

Billion-Ton Study

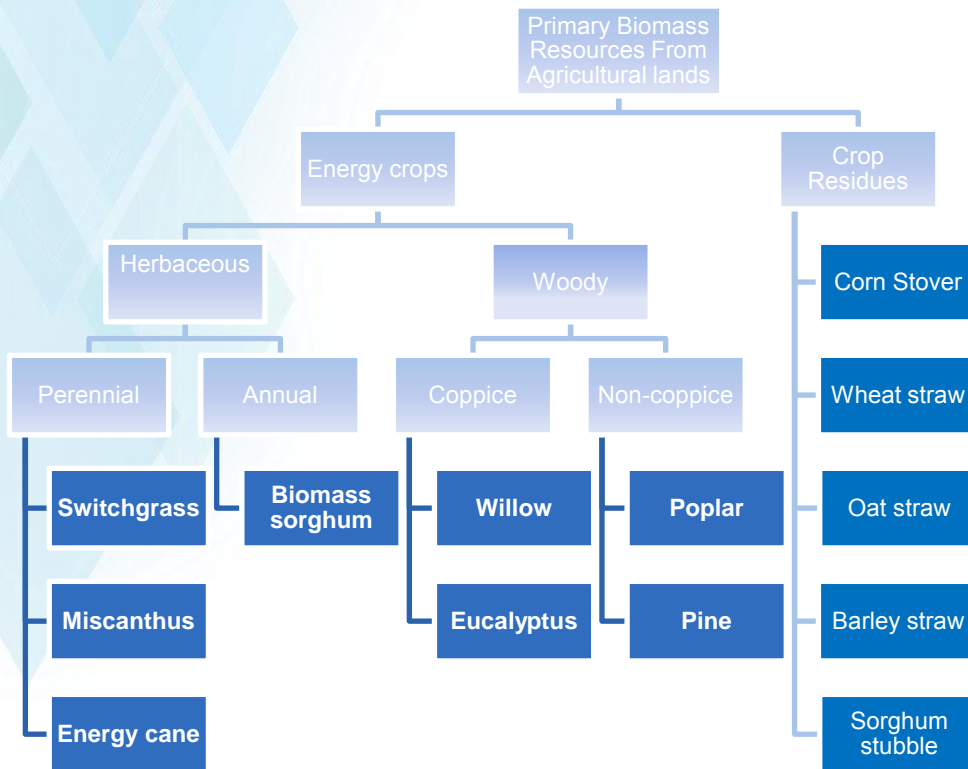
Chapter 4 - At the Farmgate: Agricultural Residues and Biomass Energy Crops

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Breakout Session 1-A
July 13, 2016

Scope



◆ Consistent with BT2 (2011):

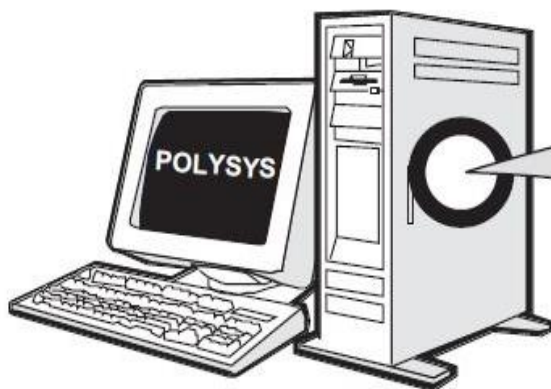
- Anchored to USDA Long Term Forecast (Baseline)
- Demands for food, feed, fiber, exports prioritized
- Scenarios
 - Basecase
 - High Yield (2-4% energy crop with high corn yield (265 bu/ac in 2040))

◆ Supplies at specified prices:

- \$30-\$100, \$5 increments
- 2015 – 2040

Approach

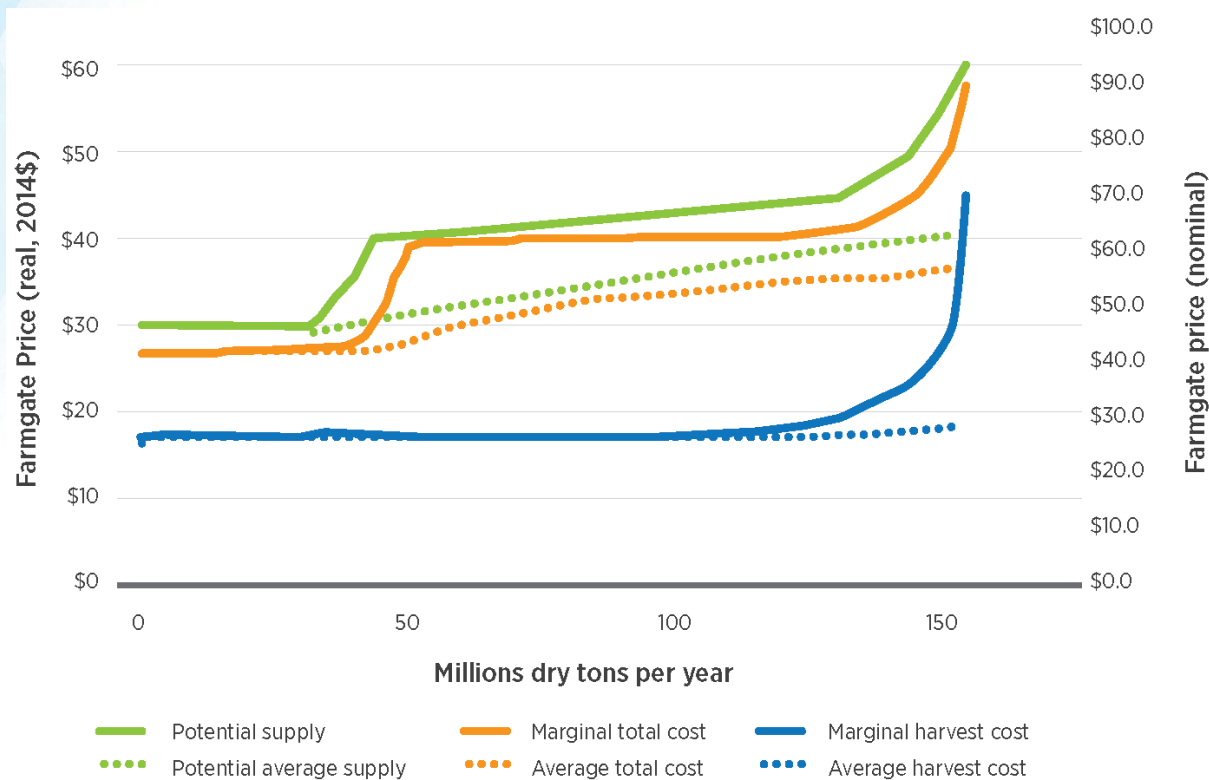
Yield, cost, assumptions (scenarios)



Inputs: Yield and cost for Corn stover

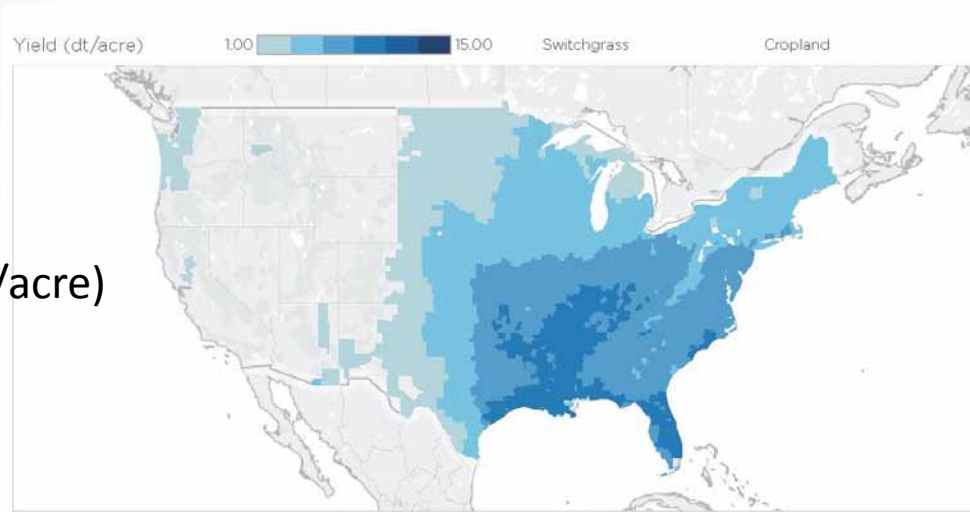
Yield: up to 265 bushels per acre in 2040 (national average)

