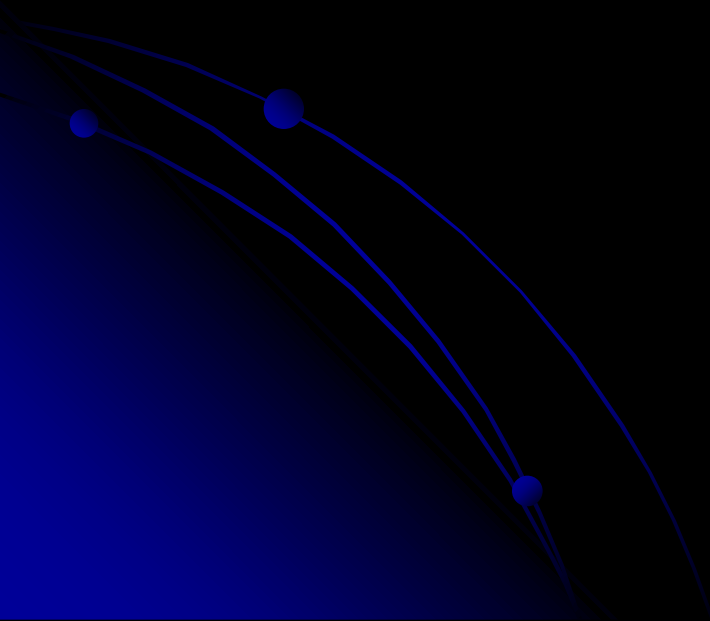
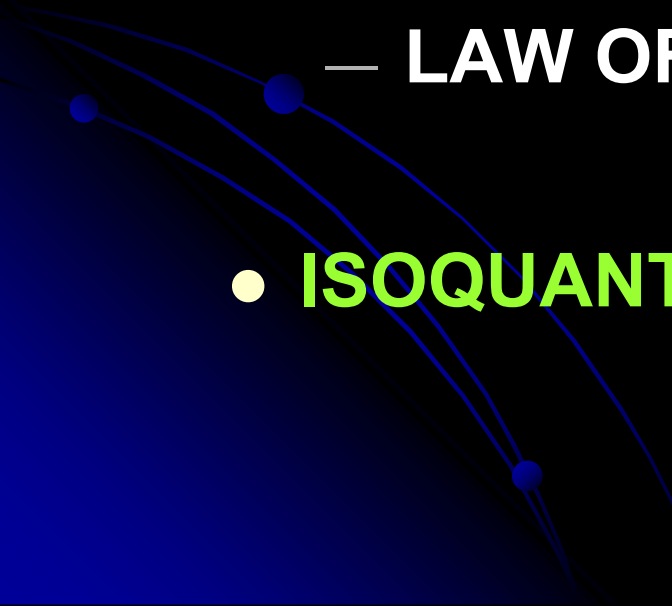


