

Agri-tech Cornwall Soil Carbon Project

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How much organic carbon is there in my soil?

- Lab analysis usually used to determine soil Carbon
- What is the most efficient way to carry out this sampling to give an accurate value for soil Carbon?
- Some of the questions we are asking are:



How often do I need to sample to detect any change in soil carbon over time?

How many soil samples do I need to collect to accurately measure soil carbon?

What time of year should I collect soil samples?

Will soil carbon concentration be the same across a field?

How do I decide where in my fields to collect samples from?

How accurate will the soil carbon final figure be?



The Answers to these questions will vary from site to site and depend on many factors including:

The soil type



Topography

Land use type



Climate



Grazing practices / livestock movements

Field size



Historical management practices



Landscape features, e.g. rivers

Fertiliser use



Ploughing Frequency

The Project – How to accurately test for soil Carbon

Step 1 : Farmer survey

Gain as much information about land management /characteristics as possible



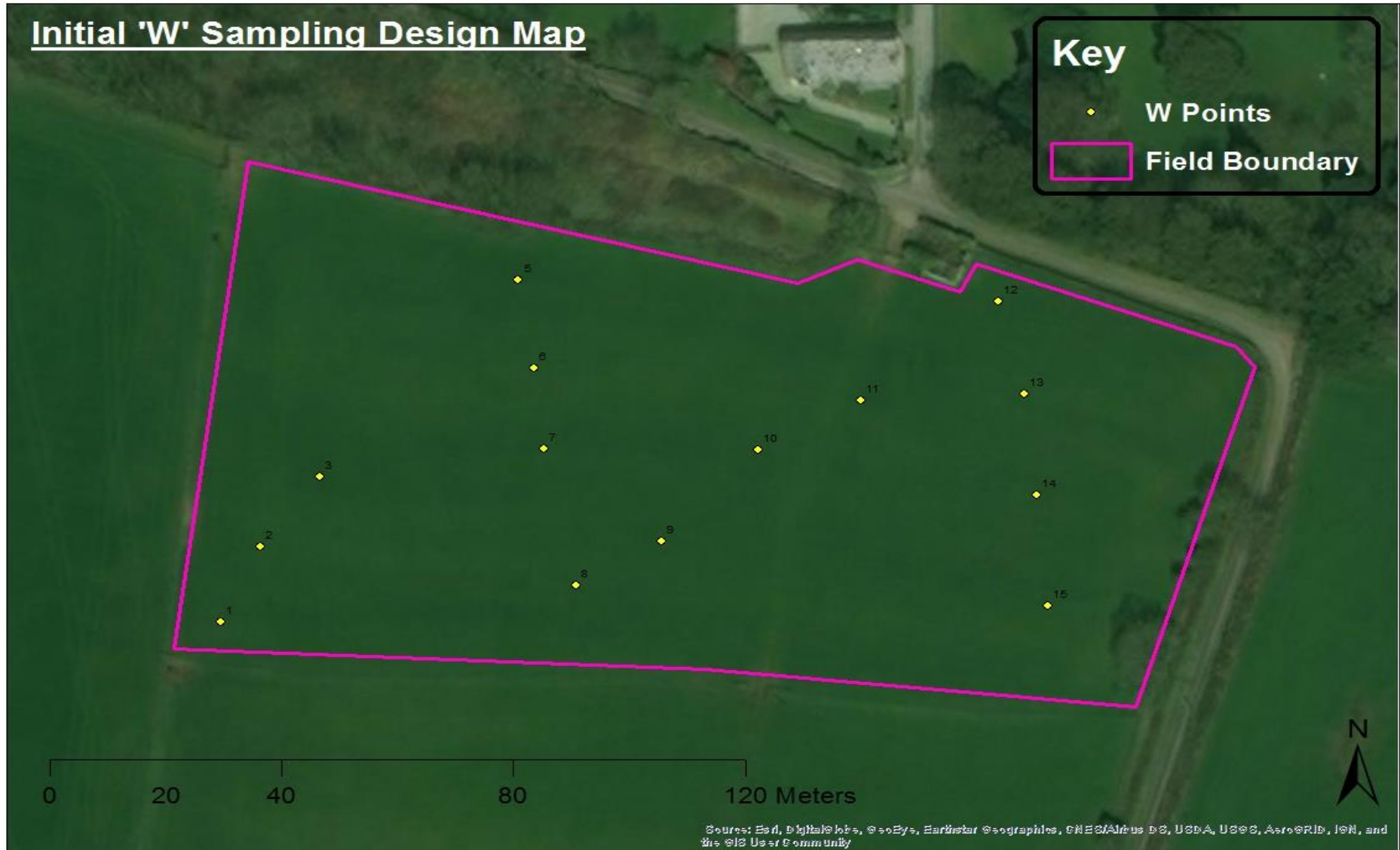
ROTHAMSTED
RESEARCH

Step 2 : Initial Field Sampling



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RESEARCH

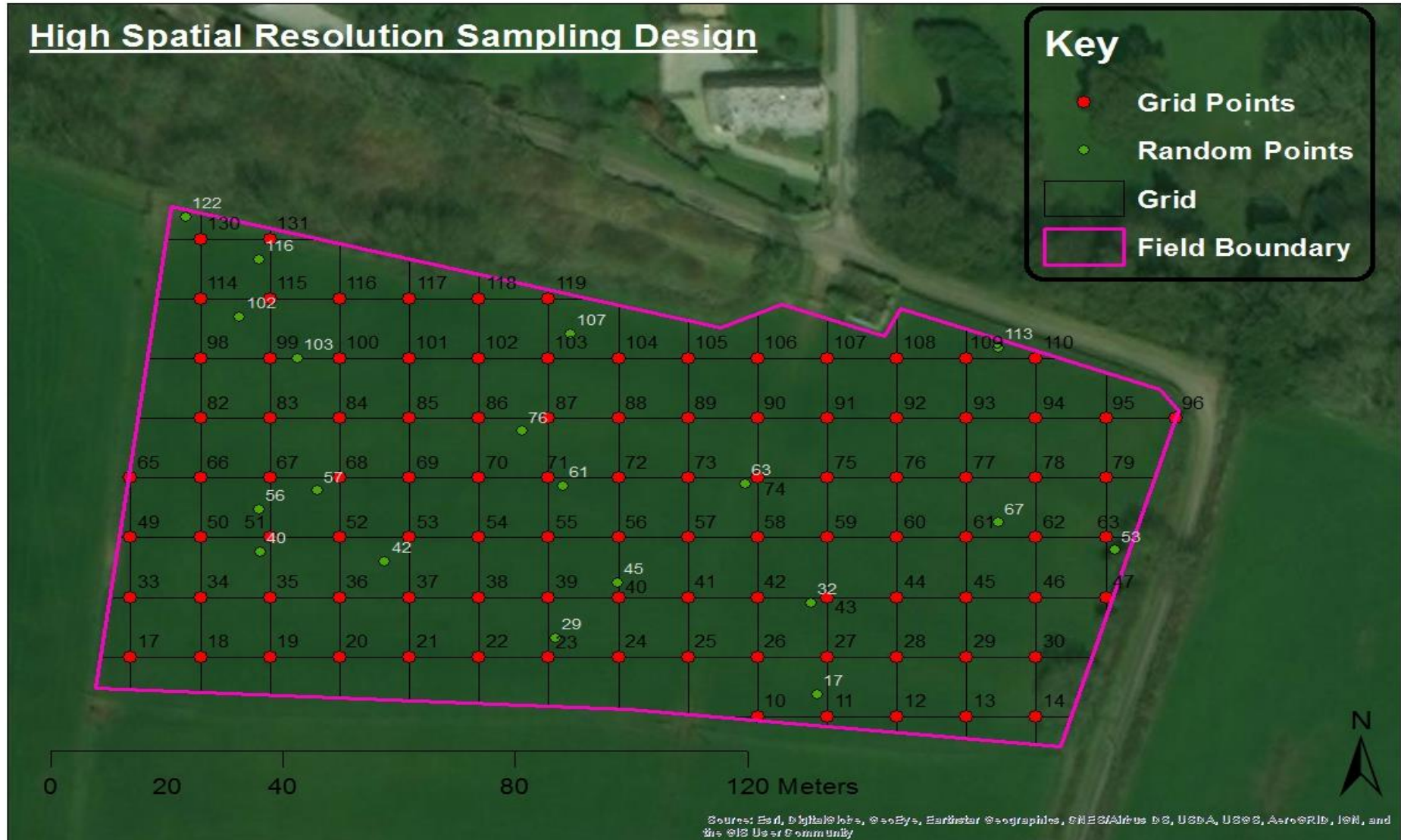
Carry out initial field sampling (15 point W's) to get an indication of soil Carbon variation at field scale level





Step 3 : More intensive field sampling

Carry out high spatial resolution sampling in selected fields (80+ points per field)



Step 4 : Linking field sampling to survey data

Use statistical analysis to determine what is causing differences in soil Carbon within a field

Types of Data included analysis:

