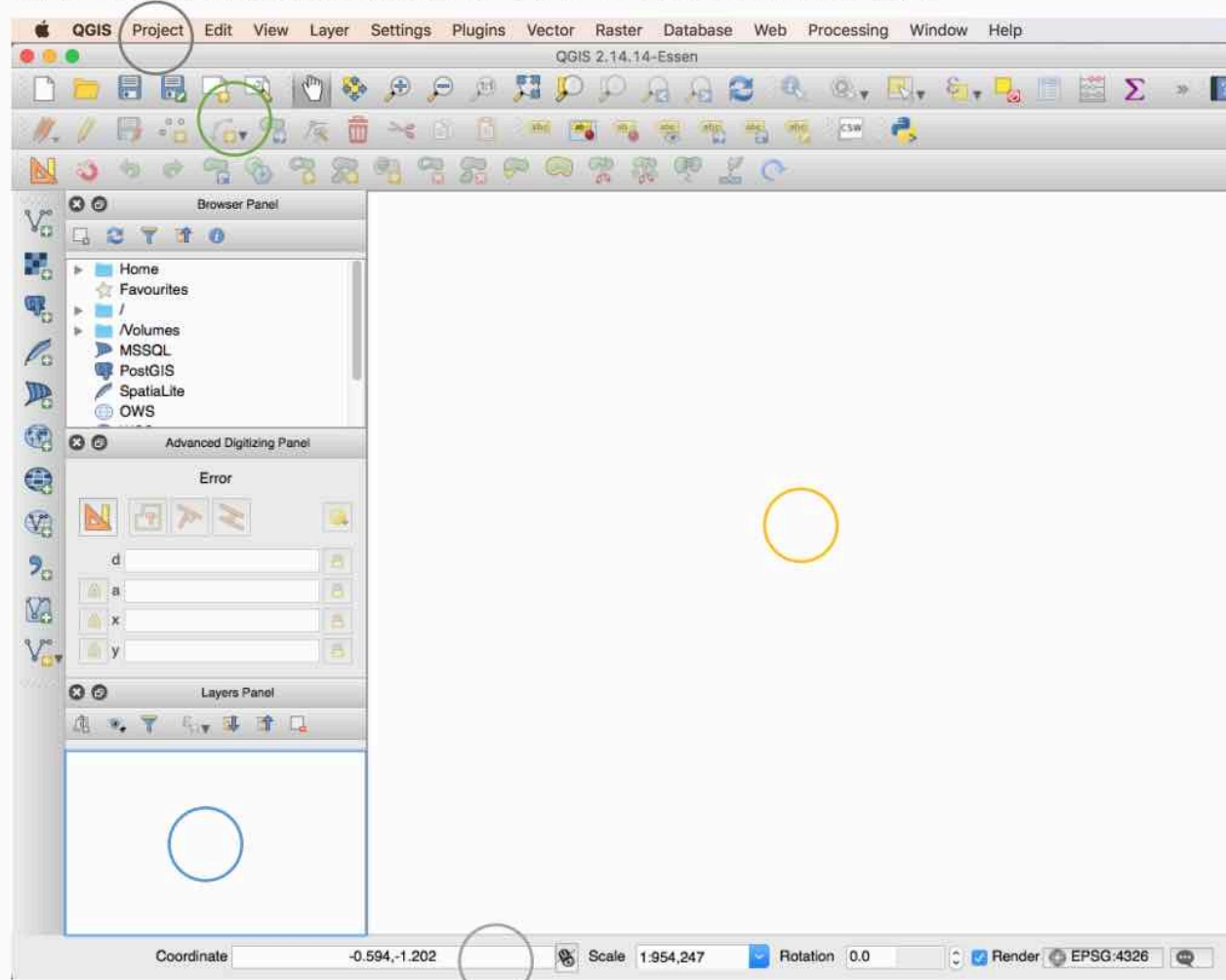
Note:
Your window decorations may appear different depending on your operating system.

Tip:
You can use middle button of your mouse to pan the map.

The QGIS GUI is divided into five areas:

1. **Menu Bar:** Provides access to various QGIS features using a standard hierarchical menu.
2. **Tool Bar:** Provides access to most of the functions as the menus, plus additional tools for interacting with the map.
3. **Map Legend**: Lists all the data layers in the project. This area also allows to change style or label the layer.
4. **Map View:** The map displayed in this window will depend on the vector and raster layers you have chosen to load.
5. **Status Bar:** The status bar shows you your current position in map coordinates as the mouse pointer is moved across the map view.

USEFUL LINKS: Official QGIS User Guide:
https://docs.qgis.org/2.2/en/docs/index.html

QGIS Training Guide:
https://docs.qgis.org/2.2/en/docs/training_manual/

Gentle Introduction to GIS:
https://docs.qgis.org/2.8/en/docs/gentle_gis_introduction/

http://www.refugeeinfoturkey.org/repo/Toolkit/CapacityBuilding/GIS/01-Introduction+to+GIS.pdf

Thank you