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# Assessing Sustainability of Geographical Indications Wine Production Through Synthetic Indicators

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# Introduction

## Background & Context:

- Wine remains differentiated by geographic origin despite globalization
- EU promotes both sustainable agriculture and Geographical Indications (GIs)
- GIs traditionally assumed sustainable due to terroir-based practices

## The Challenge:

- Climate change disrupts established terroir relationships
- Traditional terroir-based practices may compromise sustainability metrics
- Need for adaptation while maintaining GI regulatory frameworks

# Introduction

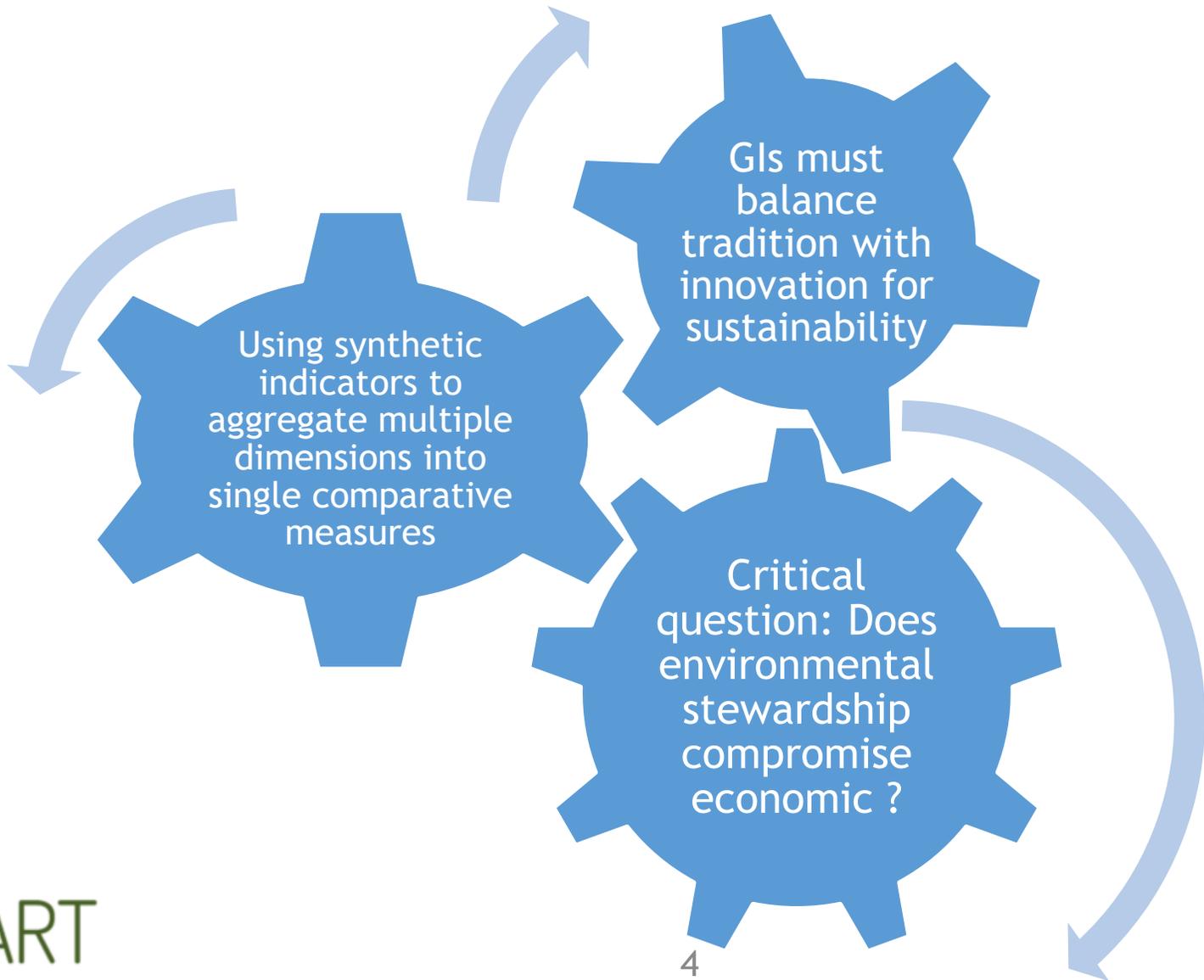
## Previous Research Insights:

