Training package 4: Information and Communication Technologies (ICT) Devices

Case 4: Selective Harvesting of Grapes (SHG)

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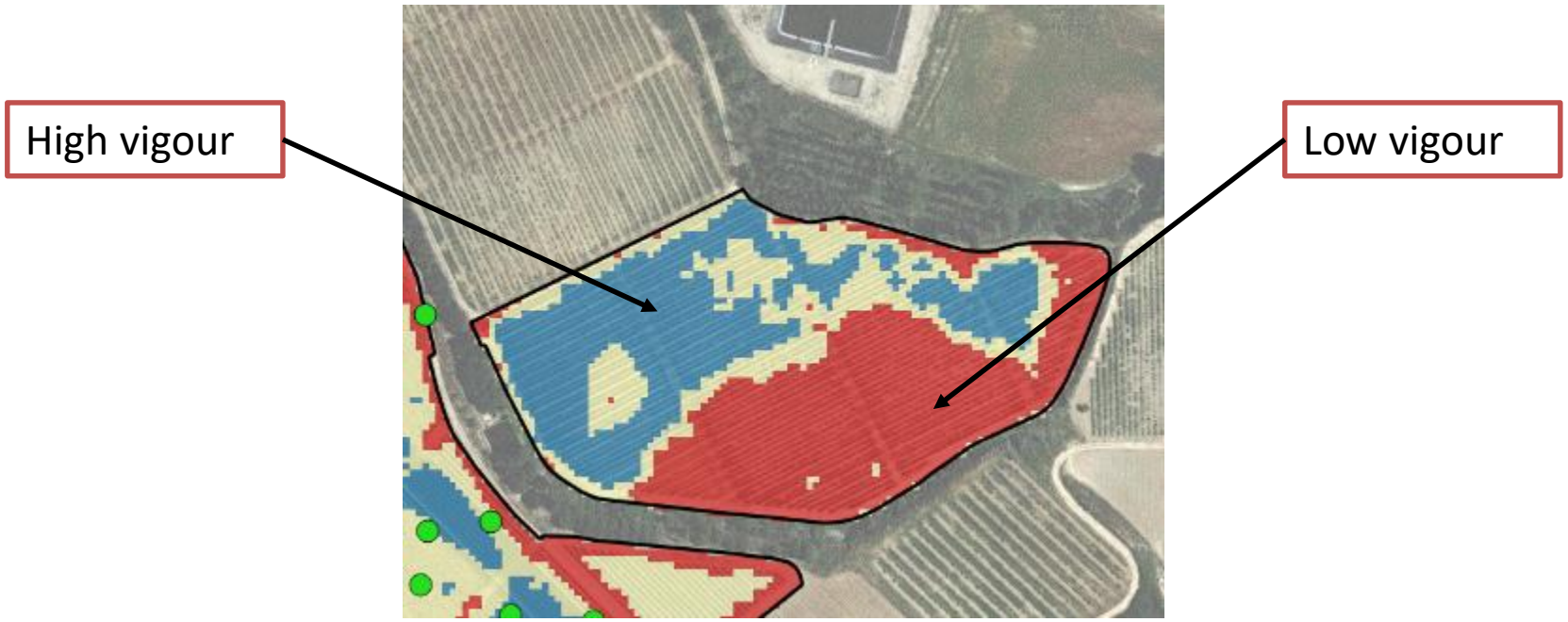
Agenda

- Background
- Steps for SHG

Background

From aerial images it is possible to observe variability at field level



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Background

- Parameters related to production of grapes before harvesting:
  - Nº of grapes/plant
  - Weight of the grapes
  - Production (kg/plant)

