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Progress and challenges in organic viticulture and winemaking

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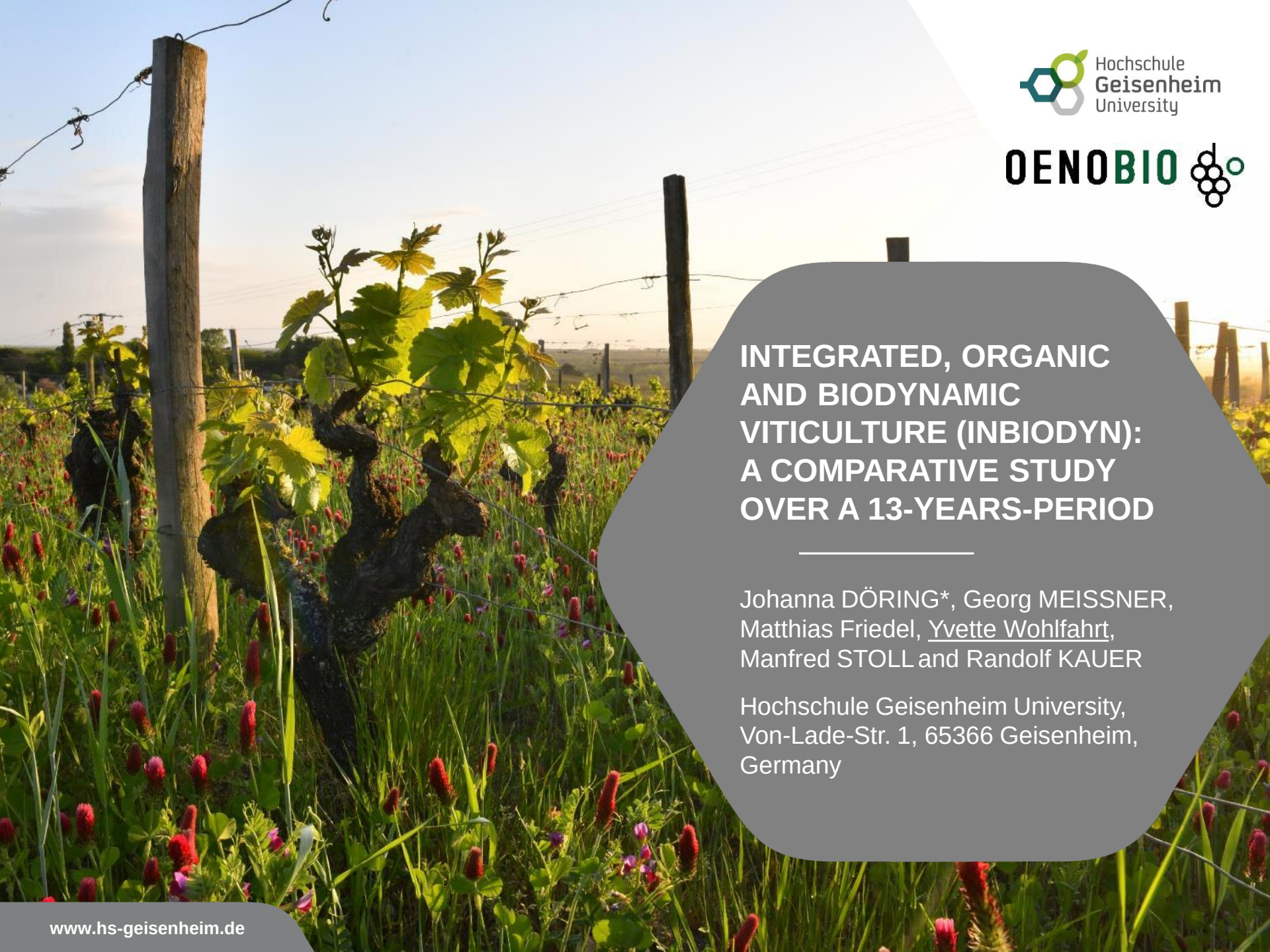

