

Development of GIS Based Forest Management Information System in Punjab

(A Way Forward Towards Digital Era)



GIS LAB PUNJAB FOREST



GIS Lab Punjab Forest Department

- Forest GIS lab has been established in the office of CF D&WP Circle during 2012-13 under the Development Scheme Titled : (Institutional Support for Planning Monitoring & Evaluation Cell of Punjab Forest Department), Lahore having, latest equipments , licensed software and technical experienced staff.
- The purpose of this setup is to develop a digital record of Forest Assets and regular Planning ,Monitoring and Evolution of Forests using Geo-Spatial Technologies



Project

DEVELOPMENT OF GIS BASED FOREST MANAGEMENT INFORMATION SYSTEM (FMIS) IN PUNJAB

- Gestation Period : **36 Months (2016-17 to 2018-19)**
 - Total Allocated Budget : **Rs. 75 million**



PROJECT OBJECTIVES

- Strengthening of forests monitoring by mapping through Remote Sensing (RS) and Geographic Information System (GIS) Techniques.
- Development of GIS based centralized forest data repository
- Development of Web GIS Based Forest Management Information System (**FMIS**) that will be useful for improved forest management and planning purpose.
- Establishment of GIS Nodes at Rawalpindi and Multan with strengthening of existing GIS Lab at Lahore.



Project Current Activities

- Development of GIS Based Centralized Forest Data Repository (CFDR).
- Development of Web GIS Based Forest Management Information System (FMIS)
- Forest Monitoring & Evolution Through Drone Technology
- Rapid Mobile Data Collection System
- Establishment of GIS Nodes at Rawalpindi and Multan
- Capacity Building of Forest Field Formations and GIS Lab Staff Through Training
- R&D with Academia



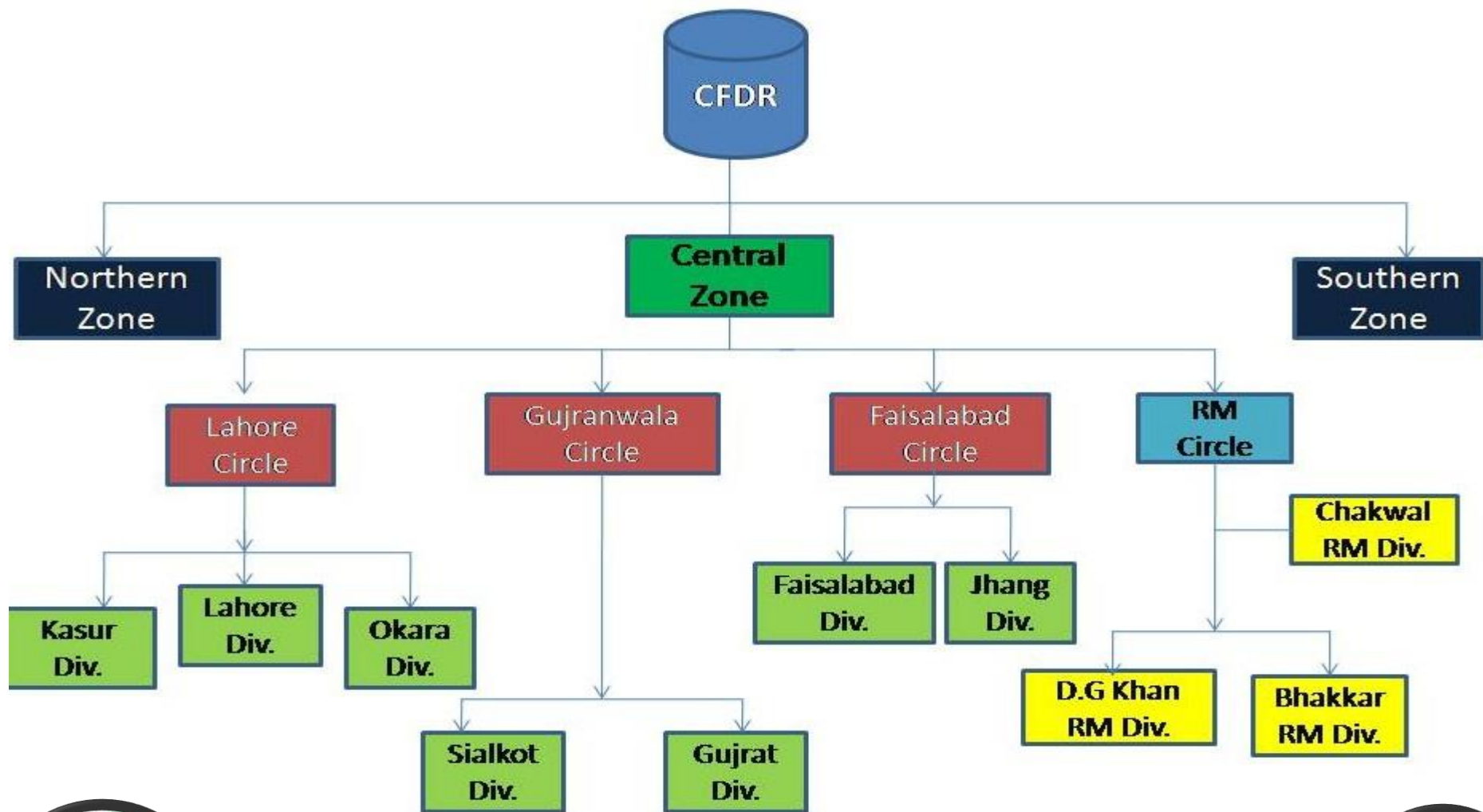
DEVELOPMENT OF GIS BASED CENTRALIZED FOREST DATA REPOSITORY (CFDR)