Cost

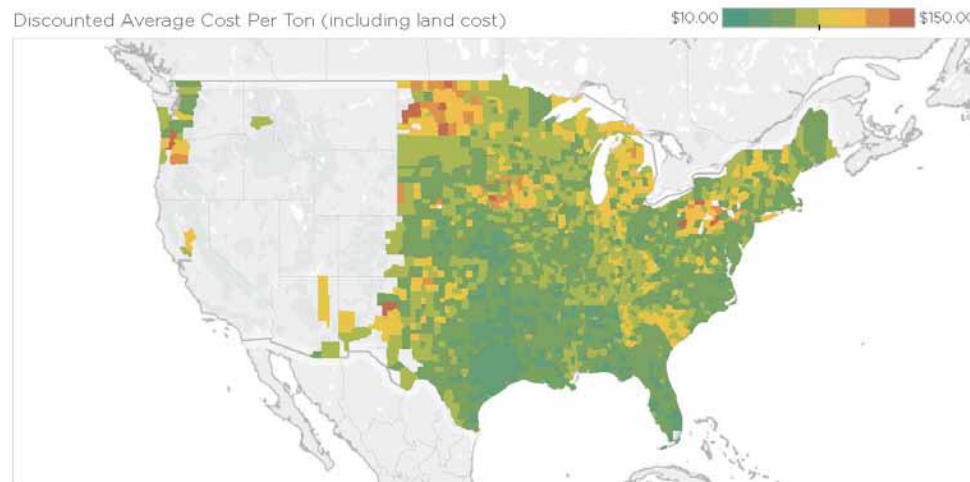


Inputs: Yield and cost for Switchgrass

Yield (dry tons/acre)

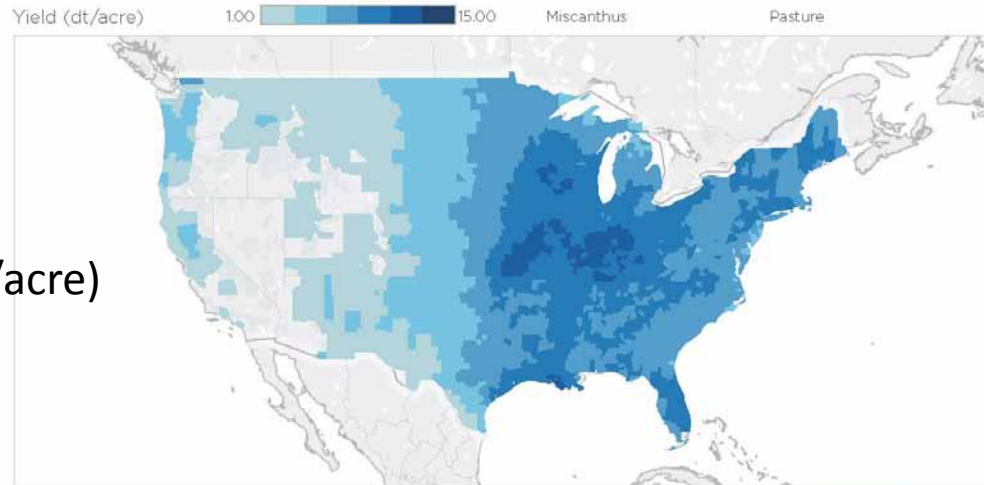


Cost (\$/ton)

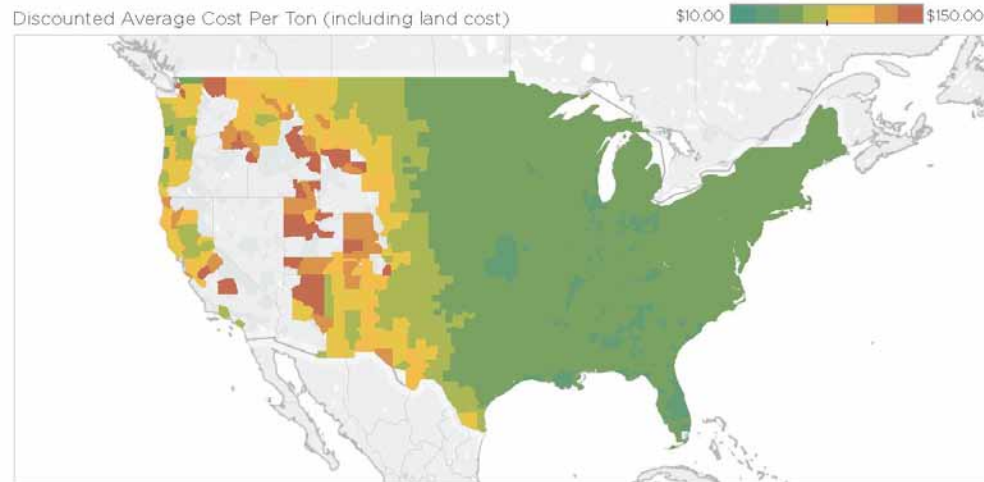


Inputs: Yield and cost for Miscanthus

Yield (dry tons/acre)

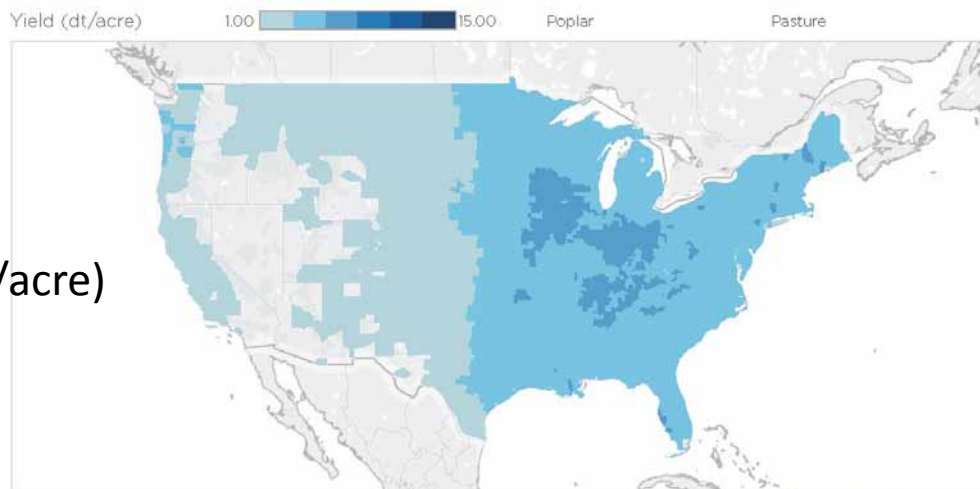


Cost (\$/ton)

