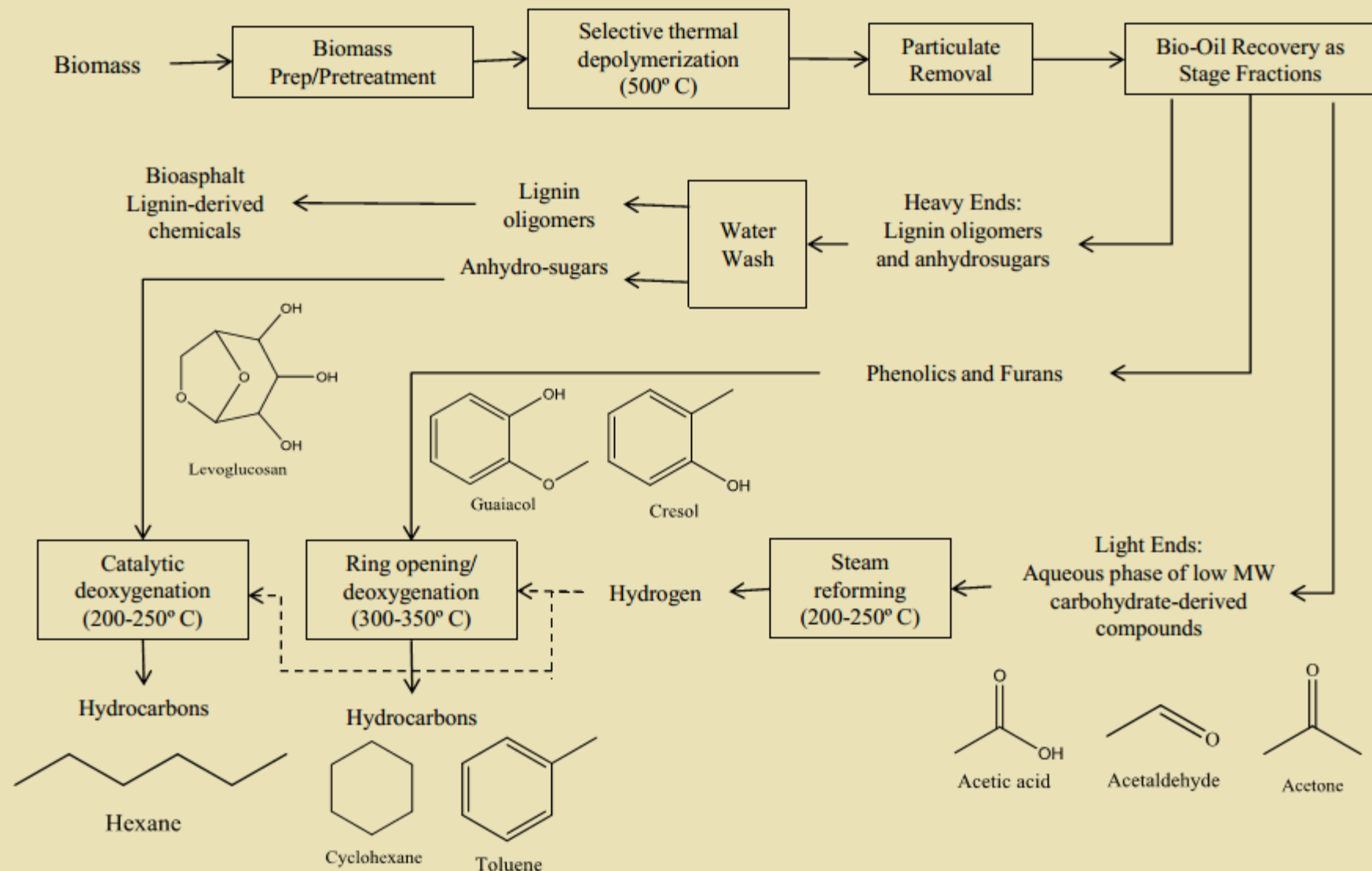
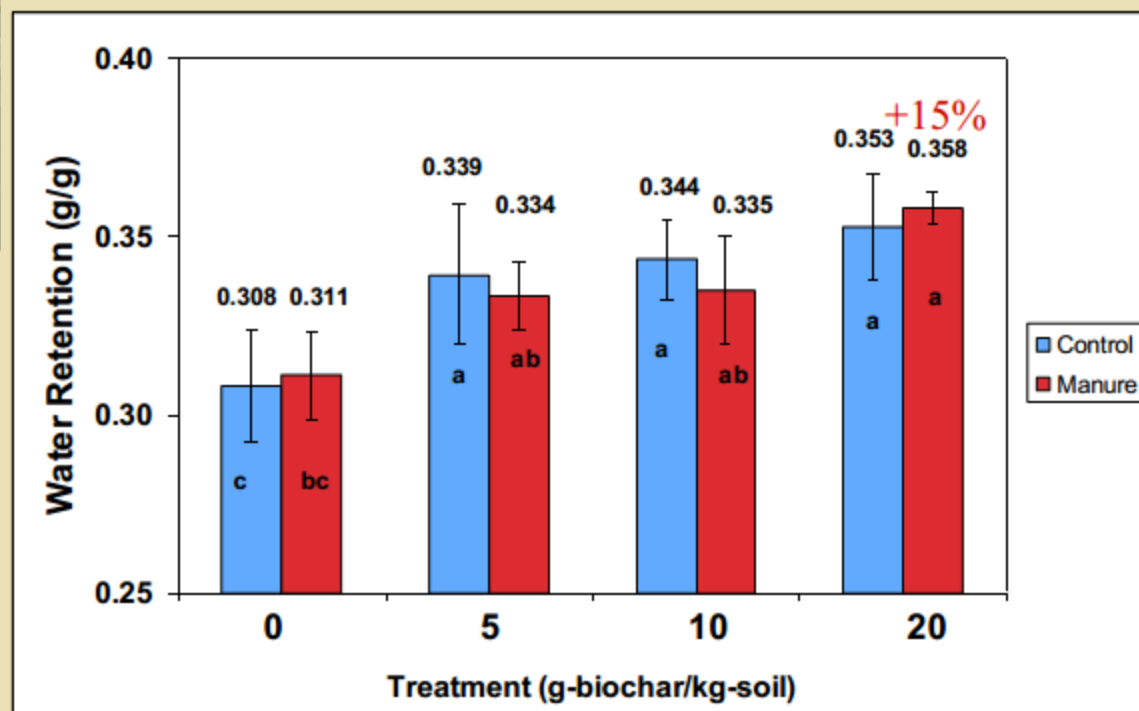
