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Estimation of carbon sequestration in vineyards in the island of Crete, Greece

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Abstract: Climate change consists of a serious global environmental problem and many efforts are focused on its mitigation either by reducing the anthropogenic carbon emissions or by absorbing atmospheric carbon. Agricultural crops usually absorb carbon via photosynthesis acting as carbon sinks. Viticulture is well developed in Crete, Greece since ancient times and the island nowadays produces several well-known grapes and wines. The carbon uptake in Cretan vineyards in Crete has been evaluated. The carbon sequestration rate in vineyards from existing studies in several countries has been used for the evaluation. These studies indicate that carbon uptake in vineyards varies in a wide range of values at 69 - 900 g C m^{-2} yr^{-1}. The total surface area of vineyards in Crete is 22,184 ha while their annual carbon sequestration has been estimated at 55,460 t C corresponding at an annual carbon sequestration per capita 0.36 t CO_2. Although our results should be considered as indicative, they show that carbon sequestration in Cretan vineyards is not negligible and it should be considered in policy development regarding decarbonization in the island. Our results could be useful to policy makers and to stakeholders of the viticulture industry in the island.

KEYWORDS: carbon, Crete-Greece, sequestration, soil, vineyards

1. INTRODUCTION

Carbon sequestration in agriculture assists in climate change mitigation alleviating its painful impacts on human societies. Several studies have estimated the carbon sequestration potential of several crops (1), (2), (3), (4), (5) including vine's cultivation. These studies indicate that vineyards act as carbon sinks while the amount of sequestered carbon varies significantly (6), (7), (8), (9), (10), (11). Viticulture is well developed in Mediterranean countries including the island of Crete, Greece (12).

The aim of the current study is to estimate the carbon sequestration in vineyards in the island of Crete, Greece.

The text is structured as follows: After the literature survey the vineyards in Crete and the carbon sequestration from agricultural crops are stated. Next, the carbon sequestration in vineyards is mentioned and the carbon sequestration in vineyards in Crete is evaluated. The text ends with discussion of the findings and the conclusions drawn.
The current work is innovative since there are not many studies on this topic in Crete and in Greece while it fills the research gap regarding the carbon sequestration in vineyards in Crete. The results could be useful to policy makers, to public authorities and to stakeholders of vine cultivation in the island.

2. LITERATURE SURVEY

The carbon sequestration in olive tree groves in the island of Crete has been estimated (1). The author estimated that the annual carbon sequestration rate due to olive groves in Crete is 1,310,393 tCO_2 or 1.92 tCO_2 per resident. The carbon removal potential in agricultural systems in Sweden has been explored (2). The authors examined three options which were preferable by farmers, such as biochar addition to the soil, cover crops and cultivation of ley crops in crop rotation. They stated that biochar addition was more effective in increasing the stock of organic carbon in the soil compared to the other two methods. A report regarding carbon sequestration through agricultural practices has been published (3). The authors assessed the effectiveness of 13 promising carbon sequestration practices. They stated that the two most effective methods were: a) the addition of compost mainly from vegetable and garden residues achieving sequestration rate at 0.62-2.1 t C ha^{-1} yr^{-1}, and b) conversion to permanent grassland achieving sequestration rate at 0.5-1.1 t C ha^{-1} yr^{-1}. The carbon sequestration potential in main crops has been reviewed (4). The authors stated that the average carbon sequestration rates in major staple crops range from very low values at 0-0.05 Mg C ha^{-1} yr^{-1} to medium values at 1-5 Mg C ha^{-1} yr^{-1}. They mentioned that the sequestration rate was in wheat-maize rotations at 4.96 Mg C ha^{-1} yr^{-1} and in