- Soil Carbon samples
- Farmer Survey
- Environmental Factors



High Spatial Resolution Sampling Design

Elevation Map

Key

● Grid Points

● Random Points

Grid

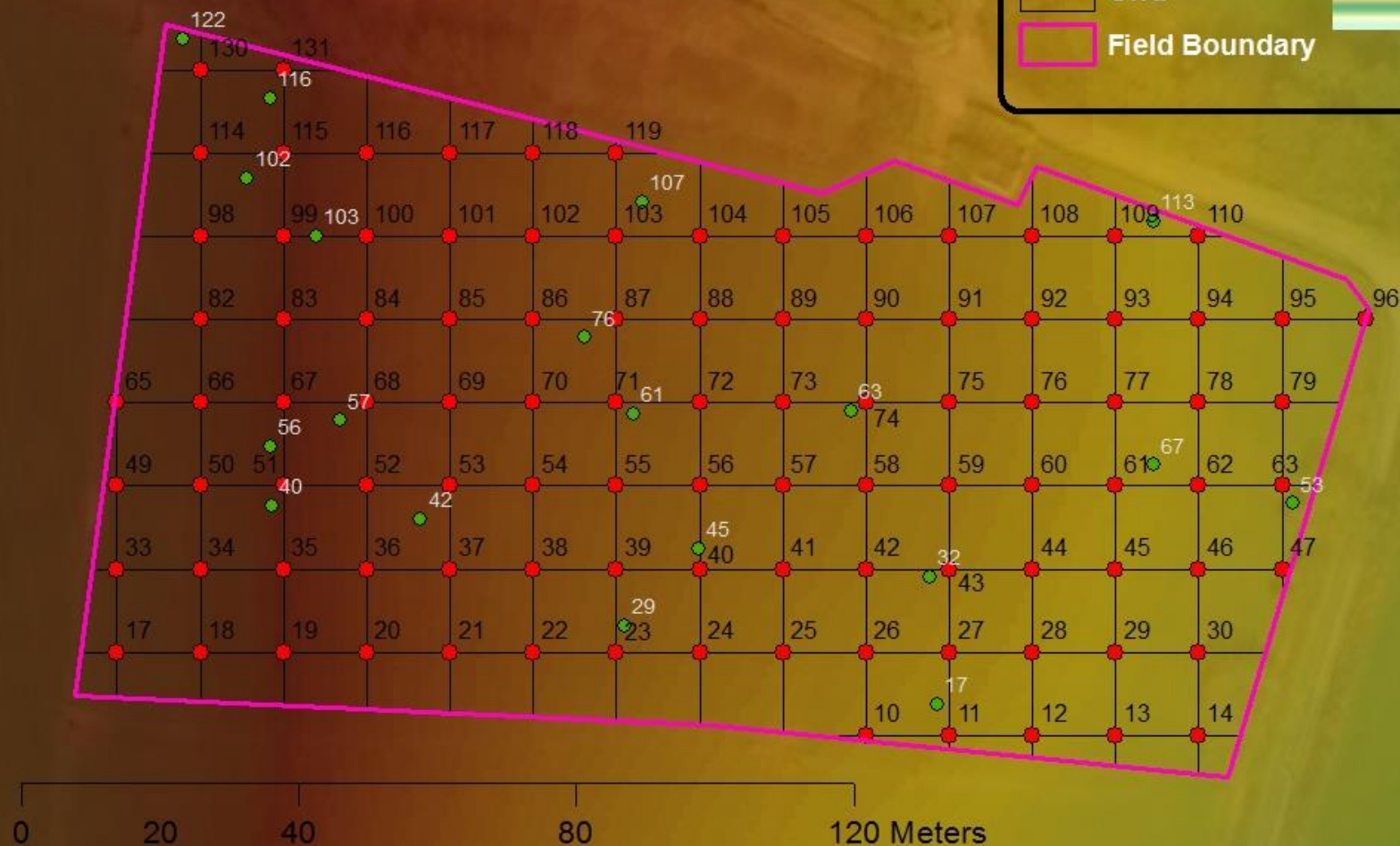
Field Boundary

Elevation (m)

