

# Cadmium Precision Mapping of Soil and Cocoa in Dominica using a Geographic Information System (GIS)

Presenter: Mr. Marvin Lewis



Cocoa



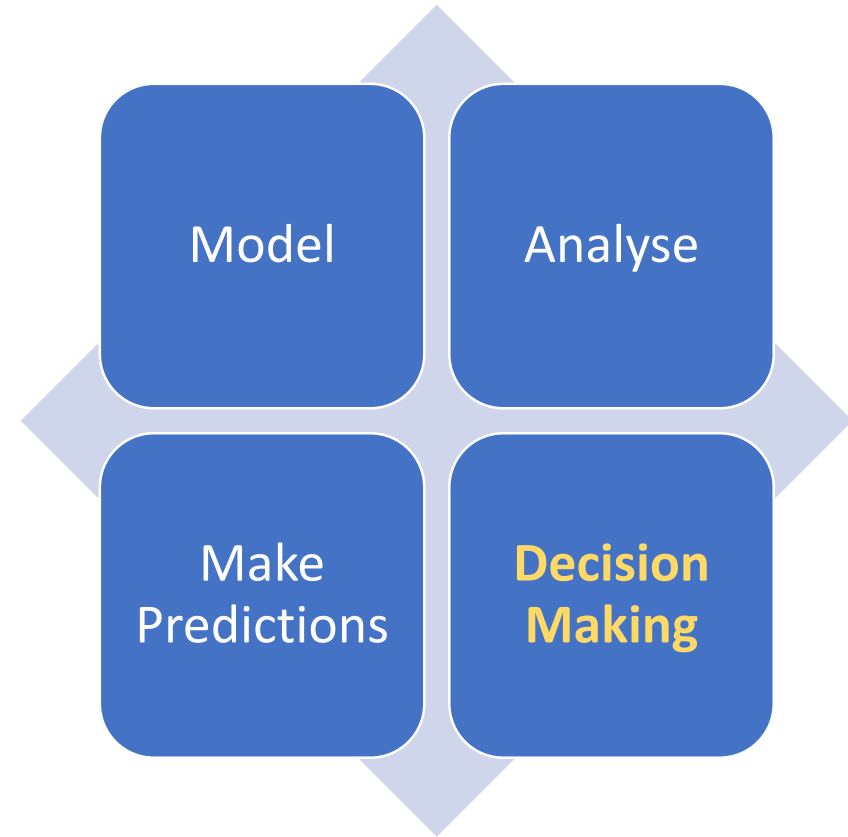
Cluster Development Project  
DOMINICA



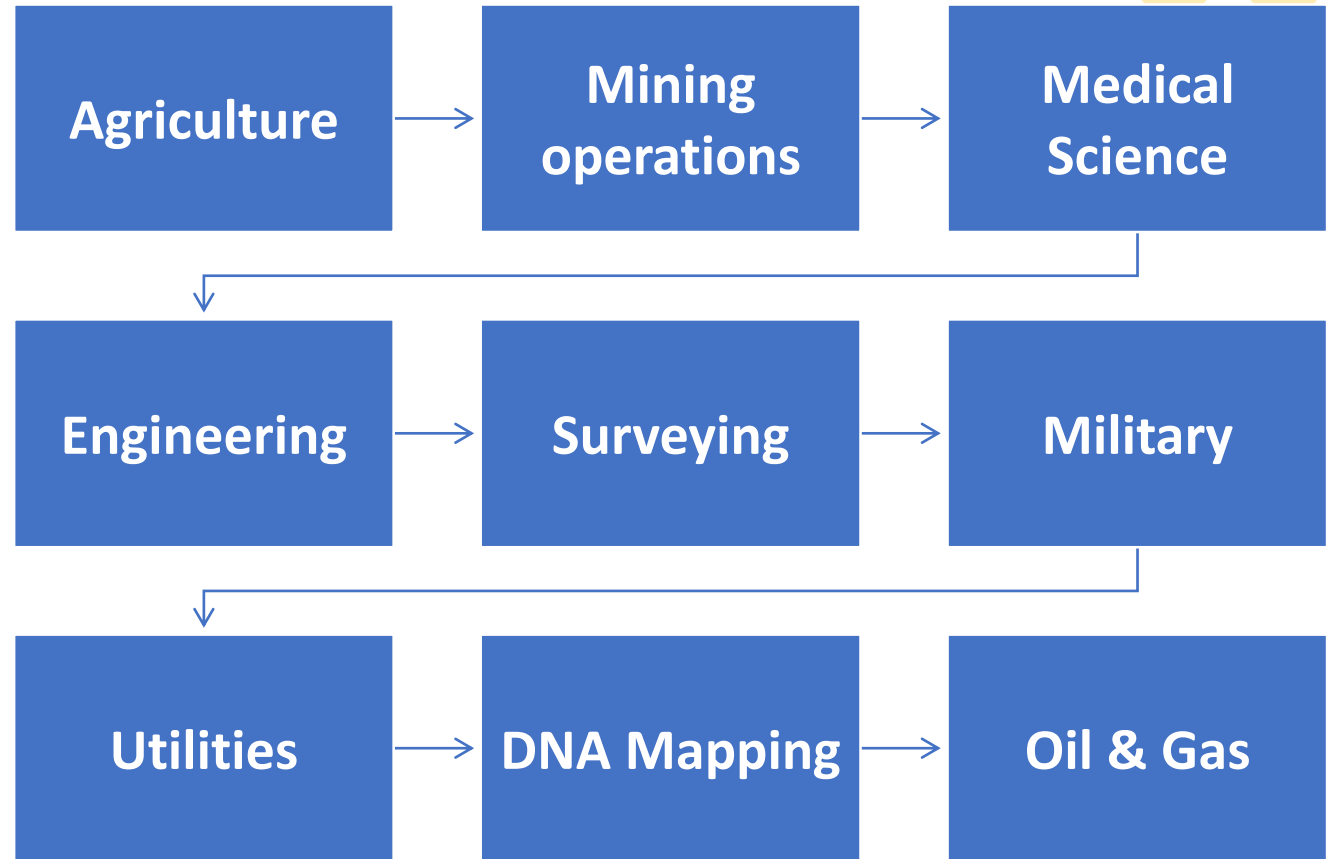
CRC



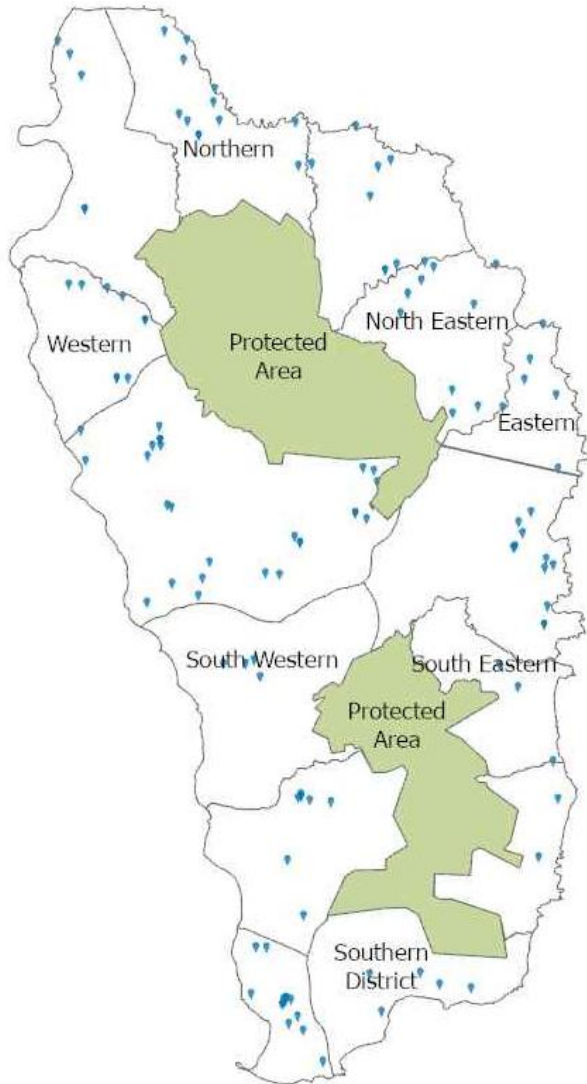
# Geographic Information System (GIS)



# Sectors



# Data Collection



Spatial distribution of samples



1. Soil sampling



2. Cocoa bean sampling



Code	Owner of Holding	Region	Location	Cd-150 mg/kg	pH-300
SR/JP/001	Jefferson Pierre	SR	Morpo	0.20174609	6.2
SR/JD/002	Joan Daniel	SR	Shawford	0.2143017	6.2
SR/AA/003	Alick Athanaze	SR	Morpo	0.24212212	5.9
SR/GD/004	Griffin Defoe	SR	Fond St. Jean	0.15080848	6.3
SR/GJ/005	George Joseph	SR	Stowe	0.4038071	6.9
SR/AS/006	Anastasie Stoute	SR	Stowe	0.45076534	6.7
SR/TL/007	Tarpla Lewis	SR	Soufriere	0.03417781	6.6
SR/JX/008	John Xavier	SR	Soufriere	0.06161517	6.3
SR/CM/009	Clifton Mitchel	SR	Gallion	0.06277481	6.4
SR/AS/010	Allison Seraphine	SR	Soufriere	0.10771705	6.8
SR/SP/011	Simonette Pacquette	SR	Soufriere	0.11750363	7
SR/CC/012	Chariston Charles	SR	Pointe Michel	0.15087299	7
SR/EB/013	Erica Biscombe	SR	Soufriere	0.11152949	6.9
SR/RC/014	Raphael Carbon	SR	Coulibrie	0.23031564	6.9
SR/AC/015	Alphonso Casimir	SR	Pointe Michel	0.08618425	7.1
SR/EL/016	Euvilla Lewis-Noir	SR	Soufriere	0.0476295	6
SR/RA/017	Rhona Armour	SR	Soufriere	0.08957158	6.5
