UNIVERSITY OF WASHINGTON

The effect of biomass moisture content on ethanol yields from steam pretreated lignocellulosics

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Biofuels and Bioproducts Laboratory
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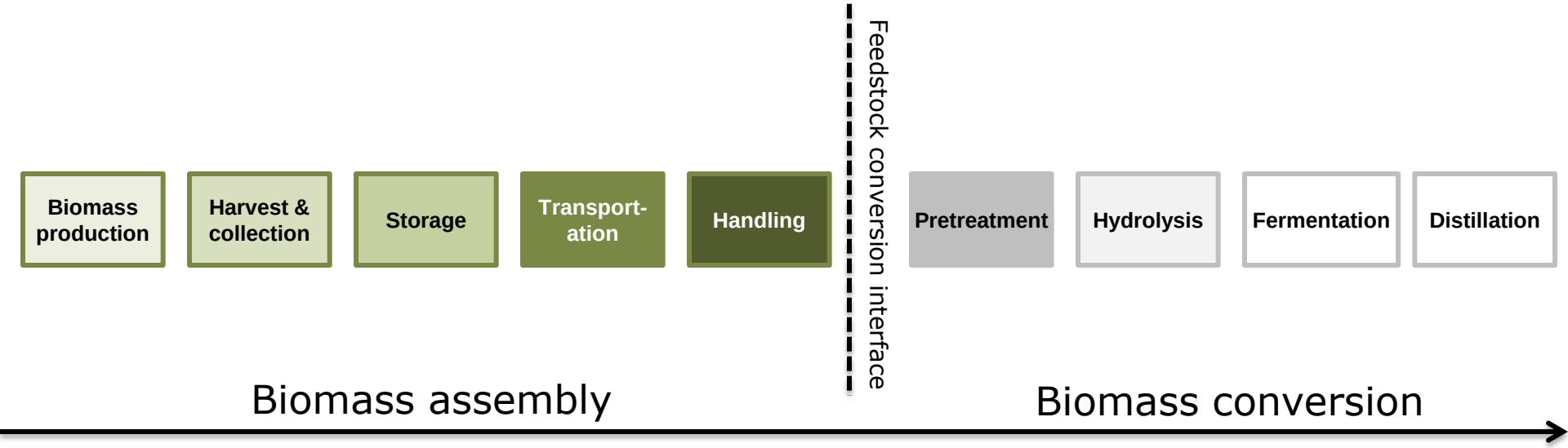
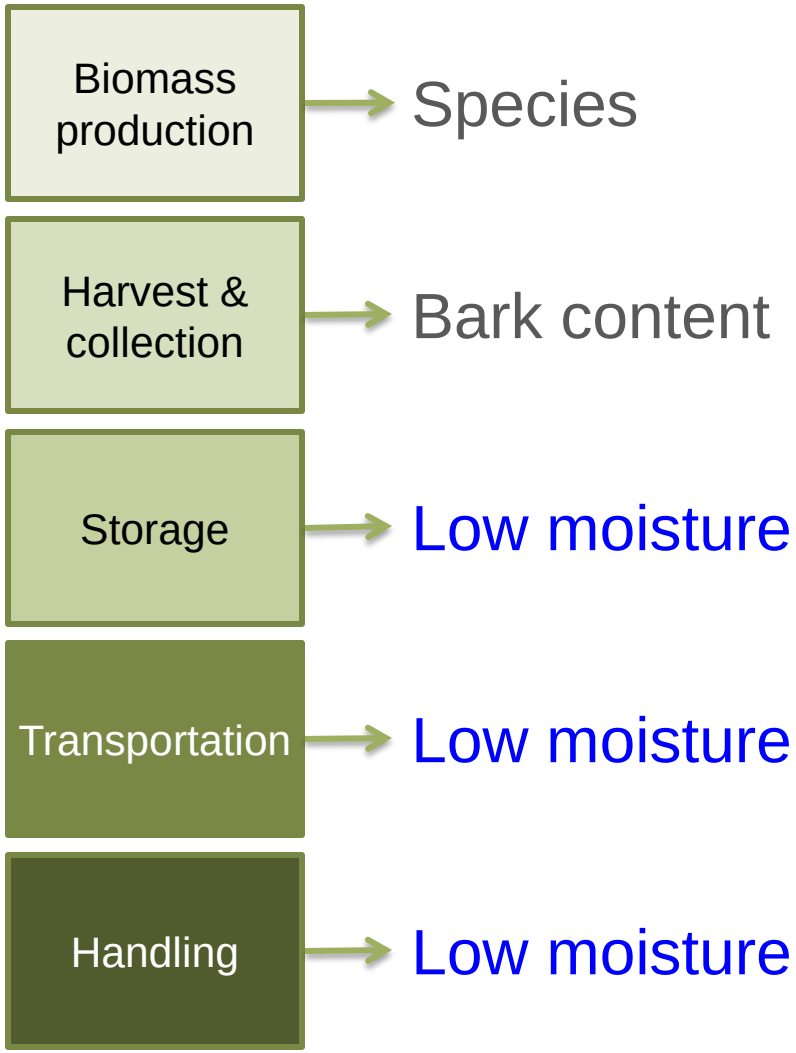
The divide between biomass assembly and conversion



