

Yield Monitoring



Yield Monitoring

Yield monitoring is the process of continuously recording the grain mass flow through the combine and integrating it with location and grain moisture information.

Types of Yield Monitors

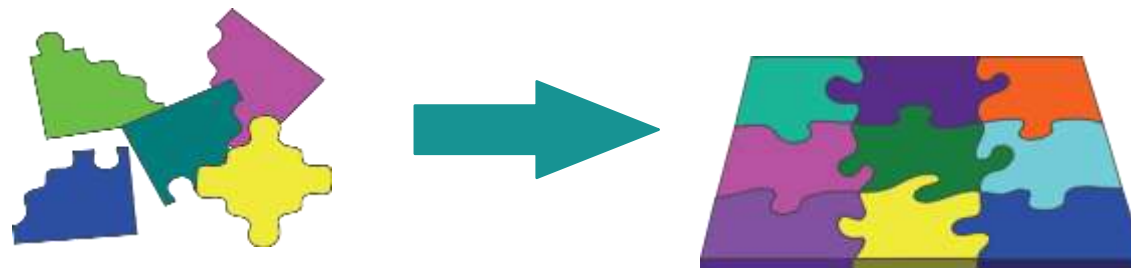
- Grain
 - ◆ Wheat, Soybean, Corn, Barley, etc.
- Non-Grain
 - ◆ Potatoes, Carrots
 - ◆ Tomatoes, Grapes, Strawberries
 - ◆ Cotton, Forage crops



Yield Map



- Yield
- Location
- DGPS

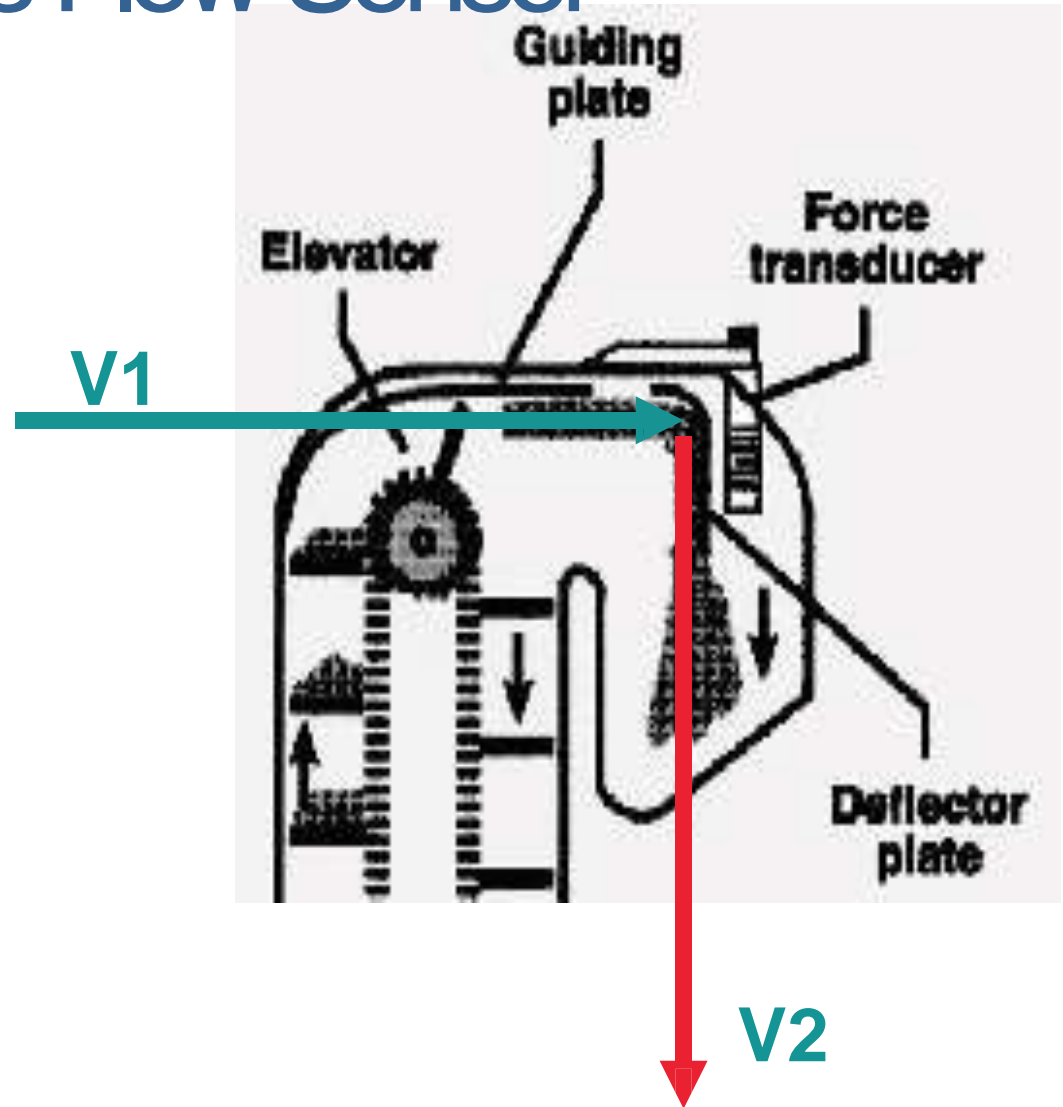


What Do We Need to Know to Determine the Crop Yield?

