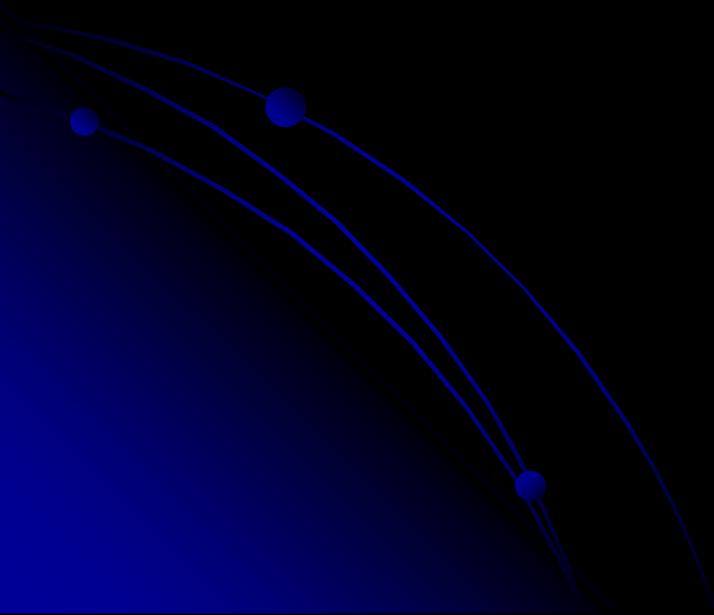
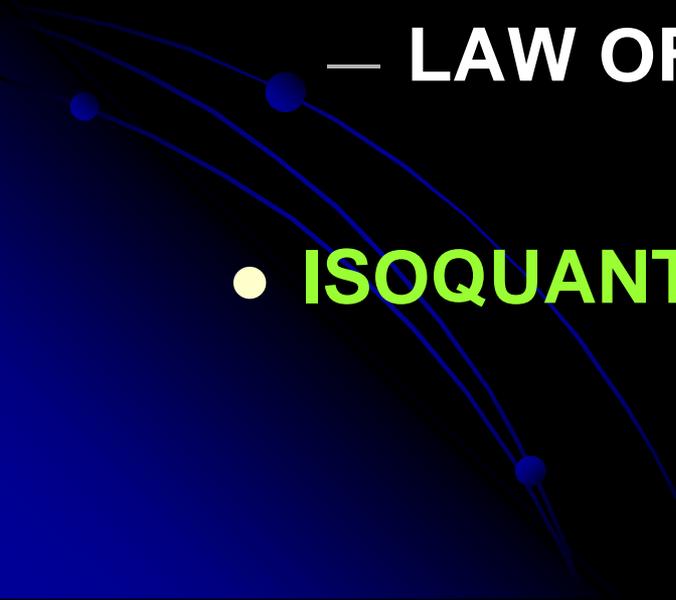


# PRODUCTION ANALYSIS



# SCOPE

- **PRODUCTION POSSIBILITY ANALYSIS.**
    - LAW OF VARIABLE PROPORTION.
    - LAW OF RETURN TO SCALE.
  - **ISOQUANT - ISOCOST ANALYSIS.**
- 

# PRODUCTION ANALYSIS

INPUT

PRODUCTION

OUTPUT

DEFENCE SERVICES PRODUCERS – THEY SATISFY NEEDS OF NATIONAL SECURITY

PRODUCTION: CONVERSION OR TRANSFORMATION OF INPUTS TO OUTPUT.

PROCESS ADDS VALUE TO INPUTS TO SATISFY NEEDS/ WANTS.

PRODUCTION: ADDITION OF VALUE/ UTILITY.

# PRODUCTION ANALYSIS



PRODUCTION ANALYSIS: LAWS GOVERNING  
RELATIONSHIP BETWEEN INPUTS & OUTPUTS.

LAWS HELP DECIDE OPTIMAL COMBINATION OF  
INPUTS (RESOURCES) FOR DESIRED RESULTS AT  
LOWEST COST.

DEFENCE SERVICES

# LAW OF VARIABLE PROPORTIONS

- **HOW TOTAL & MARGINAL OUTPUT IS AFFECTED BY CHANGE IN ONE INPUT KEEPING OTHER INPUTS CONSTANT.**
- **“AS PROPORTION OF ONE FACTOR IN A COMBINATION OF FACTORS IS INCREASED, MARGINAL & AVERAGE OUTPUTS WILL INCREASE THEN AFTER A POINT, FIRST MARGINAL AND THEN AVERAGE OUTPUT WILL DIMINISH”.**
- **APPLICABLE IN SHORT RUN.**

# LAW OF VARIABLE PROPORTIONS

- EFFECT ON OUTPUT: THREE STAGES
  - **INCREASING RETURNS** – MARGINAL RETURN RISES
  - **CONSTANT RETURNS** – MARGINAL RETURN FALLS
  - **DIMINISHING RETURNS** – MARGINAL RETURN BECOMES NEGATIVE

