DEVELOPMENT OF INTEGRATED PROCESS FOR CONVERSION OF SUGARCANE TRASH TO BIOETHANOL AND VALUE-ADDED CHEMICALS

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BIO-industry and bio-processing are key drivers on the establishment of the sustainable **BIOECONOMY**

Bioresources are explored as renewable starting material and as a pool of genetic resources providing "converters" and "catalysts" for competitive industry

Fuels:
Ethanol (E10/E20/E85), biodiesel (B5), Adv biofuels

Energy:
heat, steam, electricity

Chemicals:
commodity & specialty

Materials:
Bioplastics (PBS, PLA) & biomaterials

Microbes & Microcosms

Enzyme & Biocatalyst

Genes & Pathways

More 1st G feedstock

In Thailand

More 2nd G feedstock

8.8 → 16.8 Mt sugar/year
5.3→ 7.3 Mt starch/year
8→ 9.5 Mt chip/year

53 Mt bagasse/year
4.9 Mt cassava pulp/year

Multi-disciplinary valorization & Waste management NEEDED

However…

EV car
(finding mor  e electricity resources**?**)

Local biofuel industry will soon be reformed to integrated biorefinery with more product spectrum to increase competitiveness and fully utilize existing and future facilities

Maximized utilization

- Biofuels
- Biochemicals
- Biocomposites
- Biospecialties

Zero-waste process
Sustainability & competitiveness

Value extraction from biomass + indirect impact on waste management

BACKGROUND

Depletion of fossil fuel energy

Drawbacks in the utilization of fossil fuel energy

Biorefinery concept

Utilization of all major components of lignocellulosic materials for energy and value-added products

Development of integrated process for conversion of sugarcane trash to bioethanol and value-added chemicals

Efficient method for pretreatment and fractionation of biomass

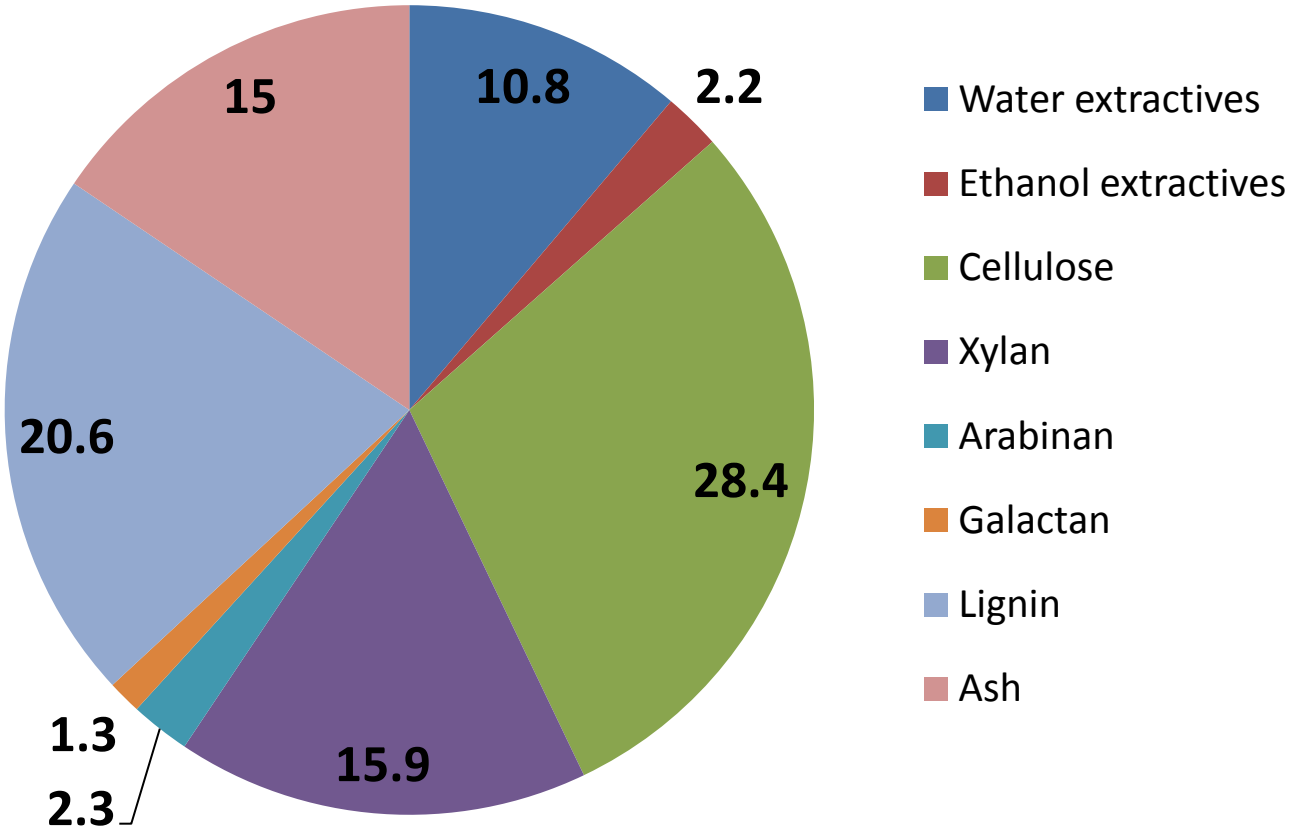
Effective enzyme system for saccharification of pretreated biomass

