This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 776467.

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A glass of wine? With seasonal forecasts it tastes better!

Decision triggers to minimize spring rain risk in vineyards

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Antonio Graça, Natacha Fontes, Marta Teixeira, Sara Silva

Agenda

- About the Case Study
- Methodology
- Climate service value by scenario
- When?
- Key messages

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MED-GOLD

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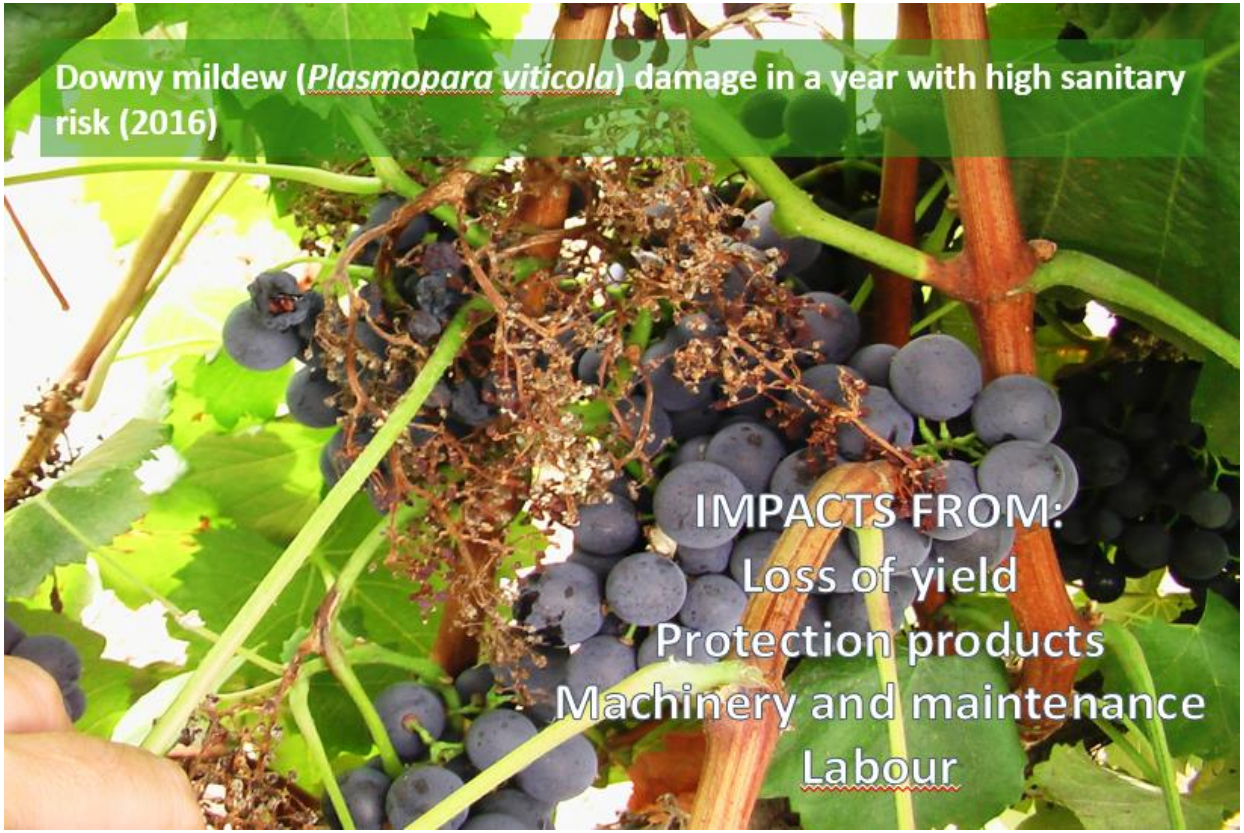
Spring rain and temperature drive risk of fungal disease causing crop loss and increased costs



