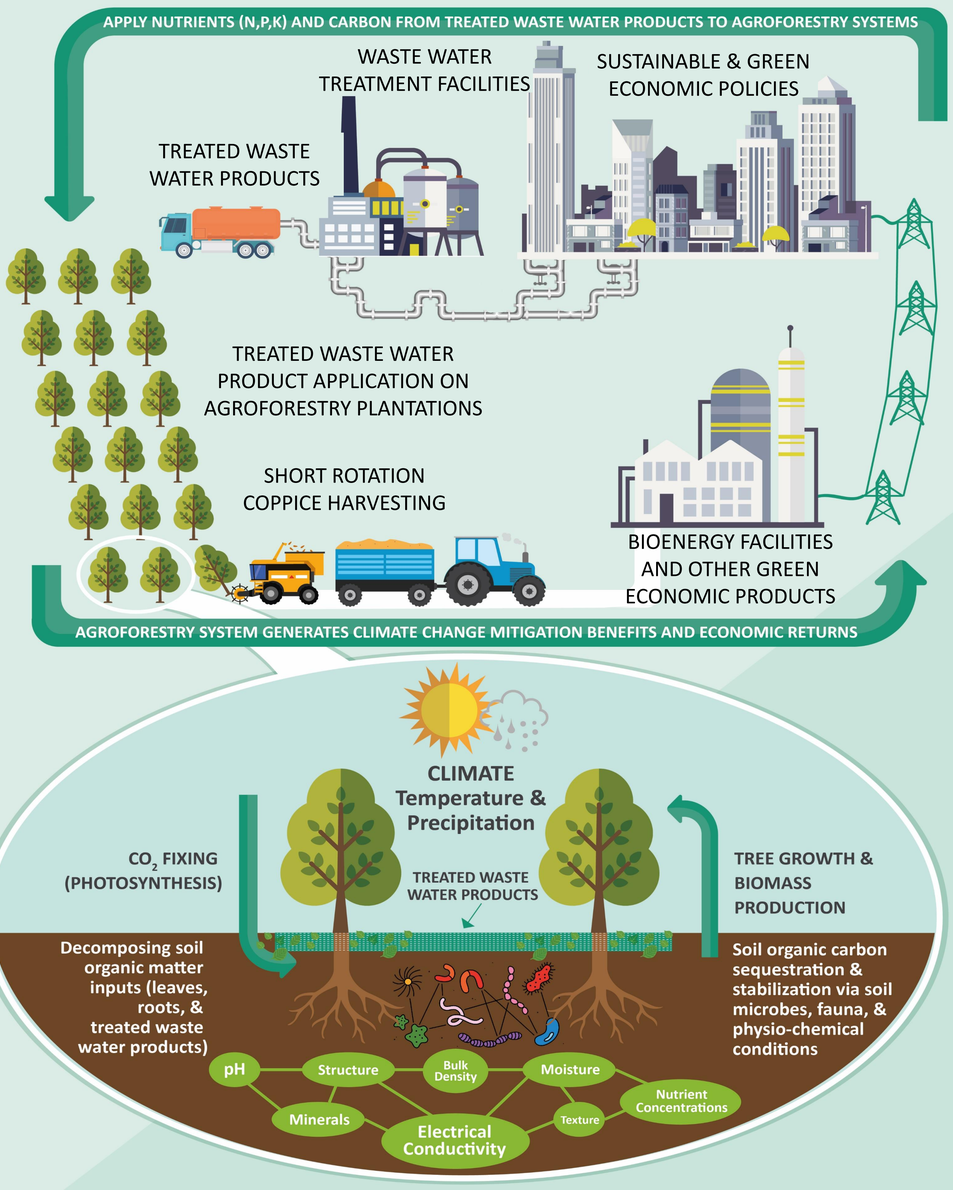
WISDOM: A Biophysical & Economic Systems Model for Short Rotation Coppice (SRC) Agroforestry Management

1. SHORT ROTATION COPPICE + WWP SYSTEMS ARE

Tools For Converting Wastes to Resources

- Manage treated domestic wastewater products (WWP) with short rotation coppice (SRC) agroforestry plantations
- Restore marginal agricultural land, and
- Produce sustainable wood fibre