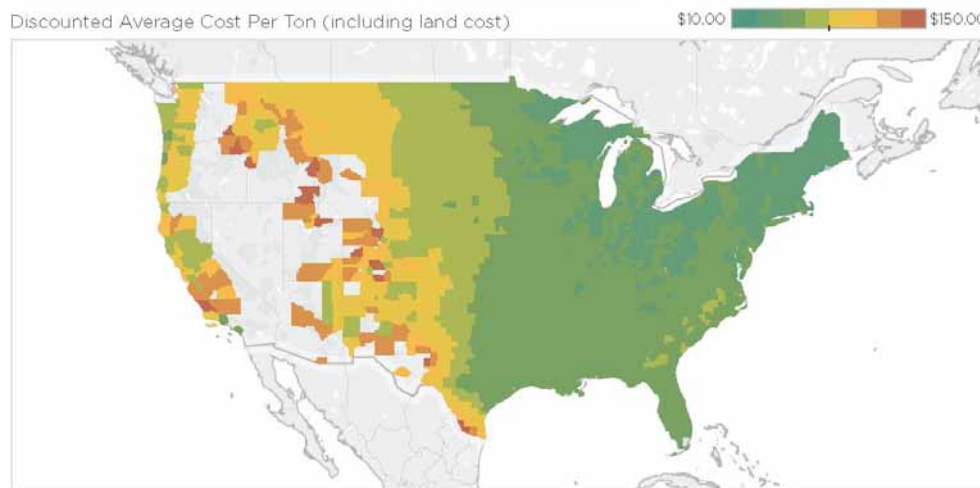


Inputs: Yield and cost for Non-coppice woody crops

Yield (dry tons/acre)

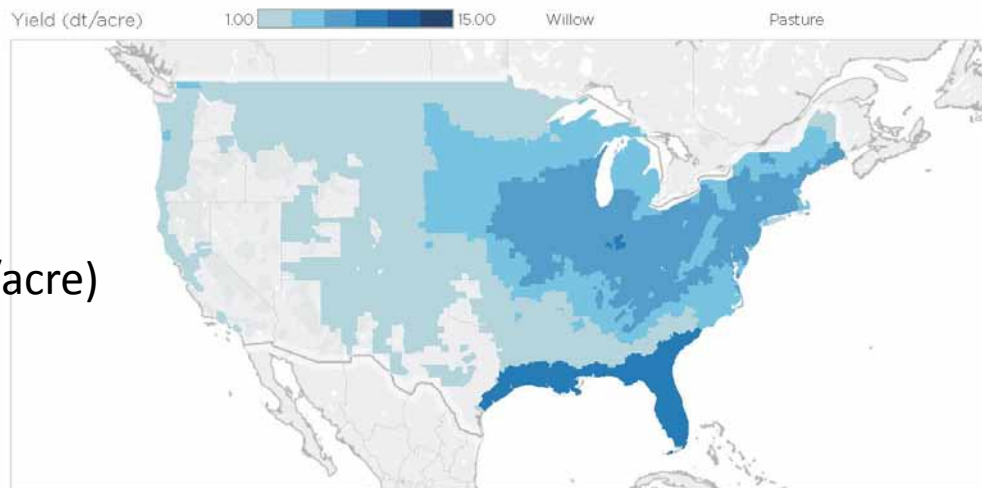


Cost (\$/ton)

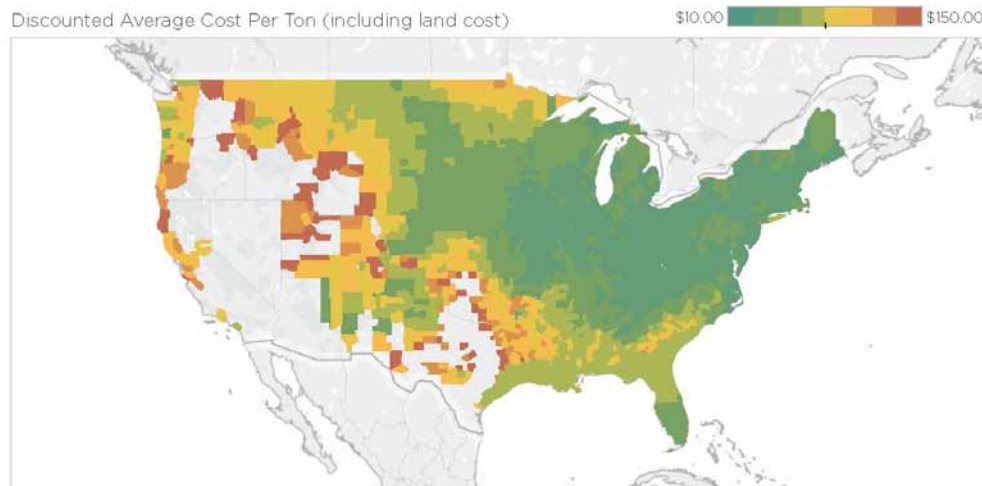


Inputs: Yield and cost for Coppice woody crops

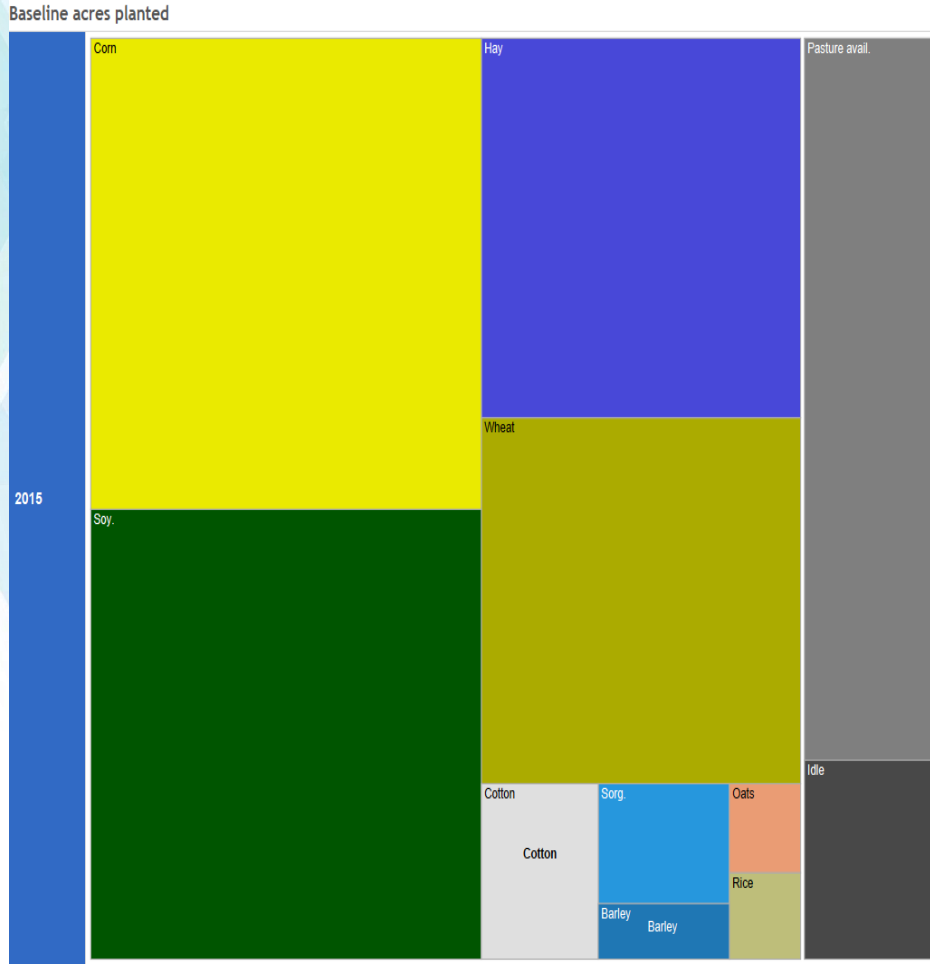
Yield (dry tons/acre)



Cost (\$/ton)