Images by SOGRAPE

SprR Indicator
Spring Total Precipitation

June 21st

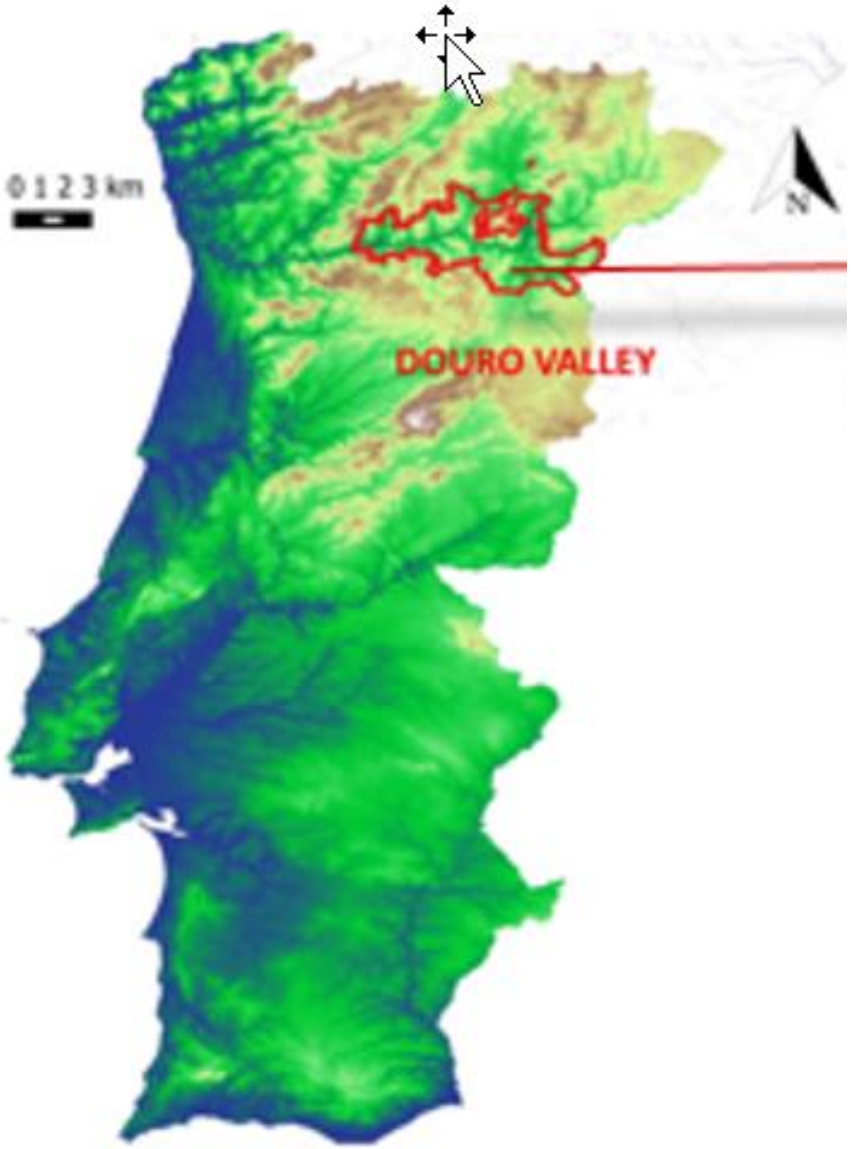
$$Total\ precipitation = \sum_{start\ date}^{end\ date} prlr$$

Daily average precipitation (mm)

April 21st

Northern Hemisphere

Fontes N., Martins J., Graça A. (2016) Study of agrometeorological measurements on "terroirs" of Alentejo wine region: impact on grape yield and harvest date variation. Simpósio de Viticultura do Alentejo, Évora. http://tinyurl.com/jxc5xsb