- Natural winemaking enhances sustainability while preserving terroir
- Successful GI producers balance tradition with innovation
- Spanish wineries use sustainability as differentiation strategy

## Study Contributions:

- Assess Catalonian GI wine production as case study
- Propose multiple synthetic sustainability index options for different applications
- Design robust comparison system with sensitivity analysis

# Objectives



## Material & Methods

- Unbalanced panel of farms, specialize in wine grape in Catalonia, from 2014 to 2022.
- From the Farm Accountancy Data Network (FADN) source.
- The GI category distribution in our sample (total observations: 380): 17% non-GI producers, 30% only GI producers, and 53% mixed production systems.

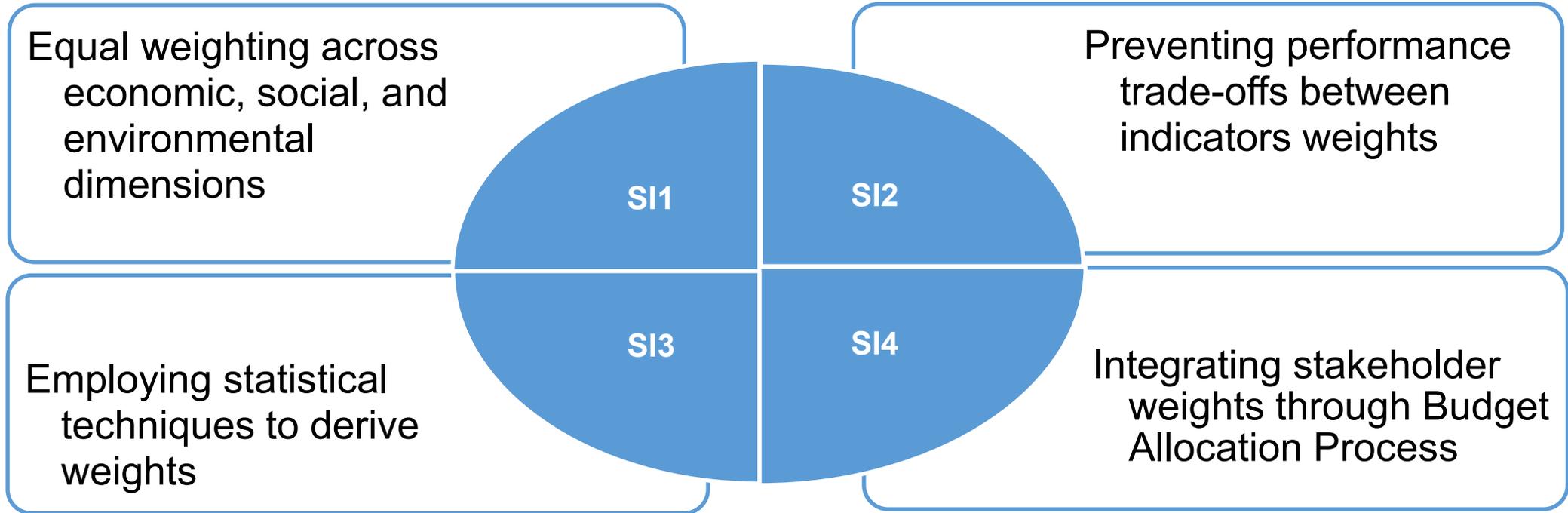
# Material & Methods

Individual Indicators	Mixed	Non-GI	Only GI
Profitability (Net income / total revenue)	0.41	0.43	0.43
Benefit-Cost (Output value / Input value)	1.48	1.74	1.60
Land productivity (Total revenue / total hectare)	0.04	0.04	0.04
Profit ratio (Total output minus intermediate cost / total output)	0.62	0.67	0.66
Remuneration of factors (Payment to fixed factors of production (work, land and capital) / total hectare)	1588.16	2457.88	2376.67
Investment intensity (Investment / total hectare)	562.33	474.54	400.63
Subsidy ratio (Total subsidies / gross income)	0.17	0.16	0.12