PRODUCTION ANALYSIS



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	

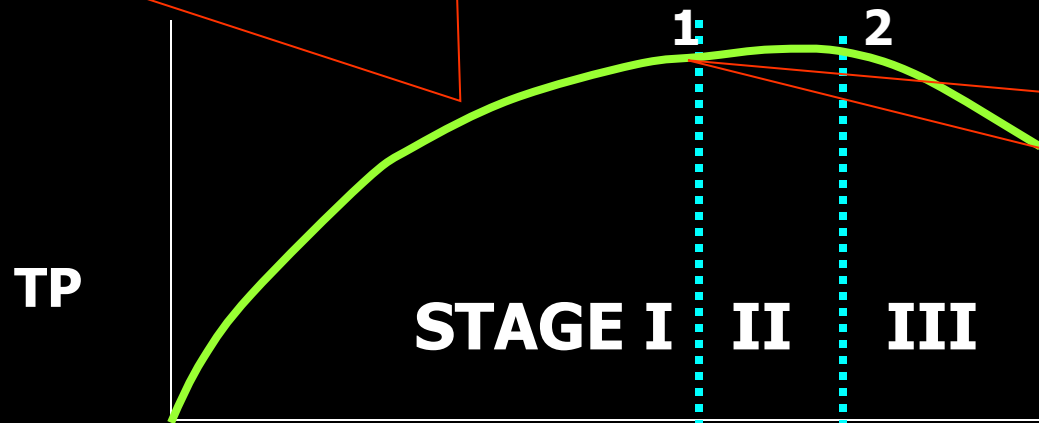
LAW OF VARIABLE PROPORTIONS

PRODUCTION OF AMN SHELLS PER MACHINE PER HOUR IN ORD FACTORY

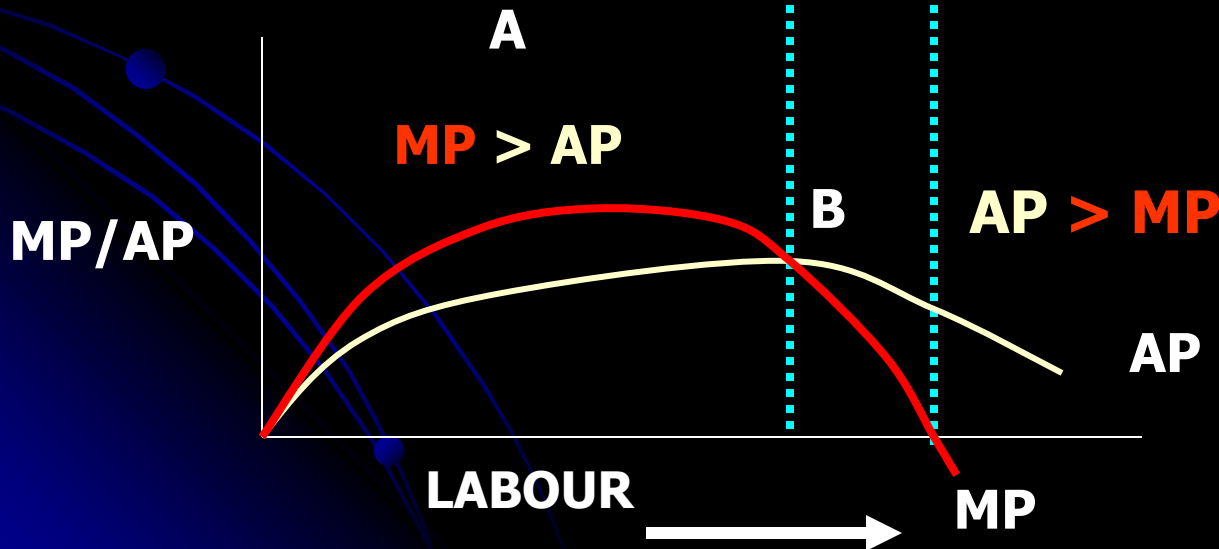
NO OF WORKERS	TOTAL PRODUCTION	AVERAGE PRODUCTION	MARGINAL PRODUCTION	STAGES OF PRODUCTION
1	8	8	8	I
2	20	10	12	I
3	36	12	16	I
4	48	12	12	II
5	55	11	8	II
6	60	10	5	II
7	60	8.6	0	III
8	56	7	- 4	III