Feedstock factors affecting bioconversion



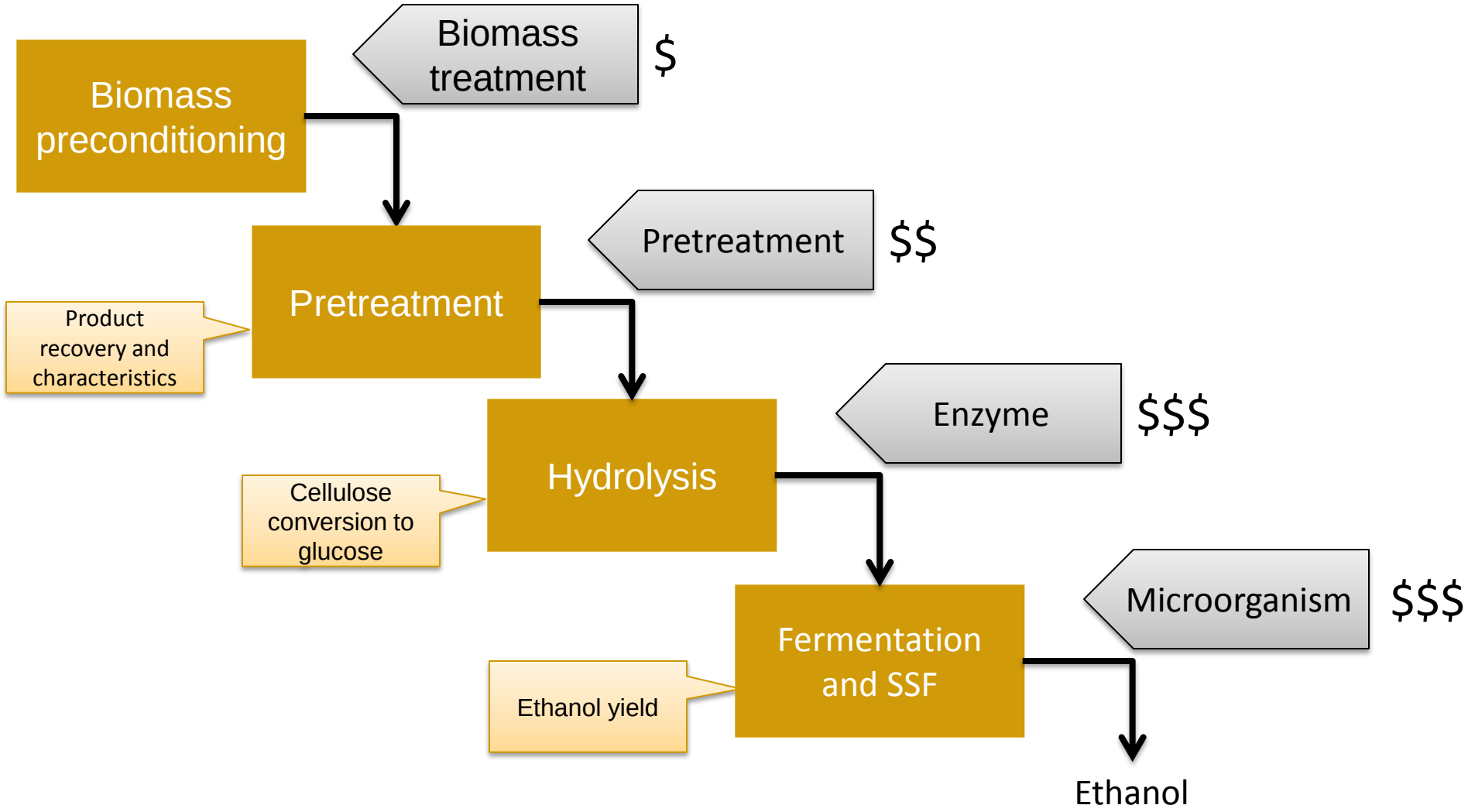
Objectives

How can we improve the production of fuels and chemicals from biomass?

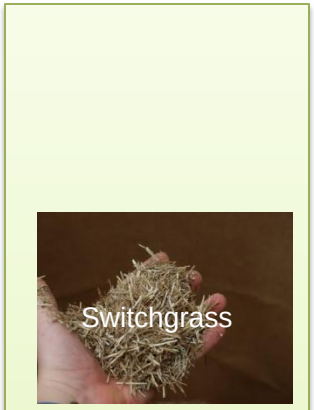
Understanding the effect of biomass assembly on subsequent processing

Analyze the effect of the initial moisture content of biomass on the overall ethanol yield

Affect of preconditioning



Switchgrass and sugarcane bagasse preparation



Starting material

Air-dry (10 % moisture)