INTEGRATED, ORGANIC AND BIODYNAMIC VITICULTURE (INBIODYN): A COMPARATIVE STUDY OVER A 13-YEARS-PERIOD

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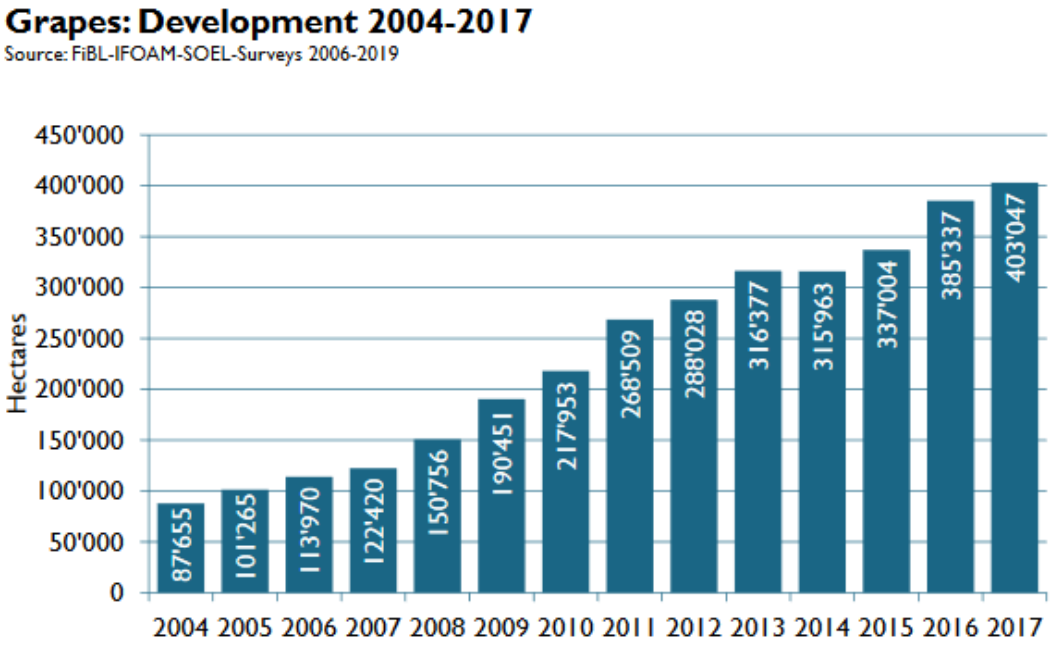
INTRODUCTION

- Demand and production of organic crops have been growing exponentially in the last few decades around the world
- Organic grape area worldwide (Willer and Lernoud, 2019)



- Organically managed grape area in Europe increased from 100.000 ha in 2007 to 340.000 ha in 2017 (Willer and Kilcher, 2009; Willer and Lernoud, 2019), almost 90% of world organic grape area
- Spain (11.6%) and Italy (15.8%) >100.000 ha, France >78500 ha (10.4%), Germany 7300 ha (7.3%) organic and biodynamic viticulture (Willer and Lernoud, 2019)
- Some of the most prestigious domains convert to organic or biodynamic viticulture

INTRODUCTION

- Effects of organic viticulture:

  ▲ soil microbiological activity, soil organic carbon, production costs, disease incidence of *Botrytis cinerea*

  ► grape composition, wine quality, wine sensory characteristics

  ▼ growth, yield, berry weight, number of berries

- Effects of biodynamic viticulture:

  ► soil quality, wine sensory characteristics

  ▼ yield, Ravaz-index, disease incidence of *Botrytis cinerea*, alcohol content, wine color and phenolic compounds (red wine)

- Aim of the study:
  - comparing existing management systems
  - searching for reasons of changes
  - management steps responsible → provide guidance for defining more effective farming systems

MANAGEMENT OF FIELD TRAIL

- management systems:
  - integrated (code of good practice)
  - organic (EU VO 834/07 and ECOVIN Guidelines)
  - biodynamic (EU VO 834/07 and DEMETER Standards)

	integrated	organic	biodynamic
cover crop	grass mixture (alternating)	Wolff-mixture (alternating)	
under-vine-management	herbicides	mechanically	
fertilisation	green waste compost + mineral fertilizers	compost + ploughing up the cover crop	compost with biodynamic preparations (or cow pat pit preparation) + ploughing up the cover crop
plant protection	systemic fungicides	copper (3 kg/ha *a max.) sulfur plant strengtheners	
biodynamic preparations	-	-	horn manure and horn silica compost preparations