- Grain flow rate through the combine
- Area covered

$$Yield = \frac{Mass/volume}{Area}$$

Impact Type Mass Flow Sensor

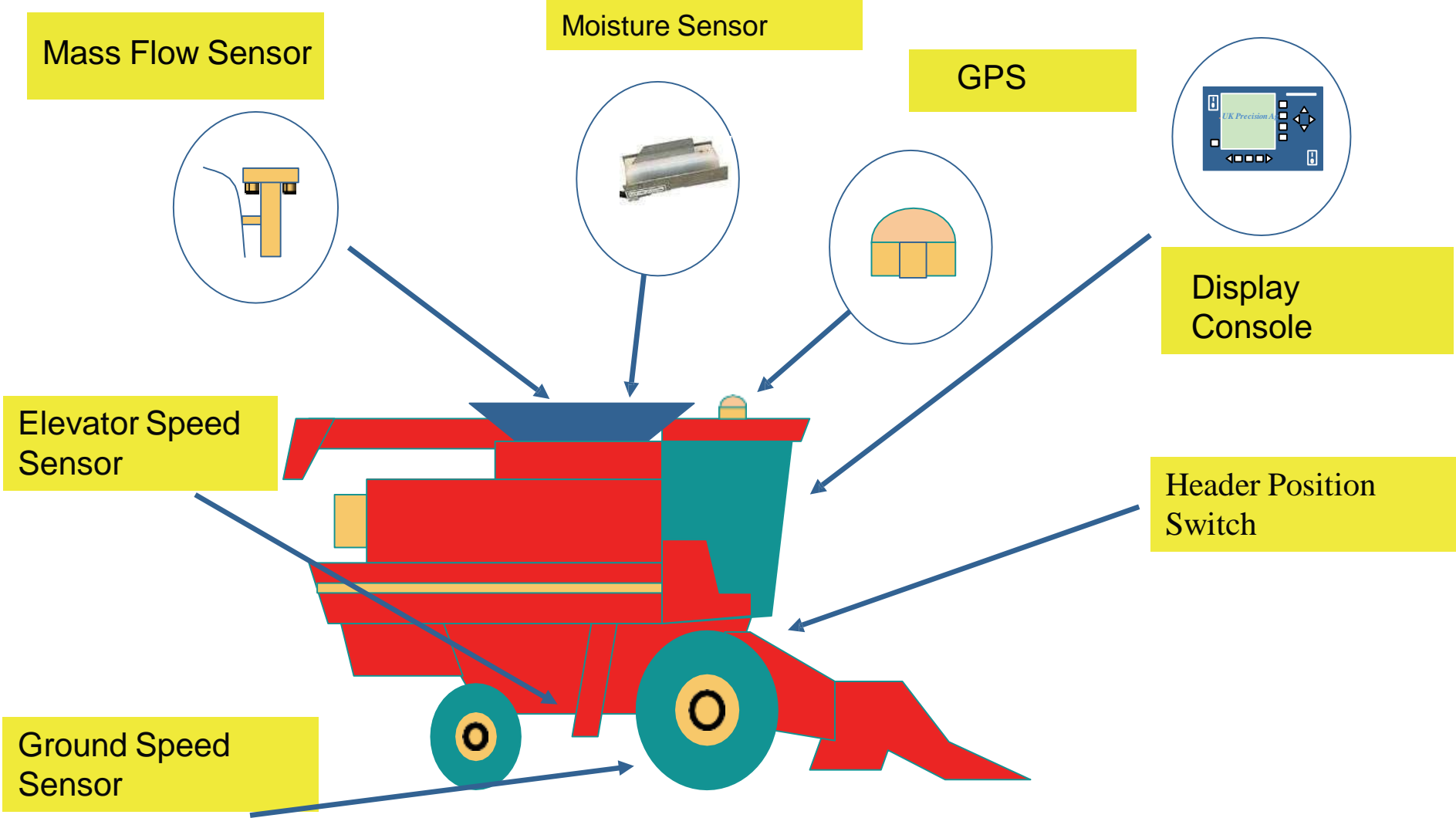


$$\frac{\text{Force} \times (T2 - T1)}{V2 - V1} = \text{Mass}$$

$$-\frac{V2}{V1} = e$$

■ **e depends on crops**