SR/LD/018	Leroy Delsol	SR	Soufriere	0.14280354	6.4

1. Cadmium in Soil Lab Report

ELEMENTS	SOIL ANALYSIS		INTERPRETATION		FERTILIZER SUGGESTIONS
	Lab No.	REF 99 - 8	Value	Code	
Acidity	AA	0.0	0.0	0.0	
Calcium	Ca	0.0	2.0	Ca	0.0
Magnesium	Mg	2.0	4.0	Mg	0.0
Phosphorus	P	0.0	0.0	P	0.0
Sulfur	S	0.0	0.0	S	0.0
Carbon	C	0.0	0.0	C	0.0
Nitrogen	N	0.0	0.0	N	0.0
Potassium	K	0.0	0.0	K	0.0
Sodium	Na	0.0	0.0	Na	0.0
Chloride	Cl	0.0	0.0	Cl	0.0
Iron	Fe	0.0	0.0	Fe	0.0
Zinc	Zn	0.0	0.0	Zn	0.0

2. Soil Fertility Lab Report



Code	A	H	I	AK	AL
	Latitude	Longitude	Cd-150 (mg/kg)	Cs-150 (mg/kg)	
SR/JP/001	15.2144569	-61.33889	0.20175	1.36603	
SR/JD/002	15.238915	-61.356056	0.2143	1.68927	
SR/AA/003	15.23793	-61.3553789	0.24212	1.05304	
SR/GD/004	15.239	-61.353054	0.15081	0.68991	
SR/GJ/005	15.232314	-61.349952	0.40381	1.41979	
SR/AS/006	15.247829	-61.293201	0.45077	1.40676	
SR/TL/007	15.229182	-61.3534709	0.03418	0.71771	
SR/JX/008	15.24044	-61.369224	0.06162	0.83222	
SR/CM/009	15.236774	-61.3564659	0.06277	4.1116	
SR/AS/010	15.239699	-61.35508	0.10772	0.77698	
SR/AS/010 dup	15.239699	-61.35508	0.10588	0.76663	
SR/SP/011	15.259524	-61.363799	0.1175	1.53249	
SR/CC/012	15.25951	-61.368082	0.15087	0.92241	
SR/EB/013	15.246826	-61.280386	0.11153	0.80645	
SR/RC/014	15.252124	-61.3012	0.23032	1.31428	
SR/AC/015	15.250753	-61.321671	0.08618	0.52597	
SR/EL/016	15.23677400	-61.35646590	0.04763	0.96459	