Soak to 80% moisture

Moisture adjustment

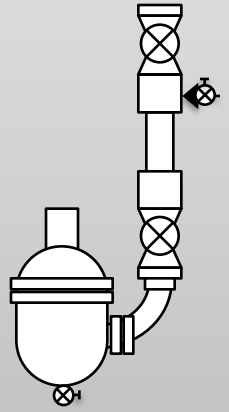
No SO_2 added

Add 3% SO_2

SO_2 addition

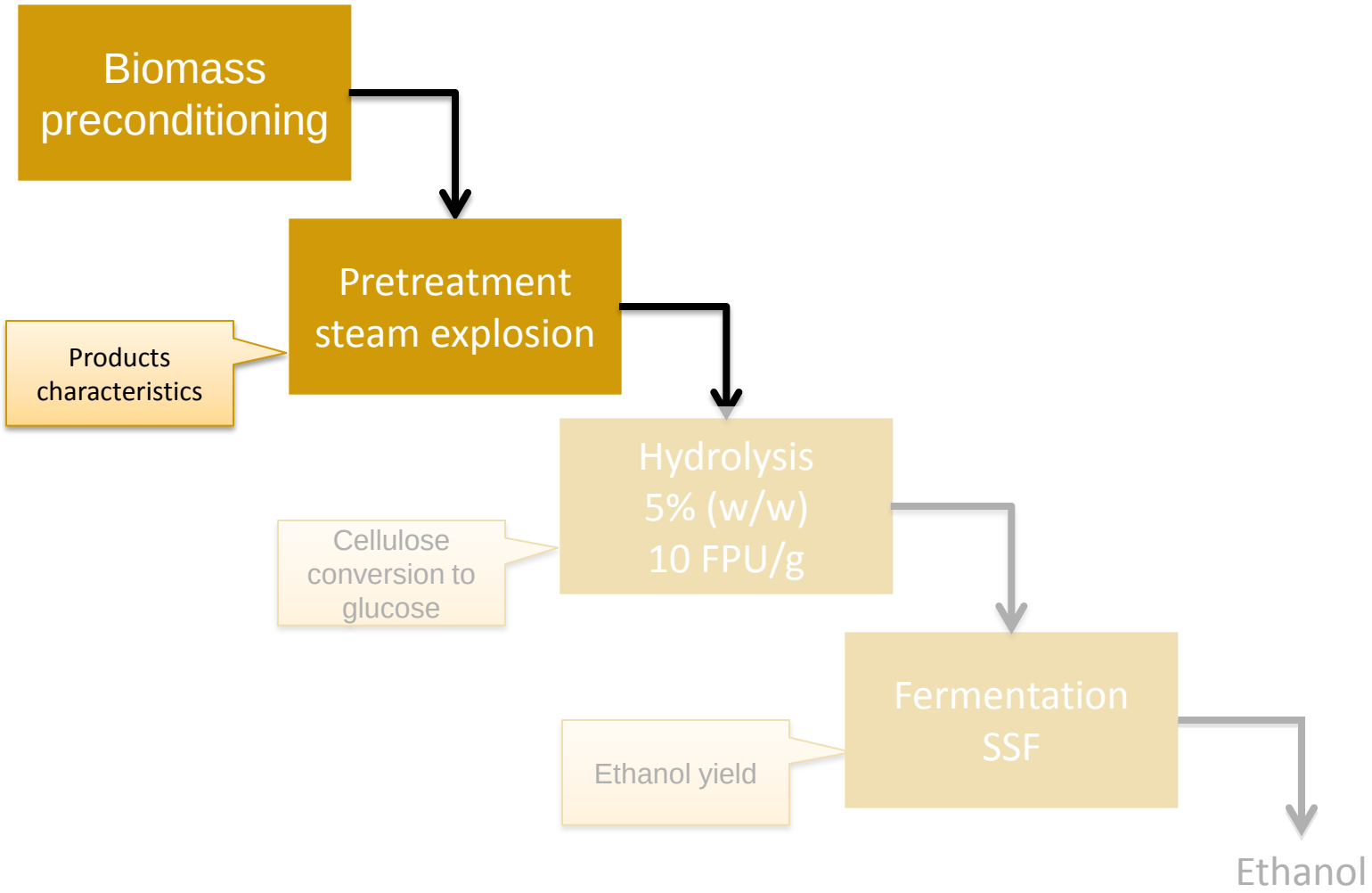
Steam explosion

195-205 ° C
7.5-10 min