0 1 2 3 km
N
DOURO VALLEY

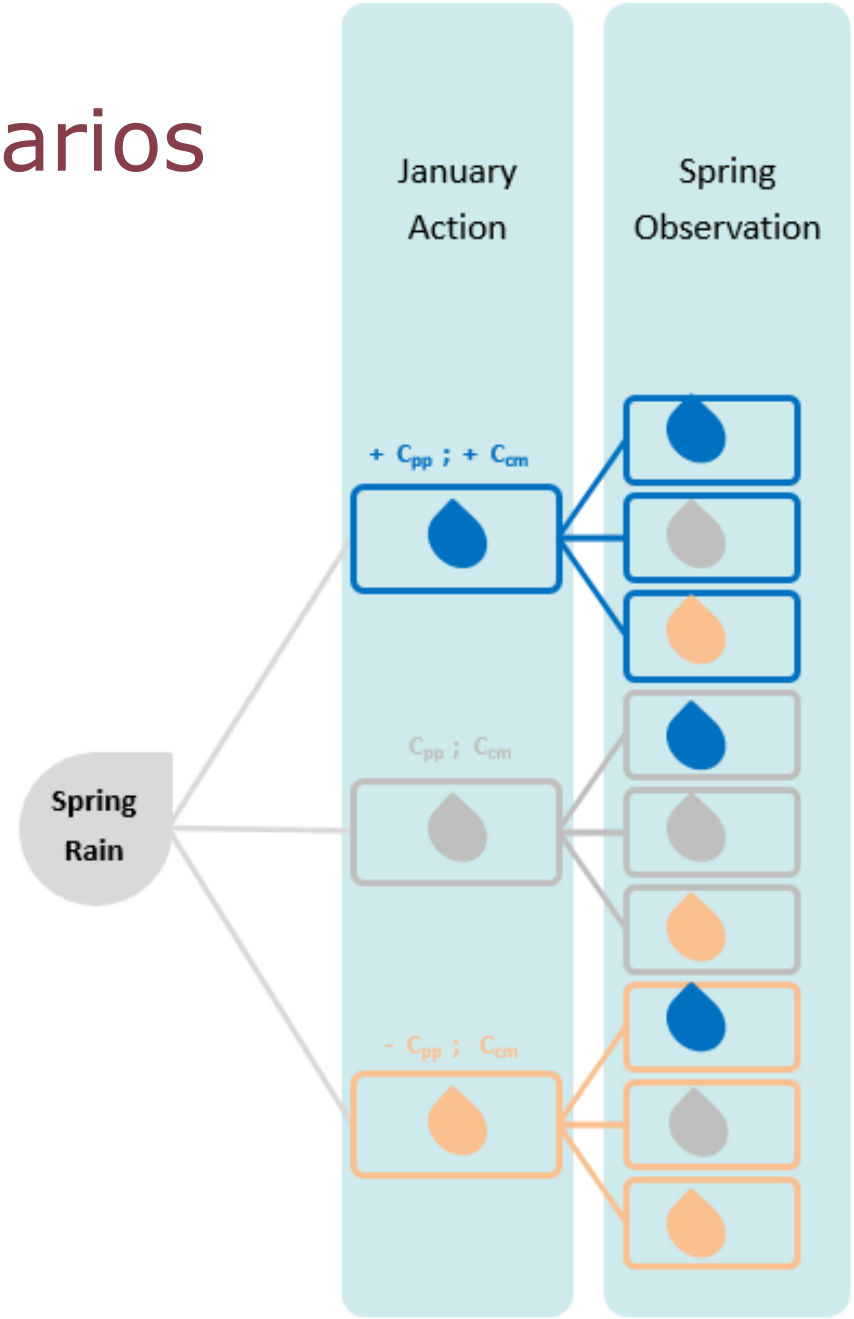
Methodology

Decision Theory (Rubas et al, 2006)

- Climate service (CS) user has to make a **decision**
- With the goal of **maximising an objective** (Payoff = Π)
- **CS' Value** = $\Pi_{wcs} - \Pi_{wocs}$