Part of Complex Socio-Ecological Systems

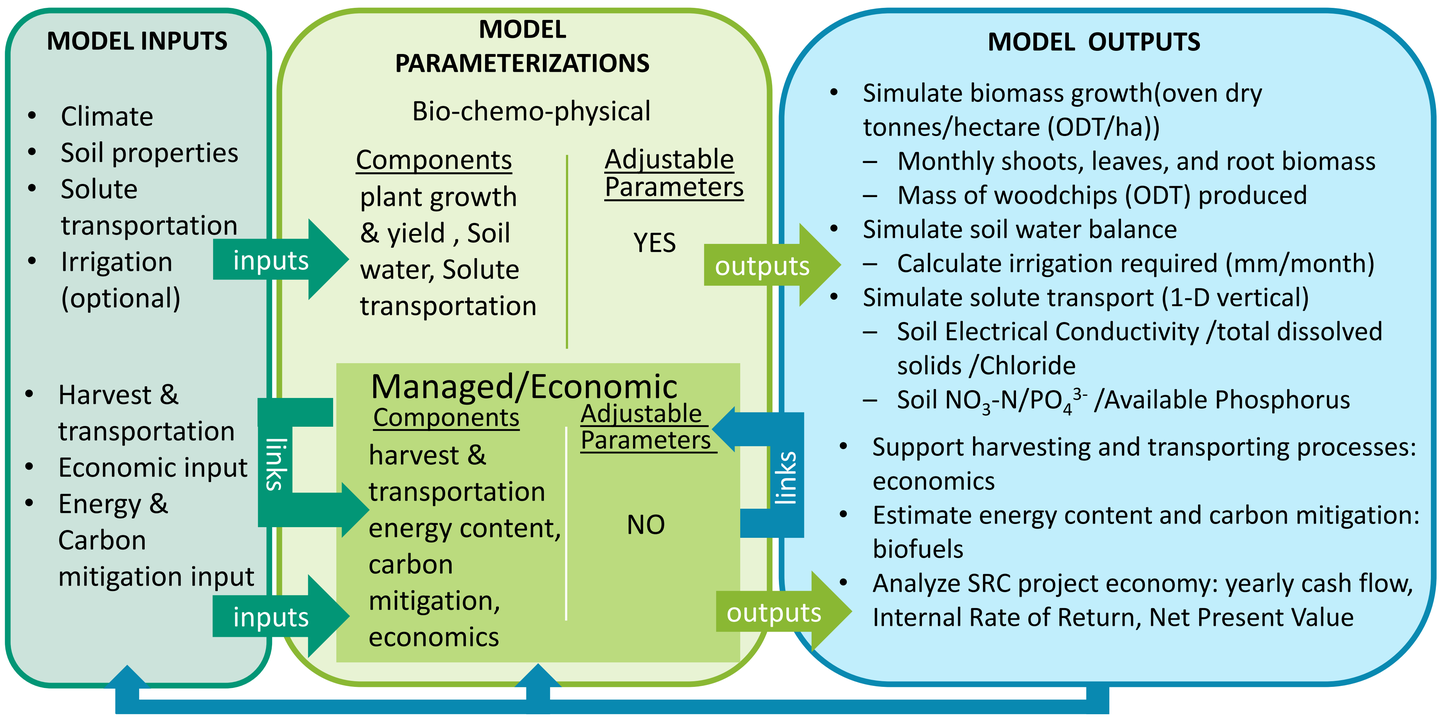


2. "WISDOM" THE WILLOW SYSTEM DYNAMICS MODEL

Comprehensive Decision-Support Model for SRC Systems

- Uses system dynamics modelling approach to simulate inputs and crop growth
- Provides a method to identify and understand interactions and feedbacks between various system components including;
  - **System Inputs:** SRC cultivar, WWP characteristics & application rates, irrigation rates
  - **Environmental Factors:** Climate, soil characteristics (physical & chemical), SRC establishment and growth rates
  - **Social Factors:** Regulations, policies, economic scenarios, and carbon offset revenue opportunities
- Aids stakeholders and decision-makers in long-term planning for environmentally- and economically-sustainable SRC+WWP plantations

WISDOM Framework



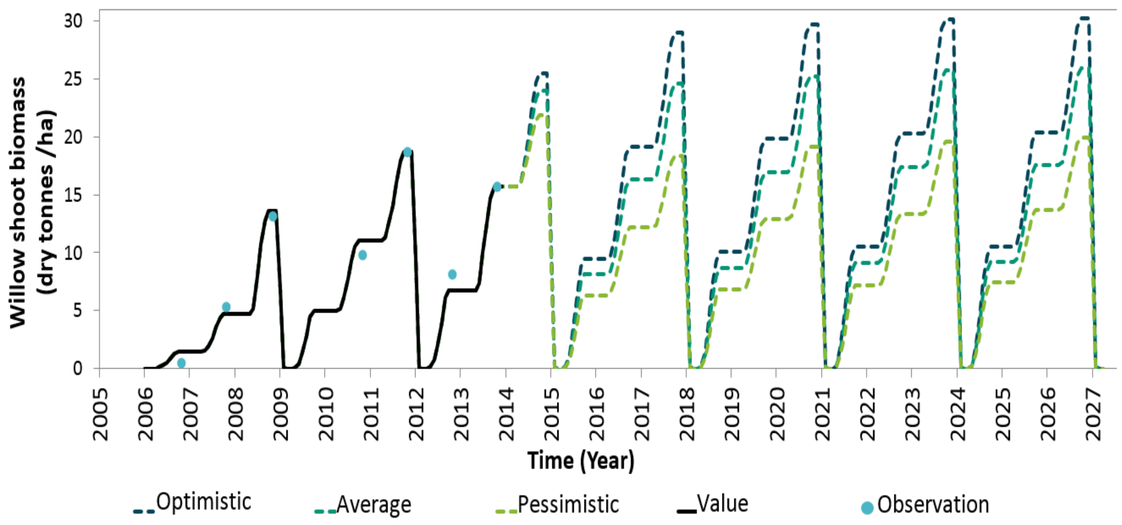
Note: The plant growth and yield (PGY) component was developed based on **3-PG** (Landsberg and Sands, 2011), the economic assessment component was primarily based on "**Ecowillow**" (Buchholz and Volk, 2010), and the harvest-transport component was mainly based on the "**KUP-Ernteplaner**", a German harvest-support tool (CREFF, 2012)

