

COMMUNICATION

Critique of the “Carbon Assessment of the Everglades Agricultural Area” by Winrock International

Gene McAvoy 

Extension Agent IV Emeritus, University of Florida, Gainesville, FL 32611, USA

ABSTRACT

In March 2022, Winrock International released the *Carbon Assessment of the Everglades Agricultural Area* (EAA) in collaboration with the Everglades Foundation. The report estimated annual greenhouse gas (GHG) emissions from sugarcane production in the EAA at 7.36 million metric tons of carbon dioxide equivalents (t CO₂e), attributing emissions primarily to peat oxidation, dissolved organic carbon (DOC), cultivation practices, transportation, and canal methane emissions. While the report seeks to frame EAA agriculture as a major contributor to regional GHG emissions, a critical review reveals that it departs significantly from accepted greenhouse gas inventory methodologies, omits crucial historical and hydrological context, and relies on oversimplified assumptions and generalized data that overestimate emissions. This article systematically examines the Winrock Report’s methodology, identifies its shortcomings, and highlights the need for more robust, context-specific, and transparent approaches to carbon accounting in the Everglades Agricultural Area.

Keywords: Everglades Agricultural Area; Greenhouse Gas Emissions; Sugarcane; Peat Soils; Winrock International; Carbon Accounting; Agricultural Policy

*CORRESPONDING AUTHOR:

Gene McAvoy, Extension Agent IV Emeritus, University of Florida, Gainesville, FL 32611, USA; Email: gmcavoy@ufl.edu

ARTICLE INFO

Received: 24 February 2025 | Revised: 8 September 2025 | Accepted: 11 September 2025 | Published Online: 23 October 2025
DOI: <https://doi.org/10.30564/jees.v7i10.8851>

CITATION

McAvoy, G., 2025. Critique of the “Carbon Assessment of the Everglades Agricultural Area” by Winrock International. *Journal of Environmental & Earth Science*. 7(10): 46–50. DOI: <https://doi.org/10.30564/jees.v7i10.8851>

COPYRIGHT

Copyright © 2025 by the author(s). Published by Bilingual Publishing Group. This is an open access article under the Creative Commons Attribution-NonCommercial 4.0 International (CC BY-NC 4.0) License (<https://creativecommons.org/licenses/by-nc/4.0/>).

1. Introduction

The Everglades Agricultural Area (EAA) is one of the most productive agricultural landscapes in the United States. Situated south and southeast of Lake Okeechobee in South Florida, the EAA spans roughly 3,000 square kilometers, encompassing lands in Palm Beach, Hendry, Glades, Martin, and Highlands counties. This region, reclaimed from the historic Everglades wetlands through extensive drainage and canal projects beginning in the late nineteenth century, now supports a thriving agricultural economy. Sugarcane dominates EAA cropping systems, accompanied by rotational crops such as rice, lettuce, green beans, celery, and sweet corn, making the area a vital supplier of winter vegetables for the U.S. market. Annual economic contributions of agriculture in Palm Beach County alone exceed \$11 billion, with over 118,000 jobs linked to EAA farming^[1,2].

In 2022, Winrock International—working in partnership with the Everglades Foundation—released its *Carbon Assessment of the Everglades Agricultural Area* (hereafter the “Winrock Report”). The report claimed that agricultural practices within the EAA annually emit 7.36 million t CO₂e, largely due to peat oxidation on drained organic soils, canal methane emissions, fertilizer and pesticide use, and pre-harvest burning. These findings, presented without robust contextualization, portray EAA agriculture as environmentally unsustainable and a major driver of climate change.

However, a rigorous critique of the Winrock Report suggests that its methodology deviates from internationally recognized GHG inventory frameworks, such as the Intergovernmental Panel on Climate Change (IPCC) Guidelines and the Greenhouse Gas (GHG) Protocol. Furthermore, the report lacks a historical perspective on why the EAA was drained and ignores the evolution of agricultural practices that have substantially reduced soil subsidence and emissions over time. This article aims to correct these deficiencies by examining the historical development of the EAA, analyzing Winrock’s methodological choices, and assessing the implications of its findings.