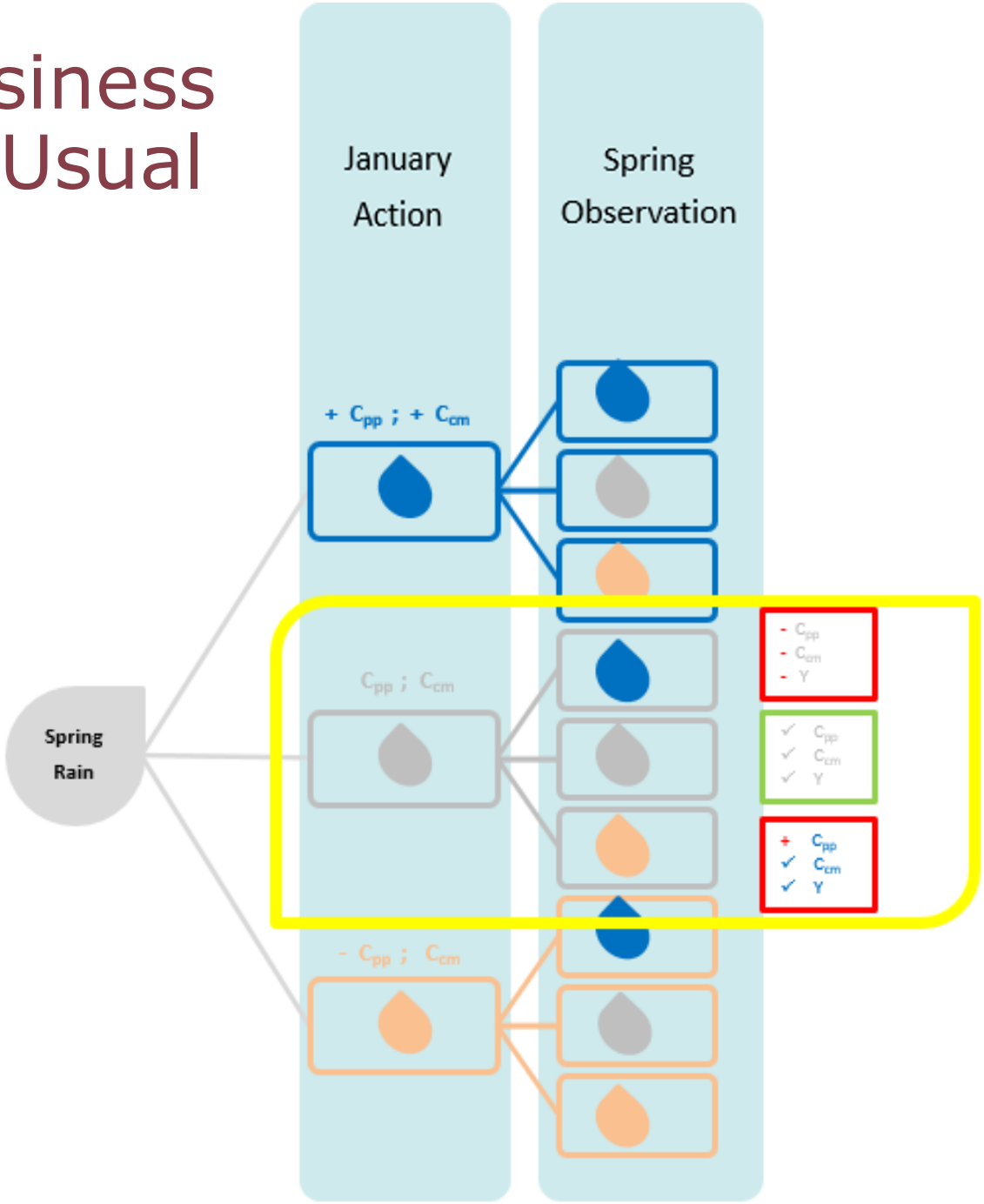
Π_{wocs} = Π decision without CS
Π_{wcs} = Π decision with CS