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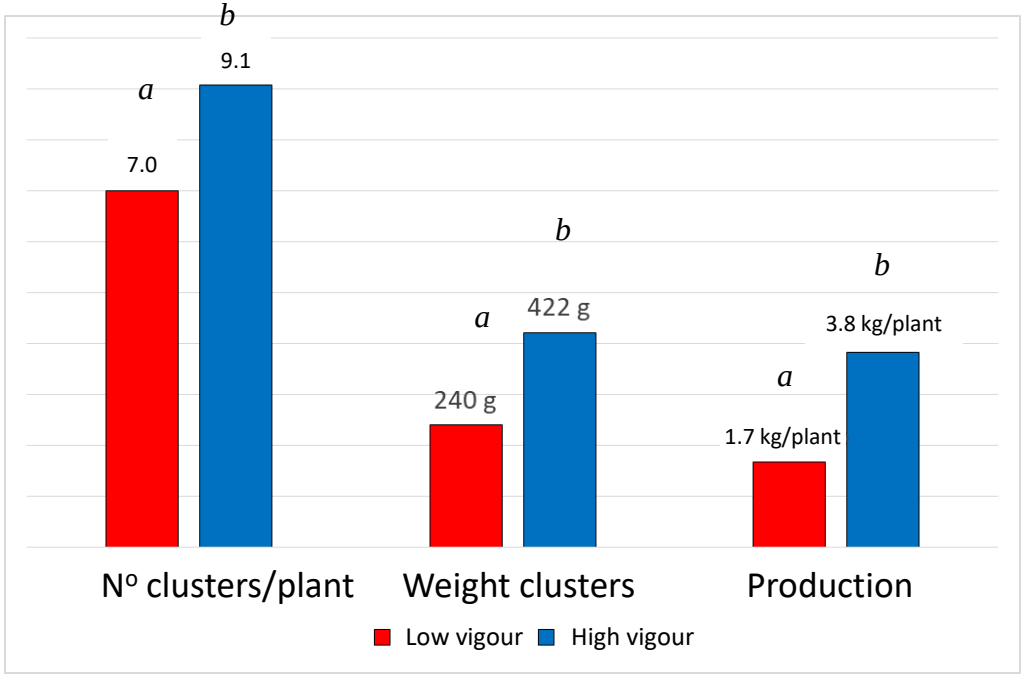
Background

- Effect of the variability on main parameters



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Background

- Parameters related to quality of grape before harvesting:
  - Probable Alcoholic Strength (PAS)
  - pH
  - total acidity (TA)

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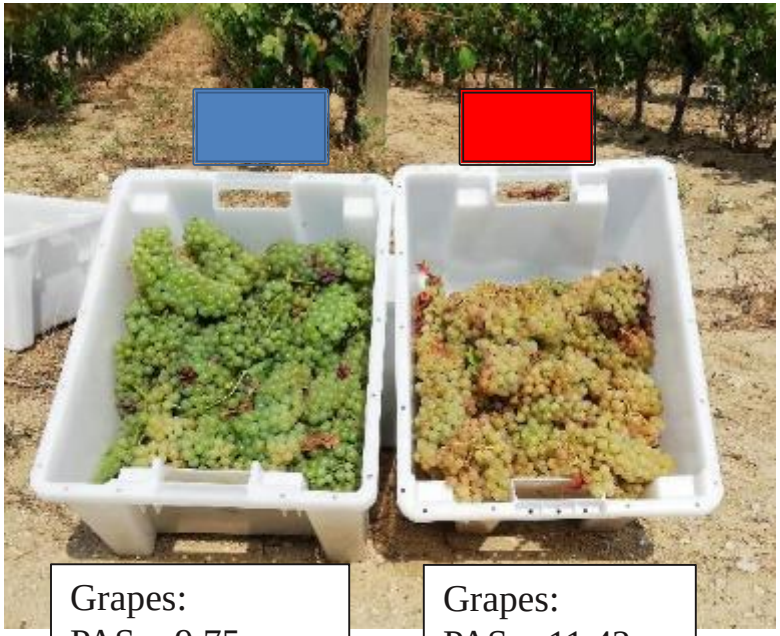
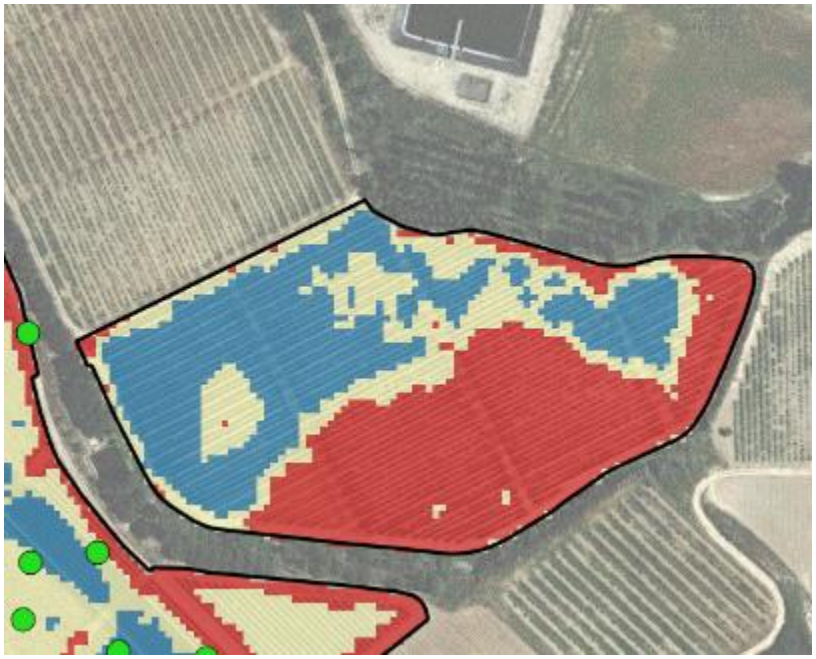
Background