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rice-wheat rotations at 0.52-0.69 Mg C ha^{-1} yr^{-1}. The carbon budget in peach orchards in three cultivation systems in Mediterranean region has been studied (5). The authors stated that carbon storage was high compared to other fruit tree species. They mentioned that carbon storage was in the range of 10,729-12,160 kg C ha^{-1} yr^{-1}. The carbon sequestration in a grassed vineyard has been evaluated (6). The authors stated that existing studies indicated that vineyards are carbon sinks absorbing atmospheric carbon in the range of 69 - 900 g C m^{-2} yr^{-1}. They also mentioned that the estimated annual overall carbon storage in vineyards is in the range of 145-159.2 t C/ha. The carbon storage characteristics in vineyards in Hongsibu, Ningxia, China have been studied (7). The authors stated that the total carbon storage was 55.35 t/hm^2 of which 43.12 t/hm^2 was in the soil. They mentioned that vineyards can serve as an effective carbon sink while the most carbon is sequestered by the soil. The carbon budget in vineyards located in north eastern Italy has been examined (8). The authors stated that the net ecosystem exchange, over a period of five years, was at around 800-900 g C/m^2 while grapes represented 20-25% of it. The carbon budget in a vineyard located in north eastern Italy has been analyzed (9). The authors stated that in one cultivated period the vineyard's ecosystem was a net sink of CO_2 absorbing around 233 g C/m^2. They mentioned that soil cultivation has decreased carbon sequestration stating that without inter-row cultivation the overall carbon removal would be at 421 g C/m^2. This indicates that grass cover increases the carbon uptake in vineyards. The carbon budget of a temperate-climate vineyard located in north-eastern Italy for three years has been evaluated (10). The authors stated that the vineyard was acting as a moderate carbon sink with an average annual carbon uptake at 134 g C m^{-2} yr^{-1}. They mentioned that during three years the carbon uptake was in the range of 69-207 g C m^{-2} yr^{-1}. The organic carbon sequestration in vineyards has been studied (11). The authors stated that existing studies in China and Italy indicated that carbon removal in vineyards was in the range of 69-992 g C m^{-2} yr^{-1} . They mentioned that the majority of biomass storage occurs in the soil while biomass of grapes stores little carbon. The nexus between wine tourism and climate change in Crete has been studied (12). The authors using 15 in-depth interviews examined the challenges of climate change to Cretan wine tourism sector and the effectiveness of the existing resilience strategies. The area of vineyards in Crete in 2020 has been estimated at 22,184 ha. (13) The pruning weight in vineyards using LiDAR sensing technologies has been estimated (14). The authors stated that their method provided a rapid mapping of vines and several characteristics of the vineyard. The soil organic carbon sequestration has been studied (15). The authors stated that: a) the climate change mitigation potential of soil organic carbon sequestration is high, and b) correlations between soil organic carbon sequestration and crop yield are strongly context dependent and it is uncertain if a causal link exists. The carbon emissions due to wine making in Crete, Greece have been estimated (16). The authors stated that carbon emissions in the life cycle of winemaking are relatively low. He estimated these annual carbon emissions in Crete at 40,000 tCO_2 or 0.064 tCO_2 per resident. The possibility of using agrivoltaics in vineyards in Crete has been examined (17). The author estimated the installation of agrivoltaics in vineyards in Crete covering 1% of their surface with coverage ratio 30% can generate annually electricity equal to 5.2% of the annual power demand in the island. The carbon footprint of a matured vineyard located in south Sardinia, Italy has been assessed (18). The authors stated that the total amount of GHG emissions related with the production of 1 kg of grapes is 0.39 $kgCO_{2e}$ while the most of them were derived from soil management and fossil fuel combustion. The CO_2 balance in a vineyard located in an arid region in northwest China has been examined (19). The authors stated that the carbon uptake was in the range of 820-961 g C m^{-2} yr^{-1} during a period of three years. The GHG budget of wine production has been evaluated (20). The authors stated that at vineyard's level the total carbon footprint is closed to zero. Sustainable cultivation practices could turn the agrosystem into a net carbon sink. They mentioned that the total carbon footprint of sustainable wine varies in the range of 0.65-0.93 $kgCO_{2e}$ per bottle of wine while 15% of it is attributable to the agricultural phase and 85% to the transformation of grape into wine. The removal of pruned vine biomass from vineyards instead of adding it into vineyard soils enhancing their carbon content has been studied (21). The authors stated that if the pruned vine biomass will be removed and used for biofuel production there is no negative impact in the carbon content of the soil in the long-term. Table 1 indicates the carbon sequestration in vineyards in Crete according to several studies.