Assumptions



◆ Land within POLYSYS fixed throughout the projection period

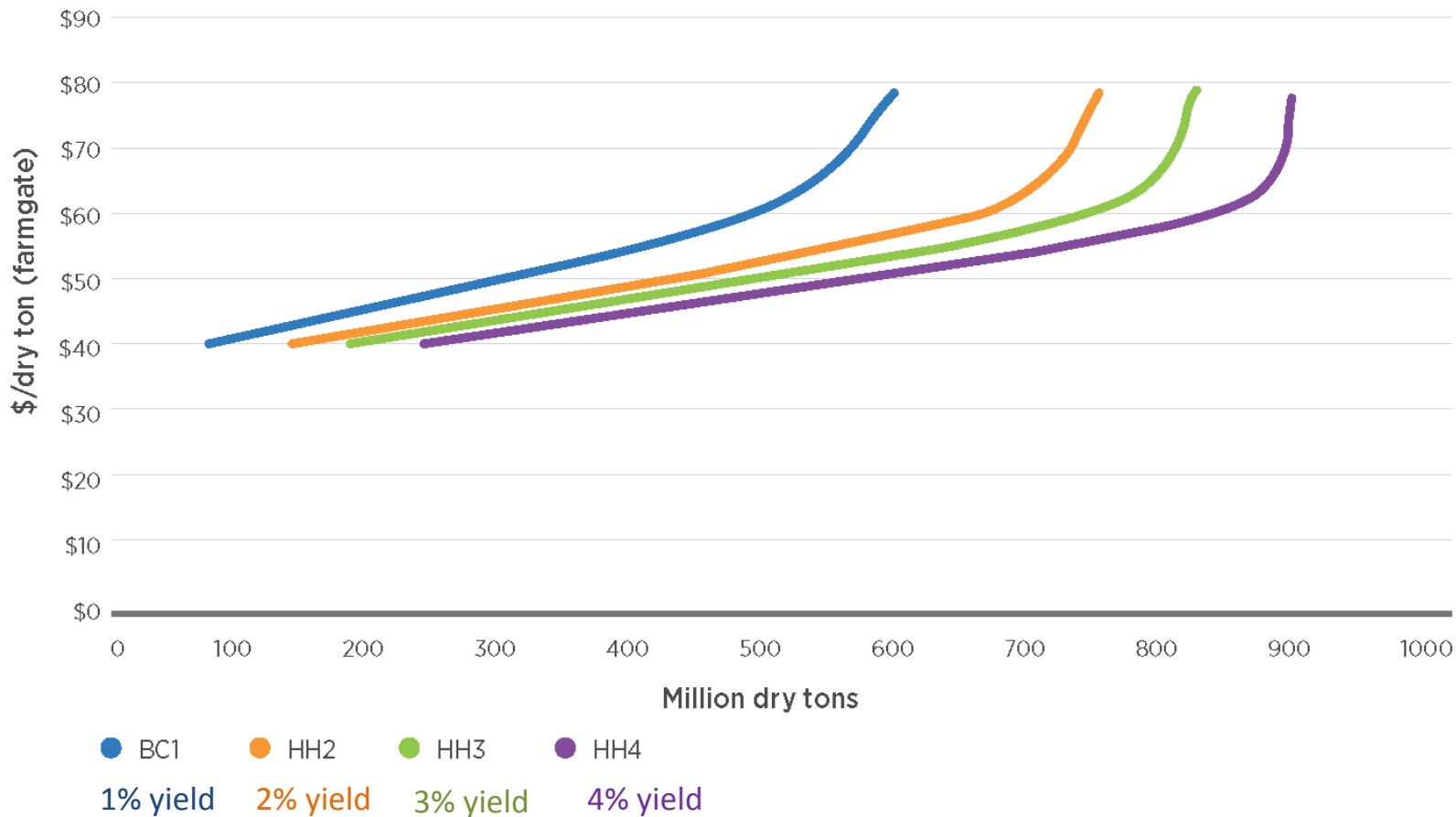
- Land base (USDA, NASS) :
 - Pastureland, all: 446.3 million acres
 - Cropland: 312.6 million acres
- **Annual transition limits (available land*):**
 - 5% of permanent pasture,
 - 20% of cropland pasture, and
 - 10% of cropland.
- **Cumulative transition limits (available land*):**
 - 40% of permanent pasture,
 - 40% of cropland pasture, and
 - 10% of cropland for most energy crops (except biomass sorghum)

***pasture: non-irrigated; > 25" annual rainfall**

***58% cropland**

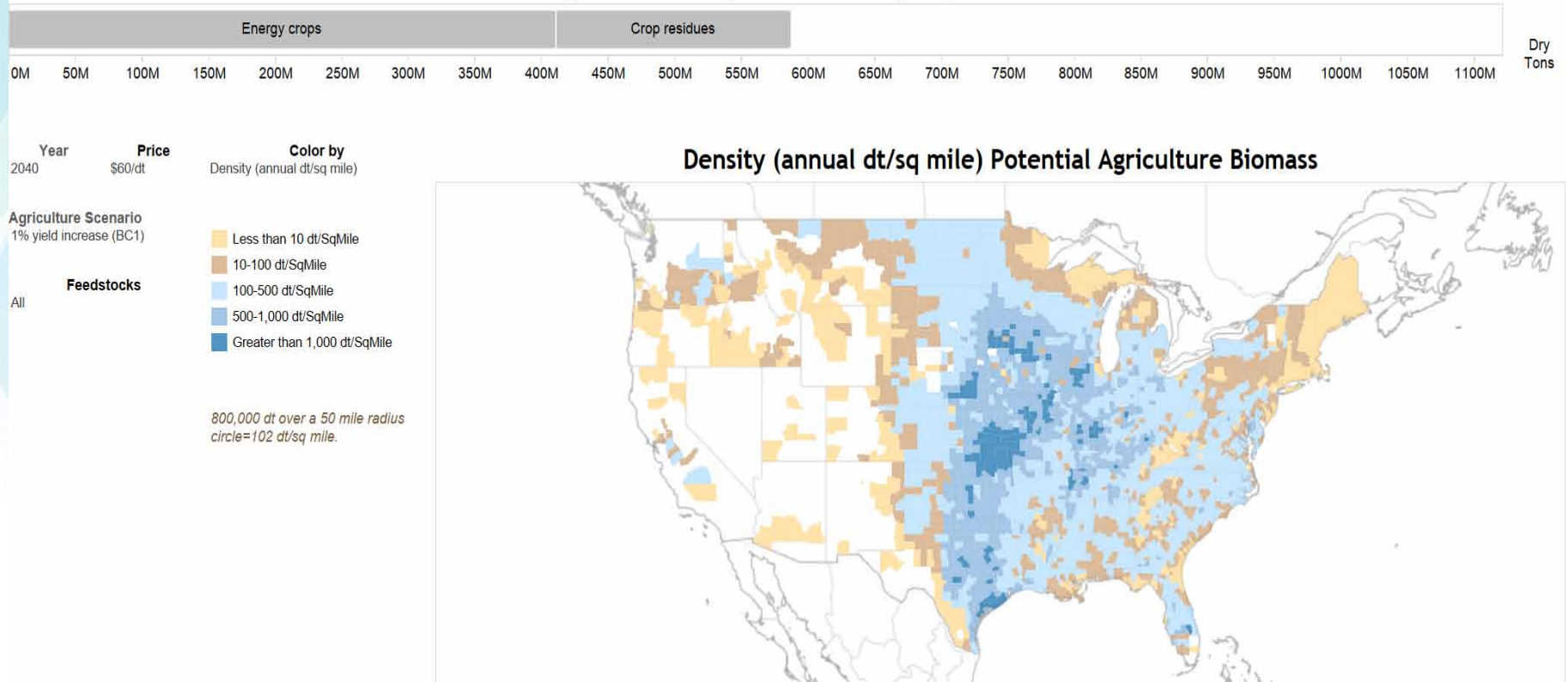
Results: \$40, \$60, \$80, 2035

All scenarios – all resources:



