Renewable Energy and Advanced Energy Storage

Bioenergy Technology and Advancement in Liberia – Integrating AI Conversion Systems and Intelligent Storage Units

Tsinghua University Certificate Program "Innovation & Entrepreneurship for Digital Economy"

(August 10 – 21st, 2020)

Group 25

Christian Mulbah – Fluid Machinery

Joshua Bosco Barvor – Cartography & GIS Engineering

OUTLINE

- Project Scope
- Past Projects and Technologies
- Challenges
- Opportunities
- Summery

PROJECT SCOPE

- Energy situation in Liberia
- Potential of biomass resources
- Conversion technologies
- Past projects and technologies
- Technology Barriers
- Usage
- Opportunities for Ai in bioenergy production

Past Projects and Technologies

- **Few successful biomass gasification plants around Liberia**

- **The Kwedin Plant**

60-kw capacity, supplying more than 2500 residents of Kwedin and 20 streamlines

Materials: wood chips, coconut, palm kernel shells.

- **The Sorlumba Plant**

50-kw capacity, supplying more than 2000 residents of Sorlumba, Lofa County

Materials: palm oil as electric source

- **The BWI Renewable Energy Center**

$.08 per kilowatt hour, or about 1/5 the cost of diesel, and powering 1/3 of the campus.

Materials: wood chips, power pallets

- **There are many other projects that are either in the pipeline or not cited in this report due to its unavailability**

CHALLANGES

- **Buchanan Renewable Failures – The US 217M USD loan**

- Aim: 35MW integrated biomass plant from waste rubberwood feedstock
- The company never built the biomass power plant as anticipated
- Instead, sold the biomass chips to repaid the U.S loans
- Departed Liberia in 2013 leaving brownfields of depleted rubber farms in the wake.

The company's CEO James Steele said, "What seemed to be a win-win situation just did not work as we expected"

CHALLANGES

- Technical Inadequacies
- National Policy and Regulation Hedges
- Insufficient Funding
- Low Awareness of Biofuel Benefits

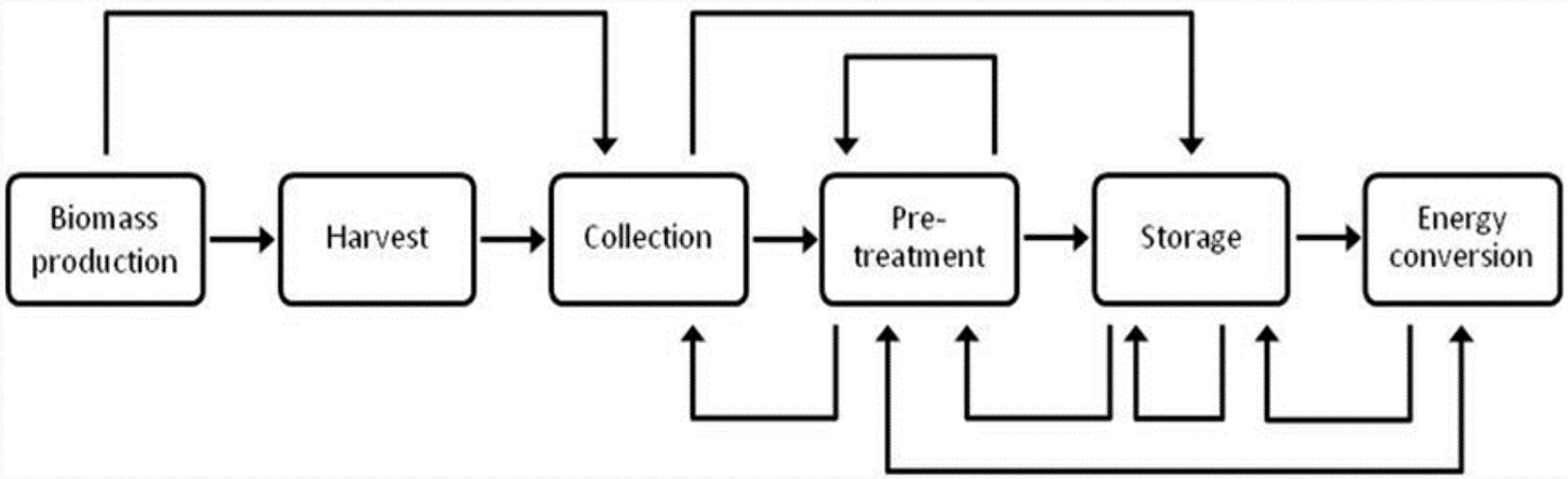
OPPORTUNITIES

- Usage
- Application of AI in Bioenergy Production

USAGE

- **STORAGE**

Long term storage is a viable as well as a necessary unit in operation relating to biomass feedstock logistics supply chain.