With the era of Science and Technology its need an hour to develop an IT infrastructure which can secure forest assets as well as rapid data accessibility for better management of Forest Resources.

- The GIS Based Data Repository is under development and it will save forest land data at centralized platform ,which can be accessed easily at any time anywhere.
- Development of CFDR will maximize data integrity, minimize the data redundancy and quick access to records, resulting in better data preservation.
- CFDR initially will manage records of 1.6 millions Ac area of forest along with satellite imagery, available working plan data and revenue records.
- It will also provide digital data of forest of Punjab for education and research purpose to the Forest Academy Ghora Galli ,Forest School Bahawalpur, PFRI Gutwala and other research institutes in Punjab.



GIS BASED CENTRALIZED FOREST DATA REPOSITORY (CFDR)



GIS LAB PUNJAB FOREST



Development of Web GIS Based Forest Management Information System (FMIS)

FMIS will integrate GIS functionality to forest management activities as operational planning and implementation, and operational control in and across administrative units of department.

- Web based FMIS will help Forest Field Staff to perform Web-based GIS Analysis, planning and retrieval of information within no time throughout Punjab.
- FMIS will also be helpful in reporting, planning about afforestation/regeneration according to available resources such as available irrigation water, plants available in forest and nurseries etc.
- It will be also helpful for rapid monitoring and evaluation activities as desired by Department.



GIS LAB PUNJAB FOREST



PUNJAB FOREST MANAGEMENT INFORMATION SYSTEM (FMIS)

Home Page



**FMIS
Website**



GIS LAB PUNJAB FOREST



PUNJAB FOREST MANAGEMENT INFORMATION SYSTEM (FMIS)

FMIS Modules



Forest, Wildlife and Fishries Department

[HOME](#) [ABOUT](#) [SERVICE](#) [TEAM](#) [FMIS](#) [PORTFOLIO](#) [CONTACT](#)

FMIS MODULES

Modules to spatially visualize, question, analyze, and interpret forests.

GIS Analysis Module

This module contains all GIS dynamic layers and information about Forests

[Get Started](#)

WebGIS Module

This module contains all GIS and Remotely sensed data along with its classification and provides whole possible information about forests.

[Get Started](#)

Remote Sensing Analysis Module

This module contains remotely sensed cover assessment dynamic maps along with its satellite imagery.

[Get Started](#)

Centralized Data Repository

Centralized data repository contain all sort of static layers and static information about forests.

[Get Started](#)

