Abstract for POC: In 2025 around 11 billion tonnes of plastic waste will pollute the environment. Therefore, a circular economy with biotransformation and biodegradation of oil-based plastics is as crucial as implementing biobased and biodegradable materials. Transforming lignocellulosic waste biomass into commercially valuable “green” materials is an emerging and promising way to minimize waste, substitute plastic and reduce our carbon footprint. As a waste resource, we suggest walnut shells, in which we discovered the interlocked 3-D puzzle cells. The homogeneity, the high surface area and the channels make these cells interesting for transformation into biodegradable bioplastic. We plan to dissolve the walnut shells in deep eutectic solvent to separate the cells, add water to regenerate lignin and recycle the solvent. The result of this closed process circle is a NUT slurry as a basis for our materials. To tailor and functionalize the composite for different applications we propose to add bacterial cellulose pellicles, a waste from kombucha fermentation or produced in bioreactors. The pure cellulose fibrils with high tensile strength are an exciting counterpart to the high lignin content pressure optimised puzzle cells. With different ratios of the two agri-residues we will tune the material properties for NUTplastic and NUTleather. Sustainable, energy and resource efficient, biodegradable NUTmaterials with a low carbon and environmental footprint are envisaged for the packaging and textile sector. The project activities comprise 1) development and characterisation of NUTleather and NUTplastic products at the demonstration level 2) life cycle analysis, cost of goods and carbon footprint, 3) define endusers, market analysis, potential industrial partner, buisness plan and IP strategy. We have a strong project team with highly motivated and experienced members with complimentary backgrounds and a solid with to prove the puzzle cell performance in sustainable materials.