

## Vienna 2019 Abstract Submission

### Title

Sunshine – good wine – profit fine? A statistical analysis of weather impact on revenues in Germany’s wine grape production

### I want to submit an abstract for:

Conference Presentation

### Corresponding Author

Hildegard Garming

### E-Mail

[hildegard.garming@thuenen.de](mailto:hildegard.garming@thuenen.de)

### Affiliation

Thuenen-Institute of Farm Economics

### Co-Author/s

Name	E-Mail	Affiliation
Walter Dirksmeyer	walter.dirksmeyer@thuenen.de	Thuenen-Institute of Farm Economics

### Keywords

farm accountancy data  
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 farm level analysis  
 weather impact

### Research Question

Our paper investigates the impact of annual variation in weather conditions on economic success variables of wine grape growers in the different wine producing regions in Germany.

### Methods

Exploratory analysis of the correlation between weather data and profitability indicators based on farm accountancy data and annual weather data over a period of 20 years

### Results

The exploratory analysis presented in this paper could be the starting point for studies on Euro-pean level, using the European farm accountancy data network (FADN), aiming at an improved understanding

### Abstract

Sunshine – good wine – profit fine? A statistical analysis of weather impact on revenues in Germany’s wine grape production

Hildegard Garming and Walter Dirksmeyer, Thuenen-Institute of Farm Economics, Germany

There is a huge impact of weather conditions on the quality of wine grapes and on the quality of wine. Major wine grape growing regions around the world are located in the sunny areas of the temperate climate zones. Annual weather data is used in prediction models to estimate the fu-ture value of specific vintages of specialty wines to guide investment decisions. Although in Ger-many wine is produced in regions with comparatively mild climate and

more sunshine hours than in the German average, weather in wine growing regions is highly variable. Sunshine hours are less, temperature is lower and climate conditions are much less stable than in the classical Italian or French or Spanish wine producing areas. One indicator to identify appropriate climate conditions for wine grape production is the Huglin-Index, which cumulates the temperature sum for all days with an average temperature exceeding 10°C during the growth period from 1st of April until the 30th of September. In several wine growing regions in Germany, this index does not exceed the critical value of 1500 in the long-term average from 1961 to 1990 (DWD, 2019). Therefore, specific local conditions such as slopes, directed to the south are important features enabling wine grape production, but also leading to large variation of climate conditions. Additionally, there are large differences in the prevailing weather conditions between years, such as exceptionally dry or wet years, or extraordinary warm or cold years or years with significantly higher or lower solar radiation. As a consequence temporal shifts in the phenological stages of the vines, early or late harvest years, or higher or lower degrees Oechsle may be observed. Also, variation in weather conditions can occur as single events or short periods that can affect wine grape production, e. g. late frost events during flowering or hail storms. Our paper investigates the impact of annual variation in weather conditions on economic success variables of wine grape growers in the different wine producing regions in Germany. Based on the hypothesis that weather conditions influence the quality of a certain vintage and hence on the output price, we explore the correlation between weather data and profitability indicators. Economic success will be measured e.g. using farm gate prices, the proportion of quality wine versus table wine and gross revenues from wine grape production over the past 20 years. Important weather variables are the Huglin-Index, the precipitation during the growth period or the radiation. Yields of wine grapes are subject to specific regulation according to the quality requirements of the different wine growing regions. Hence we assume that variation in gross revenues is mainly caused by quality and price effects. However, in years with extreme weather events, such as late frost, also significant yield effects may be observed. Therefore, both, price and yield effects are analysed.

We use data from the German network of farm accountancy data, where grape yields, output prices and revenues are available for about 2.000 wine grape producers during the period from 1997 to 2016. Revenues from grape and wine production are differentiated into three quality levels: table wine, quality wine and other wine. Also, a distinction is made between revenues from grape sales, bulk wine sales and bottle wine sales. Both, the yield per hectare and the price of the respective output category are available. Beyond the level of the municipality, which is linked to the specific weather data, the location of the farms within the defined wine growing areas in Germany is of major importance. The sample size allows accounting for the characteristics of the major wine growing areas, namely Mosel, Rheinhessen, Pfalz, Württemberg, Baden and Franken. Weather data is obtained from the Climate Data Center of the Deutscher Wetter dienst, the public German agency for meteorological services and climate monitoring. We use data from the 1 x 1 km grid, aggregated on the level of the municipalities and match these with individual farm data via the official municipality key provided in the farm accountancy data. Combining data on the phenological stages and temperature, late frost events during the flowering stage are identified and included in the analysis. Other weather conditions that mainly affect the yield are more difficult to consider, since hail storms usually occur on very small local scale.

The exploratory analysis presented in this paper could be the starting point for studies on European level, using the European farm accountancy data network (FADN). Climate change is becoming an increasingly important factor affecting agricultural production all over the world, therefore, analyses on the economic effects of variations in weather conditions on wine grape producers can help to find appropriate adaptation measures for the wine producing sector.

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