Components of A Yield Monitor



Carrot Yield Monitor



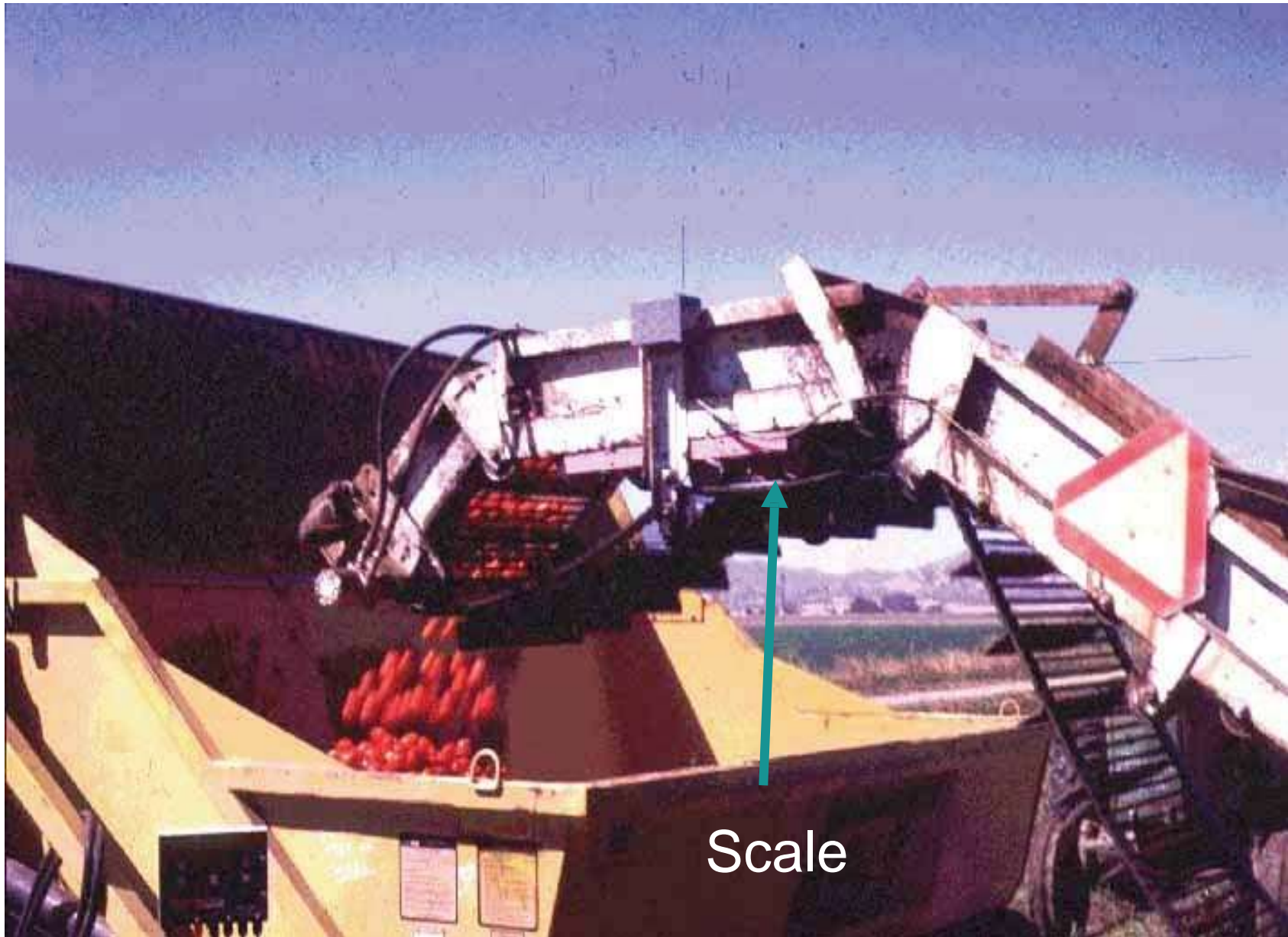
■ *Weigh roller*

Yield Monitor for Grape Harvester



Profile Yield Sensor Array

Tomato Yield Monitor



Citrus Mechanical Harvesters

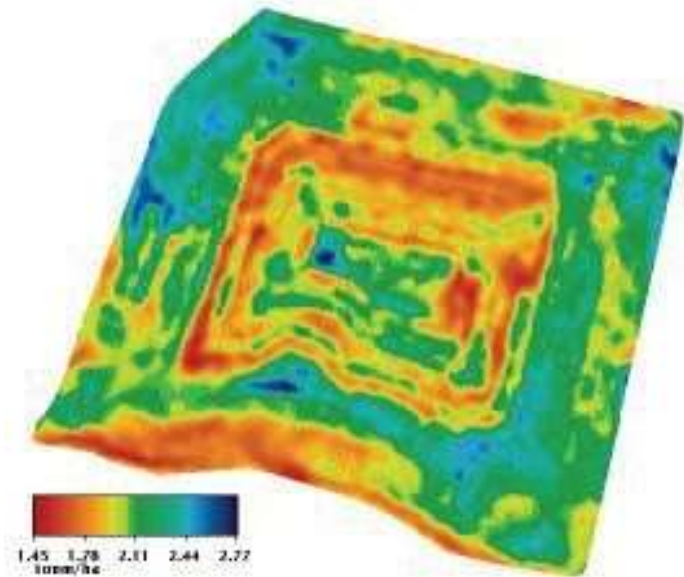