MATERIALS
Sugarcane Trash

Sugarcane Production in million tonnes (FAOSTAT, 2016)

Year	Indonesia	Japan	Thailand
2012	28.7	1.1	98.4
2013	28.4	1.2	100.0
2014	28.6	1.2	104.0

Chemical Compositions of Sugarcane Trash



Zhang et al. (2016)

RESEARCH PLAN

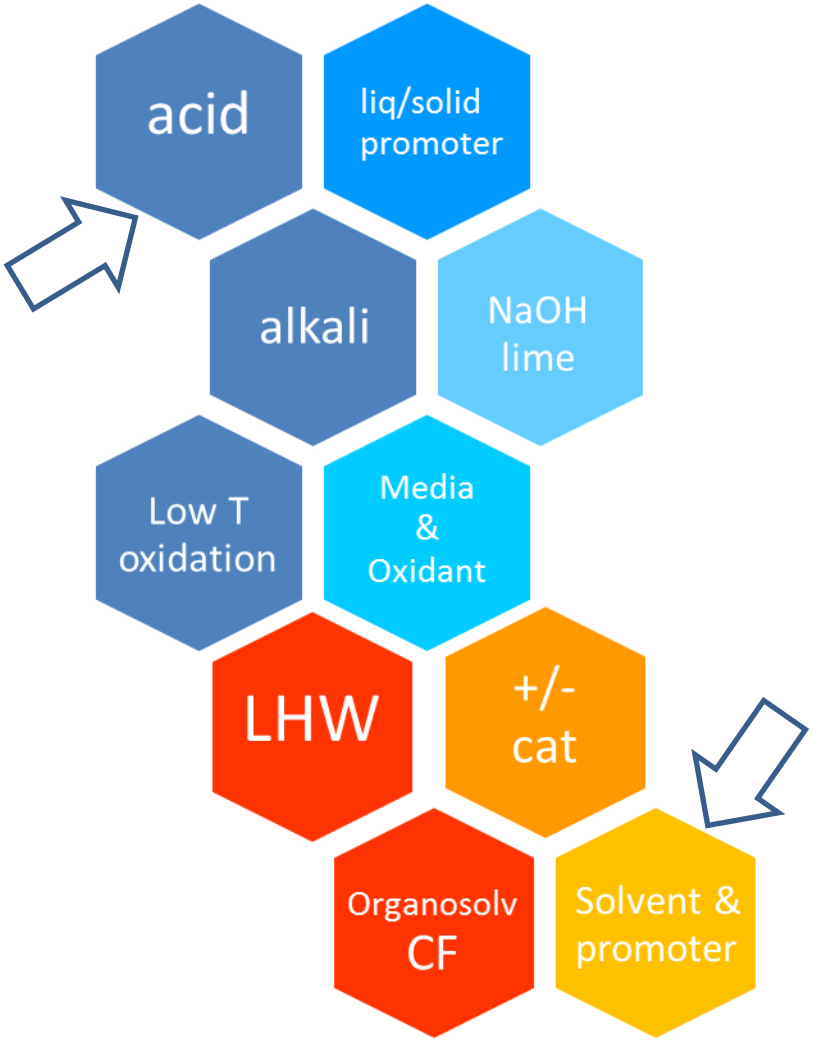
MATERIALS
Sugarcane Trash

Collected from sugarcane factory in Indonesia and Thailand

Drying & Grinding

Biomass Pretreatment and Fractionation

Approach: Development of low energy pretreatment & fractionation processes with recoverable solvents and chemicals to improve biomass digestibility and separation of components



