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AGRI-SOIL PROGRAM COMPLETED WITH PROMISING RESULTS

Emerging mineral processing technology company, Zeotech Limited (ASX: ZEO, "Zeotech" or "the Company") is pleased to provide the following update on the completion and results of its nutrient management and soil carbon research program ("Program") at Griffith University ("Griffith").

The dual-stream agri-soil program has been completed and demonstrated positive results, which validate the potential of a Zeotech agri-soil product to enhance the efficiency of fertiliser application, together with considerable potential to sequester organic and inorganic soil carbon.

HIGHLIGHTS

- Results show manufactured zeolites have considerable potential to improve soil carbon and nutrient dynamics in agricultural soils, together with added benefits such as improved water retention, buffering against soil acidification, and the capacity to eliminate some pesticide compounds.
- Datasets generated from the Program led to the lodging of a 'Method and Use of Zeolites' patent application on 21 August 2023, associated with carbon sequestration in soils utilising the Company's zeolite-based products.
- Plant growth trials have validated earlier results that demonstrate that the application of zeolite materials achieved on average ~30% more carbon protection from added carbon inputs (i.e., compost and mulch) compared with soils containing no zeolite.
- Results from the nutrient management stream confirmed that several of the liquid sorption zeolite formulations display promising performance both in terms of reduced nutrient leaching and improved plant growth in the agronomic trials.
- Promising results form the basis of ongoing engagement with industry participants with an aim to advance field testing and agri-soil product development initiatives.

Griffith University, School of Environment and Science, Australian Rivers Institute, Dr Chris Pratt commented:

"The overall outcome of Zeotech's agri-soil program has delivered compelling results and novel soil carbon pathways. Achieving organic carbon protection of around 30% in soils compared with controls, combined with high nutrient carrying capacity and enhanced nutrient efficiency are exciting findings.

The positive results increase confidence that broader in-field trials are warranted to validate that Zeotech's agricultural soil products can contribute towards improving on-farm economics, environmental outcomes and offer potential solutions to rural communities for the transition required to meet Australia's commitment to net zero emissions by 2050."

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Zeotech, Chief Executive Officer, Scott Burkhart commented:

“Results from the program have validated the potential of Zeotech’s agri-soil product, and in particular, the ability to promote soil carbon sequestration and the associated patent application that was lodged in August 2023.

We are very excited to continue our engagement with industry participants following the receipt of the final published report and advance opportunities across product development and field testing.

I would also like to acknowledge the effort from Dr. Chris Pratt and his team at Griffith University for their focus and professionalism as they have advanced this important research.”

Dual-Stream Soil Carbon & Nutrient Management Program

The Program launched in November 2021¹ with the aim of establishing scientific validation for developing Zeotech agri-products that aim to improve fertiliser delivery economics, whilst at the same time enhancing and protecting soil carbon.

The Griffith research was conducted under two parallel streams:

1. Soil Carbon
2. Nutrient Management

The work demonstrated that the Company’s manufactured zeolites have considerable potential to improve soil carbon and nutrient dynamics in agricultural soils, together with added benefits such as improved water retention, buffering against soil acidification, and the capacity to effectively remove a range of pesticide compounds.

Soil Carbon

Activities under the soil carbon stream have aimed to establish the carbon sequestration potential of Zeotech products when applied to common agricultural soil types.

Carbon sequestration by soils involves complex processes and the promising outcomes achieved during the Program confirmed that the Company’s zeolite materials facilitated the development of novel mechanisms that both protect and enhance soil carbon.

The datasets generated from the Program, led to the lodging of a ‘Method and Use of Zeolites’ patent application on 21 August 2023, associated with carbon sequestration in soils utilising the Company’s zeolite-based products².

This patent application reflects the promising outcomes achieved under the soil carbon stream and the development of novel soil carbon mechanisms associated with the Company’s agri soil products which could enhance the commercial interest and value of the Company’s technology.

