Agriplots Basic Linear Programming Model

Decision Variables

- X_j: Binary variable, equals 1 if a tracking PV is installed at location j, 0 otherwise.
- Y_j: Binary variable, equals 1 if a fixed PV is installed at location j, 0 otherwise.

Objective Function

$$\text{Maximize} \quad \sum_{j=1}^{\text{num\_locations}} \left(\text{tracking\_energy\_production}_j \cdot X_j + \text{fix\_energy\_production}_j \cdot Y_j\right)$$

Constraints

(1) $X_j + Y_j \leq 1 \quad \forall j \in \{1, \dots, \text{num\_locations}\}$

(2) $$\sum_{j=1}^{\text{num\_locations}} \left(X_j + Y_j\right) \leq \text{num\_of\_PV\_limit}$$

(3) $$\sum_{j=1}^{\text{num\_locations}} \left(\text{influence\_on\_crops}_j \cdot X_j + \text{influence\_on\_crops}_j \cdot Y_j\right) \geq$$

$$\sum_{j=1}^{\text{num\_locations}} \left(X_j + Y_j\right) \cdot \text{influence\_on\_crops\_lower\_limit}$$

(4) $$\sum_{j=1}^{\text{num\_locations}} \left(\text{total\_revenue}_j \cdot X_j + \text{total\_revenue}_j \cdot Y_j\right) \geq \text{minimal\_total\_revenue}$$

(5) $X_j, Y_j \in \{0,1\} \quad \forall j \in \{1, \dots, \text{num\_locations}\}$

Explanations

- **The objective function** maximizes the overall energy production from installed tracking and fix PVs.
- **Constraint (1):** Each location can have at most one generator: either a tracking PV or a fixed PV, but not both.
- **Constraint (2):** The total number of PV installations is limited by the maximum allowed number of PVs.
- **Constraint (3):** The total influence on crops from installed PVs must not fall below the overall average of the installed PVs.
- **Constraint (4):** The total revenue from installed PVs must meet or exceed the minimum revenue requirement.
- **Constraint (5):** The decision variables X_j and Y_j are binary, indicating whether a PV is installed at each location.