Grapes: PAS = 9.75 pH = 3.31 TA = 6.1	Grapes: PAS = 11.42 pH = 3.57 TA = 4.0
Must: PAS = 8.28 pH = 3.11 TA = 6.1	Must: PAS = 10.90 pH = 3.13 TA = 4.8



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Background

- The variation of the vigour obtained at field level has a great influence on production parameters as well as on grape quality.
- For vinification it is necessary to harvest a certain amount of volume, so it is necessary to group parcels.

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Background

- The objective of selective grape harvesting is to collect vineyard clusters of high quality
- That means to separate different quality clusters from the same parcel to maximize higher quality grapes without mixing with low quality grapes
- In other words, to separate grape clusters that will reduce the quality of the harvest

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Agenda

- Background
- **Steps for SHG**

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Steps for SHG

- 1st → Obtain an NDVI image and determine the vigour map

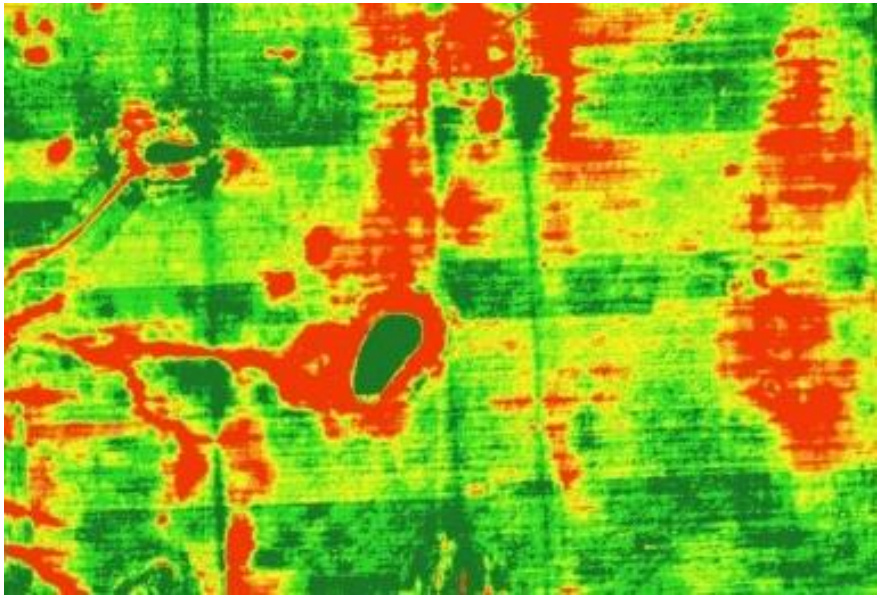

Image obtained by drone, plane or by satellite

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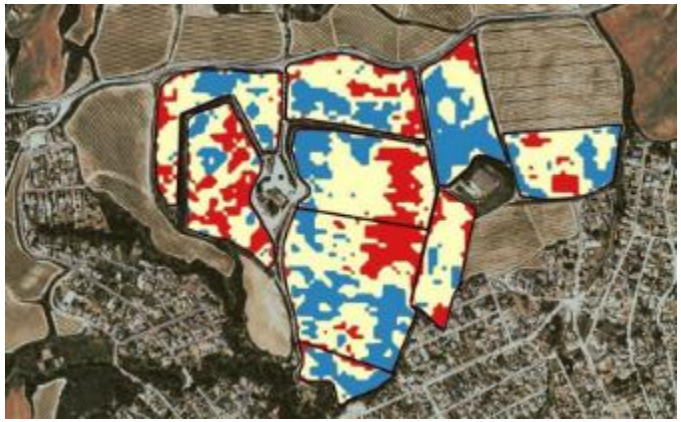
Steps for SHG

- 1st → Obtain an NDVI image and determine the vigour map
- Which is the optimal date to obtain the image?:
  - Veraison (beginning of ripening) is the optimum time to predict grape phenolic content and colour.



