

UNIVERSITEIT STELLENBOSCH UNIVERSITY

RENEWABLE & SUSTAINABLE ENERGY STUDIES

Sugarcane biorefinery for the production of biofuels and chemicals

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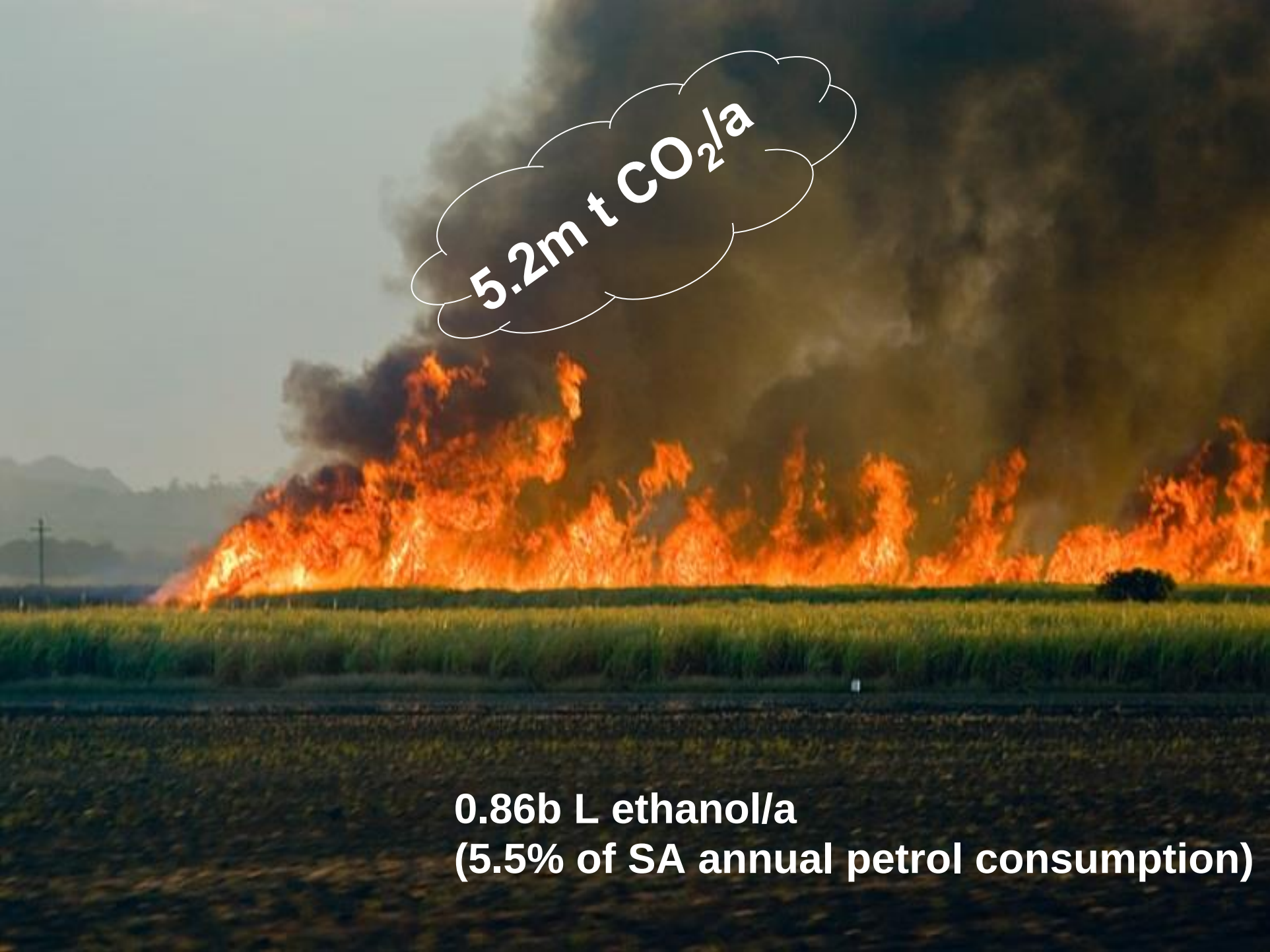
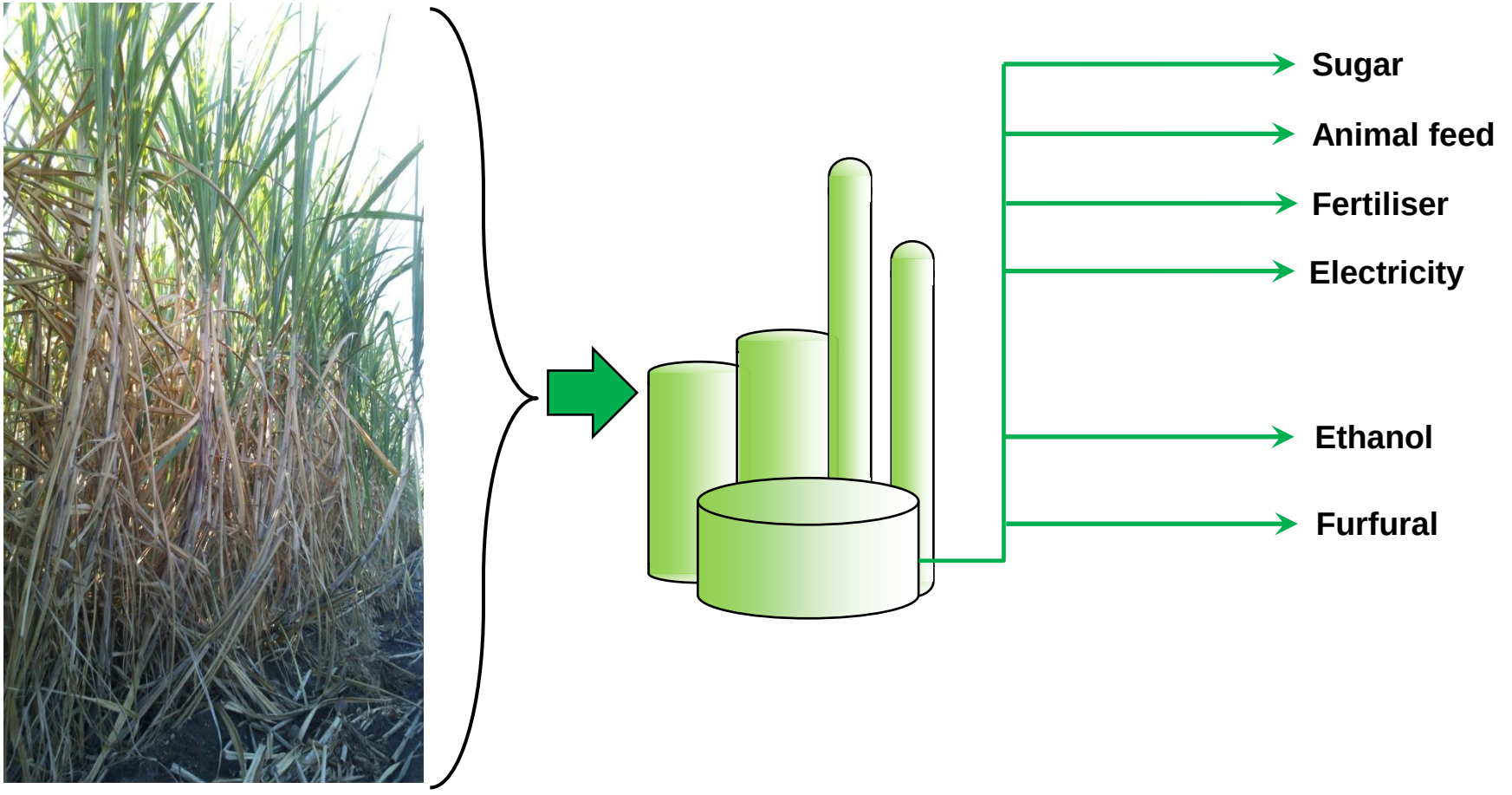