LAW OF VARIABLE PROPORTIONS

INCREASING RETURN: INCREASE IN OUTPUT MORE THAN PROPORTIONATE TO INCREASE IN INPUT



OPTIMAL POINT
IN EMPLOYMENT
OF FACTOR

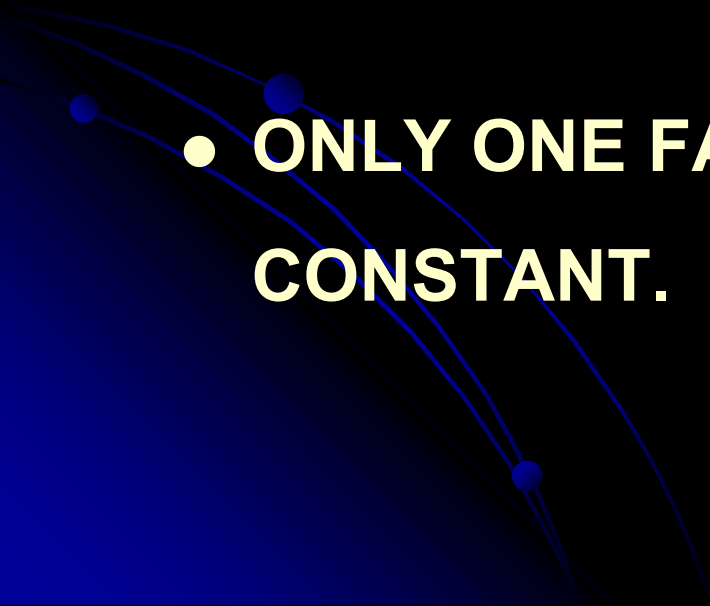


EXAMPLES OF LAW OF VARIABLE PROPORTIONS

- **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

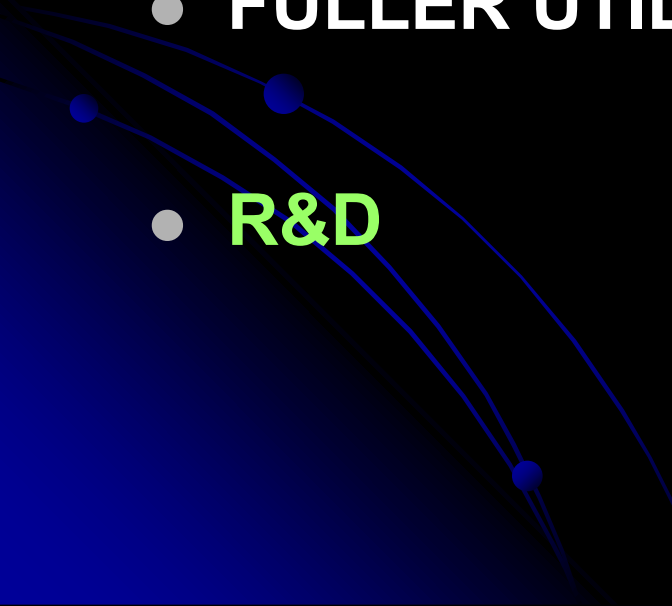
ASSUMPTIONS

- **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)

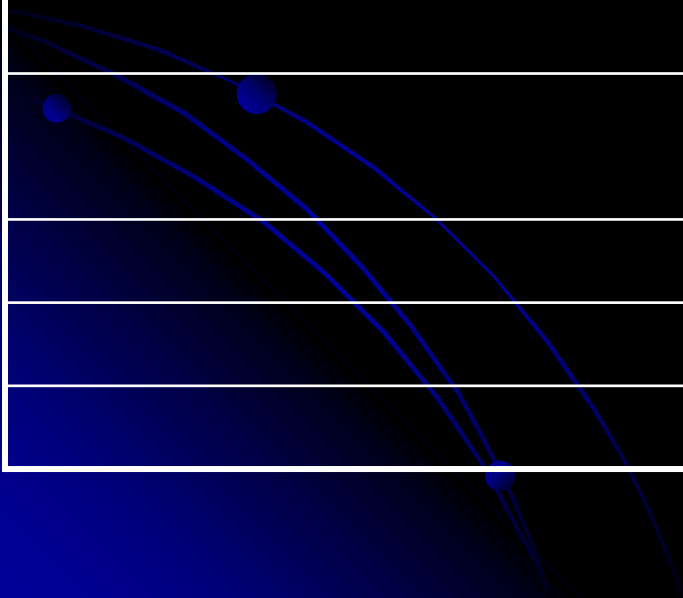
FACTORS OF PRODN EMP	TOTAL PRODUCTS /RETURNS	MARGINAL PRODUCT/ RETURNS	STAGE OF RETURN TO SCALE
1 WORKER+3 hrs			