9 Scenarios



Spring Rain (SP)	
Above Average	
Normal	
Below Average	
Plant Protection Costs	C_{pp}
Canopy Management Costs	C_{cm}
Yields	Y

Business as Usual



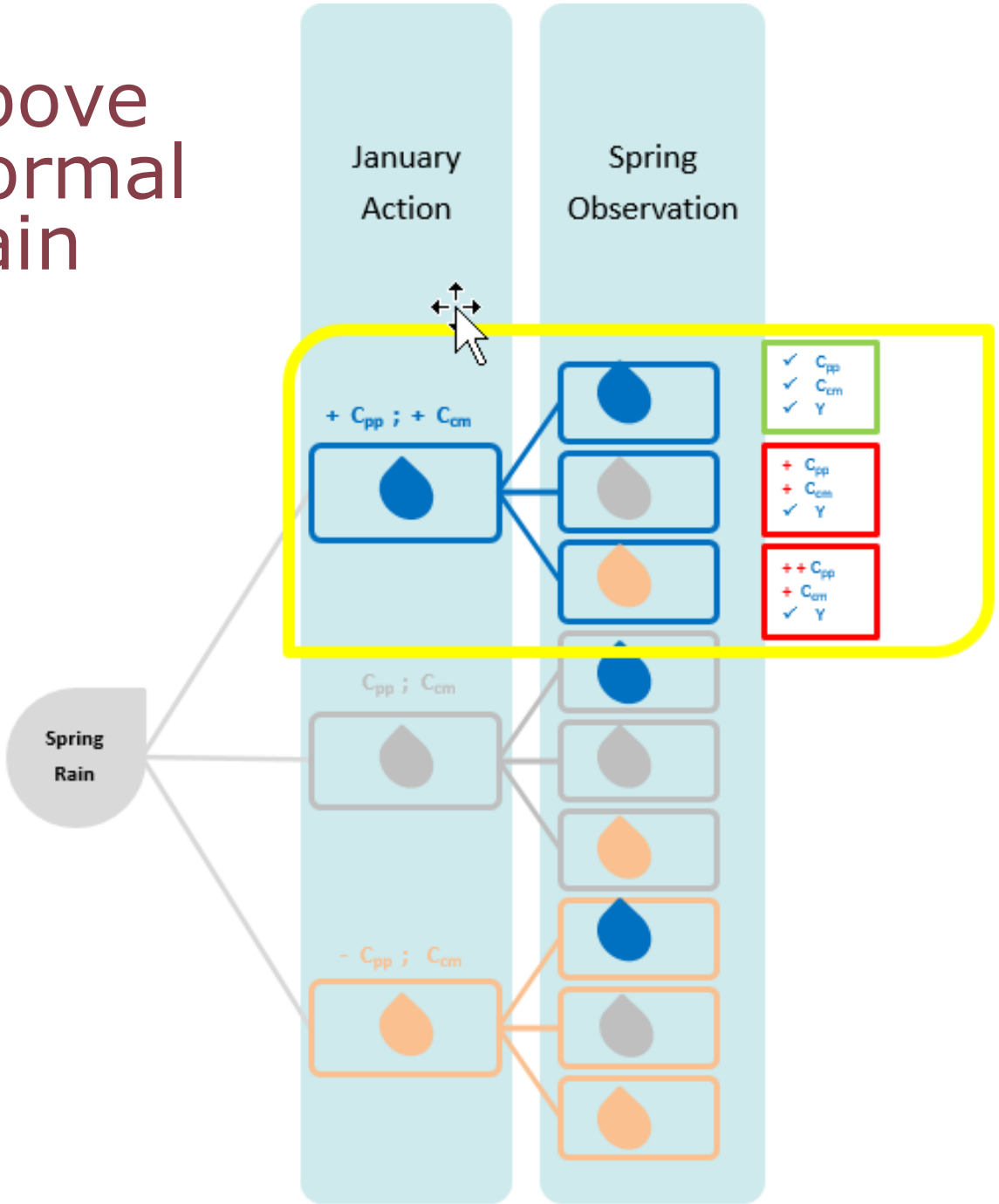
Spring Rain (SP)	
Above Average	
Normal	
Below Average	

