# Economic Evaluation of Vegetable Production

- Economic Evaluation
- Production theory for vegetable
- Cost
- Revenue
- Profit



#### • Economic evaluations

- *identification, measurement, and valuation, and then* comparison of the costs (inputs) and benefits
- (outcomes) of two or more alternative treatments or activities







# **Production process**

#### Definition

- Any activity that increases the similarity between the pattern of demand for goods, and the quantity, form, and distribution of these goods available to the market place.
- Three aspects to production processes:
  - the quantity of the commodity produced,
  - the form of the good produced,
  - the temporal and spatial distribution of the commodity produced.

# **Factors of production**

- Labour services (human capital)
- Capital goods
- Land/Raw materials (natural capital)
- Entrepreneurial and management skills

# Long-run Production

• Long-run: The key point about the long run is that all factors of production are assumed to be variable, in other words a business can vary all of its inputs and change the whole scale of production.

# Short run production

Short run : a period in which at least one of the factors of production is fixed.

- A fixed factor
  - one whose quantity cannot readily be changed.
  - Examples; agricultural equipment, land space, and farm owner
- A variable factor of production
  - one whose usage rate can be changed easily.
  - Examples; electricity, fertilizer, seeds, and most raw material inputs.

• **Note: Long-run**: all factors of production are assumed that a business can vary all of its inputs and change the whole scale of production.

#### Total, average, and marginal product

• Total Product Curve

0



Fertilisers (Units of input used per period of time)



#### Total Product Curve

- The total product of a variable factor of production identifies what outputs are possible using various levels of the variable input.
- The diagram shows a typical total product curve. In this example, output increases as more inputs are employed up until point A.
- The maximum output possible with this production process is  $Q_m$ . (If there are other inputs used in the process, they are assumed to be fixed.)

#### Average and Marginal Product Curves

AP and MP

0



#### Average and Marginal Product Curves

- The average product (AP)
- TP/input

0

• If there are 10 employees working on a production process that manufactures 50 units per day, then the average product of variable labour input is 5 units per day.

- The marginal product (MP)
- dTP/dinput

0

- the change in total output due to a one unit change in the variable input
- The marginal product curve is shown (MP).
- It can be obtained from the slope of the total product curve.



#### Production function in short run

 $Q_A = K^{\alpha}L$ 

 $Q_{A} = Min [X_{1}, X_{2}]$ 

 $\mathbf{Q}_{\mathbf{A}} = \mathbf{a}\mathbf{X}_1 + \mathbf{b}\mathbf{X}_2$ 

	Production method	Labour	Fertilizer	Costs	Total product
)	Α	2 hours	2 kg	3,800 baht/115\$	2,000 litre
	В	3 hours	1 kg	3,750 baht/113\$	2,000 litre
	С	1.5 hours	3 kg	3,900 baht/118\$	2,000 litre

#### THE LAW OF DIMINISHING MARGINAL RETURNS

• The law of diminishing returns states that as we add more units of the variable input (i.e. labour) to fixed amounts of land and capital the change in total output will first rise, then fall.



Units of labour (L)





### Example

• Farmers grow rice by using more labour with the limited land 1 Rai (1600 sq. m), rice output will increase at an increasing rate in the first period after it is in a full capacity, rice output will increase at a decreasing rate when more workers are employed..





Labour Input (workers per day)	Total Output (units per day)	Marginal Product (units)
1	5	5
2	12	7
3	22	10
4	30	8
5	36	6
6	38	2



0

http://study.com/academy/lesson/law-of-diminishingreturns-definition-examples-quiz.html

#### **Cost & Return Analysis**

SHORT RUN COSTS OF PRODUCTION

**TOTAL COSTS (TC)** 

#### = TOTAL FIXED COST (TFC) + TOTAL VARIABLE COSTS (TVC)



# **FIXED COSTS**

- Fixed costs relate to the fixed factors of production and do not vary directly with the level of output. (I.e. they are exogenous of the level of production in the short run).
- Rent of buildings, leasing of capital equipment, the annual uniform business rate charged by local authorities, the costs of full-time contracted salaried staff, interest rates on loans, the depreciation of fixed capital (due to age) and the costs of business insurance.
- Total fixed costs (TFC) remain constant as output increases.
- Average fixed cost (AFC) = Total Fixed Costs (TFC) / Output (Q) Average fixed costs will fall continuously with output because the total fixed costs are being spread over a higher level of production causing the average cost to fall.