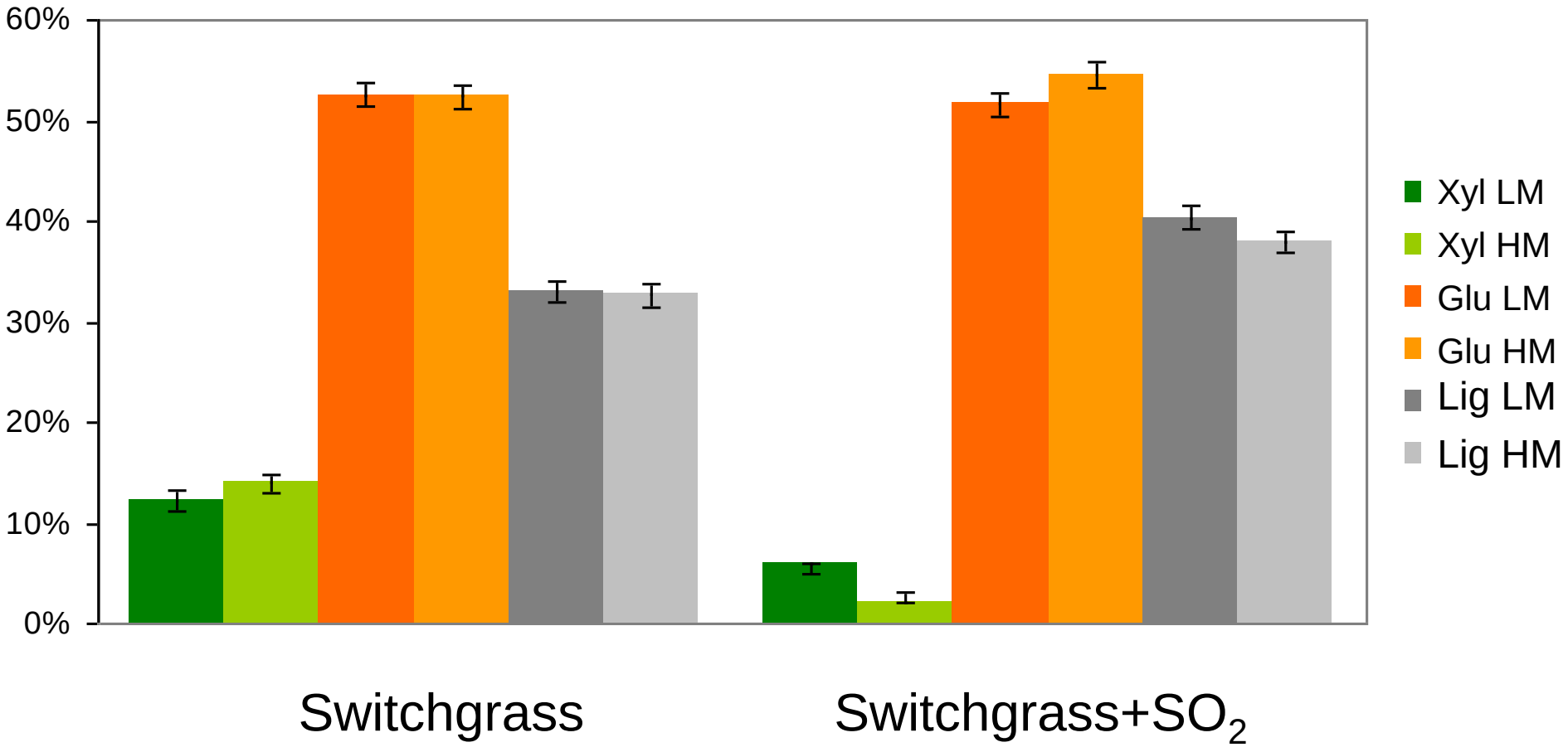


Pretreatment

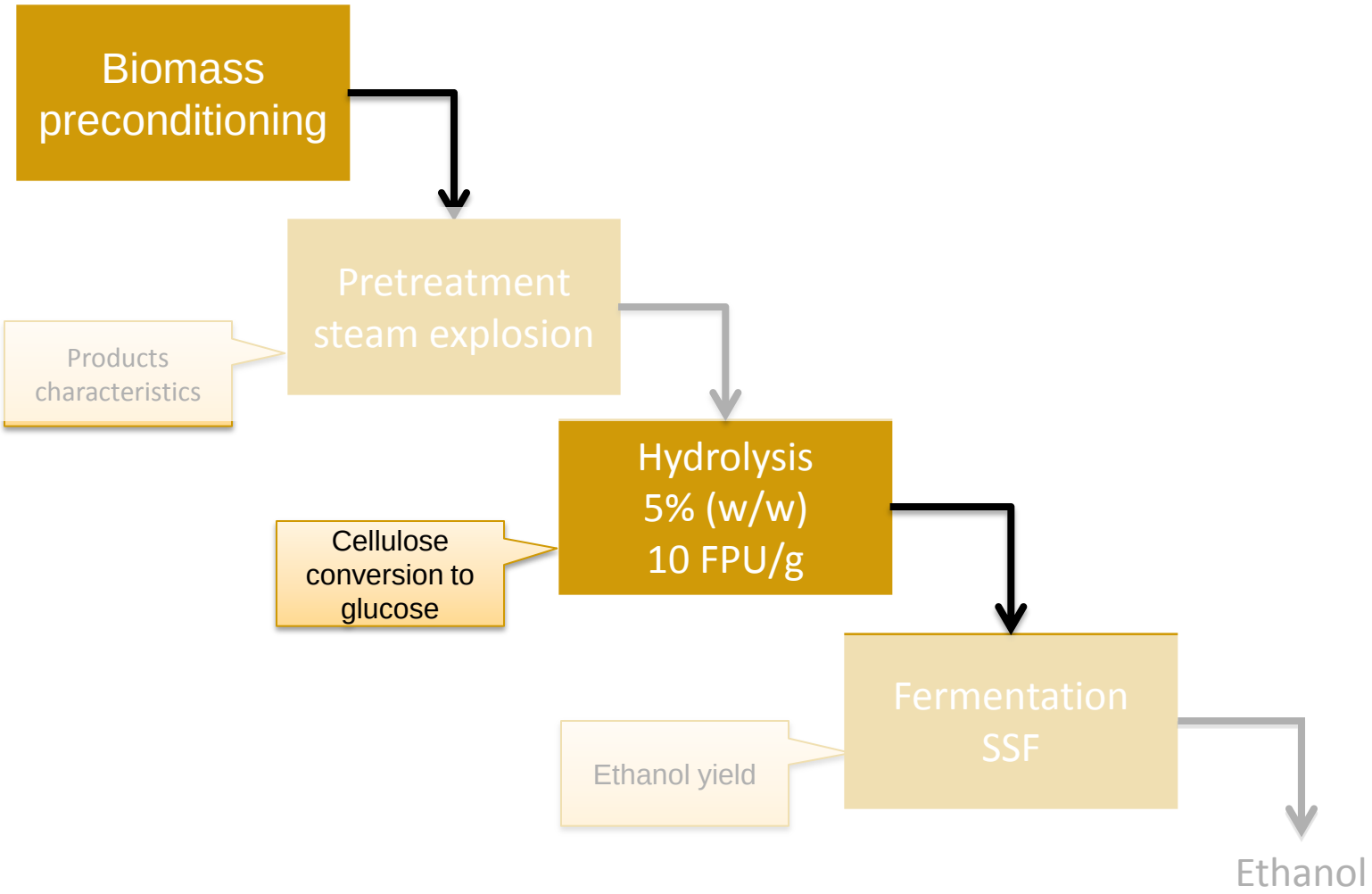
Pretreatment



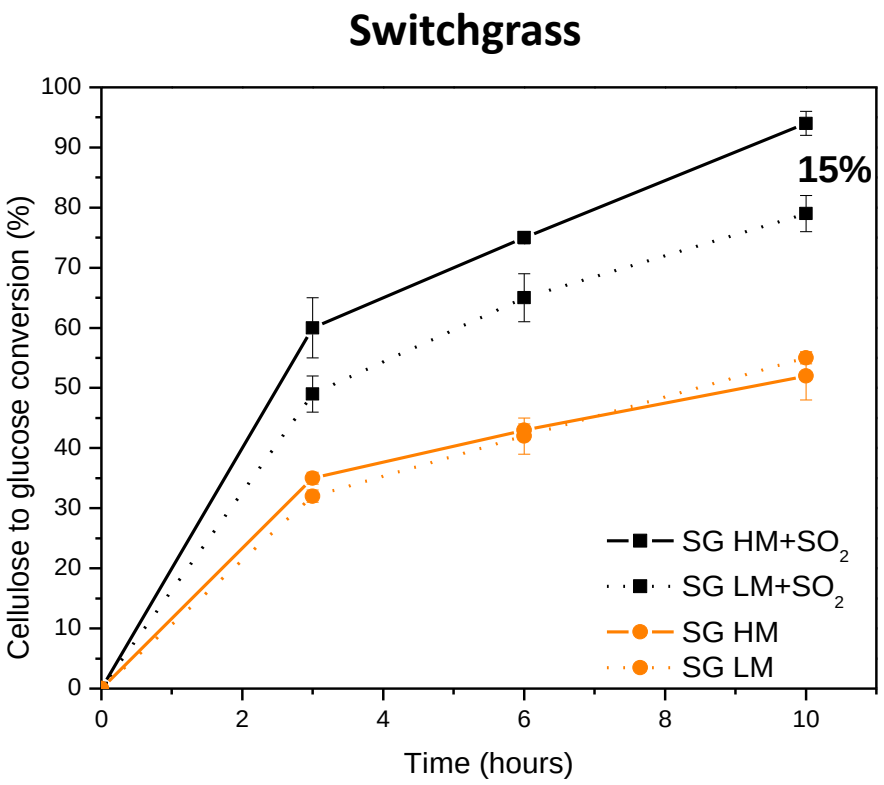
Pretreated switchgrass — solid fraction composition (% xylan, glucan, lignin)