# LAW OF VARIABLE PROPORTIONS

## PRODUCTION OF AMN SHELLS PER MACHINE PER HOUR IN ORD FACTORY

NO OF WORKERS	TOTAL PRODUCTION	AVERAGE PRODUCTION	MARGINAL PRODUCTION	STAGES OF PRODUCTION
1	8	8	8	
2	20	10	12	
3	36	12	16	
4	48	12	12	
5	55	11	8	
6	60	10	5	
7	60	8.6	0	
8	56	7	- 4	

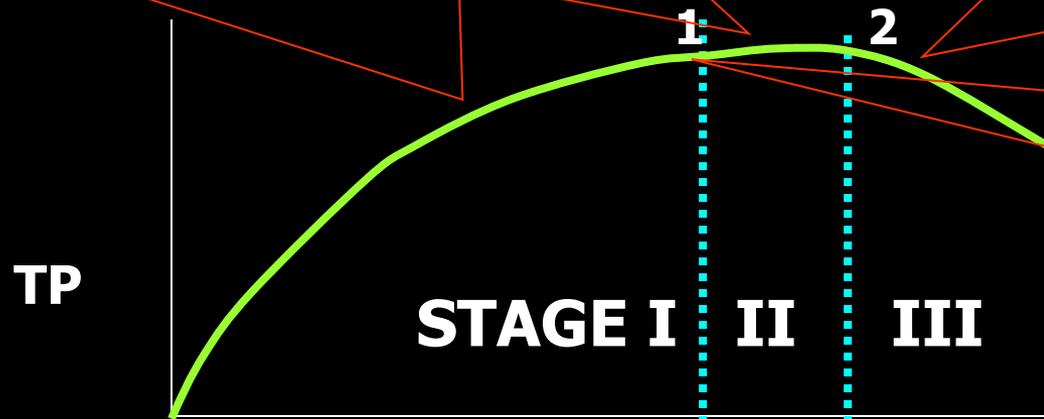
# LAW OF VARIABLE PROPORTIONS

## PRODUCTION OF AMN SHELLS PER MACHINE PER HOUR IN ORD FACTORY

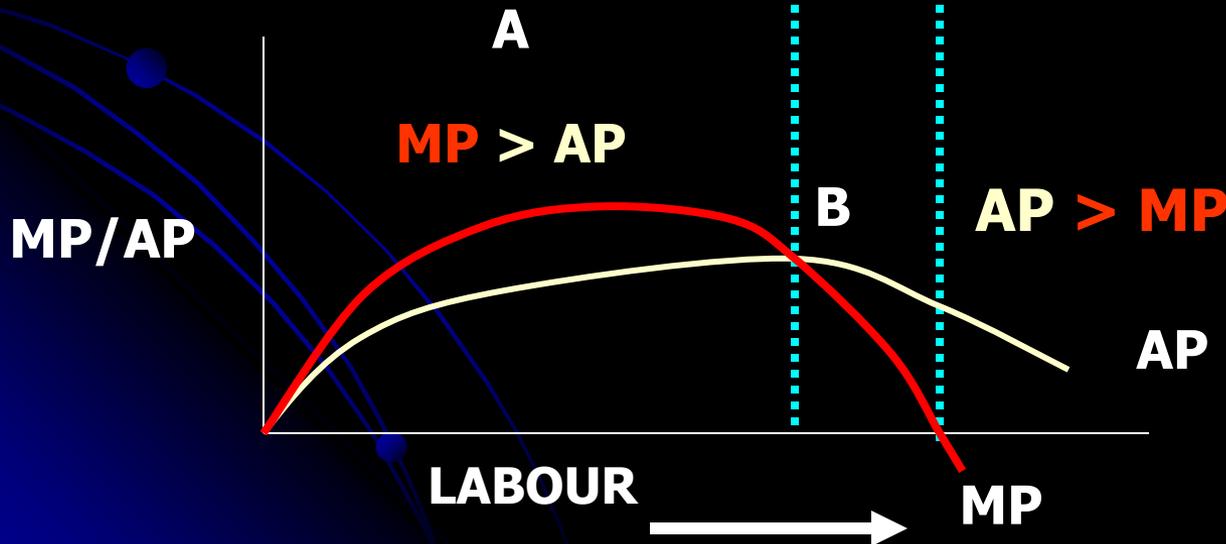
NO OF WORKERS	TOTAL PRODUCTION	AVERAGE PRODUCTION	MARGINAL PRODUCTION	STAGES OF PRODUCTION
1	8	8	8	I
2	20	10	12	I
3	36	12	16	I
4	48	12	12	II
5	55	11	8	II
6	60	10	5	II
7	60	8.6	0	III
8	56	7	- 4	III

# LAW OF VARIABLE PROPORTIONS

INCREASING RETURNS TO VARIABLE INPUT CONSTANT RETURNS TO VARIABLE INPUT DECREASING RETURNS TO VARIABLE INPUT  
PROPORTIONATE TO INCREASE IN INPUT LESS THAN PROPORTIONATE TO INCREASE IN INPUT MORE THAN PROPORTIONATE TO INCREASE IN INPUT