2. Historical and Environmental Context

2.1. Origins of the EAA

Efforts to drain South Florida’s wetlands began in the mid-nineteenth century, driven by navigation, railroad

development, flood control, and public health priorities rather than by agriculture alone. The 1850 Swamp and Overflowed Lands Act granted Florida millions of hectares of wetlands, catalyzing large-scale reclamation efforts. Entrepreneurs like Hamilton Disston and later state agencies oversaw canal construction linking Lake Okeechobee to the Caloosahatchee River, followed by federal involvement through the U.S. Army Corps of Engineers in the early twentieth century. Hurricanes in the 1920s and subsequent loss of life prompted the construction of the Herbert Hoover Dike, while the mid-twentieth-century Central and Southern Florida Flood Control Project created the modern system of levees, canals, and Water Conservation Areas that define today’s EAA^[3,4].

It is therefore misleading to suggest, as the Winrock Report implicitly does, that EAA growers were the principal agents of drainage. Drainage was a broad state and federal policy project, motivated by multiple interests including mosquito control, flood protection, navigation, and urban development. The result is that today’s EAA is not a product of unilateral agricultural expansion but of decades of interlocking public works^[5,6].

2.2. Evolution of Cropping Systems and Practices

Originally dominated by vegetable production in the early twentieth century, the EAA transitioned to large-scale sugarcane cultivation in the 1960s. This transition was pivotal because sugarcane, unlike vegetables, tolerates temporary flooding, allowing higher water tables that reduce soil subsidence. Studies show that subsidence rates have declined by more than 80% since the 1920s due to improved water management, crop rotations, and reduced tillage^[7]. Furthermore, flooded rice production, which now occurs on more than 20,000 hectares annually in rotation with sugarcane, helps rebuild soil organic matter, suppress pests, and mitigate oxidation.

Best Management Practices (BMPs), mandated since the 1990s, further minimize nutrient runoff, improve soil conservation, and reduce GHG emissions. These adaptive changes illustrate that the EAA is not static but rather a dynamic agroecosystem in which growers have progressively implemented more sustainable practices.

3. Critical Review of the Winrock Report

The Winrock Report's emissions estimates stem from assumptions regarding peat loss, bulk density, DOC fluxes, methane emissions from canals, fertilizer and pesticide applications, transportation, and pre-harvest burning. Each component is considered below.

3.1. Peat Loss and Subsidence

Winrock attributes roughly 84% of EAA emissions to peat oxidation, assuming a uniform subsidence rate of 0.65 cm yr^{-1} and attributing nearly all subsidence to microbial oxidation rather than compaction. This assumption ignores spatial variability across the EAA, the contribution of compaction, and the significant biomass inputs from sugarcane harvest residues, which can reach 25% of aboveground biomass. Empirical studies demonstrate declining subsidence rates over time, yet Winrock applies a single conservative factor, inflating emissions. More nuanced modeling, such as that of Rodriguez et al.^[8], suggests that in some fields net peat accumulation may occur.

3.2. Acreage Estimates

Winrock assumes 97% of EAA sugarcane is grown on peat soils, whereas roughly 28% of Florida sugarcane acreage is on mineral soils. This discrepancy alone likely inflates emissions estimates by 20–25%. Furthermore, the report inconsistently reports total sugarcane acreage (between 178,000 and 180,000 hectares) without reconciling with USDA and industry data^[9,10].

3.3. Bulk Density

The report applies bulk density values derived under drained conditions but assumes they represent undrained peat. This error exaggerates oxidation potential because drained peat is more compacted and less permeable than undisturbed peat^[11].

3.4. Canal Methane Emissions

Methane emission factors applied by Winrock are based on tropical climate IPCC defaults rather than subtropical mea-

surements from the Everglades^[12]. Chamberlain et al.^[13] report fluxes nearly half as large as Winrock's estimates. By applying inflated factors to extensive canal networks, the report overstates methane emissions.

3.5. Dissolved Organic Carbon (DOC)

DOC fluxes are estimated using low-resolution hydrological data and IPCC defaults for tropical peatlands, despite the absence of field measurements for subtropical EAA conditions. The assumption that all DOC is ultimately oxidized to CO₂ is overly conservative and unsupported by empirical data.

3.6. Sugarcane Cultivation Practices

Winrock misrepresents EAA practices by assuming uniform three-year ratoon cycles and limited crop rotations. In reality, ratoon cycles often extend beyond four years, and rice rotations are widely used. These practices influence soil carbon dynamics but are overlooked in the report.

3.7. Fertilizer and Pesticide Use

Estimates of fertilizer and pesticide use are derived from Louisiana sugarcane budgets rather than EAA-specific data. This overlooks site-specific BMPs, leaf tissue testing, precision application technologies, and Integrated Pest Management (IPM) that reduce chemical use. For example, rice rotations often require little to no pesticides or fertilizer, contrary to Winrock's assumptions^[14–18].