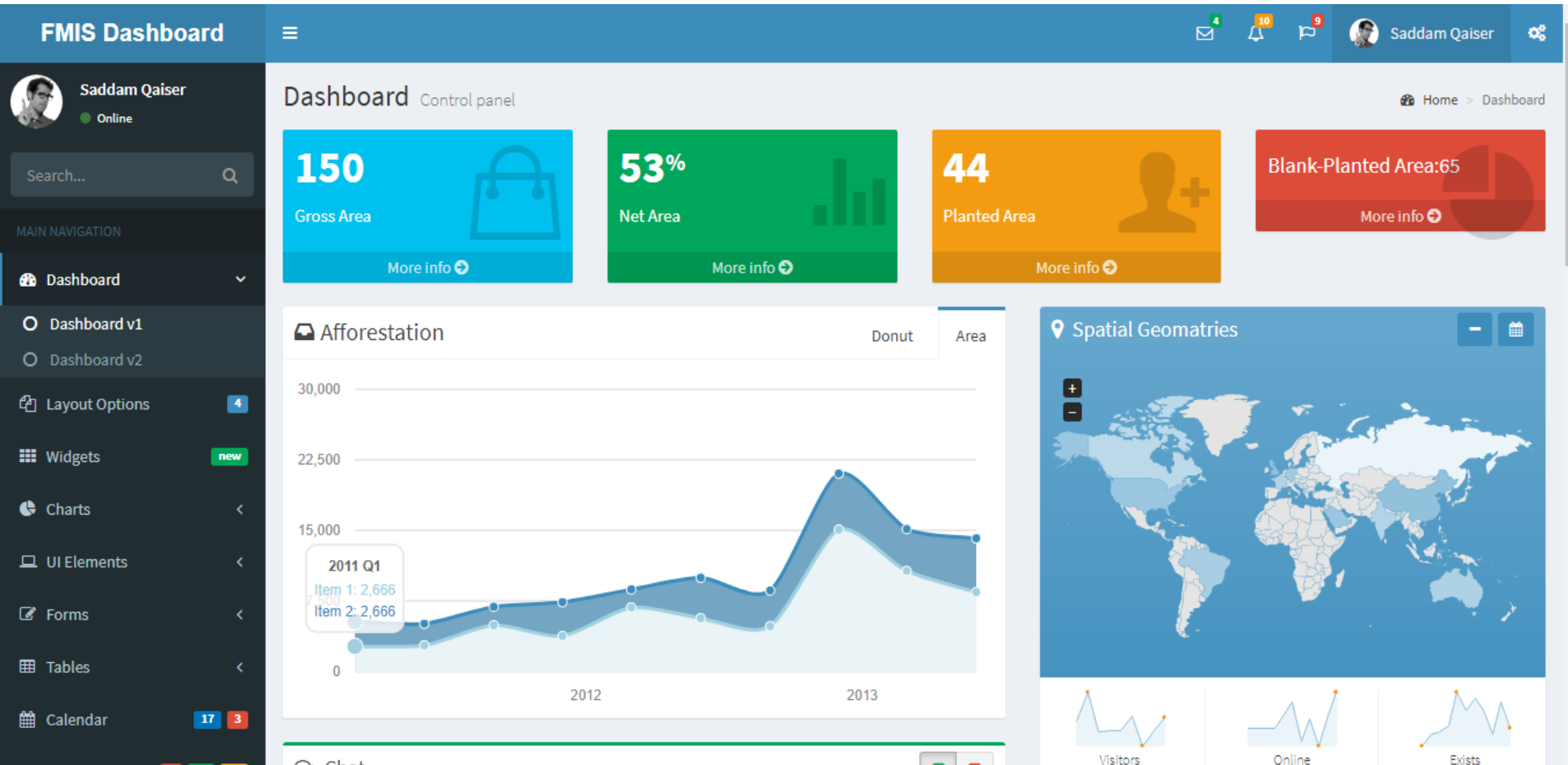
FMIS Website



GIS LAB PUNJAB FOREST



PUNJAB FOREST MANAGEMENT INFORMATION SYSTEM (FMIS) DASHBOARD



GIS LAB PUNJAB FOREST



PUNJAB FOREST MANAGEMENT INFORMATION SYSTEM (FMIS) DASHBOARD

The screenshot displays the Punjab Forest Management Information System (FMIS) dashboard, which is a web GIS application. The interface is divided into several sections:

- Header:** "Forest, Wildlife & Fisheries Department Web GIS Application".
- Navigation:** Home, Contact, Extra, Admin Panel, User List, Changa Manga Web Application, Modules, admin.
- Spatial Filter:** Forest Zone: Central Zone, Forest Circle: Lahore, Forest Division: Kasur, Forest: Changa Manga.
- Layers:** GPS Points, Linear Features, Forest Buildings, Compartments, Beats, Blocks, Forest Boundary, Classification.
- Map:** A satellite map showing a forest area with a grid overlay and various colored regions.
- Layers Panel:** Forest Boundary, Classification.
- Legend:** Identify.
- Data Popup:** "changa_manga_img31.img" showing pixel value information for a selected pixel (3).

Pixel Value	3
Oid	3
Id	3
Red	0.741176
Green	0
Blue	0
Class Name	crop
Count	109669041
Area	13549.893127



GIS LAB PUNJAB FOREST



PUNJAB FOREST MANAGEMENT INFORMATION SYSTEM (FMIS) PLANNING MODULE

FMIS Planning Module

Cost and Estimation Dashboard

Area Selection through nested cascading filtering technique

The screenshot displays the 'Forest Wildlife & Fisheries Department Cost Estimation Analysis' interface. On the left, a control panel titled 'Area Selection' includes three main sections: '1. Parameter of Selection', '2. Species Selection', and '3. Area of the feature'. The '1. Parameter of Selection' section contains several dropdown menus: 'Central' (circled in red), 'Select Zone Circle', 'Select Circle division', 'Select Division forest', and 'Select Forest Compartment'. The '2. Species Selection' section has a 'Select Species' dropdown. The '3. Area of the feature' section has three radio button options: 'By Clicking(Get Whole Area)', 'Draw Area', and 'Add Shapefile'. At the bottom of the panel are 'Clear Area' and 'Clear All' buttons. The main area is a satellite map of Punjab, India, with a green boundary outlining a specific region. A red arrow points from the 'Central' dropdown to this region. The map includes various city labels and a topographic inset map in the upper right corner.

