

















# Phenocart - Ground based field phenotyping

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IWYP conference  
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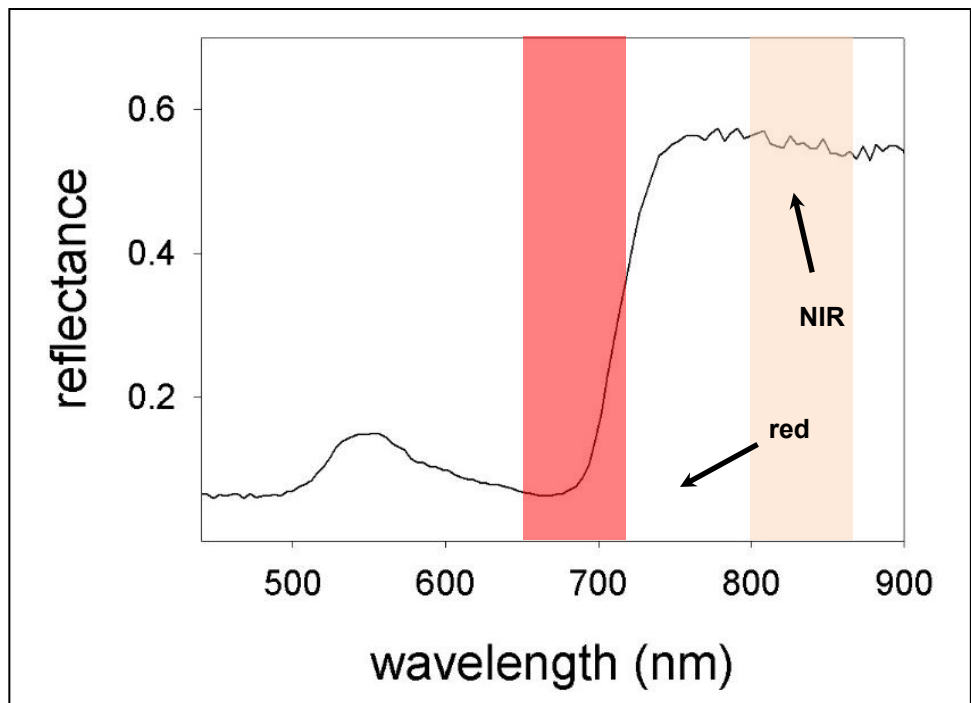
# How do you describe the characteristics of your plants in the field?

Seed form	Seed color	Pod form	Pod color	Flower color	Flower position	Stem length
 Round	 Yellow	 Inflated	 Green	 Purple	 Axial	 Tall
 Wrinkled	 Green	 Constricted	 Yellow	 White	 Terminal	 Short





