End of Waste solutions for circular economy value chains in agriculture: a review

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***Abstract.*** Circular economy aims to decouple growth from consumption of raw materials and achieve sustainable competitiveness through broader management frameworks. To reduce the production of waste and ensure better and more efficient management of the same, the European Union (EU) issued in 2018 a new circular economy package made of four legislative proposals. The package sets ambitious goals for EU, like recycling at least 55% of municipal waste by 2025, 60% by 2030 and 65% by 2035. Another important target requires every member state to reach a 65% recycling rate for packaging waste by 2025 and 70% by 2030. Furthermore, to mark the difference from linear economy, new directives aim to reduce landfill disposal to 10% or less of the total amount of municipal waste generated in every country by 2035. Given such a legislative framework, proper paradigms have therefore been shaped accordingly in order to prevent waste production and focus on life cycle assessments (LCAs), looking for shorter value chains.

Value retention of agricultural by-products represents a great opportunity for many farming businesses, leading to innovative solutions for material recovery and sustainable energy production. This research aims to review the most important scientific game-changers which might lead to a feasible scale-up for newer technology: innovations on biofuels, cost-efficient fuel production processes, fertilizers, animal nutrients, wastewater treatments, bioplastics are covered by the state-of-the-art analysis. Additional focus has also been put on integrated approaches for phytoremediation both for market-making solutions of contaminated areas and the creation of renewable energy value chains.

As a result, a taxonomy classification of newer value chains for circular economy has been proposed and analyses of the most promising innovations have been carried out.