Plant Protection Costs	C_{pp}
Canopy Management Costs	C_{cm}
Yields	Y

- Spray and labour supply shock
- Unnecessary spray purchase

Above Normal Rain

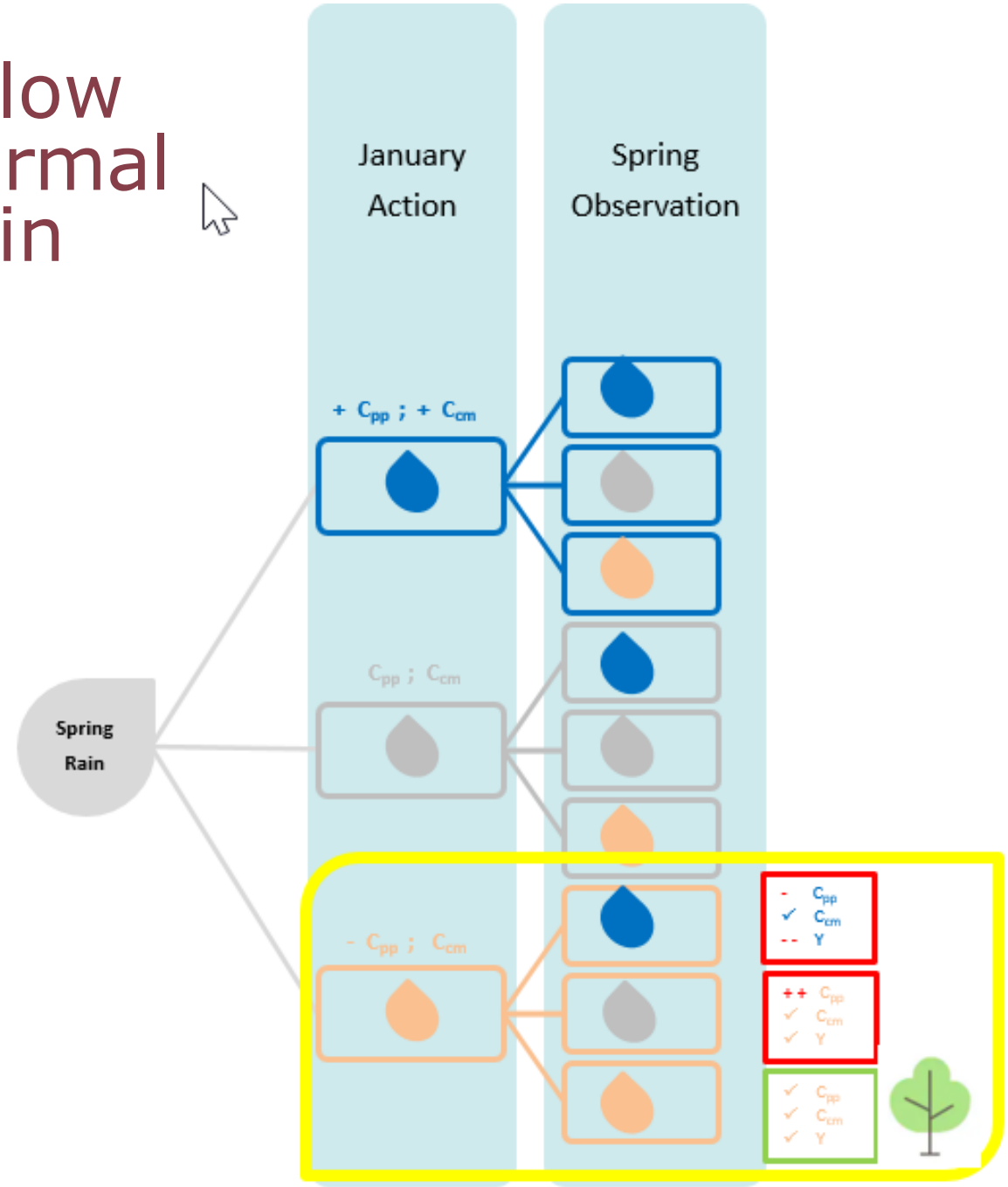
Spring Rain (SP)	
Above Average	
Normal	
Below Average	
Plant Protection Costs	C_{pp}
Canopy Management Costs	C_{cm}
Yields	Y



