



# Environmental and Economic Evaluation

During the second and third year of BIO4SELF project, the environmental and economic evaluation of 75 products have been estimated. The energy and material consumption at each stage of the process was taken into an account with an appropriate consideration of generated waste. The manufacturing process started with approx. 139 Kg of PLA.

## LCA

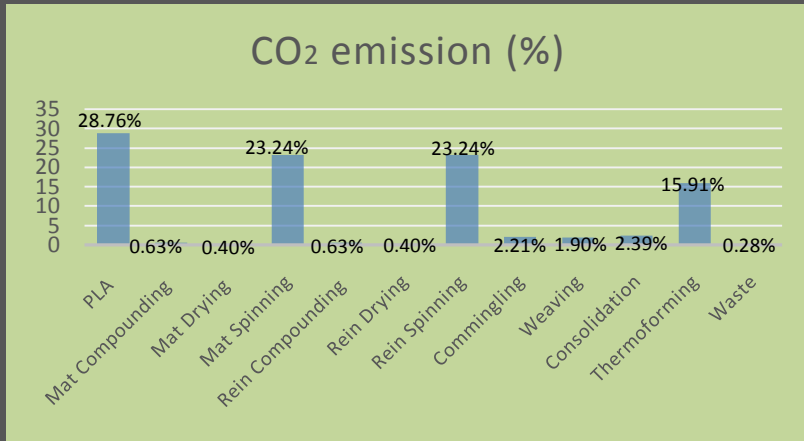


Fig. 1: CO<sub>2</sub> emission in percentage during the production of 75 products. In the figure, Mat = Matrix and Rein = Reinforcing.

The LCA was carried out by R-Tech and NTT using the software GaBi and SimaPro, respectively. Fig. 1 demonstrates that the PLA granule production (approx. 29%), spinning (approx. 23%) and thermoforming (approx. 16%) processes have the highest environmental impact due to their higher energy usage. Except waste, drying has a lowest impact.

## LCC

Life Cycle Phase	Process Categories
Materials	PLA materials and Additives
Manufacturing	Matrix PLA, Reinforcing PLA
Fabrication	Hybrid Yarns, Fabrics and Consolidation sheets
Integration	Thermoforming and Assembly

Fig. 2: Categorisation of different processes according to life cycle phase.

## TOTAL COST

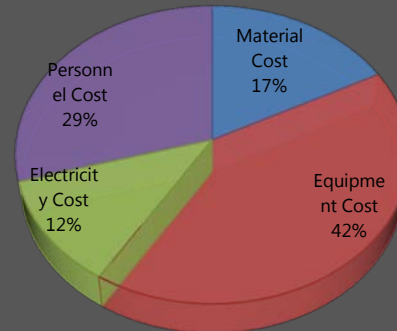


Fig. 3: Different cost categories in percentage of 75 products.

## COST PER PRODUCT

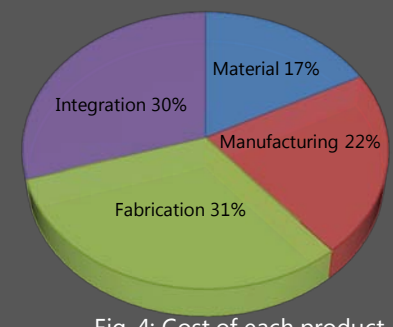


Fig. 4: Cost of each product throughout the production phase.

The demand of high energy in the process is directly proportional to the CO<sub>2</sub> emission. On the other hand, the cost categories depend on personnel, equipment and electricity costs. The equipment cost of Fabrication category is highest, making it the most expensive process.