#### Variable Cost

- These are costs that vary directly with output since more variable units are required to increase output.
- Examples; the costs of essential raw materials and components, the wages of part-time staff or employees paid by the hour, the costs of electricity and gas and depreciation of capital inputs due to wear and tear.
- Total variable cost rises as output increases.

- Average variable cost (AVC) = Total Variable Costs (TVC) /Output (Q) AVC depends on the cost of employing variable factors compared to the average productivity of these factors (usually labour productivity).
  - If additional units of labour can be hired at a constant cost there will be an inverse relationship between average product and average variable cost. Therefore, when average product is maximised, AVC will be minimised.



#### **Break-even analysis**

• a technique used by production management and management accountants. It is based on categorising production costs between those which are "variable" (costs that change when the production output changes) and those that are "fixed" (costs not directly related to the volume of production).

• Total variable and fixed costs are compared with sales revenue in order to determine the **level of sales volume, sales value or production at which the business makes neither a profit nor a loss (the ''break-even point'').** 

# **The Break-Even Chart**

• The point at which neither profit nor loss is made is known as the "break-even point" and is represented on the chart below by the intersection of the two lines:



- OA = the variation of income at varying levels of production activity ("output").
- OB = the total fixed costs
- As output increases, variable costs are incurred, meaning that total costs (fixed + variable) also increase.
- At low levels of output, Costs are greater than Income.
- At the point of intersection, P, costs are exactly equal to income, and hence neither profit nor loss is made.



- Lemon Farm (Vegetable supermarket in Bangkok) has costs/month in the following details
- Organic Vegetable costs 40,000 baht
- 2 Staffs 15,000 baht
- Letting costs 10,000 baht
- Plastic bag costs
   1,000 baht
- Advertising costs
   3,000 baht
- What are fixed costs, variable costs, and total costs?

What are total cost, average cost, average variable cost, and marginal cost?

0

Quantity	<b>Fixed cost</b>	Variable cost
0	100	0
1	100	50
2	100	80
3	100	150
4	100	320
5	100	650
6	100	1000

#### Revenue

• Revenue for production is income that farmers receive from selling output there are three categories • Total Revenue :  $TR = P \times Q = P \times Q(P)$ 

• Average Revenue :  $AR = \frac{TR}{Q} = \frac{P \times Q}{Q} = P$ 

• Marginal Revenue :  $MR = \frac{\Delta TR}{\Delta Q}$ 

Price	Q	TR	AR	MR
11	0	0	0	0
10	10	100	10	
9	20	180	9	(180-100)/(20-10)=80/10=8
8	30	240	8	(240-180)/(30-20)=60/10=6
7	40	280	7	(280-240)/(40-30)=40/10=4
6	50	300	6	(300-280)/(50-40)=20/10=2
5	60	300	5	(300-300)/(60-50)=0/10=0
4	70	280	4	(280-300)/(70-60)=-20/10=-2

#### Total revenues and quantity





# $\Pi = TR - TC$ $\Pi = TR - (TVC + TFO)$ $TR = P \times Q$ $TVC = v \times Q$

(V = variable/unit)

 $\Pi = (P \times Q) - [(v \times Q) + TFQ]$ 

At break-even point, profit = 0  

$$0 = (P \times Q_{BE}) - [(v \times Q_{BE}) + TFQ]$$

$$(P \times Q_{BE}) = [(v \times Q_{BE}) + TFQ]$$

$$Q_{BE} = \frac{TFC}{P - v}$$

$$S_{BE} = \frac{TFC}{(1 - \frac{v}{P})}$$
Or sales on B.E.



0

 If a producer sell > 1000 unit, producer will have a profit (profit:unit = p-v)



To calculate B.E. point of Baby corn shop
Fixed cost = 200,000 baht
Variable cost = 3 baht/pack
Price of baby corn = 10 baht/pack
Which level should the owner close his shop?