3. Cadmium in Beans Lab Report

# Mapping Process

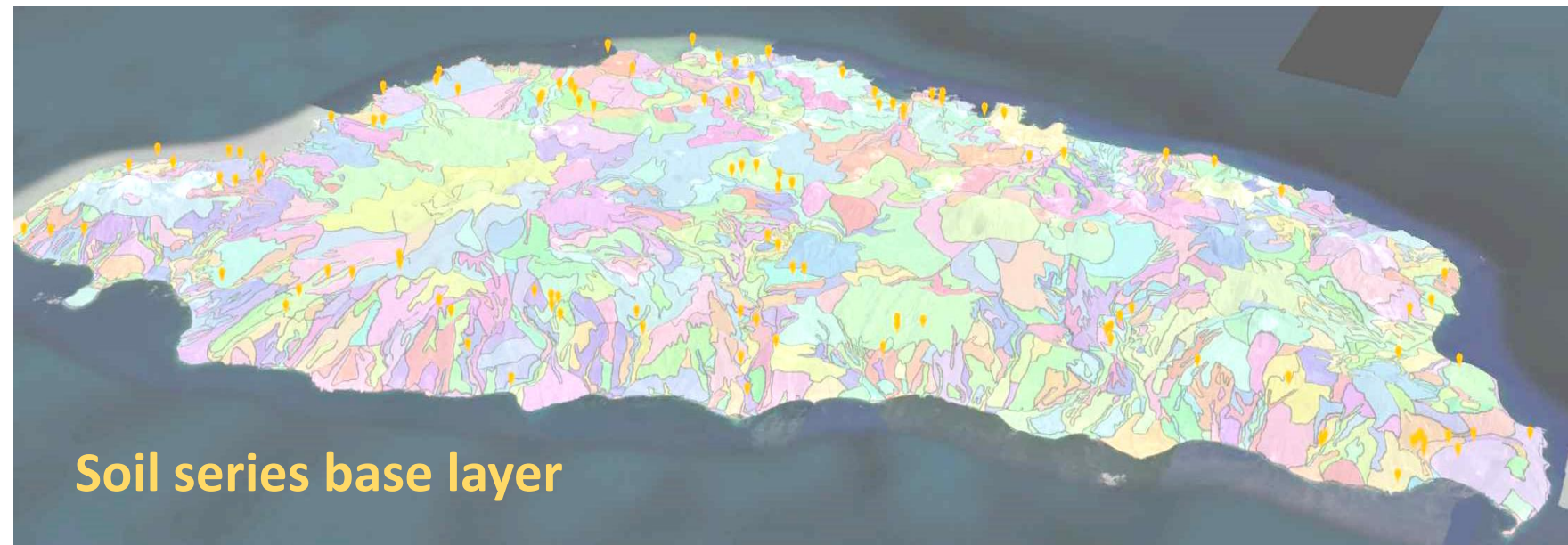
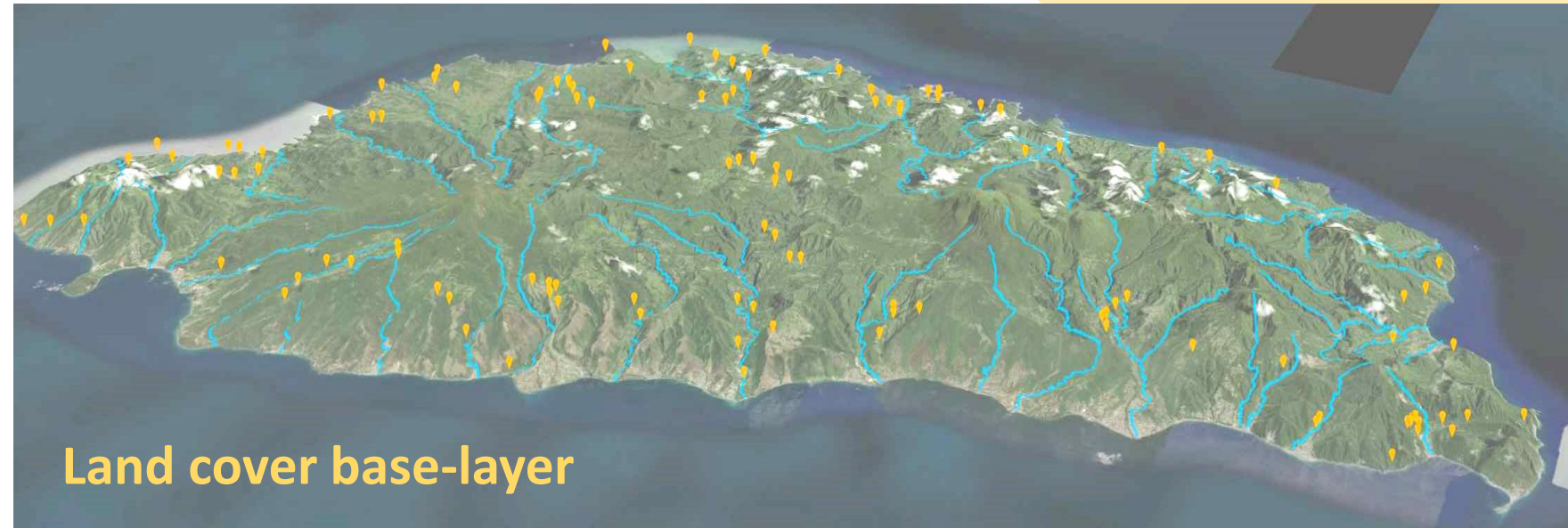
ArcGIS Pro

