



# WASTE COOKING OILS AS FEEDSTOCK FOR POLYMER BIOPRODUCTION



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H2020-MSCA-IF  
GRANT AGREEMENT: 101031186

# REWIND GOALS



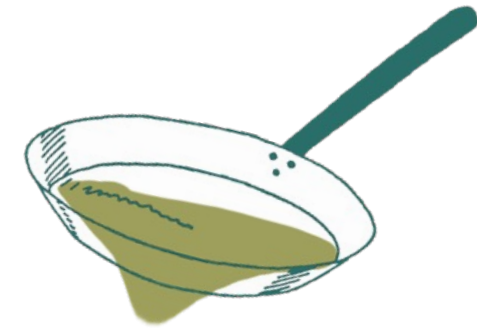
Enzymatic Recycling of Waste Cooking Oils (WCOs) into Polymers



Mechanical and Biological characterization of WCO-derived polymers



Anticipatory Life Cycle Assessment of the process



# VALORIZATION OF WASTE



Human Consumption



Oleaginous crops



Cooking Oils



Waste Cooking Oils



Biofuels

# VALORIZATION OF WASTE



Human Consumption



High Value Products



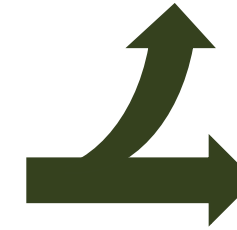
Oleaginous crops



Cooking Oils



Waste Cooking Oils



Biofuels



# POLYMERS AS HIGH VALUE PRODUCTS



Polymers are present in everyday life



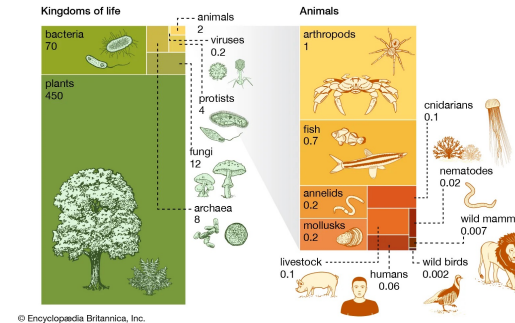
Bio-based polymers have an increasing market



Biodegradable polymers can find application in different fields and can substitute other polymers

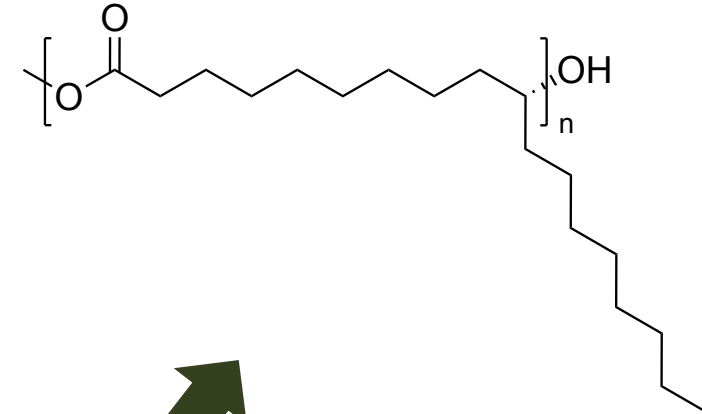
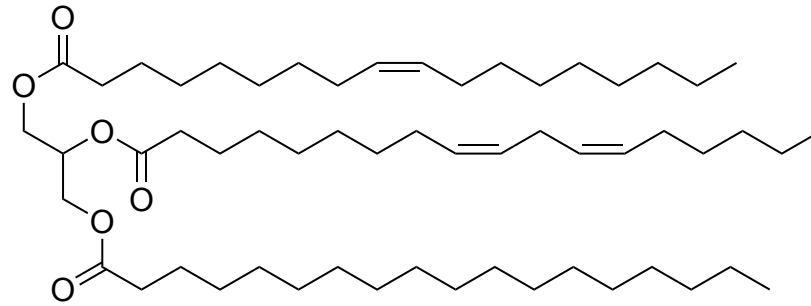
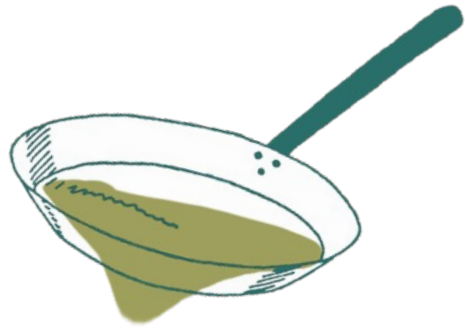