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Table 1. Carbon sequestration in vineyards

Author, year	Location	Irrigation	Plant density (vine ha^{-1})	Carbon uptake (g C m^{-2} yr^{-1})
Guo et al, 2014	Wuwei, Gansu Province, China	(5 or 6 times a year, 300 mm yr^{-1})	3,700	860-920
Pitacco and Meggio, 2015	north-eastern Italy	Rainfed	3,076	800-900
Marras et al, 2015	South Sardinia (Italy)	Drip-irrigated	5,952	195
Gianelle et al, 2015	Italy	Rainfed	-	145
Vendrame et al, 2019, Tezza et al, 2019	Italy	Rainfed (occasional water supply during dry summers)	5,050	69-207
Chiriaco et al, 2019	Italy	Rainfed	5,000	150

Source: Callesen et al, 2023

3. VINEYARDS IN CRETE

The vineyards of Crete are among the oldest and most fascinating in the Mediterranean world. Wine production on the island dates back more than four thousand years to the ancient Minoan civilization, making Crete one of Europe's earliest wine-producing regions. Today, Cretan vineyards combine deep historical traditions with modern winemaking techniques, creating wines that are increasingly admired around the world. Crete's geography plays a major role in the quality of its vineyards. The island is mountainous, with vineyards stretching across hillsides, valleys, and elevated plains. Many vines are planted at high altitudes where cooler temperatures help grapes ripen slowly and develop complex flavors. The Mediterranean climate provides hot, dry summers and mild winters, while sea breezes protect the grapes from excessive heat. This balance of sunshine and cooling winds creates ideal conditions for viticulture. One of the most important wine regions on the island lies near the city of Heraklion. Villages such as Archanes, Peza, and Dafnes are famous for their vineyards and wineries. These areas produce both red and white wines using indigenous grape varieties that are unique to Crete. Among the best-known white grapes is Vidiano, which produces aromatic wines with notes of peach, apricot, and herbs. Another important variety is Vilana, a fresh and light grape often enjoyed during the warm summer months. Cretan red wines are equally distinctive. The Kotsifali grape is known for its soft texture and fruity character, while Mandilaria adds deeper color and stronger tannins. Winemakers often blend these varieties to create balanced and flavorful wines. International grape varieties such as Syrah and Cabernet Sauvignon are also cultivated on the island, but many producers take pride in preserving local grapes that reflect Crete's unique identity. The culture of wine in Crete extends beyond agriculture. Vineyards are closely connected to family traditions, local cuisine, and hospitality. Many wineries welcome visitors for tastings, tours, and meals featuring traditional Cretan dishes. Wine is often paired with olive oil, local cheeses, grilled meats, and fresh vegetables, forming part of the famous Cretan diet, which is considered one of the healthiest in the world. Festivals celebrating the grape harvest and wine production continue to play an important role in village life.

In recent decades, the wine industry in Crete has experienced significant growth and modernization. Young winemakers, many of whom studied abroad, have returned to the island with new ideas while still respecting ancient traditions. They invest in sustainable farming, improved technology, and international marketing. As a result, Cretan wines have gained recognition in global competitions and export markets. The vineyards of Crete represent far more than a source of wine. They symbolize the island's long history, natural beauty, and cultural pride. Walking through the vineyards, one can sense the connection between the land and the people who have cultivated it for centuries. From ancient Minoan roots to modern wineries, the story of Cretan vineyards is a story of continuity, resilience, and passion for the art of winemaking. Table 2 indicates the area of vineyards in Crete.

Table 2. Area of vineyards in Crete, Greece

	2020	2015
Area of vineyards in Crete	22,184 ha	22,555 ha
%, Area of vineyards in Crete, area of Crete	2.63%	2.63%
%, Area of vineyards in Crete/area of vineyards in Greece	21.55%	21.88%

