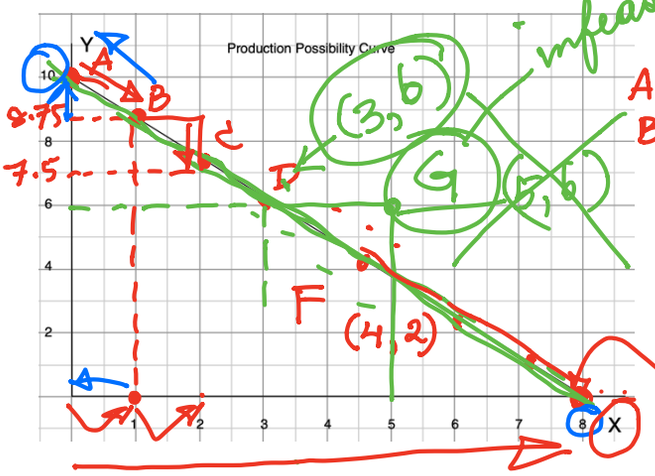
Production Possibility Curve

An economy has a given amount of resources (land, labor, capital). How much can the economy produce most efficiently?

Assumptions:

1. The economy can produce 2 products (X and Y)
2. Limited resources (Land, Labor, and Capital)
3. Full employment
4. Full efficiency—no unnecessary waste using the best technology available
5. Fixed technology

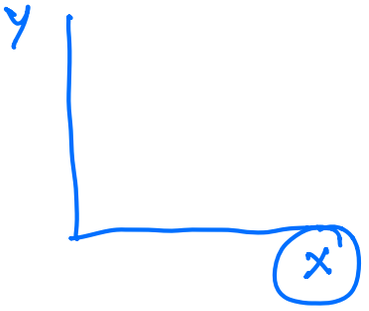
Production Possibility Curve (PPC): A line whose every point is the maximum output x and y that an economy can produce most efficiently with the resources and best technology available



x	y
0	10
1	8.75
2	7.5
3	6.25
4	
5	
6	
7	
8	

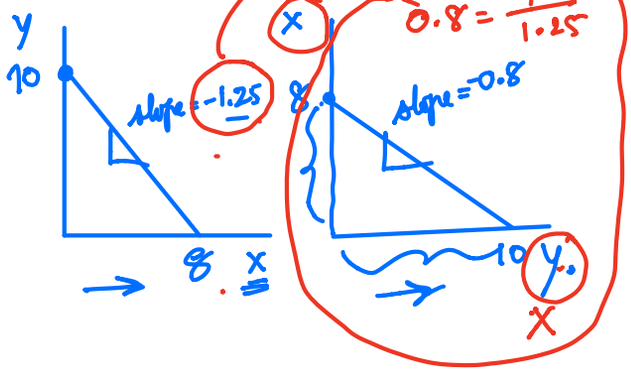
- PPC is linear and is described by function:

$$y = 10 - \frac{10}{8}x = 10 - 1.25x$$



PPC demonstrates that

1. Every point on PPC line shows the maximum of x and y that can be produced by the economy.
2. Any point below PPC is inefficient—either not full employment, unnecessary waste, or not the best technology available.
3. Any point above PPC is impossible (infeasible).
4. Scarcity of resources $\Rightarrow$ Scarcity of x and y.
5. For each additional unit of x,
   $\Rightarrow$ 1.25 units less of y.
   $\Leftrightarrow$ slope $= -1.25$
   $\Leftrightarrow$ Opp. Cost of each unit of x is 1.25 units of y
6. Opp. Cost of each unit of y = 0.8 units of x
7. Linear PPC has constant opportunity cost. This is why it is called ***a Constant Cost PPC***.



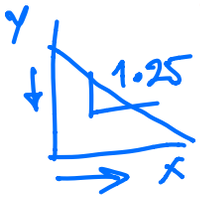
cost of X is in terms of Y.

1 more of x ⇒ 1.25 units less of Y.