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	

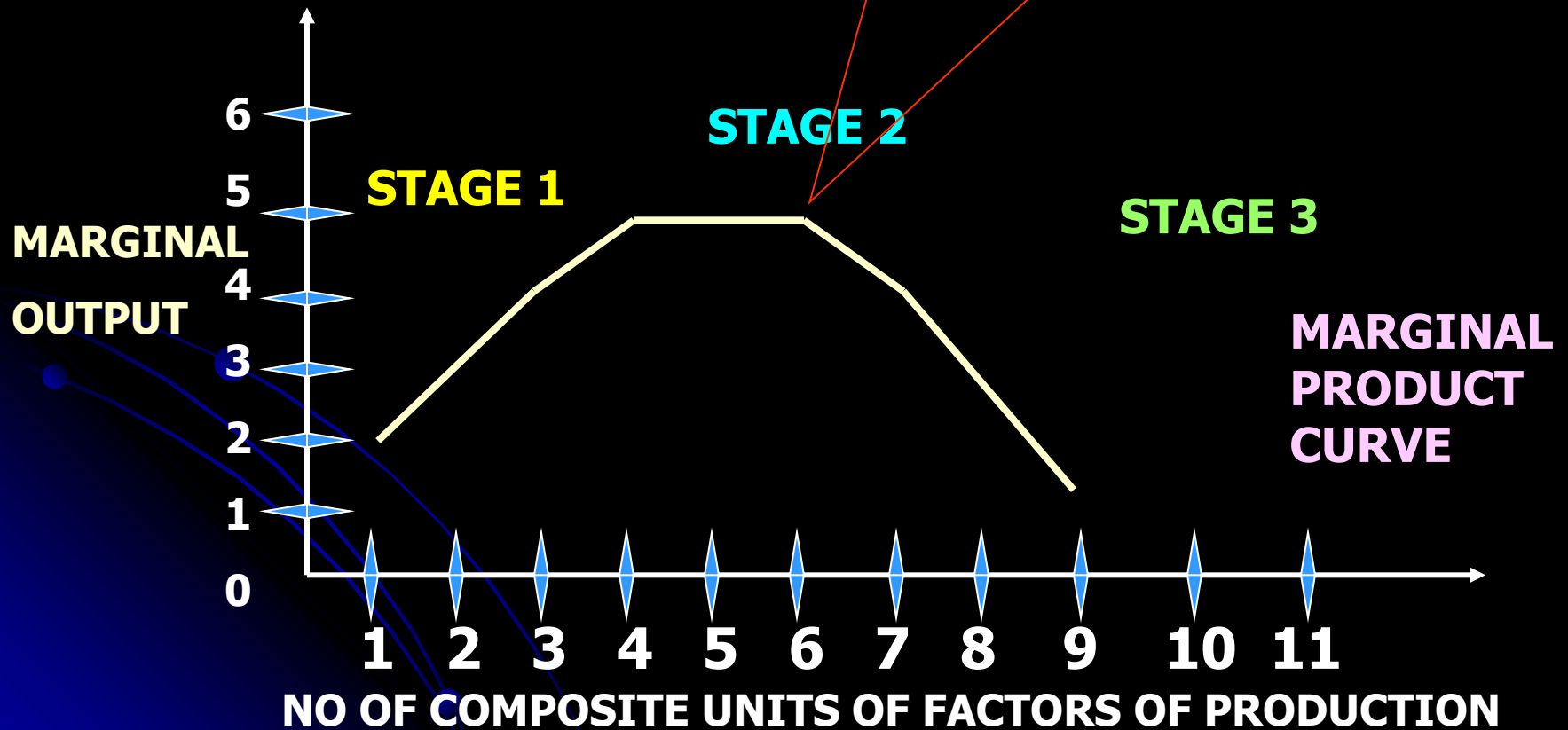
RETURNS TO SCALE

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

D	100	870