Overexploitation of soils



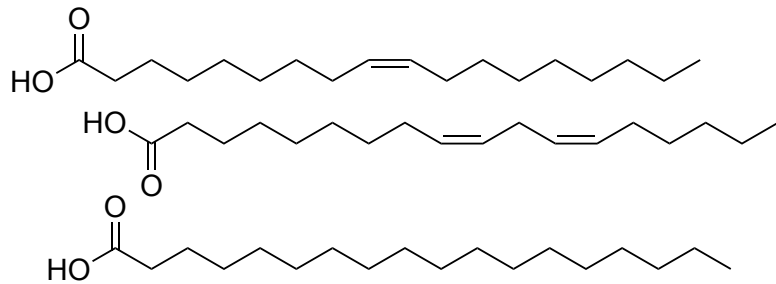
Biodiversity loss

# OUR APPROACH

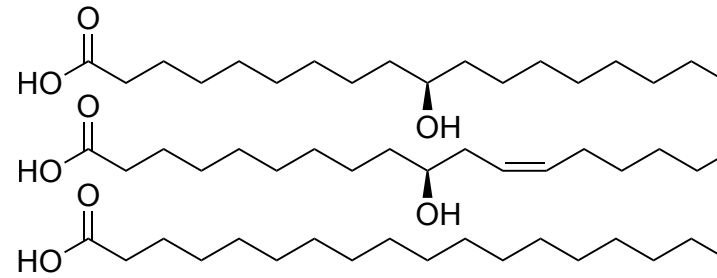


Hydrolysis

Processing and Polymerization



Hydration

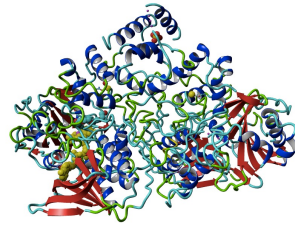


Processing Separation

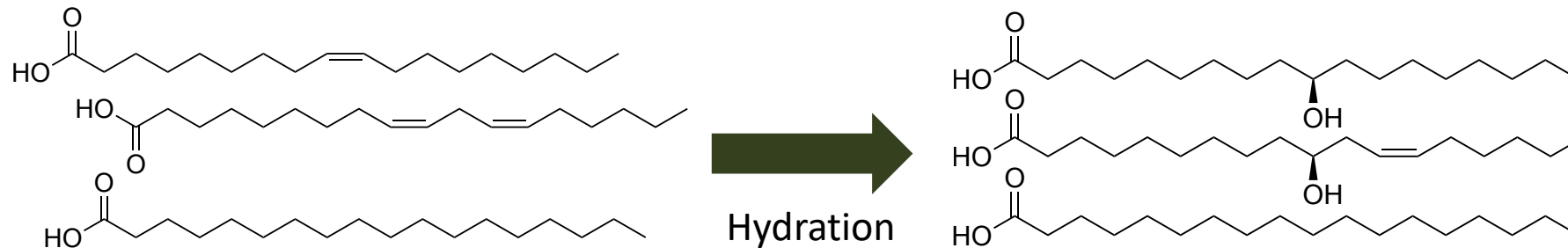
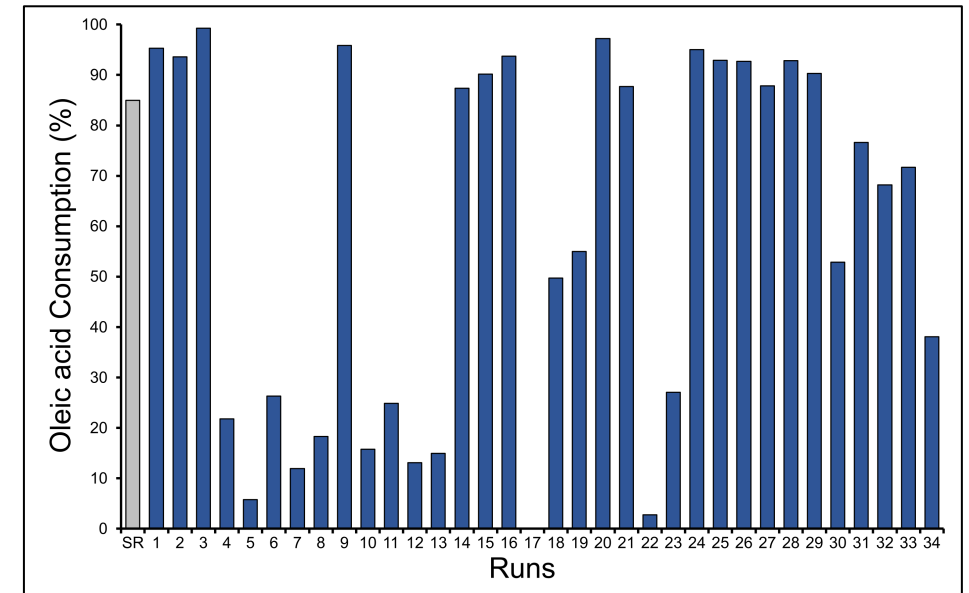
FAMES  
Biodiesel

