Black Blend Formulation

The statement of the use case is on Mip Wise's website: mipwise.com/use-cases/black-blend.

The following diagram summarizes the data of the problem.

Black Blend Flow

Input Data Model

Set of indices

- I - Set of suppliers.
- J - Set of facilities.

Parameters

- sp_i - Price (dollar/Kg) of raw coffee grains at Supplier i.
- su_i - Supply upper bound (Kg/week) from Supplier i.
- pc_j - Processing cost (dollar/Kg) at Facility j.
- pu_i - Processing upper bound (Kg/week) of Facility j.
- p - Price of roasted coffee grains at the market.
- r - Ratio or roasted to raw grain.

Decision Variables

- x_{ij} - Amount of raw grain procured from supplier i to be processed at facility j.

Constraints

- Capacity of Supplier i:

$$\sum_j x_{ij} \leq su_i, \quad \forall i.$$

- Capacity of Facility j:

$$\sum_i x_{ij} \leq pu_j, \quad \forall j.$$

Objective

The objective is to maximize the total profit.

$$\max \sum_{ij} r \cdot p \cdot x_{ij} - \sum_{ij} sp_i \cdot x_{ij} - \sum_{ij} pc_j \cdot x_{ij}.$$

Final formulation

$$
\begin{aligned}
\max \quad & \textstyle\sum_{ij} r \cdot p \cdot x_{ij} - \sum_{ij} sp_i \cdot x_{ij} - \sum_{ij} pc_j \cdot x_{ij} \\
\text{s.t.} \quad & \textstyle\sum_j x_{ij} \leq su_i, \quad \forall i, \\
& \textstyle\sum_i x_{ij} \leq pu_j, \quad \forall j, \\
& x_{ij} \geq 0, \quad \forall i, j.
\end{aligned} \tag{1}
$$