

**16TH CONFERENCE ON SUSTAINABLE
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AND ENVIRONMENT SYSTEMS**

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BOOK OF ABSTRACTS

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INTERNATIONAL CENTRE FOR SUSTAINABLE DEVELOPMENT OF ENERGY, WATER AND ENVIRONMENT SYSTEMS

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The Use of Nanofertilizers to Increase Precision in Rice Production

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Abstract

Rice cultivation (*Oryza sativa* L.) has a widespread use of fertilizers and pesticides since it is necessary to produce larger quantities and also prevent the effect of pests, diseases and weeds, in order to fulfil the food demands of a growing world population.

For the use of phosphorus, the limit set by Bertolami & Francisco (2020), at the Planetary Boundaries, has already been exceeded, causing marked disturbances in the earth system, meaning that its delivery, although indispensable, must be carried out precisely and in forms that can be easily assimilated by crops. The scarcity of phosphorus and the consequent increase in its price in recent years also impose the urgency of new forms of application. Nanofertilizers can provide a precise and more sustainable way of application, as the amount of raw material is reduced. Likewise, the pressure on aquatic ecosystems is reduced, since rice is grown in flooded beds and therefore losses to water bodies have to be reduced.

The aim of this work is to develop phosphorous nanofertilizer pellets, which use slow release technology to ensure the precise and efficient application of phosphorus to rice crops along the cycle, and to verify their possible effect as a biostimulant. The use of suitable and sustainable supports for nanofertilizers is extremely important as the main challenge for their use is the amount of support required to successfully deliver the active substance (Ekebafé et al., 2011). The proposed pellets will consist of poly-beta-amino-esters (PBAE), graphene oxide (GO), chitosan, poly lactic-co-glycolic acid (PLGA) and the active substance. Development of the pellets will comprise component integration and design, followed by kinetic tests to assess its stability under different conditions. Ecotoxicology tests, at different trophic levels, will be performed to ensure that there are no ecotoxicity effects from the use of any component and/or combination of components. Finally, when all the preparatory tests are concluded, feedback will be given to the development stage and improvements will be made to optimize the pellets. When the optimization process is complete, the pellets will be tested in pilot rice assays where conventional fertilizer will be used as control. If the pellets prove to be effective and without any harmful effect, its use can be spread to other fertilizer and other crops towards a more sustainable production.