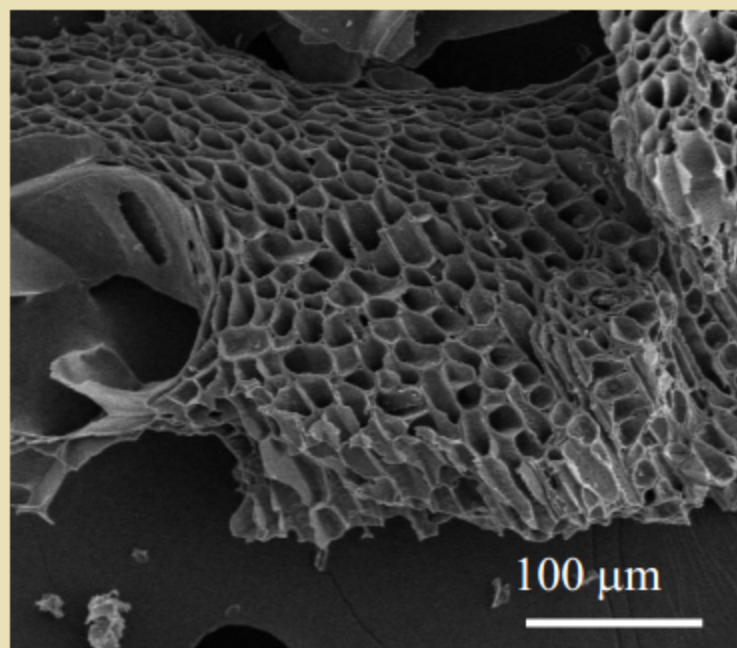