¹ ASX Announcement 08/11/2021 “Zeotech Collaboration to Develop Products for Carbon Markets”

² ASX Announcement 30/10/2023 “Quarterly Activities Report Ended 30 September 2023”

Soil Organic Carbon

Datasets have been established across multiple experiments, ranging from small-scale incubations containing soils only, through to the recent larger-scale five-month plant growth trials, that have confirmed that the addition of manufactured zeolites to soils has the potential to significantly boost soil carbon sequestration.

The purpose of the recent plant growth trials was to evaluate the capacity of the zeolites to sequester soil organic carbon in the presence of plants, as root activity and microbial community development could affect soil carbon dynamics.

The results from these trials accord well with the previous carbon incubation trials. They demonstrate that zeolites protect 30% more carbon added to soils (e.g. in the form of mulch) than soils receiving added carbon with no zeolites (refer Fig. 1).

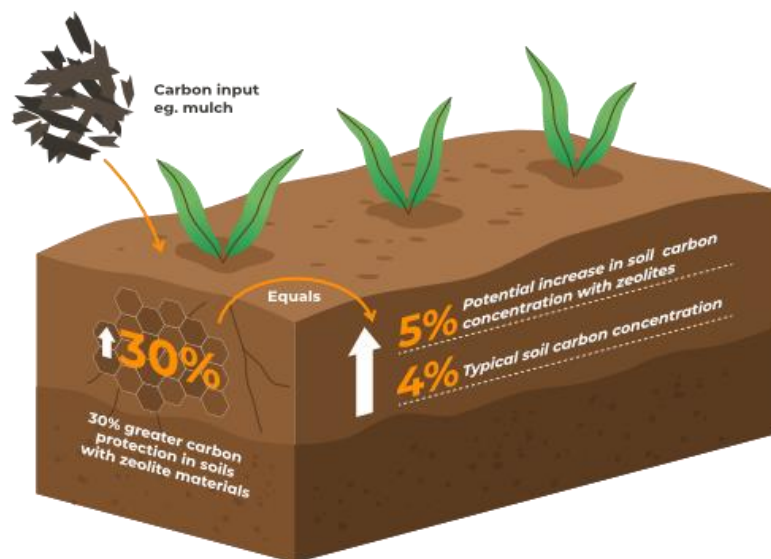


Figure 1 - Illustration showing the impact of the Company's zeolite materials protecting 30% more carbon added to soils, than soils with no zeolites.

When scaled up, this protected carbon could represent significant amounts of additional carbon sequestration. For example, for a typical soil with 4% initial soil carbon concentration, this would equate to an increase of 5% carbon, and result in additional carbon sequestration of 160 tonnes of CO₂ equivalents per hectare³.

Alongside recent independent and peer-reviewed publications^{4,5}, the results from the program confirm the ability of high surface area minerals, like zeolite, to offer good prospects for meaningful long-term soil organic carbon sequestration.

³ Dr. Chris Pratt - Griffith University. Assumes soil bulk density of 1.6 tonne/m³ and an active depth of 30cm.

⁴ Kirschbaum, M. U. F., Moinet, G. Y. K., Hedley, C. B., Beare, M. H. and McNally, S. R. 2020. A conceptual model of carbon stabilisation based on patterns observed in different soils. *Soil Biology and Biochemistry* 141: 107683

⁵ Georgiou, K., Jackson, R. B., Vindušková, O., Abramoff, R. Z., Ahlström, A., Feng, W., Harden, J. W., Pellegrini, A. F. A., Polley, H. W., Soong, J. L., Riley, W. J. and Torn, M. S. 2022. Global stocks and capacity of mineral-associated soil organic carbon. *Nature Communications* 13(1): 3797 10.1038/s41467-022-31540-9.

Soil Inorganic Carbon

Final results have confirmed the effectiveness of the Company's manufactured zeolites to protect soil organic carbon, as well as support soil inorganic carbon (carbonate). Soil inorganic carbon stocks are lower than organic carbon, nevertheless, represent an important carbon pool in regulating the global climate.