3. WISDOM PERFORMANCE

WISDOM SRC System Parameters & Performance

- SRC + WWP plantation established in Alberta in 2006
- Two 3-year-rotation biomass harvest events (2008 and 2011)
- Eight years of data collection (2006-2013)
- Based on the Nash-Sutcliffe efficiency statistical test - close matches were observed between simulated and observed values for biomass production (R^2 = 0.98), tree height (R^2= 0.92), and soil electrical conductivity (R^2 = 0.90)

Biomass Production Projections

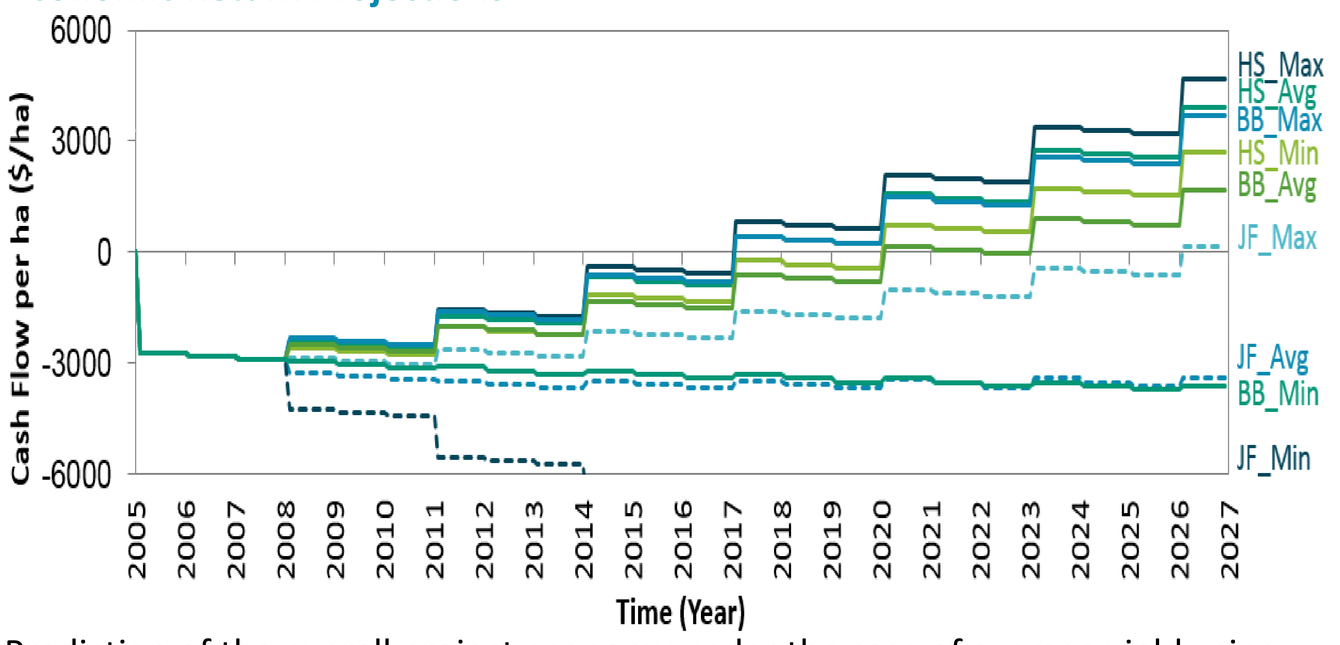


Biomass production predictions for 7 complete rotation cycles

WISDOM Projections

- Three different climate and nine yield-harvest economic scenarios were run to predict different aspects of the SRC+WWP system and project life cycle assessment outcomes 20 years into the future

Economic Return Projections



Prediction of the overall project economy under the case of average yield using Different;

- Harvesters: JF = JF-192, HS = Class HS-2, and BB = Bio-baler
- Operating speeds: Max = maximum, Avg = average, and Min = minimum

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