Employment (Total farm labor input / total hectare)	0.08	0.07	0.08
Risk management (Diversification on activities)	1.19	1.15	1.07
Rural development (Rural development payment / total hectare)	67.49	112.78	99.62
Insurance ratio (Insurance payment / total hectare)	46.34	79.32	68.34
Age profile (1: young, 2: midle-age, 3: old)	2.37	2.42	2.34
Education level (1: no, 2: basic, 3: higher)	1.56	1.26	1.35
Family labour (Unpaid farm labor / total labor)	0.58	0.57	0.55
Permanent woodland (Permanent woodland / total hectare)	4.85	5.20	29.48
Eco-efficiency ratio (Output value / energy, water, land value)	0.00	0.00	0.00
Bio-diversity (Shannon index for crop diversification)	0.48	0.31	0.08
Energy intensity (Energy consumption / total hectare)	129.83	151.94	142.31
Fertilizer intensity (Fertilizer consumption / total hectare)	71.61	60.97	74.08
Pesticide intensity (Pesticide consumption / total hectare)	155.92	170.27	190.98

Primary information  
of sample farms

Variable	Non-GI	Only GI	Mixed
Area (ha)	38	42	44
Cost (euro/ha)	2,104	2,175	1,818
Sale (euro/ha)	3,458	3,326	2,452
Yield (kg/ha)	4,829	5,346	4,859

# Material & Methods



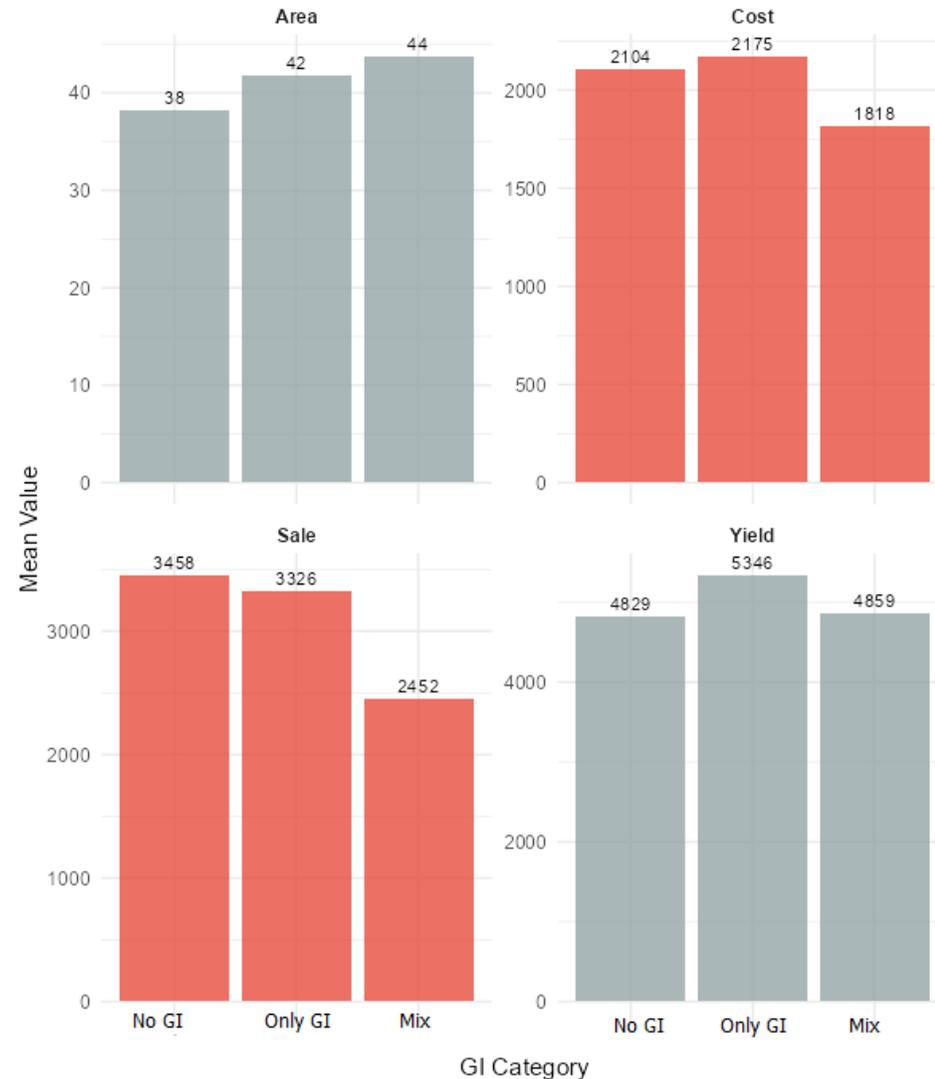
Collaboration of 15 wine experts for extracting importances of individual indicators for all dimension (economic, social and environmental) by survey in Wine round Table of Barcelona event.