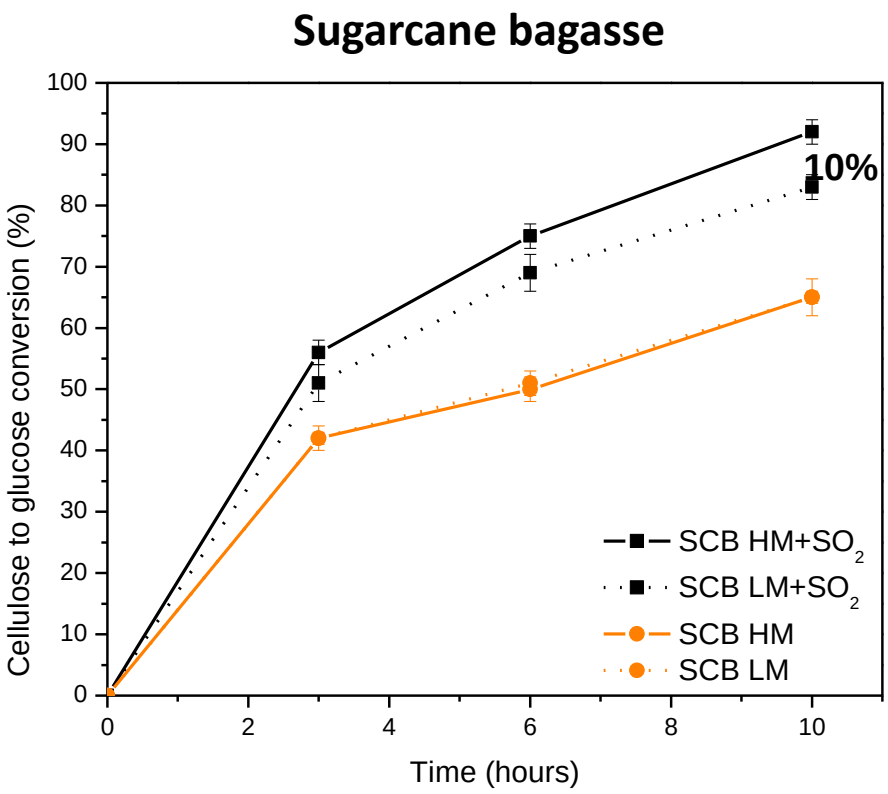


Enzymatic hydrolysis



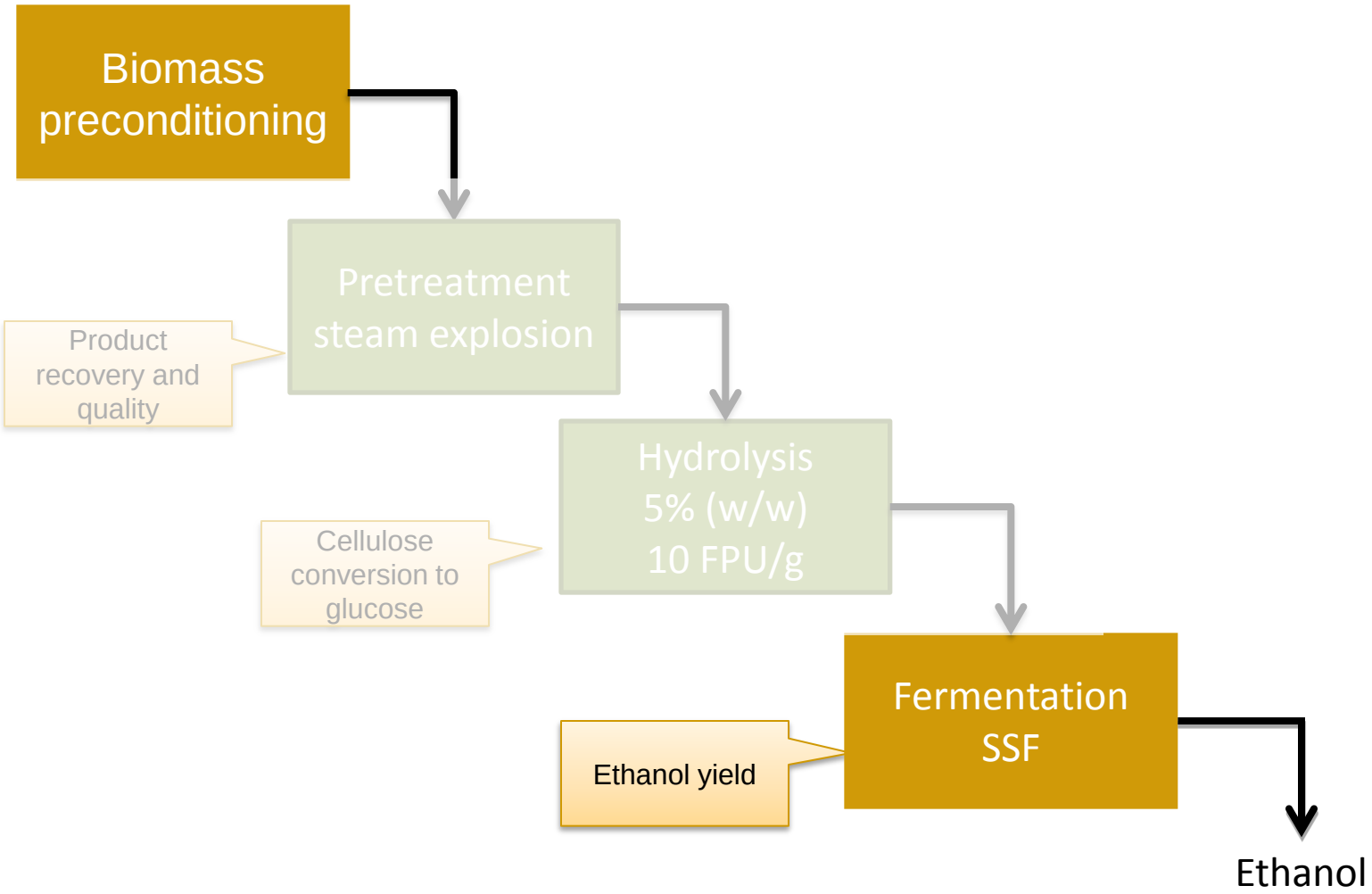
Enzymatic hydrolysis — 5% (w/w)
10 FPU/g cellulose