Model

Analyse

Make Predictions

Decision Making



# Mapping Process

ArcGIS Pro

**1. Cadmium Soil**

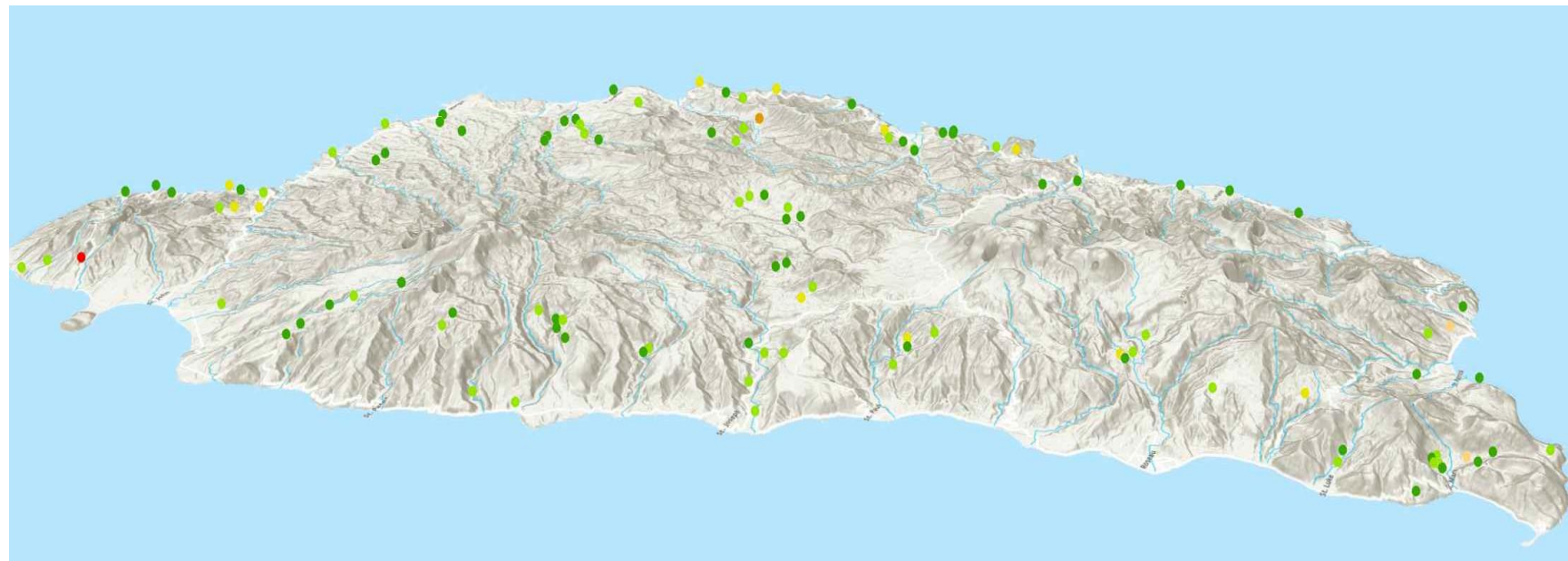
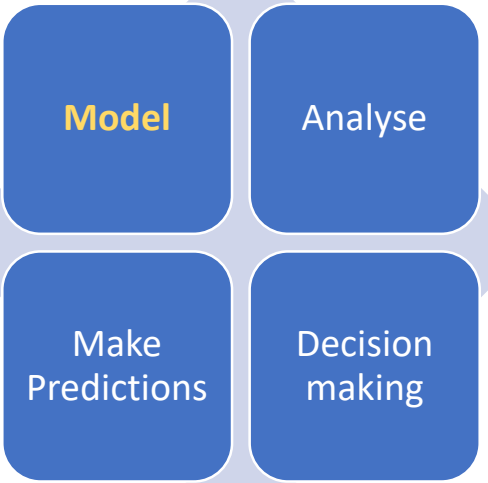
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SR/EB/013	Erica Biscombe	SR	Soufriere	0.11152949	6.9
SR/RC/014	Raphael Carbon	SR	Soufriere	0.23031964	6.9
SR/AC/015	Alphonso Casimir	SR	Soufriere	0.08618425	7.1
SR/EL/016	Rhona Armour	SR	Soufriere	0.04762295	6
SR/RA/017	Rhona Armour	SR	Soufriere	0.08957158	6.5
SR/LD/018	Leroy Delsol	SR	Soufriere	0.14280354	6.4

**2. Soil Fertility**

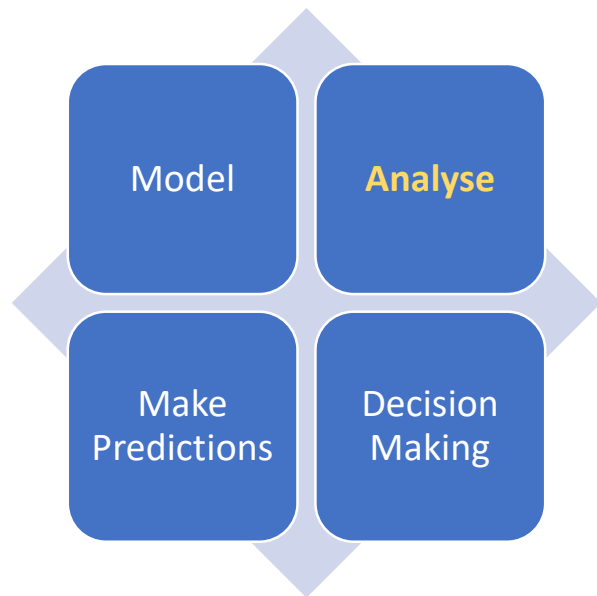
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SR/AC/015	15.250753	-61.321671	0.08618	0.52597
SR/EL/016	15.23677400	-61.35646590	0.04763	0.96459