# Important points in sample basic information

GI characteristic strongly linked to financial performance (sales/costs), and not production traits (yield/area).

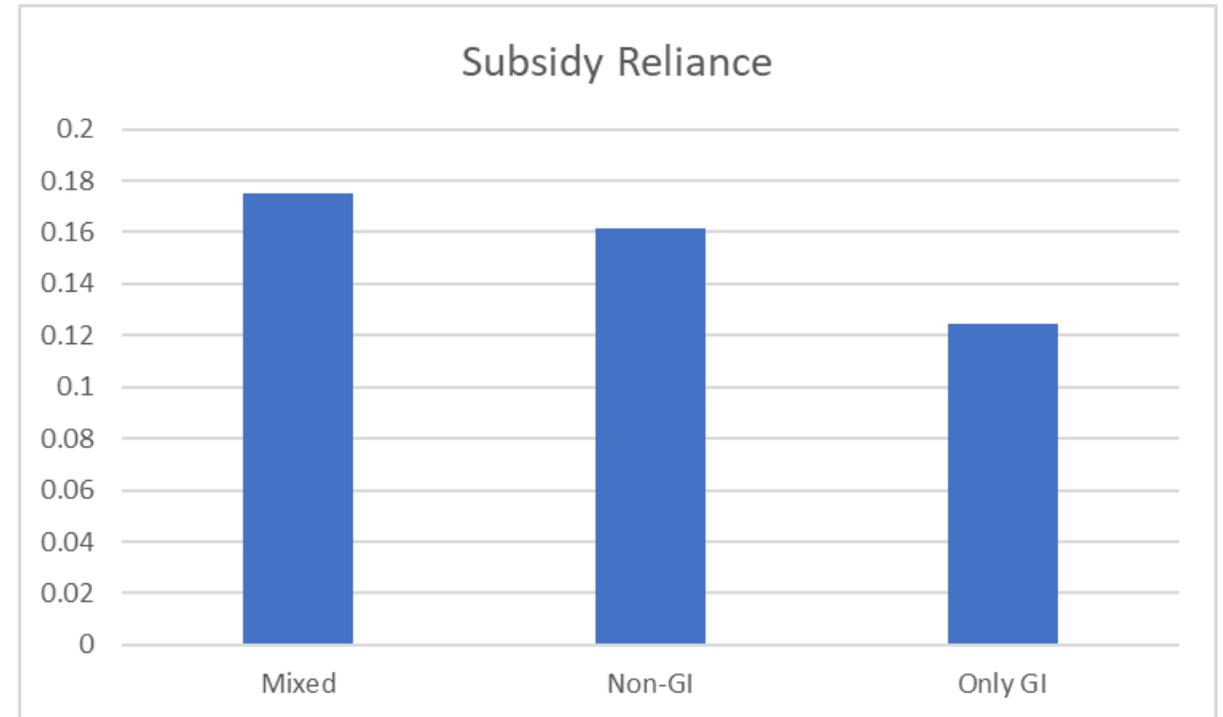
Mixed GI farms: Lower costs + lower sales

Non-GI & only GI farms: Higher costs + higher sales.