Continuous Canopy Shaker

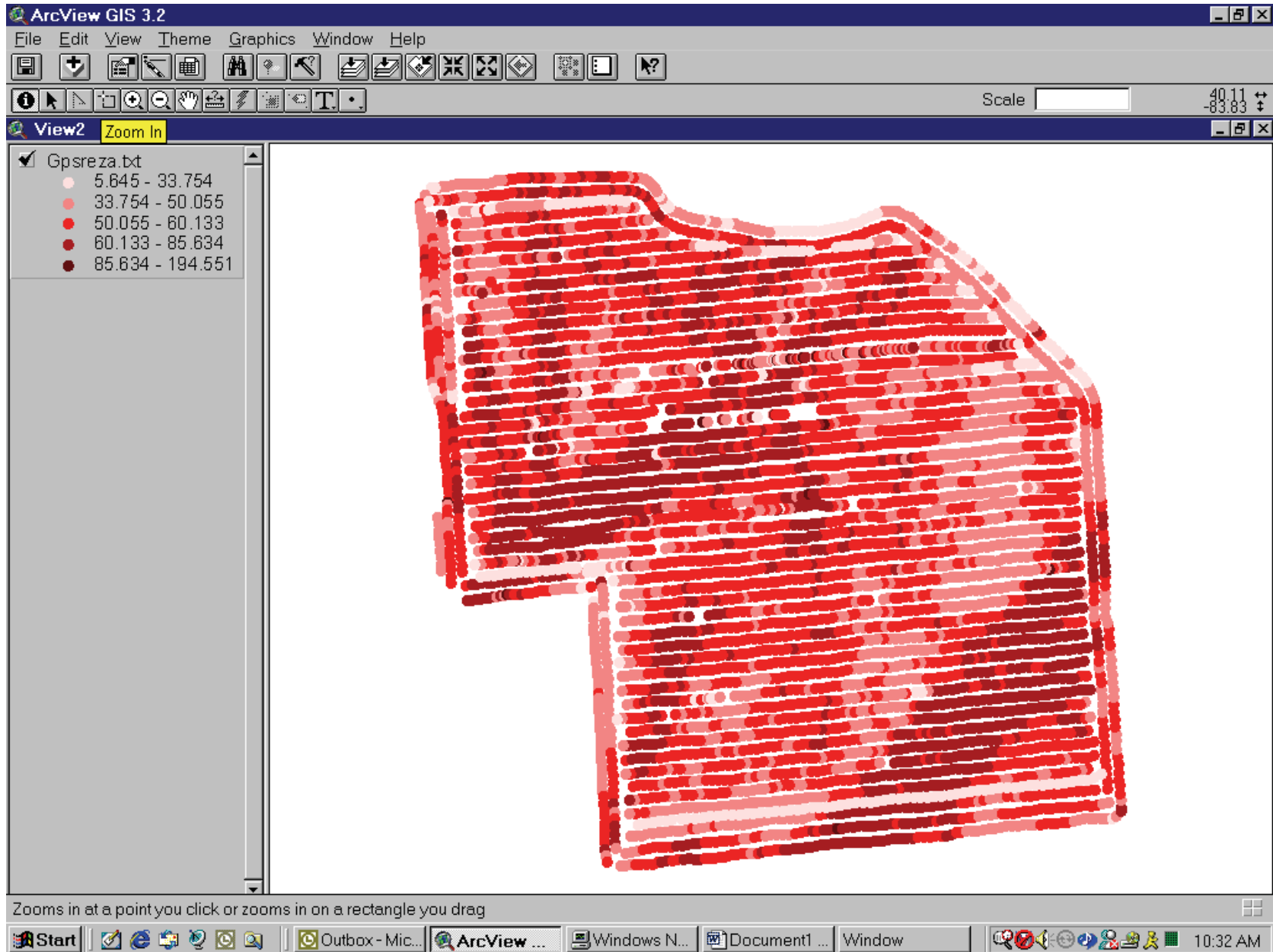


Yield Data Contains Useful Information

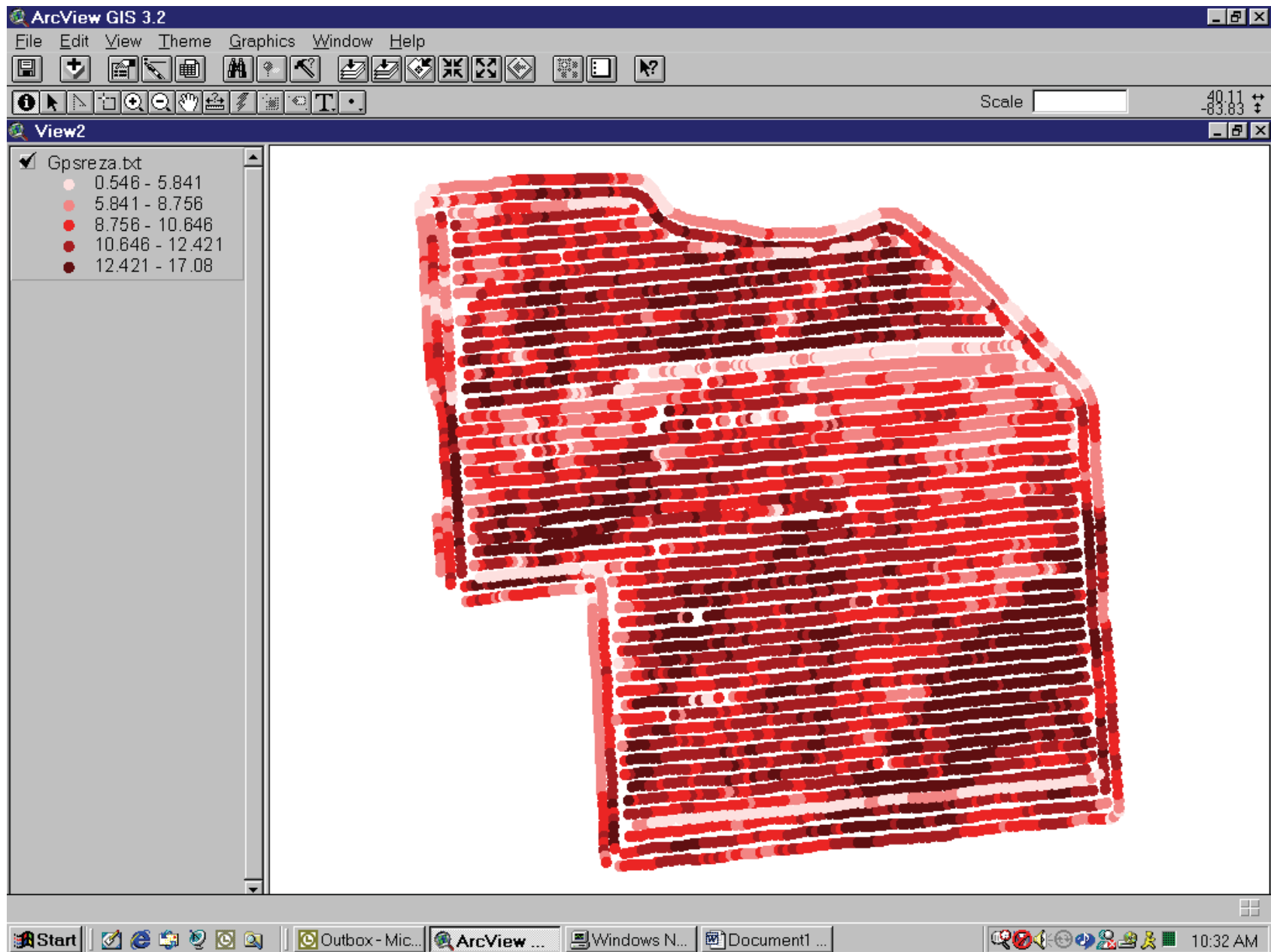
- Soil Type Productivity
- Variety & Soil Type
- Herbicide & Variety
- Disease & Variety
- Fertility Level
- Organic Matter & Variety