OPTIMAL POINT  
IN EMPLOYMENT  
OF FACTOR



# EXAMPLES OF LAW OF VARIABLE PROPORTIONS

- **NO OF AIRCRAFT TAKING PART IN BOMBING MISSION AND DESTRUCTION SOUGHT.**
- **NO OF GUNS ALLOTTED TO NEUTRALISE A TARGET AND EFFECT ACHIEVED.**
- **AMOUNT OF TIME ALLOCATED TO TRAINING AND STANDARDS ACHIEVED.**
- **NO OF MEN ALLOCATED TO A TASK AND OUTPUT.**
- **IN SHORT, IN SITUATIONS WHERE ONE FACTOR IS INCREASED, WHILE OTHERS REMAIN CONSTANT.**

# LAW OF VARIABLE PROPORTIONS

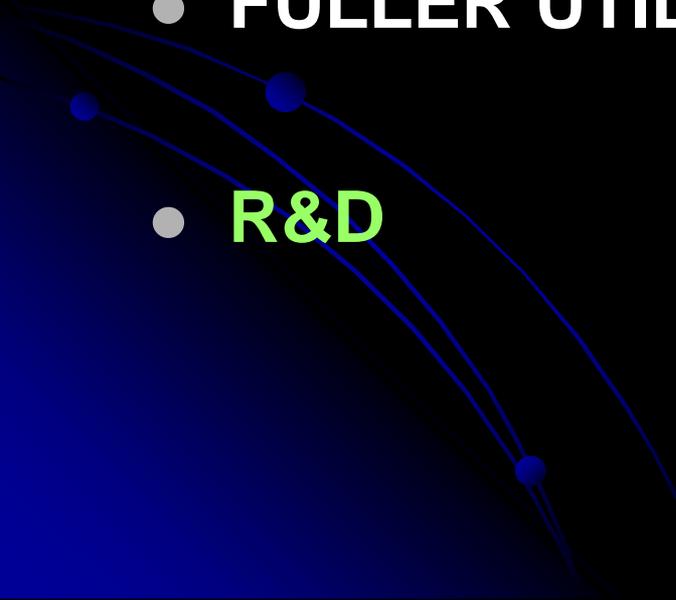
## ASSUMPTIONS

- **NO CHANGE IN TECHNOLOGY**  
**IMPROVEMENT IN TECHNOLOGY BOUND**  
**TO RAISE OUTPUT.**
  - **ONLY ONE FACTOR VARIABLE, REST**  
**CONSTANT.**
- 

# LAW OF RETURN TO SCALE

- DEALS WITH EFFECT ON OUTPUT, WHEN ALL INPUTS CHANGE SIMULTANEOUSLY IN SAME RATIO - DOUBLE, TREBLE ETC...
- LARGER THE SCALE OF ACTIVITIES – LOWER GENERALLY THE COST OF ACHIEVING OUTPUT.
- ECONOMIES OF SCALE ARISE FROM LARGE SCALE ACTIVITIES.

# LAW OF RETURN TO SCALE

- **ECONOMIES RESULT FROM**
    - **EFFICIENT USE OF RESOURCES**
    - **FULLER UTILISATION OF EXISTING CAPACITY**
    - **R&D**
- 

# LAW OF RETURN TO SCALE

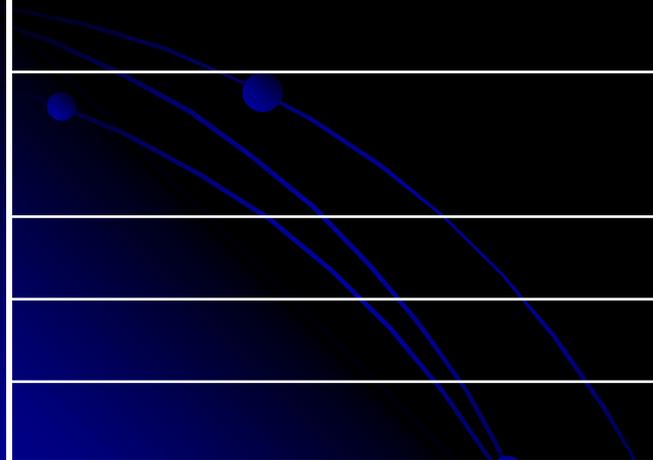
- ECONOMIES OF SCALE
  - TRUE ONLY UP TO A POINT.
  - THEN DIS-ECONOMIES SETS IN.
- THREE STAGES
  - **INCREASING RETURNS** – MARGINAL RETURN RISES
  - **CONSTANT RETURNS** – MARGINAL RETURN CONSTANT
  - **DIMINISHING RETURNS** – MARGINAL RETURN DIMNISHES