# Sensors and instruments: breaking our physiological limitations



$$NDVI = \frac{R_{NIR} - R_{RED}}{R_{NIR} + R_{RED}}$$



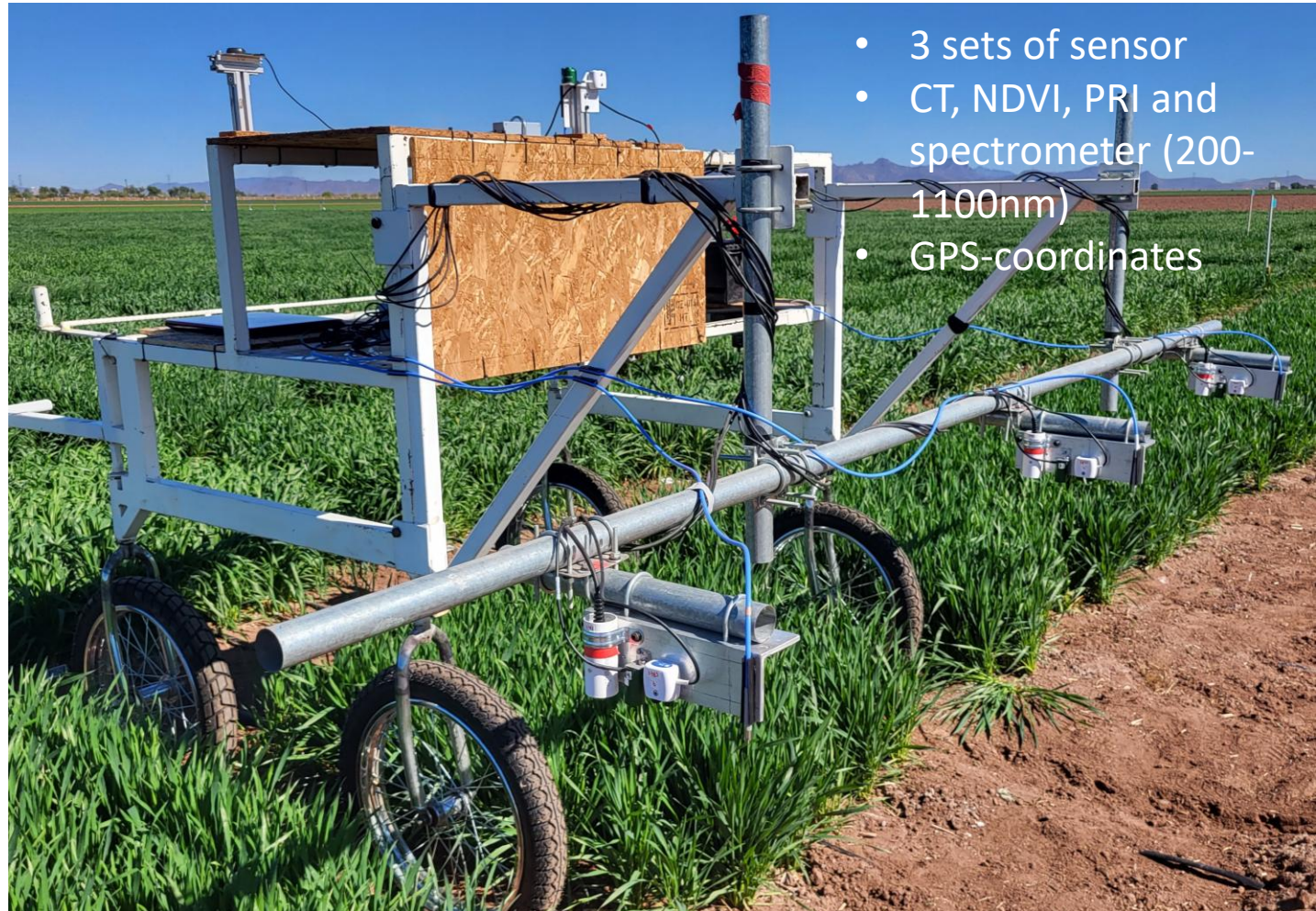
Infrared thermometer

- Canopy temperature
- Strong correlation with root capacity & yield





# Phenocart - multi sensor field phenotyping system



- 3 sets of sensor
- CT, NDVI, PRI and spectrometer (200-1100nm)
- GPS-coordinates



# Phenocart - Data process and extraction

20240125\_TEST V23-24\_S0112\_001: Bloc de notas

Archivo Edición Formato Ver Ayuda

```
timestamp,datetime_iso,quality_fix,latitude,longitude,altitude,sensor_id
1706208331.703441,2024-01-25 18:45:49.199,1,27.395232391,-109.927831950,
1706208333.799261,2024-01-25 18:45:51.199,1,27.395232381,-109.927831976,
1706208334.852313,2024-01-25 18:45:52.199,1,27.395232379,-109.927831972,
1706208335.908382,2024-01-25 18:45:53.399,1,27.395232402,-109.927831950,
1706208338.088906,2024-01-25 18:45:55.599,1,27.395232409,-109.927831949,
1706208339.172697,2024-01-25 18:45:56.599,1,27.395232392,-109.927831988,
1706208340.260288,2024-01-25 18:45:57.799,1,27.395232406,-109.927831931,
1706208341.314527,2024-01-25 18:45:58.799,1,27.395232413,-109.927831963,
1706208342.370801,2024-01-25 18:45:59.799,1,27.395232413,-109.927831968,
1706208343.424826,2024-01-25 18:46:00.799,1,27.395232426,-109.927831965,
1706208344.515260,2024-01-25 18:46:01.999,1,27.395212398,-109.927831969,
1706208345.606011,2024-01-25 18:46:02.999,1,27.395232402,-109.927831951,
1706208346.692729,2024-01-25 18:46:04.199,1,27.395232380,-109.927831948,
1706208347.747836,2024-01-25 18:46:05.199,1,27.395232399,-109.927831943,
1706208348.801195,2024-01-25 18:46:06.199,1,27.395232393,-109.927831954,
1706208349.861709,2024-01-25 18:46:07.399,1,27.395232370,-109.927831985,
1706208350.952785,2024-01-25 18:46:08.399,1,27.395232376,-109.927831987,
1706208352.038963,2024-01-25 18:46:09.399,1,27.395232390,-109.927831978,
```

```
# Asumiendo que las columnas se llaman 'longitud' y 'latitud' (ajusta según sea necesario)
trial_temperatures_shp = gpd.GeoDataFrame(trial_temperatures, geometry=gpd.points_from_xy(trial_temperatures['longitud'], trial_temperatures['latitud']))
trial_ndvi_shp = gpd.GeoDataFrame(trial_ndvi, geometry=gpd.points_from_xy(trial_ndvi['longitud'], trial_ndvi['latitud']))
trial_pri_shp = gpd.GeoDataFrame(trial_pri, geometry=gpd.points_from_xy(trial_pri['longitud'], trial_pri['latitud']))
trial_spec_shp = gpd.GeoDataFrame(trial_spec, geometry=gpd.points_from_xy(trial_spec['longitud'], trial_spec['latitud']))
#trial_spec_shp = gpd.GeoDataFrame(trial_spec, geometry=gpd.points_from_xy(trial_spec['longitud'], trial_spec['latitud']))
```