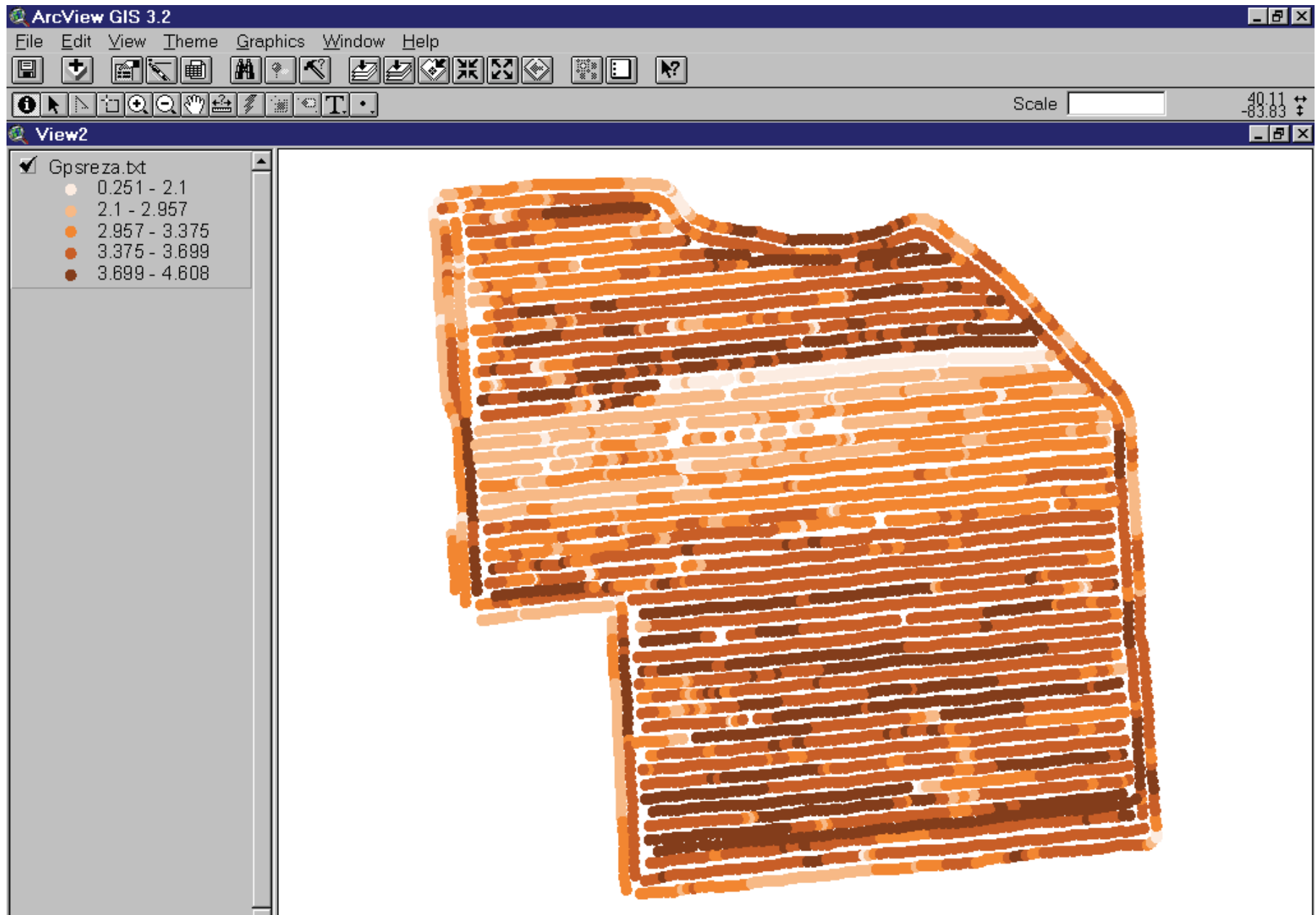
Yield Map



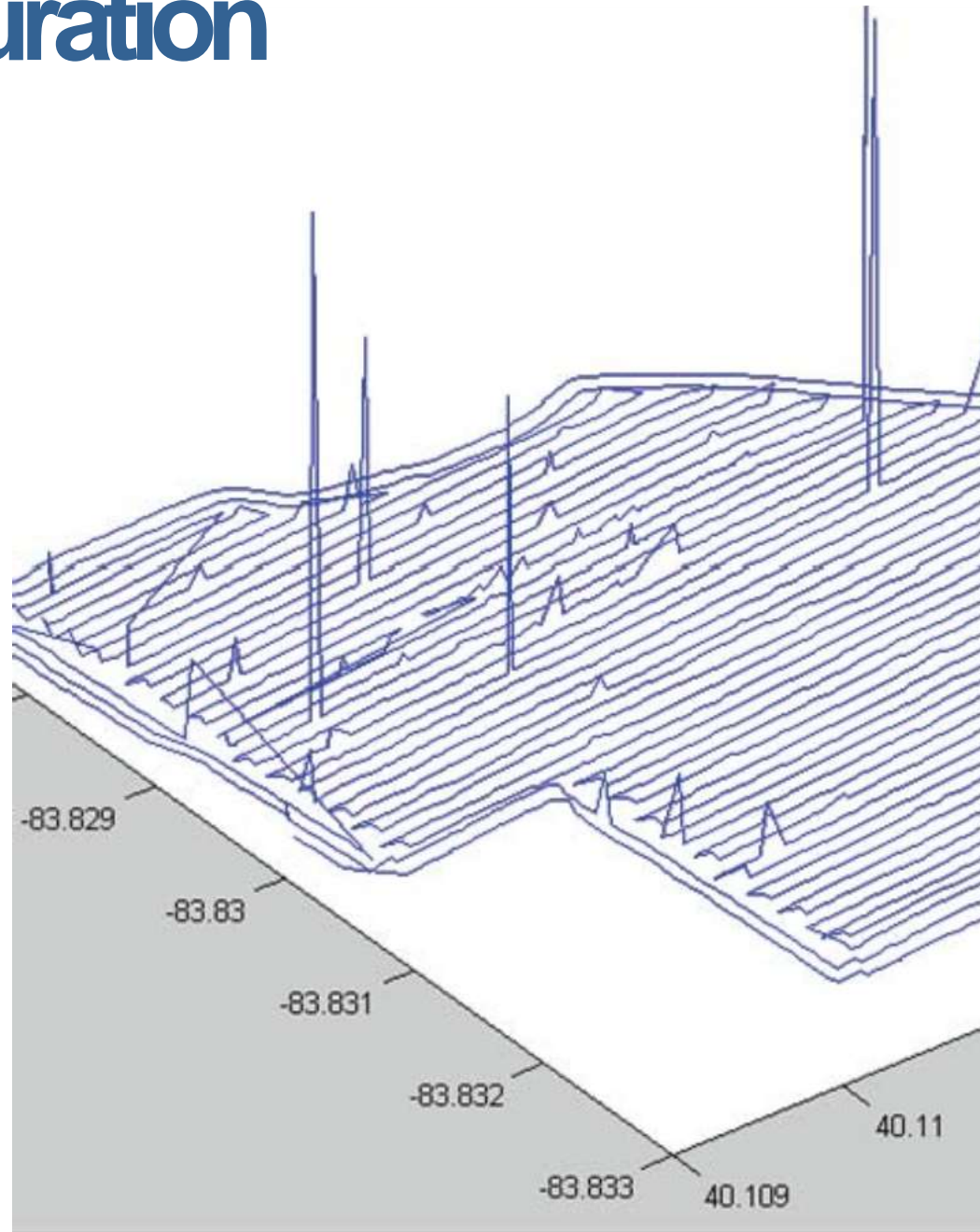
Flow



Speed



Duration



Field Efficiency

- Field Efficiency = harvest time/total time
- = 61% for the field shown
- Depends on
 - ◆ Field shape
 - ◆ Turns
 - ◆ Plugging
 - ◆ Unloading
 - ◆ Other time losses

Factors influencing yield variations

Little Control	Possible Control
<ul style="list-style-type: none">■ Soil Texture■ Climate■ Topography■ Hidden features	<ul style="list-style-type: none">■ Soil Structure■ Available water■ Water-logging■ Nutrient levels■ pH Level■ Trace element levels■ Weed competition■ Pests and diseases

Earl etal 1996

Cost Effective Data Collection

- Soil sensors
- Plant sensors
- Remote sensing
 - Aerial images



Soil Sensors

- Electrical Conductivity (EC)
- Soil Texture Compaction Index (TCI) sensor
- Soil organic matter sensor
- Soil pH sensor