3.8. Pre-Harvest Burning

The report assumes that 97% of fields are burned pre-harvest, based on permit approvals, while industry data indicate that only 64–84% are burned in a given year. Green harvesting, which leaves residues on fields, is increasingly practiced. Failure to account for these practices exaggerates emissions.

3.9. Transportation

Winrock assumes all harvested cane is trucked to mills, ignoring that nearly 40% is transported by rail, displacing more than 2,000 truck trips daily. Rail is significantly more fuel-efficient, reducing actual transport-related emissions^[19].

3.10. Scope of Inventory

The Winrock Report inconsistently applies Scope 3 accounting, including fertilizer production but excluding downstream uses and benefits of biomass recycling, composting, and renewable energy integration in mills^[20]. By partially applying Scope 3, the report provides an incomplete and biased inventory.

4. Discussion

The methodological shortcomings of the Winrock Report highlight broader issues in agricultural carbon accounting. First, the failure to situate emissions within historical drainage and land management contexts risks assigning disproportionate responsibility to agriculture while ignoring the role of flood control, navigation, and urban development. Second, reliance on generalized assumptions and conservative defaults rather than site-specific data systematically inflates emissions estimates. Third, the inconsistent application of GHG accounting standards undermines comparability with accepted inventories.

Accurate GHG inventories are critical for guiding agricultural policy, informing carbon markets, and shaping public perception. Overestimation of emissions from the EAA could have serious implications for growers, policymakers, and consumers, potentially stigmatizing an industry that has demonstrated noteworthy progress in soil and water stewardship. Moreover, misleading inventories can distort priorities for climate mitigation, directing attention away from more significant emission sources.

Future assessments must incorporate: (1) field-based measurements of subsidence, DOC fluxes, and methane emissions; (2) spatially explicit modeling of soil and crop dynamics; (3) transparent adherence to GHG Protocol standards; and (4) recognition of co-benefits such as renewable energy generation from bagasse, carbon sequestration through cover crops, and reductions in wildfires due to controlled pre-harvest burning.

5. Conclusions

The Winrock Report estimates 7.36 million t CO₂e in annual emissions from the Everglades Agricultural Area, but methodological flaws, misrepresentations of agricultural

practices, and the absence of historical context undermine its validity. By overestimating peat oxidation, overstating pesticide and fertilizer use, misclassifying transportation modes, and applying inappropriate emission factors, the report paints an inaccurate picture of EAA agriculture. A more robust, transparent, and context-sensitive approach is needed to accurately assess emissions and to inform balanced policy decisions.

The Everglades Agricultural Area is a cornerstone of Florida's agricultural economy and a vital contributor to U.S. food security. Its growers have adopted practices to mitigate soil loss, improve water management, and enhance sustainability. Recognizing both the challenges and the progress of EAA agriculture is essential for fair and effective climate policy.

Funding

This work received no external funding.

Institutional Review Board Statement

Not applicable.

Informed Consent Statement

Not applicable.

Data Availability Statement

No new data generated.

Conflicts of Interest

The author declares no conflict of interest.

References

- [1] EAA Farmers, 2018. Everglades Agricultural Area 2018 Pre-Harvest Celebration. Available from: <https://rchattonfarms.com/wp-content/uploads/2018/10/EAA-2018-Pre-Harvest-Celebration.pdf> (cited 10 October 2018).
- [2] Court, C.D., Ferreira, J.P., Botta, R., et al., 2023. 2019 Economic Contributions of Agriculture, Natural Resources, and Food Industries in Florida. January. Available from: <https://fred.ifas.ufl.edu/media/fredifasuf>

