

EE5600 Assignment 3

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Abstract—This document contains the solution of geometry through linear algebra through the concept of optimization.

Download latex and python codes from

https://github.com/abhishekt711/EE5600/tree/master/Assignment_3

1 PROBLEM

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. Further, no more than 800 litres of herbicide should be used in order to protect fish and wild life using a pond which collects drainage from this land. How much land should be allocated to each crop so as to maximise the total profit of the society?

2 EXPLANATION

The profit from crops X and Y per hectare are estimated as Rs 10,500 and Rs 9,000 respectively. So, The given problem can be written as

$$\max_{\mathbf{x}} Z = \begin{pmatrix} 10500 & 9000 \end{pmatrix} \mathbf{x} \quad (2.0.1)$$

A liquid herbicide has to be used for crops X and Y at rates of 20 litres and 10 litres per hectare. Further, no more than 800 litres of herbicide should be used to control the weeds. So this can be formulated as:

$$s.t. \quad \begin{pmatrix} 20 & 10 \end{pmatrix} \mathbf{x} \leq 800 \quad (2.0.2)$$

A cooperative society of farmers has 50 hectare of land to grow two crops X and Y. We can write it as:

$$\begin{pmatrix} 1 & 1 \end{pmatrix} \mathbf{x} = 50 \quad (2.0.3)$$

Fig 0 shows the optimal point through the intersection of various lines.

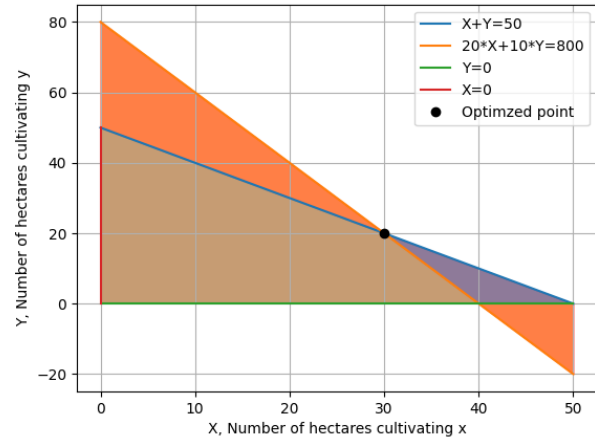


Fig. 0: Feasible region for allocation Problem

The following code provides the optimal solution to (2.0.3) at $\begin{pmatrix} 30 \\ 20 \end{pmatrix}$.

Hence 30 hectare of land should be allocated to crop X and 20 hectare of land should be allocated to crop Y.