

# Evaluation of agricultural sustainability on a mixed vineyard and olive-grove farm in Southern Spain through the INSPIA model

## Description

This case study is part of the INSPIA project<sup>1</sup> (European Index for Sustainable Productive Agriculture), which aims to perform Best Management Practices (BMPs) in more than fifty farms located in Spain, France, Denmark and Belgium, in order to achieve agricultural sustainability. The BMPs are based on sustainable agricultural activities focused on the protection and improvement of soil, water and biodiversity, whilst enhancing productivity. INSPIA methodology<sup>2</sup> facilitates the monitoring of agricultural practices on farms and their levels of sustainability, by using indicators that focus on the environmental benefits of BMPs, evaluate the social welfare of the farmer and farm's level of productivity. All these activities aim to contribute to redefine the current Common Agricultural Policy towards a more sustainable model.



In this case, the sustainability assessment was carried out on a mixed farm of vineyards and olive groves located in Córdoba (Spain) to evaluate the agricultural management across five agricultural seasons (from 2013/2014 to 2017/2018). The performance of the BMPs were monitored through a tailored set of thirty-one open-source basic indicators that assessed the degree of sustainability according to its three main dimensions: social, economic, and

environmental. These core indicators were grouped into twelve combined indicators<sup>3</sup> that provided the composite index of sustainability, proportional to the number of BMPs. This means that an optimal index of sustainability is composed of uniformly high indicator values, derived from the adequate development of BMPs, whilst a set of medium and high indicator values and some low values are sub-optimal and unsustainable.

Once the BMPs were implemented during five seasons, the highest value of the sustainability index was reached in the fourth season (2016-2017, 72.7%) which was the only season that exceeded the established optimal threshold of the index. During the fifth season (2017 – 2018), there was a reduction in the value of the index due to a lack of BMP implementation, specifically those linked to soil management. This included, for example; soil cover use and use of minimum soil disturbance practices. These actions are fundamental natural assets for improving the processes that contribute to the sustainability of the agricultural system.

It shows how the implementation BMPs in agricultural ecosystems can improve the sustainability of the natural capital that land with permanent croplands in Southern Spain holds. Due to BMP, farmers can maintain an ecosystem and improve the productivity of their crops, while helping the environment.

## Methodology and tools

The INSPIA methodology is a model developed by the Initiative for Sustainable Productive Agriculture<sup>4</sup> and it measures sustainability at farm level through sustainability indicators (economic, environment and social). Indicators are tools to support farmers in assessing the sustainability situation, i.e., to check whether agricultural practices were developed in a sustainable way or need to be improved and in what respect. The method evaluates both the direct and indirect effects of the BMPs developed. Therefore, this tool makes it easier for farmers to monitor farms and make decisions in line with BMP implementation, to improve the farmed environment for biodiversity and enhance the natural capital of which farm productivity relies on. This will be achieved by avoiding traditional agricultural practices that aggravate environmental degradation.

Farmers in collaboration with project researchers monitor agriculture sustainability, enabling them to improve their performance by implementing BMPs that restore and protect natural capital. The monitoring of BMPs was done through a set of 31 open-source core indicators, which were standardized to a value between 0-100. Once indicators were controlled, the weighting and subsequent collection were conducted to obtain the final composite INSPIA index. All indicators were divided according to the main three pillars of sustainability, calculated using data collected in the field and were conducted to farmers during interviews placed throughout the five agricultural seasons. These resulted in the construction of the final composite index of sustainability.

## Impacts achieved by the study

During five agricultural seasons, in line with the five project implementation years (from 2013/2014 to 2017/2018 seasons), thirteen BMPs were applied, two of which were constant over time (use of ground for permanent crops and optimization of irrigation timing and rate). The farmer was increasingly aware of his ability to reduce negative effects linked to the environment and society. For example, the use of pesticides was reduced, and waste management improved. Multi-functional buffer zones and margins were also established, along the watercourses and between plots. These areas act as a green screen, so fertilizers, used according to soil deficiencies and crop needs, are not deposited in adjacent watercourses. It also increases the population of pollinators, which encourages the attractiveness for pest predators.