- ledu/economic-impact-analysis/reports/FRE_Economic_Contributions_Ag_Natural_Resources_Food_Industries_FL_Report_2019_WEB-(2).pdf (cited 23 January 2023).
- [3] Jones, L.A., 1948. Soils, Geology and water control in the Everglades Region. Agricultural Experiment Station Bulletin No. 442 University of Florida.
- [4] Izuno, F.T. A., 1989. Brief History of Water Management in the Everglades Agricultural Area. University of Florida Institute of Food and Agricultural Science Florida Cooperative Extension Service Circular 815. Available from: <https://ufdcimages.uflib.ufl.edu/UF/00/01/44/86/00001/00003.pdf> (cited 20 February 2023).
- [5] LeMieux, G.S., Mize, L.E., 2018. Florida Made: The 25 Most Important Figures Who Shaped the State. The History Press: Gloucestershire, UK. pp 69–80.
- [6] Florida Senate, 1905. FLORIDA STATUTES, Chapter 5377, May 27, 1905. The Florida Senate: Tallahassee, FL, USA.
- [7] Bhadha, J.H., Wright, A.L., Snyder, G.H., 2020. Everglades Agricultural Area Soil Subsidence and Sustainability. Available from: <https://edis.ifas.ufl.edu/publication/SS523> (cited 3 March 2020).
- [8] Rodriguez, A.F., Gerber, S., Daroub, S.H., 2020. Modeling soil subsidence in a subtropical drained peatland. The case of the everglades agricultural Area. Ecological Modelling. 415, 108859. DOI: <https://doi.org/10.1016/j.ecolmodel.2019.108859>
- [9] United States Department of Agriculture (USDA): National Agricultural Statistics Service, 2022. Crop Values 2021 Summary. Available from: <https://downloads.usda.library.cornell.edu/usda-esmis/files/k35694332/gb19g8865/jd474051x/cpvl0222.pdf> (cited 24 February 2022).
- [10] Otero, D.C., Beuzelin, J.M., VanWeelden, M., et al., 2023. Florida Crop/Pest Profile: Sugarcane. Available from: <https://edis.ifas.ufl.edu/publication/PI207> (cited 20 February 2023).
- [11] Couwenberg, J., Hooijer, A., 2013. Towards robust subsidence-based soil carbon emission factors for peat soils in south-east Asia, with special reference to oil palm plantations, Mires Peat. 12(1). Available from: http://pixelrauschen.de/wbmp/media/map12/map_12_01.pdf (cited 5 April 2023)
- [12] IPCC, 2014. Climate Change 2014: Synthesis Report. Available from: <https://www.ipcc.ch/report/ar5/syr/> (cited 20 February 2023).
- [13] Chamberlain, S.D., Gomez-Casanovas, N., Walter, M.T., et al., 2016. Influence of transient flooding on methane fluxes from subtropical pastures. Journal of Geophysical Research: Biogeosciences. 121(3), 965–977. DOI: <https://doi.org/10.1002/2015JG003283>
- [14] Cherry, R., 2014. Wireworms in Florida Sugarcane. ENY665. University of Florida Institute of Food and Agricultural Sciences: Gainesville, FL, USA.
- [15] Liu, G., Simonne, E.H., Morgan, K.T., et al., 2015. Soil and Fertilizer Management for Vegetable Production in Florida. Available from: <https://edis.ifas.ufl.edu/publication/CV101> (cited 20 February 2023).
- [16] Roka, F.M., Alvarez, J., Baucum, L.E., 2009. Projected Costs and Returns for Sugarcane Production on Mineral Soils of South Florida, 2007-2008. University of Florida Institute of Food and Agricultural Sciences EDIS document SC087. Available from: <https://ufdcimages.uflib.ufl.edu/IR/00/00/34/17/00001/SC08700.pdf> (cited 9 September 2009).
- [17] Roka, F.M., Baucum, L.E., Alvarez, J., 2010. Costs and Returns for Sugarcane Production on Muck Soils in Southern Florida 2008–2009. University of Florida Institute of Food and Agricultural Sciences EDIS document SCO88. Available from: <http://ufdcimages.uflib.ufl.edu/IR/00/00/34/18/00001/SC08800.pdf> (cited 13 March 2010).
- [18] Sanchez, C.A., 1990. Soil testing and fertilization recommendation for crop production on organic soils in Florida. Available from: <https://ufdc.ufl.edu/U00086505/00001/images> (cited 20 February 2023).
- [19] American Association of Railroads, 2020. The Positive Environmental Effects of Increased Freight by Rail Movements in America. Available from: <https://www.aar.org/wp-content/uploads/2020/06/AAR-Positive-Environmental-Effects-of-Freight-Rail-White-Paper-62020.pdf#%3Atext=In%202019%2C%20U.S.%20freight%20railroads%20moved%20one%20ton,to%20Omaha%20or%20New%20York%20City%20to%20Cleveland> (cited 28 June 2020).
- [20] United States Environmental Protection Agency (USEPA), 2024. Scope 3 Inventory Guidance. Available from: <https://www.epa.gov/climateleadership/scope-3-inventory-guidance> (cited 20 February 2023).