5.2m t CO_2/a
0.86b L ethanol/a
(5.5% of SA annual petrol consumption)

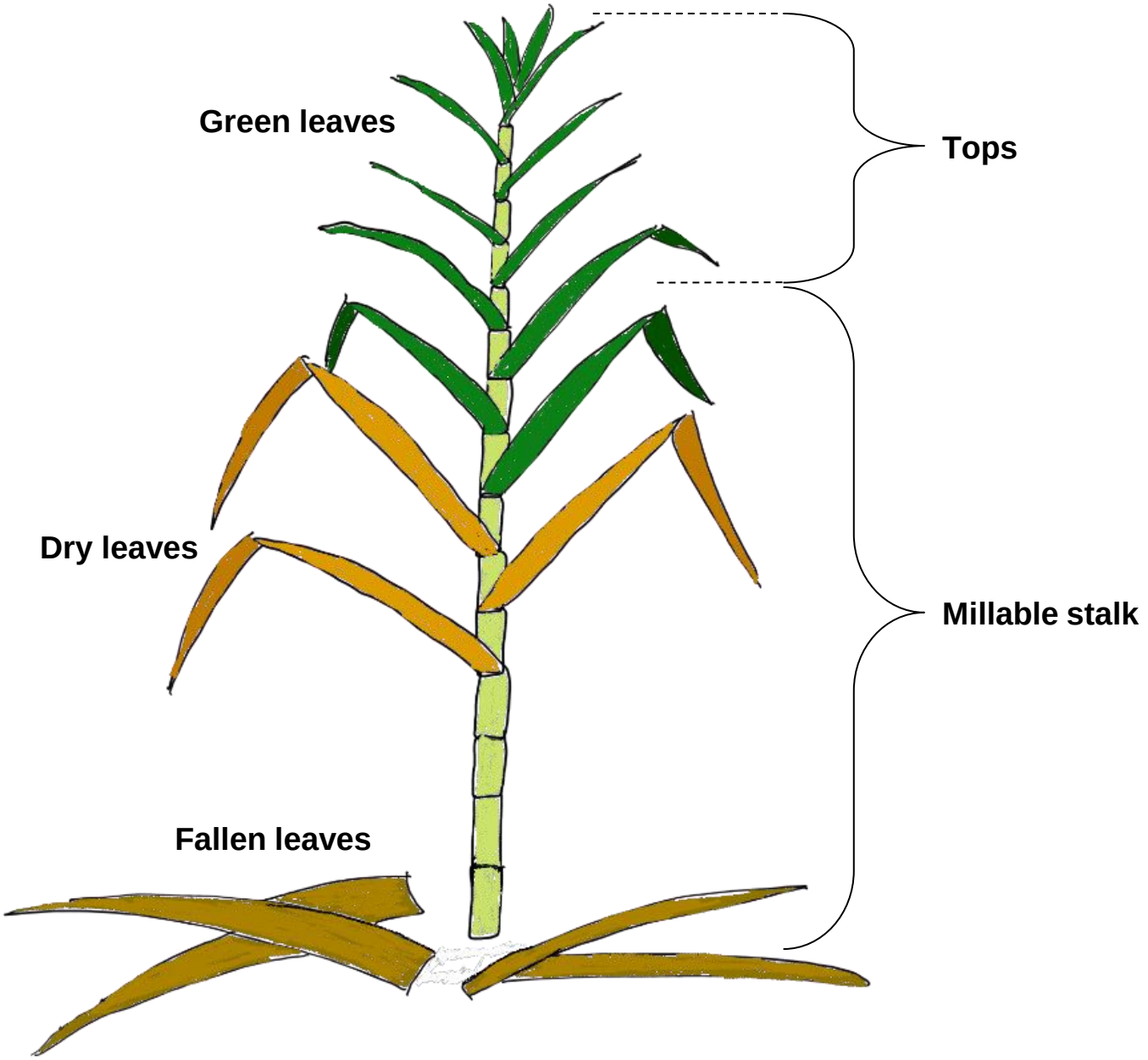
Proposal

- **Utilise the lignocellulosic waste material as a cheap carbon feedstock for the production of ethanol.**
- **Co-produce a high-value chemical to improve economics.**
- **Co-produce a fuel source for the generation of electricity to improve economics.**
- **Optimise the material handling and pretreatment to accommodate a variable lignocellulosic feedstock.**