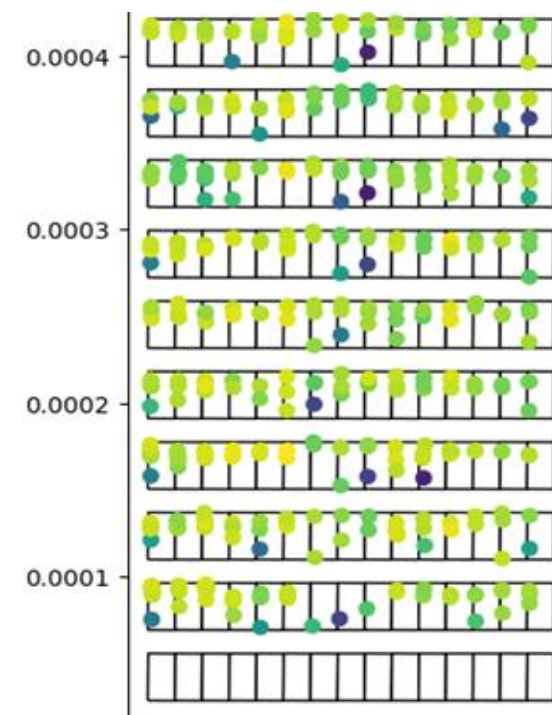
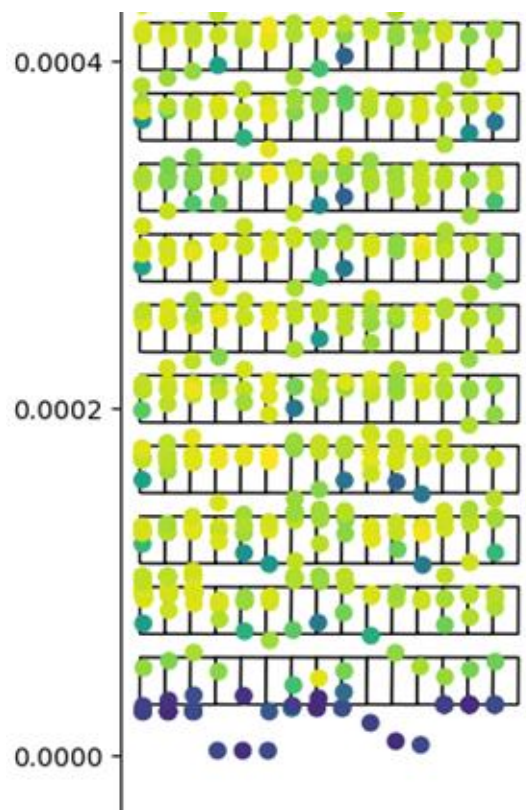
```
# Crear el gráfico
fig, ax = plt.subplots(1, 3, figsize=(10, 10))
for x in ax:
```

```
    trial_temperatures_shp.plot(ax=ax[0], column='target_temp_c')
    trial_ndvi_shp.plot(ax=ax[1], column='index_value')
    trial_pri_shp.plot(ax=ax[2], column='index_value')
    trial_spec_shp.plot(ax=ax[2], column='ndvi')
```

```
# Agregar títulos a cada subgráfico
ax[0].set_title("Canopy temperature", fontsize=12)
ax[1].set_title("NDVI index", fontsize=12)
ax[2].set_title("spec NDVI", fontsize=12)
```