Soil data

Bean data



# Analysing Relationships

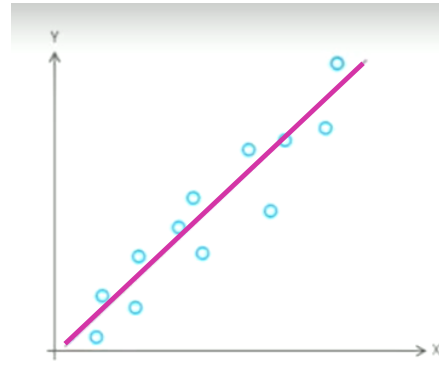


Explore correlations

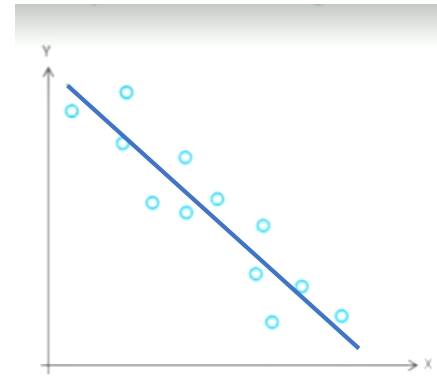


Understand key factors

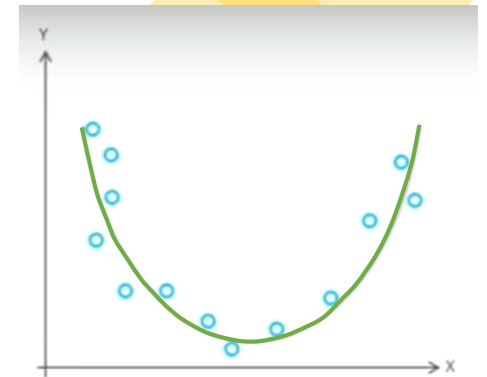
# Exploring Correlations



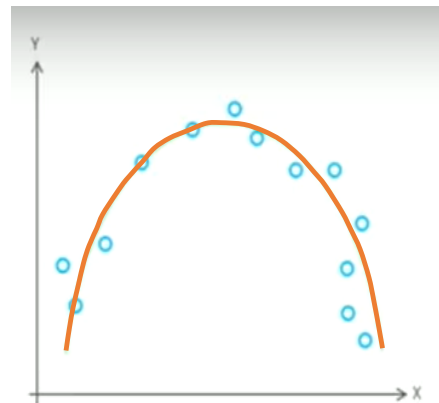
Positive Linear



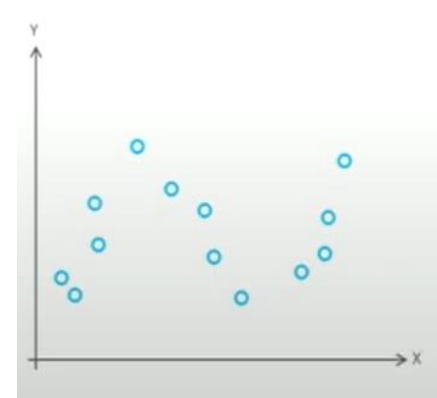
Negative Linear



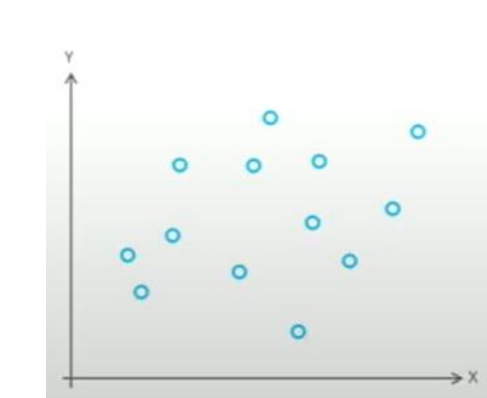
Convex



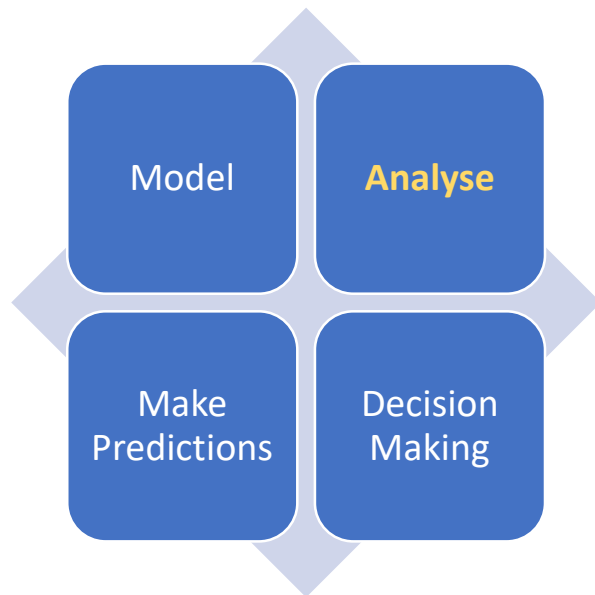
Concave



Undefined Complex



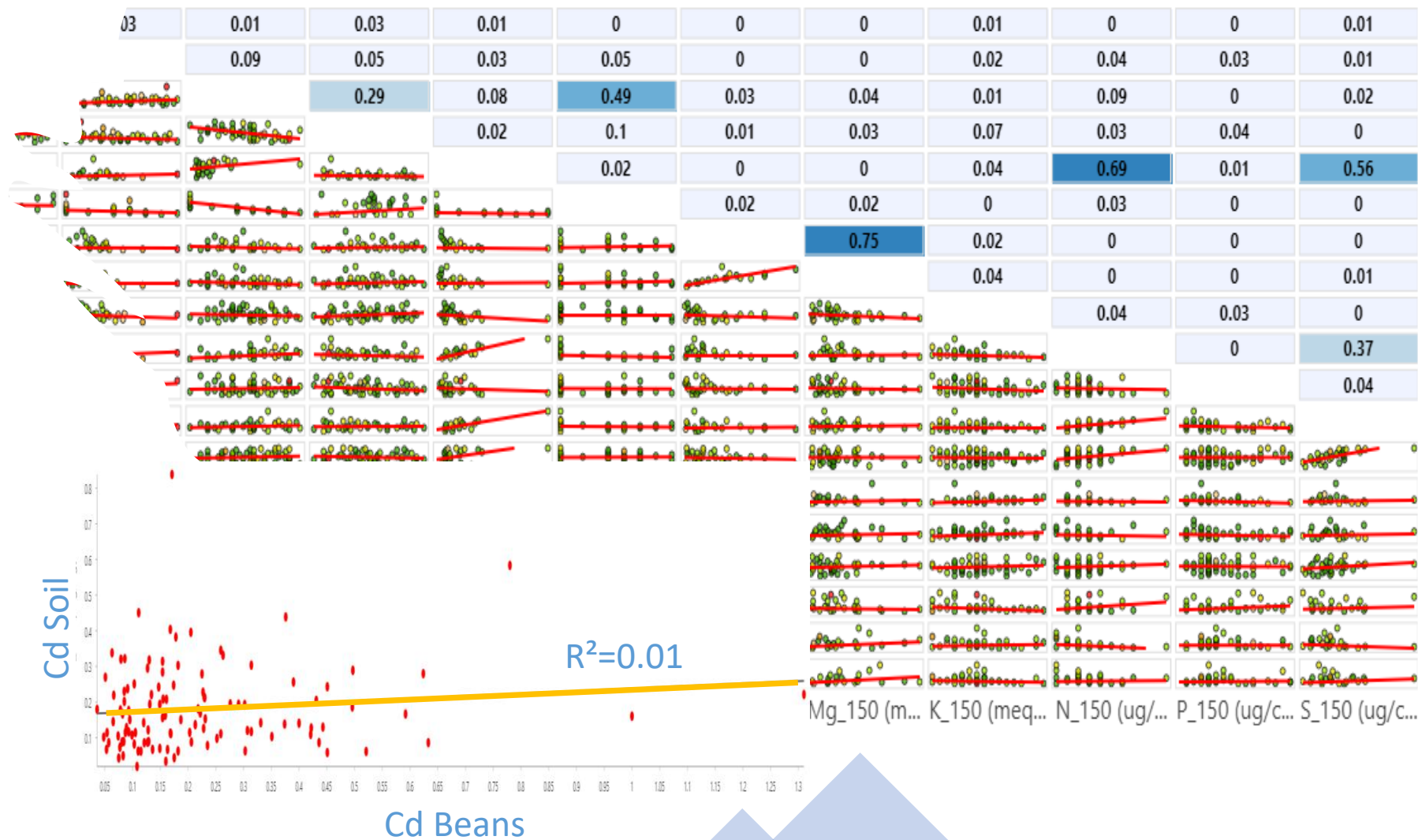
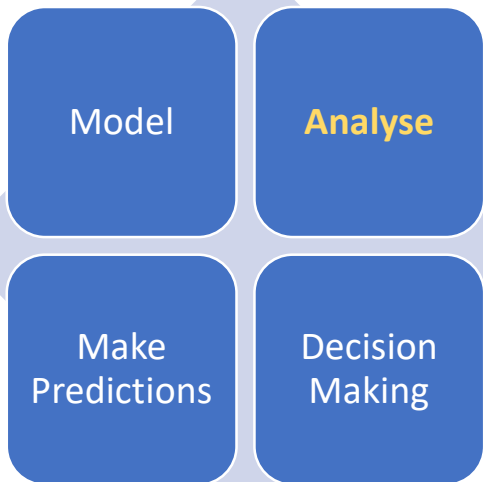
Not Significant