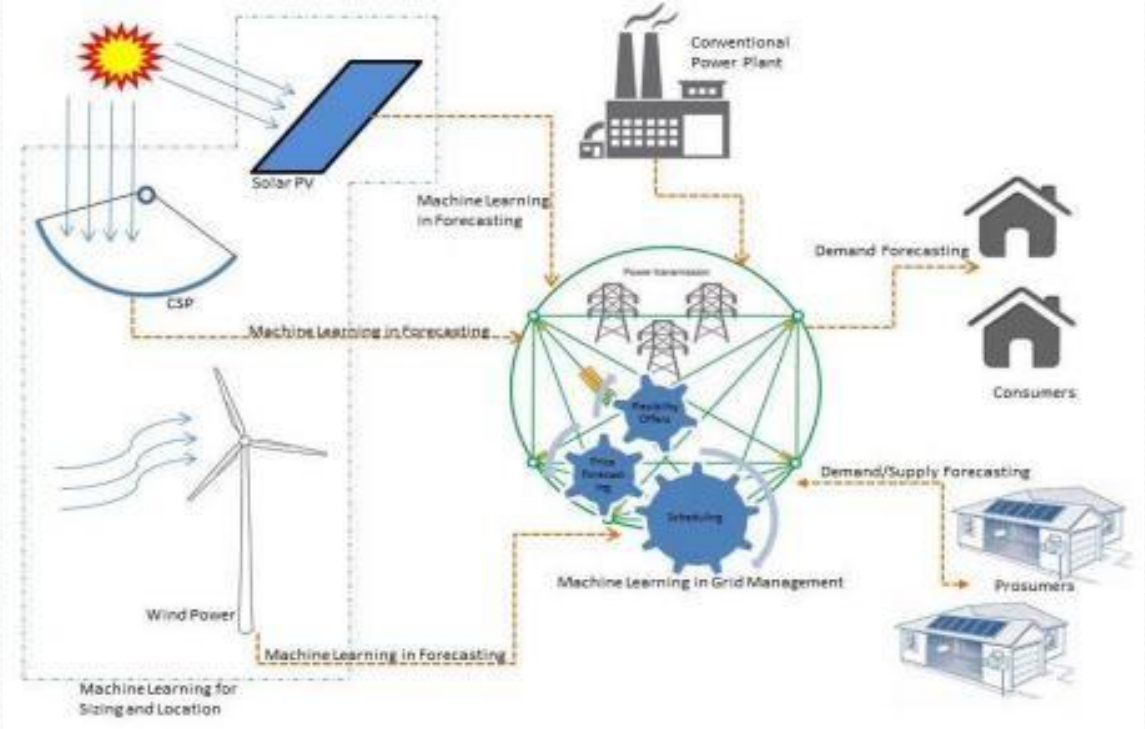
AI in Bioenergy Production

Where energy is needed most and where it is not

Where supply is booming and where it's likely to fall short

Where blackouts are happening and where they are likely

When to supplement supplies by activating additional energy-generating infrastructure



AI in Bioenergy Production

- **Performance Prediction**

- AI integrated systems tremendously aid bioenergy performance prediction
- Good quality biodiesel fuel generally performs well in engines