E	0	940

PRODUCTION POSSIBILITY CURVE

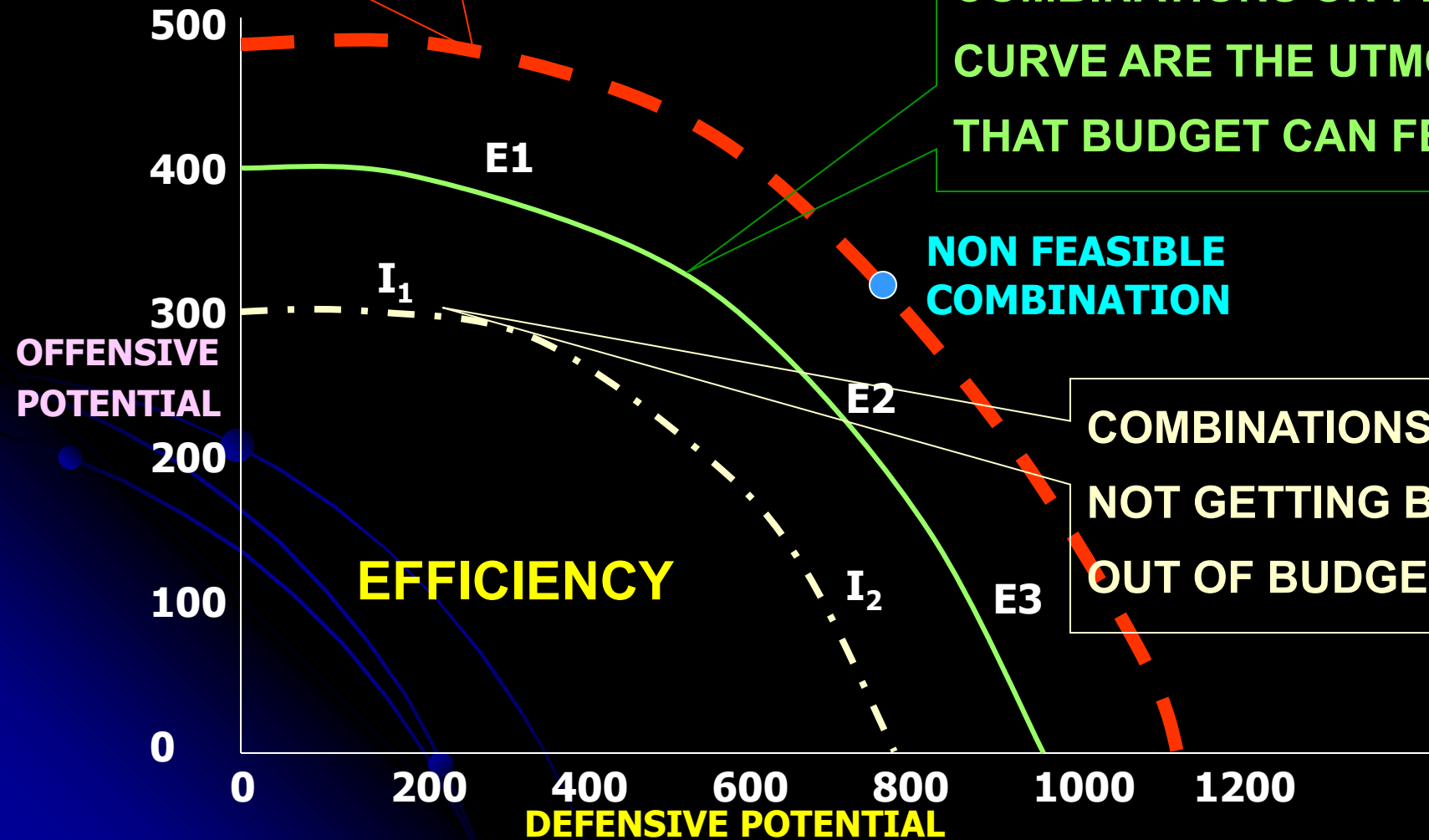
PP CURVE FOR BUDGET C + X CRORES

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