# RETURNS TO SCALE

(PRODUCTION OF AMN SHELLS IN ORD FACTORY PER MACHINE)

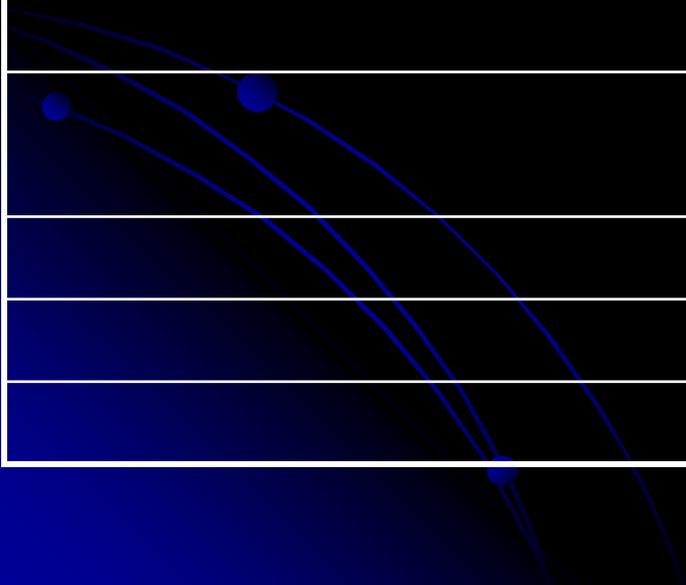
FACTORS OF PRODN EMP	TOTAL PRODUCTS /RETURNS	MARGINAL PRODUCT/ RETURNS	STAGE OF RETURN TO SCALE
1 WORKER+3 hrs			



# RETURNS TO SCALE

(PRODUCTION OF AMN SHELLS IN ORD FACTORY PER MACHINE)

FACTORS OF PRODN EMP	TOTAL PRODUCTS /RETURNS	MARGINAL PRODUCT/ RETURNS	STAGE OF RETURN TO SCALE
1 WORKER+3 hrs			
2 WORKERS + 6 hrs			



# RETURNS TO SCALE

(PRODUCTION OF AMN SHELLS IN ORD FACTORY PER MACHINE)

FACTORS OF PRODN EMP	TOTAL PRODUCTS /RETURNS	MARGINAL PRODUCT/ RETURNS	STAGE OF RETURN TO SCALE
1 WORKER+3 hrs			
2 WORKERS + 6 hrs			
3 WORKERS + 9hrs			
4 WORKERS+ 12 hrs			
5 WORKERS +15 hrs			
6 WORKERS + 18 hrs.			
7 WORKERS + 21 hrs			
8 WORKERS + 24 hrs			
9 WORKERS + 27 hrs			

# RETURNS TO SCALE

(PRODUCTION OF AMN SHELLS IN ORD FACTORY PER MACHINE)

FACTORS OF PRODN EMP	TOTAL PRODUCTS /RETURNS	MARGINAL PRODUCT/ RETURNS	STAGE OF RETURN TO SCALE
1 WORKER+3 hrs	200		
2 WORKERS + 6 hrs	500		
3 WORKERS + 9hrs	900		
4 WORKERS+ 12 hrs	1400		
5 WORKERS +15 hrs	1900		
6 WORKERS + 18 hrs.	2400		
7 WORKERS + 21 hrs	2800		
8 WORKERS + 24 hrs	3100		
9 WORKERS + 27 hrs	3200		

# RETURNS TO SCALE

(PRODUCTION OF AMN SHELLS IN ORD FACTORY PER MACHINE)

FACTORS OF PRODN EMP	TOTAL PRODUCTS /RETURNS	MARGINAL PRODUCT/ RETURNS	STAGE OF RETURN TO SCALE
1 WORKER+3 hrs	200	200	
2 WORKERS + 6 hrs	500	300	
3 WORKERS + 9hrs	900	400	
4 WORKERS+ 12 hrs	1400	500	
5 WORKERS +15 hrs	1900	500	
6 WORKERS + 18 hrs.	2400	500	
7 WORKERS + 21 hrs	2800	400	
8 WORKERS + 24 hrs	3100	300	
9 WORKERS + 27 hrs	3200	100	