Solvents system

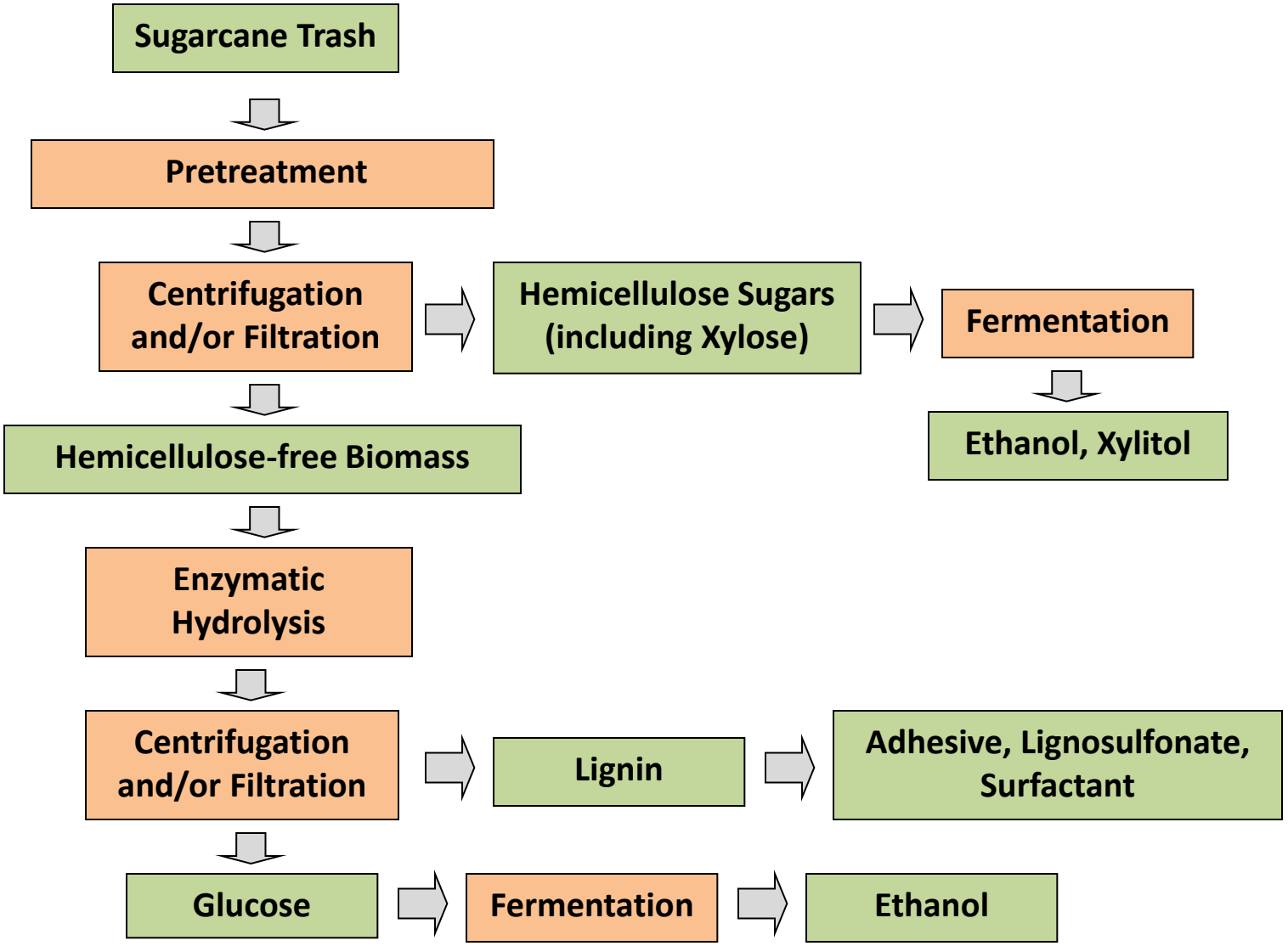
- Aqueous (Liquid hot water)
- Organic solvent (Organosolv)

Catalysts/Promoters

- Mineral acids v.s. organic acids
- Inorganic v.s. organic bases
- Liquid v.s. solid catalysts

Solvent recycling and process design

METHODS


Sugarcane Trash
Pretreatment
Centrifugation and/or Filtration
Hemicellulose Sugars (including Xylose)
Fermentation
Ethanol, Xylitol
Hemicellulose-free Biomass
Enzymatic Hydrolysis
Centrifugation and/or Filtration
Lignin
Adhesive, Lignosulfonate, Surfactant
Glucose
Fermentation
Ethanol

EXPECTED RESULTS

Providing innovative technology for conversion of sugarcane trash to biofuel and value-added chemicals.

Improving capacity building of researchers from ASEAN member countries.

Strengthen research collaboration on science and technology between Japan and ASEAN researchers

Publications in international journals.

ACKNOWLEDGEMENT

JST
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Kyoto University
NSTDA
LIPI

THANK YOU
for your attention