

Measuring the Impact of Crop Production under Protected Agriculture Systems

August 2023

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Executive Summary

The comparative assessment of climate change potential or carbon footprint between two blueberry production systems in the Valleys of Jalisco, Mexico—specifically protected agriculture (PA) and conventional open-field agriculture (OA)—has provided a detailed view of the environmental impacts associated with each method.

The results reveal that protected agriculture shows a significant reduction in the carbon footprint per hectare equivalent of cultivation compared to open-field agriculture. This decrease is largely attributed to the high efficiency and yield of the protected agriculture system, which achieves approximately four times the yield per hectare of open-field agriculture.

The categories of energy, infrastructure, and pesticides have emerged as the main contributors to the carbon footprint in both production systems. However, open-field agriculture is particularly affected by the excessive use of pesticides and fertilizers, which account for more than 51% of the system's total impacts. On the other hand, protected agriculture faces challenges related to optimizing and reducing the use of resources such as fertilizers, energy, and substrate to mitigate its environmental impact. The results of the study demonstrated a 26% reduction in water use, 76% reduction in fertilizer use, 84% reduction in pesticide use, and a 28% reduction in greenhouse gas (GHG) emissions when implementing protected agriculture compared to open-field production techniques.

Despite the significant contributions of this study, it is important to acknowledge some limitations. Data collection was based on available field information and scientific literature, which may have led to some lack of precision or granularity in the data, especially regarding pesticide use and emissions. Additionally, the exclusion of machinery from the inventory and variability in yield data per hectare pose challenges that could be addressed in future research. In this regard, future studies could focus on refining the inventory for open-field agriculture with more detailed data, as well as improving the accuracy of information on pesticide use.

Ultimately, this study provides a solid foundation for informed decision-making regarding sustainable agricultural practices in the Jalisco region, highlighting the importance of considering not only productivity but also the environmental impacts associated with different blueberry production systems.