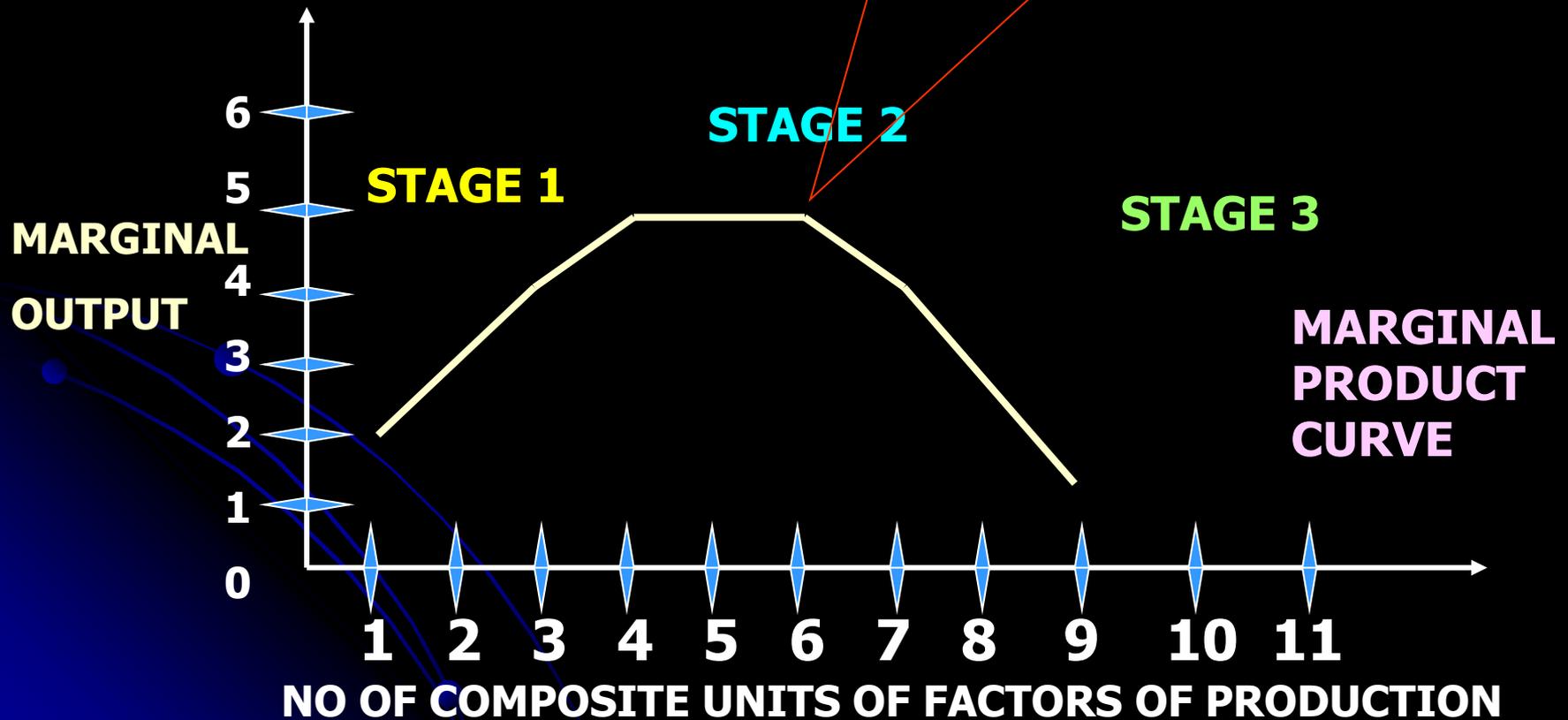
# RETURNS TO SCALE

(PRODUCTION OF AMN SHELLS IN ORD FACTORY PER MACHINE)

FACTORS OF PRODN EMP	TOTAL PRODUCTS /RETURNS	MARGINAL PRODUCT/ RETURNS	STAGE OF RETURN TO SCALE
1 WORKER+3 hrs	200	200	STAGE OF INCREASING RETURNS
2 WORKERS + 6 hrs	500	300	
3 WORKERS + 9hrs	900	400	
4 WORKERS+ 12 hrs	1400	500	
5 WORKERS +15 hrs	1900	500	STAGE OF CONSTANT RETURNS
6 WORKERS + 18 hrs.	2400	500	
7 WORKERS + 21 hrs	2800	400	STAGE OF DECREASING RETURNS
8 WORKERS + 24 hrs	3100	300	
9 WORKERS + 27 hrs	3200	100	

# LAW OF RETURN TO SCALE

OPTIMAL POINT IN  
EMPLOYMENT OF FACTORS



# LAW OF RETURN TO SCALE

- **DIS-ECONOMIES START OPERATING AS SCALE OF ACTIVITY IS RAISED BEYOND A POINT.**
- **OPTIMUM MIX OF INPUTS TO ACHIEVE THE RESULT VARIES WITH THE DEGREE OF RESULT DESIRED.**
- **APPLICABLE IN LONG RUN.**
- **CDR MUST ANALYSE THAT MARGINAL RETURN IN TERMS OF RESULT NOT LESS THAN MARGINAL INCREASE IN INPUT.**

# PRODUCTION POSSIBILITY ANALYSIS

- DETERMINES MAX RESULT POSSIBLE WITHIN GIVEN RESOURCE ALLOCATION.
- ANALYSIS OF ONE INPUT – TWO OUTPUT CASE.
- DETERMINES MOST EFFICIENT COMBINATION OF TWO FOR MAXIMISING RESULTS WITHIN GIVEN ONE INPUT.
- TECHNIQUE MAKES USE OF PRODUCTION POSSIBILITY CURVE.