Value

High : 188

Low : 80

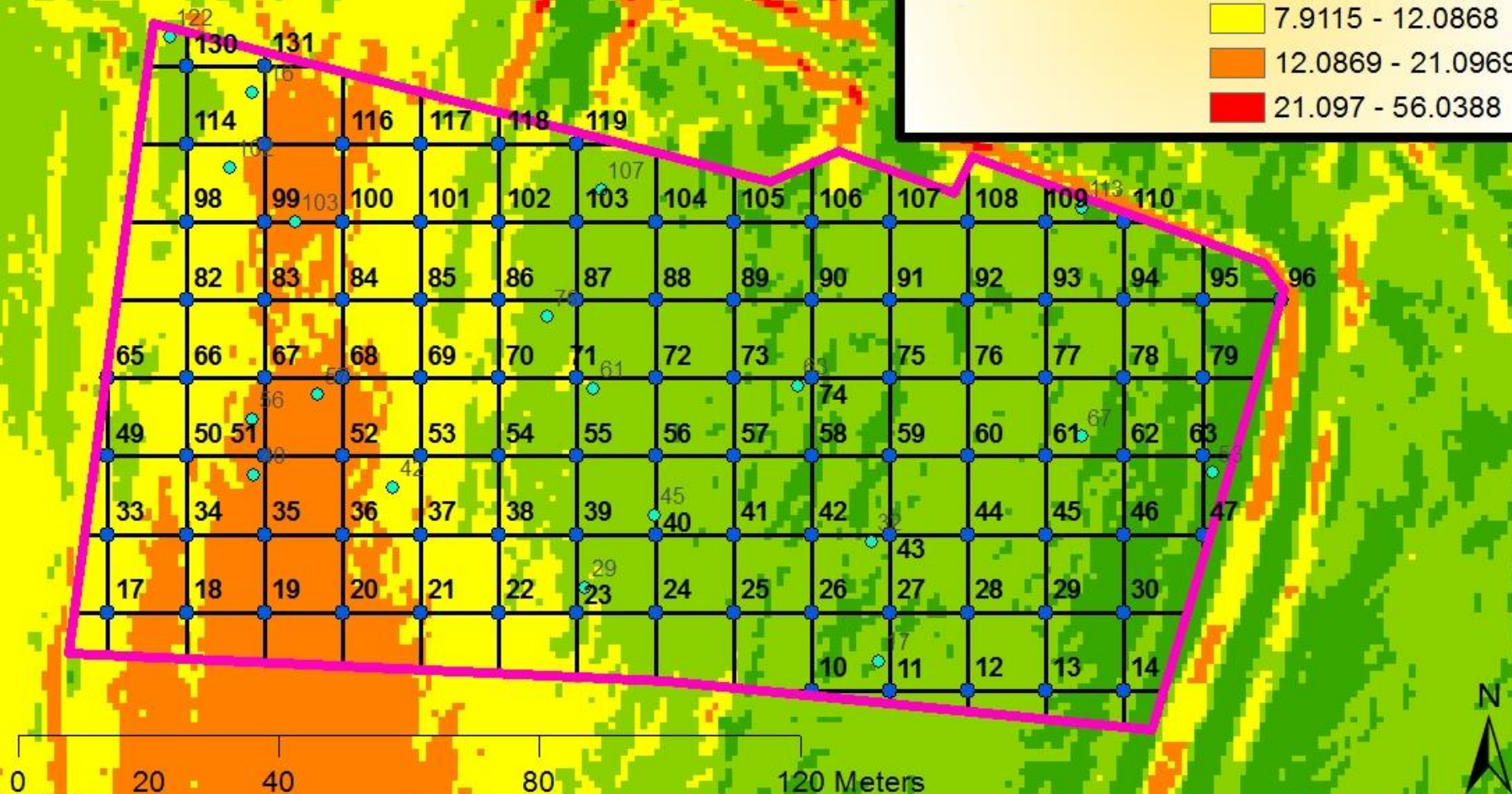


High Spatial Resolution Sampling Design

Slope Map

Key

- | | |
|------------------|-------------------|
| ● Grid Points | Slope (degrees) |
| ● Random Points | <VALUE> |
| □ Grid | 0 - 4.615 |
| □ Field Boundary | 4.6151 - 7.9114 |
| | 7.9115 - 12.0868 |
| | 12.0869 - 21.0969 |
| | 21.097 - 56.0388 |



Sources: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Step 5 : Design and test an 'Ideal' sampling strategy maximise accuracy of findings

- Identify the optimal number and location of soil sampling points and the frequency of sampling needed to accurately determine soil carbon
- 'Ideal' strategy will be compared to current W sampling practices



'Ideal' Sampling Design

Key

• Grid Points

Grid

Field Boundary

0 20 40 80 120 Meters



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

'Ideal' Sampling Design

Slope Map

Key

● Grid Points

□ Grid

□ Field Boundary

Slope

<VALUE>

0 - 4.615

4.6151 - 7.9114

7.9115 - 12.0868

12.0869 - 21.0969

21.097 - 56.0388

0 20 40 80 120 Meters



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Sampling Design Outcomes

- Low Variability – ‘Ideal’ sampling design may not be any different to a W
- High variability - ‘Ideal’ sampling design will capture the variability and be more representative than a W
- Very High variability – High-resolution grid is the only way to get accurate representation – this isn’t practical - so standard W could be used but with high uncertainty

Step 6 : Repeat sampling in different years / at different times of year

- Identify the best time of year to sample soil carbon
- Different Crop type/Land use also taken into account



Benefits

- Indication on best land management practice
- Possible reduction in inputs
- Possible indication for crop suitability
- Potential for payment under new agricultural
Payment Schemes



Thank you

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