**University of Amsterdam**

ANALYTICS FOR BETTER WORLD

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**Assignment: Feed Calculator**

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**Problem:** optimize the feed for the chicken of a specific farmer in Africa, such that the total cost of 1 kg feed is minimized, and all the requirements are satisfied

**Notation Keys:**

**Sets:**

I – set with the names of all the available ingredients

J – set with the names of all the nutrients

L – set with the combined rules

M – subset of the ingredients from the set I for which combined rule l exists

**Variables:**

– amount of ingredient in kg (put i incl in I here, do everywhere)

– nutrient j ( content in g/kg in the ingredient i ()

– combined ingredients rule in kg,

, – price in $ of the ingredient i per kg

lower bound for the ingredient i ( in kg

upper bound for the ingredient i ( in kg

lower bound for the nutrient j ( in g

upper bound for the nutrient j ( in g

– amount of ingredient m ( in kg for which a combined rule l ( exists

**Linear Optimization Model:**

1. Define the decision variables:

Amount of ingredient in kilos: ,

1. The Objective Function:

Minimize the total cost of 1 kilo:

1. Define the constraints:

The upper bound of the ingredients:

The lower bound of the ingredients:

The upper bound of the nutrients:

The lower bound of the nutrients:

Combined ingredients upper bound:

Total amount of nutrients:

1. Non-Negativity:

We can skip this step because the non-negativity of every ingredient is already included in the ingredient lower bound.

**Optimal Solution:**

Objective function value: $0.2697643896412 (total cost of 1 kilo)

Ingredient’s amount in grams:

|  |  |
| --- | --- |
| Barley | 0.000000 |
| Blood | 0.000000 |
| Boneash | 0.000000 |
| Cotton | 50.000000 |
| Fish | 14.126323 |
| Fishlq | 0.000000 |
| Gnseeds | 55.750927 |
| Maize | 200.000000 |
| Maizebrainhighq | 250.000000 |
| Maizebranlowq | 0.000000 |
| Mbmeal | 50.000000 |
| Sugars | 0.000000 |
| Soybeanexp | 68.359545 |
| Soybeanmeal | 0.000000 |
| Sunflower | 120.000000 |
| Sunflowerseeds | 0.000000 |
| Tapbran | 0.000000 |
| Caswhole | 186.767560 |
| Casfine | 0.000000 |
| Wheatbran | 0.000000 |
| Lysine | 1.555065 |
| Dl | 0.733932 |
| Ltryp | 0.000000 |
| Dicaph | 0.521583 |
| Shells | 0.000000 |
| Salt | 2.185066 |