Chapter 3: Art of Optimization

# LP Sensitivity Analysis: Blending Application

## Corresponding reading: Chapter 3, Page 2

### Purpose: Conducting sensitivity analysis for the LP for the blending problem.

The data for the coffee manufacturing company example discussed in Case 3.2.a1 is repeated below.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Acidity (0-9) | Bitterness (0-9) | Aroma (0-9) | Cost ($/lb) |
| Type 1 | 4 | 8 | 6 | 0.95 |
| Type 2 | 6.5 | 6 | 9 | 1.25 |
| Type 3 | 8 | 4 | 7 | 1.15 |
| Range |  |  |  |  |

Below is the LP formulation for this problem along with the Answer and Sensitivity Reports.

(Cost)

(Acidity)

(Bitterness)

(Aroma - min)

(Aroma - max)

(Sum equals 1 lb.)

(Type 1 at least twice Type 2)

(Type 3 at most 30%)

(Type 1 no more than other types combined)

(Non-negativity)

**Answer Report:**

Table

Description automatically generated

**Sensitivity Report:**

Table

Description automatically generated

**Note: You need to answer the following questions ONLY using the information in the Answer and Sensitivity reports shown above. In particular, you should NOT rerun the model to answer the following questions. In each question, make sure you justify your response by referring to the information in the Answer and/or Sensitivity reports.**

1. If the minimum acidity requirement increases from 5.50 to 5.51, how would this change impact the optimal total cost? What if the minimum requirement changes from 5.5 to 6?
2. If the minimum bitterness requirement increases from 7 to 9, how would this change impact the optimal solution? What if it changes from 7 to 6.5?
3. If the minimum requirement for aroma rating changes to 6.9, how would this change impact the optimal total cost?
4. How much the maximum requirement for aroma rating can decrease before the current solution is no longer optimal?
5. The supplier has decided to increase the price of type 1 to $1.05. Would this change impact the current optimal combination of the three types? Would this change impact the optimal total cost?
6. If the supplier is willing to provide type 1 for free, would it impact the optimal combination?
7. The supplier has decided to increase the price of one of the types by $0.1. The manufacturer can choose which type is going to be more expensive. Which type the manufacturer should choose?

***Note:*** *Understanding the case and what you need to do is PART OF THE CASE. If you do not understand a specific part, or are not sure what you should do, you need to review the corresponding reading section in the text before asking for help. You might also need to do some search on the internet. That is all part of the case and your learning process.*