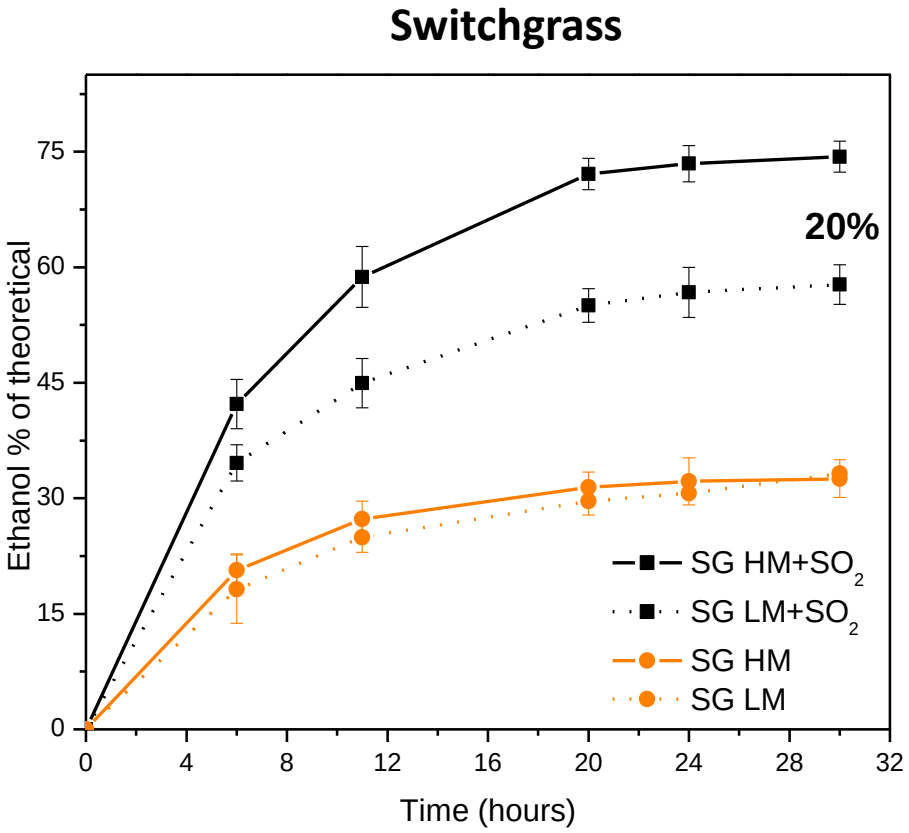


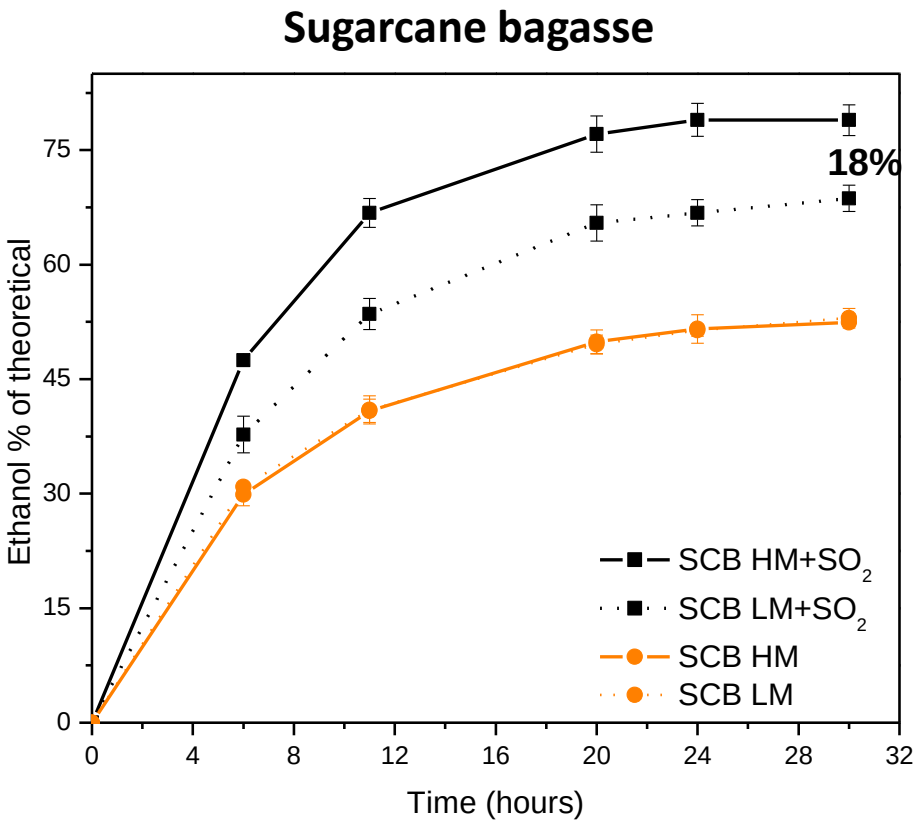
(Ewanick and Bura, 2011; *Bioresource Technology* 102)

Fermentation



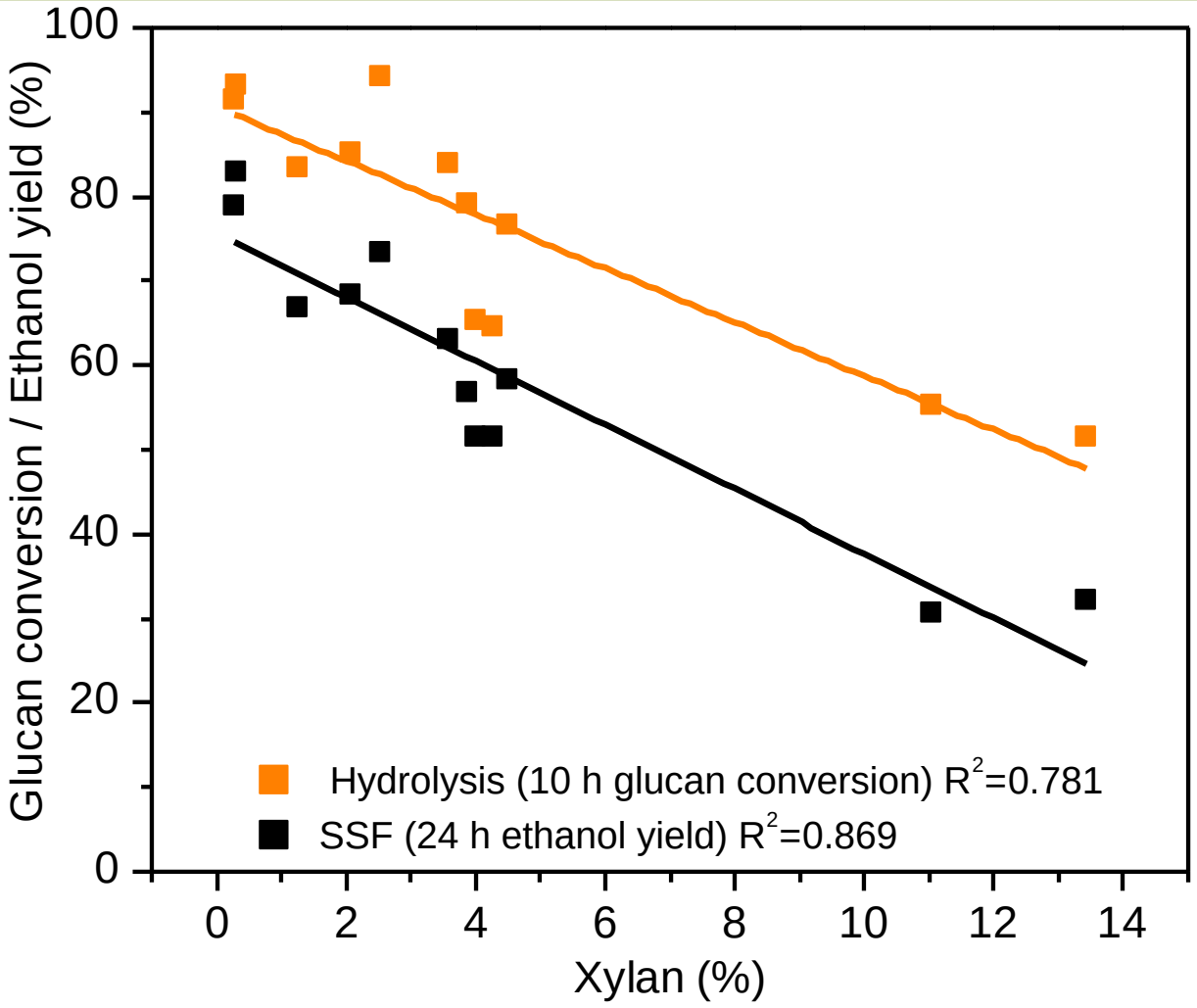
SSF — 5% (w/w), 10 FPU/g cellulose, 5 g/L of *S. cerevisiae*