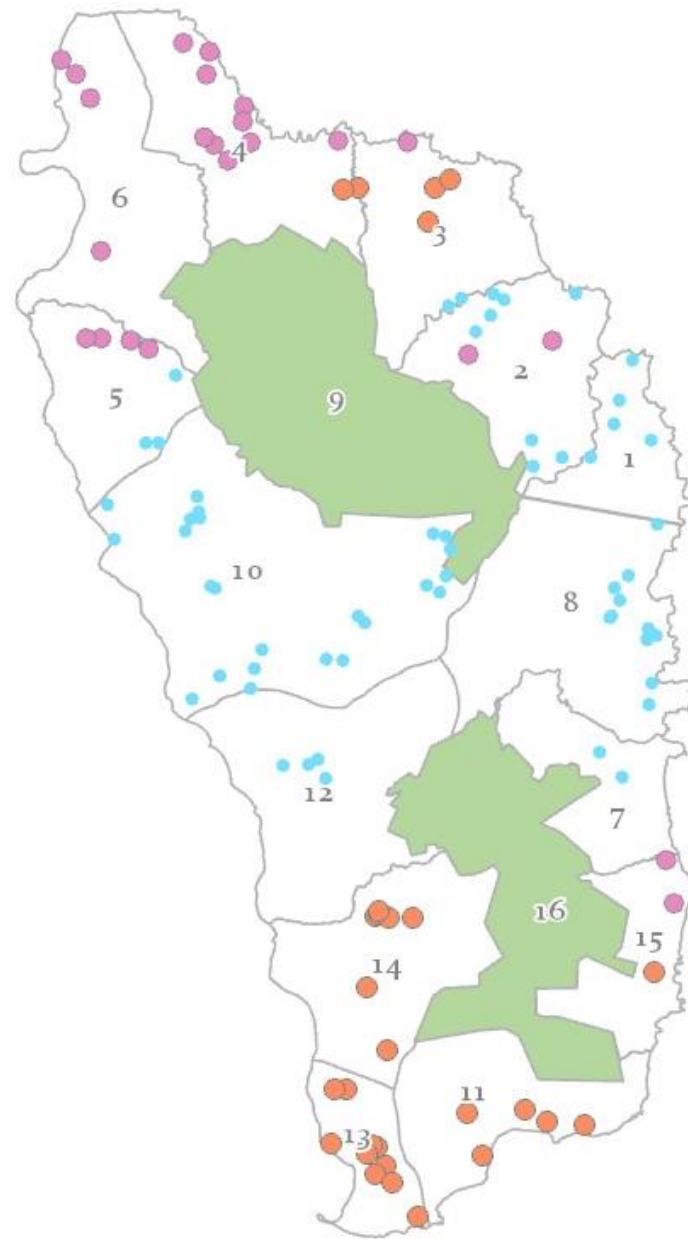
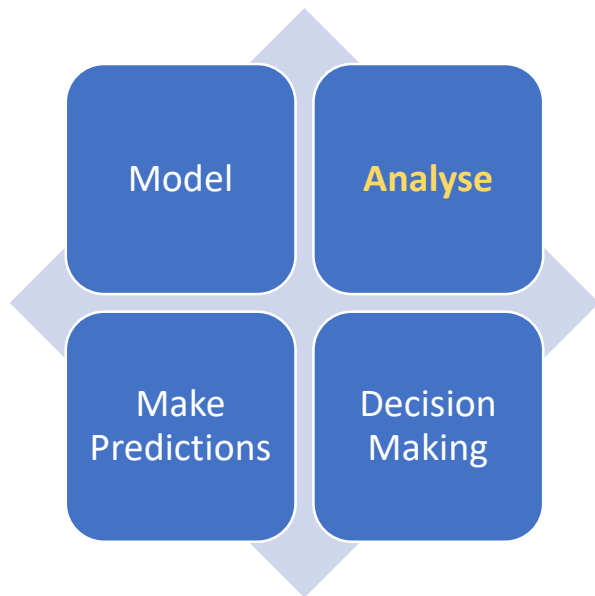
# Analysis

## Scatterplot Matrix



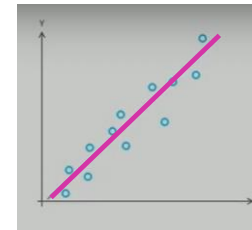
# Mapping Relationships

Local bivariate relationship model

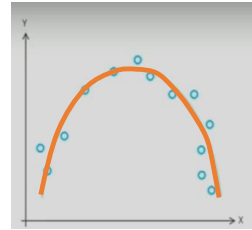


**Cadmium in soil vs Zinc in soil**

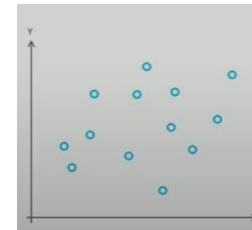
## Type of Relationships



● Positive Linear



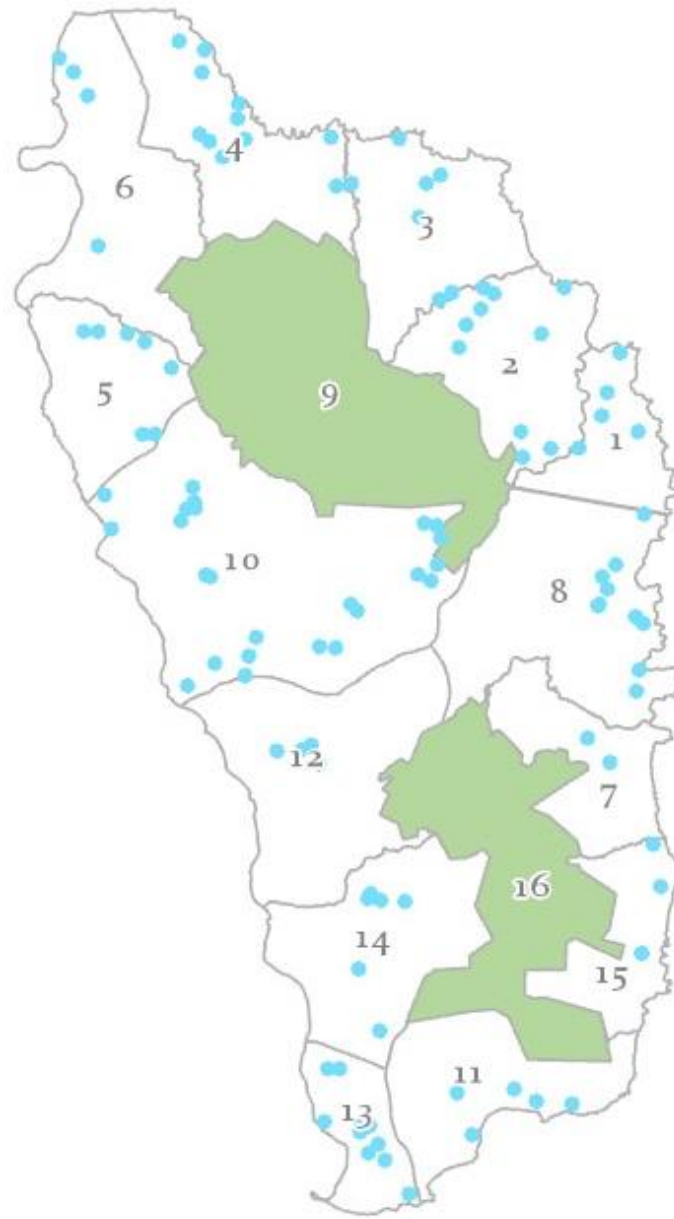
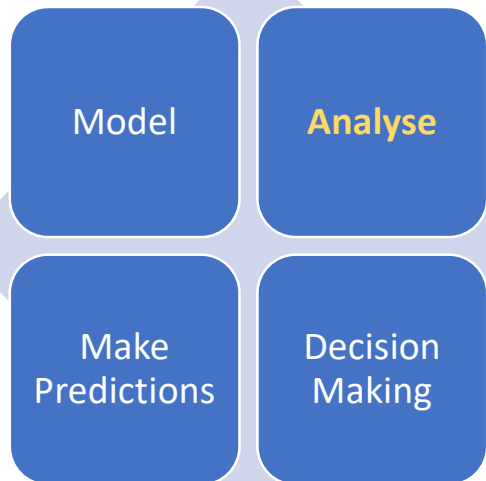
● Concave