# BIOPRODUCTION OF MONOMER

## Optimization

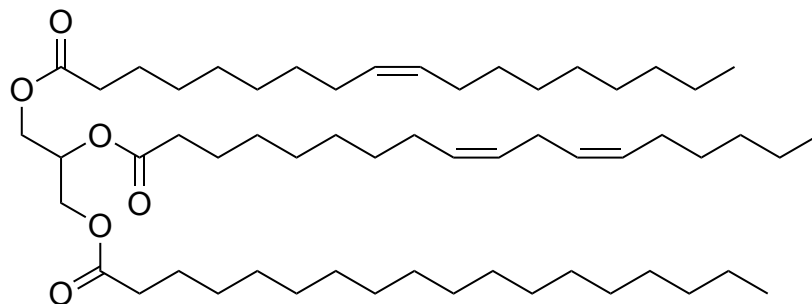


*Elizabethkingia meningoseptica*  
Oleate Hydratase

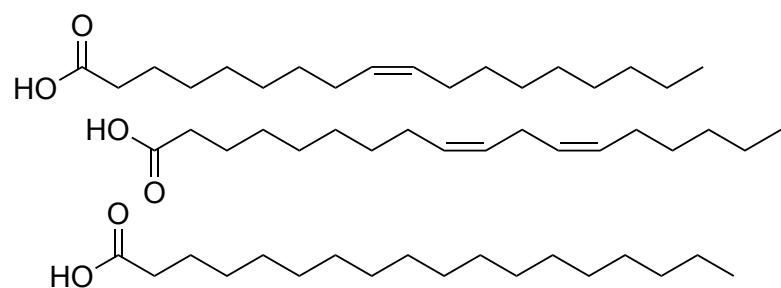


# BIOPRODUCTION OF MONOMER

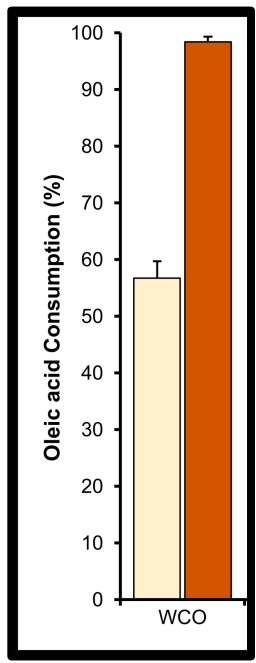
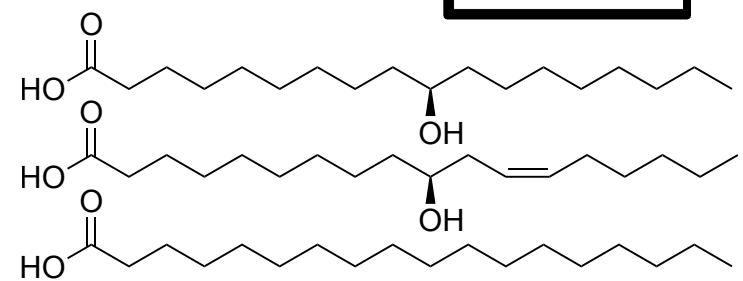
## Optimization



