Gadian *et al. Carbon Footprints* 2023;2:5
DOI: 10.20517/cf.2022.19

Carbon Footprints

Meeting Abstracts

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Meeting Abstracts of World Conference on Climate Change & Sustainability

Alan Gadian, Bernard Amadei, Carla Woydt, Dai-Yeun Jeong, Gene R. H. Fry, Karl Aiginger, Robert Leland, Tomas Thierfelder, Anna Caughron, Anthony McGregor, Admire Nyamwanza, Anna Timonina-Farkas, Annette Toivonen, Augusta Costa, Basma M'lahfi, Cassia Lemos, Chigozie Nweke-Eze, CI Pardo Martínez, Clara Salina, Felix Boruchowitch, Francyne Elias-Piera, Gang Hyun Park, H. J. Sartorius von Bach, Ibrahim Abubakar Radda, Ikechukwu Eugene Onah, Isimar A. Santos, Jayanthi Murali, Joanna Adamczyk, Jonggu Kang, Ju-Ching Huang, Judite Vieira, Karen J. Cloete, Kathy Xu, Kirk Douglas, Klaudijo Klaser, Leonid Fainzilberg, Niels Lundtorp Olsen, Nurul Huda Md Adnan, Patricia M. DeMarco, Ray Garnett, Robert Tippmann, So Yeon Choi, Theophilus Clavell Davies, Werner Neumann, Yee Lee, Yemin Jeong, You-Ren Wang, Amna AlRuheili, Lukas Kammerer, Marinella Passarella, Youngmin Seo

How to cite this article: Gadian A, Amadei B, Woydt C, Jeong DY, Fry GRH, Aiginger K, Leland R, Thierfelder T, Caughron A, McGregor A, Nyamwanza A, Timonina-Farkas A, Toivonen A, Costa A, M'lahfi B, Lemos C, Nweke-Eze C, Martínez CIP, Salina C, Boruchowitch F, Elias-Piera F, Park GH, von Bach HJS, Radda IA, Onah IE, Murali J, Adamczyk J, Kang J, Huang JC, Vieira J, Cloete KJ, Xu K, Douglas K, Klaser K, Fainzilberg L, Olsen NL, Md Adnan NH, DeMarco PM, Garnett R, Tippmann R, Choi SY, Davies TC, Neumann W, Lee Y, Jeong Y, Wang YR, AlRuheili A, Santos IA, Kammerer L, Passarella M, Seo Y. Meeting Abstracts of World Conference on Climate Change & Sustainability. *Carbon Footprints* 2022;1:11. http://dx.doi.org/10.20517/cf.2022.19

Received: 13 Oct 2022 **Accepted:** 21 Oct 2022 **Published:** 2 Nov 2022

Academic Editor: P. K. Ramachandran Nair **Copy Editor:** Fangling Lan **Production Editor:** Fangling Lan

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1. Is the planet really going to be cooked?

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Climate Net zero is desirable but inadequate because it will leave all present CO_2 PLUS what we emit between now and the zero-emission date. Current releases suggest China is building 39 new power stations and India is reopening coal mines so it is likely emissions of CO_2 will increase. Some estimate emissions of CO_2 will consequently increase by 40%-100% over the next 20 years; thus, Net Zero will leave CO_2 levels much higher than current values.

Marine Cloud Brightening (MCB) is a cost effective and likely to have lesser negative impact emergency temporary tool to reduce the rising surface temperature forcing. This will be discussed in the paper and atmospheric model results will be presented.

The short life forcing and ability to "switch off" if required, of the Latham-Twomey MCB of sea salt injections and further the mobility of spray vessels gives regional and seasonal control. The amount of salt needed is orders of magnitude lower that what is put into the atmosphere by breaking waves. The difference is that salt mass is in a narrow spread of sizes where there is a gap between Aitken and accumulation modes and is injected into clouds where they can most effectively increase the albedo of the planet and reduce the short wave forcing. The Engineering design of spray vessels is nearly complete and economically feasible.

Overall, MCB can save polar ice and coral, moderate hurricanes reverse sea level rise and help mitigate the effects of temperature extremes which are affecting food production.

2. A systems approach to the peace-sustainability-climate nexus

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There is enough evidence that humanity will continue to face significant challenges way into the rest of the 21st century. In that context, a question arises as to whether it is possible to envision a world where

Taiwan can shed light onto other similarly situated locales.

31. Summer production of lettuce grown in a hydroponic system using wastewater

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Population growth leads to an increasing need for food production, which causes negative impacts on the environment, namely a higher use of water, and fast depleting land. The search for more efficient technologies in the agricultural sector aims for sustainable production, reducing water consumption and waste, inducing wastewater reuse, and the use of soilless cropping systems as an alternative to traditional agriculture. The aim of this study was to evaluate the growth of lettuces in wastewater from an urban treatment plant in a small hydroponic system, without recirculation, during the summer period, when the scarcity of water is higher thus increasing the impacts of crop production with soil. The crop growth was studied under three different conditions: wastewater (after primary or secondary treatment); wastewater with potassium supplementation; and synthetic medium, as control. Physical and chemical parameters of the wastewater, crop growth, and the environmental conditions of the greenhouse were monitored. At end of the assay the crop fresh weight was determined, and toxicity analysis were carried out through cell viability assays with the Caco-2 cell line. Results point to a limited crop growth in the wastewater with a secondary treatment, due to low nutrients concentrations, which affects the plants fresh weight. Solids load, pH value and nitrite concentration in wastewater seem to affect crop growth. Wastewater with a primary treatment had a large organic load, and the system allowed the removal of over 98% of BOD_5 and the removal of over 68% of COD. The system provided an improvement in the wastewater quality, allowing the removal of the nutrient load (minimum value) of 43% N, 53% K, and 46% P (total phosphorus). For extract percentages up to 1% (w/v) there is no evidence of toxicity associated with the lettuce culture from the hydroponic system. The reuse of urban wastewater in hydroponics seems to be a sustainable promising technology that may complement the lack of crop production in soil due to water scarce.

32. Nanoparticles as a novel generation of fertilizers for sustainable agriculture during a time of climate change

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Climate change is significantly affecting sustainable agriculture. Droughts, floods, melting permafrost, and rising sea levels are triggering dyshomeostasis in the soil substrate required for sustaining vigorous crop growth and productivity. Not only are the physico-chemical properties and microbial fingerprint of soil modified, but also its ability to retain essential nutrients quintessential for plant growth and performance. Urgent and innovative technologies are hence required to enable the sustainable production of high-quality crops. Furthermore, the development of cost-effective crop production methods negating the use of chemical fertilizers responsible for environmental eutrophication are warranted. This presentation will focus on introducing the potential of nanoparticles as a novel generation of macro and micronutrient nanofertilizers to boost plant growth and performance. The synthesis of nanoparticle nanofertilizers using