# PRODUCTION POSSIBILITY ANALYSIS

## EXAMPLE

- **ALLOCATED BUDGET – C CRORES.**
- **ACQUISITION OF OPTIMUM COMBINATION OF OFFENSIVE POTENTIAL (OP) AND DEFENSIVE POTENTIAL (DP).**
- **C CRORE – 400 OP OR 930 DP POSSIBLE.**
- **DEFENCE PLANNER FORMULATES PRODUCTION POSSIBILITY SCHEDULE.**

# PRODUCTION POSSIBILITY SCHEDULE

(INPUT- DEFENCE RESOURCES OUTPUT -OP&DP)

## COMBINATIONS POSSIBLE

POSSIBLE COMBINATIONS	OFFENSIVE POTENTIAL	DEFENSIVE POTENTIAL
A	400	0
B		
C		
D		
E	0	940

# PRODUCTION POSSIBILITY SCHEDULE

(INPUT- DEFENCE RESOURCES OUTPUT -OP&DP)

## COMBINATIONS POSSIBLE

POSSIBLE COMBINATIONS	OFFENSIVE POTENTIAL	DEFENSIVE POTENTIAL
-----------------------	---------------------	---------------------

**REAL SITUATION PRODUCTION POSSIBILITY SCHEDULE CAN BE FORMULATED BASED ON COST BENEFIT ANALYSIS, SYSTEM ANALYSIS AND OR**

