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**Biomass Co-Firing Potential and Land Use Changes: A Partial Equilibrium Study in the United States**

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# Biomass Co-Firing Potential and Land Use Changes: A Partial Equilibrium Study in the United States

Shanxia Sun, Thomas W. Hertel, and Mort D. Webster

## Motivations

- Most states in MISO region created State Renewable Portfolio Standards that require power plants generate a certain portion of renewable and clean energy
- Accordingly, power plants adopt certain practices, including biomass co-firing in coal-fired power plants
- Due to the high transportation cost associated with biomass feedstock, the potential for co-firing at a given coal-fired power plant depends very much on the local availability of biomass
- For large-scale co-firing, a stable supply of biomass is required, and for this, the planting of dedicated energy crops is essential, which, in turn results in land use change

## Objectives

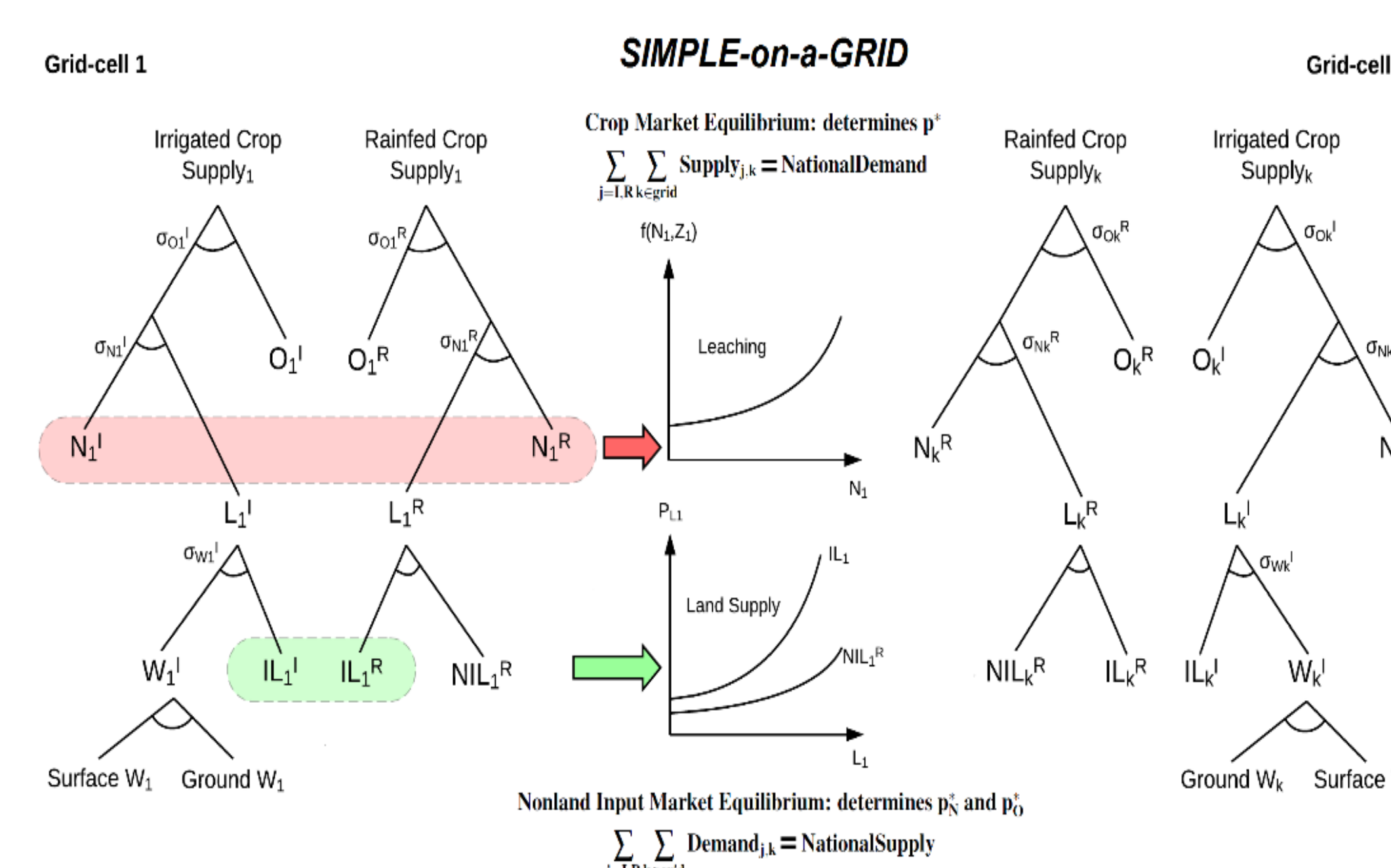
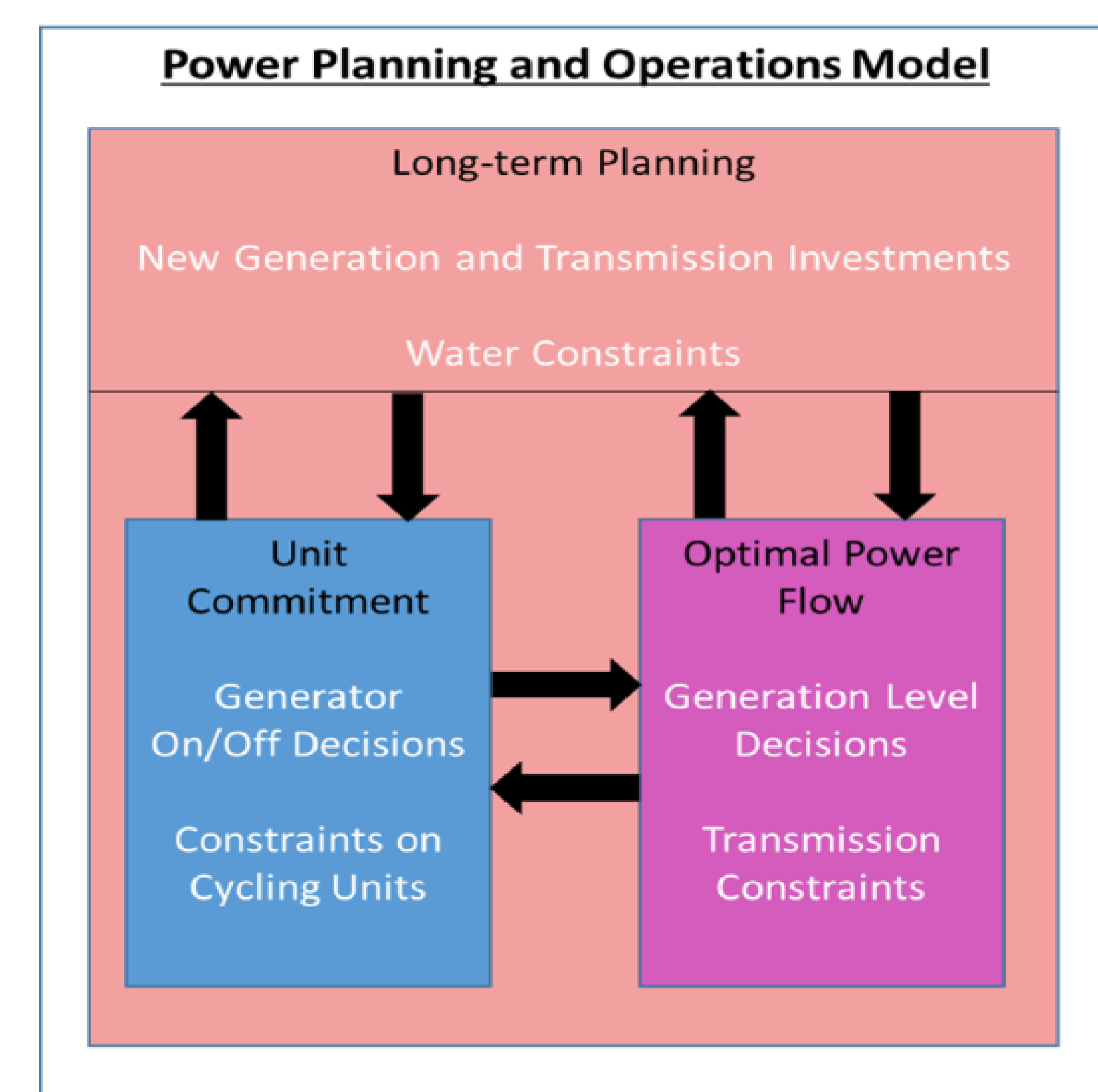
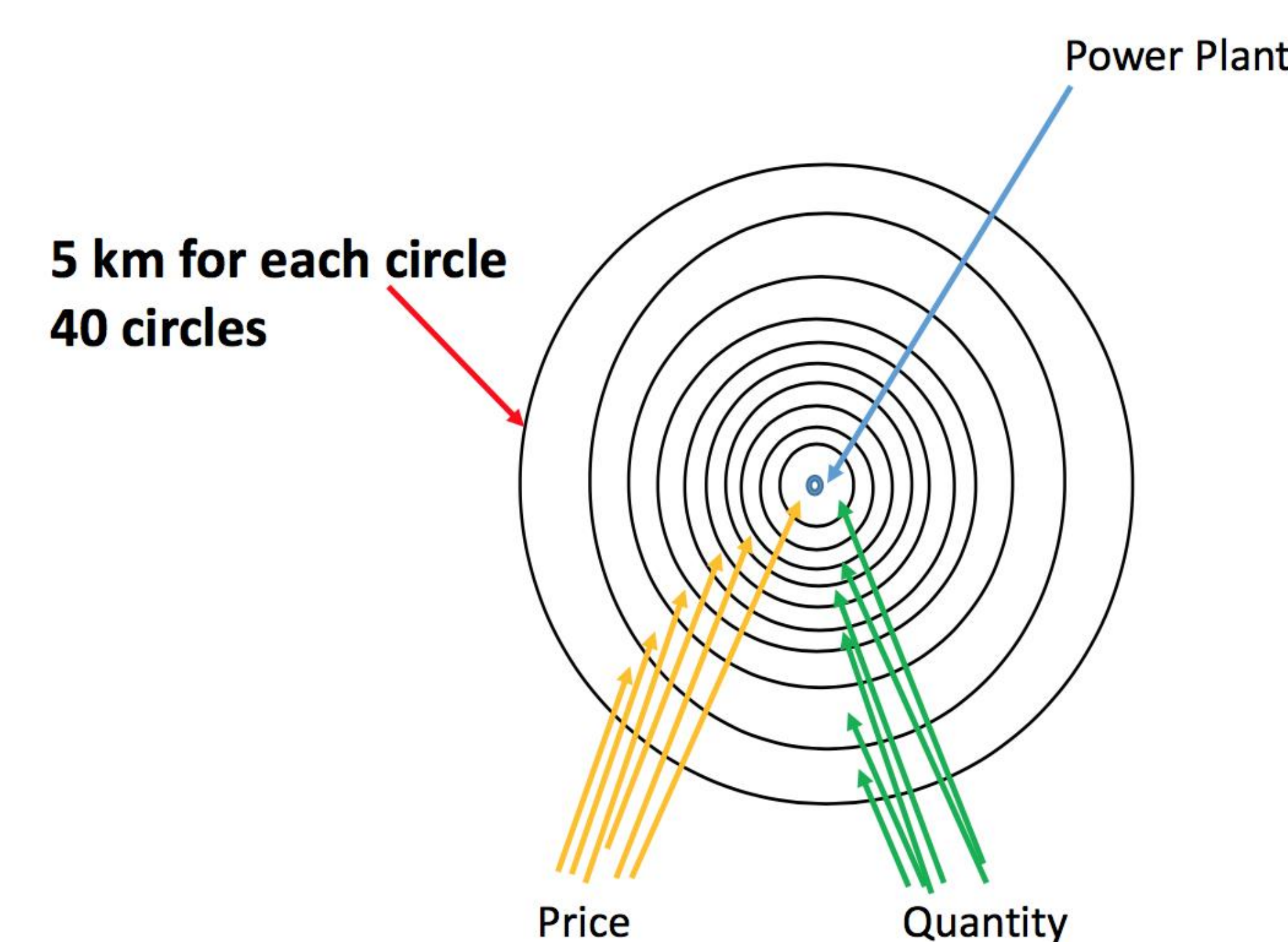
- Investigate the total potential of co-firing and the associated land use changes in MISO region
- Explore the heterogeneity in the potential for co-firing across different existing power plants and heterogeneity in the induced land use changes in different areas
- Identify the co-firing threshold that requires dedicated energy crops involved as feedstock beyond residues from forest and agriculture
- Explore the heterogeneity in these thresholds for different power plants in different areas
- Investigate the magnitudes of policy incentives required to motivate co-firing at different levels

## Biomass

- Forest residue
- Agricultural residue (corn residue)
- Dedicated energy crops (willow)

## Method

- Estimate supply functions of different types of biomass for each power plant
- Simulate the final demand of biomass for co-firing at each power plant using Power Planning and Operations Model
- Simulate land use changes induced by co-firing in different area using SIMPLE-on-a-Grid model



## Data

- Forest Inventory and Analysis (FIA) Program dataset
- USDA Cropland Data Layer (CDL)
- Parameters in literature

## Preliminary results