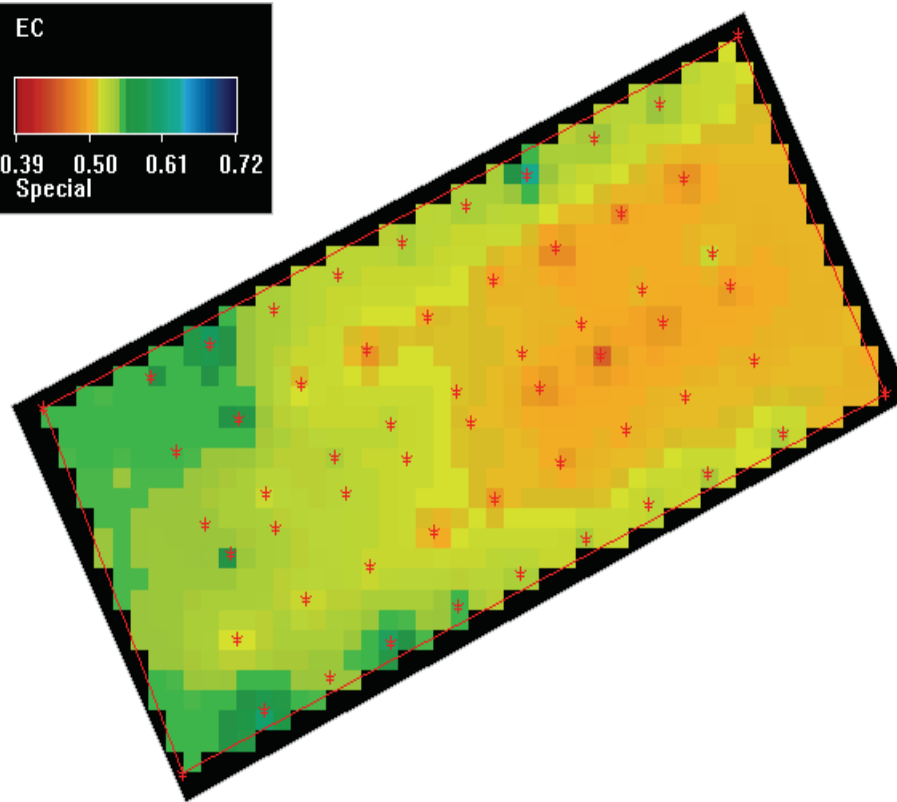
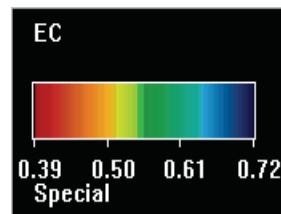
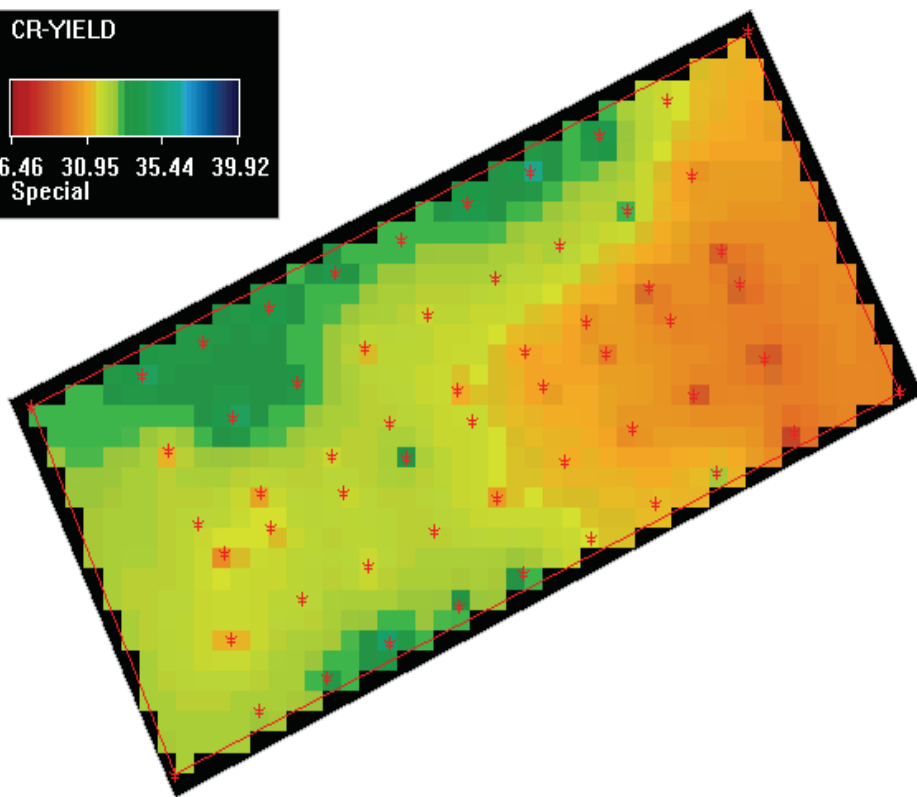
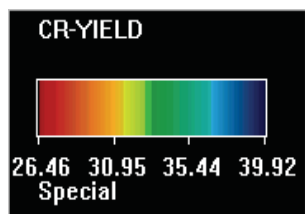
Soil Electrical Conductivity



