

Optimization

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INTRODUCTION

Problem Statement 7.8:

- ▶ A cooperative society of farmers has 50 hectare of land to grow two crops X and Y.
- ▶ The profit from crops X and Y per hectare are estimated as Rs 10,500 and Rs 9,000 respectively.
- ▶ To control weeds, a liquid herbicide has to be used for crops X and Y at rates of 20 litres and 10 litres per hectare and no more than 800 litres of herbicide should be used
- ▶ How much land should be allocated to each crop so as to maximise the total profit of the society?

Decision Variables and Objective Function

Decision Variables:

- ▶ : X : Number of hectares of land in which 'x' is cultivated
- ▶ : Y : Number of hectares of land in which 'y' is cultivated

Objective Function:

- ▶ Profit = Profit from x per hectare * X
+
Profit from y per hectare * Y

$$Profit_{max} = 10500 * X + 9000 * Y$$

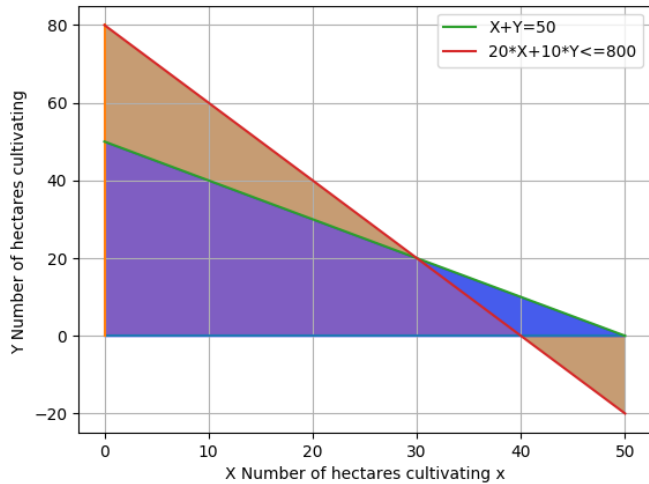
Constraints

$$X + Y = 50 \quad (1)$$

$$20 * X + 10 * Y \leq 800 \quad (2)$$

- ▶ Constraint (1) indicates the total number of hectares available to cultivate both X and Y in our mission to maximise profit.
- ▶ Constraint (2) ensures that the total amount of herbicide used for cultivating is no more than 800 litres

Graph



Solution

Number of hectares with x crop = 30

Number of hectares with y crop = 20

Total Profit = 495000

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goutham@goutham-hp-laptop-15g-br0xx: ~/Desktop/GVV
File Edit View Search Terminal Help
goutham@goutham-hp-laptop-15g-br0xx:~$ cd Desktop/GVV
goutham@goutham-hp-laptop-15g-br0xx:~/Desktop/GVV$ python3 7.8.py
profit_maximising_problem:
MAXIMIZE
10500*x + 9000*y + 0
SUBJECT TO
_C1: x + y = 50
_C2: 20 x + 10 y <= 800
VARIABLES
x Continuous
y Continuous
Optimal
Number of hectares in which x is grown: 30.0
Number of hectares in which y is grown: 20.0
Maximum Profit: 495000.0
goutham@goutham-hp-laptop-15g-br0xx:~/Desktop/GVV$
```

Code for this problem can be accessed [here](#)