Biorefinery proposal



Sugarcane biomass



Lignocellulose feeds

Sugarcane bagasse

Sugarcane tops and leaves

Forestry waste (poplar)

Bioprocessing

Cellulose → **Ethanol**

Hemicellulose → **Furfural**

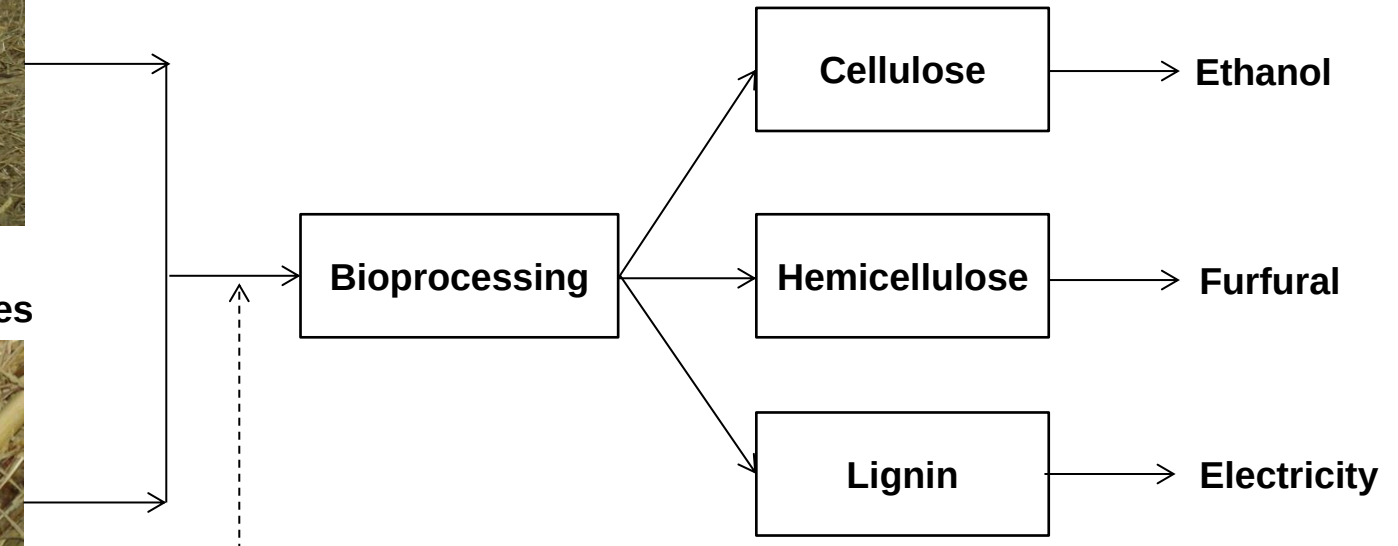
Lignin → **Electricity**

Lignocellulose feeds

Sugarcane bagasse

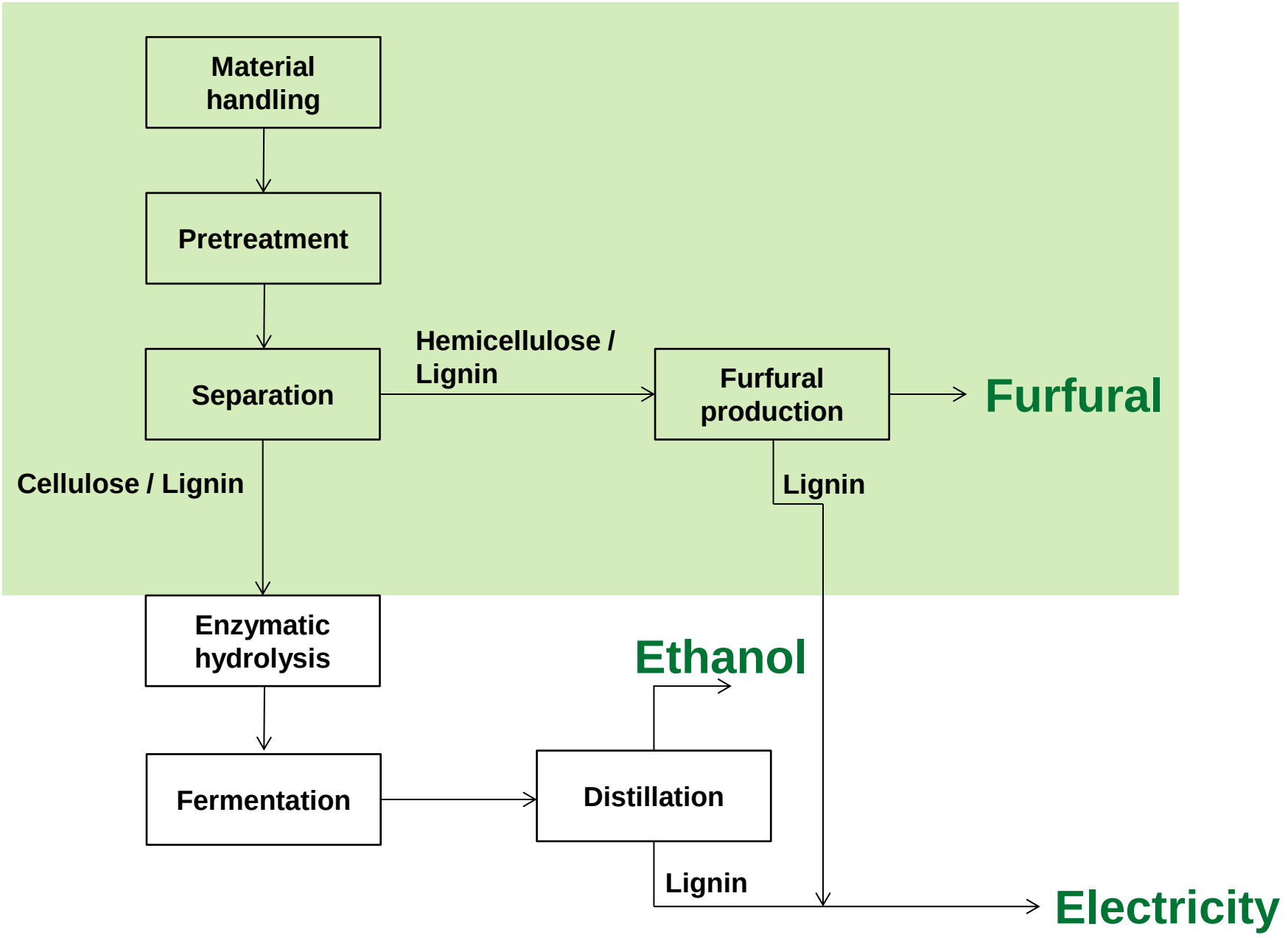
Sugarcane tops and leaves

Forestry waste