<b>D</b>	<b>100</b>	<b>870</b>
<b>E</b>	<b>0</b>	<b>940</b>

# PRODUCTION POSSIBILITY CURVE

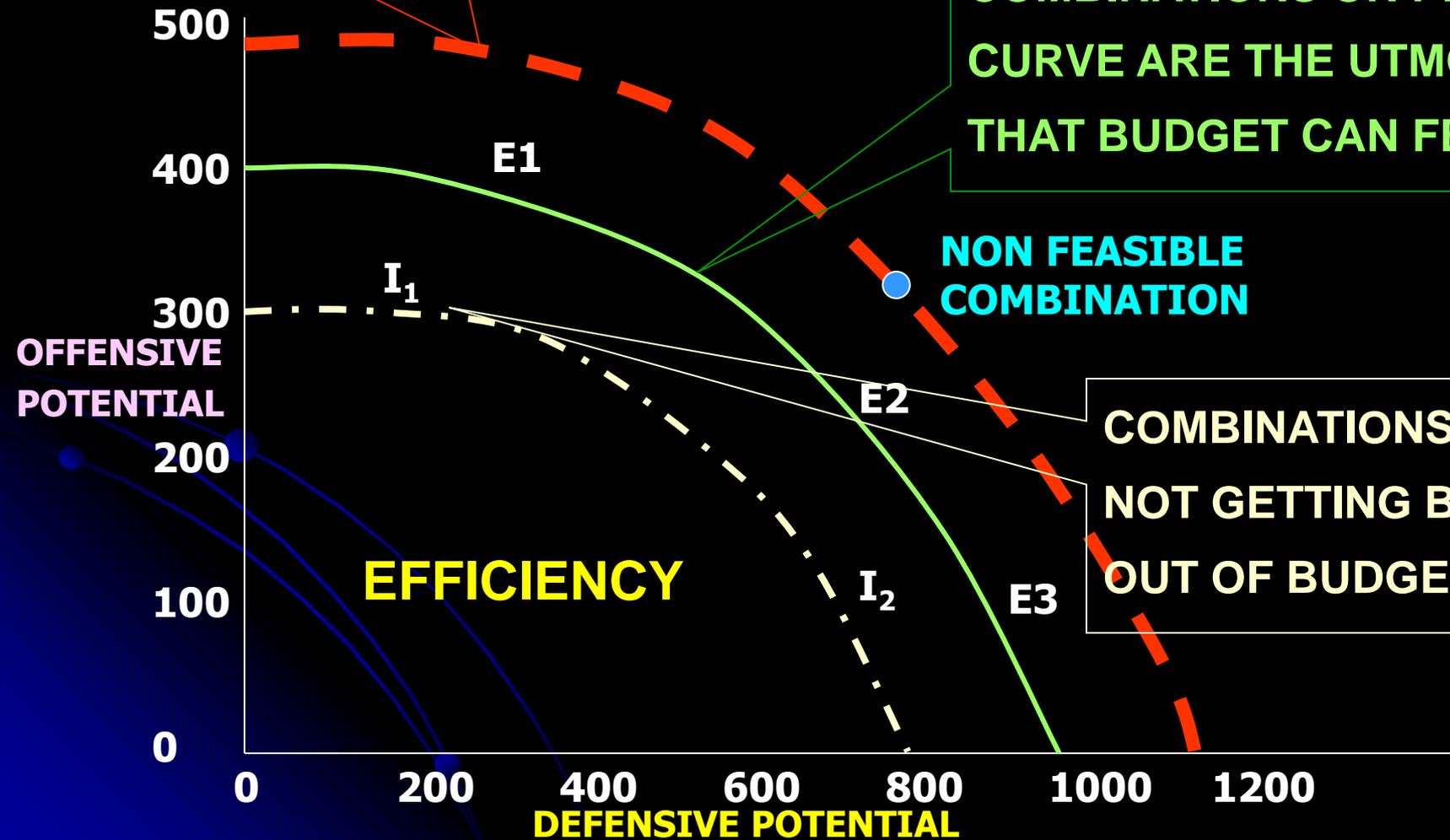
PP CURVE FOR BUDGET C + X CRORES

COMBINATIONS ON PP CURVE ARE THE UTMOST THAT BUDGET CAN FETCH

NON FEASIBLE COMBINATION

COMBINATIONS  $I_1$  &  $I_2$  NOT GETTING BEST OUT OF BUDGET

EFFICIENCY

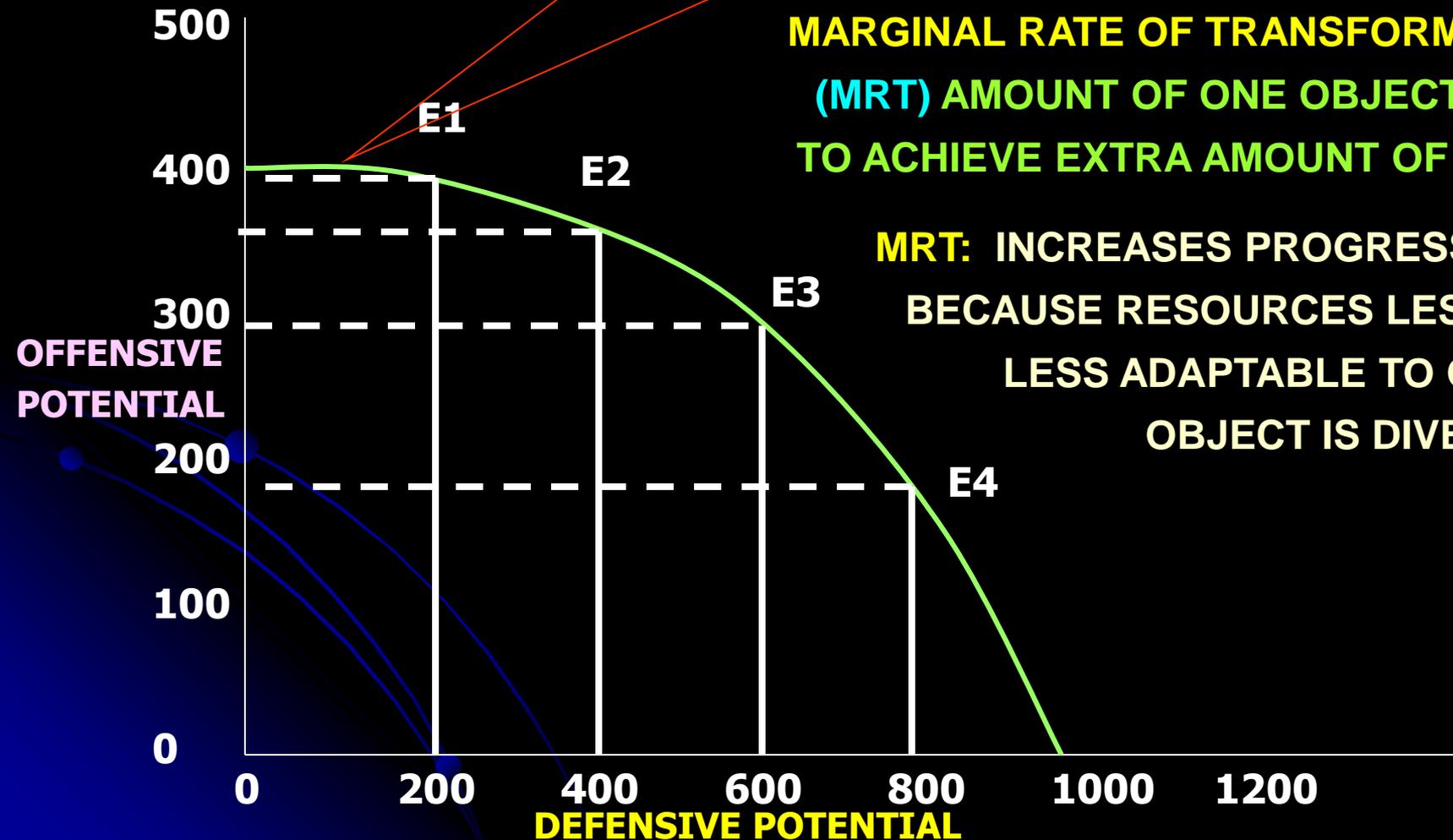


# PRODUCTION POSSIBILITY CURVE

CONCAVE NATURE OF PP CURVE

**MARGINAL RATE OF TRANSFORMATION:**  
(MRT) AMOUNT OF ONE OBJECT GIVEN  
TO ACHIEVE EXTRA AMOUNT OF OTHER