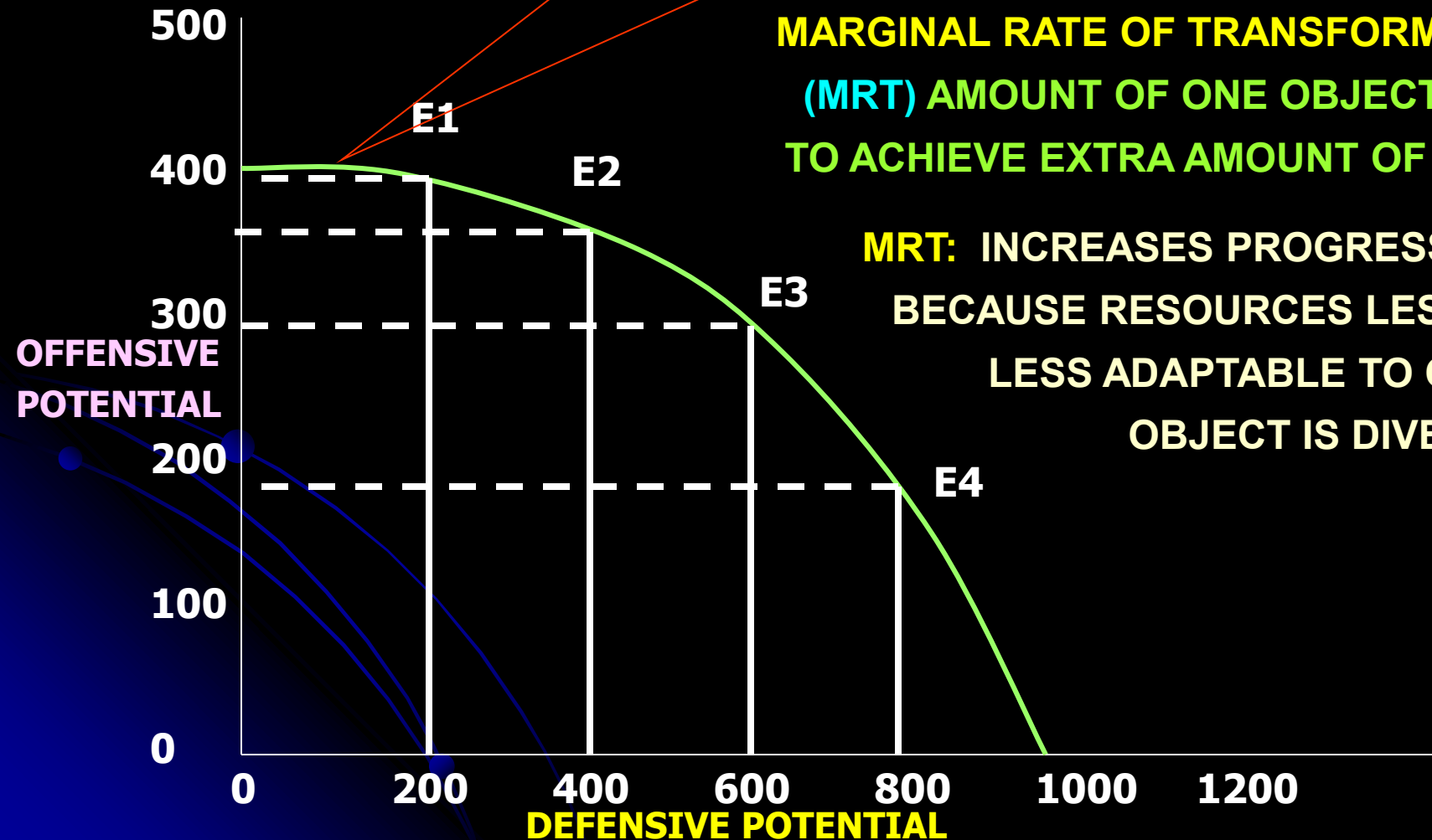


PRODUCTION POSSIBILITY CURVE

CONCAVE NATURE OF PP CURVE

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

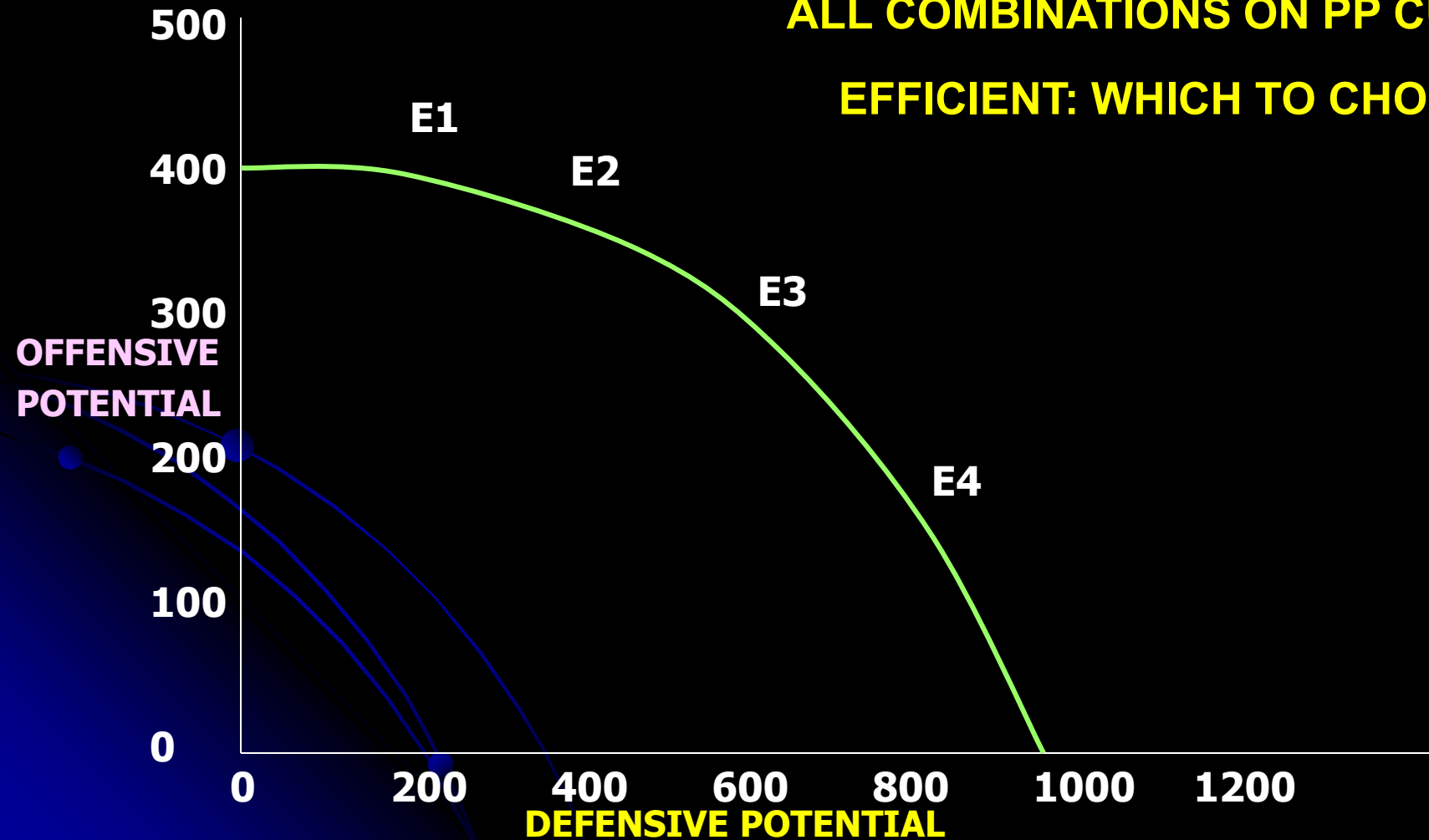
MRT: INCREASES PROGRESSIVELY
BECAUSE RESOURCES LESS AND
LESS ADAPTABLE TO OTHER
OBJECT IS DIVERTED.



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