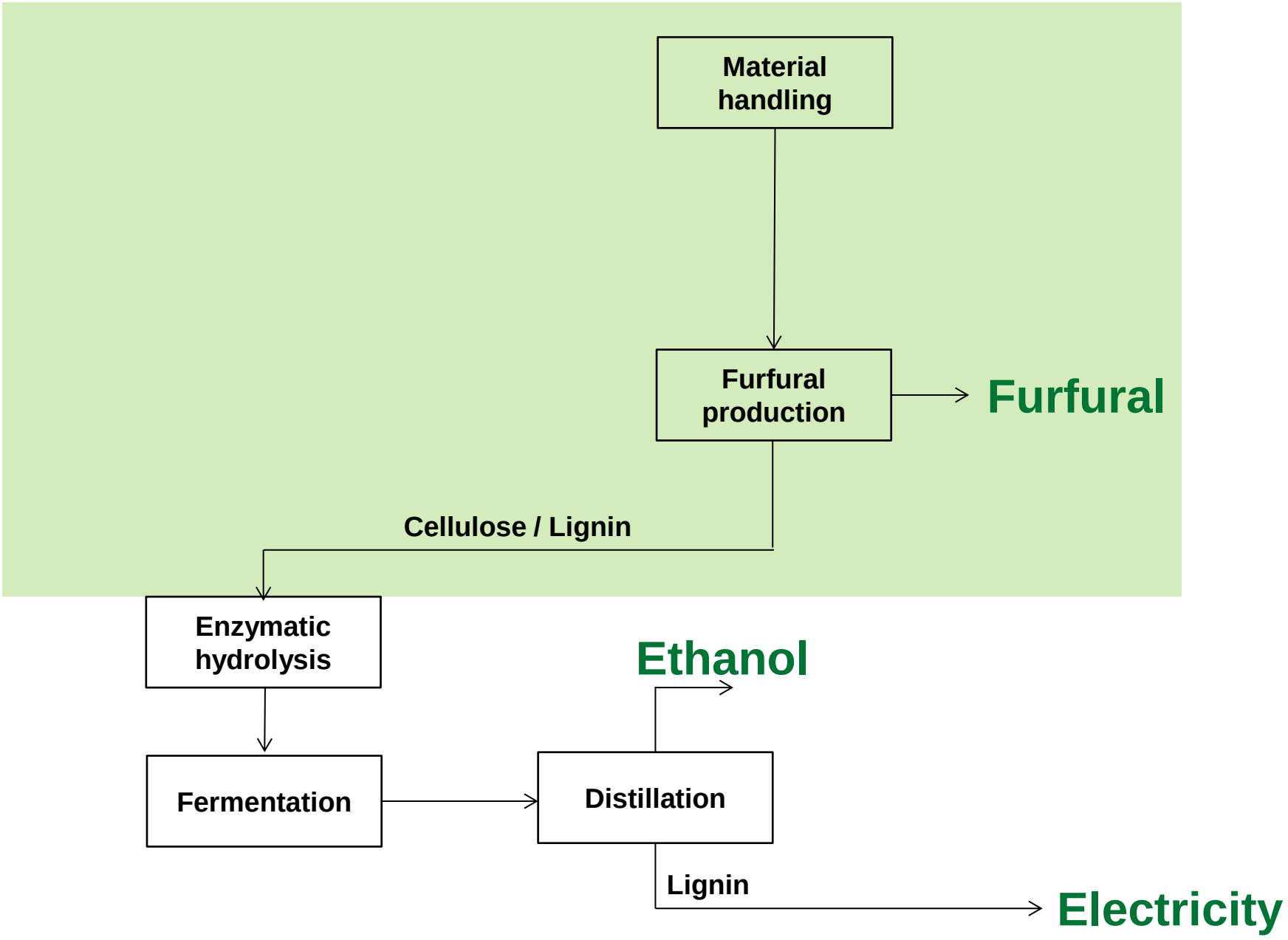
	Bagasse	Tops/Leaves	Poplar
Cellulose	25% - 45%	30% - 40%	45% - 51%
Hemicellulose	28% - 32%	30% - 35%	25% - 28%
Lignin	15% - 25%	13% - 18%	10% - 21%

