

Removal of Atmospheric Nitrous Oxide (N₂O) Using Photocatalytic Technology Methodology Review

External, R1 Review Round

R #2

December 12, 2023

CONTENT referenced by reviewer's comment <i>e.g. Section number + paste exact text</i>	REVIEWER'S COMMENT <i>Please paste the comment from the reviewer</i>	AUTHOR'S RESPONSE <i>Please describe how the comment was addressed and include new content in quotations</i>	Reviewer's Conclusion [PASSED/ REJECTED WITH COMMENTS]
This is an unproven concept touted to do many great things. Milligrams per ha should be applied to impact NO _x but no overall data provided.	Unproven procedure that needs to be tested and preliminary data provided; else, it is hard to be supportive.	<i>e.g. This was changed to "The majority of the material must have a moisture content of 25% or less, as measured in the field."</i>	PASSED
<i>The following comments refer to the credit class</i>			

mg per ha of applied catalyst will remove kg per ha of nitrous oxide; (another place in the proposal application rate is miligrams/ha which is a 3 order of magnitude difference)	There is no data referenced or included to support the proposal.	RE: Lab experiments which have now been provided have shown a consistent 10% reduction in the levels of N2O at different concentration rates. Additionally, Crop Intellect is providing the results of the first outdoor experiment using a LICOR analyser. Please refer to these documents to obtain the information required.	
The photo catalyst is apparently region specific	Please provide some limits to your hypotheses...climate, rainfall, temperature	RE: The efficiency of the photocatalyst is linked to a number of factors where the most relevant is light intensity. All trials work have been performed under normal daylight showing an efficient conversion of NOx (NO and NO2) into nitrates. O	
Since there are lab and field trials, kindly include some of the data	Data is needed to address the product efficacy	RE: Data has been provided on May 10th and May 23rd.	
What do you mean by it only works on projects that have access to photocatalytic technology and equipment (instrumentation?) needed to monitor the project.	This instrumentation is expensive. It is also hard to price this instrumentation until the baseline is known and the expected efficiency of the catalyst. This "equipment" is expensive and could greatly negate the overall	RE: Crop Intellect refers to the use of the photocatalytic technology as the only method known by the developers of this methodology to effectively remove N2O from an agricultural activity at scale. Until new competitors come develop their own technologies, R-Leaf is today they only photocatalytic material doing this in agriculture.	

	impact of the proposed methodology.	In terms of the equipment, specialized equipment will be required but Crop Intellect is developing sampling bags systems to facilitate project development and scalability of these projects. This sampling bags will be connected to pumping system to capture air samples of the areas treated. Then this samples can be analyses in lab equipment which will result in less complex and expensive systems to measure N2O levels and reductions.	
PCR and DNA traceability...	These are expensive tests	RE: Crop Intellect is considering as well alternative systems such as QR codes and tags systems attached to the product to proof usage of the material together with physical proof such as images or videos.	
2 1 kg/ha spray applications per 8 weeks	What is the cost of the catalyst? What is the cost per kg nitrous oxide removed under	RE: Price of the final product at farm gate is £25 per litre, making a required investment of £50 per ha to apply R-Leaf. I believe the question is not completed. What is the cost per kg nitrous oxide removed under? If the question is correctly understood, there are studies from the consulting firm McKinsey and the US National Centre for Environmental Economics, that estimate	

		the cost per ton of N ₂ O at 40 euros. This cost is relative and there are a number of ways to estimate that cost.	
What instrumentation is in the “specially designed chamber?”	This sounds expensive!	RE: These chambers have already been developed by Crop Intellect to test N ₂ O reductions where the cost have been inexpensive. Alternatively there are similar solutions in the market with a cost around £1000, so relatively inexpensive for the intended size of the projects proposed. Also, using the sampling bags and N ₂ O analysers, should minimize the use of these chambers.	
What are the “specifications of the project?”	Any idea on per cent removal of the target compounds? It would be nice to see one of these.	RE: Crop Intellect has been able to see a consistent 10% reduction in chamber experiments. While the firm cannot guarantee similar behavior outdoors, just a 1% reduction in field trials, due to the N ₂ O being c.300 times more potent than CO ₂ , has a major impact when the aim is to apply this technology at scale.	

Reviewer's Blind Review Comments regarding Methodology

Kindly enter your comments based on these questions in the table below. Also, if referencing specific text, please include text excerpt or row/page number from the methodology for ease of reference by the authors. All reviewer comments will remain anonymous unless you choose to be named.

Is the methodology clearly written with adequate detail for implementation?	Impossible to comprehend exactly how this could work and its efficacy
Is the underlying foundation of the methodology clear?	No
Is the methodology feasible?	Unclear, impossible to assess
Are there any alternative or additional steps that should be considered?	Field and lab data is available and should be presented
Will the proposed processes for data collection and verification achieve the results defined in the methodology?	Unclear and abstract

<p>Do you want to be named in the review? (Expert Reviewers will be anonymous unless you choose to be named)</p>	No
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Recommendation

Kindly mark with an X

Accept As Is:	
Requires Minor Revision:	
Requires Moderate Revision:	
Requires Major Revision:	
Reject and Re-submit:	
Rejection: (Please provide reasons)	X

General/Additional Comments: Without field and lab data it is impossible to determine the merit of the material, its cost on an area basis, and the cost and specs of the monitoring equipment.