Steps for SHG

- 2nd → Determine the Opportunity Index for selective vintage (OI_{sv})*
- OI_{sv} is a method that helps decide to undertake selective harvesting for a given vineyard field.
- The proposed OI_{sv} is based on:
  i. Vigour maps
  ii. Parameters considering productive plant and logistics of the winery.

* From Arnó & Martinex, 2017

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Steps for SHG

- 2nd → Opportunity Index for selective vintage (OI_{sv})* is based on three components:

  A. Spatial variation of NDVI (S_V)

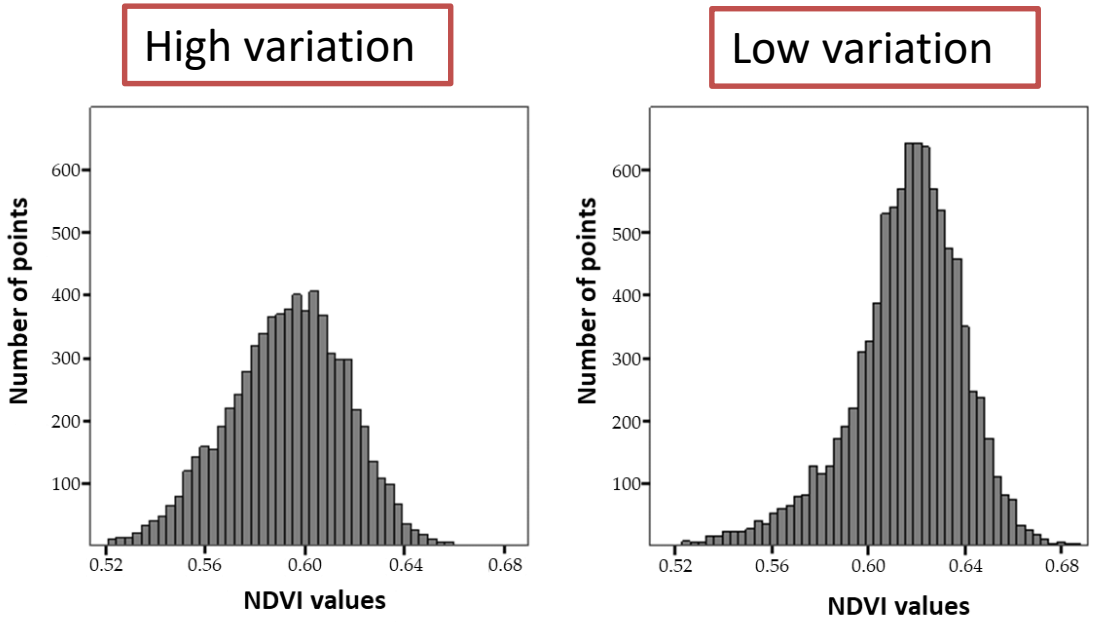
  B. Spatial structure (S_S)

  C. Quality area (Q_A)

* From Arnó & Martinex, 2017

Steps for SHG

- A. Spatial variation of NDVI (S_V)
  - A minimum NDVI variation is necessary to justify selective harvesting.