PUNJAB FOREST MANAGEMENT INFORMATION SYSTEM (FMIS) PLANNING MODULE

FMIS Planning Module

Cost and Estimation
Dashboard

Area Selection

1. Parameters of Selection

Central

Lahore Circle

Kasur Division

Changamanga

Select Forest Compartment

2. Species Selection

Select Species

3. Area of the feature

By Clicking(Get Whole Area)

Draw Area

Add Shapefile

Clear Area Clear All

Linked Planning Cost Calculation



PUNJAB FOREST MANAGEMENT INFORMATION SYSTEM (FMIS) PLANNING MODULE

FMIS Planning Module

Cost and Estimation Dashboard

Cost calculation form of Irrigated Plantation

Forest Wildlife & Fisheries Department

BREAK-UP FOR AFFORESTRATION IN IRRIGATED PLANTATION @ RS :425/- DAILY WAGES

SR.NO	PARTICULAR	COOLY DAYS	AMOUNT(RS.)
1.	Jungle Clearance Kana Mesquite Stubbing	207.60	88230
2.	Debris Collection and Burning	62.28	26469
3.	Extraction of Mudhies	83.04	35292
4.	Ploughing & leveling with private bulldozer tractor	311.40	132345
5.	Lay Out & dag bailing	41.52	17646
6.	Earth work(main Branches, khals,bunds,trenches,passels etc)5000Cft	519.00	220575
7.	Making of slots 726 Nos	30.10	12792
8.	Cost of plant including carriage (726-110 =836 No.)Rs.10/-each	408.35	173548
9.	Planting including restocking 15% 836 No.(726-110)Plants @ Rs.4/-each	163.38	69436
10.	Irrigation 25times @ 1/2 CD per irrigation	259.50	110287
11.	Weeding 1 time	207.60	88230
12.	Re-Stubbing of Kana Mesquite	103.80	44115
13.	Spray Insecticide Unforseen	15632	15632
Total Cost			1034597.00

Note: The rates and Charges are schedule of rates for forest works and operation, 1947.

Print Close



Soil Map Of Changa Manga Forest

FMIS Planning Module

Soil Suitability Analysis Dashboard

Forest Wildlife & Fisheries Department
Soil Suitability Analysis

Area Selection

1. Parameters of Selection

Central Zone
Lahore
Kasur
Changa Manga

2. Soil/Temperature/Elevation Map

Soil Map

Weather Report

CHUNIAN, PK

30°C

Humidity: 74%
Pressure: 29.58hPa
Cloudiness: 20

Edaphic Factors

- Silt Loam
- Silt Loam_High Water Table
- Silt Loam_Saline
- Sodic_High Water

GIS BASED CENTRALIZED FOREST DATA REPOSITORY (CFDR)

pgAdmin 4

pgAdmin 4 File Object Tools Help

Browser

- PostgreSQL 9.2
- PostgreSQL 9.6
 - Databases (1)
 - postgres
 - Casts
 - Catalogs
 - Event Triggers
 - Extensions
 - Foreign Data Wrappers
 - Languages
 - Schemas (1)
 - public
 - Collations
 - Domains
 - FTS Configurations
 - FTS Dictionaries
 - FTS Parsers
 - FTS Templates
 - Foreign Tables
 - Functions
 - Materialized Views
 - Sequences
 - Tables (4)
 - forest_boundary
 - Columns
 - Constraints
 - Indexes
 - Rules

Dashboard Properties SQL Statistics Dependencies Dependents Query-1

PostgreSQL 9.6-postgres-public.forest_boundary

```

1 SELECT * FROM public.forest_boundary
2 ORDER BY gid ASC