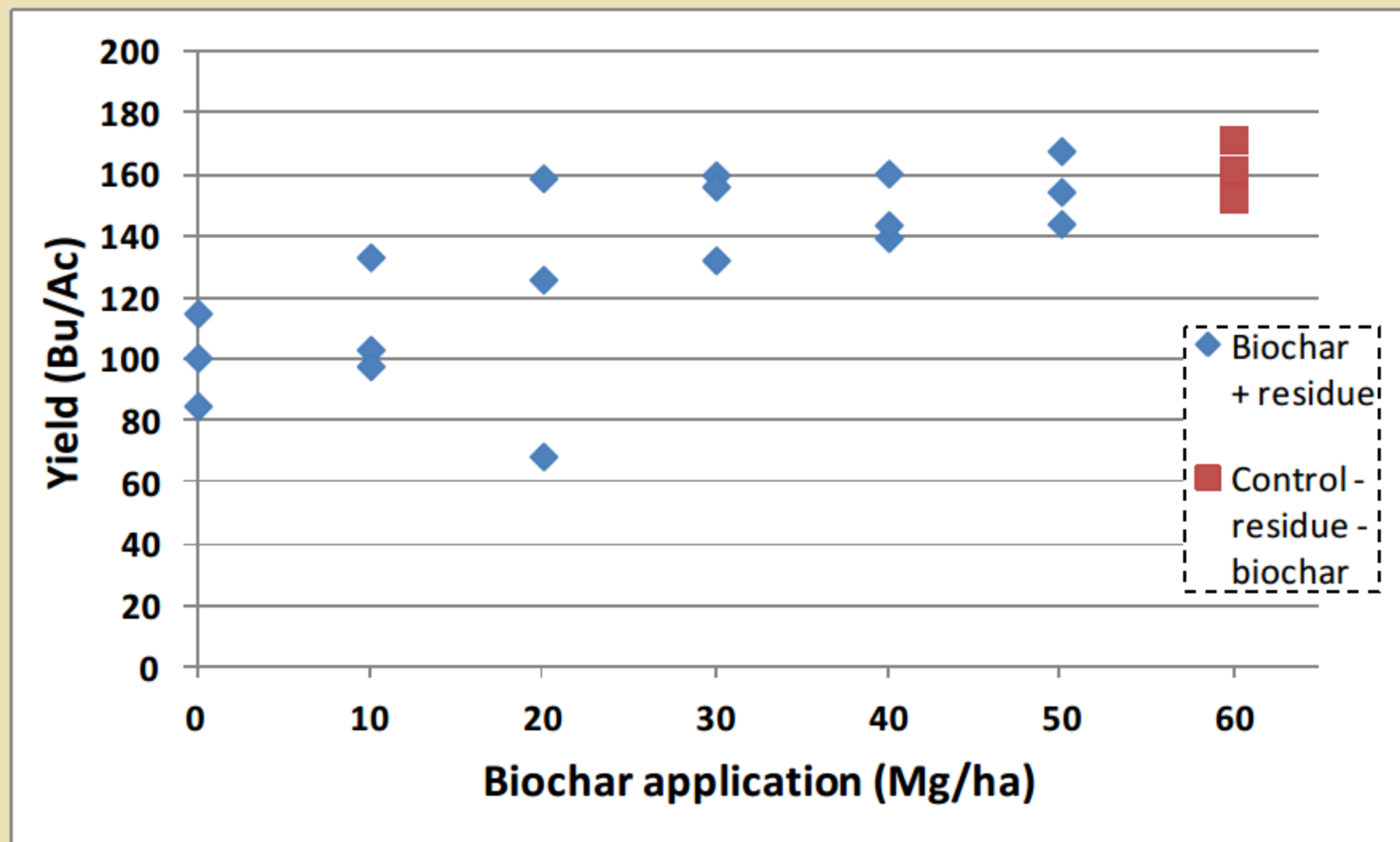
Bio-Oil Upgrading Approach



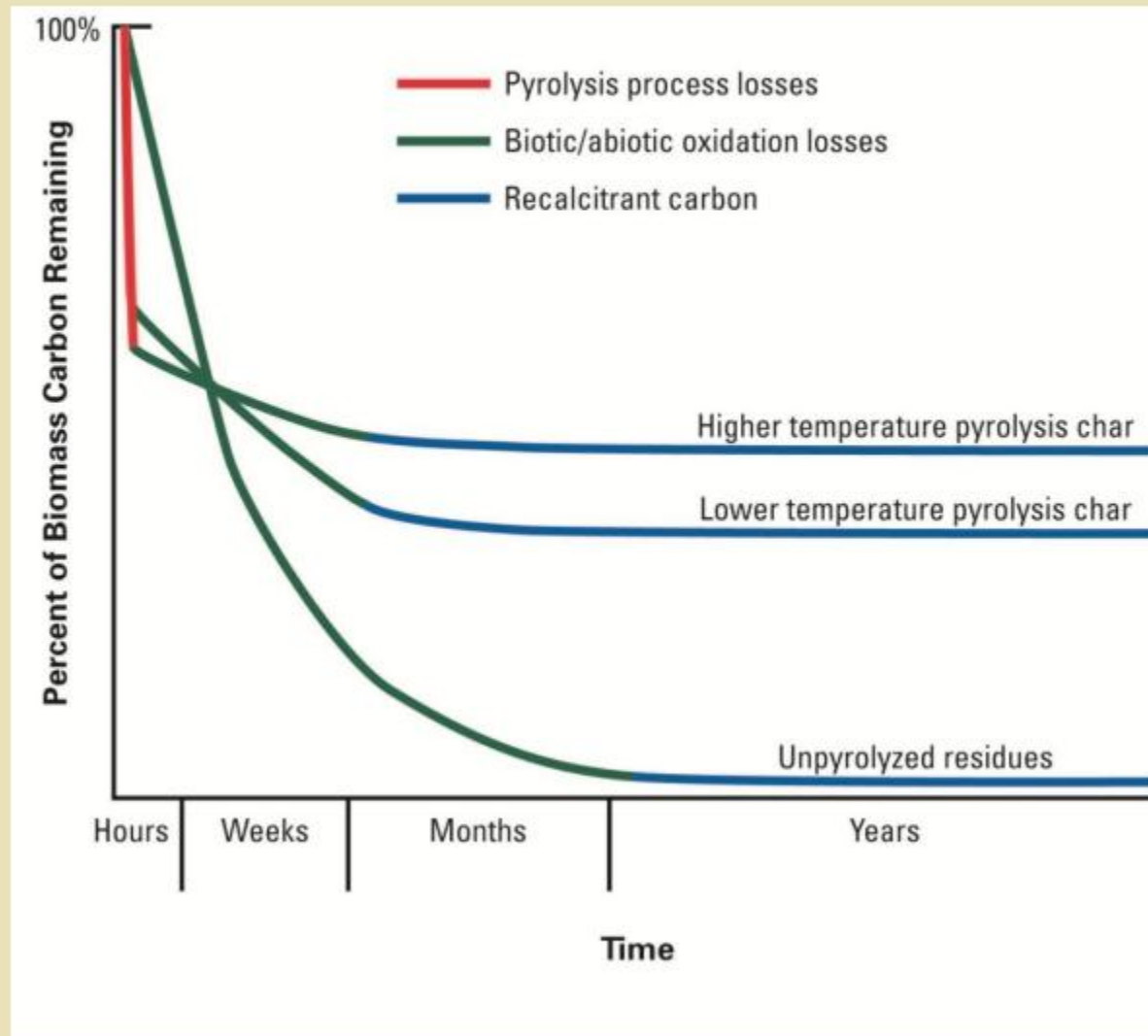
Water Retention with Biochar



Biochar Influence on Yield



Carbon Residence Time



Biochar Effects on Soils



Increases:

Nutrient Availability

Microbial Activity

Soil Organic Matter

Water Retention & Quality

Crop Yields



Decreases:

Fertilizer Needs

Greenhouse Gas Emissions

Nutrient Leaching

Soil Bulk Density

Conclusions

- Plenty of challenges and opportunities in biofuels.
- Economics *plus* scalability
- Need to think about integration.