MANAGEMENT OF FIELD TRAIL

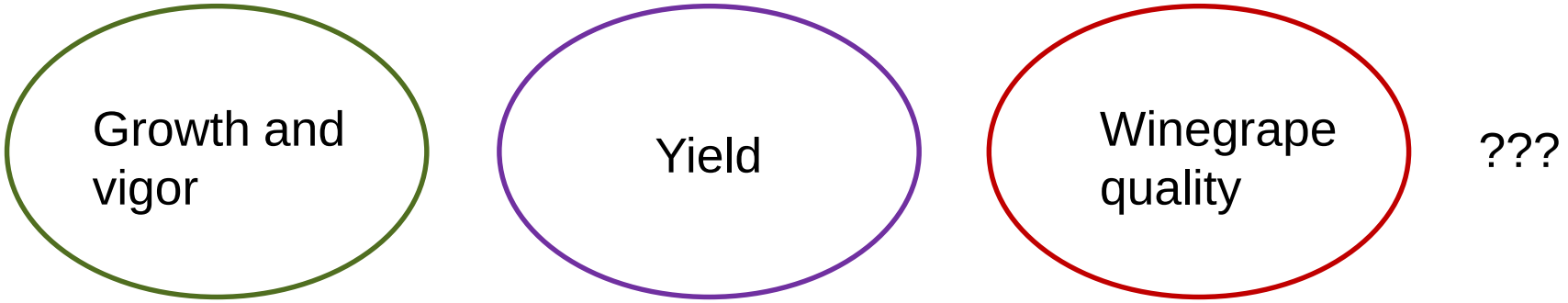
organic

integrated

biodynamic

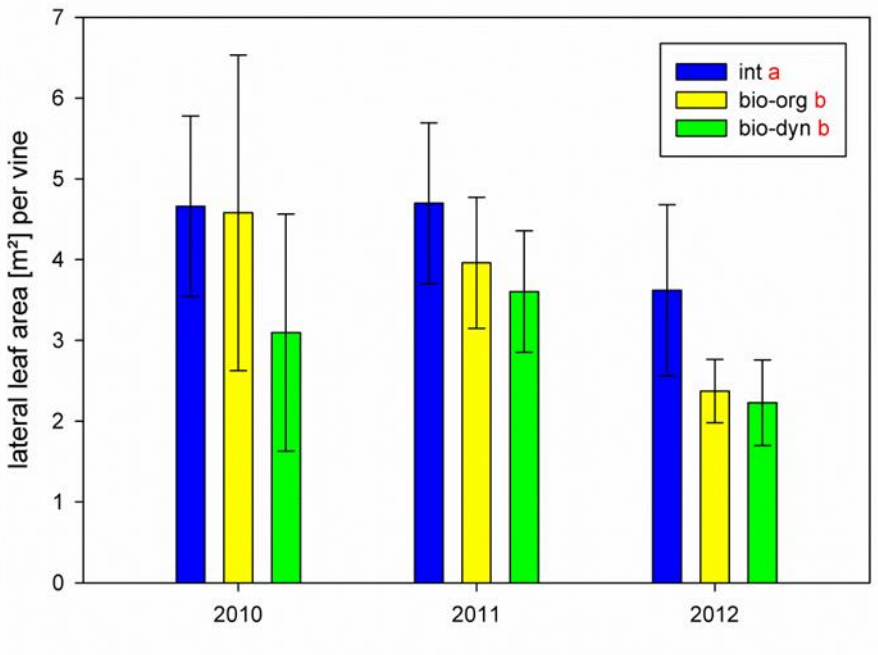
RESULTS

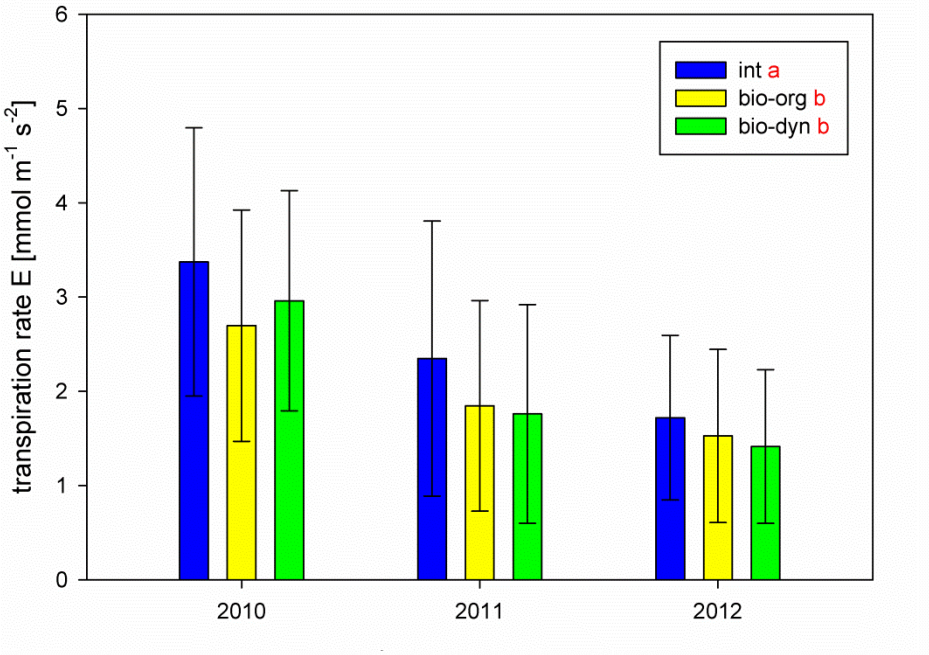
- Do the management systems differ in



- If they differ:
  - What might me the reasons?
  - Which management system steps might be responsible for the changes?