Results: Base-case \$60, 588m dt by 2040

2040 Agricultural Resources, \$60/dt per dry ton or less, roadside.
Agriculture: 1% yield increase (BC1).



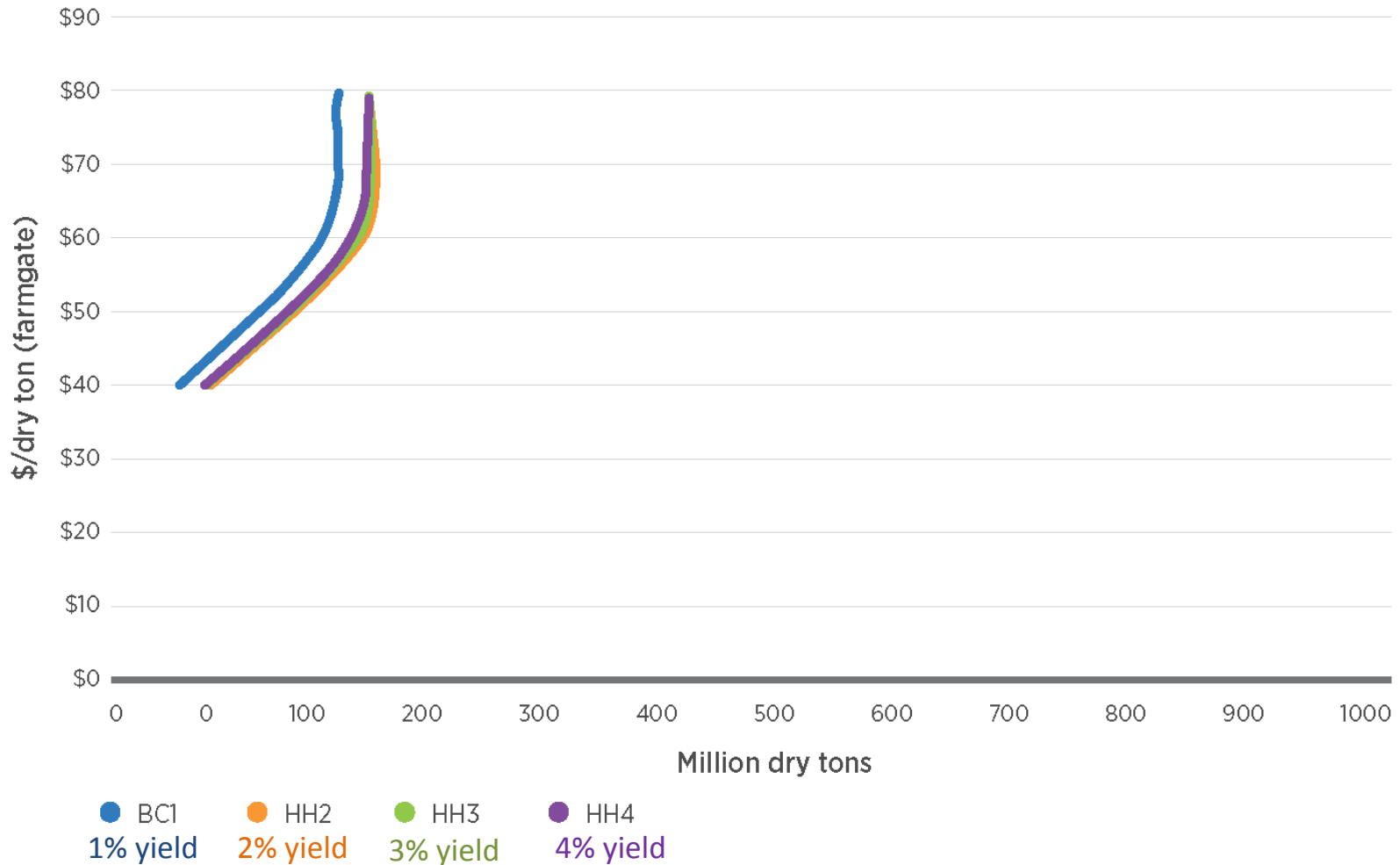
U.S. Department of Energy. 2016. U.S. Billion-Ton Report: Advancing Domestic Resources for a Thriving Bioeconomy. Volume 1: Economic Availability of Feedstocks. M.H. Langholtz, B.J. Stokes, and L.M. Eaton (Leads), ORNL/TM-2016/###. Oak Ridge National Laboratory, Oak Ridge, TN. ###p.

<https://bioenergykdf.net/billionton2016/4/6/tableau>

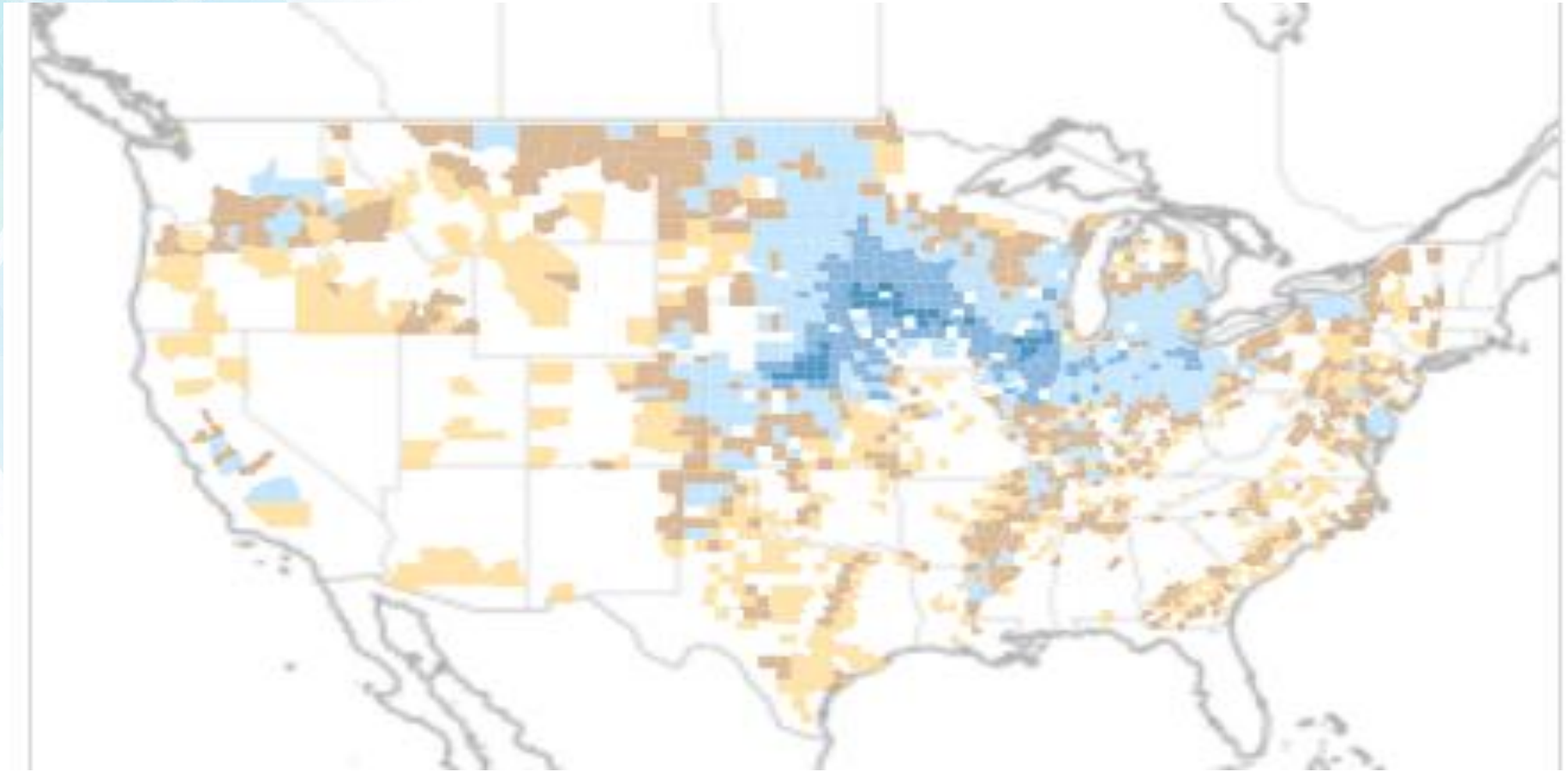


Results: \$40, \$60, \$80, 2035

All scenarios - residues:

