Climate Change Resilience in Viticulture: Knowledge transfer and ecosystem services of adaptation strategies

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The Rheingau is one of the 13 designated German wine-growing regions and produces the highest proportion of Riesling in Germany. The effects of climate change on air temperature and precipitation can already be seen in phenological observations. The result is an earlier beginning of the budding, flowering and maturing dates. If the date of the beginning of the wine harvest for Riesling in the period 1961-1990 was on October 17 on average, the time in the period 1981-2010 shifted five days to the beginning of the month to October 12. In 2019, the harvest yield was significantly lower than the average of the past ten wine harvests. A consequence of increasing drought and heat in summer, more sunburn damage, but also increasingly late frosts and hailstorms. An evaluation of climatic variables for the near future (2050) relevant to viticulture performed for the individual phenological phases indicated critical changes. An increasing probability of the occurrence of tropical nights (minimum air temperature ≥ 20°C) which would potentially endanger the character of the Riesling and an increased probability of humid conditions during maturation, with the danger of higher pest load is to be expected. Higher, increasing evaporation rates will further reduce the availability of soil water in the growing and especially in the maturing phase. A systematic and regional-specific adaptation strategy for the Rheingau is still lacking. In addition, viticulture produces monoculture agro-ecosystem and causes specific environmentally problems, like soil erosion, loss of biodiversity and nitrate leaching relating to surface and groundwater eutrophication. The KliA-Net project launched in the middle of 2019 to address these problems together with the effects of climate change and to find sustainable, nature-based and landscape-integrative solutions. The aim of the project is to establish local and, above all, inter-communal cooperation and to develop it into joint action for adaptation to climate change. The resulting impulses lead to measures to reduce climate damage under the premise of climate protection, sustainable management and the best possible provision of ecosystem services. We will present the overall theoretical framework and the integrated approach to demonstrate that the concept of Terroir reflects the interactions between people and nature. Here, the concept of Vinecology was adapted, as the integration of ecological and viticultural principles and practices; it contextualizes sustainable land management within the specific agricultural sector and serves as an entry point to biodiversity conservation in an economically and biologically important biome integrated in its adjacent landscape. Concrete measures for climate adaptation in viticulture compiled in a catalogue, which is divided into 5
areas of action: viticulture, soil protection, water, biodiversity and landscape. These represent the
different vinecological scales (landscape, vineyard, plant). This catalogue forms the basis for the
transfer of knowledge between science, winegrowers, communal politics, administration and
NGOs. Furthermore, we also contextualize related ecosystem services to indicate benefits
resulting from a concrete measure. We hypothesize, that this is a way to harmonize objectives in
nature conservation, soil and water protection and sustainable economic development.