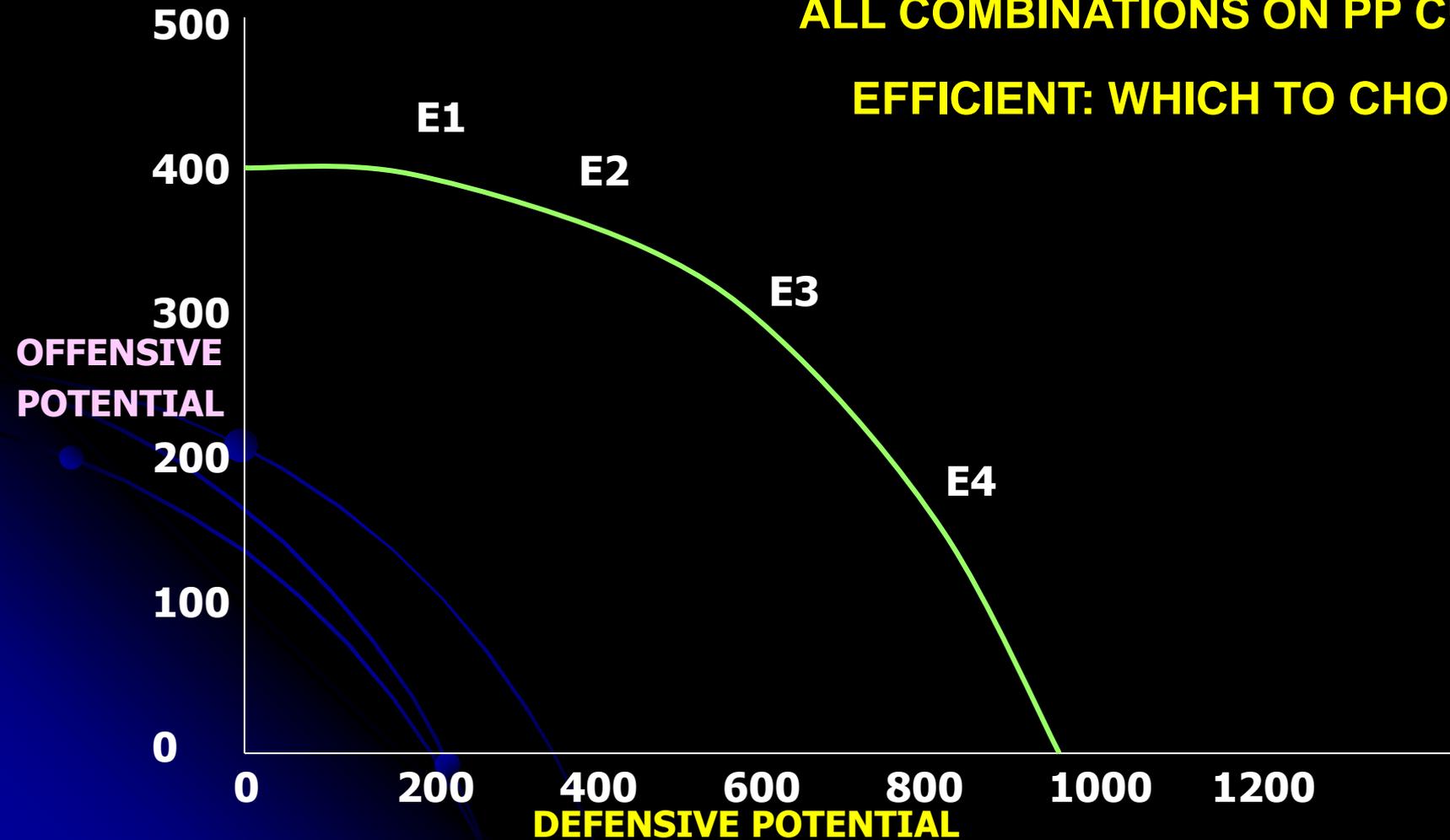
**MRT: INCREASES PROGRESSIVELY**  
BECAUSE RESOURCES LESS AND  
LESS ADAPTABLE TO OTHER  
OBJECT IS DIVERTED.



# PRODUCTION POSSIBILITY CURVE

ALL COMBINATIONS ON PP CURVE

EFFICIENT: WHICH TO CHOOSE?



# PRODUCTION POSSIBILITY CURVE APPLICATIONS

- **A SQN OF TPT AIRCRAFT LIFTING MEN AND MATERIAL.**
- **AN ENGINEER COY CLEARING MINES AND CONSTRUCTING DEFENCES.**
- **A SET OF MACHINES PRODUCING TWO PRODUCTS.**
- **FORCES USED NOW AND HELD IN RESERVE.**

ALL SITUATIONS WHERE ONE RESOURCE CAN BE  
USED FOR TWO PURPOSES