INSTITUTO SUPERIOR DE AGRONOMIA

Applied Operations Research - Linear Programming

Part 2

31 March 2022

I. Consider the following linear programming problem (LPP):

$$\text{Max } Z = 4y_1 + 5y_2$$

subject to:

$$2y_1 + y_2 \leq 4$$
$$-y_1 + y_2 \leq 2$$
$$y_1, y_2 \geq 0$$

a) Display the feasible region in a graphic and highlight the corner points.

b) Find the optimal solution graphically and indicate the corresponding optimal objective function value.

b) Write the LP problem in the standard form.

c) Apply the Simplex Method and display all Simplex tableaus

d) For each tableau, make sure you indicate the:

- feasible solution and objective function value
- the basic and non-basic variables
- corresponding corner point in the graphic
- operations carried out to update each row/table

e) Consider the optimal solution: indicate which constraints are binding and interpret your answer from a graphical point of view

f) Define shadow price. Without resolving the simplex, indicate the impact on the objective function that a unitary change in the RHS of constraint 2 would have.

II. If the objective function was Max Z = 4y1 + 2y2 (instead of Max Z = 4y1 + 5y2) what change in the solution would you expect? Show it in the graphic.

III. Write the standard form of the LP problem considering

a. A change in the non-negativity constraint: y1 ≤ 0 (instead of y1 ≥ 0).
Present the Simplex starting table.

b. A change in the second constraint: -y1 + y2 ≥ 2 (instead of -y1 + y2 ≤ 2).
Present the Simplex starting table.