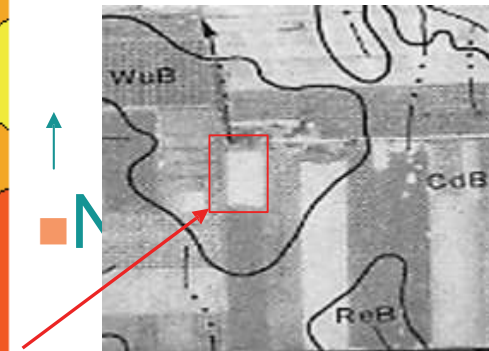
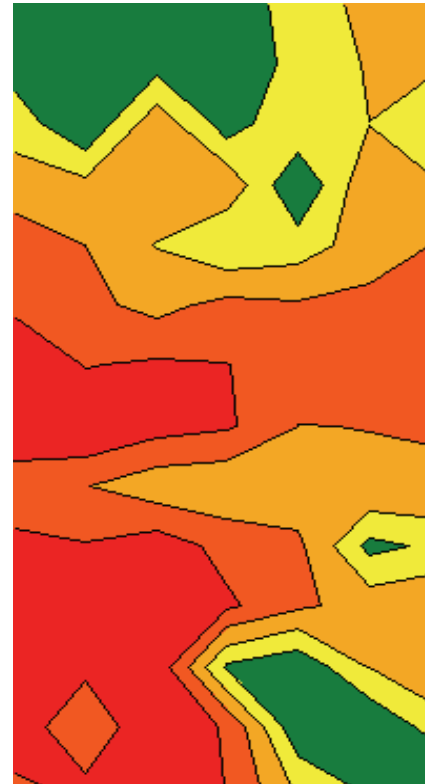
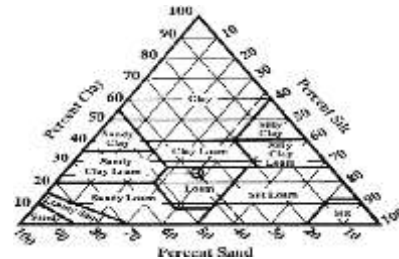
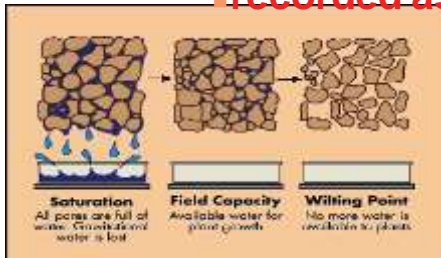
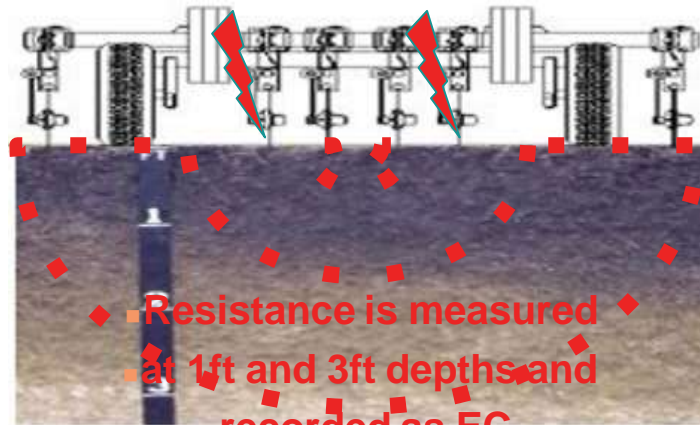
VERIS Technologies EC Device