Source: Hellenic Statistical Authority, 2022, Area of Crete is 8,450 km^2

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4. CARBON SEQUESTRATION FROM AGRICULTURAL CROPS

Carbon sequestration from agricultural crops has become an increasingly important topic in discussions about climate change and environmental sustainability. As global temperatures continue to rise due to increasing concentrations of greenhouse gases in the atmosphere, scientists and policymakers are searching for effective ways to reduce carbon dioxide levels. Agriculture, often viewed as a contributor to greenhouse gas emissions, also has significant potential to act as a solution. Through proper land management and crop cultivation practices, agricultural systems can capture and store carbon from the atmosphere, helping to mitigate climate change while improving soil health and productivity. Carbon sequestration refers to the process of capturing carbon dioxide from the atmosphere and storing it in plants, soils, or other natural reservoirs for long periods of time. Agricultural crops play a major role in this process through photosynthesis. During photosynthesis, plants absorb carbon dioxide and use sunlight to convert it into organic matter such as roots, stems, leaves, and grains. A portion of this carbon is transferred into the soil through root systems and plant residues, where it can remain stored as soil organic carbon. Healthy agricultural soils are among the largest terrestrial carbon reservoirs on Earth. However, conventional farming practices such as excessive plowing, monoculture farming, and overuse of chemical fertilizers can reduce soil organic matter and release stored carbon back into the atmosphere. For this reason, modern sustainable farming practices focus on increasing the capacity of soils to retain carbon while maintaining agricultural productivity.

One important method of carbon sequestration is conservation tillage or no-till farming. Traditional plowing disturbs the soil structure and exposes organic matter to oxygen, accelerating decomposition and releasing carbon dioxide. In contrast, no-till farming minimizes soil disturbance, allowing organic matter to accumulate over time. This practice not only increases carbon storage but also reduces soil erosion and improves water retention. Cover cropping is another effective strategy. Cover crops such as clover, rye, and legumes are planted between main crop seasons to protect the soil from erosion and maintain soil fertility. These crops absorb atmospheric carbon dioxide during their growth and add organic matter to the soil when they decompose. In addition, cover crops improve biodiversity, reduce nutrient loss, and decrease the need for synthetic fertilizers. Despite its many benefits, carbon sequestration in agriculture faces several challenges. Climate conditions, soil type, and farming practices all influence the amount of carbon that can be stored. In some cases, economic pressures may discourage farmers from adopting sustainable practices due to higher short-term costs or lower immediate profits. Furthermore, accurately measuring and monitoring soil carbon storage remains scientifically complex. Governments and international organizations are therefore working to create incentives, subsidies, and carbon credit programs that encourage farmers to participate in climate-friendly agriculture. The future of carbon sequestration in agriculture is closely linked to global food security and environmental sustainability. As the world population grows, agricultural systems must produce more food while minimizing environmental damage. Sustainable farming practices that enhance carbon storage offer a promising solution because they improve soil fertility, increase resilience to drought, and reduce greenhouse gas emissions simultaneously. Therefore, agricultural crops have enormous potential to contribute to carbon sequestration and climate change mitigation. Through practices such as no-till farming, cover cropping, agroforestry, and the cultivation of perennial crops, agriculture can transform from a source of emissions into a valuable environmental ally. By investing in sustainable agricultural systems, societies can protect ecosystems, support farmers, and create a healthier and more stable climate for future generations.

5. CARBON SEQUESTRATION IN VINEYARDS

Carbon sequestration in vineyards has become an increasingly important subject in the fields of sustainable agriculture and climate change mitigation. As concerns about global warming continue to grow, researchers and wine producers are exploring ways to reduce greenhouse gas emissions while improving environmental sustainability. Vineyards, traditionally associated with wine production and cultural heritage, are now recognized as valuable ecosystems capable of storing atmospheric carbon and contributing to the reduction of carbon dioxide levels in the environment. Carbon sequestration refers to the process by which carbon dioxide is captured from the atmosphere and stored in plants, soils, and other natural systems. In vineyards, grapevines absorb carbon dioxide during photosynthesis and convert it into organic compounds that support plant growth. Carbon is stored in the vine trunks, roots, leaves, and grapes, while a significant portion is transferred into the soil through root activity and decomposing plant material. Healthy vineyard soils can therefore act as long-term carbon reservoirs. Soil management is one of the most important factors influencing carbon sequestration in vineyards. Traditional intensive cultivation methods often involve frequent tillage, which disturbs the soil structure and accelerates the decomposition of organic matter. This process releases stored carbon back into the atmosphere in the form of carbon dioxide. In contrast, sustainable vineyard practices such as reduced tillage or no-till management

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help preserve soil organic carbon by minimizing soil disturbance. These methods improve soil structure, enhance water retention, and encourage microbial activity, all of which contribute to increased carbon storage.