- No yield losses
- But losses due to inefficient purchase and contracting

Below Normal Rain

Spring Rain (SP)	
Above Average	
Normal	
Below Average	
Plant Protection Costs	C_{pp}
Canopy Management Costs	C_{cm}
Yields	Y



- Spray and labour supply shock
- Later purchase of higher activity spray
- Savings & sustainability

Outcomes by scenario

Spring Rain (SP)	
Above Average	
Normal	
Below Average	

Plant Protection Costs	C_{pp}
Canopy Management Costs	C_{cm}
Yields	Y

Forecast	Obs	Cpp €/ha	Ccm €/ha	Y kg/ha	Π
		411	521	3997	**1067**
		411	521	3997	**1067**
		411	521	3997	**1067**
		316	496	2798	**587**
		316	496	3997	**1187**
		316	496	3997	**1187**
		221	496	1998	**282**
		537	496	3997	**965**
		221	496	3997	**1281**

BaU

Payoff (Π) = €Y – Cpp - Ccm

- Price of grapes for Douro Wines = 0,5 €/kg

Calculating CS Value

Spring Rain (SP)	
Above Average	
Normal	
Below Average	

Plant Protection Costs	C_{pp}
Canopy Management Costs	C_{cm}
Yields	Y

Forecast	Obs	Cpp €/ha	Ccm €/ha	Y kg/ha	Π
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BaU

Π − Π(BaU)

The value of the forecast is equivalent to the value of the information conveyed to the user