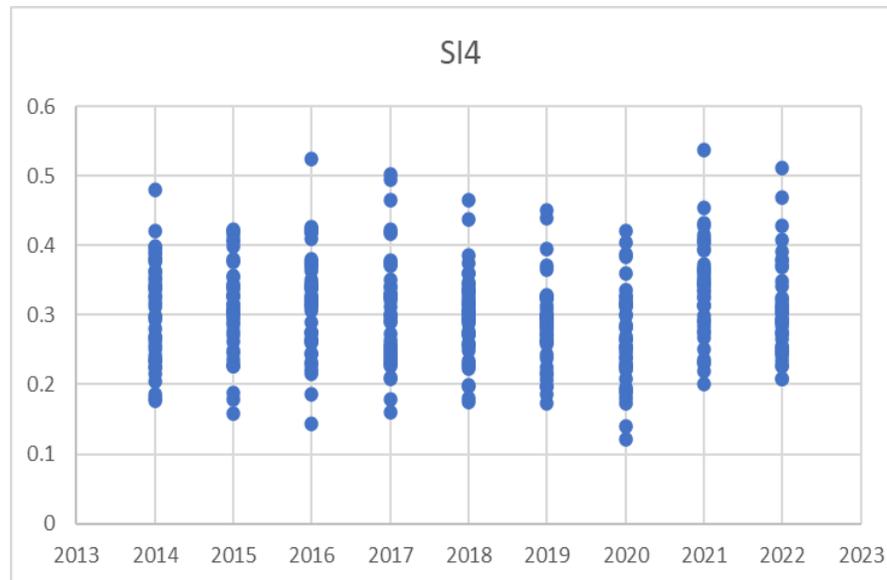
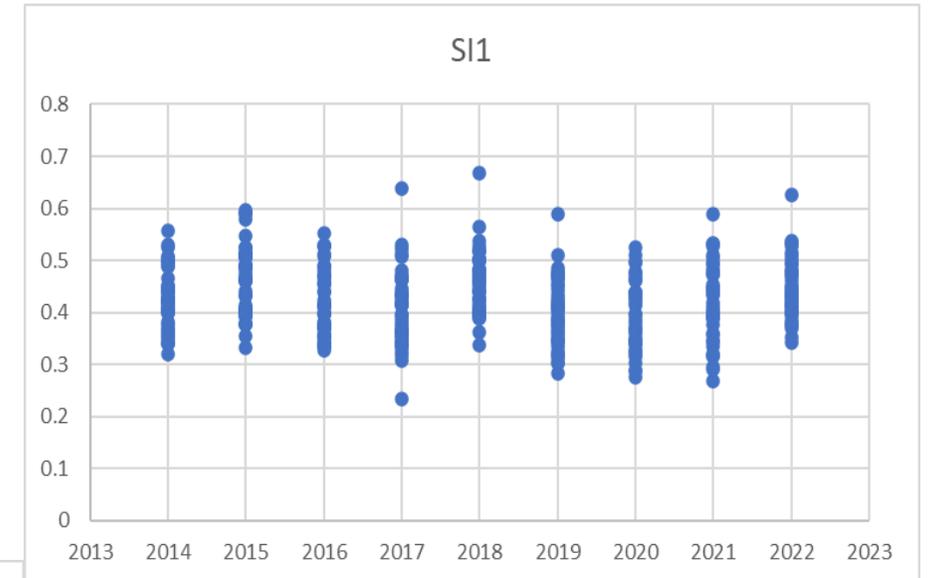
# Important points in sample basic information

Only GI farms has minimum subsidy ratio which mean less share of subsidy in their income.