The application of BMPs had a positive impact on the soil, water, biodiversity, and CO<sub>2</sub> sequestration. For example, the farm's sequestration potential was estimated at 622.22 t CO<sub>2</sub> for the five agricultural seasons. In addition, 41.4% decrease in soil tillage resulted in social (12.7% working hours per hectare reduction), economic (improvement of productivity) and environmental (66.6% and 3.7% organic matter content and energy productivity increases, respectively, 10.5% lower erosion risk) benefits. In terms of economic and social benefits, establishing a vegetation cover means higher profitability due to less soil loss or reduced tillage which enables farmers to have more time for other tasks.

In comparison to traditional agriculture, sustainable agriculture does not negatively impact soil, which is the main natural asset along with water. Soil cover prevents erosion and improves organic matter, increasing biodiversity, whilst reducing greenhouse gas emissions. Farmers can increase agricultural production and the quality of their products, improving their profit and their welfare.

The results of the application of the INSPIA methodology will serve as a basis for incorporating Conservation Agriculture into the Common Agricultural Policy. Accordingly, The INSPIA project will serve to establish agri-environmental measures in future reviews of the EU Common Agricultural Policy<sup>5</sup>. In addition, the INSPIA model will be a useful tool for European farmers to contribute and commit to achieve sustainable European agricultural and environmental policies.



## Lessons Learned

The European Parliament has been involved and participated in the INSPIA project as well as other politicians. Thanks to their in-situ visits to the project areas and participation in meetings with the project coordinator and farmers, they were able to promote the benefits of INSPIA and the regenerative agriculture models in the EU parliament. They have supported, encouraged and sponsored this initiative to incorporate the Conservation Agriculture into the EU Common Agricultural Policy. Therefore, this public-private collaboration is beneficial for the elaboration of new agricultural policies that generate greater benefits to farmers and are more environmentally friendly.

“European collaboration helped to bring MEPs closer to the reality of the territory, with a view of promoting and developing a model of conservation agriculture throughout Europe through the Common Agricultural Policy” (Paula Triviño Tarradas, Associate Prof. Cordoba University).

In this case, INSPIA’s methodology has been validated as a tool for assessing the sustainability of permanent

farmlands. It has been shown that a greater application of BMPs on the ground lead to improved value of sustainability indicators. Currently, the owner continues to incorporate and continue the BMPs implemented.

“The application of the measures proposed by INSPIA helps to minimize the risks of soil loss and erosion, so that farmers reduce risks and dependencies on agricultural inputs and greenhouse gas emissions by increasing the capture and fixation of CO<sub>2</sub>. Farmers receive increased economic returns by reducing staff and operational costs” (Paula Triviño Tarradas, Associate Prof. Cordoba University).

The results of INSPIA make it easier to understand the BMPs that farmers need to consider for the improvement of sustainability on their farms. INSPIA’s analysis of BMPs also provides a framework of agricultural practices that should be applied at farm level. We can confirm that there is a positive trend in the progress and sustainability of the farm, due to the increased awareness of the farmer about the application of best agricultural practices.

<sup>1</sup> <http://www.inspia-europe.eu/>

<sup>2</sup> <http://www.inspia-europe.eu/index.php/menu-blog/item/20-the-inspia-methodology>

<sup>3</sup> Triviño-Tarradas, P., Gomez-Ariza, M. R., Basch, G., & Gonzalez-Sanchez, E. J. (2019). Sustainability assessment of annual and permanent crops: The Inspia model. *Sustainability*, 11(3), 738.

<sup>4</sup> <https://www.youtube.com/watch?v=lqIQPEtnuK0>

<sup>5</sup> <https://www.inspia-europe.eu/index.php/menu-blog/item/4-inspia-presentation-in-the-farm-cortijo-maestre-alcala-de-guadaira-sevilla-spain>

The campaign is being led by the [Institute of Chartered Accountants in England and Wales](#) alongside the [World Business Council for Sustainable Development](#), [IUCN](#) and [Oppla](#).



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