Agricultural manures, biosolids and municipal/industrial organic residues, coproducts/by products and other organic residues are an important national resource within the bioeconomy. For example within the EU over 1.6 billion tonnes of manure is generated by animal agriculture. Technological developments occurring in bioresource utilisation, industrial chemistry, biotechnology and microbiology are providing tools and technologies to extract value from the full range of organic residues within agriculture. Currently many organic residues in Ireland are returned to soils as an important nutrient source with little additional value extraction before landspreading. There are opportunities for the use of biotechnologies to extract additional value from these organic residues. Valorisation of agricultural organic residues such as manures can develop a range of products extracting value along the product chain from high value low volume products. These high value include chemical extract, materials for plastics, nutrient extraction, energy recovery, use for algal biofuel generation. These technologies can be applied before the final use of organic residues as an important soil nutrient source through the creation of biofertilisers, soil improvers and soil carbon supply.

Animal manures in Ireland are responsible for 15% of agricultural greenhouse gas emissions. The extraction of energy from agricultural manures could produce up to 23 kT of electrical energy and 50 kt of heat energy per year by 2035 (SEAI 2016). SEAI also predicts that biomethane from animal manure, food waste and grass could provide 28% of Ireland's gas needs by 2050. While technologies such as anaerobic digestion are long established technologies for recovering energy from agricultural manures and other organic residues. There is increasing acceptance of the biorefinery concept to more fully utilize animal manures and create a new value-added route for animal waste management. For example, co-digestion of pig slurry and algae has been shown to increase methane yields and, in addition, the extraction of lipids (solvent-based Soxhlet extraction) and/or protein (free nitrous acid pre-treatment) represent high-value co-products (Astals et al 2015). Extraction of maximum value to the economy from agricultural organic residues needs to be encouraged and incentives to identify, develop and implement a range of cutting edge technologies in Ireland in the context of the circular economy and the closing of nutrient loops on farms. Ligno-cellulosic feedstock biorefinery uses lignocellulosic biomass, including forestry residue, agricultural residue, yard waste, wood products, animal wastes, etc. These feedstocks can either be fermented to produce fuels, biologically or chemically converted to produce plastics, paints and solvents, or pyrolised/gasified to produce energy and biochar, which can be used as a soil conditioner (Wertz & Bedue 2013)

Manures as more efficient fertilisers

Dairy cattle slurry and digestates from anaerobic digestion of municipal solid wastes (MSW) contain large amounts of phosphorus which can potentially be used as a secondary source of this nutrient. Alterations in pH initiates phosphorus release from these wastes using acid and base extraction followed by phosphorus recovery via precipitation and can be converted into a biofertiliser. In addition, more nitrogen use efficiency of manures and sludges can be increased by composting, separation and acidification, which reduce ammonia losses during storage.

SEAI (2016) Bioenergy Supply in Ireland 2015 – 2035.

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