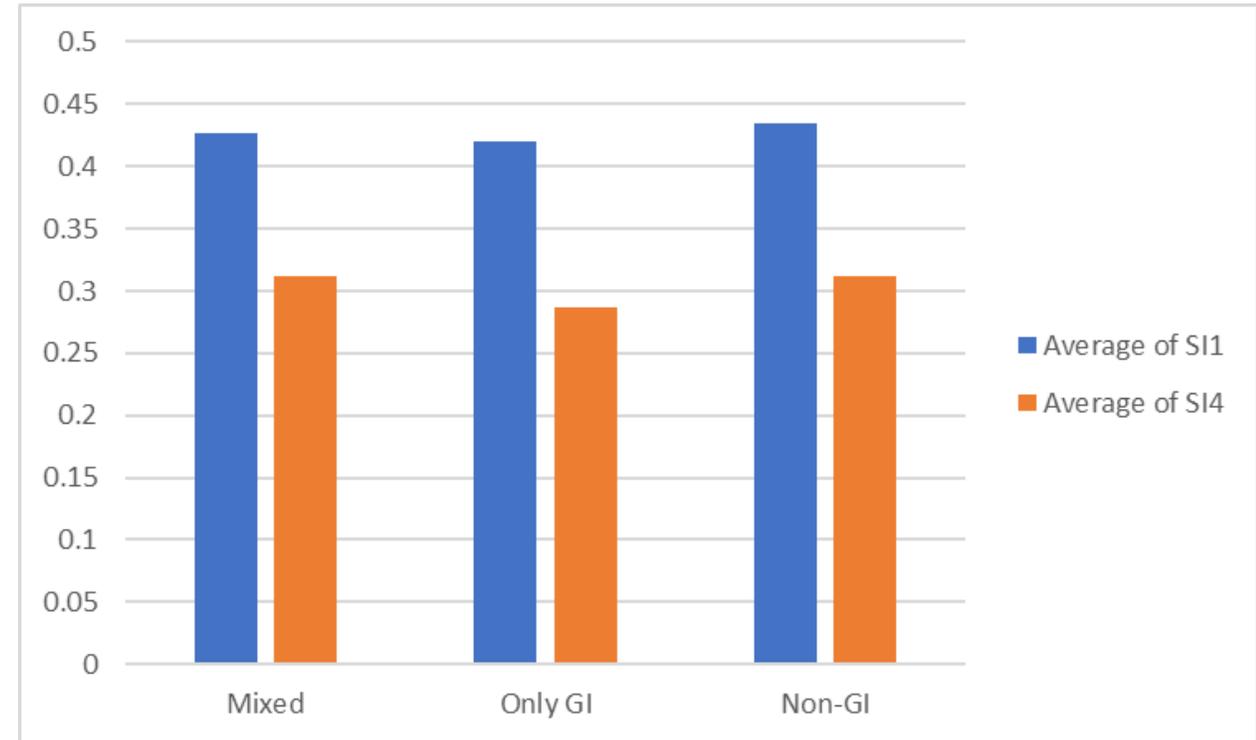
# Results of farm SIs distributions during time

Based on SI1 (Equal Weighting) and SI4 (Participatory) which are more relevant synthetic indexes for policy analysis; there are fluctuation in sustainability situation of GI wine farms during time.

