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ENVIRONMENTAL SUSTAINABILITY INDICATORS
IMPLEMENTED IN A DECISION SUPPORT SYSTEM FOR
VITICULTURAL SECTOR

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ABSTRACT

Environmental sustainability principles applied to agricultural and specifically to viticultural sector are presented.

A rigorous and complete approach is built with the final purpose to assess the sustainability level of agricultural productions. The work focuses on grape growing process and undergoes a detailed analysis of the environmental performance associated to all the phases of the grape lifecycle.

The approach takes into account different impacts in a comprehensive modelling of the processes and estimates impacts categories regarding human health, air, soil, biodiversity conservation, energetic consumptions and water use. The methodology comprehends both indicators that evaluate the emissions and resources use with a Life Cycle Assessment approach, and typically agronomic indicators. In fact, besides using indicators like carbon, water and ecological footprint or acidification and eutrophication, the research work includes also agronomic indicator such as carbon sequestration, soil coverage, erosion risk, water use efficiency, fuel consumptions, etc. as well as biodiversity issues and the assessment of toxicological and eco-toxicological risk caused by chemical products use in the field.

The study is carried out following the guidelines from international standards and from documented literature sources for the assessment of the environmental performance and elaborating original methodologies for the input data collection, the quantification of the impacts, and the interpretation of the results.

The main goals of the work are the: (i) analysis of the literature background on environmental indicators implementation in agricultural and viticultural sector; (ii) development of innovative methodology to assess environmental impact of grape production process; and (iii) testing of the methodology in practical cases.

Four parts and a conclusion chapter form the structure of the thesis.

Part I - The introduction concerns the general framework of the thesis and is divided in different sections concerning: i) the implementation of sustainability aspects into agricultural sector through the construction of a set of indicators; ii) environmental sustainability indicators issues; iii) researches and methodologies to analyse the environmental sustainability of an agricultural productions; iv) the interest in sustainable wine consumption and production and initiatives of vitivinicultural sustainability assessments in Italy and at international level; and v) the DSS, specific tools that help implementing sustainability principles into agricultural sector.

Part II - The second part of the thesis explains the main objectives of the Doctoral work programme and the methodology used to build the environmental sustainability indicators for the viticultural sector.

Part III - The third chapter examines the indicators, starting with the definition of the macro-areas (Human Health, Air, Soil, Biodiversity, Energy and Water) going through the description of the sub-indicators calculation methodology and characteristics and finishing with the definition of the applied scores.

Part IV - After having defined indicators and sub-indicators, weights were attributed and the methodology was tested. Therefore, the fourth part shows the results of the indicators test in practical cases within the European FP7-KBBE project "*InnoVine*" on innovation in viticulture. In particular, the indicators were tested with two InnoVine partners, one located in Italy and the other in Spain. In the first section of this part the InnoVine project is described with a specific focus on the work package 4, in which the tests were performed. A second section explains data collection process and the indicators implementation in the practical cases. Finally the results about environmental indicators calculation are presented and discussed.

The final chapter of the thesis summarizes the results obtained and draws the conclusions, confirming: i) the methodology validity in quantifying the impacts of different grape production practices on the environment and ii) the methodology implementation in the DSS vite.net® through a calculator.

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