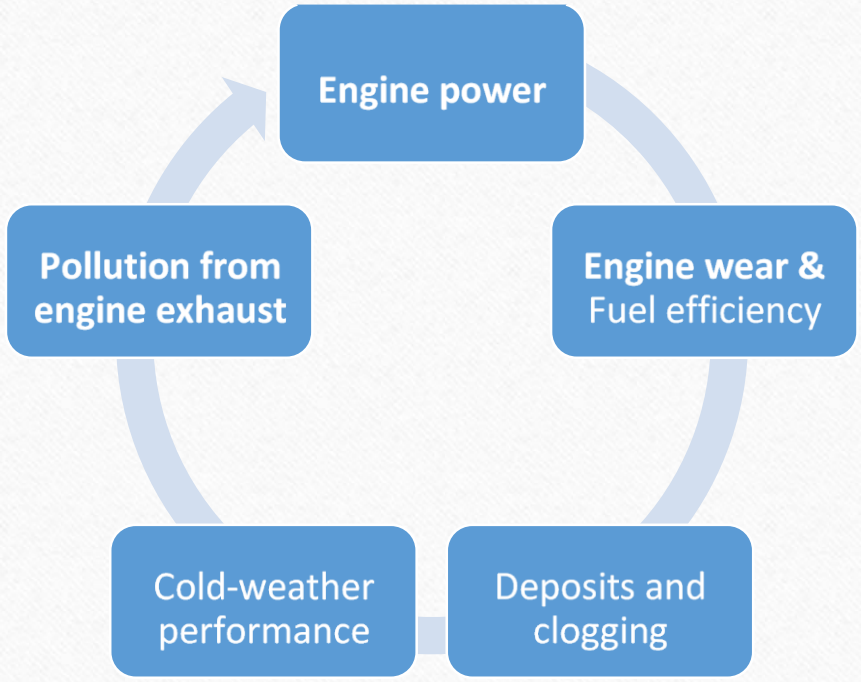


Fig x: Biodiesel engine cycle

AI in Bioenergy Production

- **Performance Prediction**

Strategic Decision Making

a. Long Term
b. Medium
c. Short Term

Biomass Supply Chain Activities

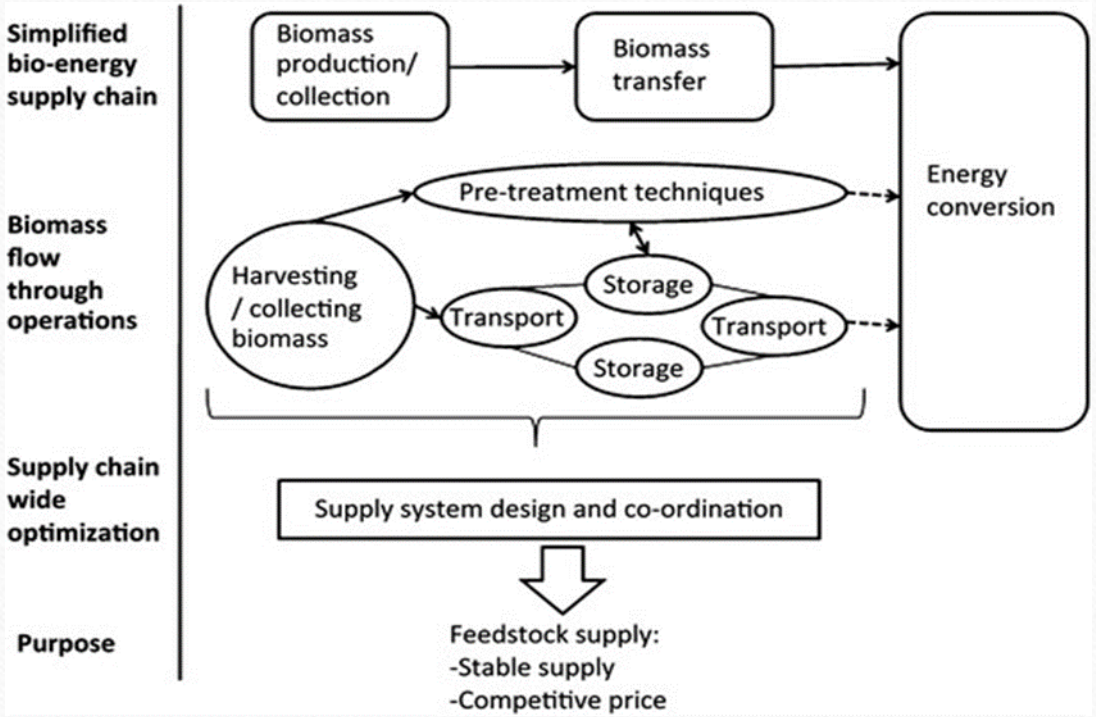
a. Upstream
b. Midstream
c. Downstream

AI in Bioenergy Production

- **Biomass Supply Chain Optimization**

Activities

1. Chipping
2. Baling
3. Handling
4. Transporting
5. Storing
6. Preprocessing



Summery

- Even though there are abundant biomass resources in Liberia, only a few bioenergy projects have been implemented.
- The failure of bioenergy advancement in Liberia could be attributed to several factors, including technical inadequacies and national policy, among others.
- Integrating AI systems in bioenergy technology should be a path to sustainable energy development.
- Liberia, with a favorable climate condition, is highly encouraged to consider bio-renewable energy as an essential alternative source of energy.

THANK YOU!