Cover crops are widely used in modern vineyards to promote carbon sequestration and soil health. Cover crops are plants grown between vine rows during periods when the soil would otherwise remain bare. Species such as legumes, grasses, and clover absorb atmospheric carbon dioxide during their growth and add organic matter to the soil when they decompose. In addition to increasing soil carbon, cover crops reduce erosion, improve biodiversity, and help control weeds naturally. They also enhance the overall ecological balance of vineyard ecosystems by supporting beneficial insects and microorganisms. Organic matter management also plays a crucial role in vineyard carbon storage. Pruned vine branches, grape pomace, compost, and other organic residues can be returned to the soil rather than burned or discarded. This practice enriches the soil with carbon-rich material and supports the formation of stable soil organic matter. Compost application is particularly beneficial because it improves soil fertility while increasing the long-term sequestration of carbon. Agroforestry techniques in vineyards further enhance carbon sequestration potential. Some vineyard systems incorporate trees, hedgerows, or natural vegetation around cultivation areas. Trees capture large amounts of carbon in their biomass and provide additional environmental benefits such as shade, wind protection, and improved biodiversity. Integrating natural vegetation into vineyard landscapes creates more resilient agricultural systems capable of adapting to climate change.

Climate conditions strongly influence the carbon sequestration capacity of vineyards. Mediterranean regions, such as Crete, Italy, and France, often experience hot and dry summers that can affect soil organic matter and biological activity. Sustainable irrigation practices and proper soil cover are therefore essential for maintaining healthy soils and maximizing carbon storage under changing climatic conditions. Despite their potential, vineyards also face environmental challenges. The use of machinery, fertilizers, pesticides, and transportation in wine production contributes to greenhouse gas emissions. For this reason, many wineries are adopting environmentally friendly approaches such as organic farming, renewable energy use, and carbon-neutral production systems. Some wine producers now measure their carbon footprint and implement strategies to reduce emissions throughout the entire winemaking process. The role of vineyards in carbon sequestration extends beyond environmental benefits. Sustainable vineyard management can improve soil fertility, increase resilience to drought, and support long-term agricultural productivity. Consumers are also becoming more interested in environmentally responsible wines, encouraging the wine industry to invest in sustainable practices and ecological certifications. Therefore, vineyards have significant potential to contribute to carbon sequestration and climate change mitigation. Through sustainable soil management, cover cropping, organic matter recycling, and agroforestry practices, vineyards can function as effective carbon sinks while maintaining high-quality grape production. As climate challenges continue to intensify, the adoption of sustainable vineyard practices will become increasingly important for protecting ecosystems, supporting agricultural resilience, and promoting a more environmentally sustainable wine industry.

6. ESTIMATION OF CARBON SEQUESTRATION IN VINEYARDS IN CRETE

For the estimation of the carbon uptake in vineyards in Crete the following assumptions are made:

a) The area of vineyards in Crete in 2020 was 22,184 ha,
b) The average annual carbon uptake in vineyards is at 250 g C m^{-2},
c) The population in Crete is 624,408 residents (census 2021),
d) The total annual carbon emissions per capita in Greece in 2023 were at 4.46 tCO_2 (www.iea.org).

The results of the estimations are presented in table 3.

Table 3. Estimation of carbon sequestration from vineyards in Crete, Greece

Surface area of vineyards in Crete	22,184 ha
Average annual carbon sequestration	2.5 t C per ha
Total annual carbon sequestration in vineyards in Crete	55,460 t C
Annual carbon sequestration in Cretan vineyards per capita	0.09 t C or 0.36 t CO_2
%, annual carbon sequestration in vineyards in Crete to annual carbon emissions per capita	8.07 %