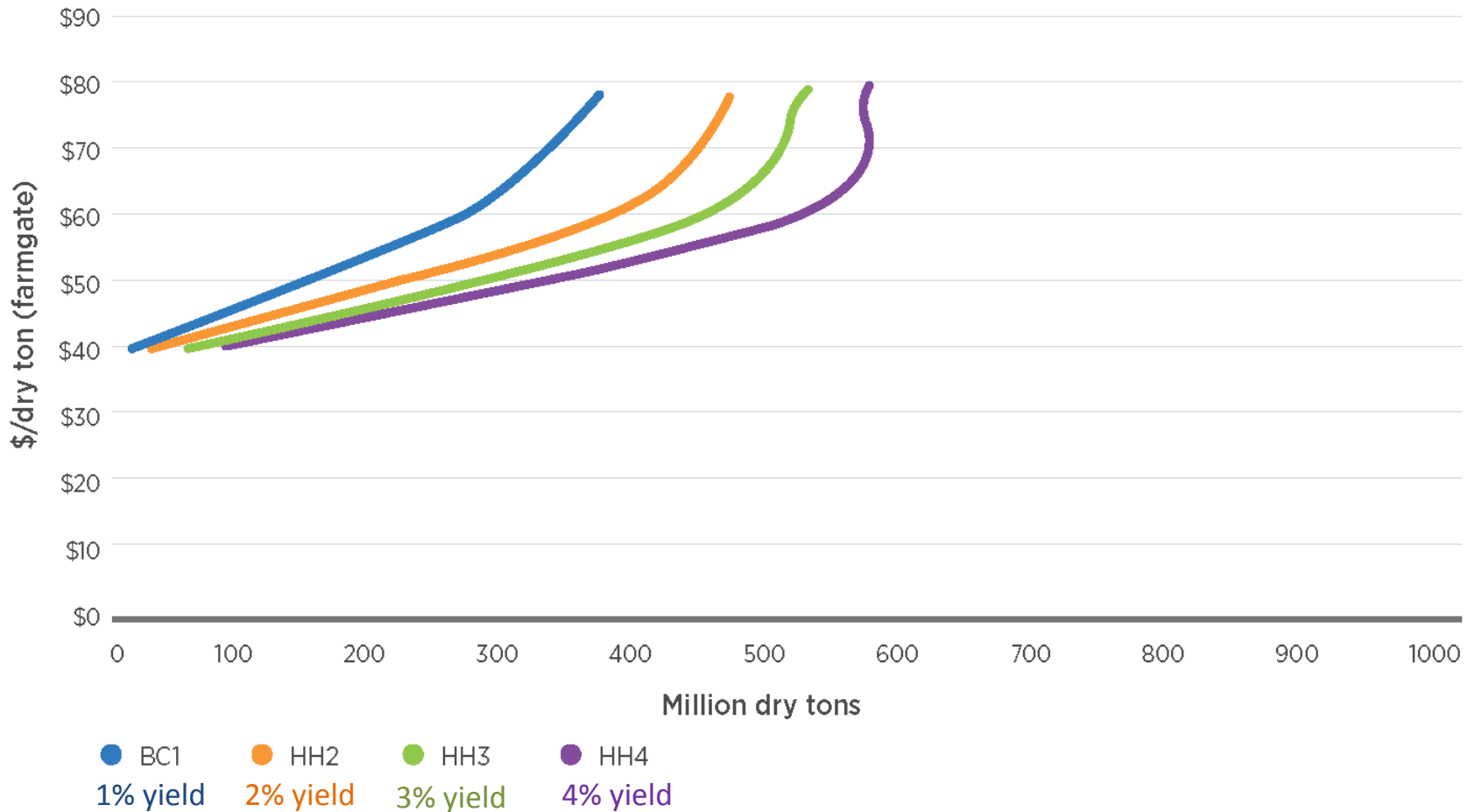


Results: Base-case \$60, Residues: 176m dt by 2040

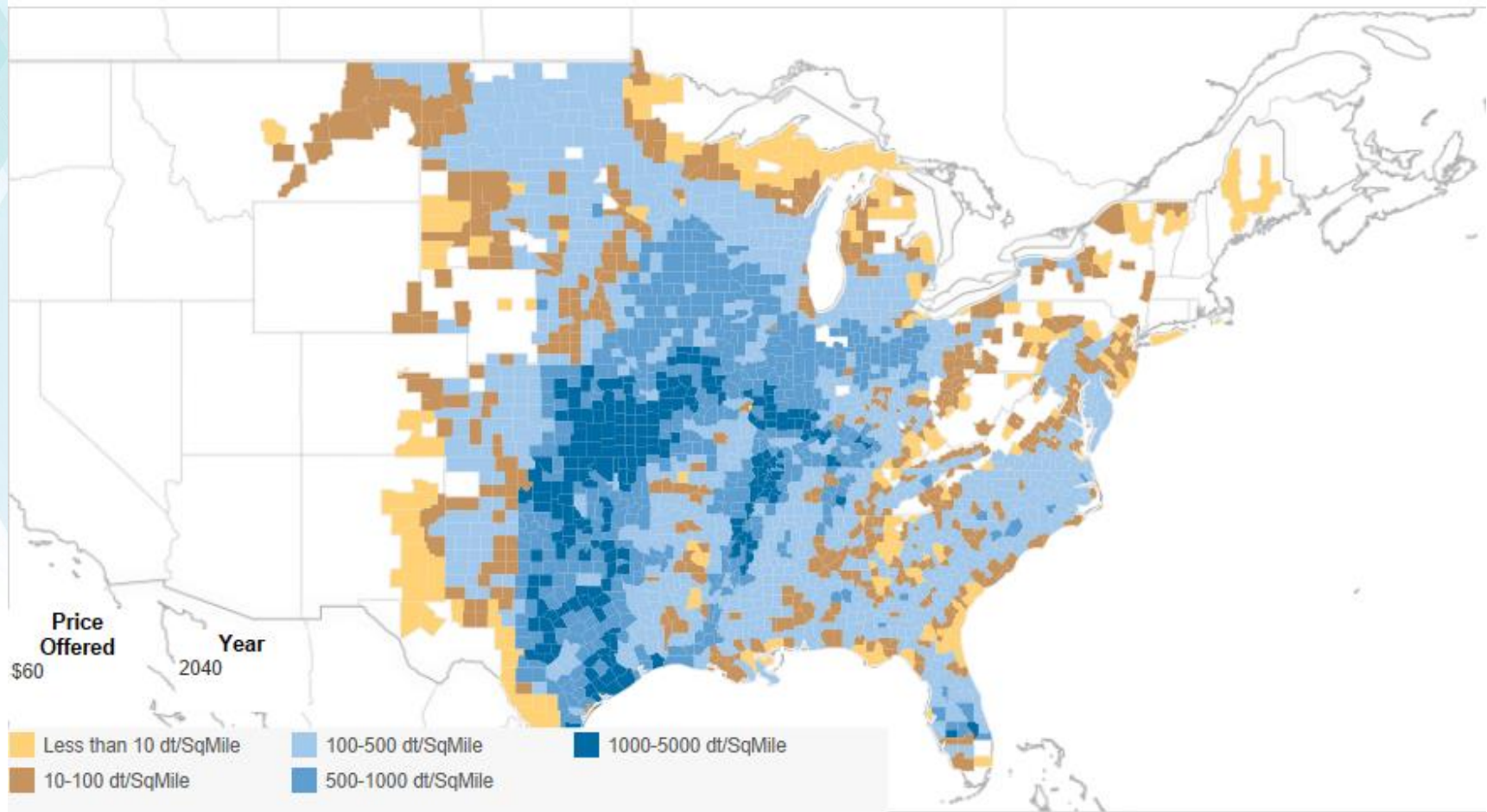


Results: \$40, \$60, \$80, 2035

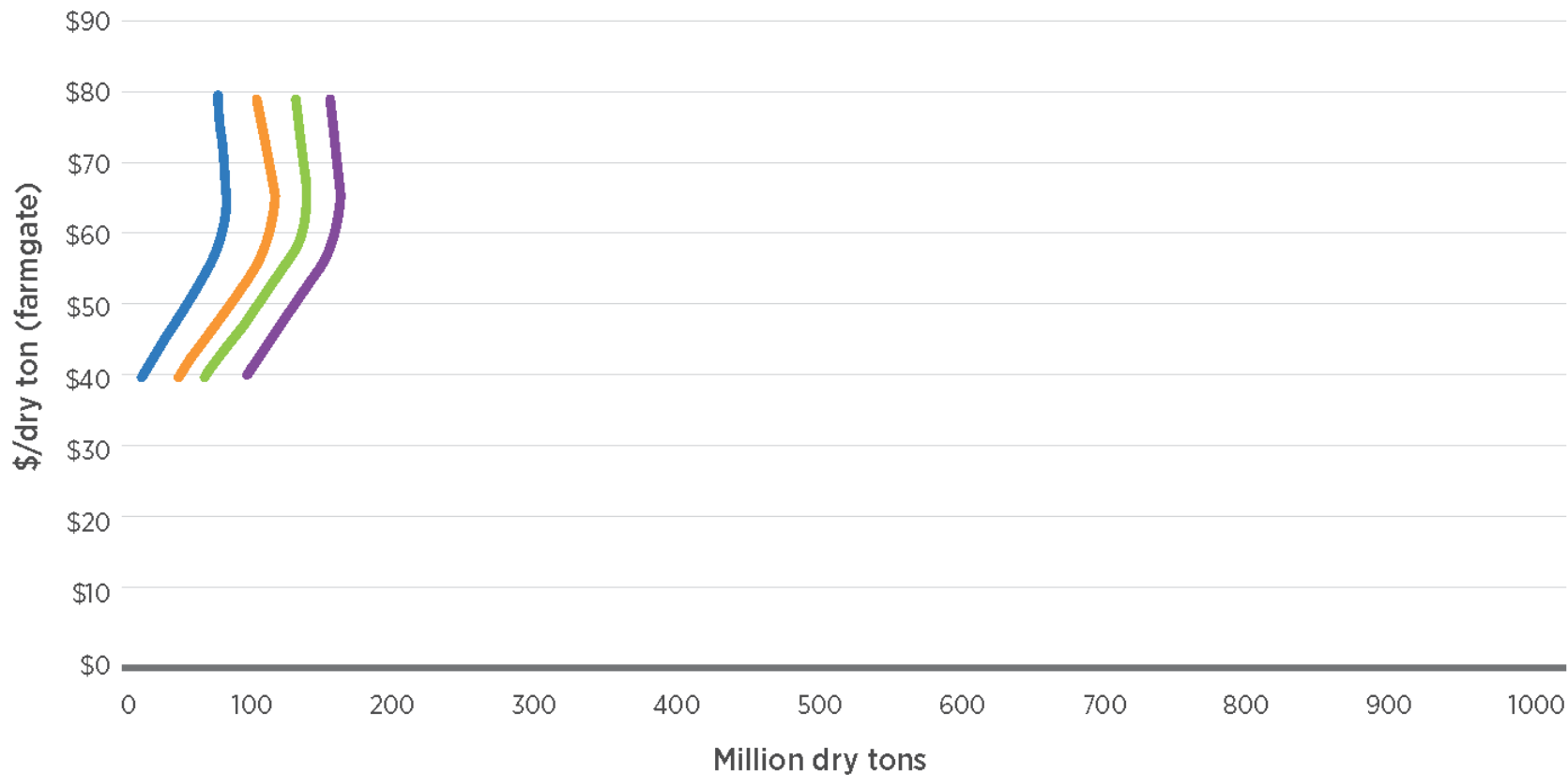