Yield Map

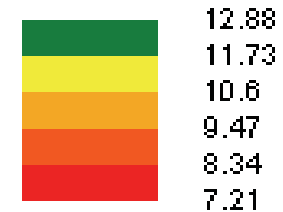
EC Map



Application of EC Survey for Vineyard Site Selection



Soil Survey
EC Ms/m



EC maps can help identify zones of variable moisture which may help in vineyard planning and management.

Soil Sensor



Load Pins

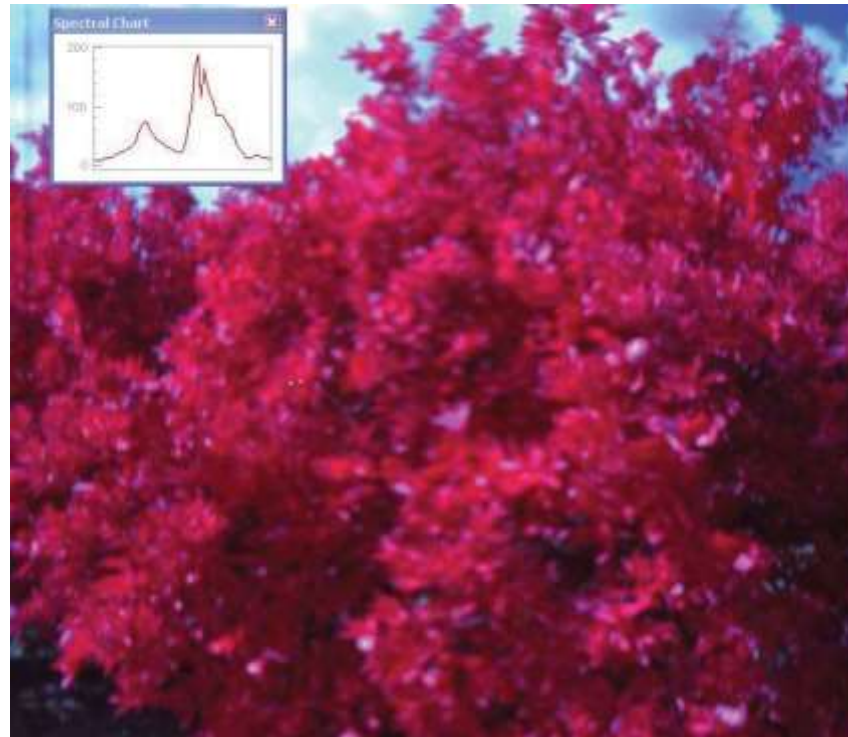
Soil Moisture Sensor



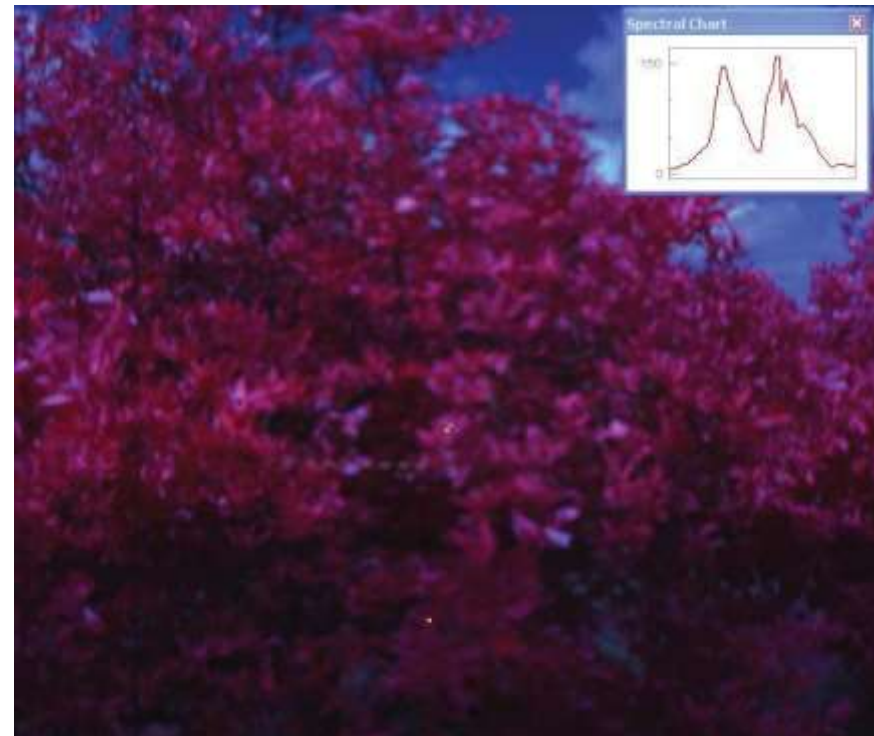


Hyperspectral Imaging

Healthy Tree



HLB Infected Tree



Application of handheld computers, GPS, and GIS software for crop scouting



Rugged PCs



Trimble GeoXH



Farm Works
Titan RT
Ruggedized
Tablet



AgLeader SMS Mobile

Pocket PC

■ Without GPS



HP iPAQ hx4700

■ With GPS



HP iPAQ rx5910

Agricultural Robots