● Not significant

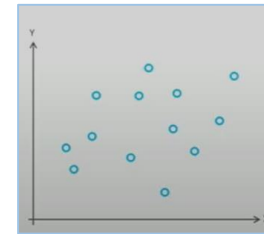
# Mapping Relationships

Local bivariate relationship model



**Cadmium in bean vs cadmium in soil**

## Type of Relationships

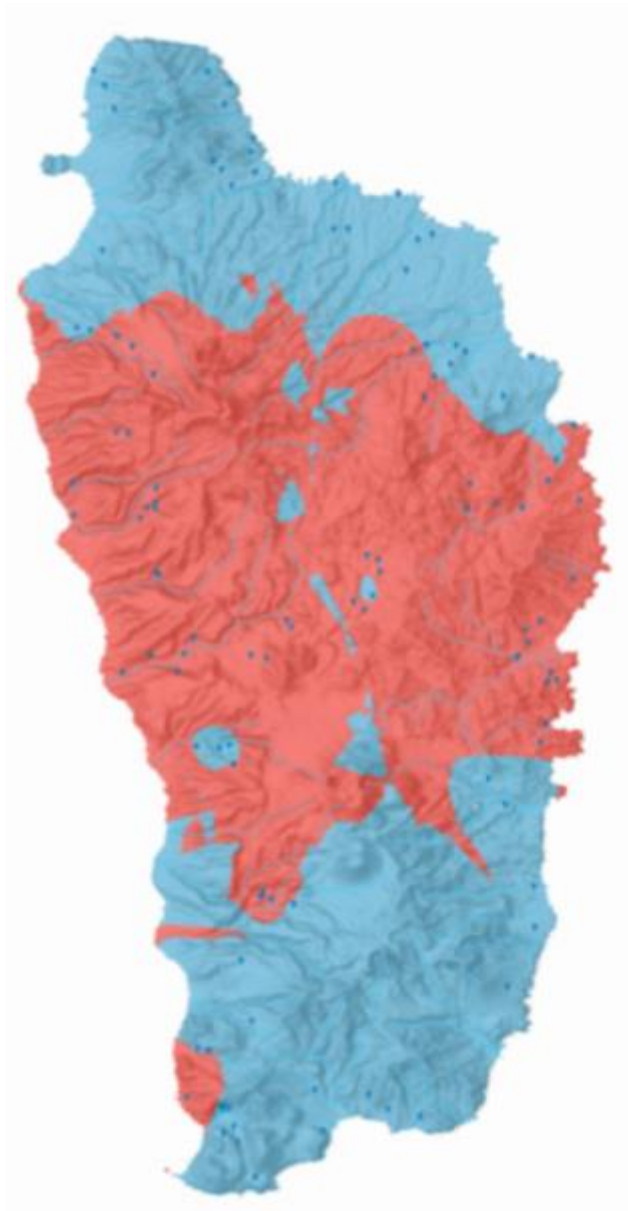
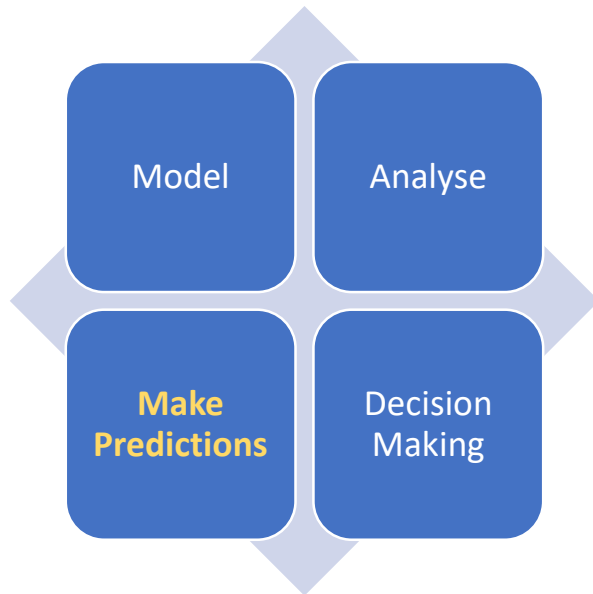