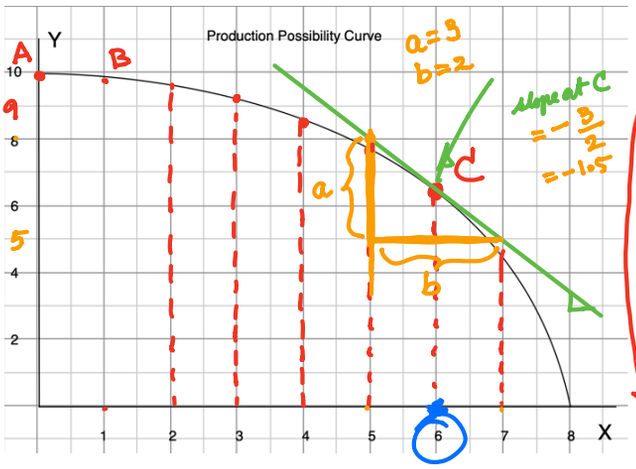
1 more unit of Y ⇒ 0.8 units less of X.

$= -\frac{1}{1.25} = \frac{-1}{\text{slope}}$

opp cost of Y in terms of X.



Nonlinear PPC



x	y	Opp. Cost of x
0	10	
1	9.9	= 0.1 less of y.
2	9.7	= 0.2
3	9.2	= 0.5
4	8.6	= 0.6
5	7.8	= 0.8
6	6.4	= 1.4
7	4.5	= 1.9
8	0	= 4.5

when x increases 1 unit at a time.

- We can compute the amount of y to be sacrificed for each additional unit of x.
- The opportunity cost of x is increasing as we more and more of x. ***This is why this PPC is an Increasing Cost PPC***
- We can also find the opportunity cost per unit of x at point A where $x = 6$ on PPC by using a tangent line.
- This is the *instantaneous rate* of opportunity cost per unit of x in terms of y.
- Knowing the slope, we can approximate if we have 0.1 unit more of $x, i.e., \Delta x = 0.1$, the amount of y we have to sacrifice =

opp cost of x = 1.5 units of y per unit change of x. - but x does not actually change by 1 unit.

60 km/hr.

at C = (6, 6.5), $\Delta x = 0.1$

$\Delta y \approx (\text{slope at C}) \cdot \Delta x$

$= (-1.5)(0.1)$

$= -0.15$

at C. $\Delta x = -0.2$ less of x.

$\Delta y \approx (\text{slope at C})\Delta x$

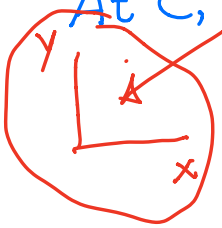
$= (-1.5)(-0.2)$

$= +0.3.$

– approx. 0.3 unit more of y.

∴ if x increases by 0.1 unit we have to have 0.15 unit less of y. (approximately)

At C, slope $= -1.5 \Rightarrow$ opp cost of x in Terms of y (per unit)



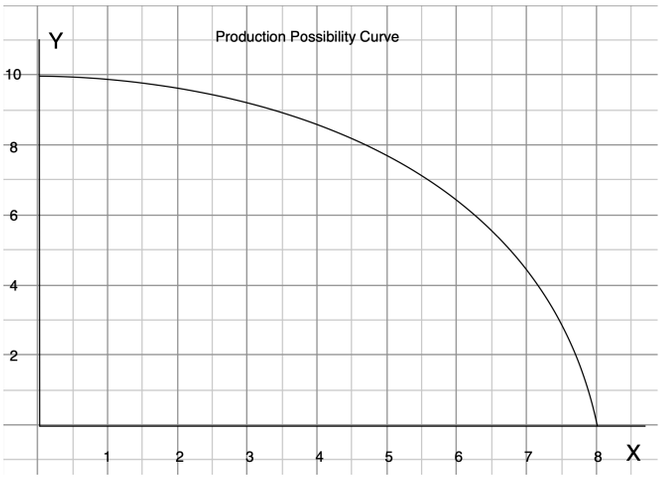
$\frac{1}{\text{slope}}$ $\frac{1}{-1.5}$ = Opp cost of y in Terms of x. (per unit)

$= -0.67 = -\frac{2}{3}.$

At C, $\Delta y = 0.3 \Rightarrow \Delta x \approx (-.67)(0.3) = -0.2$

$(-.67)$: $\frac{1}{\text{slope at C}}$; 0.3: Δy.