RESULTS – GROWTH and VIGOR



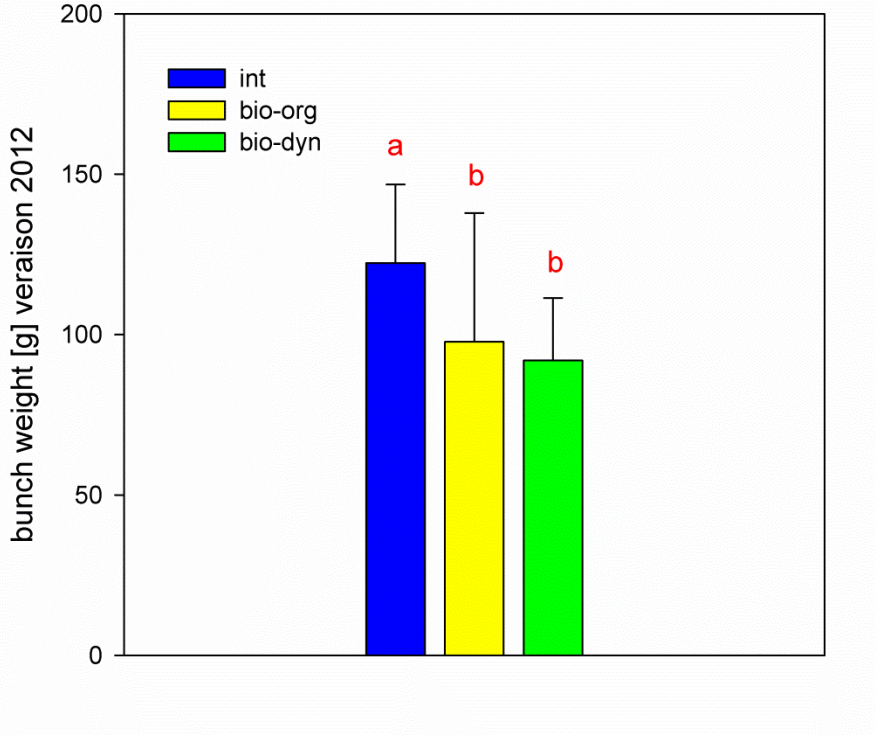


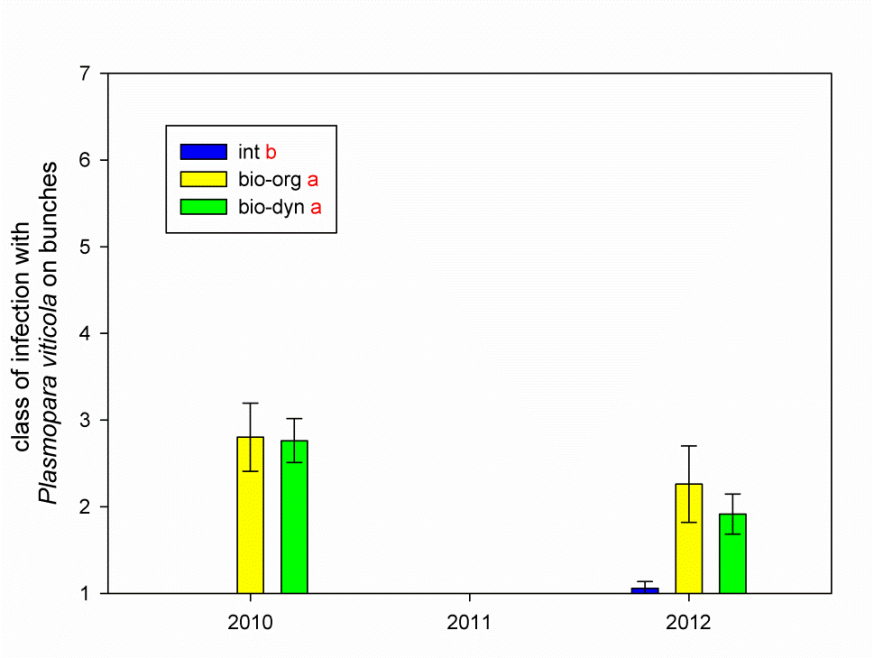
▼organic and biodynamic treatments show significantly reduced growth (pruning weight, internode length + shoot length primary shoots, lateral leaf area)

