



Single Input Production Economics for Farm Management

EXAMPLES

AAE 320: Farming Systems Management

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Example #1

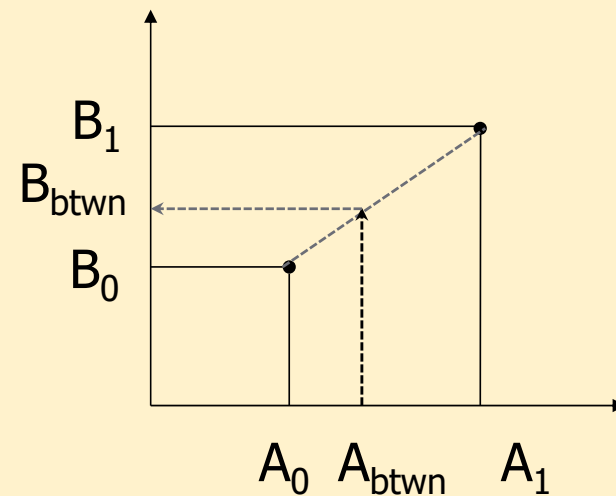
- Fill in the columns in the table using \$3.50/bu for the corn price
- What is the profit maximizing N fertilizer rate if the N fertilizer price is \$0.35/lb?

N lbs/A	Yield bu/A	AP	MP	VMP
0	50	---	---	---
20	90		2	\$7
40	120			
60	148			
80	172			
100	192			
120	210			
140	222			
160	228			
180	230			

Linear Interpolation

- You have a variable A with two values A_0 and A_1 and matched with it is another variable B with two values B_0 and B_1
- You know A_{btwn} that is between A_0 and A_1 and you want to linearly interpolate what the corresponding B_{btwn} is

How do you find B_{btwn} when you know A_0, A_1, B_0, B_1 and A_{btwn} ?



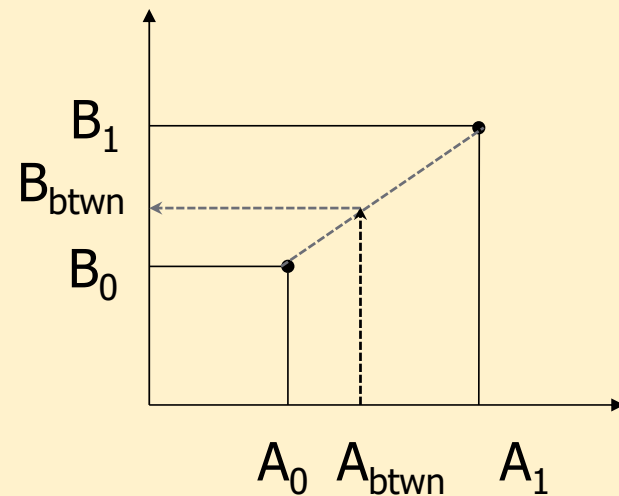
Linear Interpolation

- This formula will hold

$$\frac{B_{btwn} - B_0}{A_{btwn} - A_0} = \frac{B_1 - B_0}{A_1 - A_0}$$

- Solve this for B_{btwn}

$$B_{btwn} = B_0 + (A_{btwn} - A_0) \frac{B_1 - B_0}{A_1 - A_0}$$



Linear Interpolation Example

- Suppose have inputs & VMPs from this table & input price is \$0.60
- What is the optimal N, linearly interpolating between 1.05 & 0.35?

$$B_{btwn} = B_0 + (A_{btwn} - A_0) \frac{B_1 - B_0}{A_1 - A_0}$$

$$B_{btwn} = 160 + (0.6 - 1.05) \frac{180 - 160}{0.35 - 1.05}$$

$$B_{btwn} = 160 + (-0.45) \frac{20}{-0.7} = \mathbf{172.9}$$

	B_{btwn} Unknown		A_{btwn} Known
Input N (B)	Yield	MP	VMP (A)
Row 0 160	228	0.3	1.05
Row 1 180	230	0.1	0.35

Example #2

- You manage a small vegetable farm, the table reports how many bags of potatoes are dug, cleaned, and ready for sale in one hour with different numbers of workers
- How many workers is it optimal to hire if potatoes sell for \$2/bag and you hire workers for \$20/hr? What if the wage is \$18/hr?

Workers	Bags/hr	MP	VMP
3	50		
5	75		
7	95		
9	105		

Example #3

- Soybean yield is $Q = 3 + 2S - 0.01S^2$, where yield Q is total bushels per acre (bu/ac) and the seeding rate S is thousands of seeds planted per acre. The soybean price is \$9/bu and seeds cost \$0.35 per thousand seeds.
- What is the economically optimal seeding rate (S) to plant? Set up and solve this economic problem using calculus. Check the second order condition.
- At the seeding rate S you find, what is the soybean yield (bu/ac)?
- Besides seed costs, other costs = \$800/ac. What are net returns (\$/ac)?

Example #4

- Corn yield is $Y = 150 + 0.994N - 0.00228N^2$, where Y is corn yield in bushels per acre and N is the total nitrogen applied as pounds of N per acre. The corn price is \$5/bu. Urea N nitrogen fertilizer solution (which is 45% N by weight) costs \$400/ton.
- What nitrogen application rate maximizes net returns? Set up and solve this economic problem using calculus. Check the second order condition.
- At the nitrogen rate N you find, what is the corn yield (bu/ac)?
- Besides nitrogen costs, other costs = \$900/ac. What are net returns (\$/ac)?