Calculating CS Value

Spring Rain (SP)	
Above Average	
Normal	
Below Average	

Plant Protection Costs	C_{pp}
Canopy Management Costs	C_{cm}
Yields	Y

	Forecast	Obs	Cpp €/ha	Ccm €/ha	Y kg/ha	Π	
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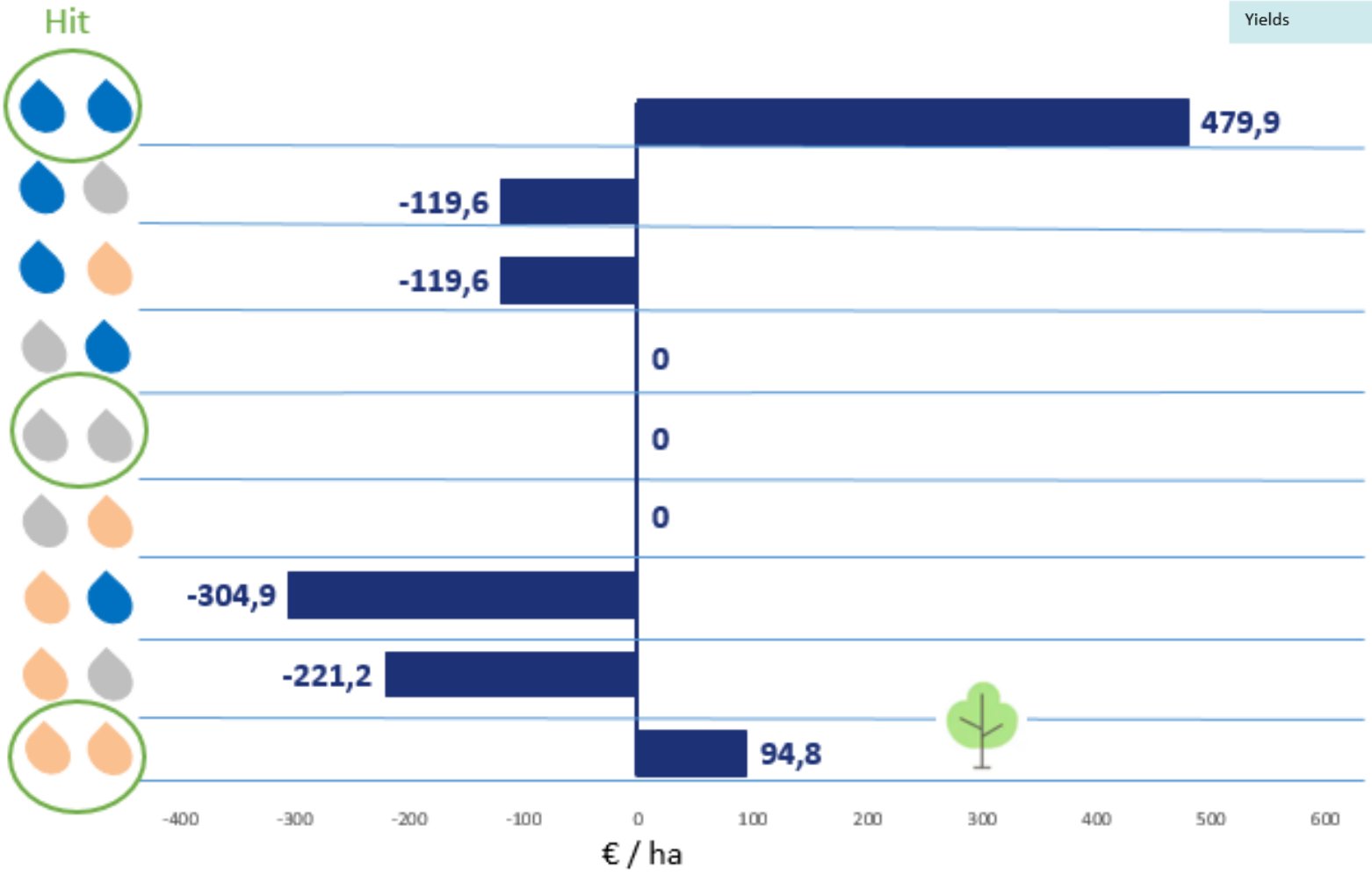
			411	521	3997	**1067**	
			411	521	3997	**1067**	
BaU			316	496	2798	**587**	Π − Π(BaU) = 0
BaU			316	496	3997	**1187**	
BaU			316	496	3997	**1187**	
			221	496	1998	**282**	
			537	496	3997	**965**	
			221	496	3997	**1281**	

If the forecasts doesn't lead to a change in decision, the value is null

Value by Scenario

Spring Rain (SP)	
Above Average	
Normal	
Below Average	
Plant Protection Costs	C_{pp}
Canopy Management Costs	C_{cm}
Yields	Y



Decision-triggering thresholds

$$D_1 + D_2 + D_3 = 100$$

$$D_1 x + D_2 y + D_3 z \geq 0$$

D = % of times each scenario has been observed

x, y, z = economic impact of using the CS in each of these scenarios compared to BaU

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Decision-triggering thresholds

ABOVE NORMAL RAIN	BELOW NORMAL RAIN
20%	73,7%

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Key messages

- Value is user and decision dependent
- Replicable approach
- Co-development
- Climate is not the only variable to account for

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