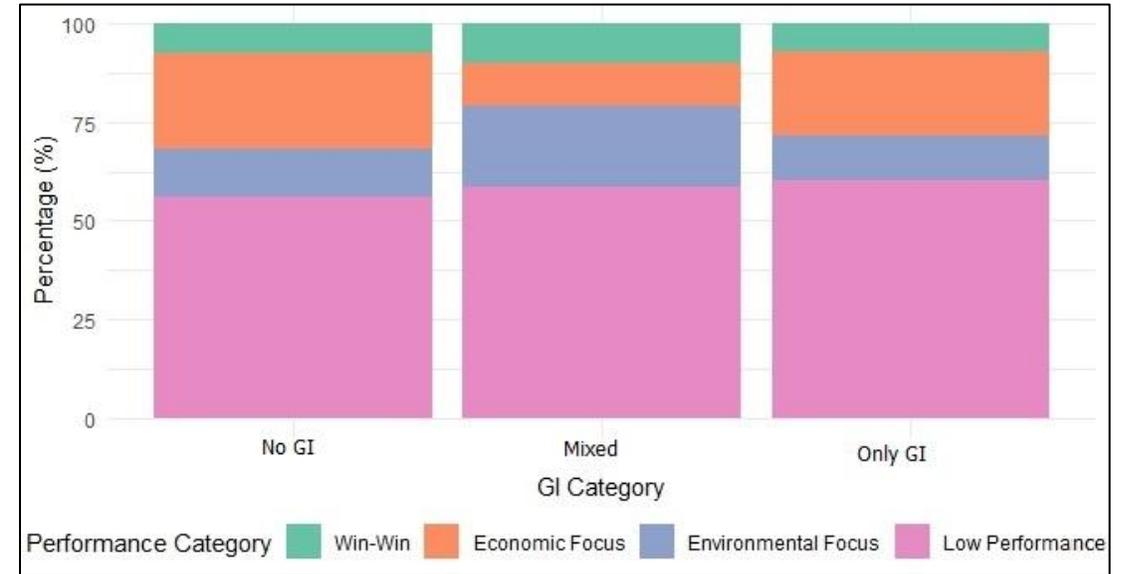
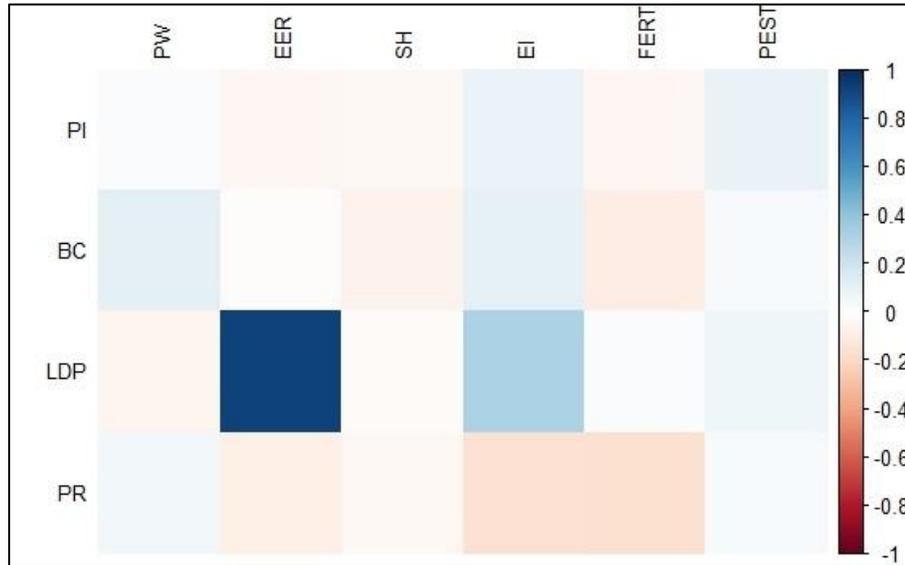


# Results

- GI category differences smaller than methodological differences between indicators
- Results show similarity across GI characteristics unlike method variations
- GI specialization does not appear to enhance sustainability performance
- Mixed production approaches show potential advantages over pure GI focus



# Results of economic-environment trade-offs



- Weak positive correlation ( $r = 0.107$ ) between economic and environmental performance
- Limited trade-offs between sustainability dimensions
- Environmental stewardship does not necessarily compromise economic viability
- Diversified production strategies show promise for balancing both objectives

# Key Takeaways

Core principles for sustainable wine GI production

## Central Finding

Flexibility and diversification enhance sustainability while maintaining regional distinctiveness

✓ **Support Mixed Production**  
10% achieve win-win outcomes

✓ **Multi-Method Monitoring**  
Different tools for different purposes

✓ **Challenge Assumptions**  
Limited economic-environmental trade-offs

✗ **Avoid Over-Specialization**  
Only-GI shows lowest scores

## Conclusion

Future sustainable GI wine production requires intelligent combinations preserving regional character while adapting to contemporary sustainability challenges.

Thanks for attention!



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