```

Data Output Explain Messages History

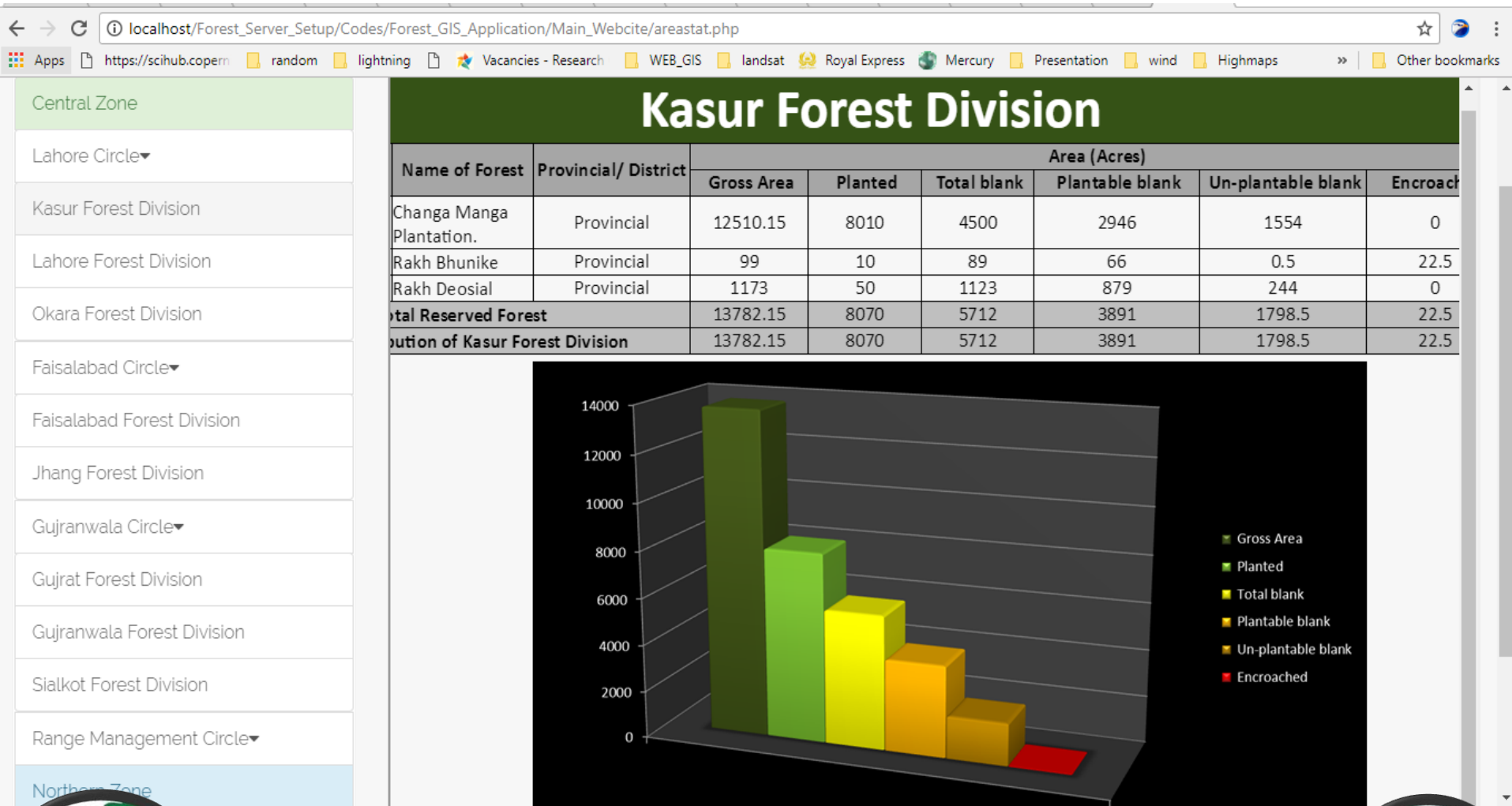
f_zone character varying (50)	f_circle character varying (50)	f_div character varying (50)	f_name character varying (100)	f_area numeric
Southern Zone	D.G Khan	Muzaffar Garh	Bakaini	2006
Southern Zone	D.G Khan	Muzaffar Garh	Dumber Wala	2618
Southern Zone	D.G Khan	Muzaffar Garh	Dhaka-I	1464
Southern Zone	D.G Khan	Muzaffar Garh	Dhaka-II	848
Southern Zone	D.G Khan	Muzaffar Garh	Isson Wala	7094
Southern Zone	D.G Khan	Muzaffar Garh	Khair Pur Para I	465
Southern Zone	D.G Khan	Muzaffar Garh	Khair Pur Para II	553
Southern Zone	D.G Khan	Muzaffar Garh	Middle Girri	335
Central Zone	Sargodha	Mianwali	Chak Sarkar	1031
Southern Zone	D.G Khan	D.G Khan	Triman	5346
Southern Zone	D.G Khan	Muzaffar Garh	Ahmad Mohana	2216
Southern Zone	D.G Khan	Muzaffar Garh	Ali Wali	14670
Southern Zone	D.G Khan	Muzaffar Garh	Ali Pur Khaira	2453
Southern Zone	D.G Khan	Muzaffar Garh	Bait Qaim Shah	1282



GIS LAB PUNJAB FOREST



GIS BASED CENTRALIZED FOREST DATA REPOSITORY (CFDR)