Results demonstrated that the addition of Zeotech products can provide the necessary chemical conditions for organic and inorganic carbon protection in soil, primarily from their alkaline pH and supply of base nutrients.

This process is particularly promising for agricultural soils which commonly experience acidification resulting from continued application of ammonium-based fertilisers. Over time, the ammonium is oxidised to nitrate by the soil microbial community and the soil becomes acidic⁶. By buffering against this acid-generating process, zeolites can directly protect common soil inorganic carbon compounds.

Greenhouse Gas Capture

A key activity in the Program was to evaluate the carbon dioxide and methane adsorption capacities of zeolites, which links to the Company's current methane emissions control program. Results from this activity have provided further validation of the high direct adsorption capacity for methane and carbon dioxide, that accords with outcomes of the methane emissions control program.

Nutrient Management

Following the promising nutrient sorption and desorption trials announced in May 2023, that demonstrated superior phosphate, nitrate and ammonium retention capacity of Zeotech products relative to natural zeolites, activities progressed toward optimising nutrient loading and testing configurations in nutrient delivery trials.

Several low-cost zeolite granule formulations were developed under the Program that were deemed suitable for application in agricultural settings.

Formulation development then considered loading the zeolite compound with key commercially-available nutrients - nitrogen (N), phosphorus (P) and potassium (K). Two approaches were investigated to form the zeolite and fertiliser compound, including:

1. Dry fusion - where the zeolite powder was directly blended with the commercial fertiliser and a binding agent to form the granule; and
2. Liquid sorption - where the zeolite granule was 'soaked' in the commercial fertiliser that has been dissolved in water.

Nutrient leach testing on the formulations blended with commercial fertiliser showed promising results, by exhibiting lower leached nutrient concentrations compared with conventional chemical fertiliser.

This shows that the zeolite-fertiliser compounds provide a more efficient release mechanism for nutrients over a longer period, compared with conventional fertiliser application.

⁶ Bouman et al. (1995). "Soil Acidification from Long-Term Use of Anhydrous Ammonia and Urea."

When applied in the plant growth agronomic trials, the zeolite fertiliser compounds that underwent liquid sorption generally resulted in positive impact on plant growth and outperformed the dry fused compound. Given the similar performance of the two blending approaches observed in the leaching test, the reasons for the variance are not clear and further research may be required to understand this difference.

Overall, results from the nutrient management stream confirmed that several of the liquid sorption zeolite formulations display promising performance both in terms of nutrient leaching and plant growth in the agronomic trials.

Pesticide Removal Trials

Trials revealed that the Company's manufactured zeolites are very effective at removing a range of pesticide compounds that are commonly used in agriculture, such as glyphosate, carbaryl and penthiopyrad from solution.

Across a range of concentrations and dose rates tested, the materials achieved more than 60% removal on average, and for carbaryl, achieved 100% removal, demonstrating a capacity to regulate pesticide compounds.

This shows promise for zeolites to be used in drainage systems on farms to intercept, and in some instances break-down (e.g. carbaryl), harmful pesticides.

Next Steps

The final report provides a platform to extend our engagement with industry and underscores the potential for the Company's development of an agri-soil product to improve soil carbon and nutrient dynamics in agricultural soils.

The Company has initiated engagement with fertiliser industry participants, with the intent to leverage the datasets generated throughout the program to attract an industry partner.

Together with industry, the Company aims to advance the next stage of field testing and agri-soil product development, that could potentially include a large-scale glasshouse trial and/or on farm trials at an agricultural site, as recommended within the report.

This announcement has been approved by the Board.

- End -

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About Zeotech

Zeotech Limited (ASX: ZEO) is a team of dedicated people, working together to build a future focused company, leveraging proprietary technology for the low-cost production of advanced materials 'manufactured zeolites' to deliver solutions aimed at addressing sustainability challenges.

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