HW Nonlinear PPC



a) Find the opportunity cost of each additional unit of y in terms of units of x

y	x	Opp. Cost of y
0	8	
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

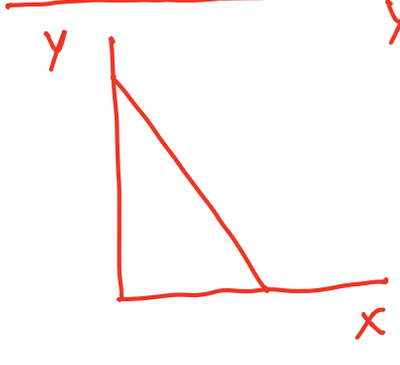
when y increases 1 unit at a time.

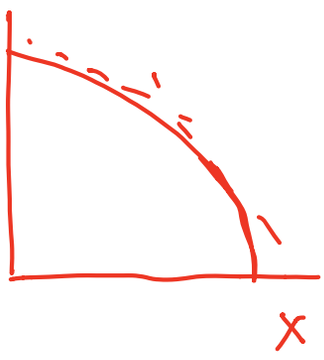
b) Is the opportunity cost of y increasing?

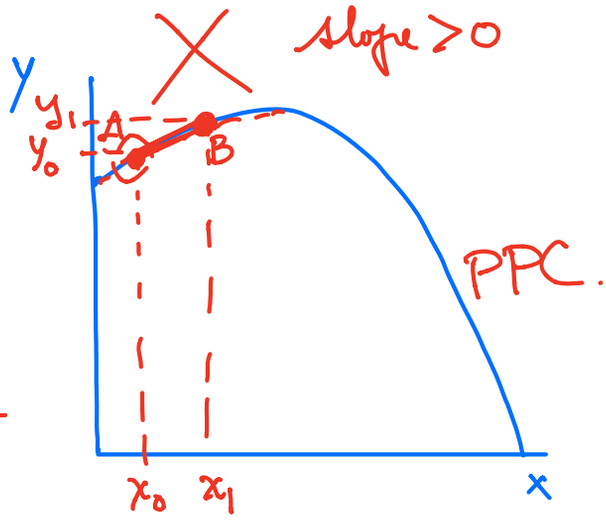
c) Compute the opportunity cost per unit of y when $x = 6$. at C.

d) At $x = 6$, approximate how much more x can be produced if we have y less by 0.2 units.

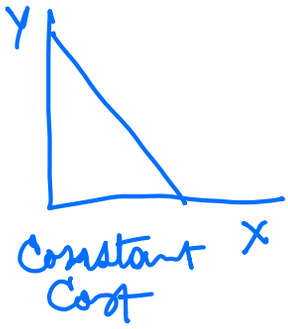
Can a PPC have positive slope?

