Agriplots Linear Programming Model

# Parameters

* Set of possible locations to install PV’s
* Energy production (10^6 kWh/year) for installing PV at location
* Area in dunam used for installing PV at location
* influence on crops from installing PV at location
* potential revenue before installing PV at location
* Upper bound on the total area in dunam that can be used for installing PV’s
* Minimal loss of revenue in percentage allowed as a result of influence on crops
* Set of Yeshuvim that contain locations
* upper bound of energy production in yeshuv
* Set of Eshkolot that contain locations
* Wealth ratio of eshkol
* Set of Machozot that contain locations
* upper bound of energy production in county
* upper bound on the Gini coefficient value

# Decision Variables

* Binary variable, equals to 1 if a PV is installed at location , otherwise 0.
* Total energy produced in eshkol .
* Absolute difference between energy production, weighted by wealth, for pair of eshkolot  
  i,j 𝞊 E such that i<j. equals to .

# Objective Function

# Constraints

# Explanations

* The **objective function** maximizes the total energy production from the installed PV systems at various locations.
* **Constraint (1)** places an upper bound on the total area used for PV installations.
* **Constraint (2)** ensures that the change in revenue as a result of installing the PV’s and influencing the crops remains above a certain threshold.
* **Constraint (3)** ensures that the total energy production for each Yeshuv does not exceed it’s energy consumption limit.
* **Constraint (4)** ensures that the total energy production for each machoz does not exceed it’s energy consumption limit.
* **Constraint (5)** assigns values to the decision variables by summing the energy produced of all locations in eshkol i that had a PV installed in them (), for all i.
* **Constraint (6) + (7)** linearize the absolute values of decision variables so that we could use it in our LP model
* **Constraint (8) places** an upper bound on the value of the Gini coefficient, using the parameter. The value of the Gini coefficient G is calculated with the following formula:
* **Constraint (9)** requires that each decision variable is binary, meaning that a PV system is either installed or not at each location.

# Table of contents (need a better name)

|  |  |
| --- | --- |
| **Value/variable in the LP model** | **Value/variable in the data** |
|  | OBJECTID (column from dataset) |
|  | Energy production (fix) mln kWh/year (column from dataset) |
|  | Dunam (column from dataset) |
|  | Average influence of PV on crops (modified column from dataset) |
|  | Potential revenue from crops before PV, mln NIS (column from dataset) |
|  | Parameter decided by user |
|  | Parameter decided by user |
|  | YeshuvName (column from dataset) |
|  | energy\_consumption\_by\_yeshuv |
|  | yeshuvim\_in\_eshkolot |
|  | energy\_division\_between\_eshkolot |
|  | Machoz (column from dataset) |
|  | energy\_consumption\_by\_machoz |
|  | G\_max |