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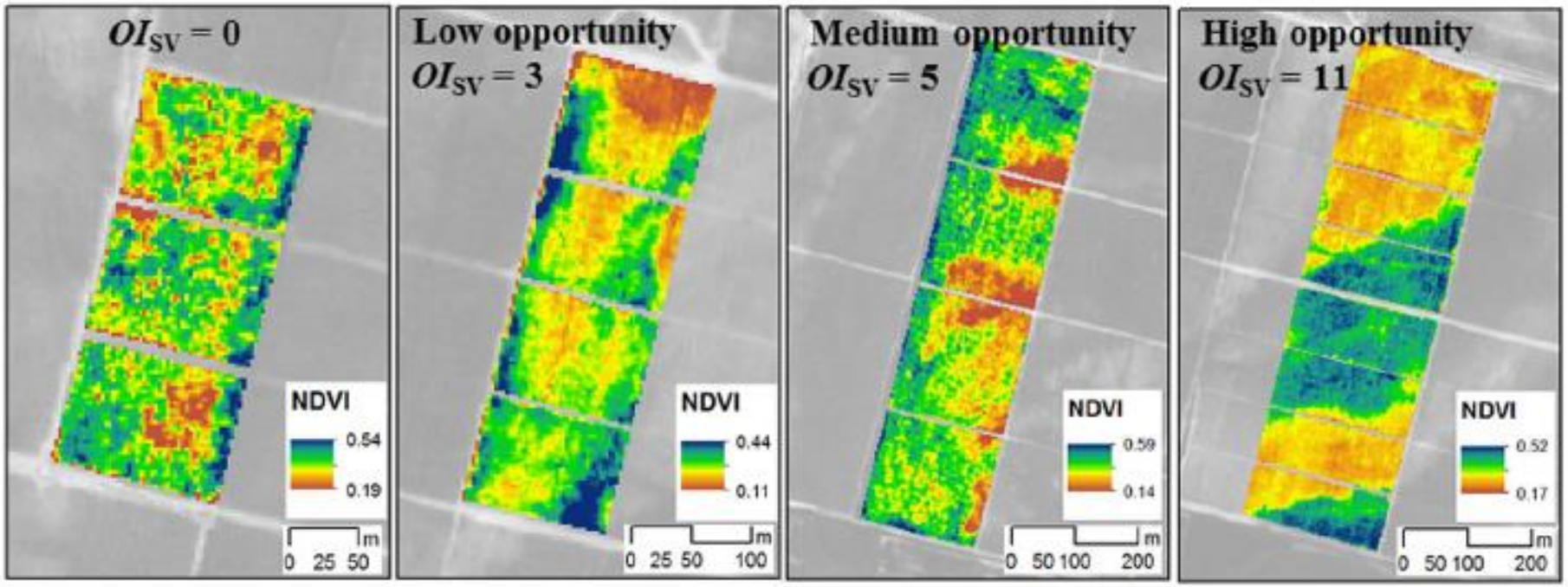
Steps for SHG

- B. Spatial structure (S_S)
  - Obtain variability strong enough to be technically manageable
    - In case of machine harvesting, variability should be structured along rows
    - Higher flexibility is allowed when manual harvesting is performed

* From Arnó & Martinex, 2017

Opportunity Index for selective vintage (OI_{sv})

Variation of the OI_{sv} index



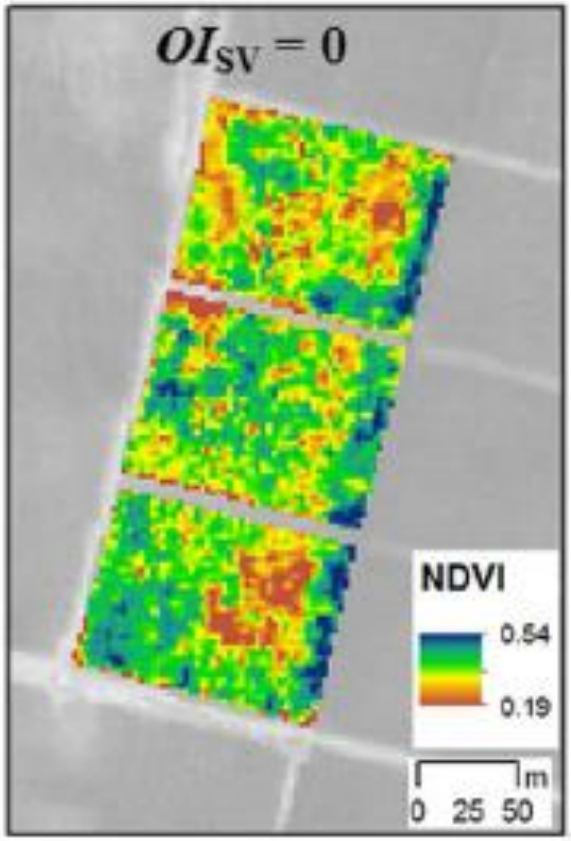
(Arnó&Martínez, 2017)

Steps for SHG

- C. Quality area (Q_A)
  - Quantify the area with high quality grapes
  - Limited to two or three classes according to winery strategy