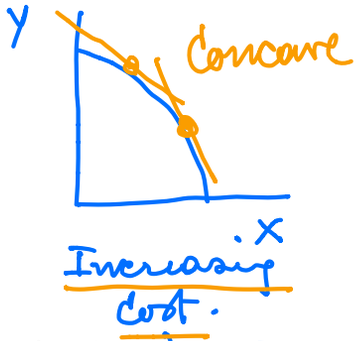


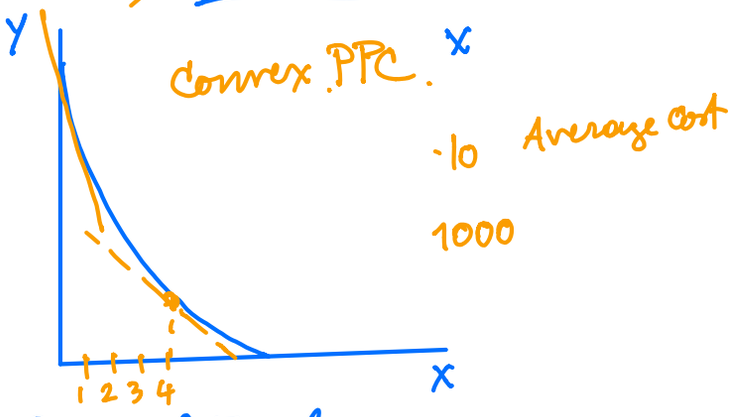




Nonlinear PPC: ***Decreasing Cost PPC***



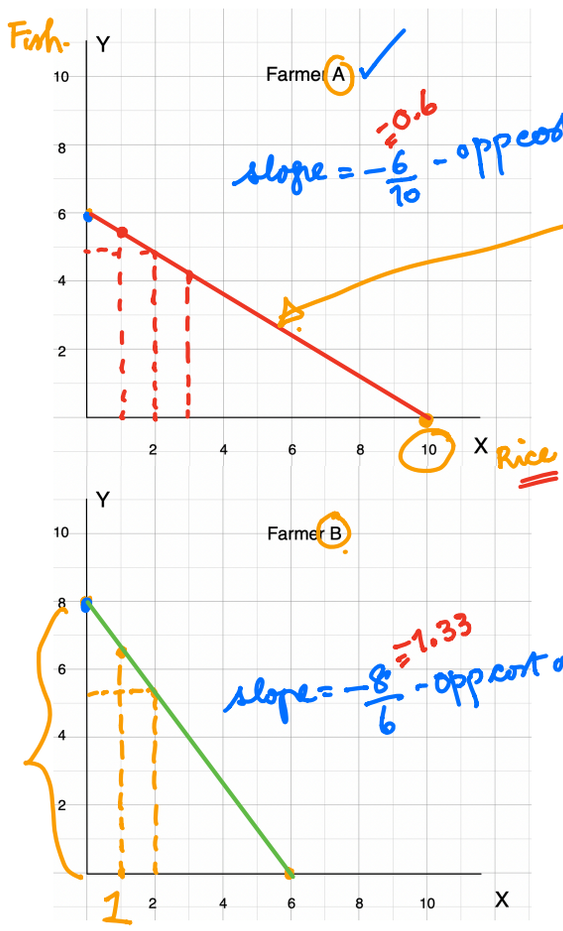


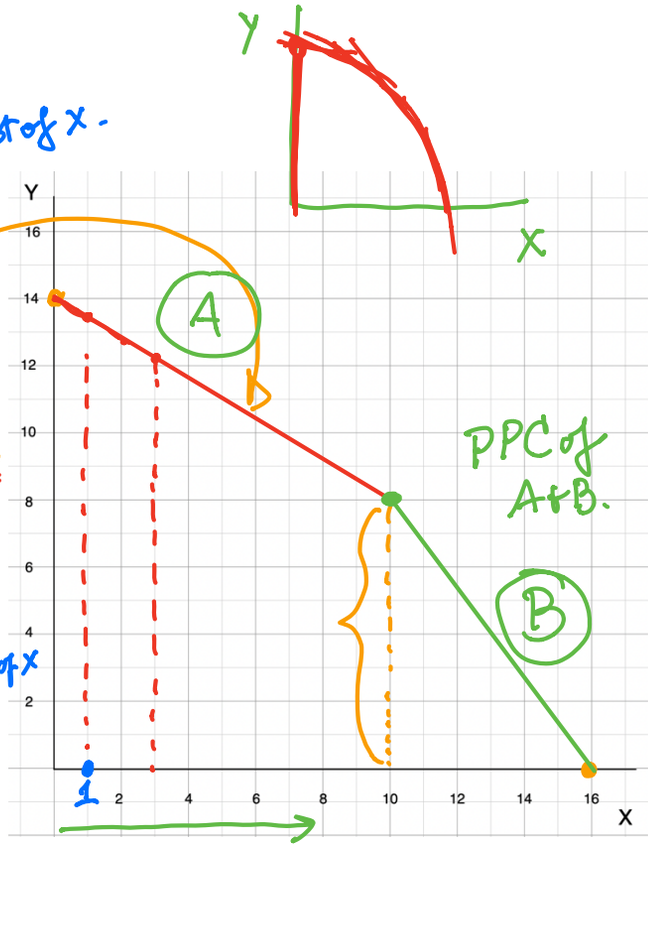


- Most PPC are Increasing Cost

slope is increasing in absolute value

Example There are two farmers A and B who produce X = rice and Y= fish, each having a constant PPC as given.