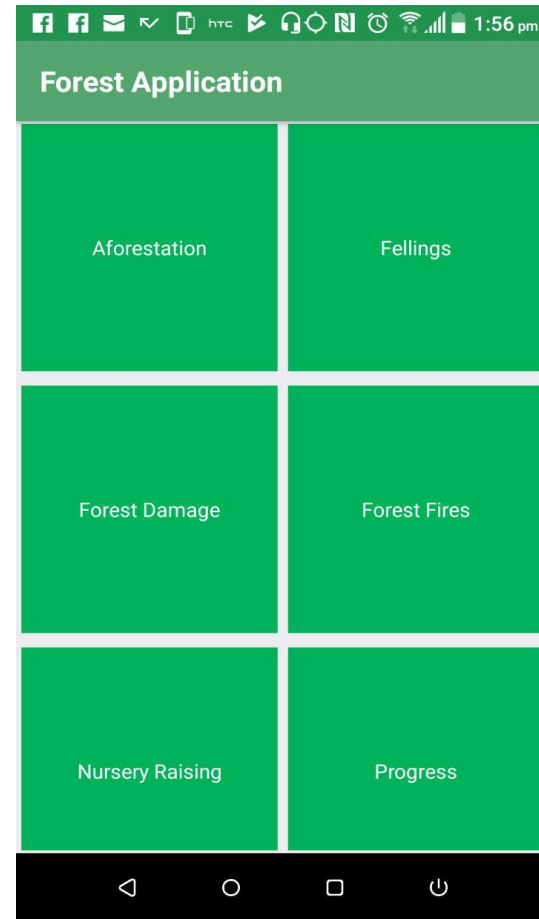


GIS LAB PUNJAB FOREST



RAPID FIELD DATA COLLECTION SYSTEM

FMIS Android Application for Field Data Collection

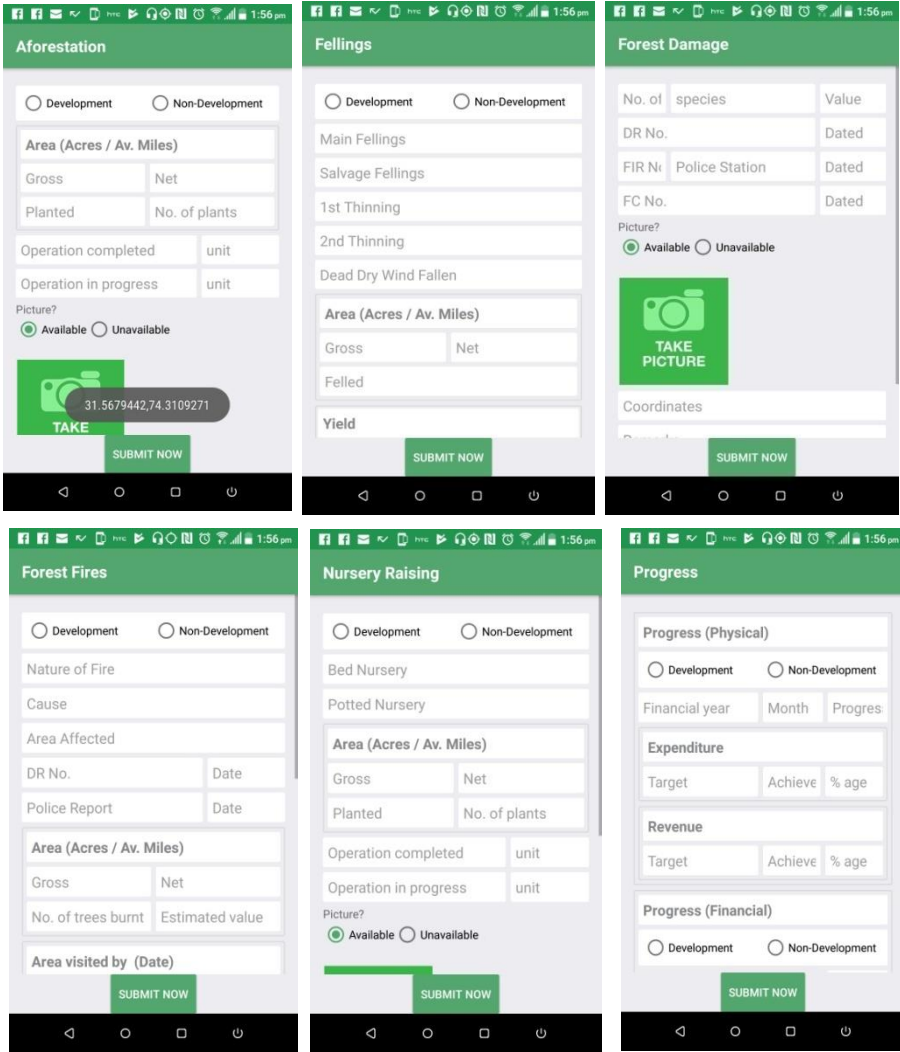


GIS LAB PUNJAB FOREST



Data Entry Forms under Each Module

**FMIS
Android
Application
for Field Data
Collection at
user end**



GIS LAB PUNJAB FOREST



FMIS Android Application Dashboard at Administration end

For Field Data Monitoring and Data
Retrieval

The screenshot displays the 'Punjab Forest System' dashboard. At the top right, it indicates 'Logged in as Admin'. A dark sidebar on the left contains a menu with the following items: Dashboard, Zone, Circle, Division, Sub-Division, Forest, Block, Beat, CTP / Reach, Map View, Afforestation List, Felling List, and Forest Damage. The main content area is titled 'Dashboard' and includes a breadcrumb trail 'Home > Dashboard'. It features six large, colorful tiles: 'Zone' (blue), 'Circle' (light blue), 'Division' (orange), 'Subdivision' (yellow-orange), 'Forest' (green), and 'Logout' (purple). Each tile contains an icon, the category name, and a 'VIEW MORE' button with a right-pointing arrow.



GIS LAB PUNJAB FOREST



EBEE SENSEFLY DRONE FOR PUNJAB FOREST DEPARTMENT



GIS LAB PUNJAB FOREST



EBEE SENSEFLY DRONE SPECIFICATIONS

- Origin : Switzerland
- Flight Duration : 40 mints Aprox
- Area Coverage : 300-500 Acres per flight
- Resolution : 3 cm
- Auto Pilot : Yes
- Manual Flight : Yes
- Flight Planning Module
- DSM Generation: Yes



EBEE SENSORS

Sequoia Sensor

- Four 12 MP spectral cameras (Red, Green, Red Edge and NIR)
- One 16 MP with RGB