● Not significant

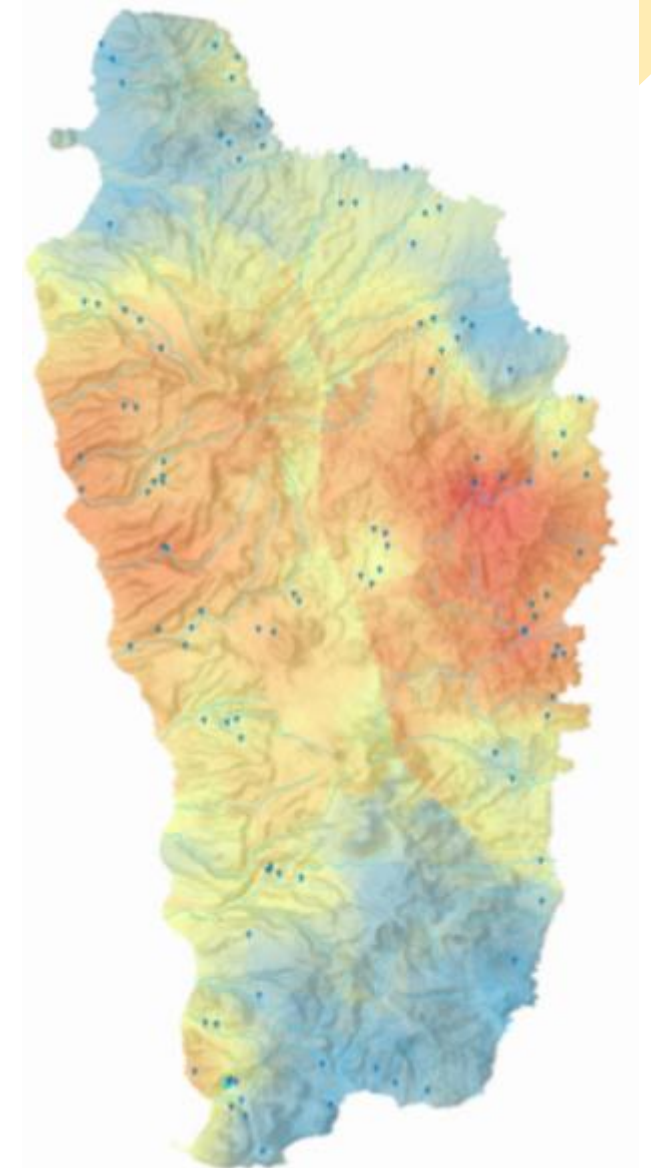
# Making Predictions

Kriging interpolation method

- Same data used for both maps
- Number of data classes varied

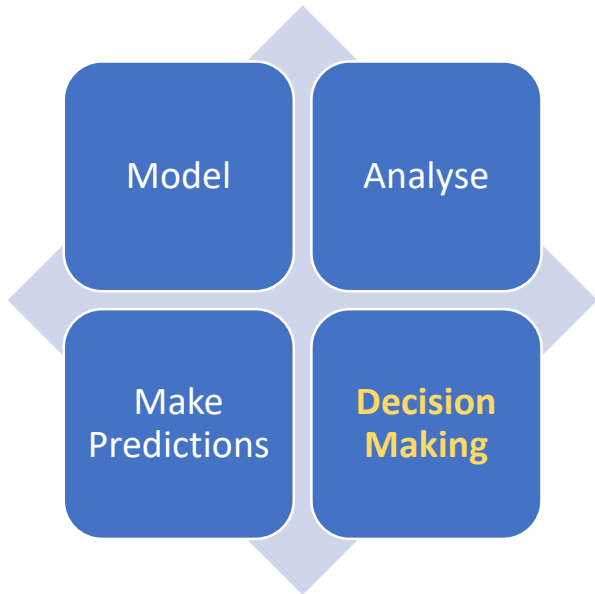


Data divided into **2** classes of cadmium in beans



Data divided into **32** classes of cadmium in beans

# Decision Making



**Efficiency**



**Effectiveness**

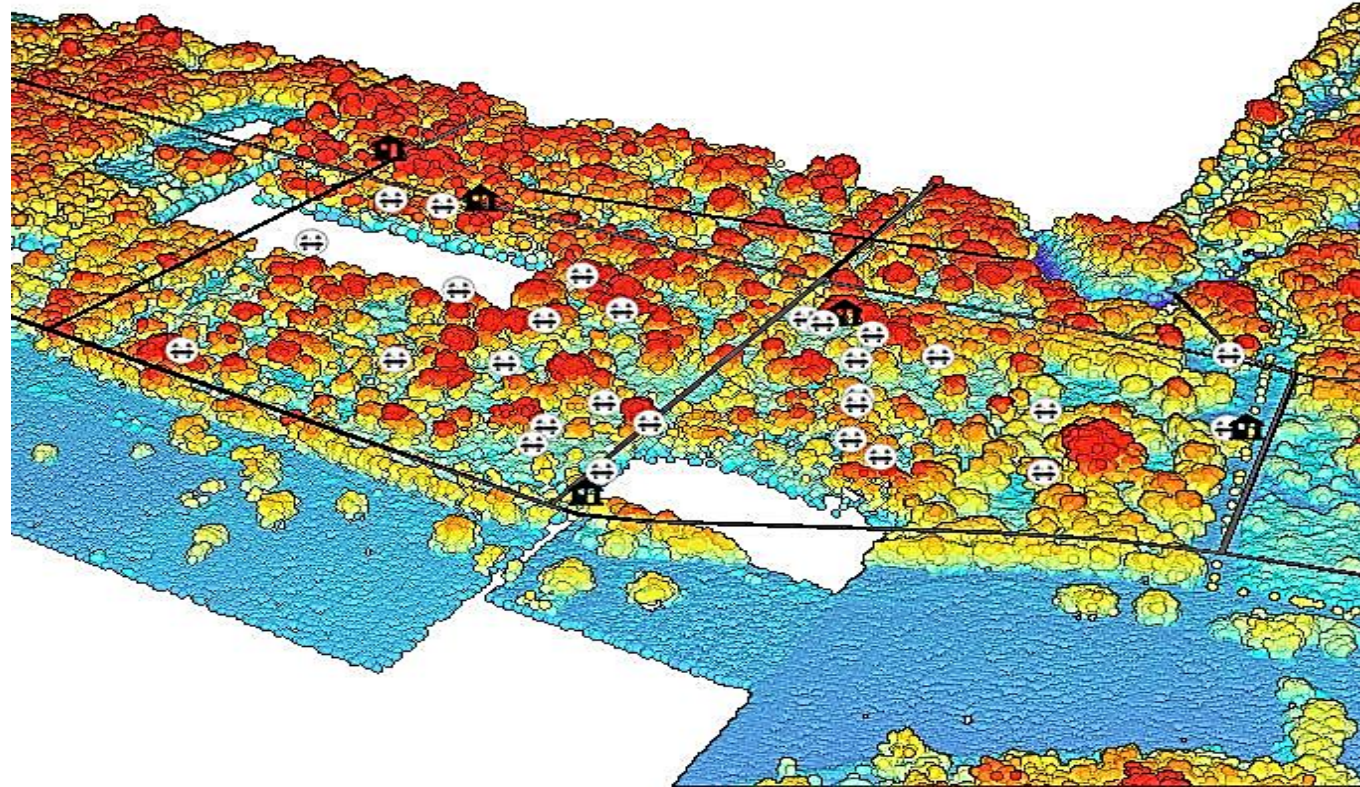


**Cost**

# Remote Sensing

Multispectral, Thermal,  
RGB, LIDAR point cloud data

- Satellite imagery
- Airborne laser scanning
- Drone mapping imagery



# Cadmium Precision Mapping of Soil and Cocoa in Dominica using a Geographic Information System (GIS)

## Thank You



Cocoa



Cluster Development Project  
DOMINICA



IDB   Canada



CRC