Source: own estimations

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7. DISCUSSION

A study regarding the carbon sequestration in vineyards in Crete has been conducted. Existing studies have indicated that vineyards act as moderate carbon sinks. Data from published studies worldwide have been used to find the range of carbon sequestration in various vineyards. Our results indicate that existing vineyards in Crete absorb significant amounts of atmospheric carbon which though are lower that carbon sequestration in other crops in the island such as olive groves which has been estimated at 1,310,393 tCO_2 (1). Existing studies indicate the carbon uptake in several vineyards in several countries varies in a wide range of values between 69 - 900 g C m^{-2} yr^{-1} (6) while we have assumed that the annual carbon uptake in vineyards in Crete is at 250 g C m^{-2}. Our findings indicate that carbon sequestration in Cretan vineyards is not negligible and it should be considered in policy development for achieving the net-zero emission target in Crete. The accuracy of our results depends on the accuracy of our assumptions and the data used. Several data used in our study are mentioned in different years (area of vineyards, population in Crete, carbon emissions per capita in Greece). Therefore, our results should be considered rather indicative while more accurate evaluations require the realization of experimental studies in Cretan vineyards. Future work should be focused on conducting experimental studies in Cretan vineyards to evaluate more accurately their carbon uptake.

8. CONCLUSIONS

The carbon sequestration in vineyards in the island of Crete, Greece has been evaluated. The main findings of the study include:

a) Cultivation of vines in the island has a long history. The surface area of vineyards in Crete was in 2020 at 22,184 ha,
b) The estimated carbon sequestration in vineyards in several countries varies in a wide range of values. Experimental studies related to carbon uptake in Cretan vineyards have not been conducted so far,
c) Total annual carbon sequestration in vineyards in Crete is evaluated at 55,460 t C. For the evaluation an average value of several implemented studies in several countries has been used,
d) The annual carbon sequestration in Cretan vineyards per capita is at 0.09 t C or 0.36 t CO_2 that corresponds at 8.07 % of the annual carbon emissions per capita in Crete,
e) The estimated amount of carbon sequestration in vineyards in Crete should be considered as indicative, and
f) The carbon sequestration in vineyards in Crete is not negligible and it should be considered in the design of policies for the clean energy transition in Crete.

The main takeaway of our study is that carbon uptake in vineyards in Crete is not negligible although it is lower that the carbon sequestration from other crops in the island like olive groves.

REFERENCES

1. Vourdoubas, J. (2020). Estimation of carbon sequestration from olive tree groves in the island of Crete, Greece, *International Journal of Agriculture and Environmental Research*, *6*(4), 553-565. DOI: https://doi.org/10.51193/IJAER.2020.6402
2. Rehn, A., Berndes, G., Cederberg, Ch. & Englund, O. (2024) Carbon removal potentials in agricultural systems – participatory scenario modelling with farmers in Sweden, *Carbon Management*, *15*(1), 2436872, DOI: 10.1080/17583004.2024.2436872
3. Martinez Garcia, L.B., Herbert, Z.G.J., Westerik, D. & Schepens, J.A.B. (2023). Carbon sequestration through agricultural practices – a review of international literature. Available from: https://slimlandgebruik.nl/sites/default/files/2023-07/SL%20A7%20Onderbouwing%20C-vastlegging%20-%20eindrapportage.pdf
4. Arellano Vazquez, D.A., Gagliano, E., Del Borghi, A., Tacchino, V., Spotorno, S. & Gallo, M. (2024). Carbon Farming of Main Staple Crops: A Systematic Review of Carbon Sequestration Potential, *Sustainability*, *16*, 7907. https://doi.org/10.3390/su16187907
5. Plenet, D., Borg, J., Barra, Q. & Bussi, C. (2022). Net primary production and carbon budget in peach orchards under conventional and low input management systems, *European Journal of Agronomy*, *140*, 126578. https://doi.org/10.1016/j.eja.2022.126578
6. Callesen, T.O., Gonzalez, C.V., Campos, F.B., Zanotelli, D., Tagliavini, M. & Montagnani, L. (2023). Understanding carbon sequestration, allocation and ecosystem storage in a grassed vineyard, *Geoderma Regional*, *34*, e00674. https://doi.org/10.1016/j.geodrs.2023.e00674