Bioprocessing flow sheet – 1st configuration

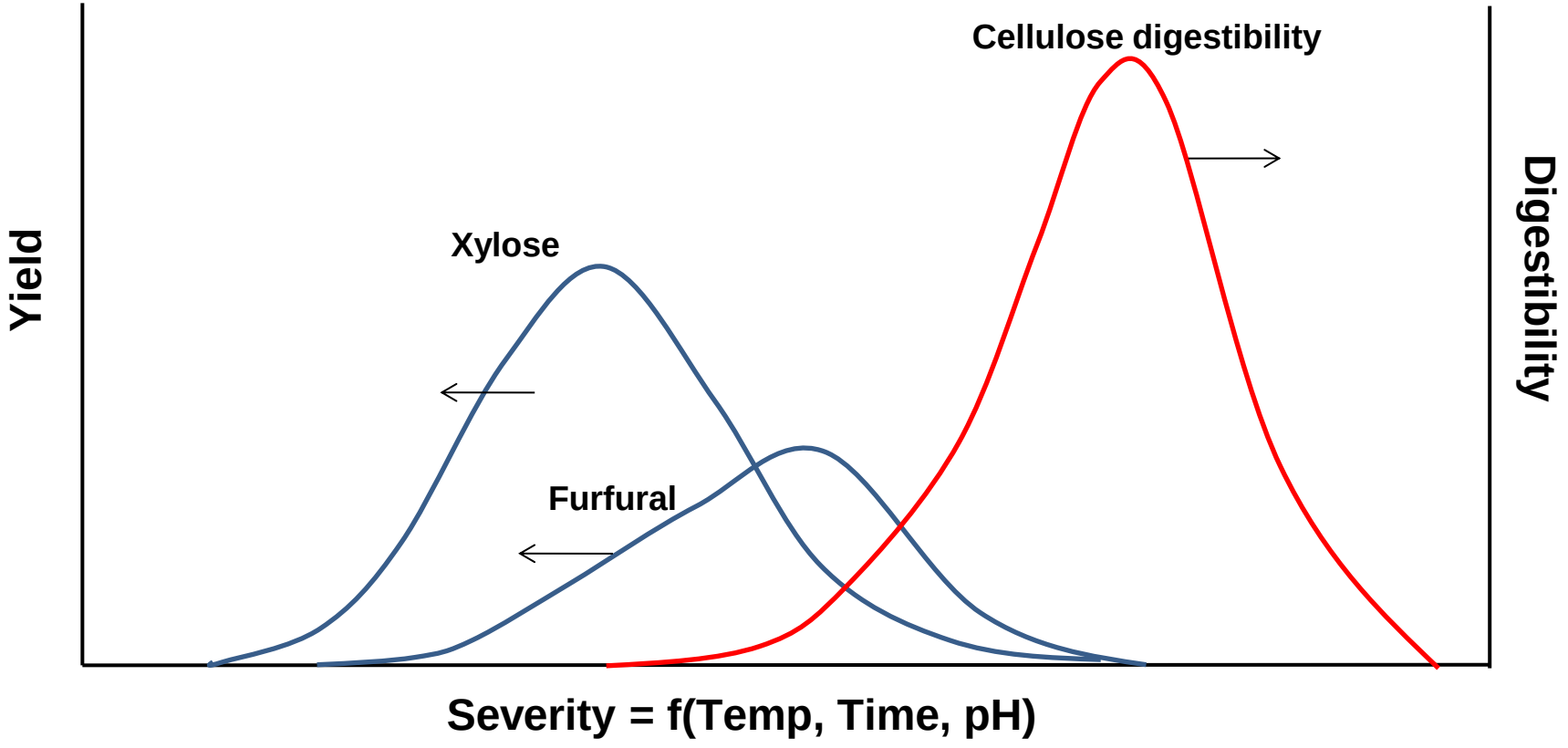


Steam pretreatment

Bioprocessing flow sheet – 2nd configuration



Impact of pretreatment severity



Conclusions

- **Sugarcane industry ideally positioned for biorefineries.**
- **Large amounts of low-value biomass available.**
- **Co-production of value-adding chemicals and/or electricity**
- **necessary to produce bioethanol economically.**
- **Pretreatment paramount to cost of producing ethanol.**