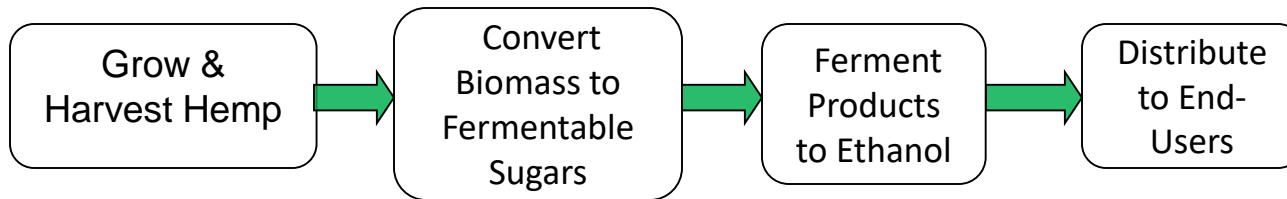


Hemp Crude: Converting Residual Hemp Leaves, Stems, and Stalks to Biofuels & Bioproducts



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COLLEGE OF FOOD, AGRICULTURAL,
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1. Nearly 80 Percent of Hemp Biomass is Available for Ethanol Production

- Buds and flowers used for THC or CBD production are only about 20 percent of total plant weight.
- Plant leaves, stems and stalks, about 80% of biomass, are all suitable for ethanol production.

UMES 2021 Hemp Crop: Average Biomass Composition

Hemp Biomass Type	% Total Wgt
Flowers and Buds for THC & CBD	20.5%
Leaves and Stems < 5mm diameter	19.9%
Stems 5-10 mm diameter	39.9%
Stalks > 10 mm diameter	19.7%
Total Available Biomass	79.5%

2. Yields of Ethanol from Residual Hemp Biomass are Comparable to Those from Corn Grown Expressly for Ethanol Production

1 Acre Processed	Tons Residual Biomass Produced	Gallons Ethanol Produced	Wholesale Ethanol Income \$2.20/gallon	Income to Growers @ \$40.00/Ton
Low-End Hemp Production	5.2	405	\$ 892	\$ 208
High End Hemp Production	7.0	541	\$1,189	\$ 280
US Average Corn Production		462	\$1,016	

3. Hemp Ethanol May be Used for Multiple Fuels and Products



**Hemp Ethanol for
Bio-Jetfuel**



**Hemp Ethanol for
Motor Vehicles: 10%-85%**

**Hemp Ethanol for
Bio-Polyethylene**



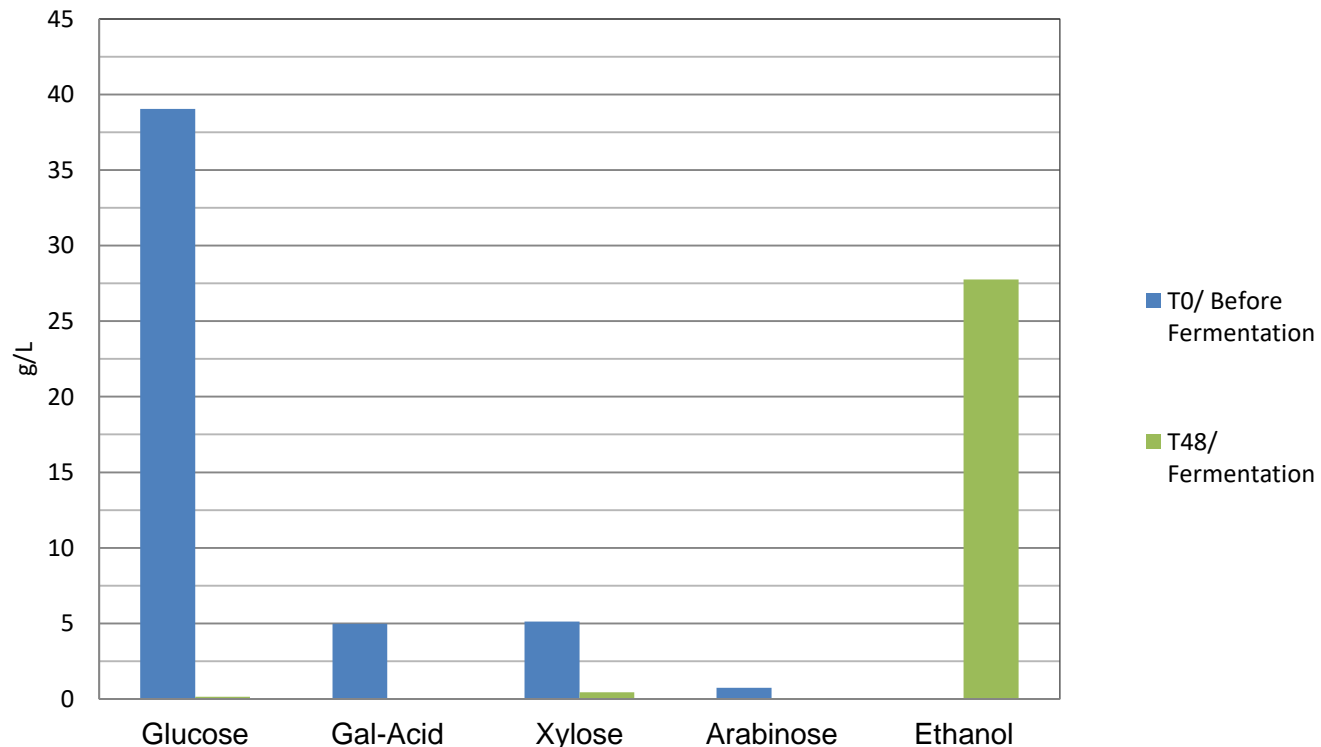
4. Economic Equity Income from Residual Hemp Biomass Would De-Risk Start-Up Hemp/Cannabis Operations