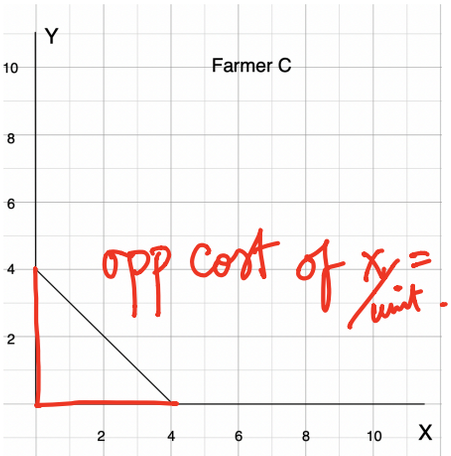




X	Y
0	14.
1	13.4.
2	12.8.
3	12.2
4	⋮
5	
6	
7	
8	
9	
10	8.
11	6.67
12	5.33.
⋮	

We can find the PPC of the combined resources of both farms.

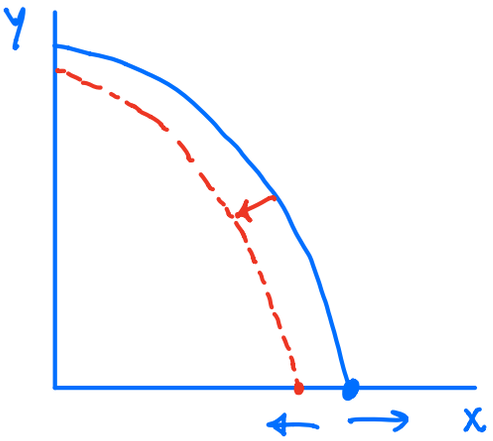
HW Farmer C has the PPC given below. Find the PPC of all three farmers A, B and C combined.



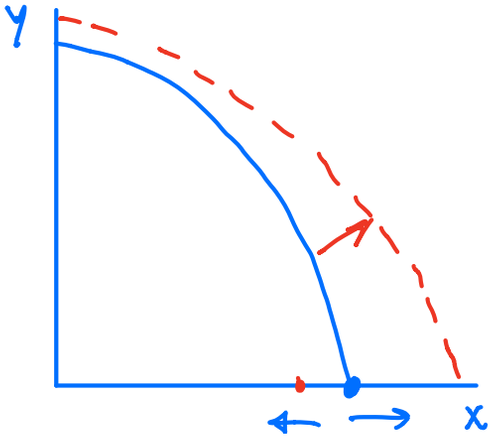
opp cost of x / unit = 1 (slope = −1).

Change in PPC – fixed resources, fix technology, most efficient.

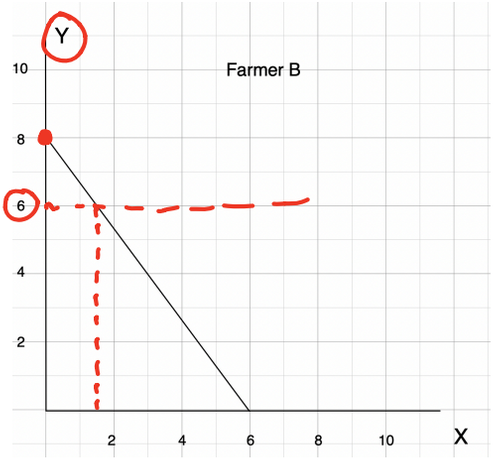
1. COVID-19



2. Improvement of Technology of producing both x and y.

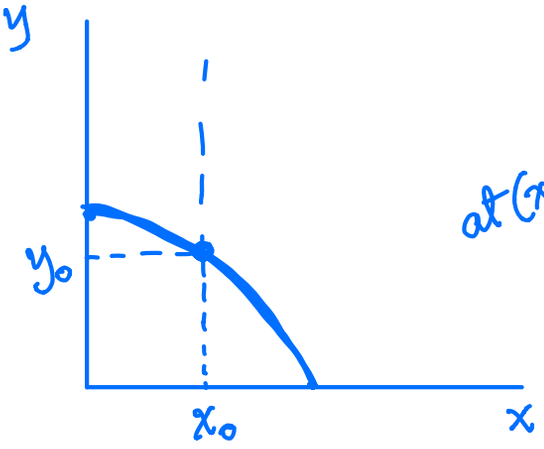


HW. If a new fertilizer is found to double the output of rice (x) for any level of production of fish (y), how will PPC of farmer B change? Does the opportunity cost of x increase? Does the opportunity cost of y increase?



Thanakrit.

Problem.



what if tech improves production of y to be double at every output of x.

at (x_0, y_0)
- how opp. cost of x changes ?
- ——— y ——— ?