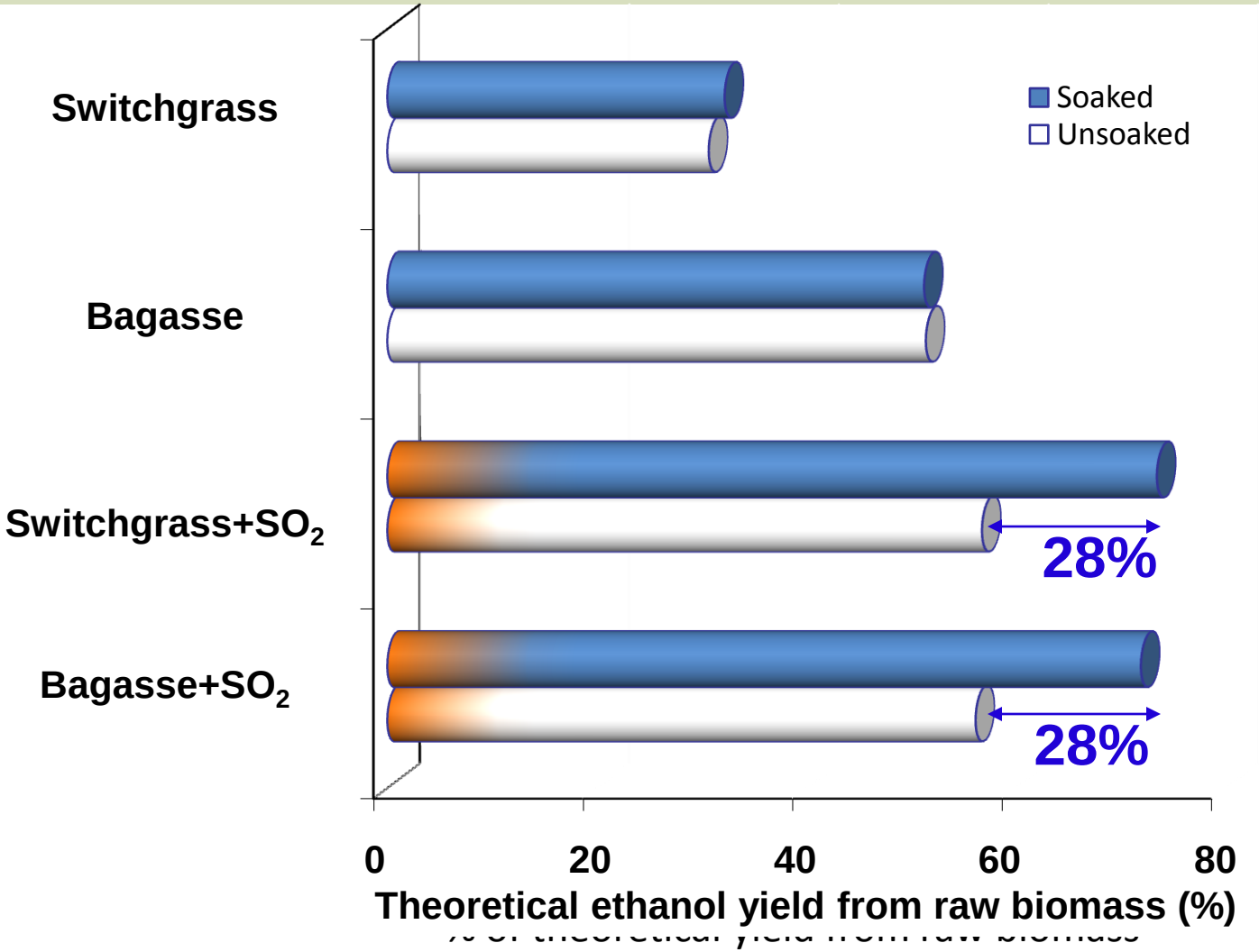
(Ewanick and Bura, 2011; *Bioresource Technology* 102)