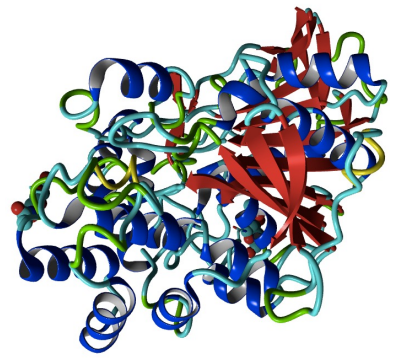
Hydrolysis



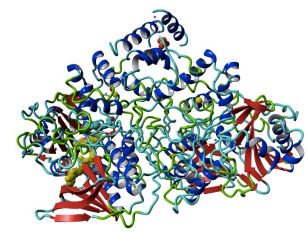
Hydration



SR  
OR



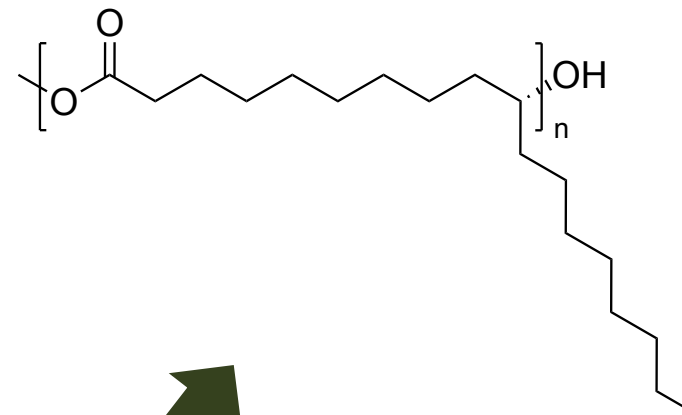
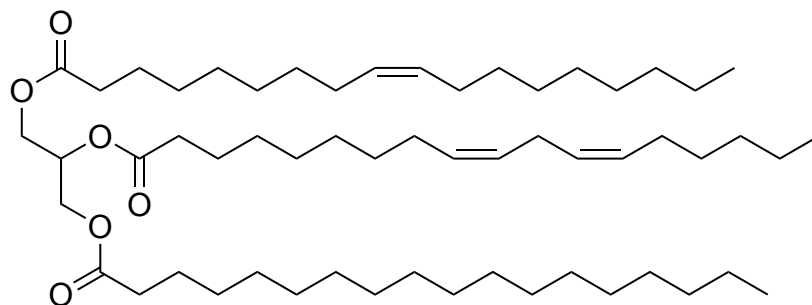
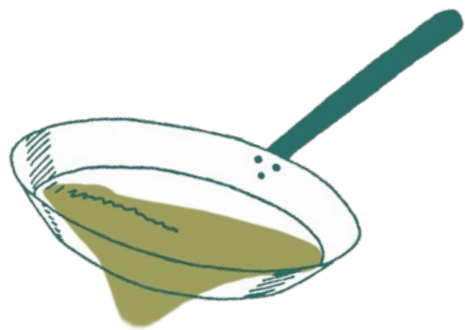
*Candida rugosa*  
Lipase



*Elizabethkingia meningoseptica*  
Oleate Hydratase

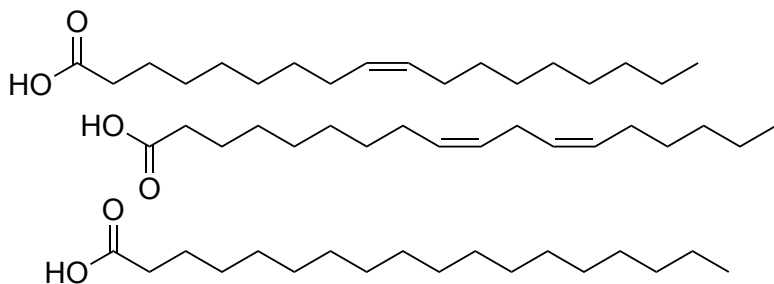


# PROCESSING AND POLYMER PRODUCTION

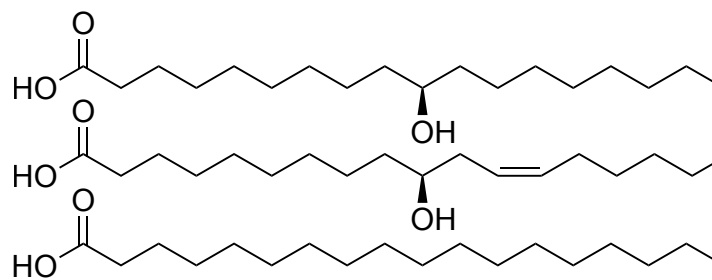


Hydrolysis

Processing and Polymerization



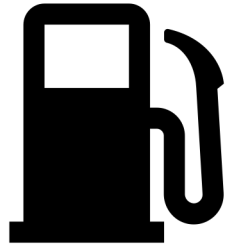
Hydration



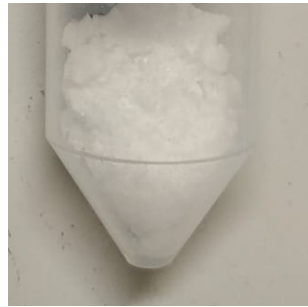
Processing Separation

FAMES  
Biodiesel

# MONOMER PURIFICATION AND POLYMERIZATION



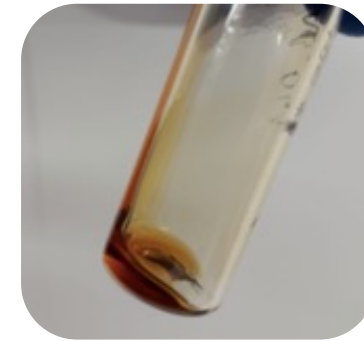
FAME



10-hydroxystearic acid methyl ester



Polymerization



Aliphatic polyester

**Total Yield  
30 %**



# TAKE HOME MESSAGE



Bioproduction of polymers from waste cooking oils



Design of Experiments as important tool for the optimization of bioprocesses



Biodegradability and LCA analysis ongoing

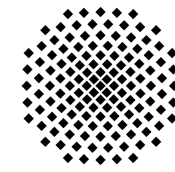
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Universität Stuttgart

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Dr. Arne Stamm



university of  
 groningen

Prof. Patrizio Raffa





# THANK YOU FOR YOUR ATTENTION



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