- 64 GB built-in storage
- GPS
- 32 GB SD card

RGB Sensor

- Resolution : 18.2 MP
- Ground resolution at 100 m (328 ft) : 2.75 cm (1 in) / pixe
- Image format JPEG



DRONE FLIGHT PLANNING AND IMAGE PROCESSING SOFTWARES

- Flight planning & control software : eMotion
- Image processing software: Pix4Dmapper Pro



GIS LAB PUNJAB FOREST



DRONE FLIGHT PLANNING AND DATA ACQUISITION

The screenshot displays the DroneSimulator (DS) interface for flight planning and data acquisition. The central window shows a top-down view of a simulated environment with a yellow flight path overlaid on a satellite-style map. The path consists of several loops and straight segments, indicating a planned mission. A 'WARNING' box at the top left of the map indicates a 'Ready for take-off' status at 06:13. The left sidebar contains mission settings for 'My Mission 3' and 'My Block #1', including details like 'Name', 'Camera', 'Resolution', and 'Area'. The right sidebar provides real-time status information under the heading 'Drone: Simulator (EB-01-008)', including 'Autonomy' (92% battery, 06:12 flight time, 5m height, 97% link quality), 'Flight data' (0.0 m/s ground speed, 07.1 m/s airspeed), 'Instruments' (25.0°C temperature), and 'Camera information' (WS 828 1.21 camera, 8 photos). The bottom of the interface shows a Windows taskbar with the time 1:56 PM on 7/24/2017.



GIS LAB PUNJAB FOREST



MONITORING THROUGH DRONE



SHAHDARA DRONE IMAGE LAHORE FOREST DIVISION

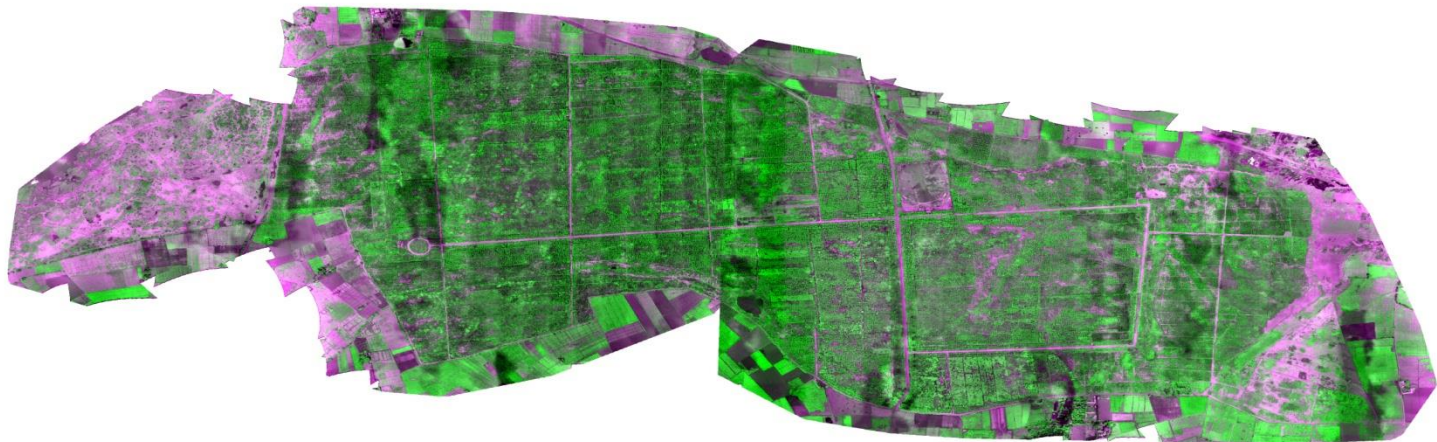


Image Acquisition = Drone Image
Image Acquisition Year = July, 2017
Image Resolution = 13 cm