(Meißner 2015; Döring et al. 2015)

- **reasons**: nitrogen supply? physiological activity? water relations?
- **management steps responsible**: soil management and fertilization strategy

RESULTS – YIELD



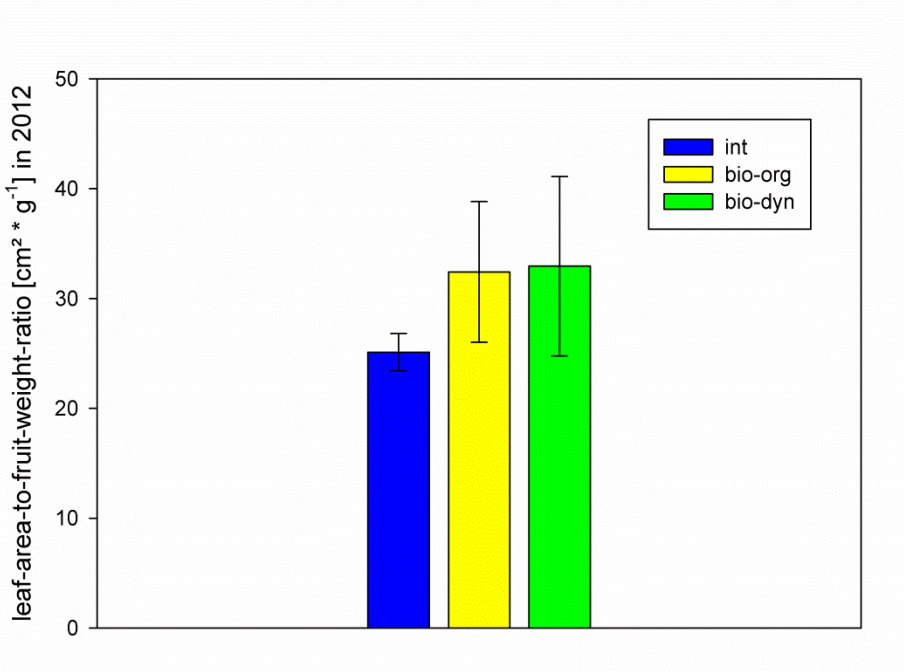


▼organic and biodynamic treatments show significantly reduced yields

(Meißner 2015; Döring et al. 2013; Döring et al. 2015)

- **reasons**: infection with *Plasmopara viticola*? bunch architecture?
- **management steps responsible**: plant protection strategy, soil management

RESULTS – WINEGRAPE QUALITY



▲ organic and biodynamic treatments show significantly higher total soluble solids at harvest

► no difference in total acidity or pH

(Meißner 2015; Döring et al. 2015)

- **reasons**: leaf-area-to-fruit-weight-ratio?
- **management steps responsible**: plant protection strategy, soil management and fertilization strategy

CONCLUSION

- Effects of organic viticulture:

  ▲ **N content in soil and leaf tissue, total solule solids at harvest,** disease incidence of *Plasmopara viticola*

  ► total acidity, pH at harvest

  ▼ growth, chlorophyll content in leaves (veraison and harvest),

  physiological activity, yield, **bunch weight**, berry weight, number of berries

- Effects of biodynamic viticulture:

  ► vine growth and yield

  ▼ P content in leaves, pre-dawn water potential

CONCLUSION

- New findings of this long-term study:
  - exploration of reasons for observed changes under organic and biodynamic management, e.g. physiological activity, nitrogen supply, bunch architecture, leaf-area-to-fruit-ratio

- Guidance:
  - ✓ **nitrogen supply** in the organic and the biodynamic treatments has been successfully ensured through cover crop management and compost addition
  - ✓ organic and biodynamic growers should **minimize water consumption** of the cover crop **after full-bloom** through mulching or rolling, because in this period berry size is determined and limited water availability might cause a reduction in bunch weight of the current and the subsequent year
  - ✓ a **stringent organic plant protection strategy** with narrow intervals of spraying events especially in wet periods throughout the growing season is crucial to guarantee yield and fruit quality of grapevines.
  - ✓ organic and biodynamic winegrowers should **ensure sufficient magnesium supply** to potentially enhance chlorophyll content and physiological performance of grapevines

OUTLOOK

- microclimate in bunch zone
  - phenol content
  - aroma potential
- sensory evaluation of wines
- chemical analysis of wines
- sustainability of different management systems
- physiological performance, water relations, hydraulic conductivity and ABA content

THANK YOU FOR YOUR ATTENTION

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