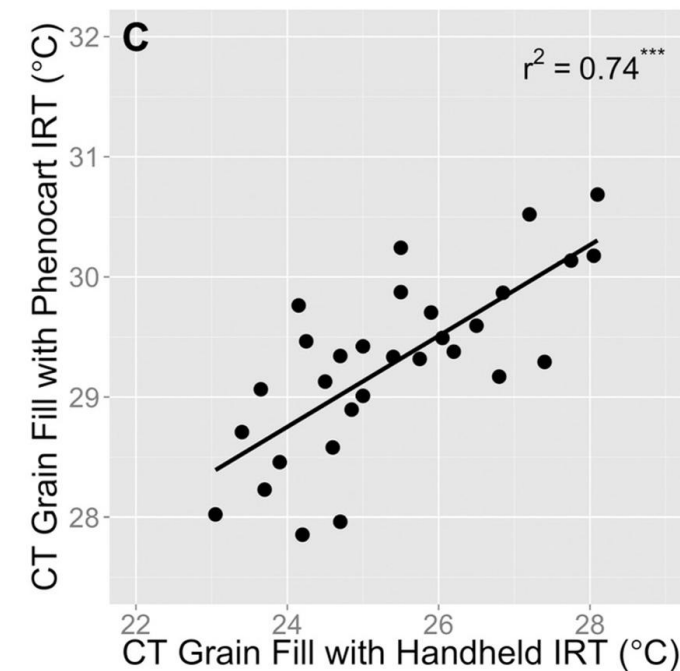
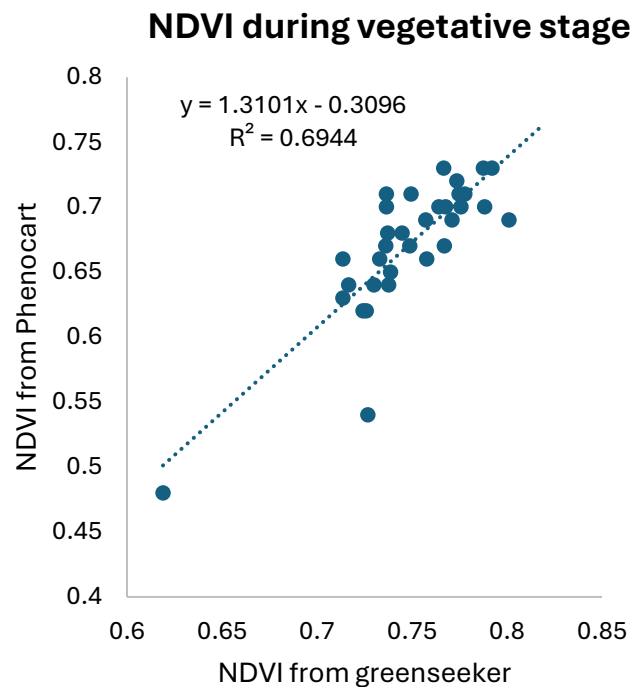
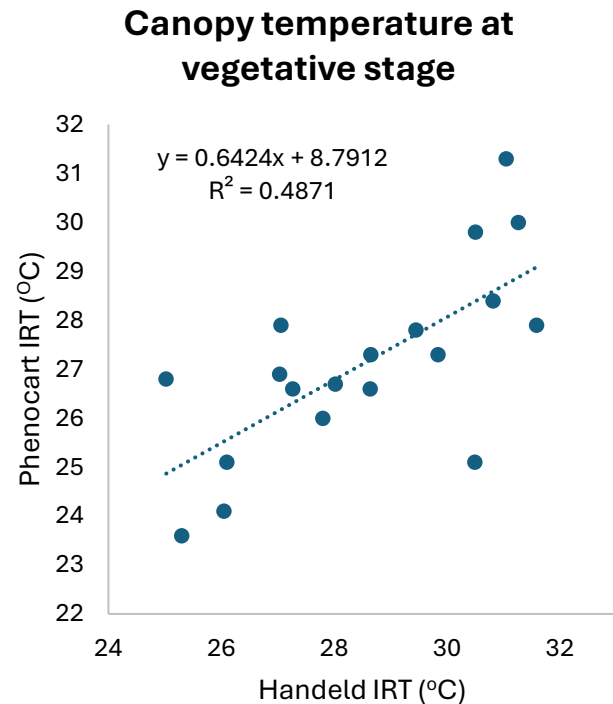
```
# Ajustar el diseño para evitar superposición
plt.tight_layout()
```

```
# Mostrar la figura
```





# Phenocart - Data validation





# The way to breeder-ready field phenotyping platform

A few key points for discussion

- Possible adoption by NARS
- Standardization and automation
- More sets of sensors



An option of portable, affordable and reliable ground-based HTP platform





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your interest!