- With Atlantic Biomass system, growers would receive up to \$280/acre for their residual biomass no matter what happens to their CBD or THC producing buds.
- This would **cover seed and nutrient costs**. For the agriculture credit industry this would **provide sufficient de-risking income** that “**directly correlates to showing cash flow to repay the loan.**”
- Selling residual biomass for biofuel would also help growers by helping to cover costs imposed by regulations that include the disposal of non-compliant crops. This expense is ***not covered by crop insurance.***

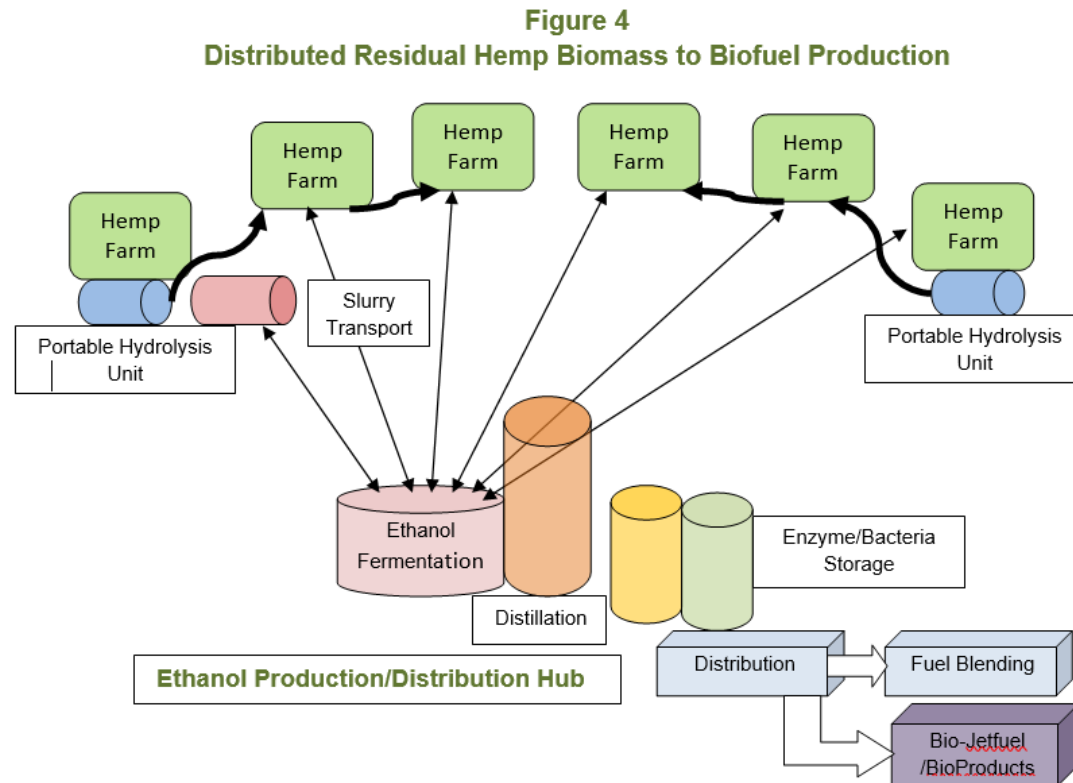
5. The Atlantic Biomass Process Achieves High Ethanol Yields by Using All Biomass Sugars

- The Atlantic Biomass process converts hemicellulose and pectin sugars: **xylose**, **arabinose**, and **galacturonic acid**, as well as **glucose** into ethanol.
- This increases ethanol yields by a minimum of 20 percent over current glucose based systems

FBR5 Ethanol Fermentation from Mixed Hemp



6. The Atlantic Biomass System is Distributed and Uses Portable Modules



- Less transportation is needed to move highly concentrated sugar slurry than low density biomass.
- Trains or waterways could also be used for slurry transport to reduce transportation costs and energy use.
- The portable system would also overcome regulations that prohibit the transport of hemp not meeting certain THC conditions.

7. The Atlantic Biomass Conversion System Does not Require Pretreatment or Hydrolysis Additive Costs

- Our carbohydrate conversion rate of **84%** is achieved with a simple, non-pretreatment proprietary system.
- This is comparable to or better than complex enzyme hydrolysis processes that require pretreatment.
- For example, Kim, et al 2021 showed hemp cellulose conversion, requiring acid pretreatment and a lignin-blocking additive, reached about 70%.
- The economic benefits of not using pretreatment also includes foregoing the additional costs of removing pretreatment chemicals that inhibit hydrolysis and fermentation processes.

Thank You

Atlantic Biomass, LLC.

