From plastic use in agriculture to climate change: the research project ClimOO

Agnese Aguzzoni [(1)] - Giorgio Ubbiali [(2)] - Davide Don [(3)] - Massimo Donegà [(1)] - Francesco Iannone [(1)] - Jasmina Jusic [(3)] - Sarah Notarfrancesco [(3)] - Anna Rottensteiner [(4)] - Werner Tirler [(1)] - Ludger Jansen [(2)]

[(1)] Eco Research, Bolzano, Italy - [(2)] Philosophical-theological College Brixen, Bressanone, Italy - [(3)] Fraunhofer Italia, Bolzano, Italy - [(4)] Laimburg Research Center, Sustainable Cultivation Systems, Vadena, Italy

Keywords: microplastic, agriculture, sustainability, Clima Plan 2040

Abstract Plastic pollution is an urgent issue in today's scientific debate, but its connection to climate change remains mainly unexplored. While plastic degradation into micro- and nano-plastics in the environment is a recognized threat, its release of greenhouse gases in the atmosphere is undercovered in the existing normative frameworks, with a lack of methods for defining and measuring the climate-related impacts of plastics. Among the different productive sectors, agriculture is not immune to the problem. Due to its heavy dependence on the use of plastic material, from irrigation pipes to anti-hail nets, it might face severe consequences in terms of sustainability in the near future. As in South Tyrol, agriculture shapes the landscape and drives the local economy, a comprehensive investigation of the current (micro)plastic pollution and plastic reduction strategies is needed.

ClimOO (Climate, Plastics and Sustainability: Ontology and Operationalisation) is a project funded by the Autonomous Province Bolzano–South Tyrol as part of the South Tyrol 2040 climate plan. Involving as partners the Philosophical-Theological College Brixen, Eco Research, Fraunhofer Italia, and Laimburg Research Center, ClimOO converges multiple competences, including agricultural technologies, environmental chemistry, sustainable operationalisation, and semantic modelling, into a transdisciplinary approach to address these gaps towards a more sustainable agriculture. Using farmer surveys and soil sampling, the project aims at quantifying the presence of (micro)plastics in the environment and identifying technical and cultural barriers to the transition towards a more sustainable agriculture. In parallel, it critically reviews existing guidelines and methods to analyse how sustainability and climate impacts are currently assessed in agriculture and suggest a more coherent approach to the issue. On this basis, a reference ontology will be developed to enable project data integration, thereby facilitating comparability across methods and disciplines.

This contribution will show how ClimOO intends to turn research into actionable knowledge, offering new perspectives into material use, environmental monitoring, and sustainable transition in agriculture. The results of this research will help policymakers and farmers adopt more sustainable decisions.