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7. Zhang, L., Xue, T., Gao, F., Wei, R., Wang, Z., Li, H. & Wang, H. (2021). Carbon Storage Distribution Characteristics of Vineyard Ecosystems in Hongsibu, Ningxia, *Plants*, *10*, 1199. https://doi.org/10.3390/plants10061199
8. Pittaco, A. & Meggio, F. (2015). Carbon budget of the vineyard – A new feature of sustainability, *BIO Web of Conferences, 5*, 01024. DOI: 10.1051/bioconf/20150501024
9. Tezza, L., Vendrame, N. & Pitacco, A. (2019). Disentangling the carbon budget of a vineyard: The role of soil management, *Agriculture, Ecosystems and Environment*, *272*, 52-62. https://doi.org/10.1016/j.agee.2018.11.002
10. Vendrame, N., Tezza, l. & Pitacco, A. (2019). Study of the carbon budget of a temperate-climate vineyard: inter-annual variability of CO_2 flux, *American Journal of Enology and Viticulture, 70*(1), 34-41. https://doi.org/10.5344/ajev.2018.18006
11. Xue, T., Zhang, l., Yang, F., Cheng, C. et al. (2024). Carbon sink and soil organic carbon sequestration mechanisms in vineyards, *Journal of Cleaner Production*, *469*, 143217. https://doi.org/10.1016/j.jclepro.2024.143217
12. Alebaki, M., Kladou, S. & Paraskeva, M. (2024). Wine tourism and climate change: How resilient is Crete? In the 12th International Conference on Contemporary Marketing Issues - ICCMI2024, Heraklion, Crete, Greece. Available from: https://www.researchgate.net/publication/381657513_Wine_tourism_and_climate_change_How_resilient_is_Crete
13. 2020 Vineyard Survey, Hellenic Statistical Authority. Available from https://www.statistics.gr/documents/20181/98adf594-84ad-25ce-0f80-dac350b668b3
14. Tagarakis, A.C., Biniari, K., Daskalakis, I., Kateris, D., Balafoutis, A. & Bochtis, D. (2026). Digital mapping of pruning weight in vineyards in the frame of precision agriculture, *Proceedings, 134*, 43. https://doi.org/10.3390/proceedings2026134043
15. Moinet, G.Y.K., Hijbeek, R., van Vuuren, D.P. & Giller, K.E. (2023). Carbon for soils, not soils for carbon, *Global Change Biology*, *29*, 2384-2398. DOI: 10.1111/gcb.16570
16. Vourdoubas, J. (2026). Carbon emissions due to wine making in the island of Crete, Greece, *Engineering and Technology Journal*, *11*(4), 9549-9558. DOI: 10.47191/etj/v11i04.28
17. Vourdoubas, J. (2026). Possibility of using agrivoltaics in vineyards in the island of Crete, Greece, *International Journal of Current Science Research and Review*, *9*(5), 2244-2253. DOI: 10.47191/ijcsrr/V9-i5-03
18. Marras, S., Masia, S., Duce, P., Spano, D. & Sirca, C. (2025). Carbon footprint assessment on a mature vineyard, *Agriculture and Forest Meteorology*, *214215*(4), 350-356. https://doi.org/10.1016/j.agrformet.2015.08.270
19. Guo, W.H., Kanz, S.Z., Li, F.S. & Li, S.E. (2014). Variation of NEE and its affecting factors in a vineyard of arid region of northwestern China, *Atmospheric Environment*, *84*, 349-354. http://dx.doi.org/10.1016/j.atmosenv.2013.11.057
20. Chiriaco, M.V., Belli, C., Chiti, T., Trotta, C. & Sabbatini, S. (2019). The potential carbon neutrality of sustainable viticulture showed through a comprehensive assessment of the greenhouse gas (GHG) budget of wine production, *Journal of Cleaner Production*, *225*, 435-450. https://doi.org/10.1016/j.jclepro.2019.03.192
21. Pike, B., Muhlack, R., Cavagnaro, T. & Colling, C. (2023). Removal of pruned vine biomass (PVB) from vineyards – Examining the impact of not incorporating PVB into vineyards soils, *OENO One*, *57*(3), 177-187. https://doi.org/10.20870/oeno-one.2023.57.3.7348
22. www.iea.org

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