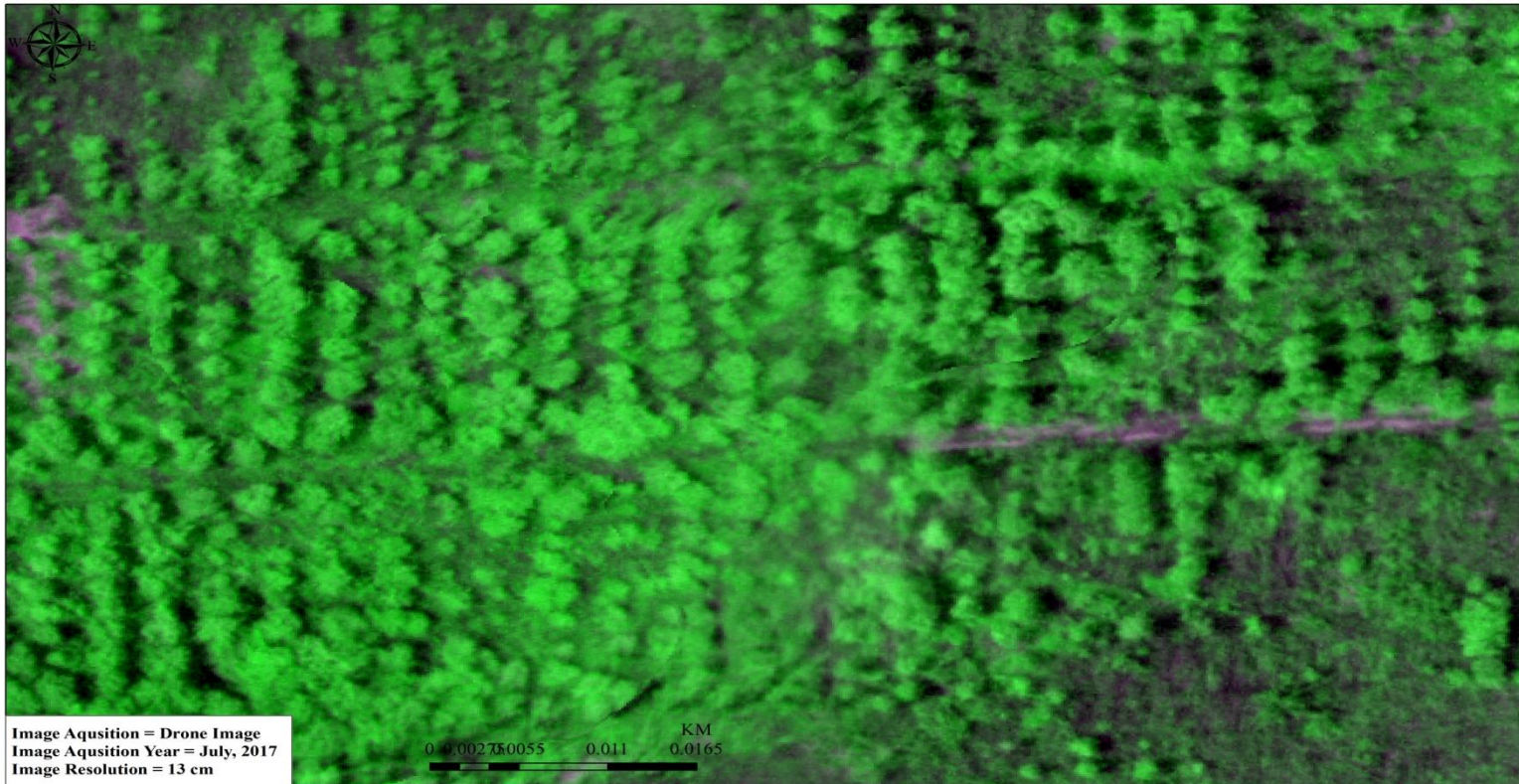
GIS LAB PUNJAB FOREST



MONITORING THROUGH DRONE



SHAHDARA DRONE IMAGE LAHORE FOREST DIVISION



GIS LAB PUNJAB FOREST



IMAGE RESULT



GIS LAB PUNJAB FOREST



THANK YOU



GIS LAB PUNJAB FOREST