All scenarios - herbaceous:



Results: High-yield \$60, Herbaceous: 594m dt by 2040



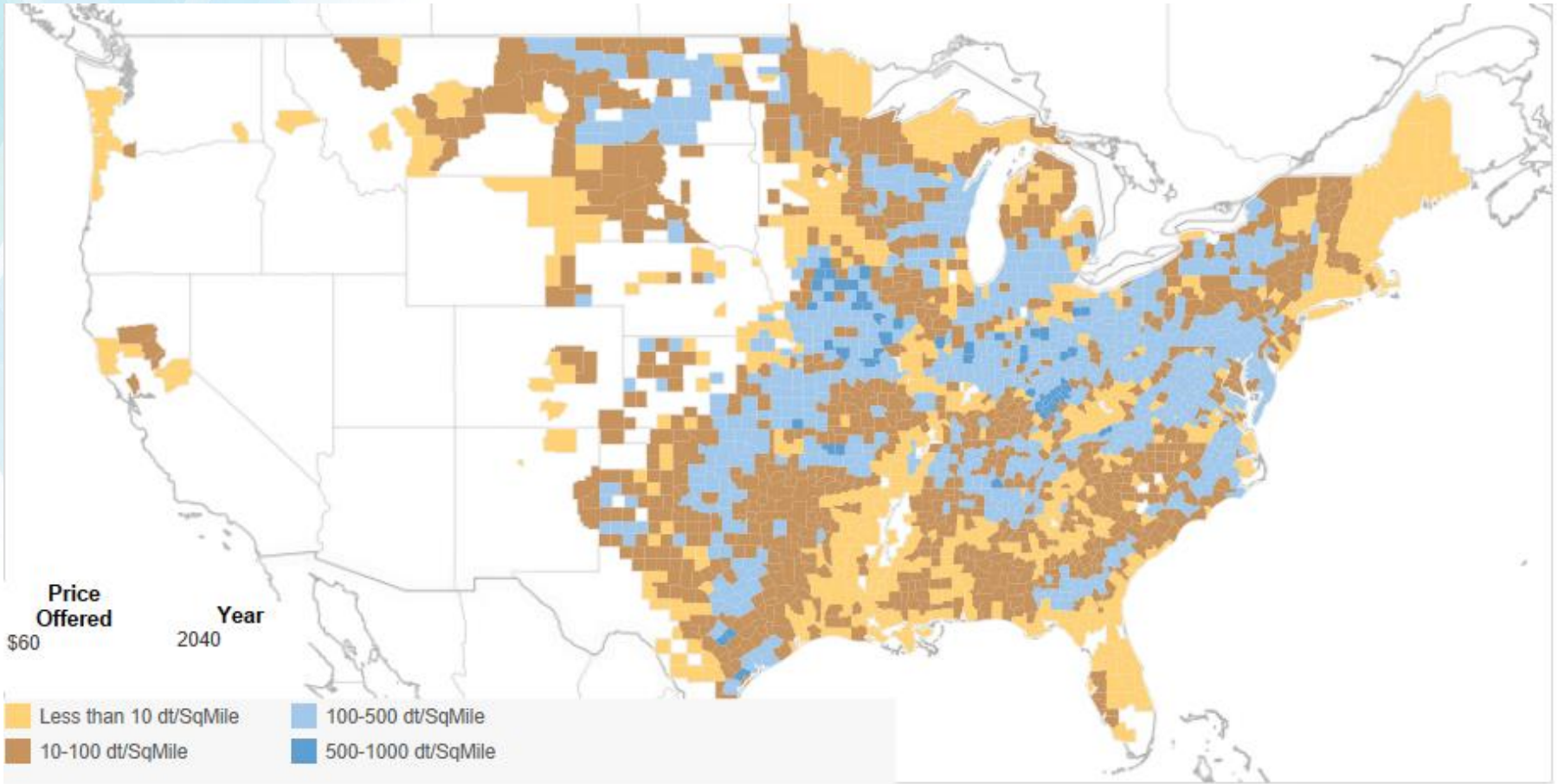
Results: All scenarios - woody: \$40, \$60, \$80, 2035