Xylan removal



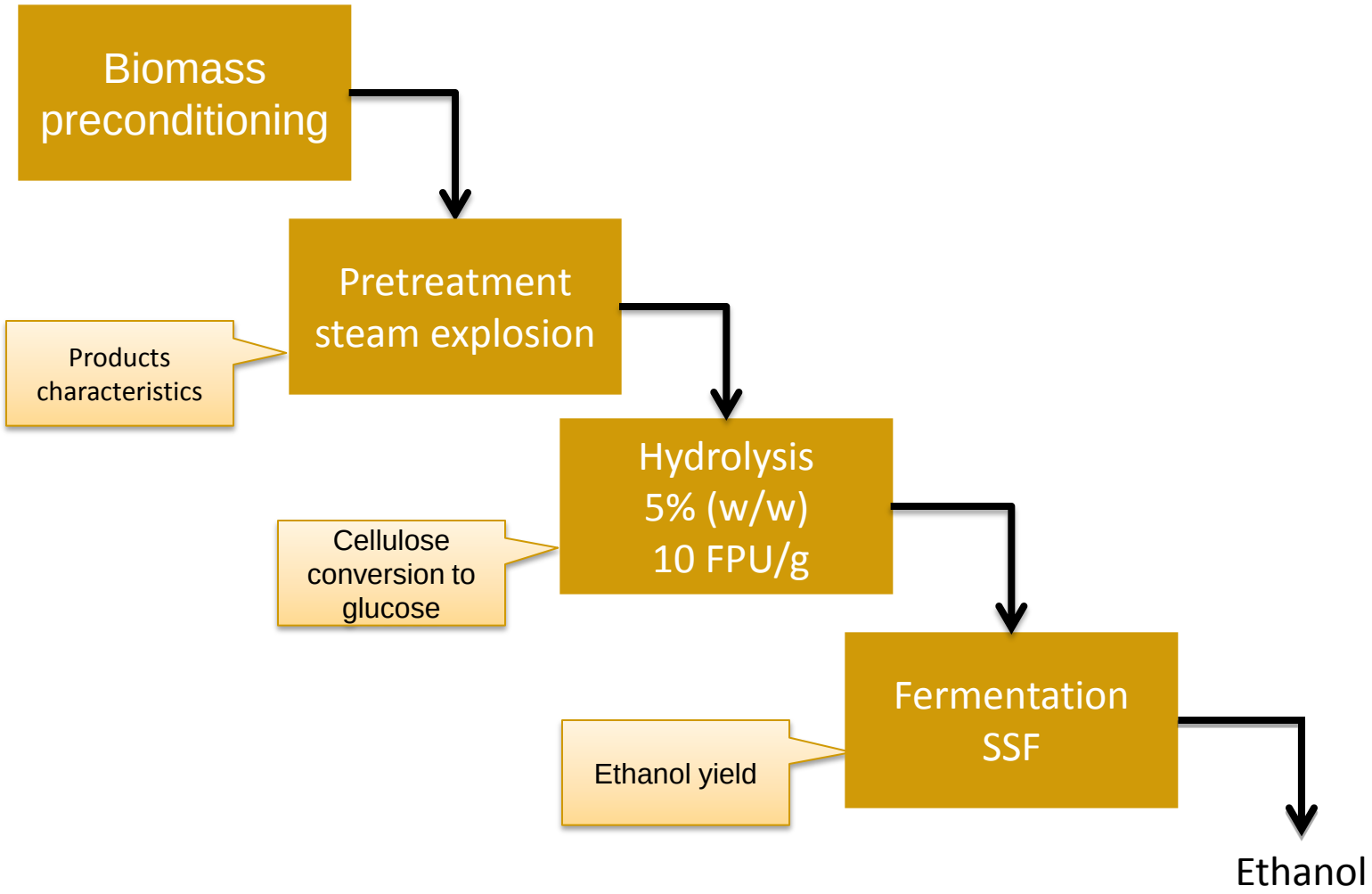
(Ewanick and Bura, 2011; *Bioresource Technology* 102)

Final results — theoretical ethanol yield from raw biomass



(Ewanick and Bura, 2011; *Bioresource Technology* 102)

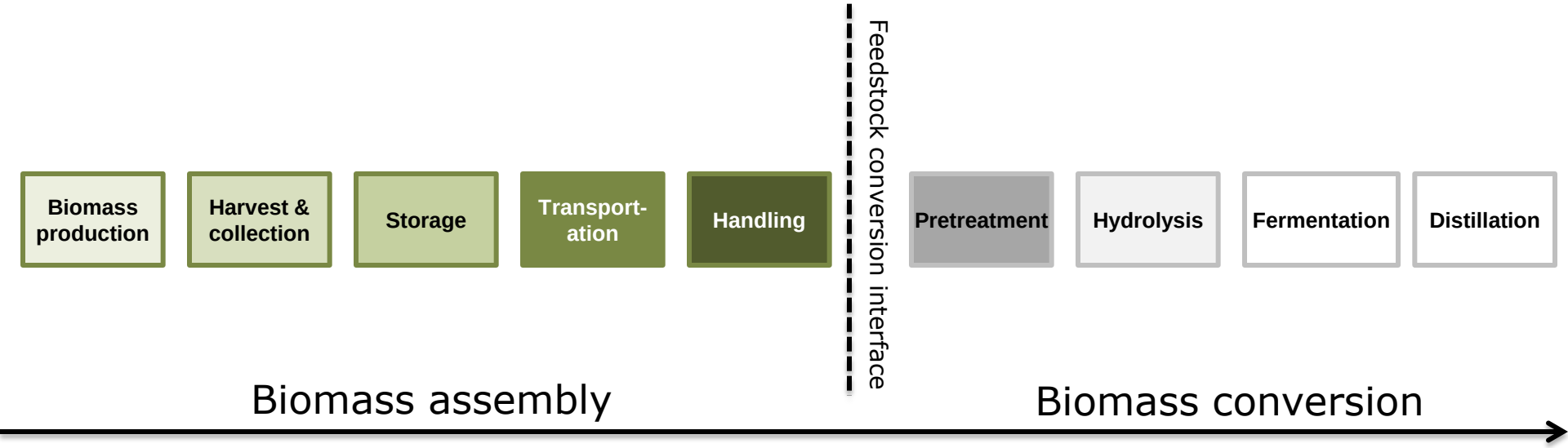
Conclusions (1)



Conclusions (2)

- Ethanol yields are over 25% higher for high MC, SO_2-catalyzed samples
- Ethanol yields do not change for low MC, uncatalyzed samples
- Increased moisture improves SO_2 penetration, resulting in higher xylan removal and increasing cellulose accessibility
- Lower xylan content in high MC, SO_2-catalyzed samples improves solids digestibility leading to high ethanol yield

Conclusions (3)



Acknowledgements

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