* From Arnó & Martinex, 2017

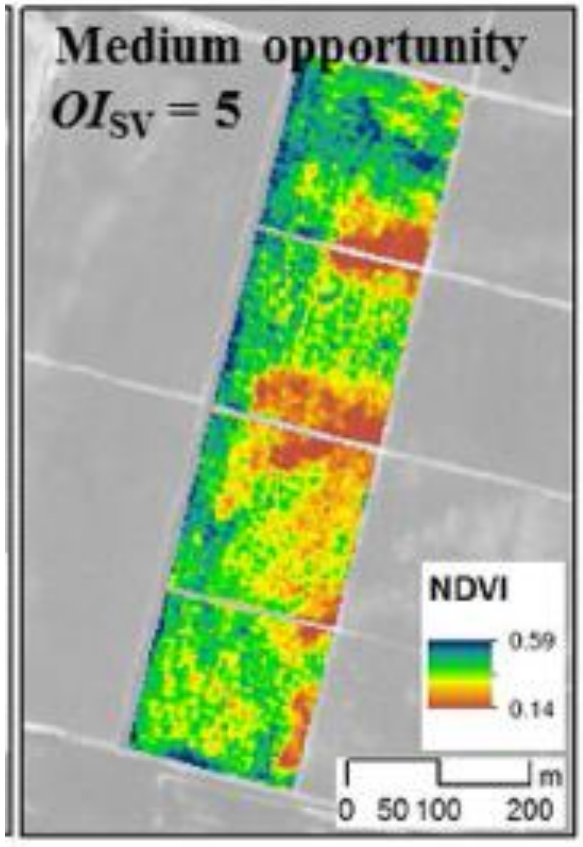
Opportunity Index for selective vintage (OI_{sv})



- **OI_{sv} = 0**
- Not suitable for SHG
- Difficulties to change the destination tank of the different qualities
- SHG is only relevant for manual harvesting when high profit is expected on the winery process

(Arnó&Martínez, 2017)

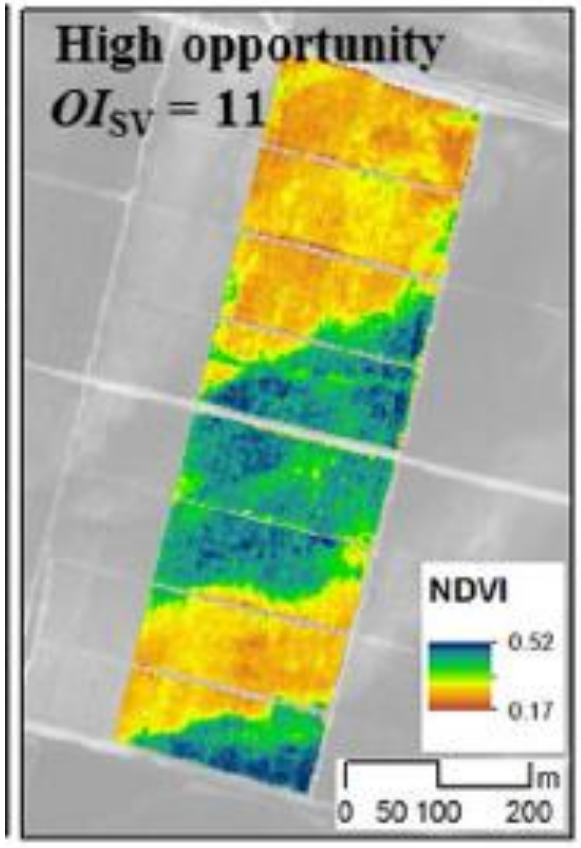
Opportunity Index for selective vintage (OI_{sv})



- **OI_{sv} = 5**
- Suitable for SHG
- An adaption of the harvesting machine is needed (a separate hopper should be installed)
- Time consumption for changing the destination hopper will be high

(Arnó&Martínez, 2017)

Opportunity Index for selective vintage (OI_{sv})



- **OI_{sv} = 11**
- Suitable for SHG
- Few changes of hopper are needed. High and low quality grapes will be produced
- Time consumption for changing the destination hopper will be very low.

(Arnó&Martínez, 2017)

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Considerations

- Variability observed in field has an effect on production parameters, including the grape quality
- A large area is needed to justify the selective harvesting of grapes due to the grape quantities needed for vinification
- The length of the rows and the field orientation play a crucial role in logistics in field to adopt selective harvesting of grapes
- The strategy of harvesting (manual, harvester with multiple hoppers, harvester with different tractor-trailer) is important on the profit of selective harvesting

DEVELOPMENT OF A TRAINING PROGRAM FOR ENHANCING THE USE OF ICT TOOLS IN THE IMPLEMENTATION OF PRECISION AGRICULTURE

Project coordinator

UNIVERSITAT POLITÈCNICA DE CATALUNYA BARCELONATECH

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