- BC1
1% yield
- HH2
2% yield
- HH3
3% yield
- HH4
4% yield

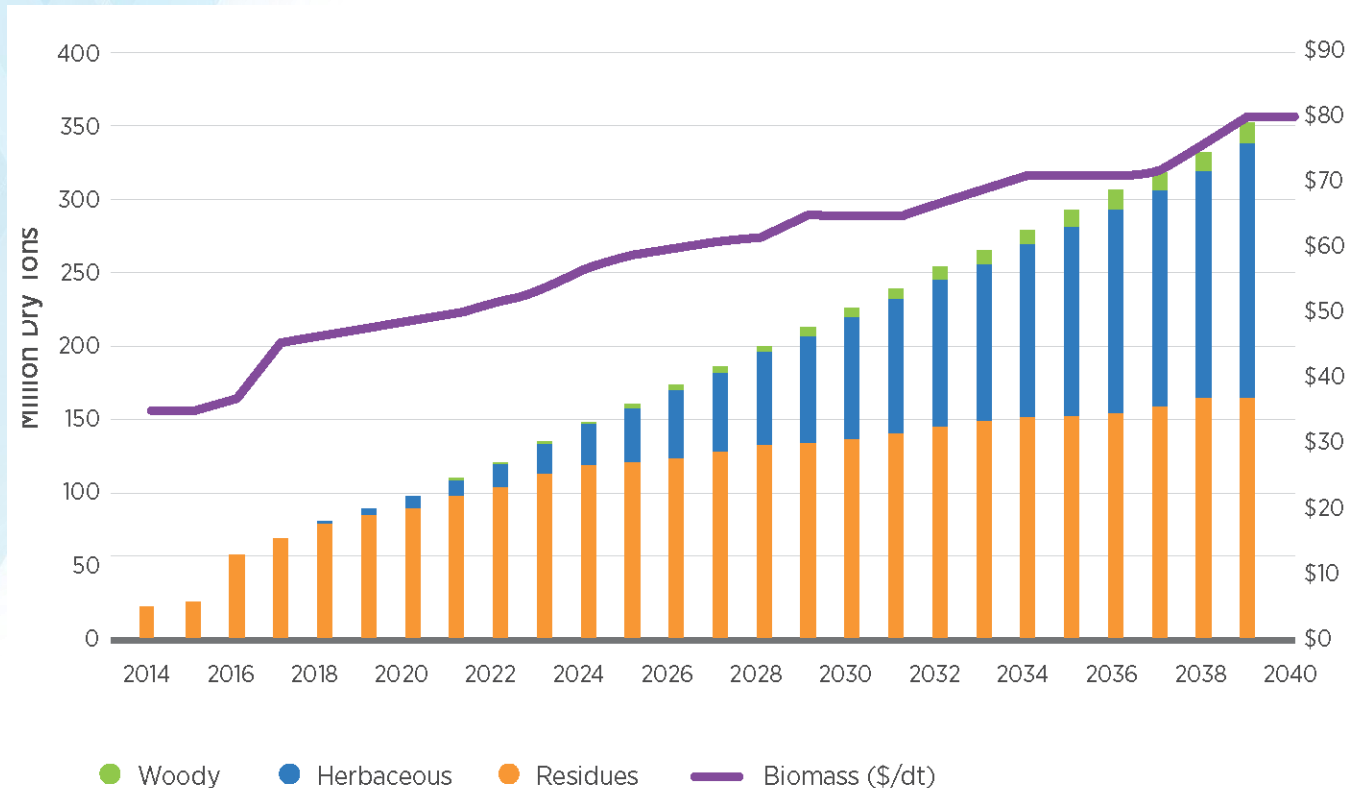


Results: High-yield \$60, Woody: 142m dt by 2040

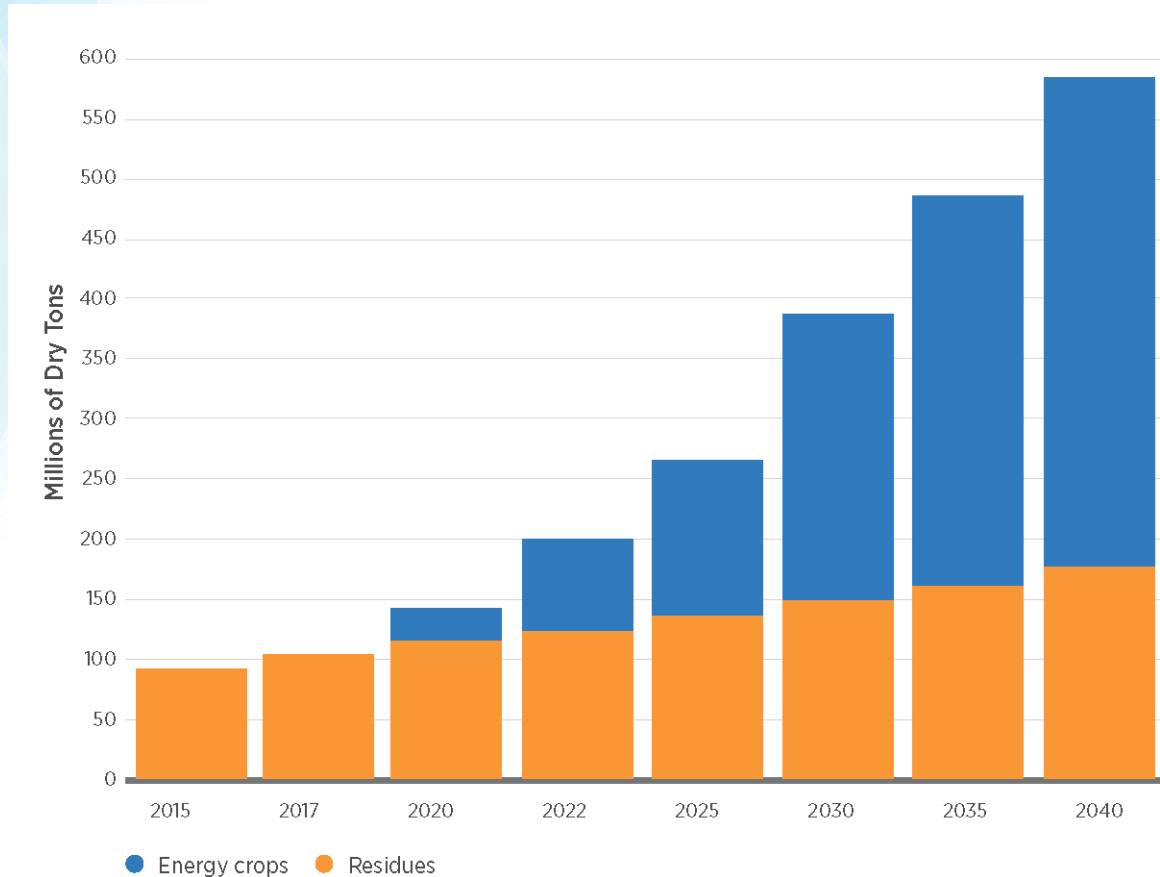


Results: Demand scenario

325m dt by 2040: up to \$81/dt



Results: Dependent on sustained market demand



Results



<https://bioenergykdf.net/billionton2016/4/>

Thank you on behalf of the entire chapter 4 team

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