

Yield gaps and natural resource use efficiency

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**Closing the efficiency gap in natural resource use,
FAO - Rome, 2-4 April 2012**

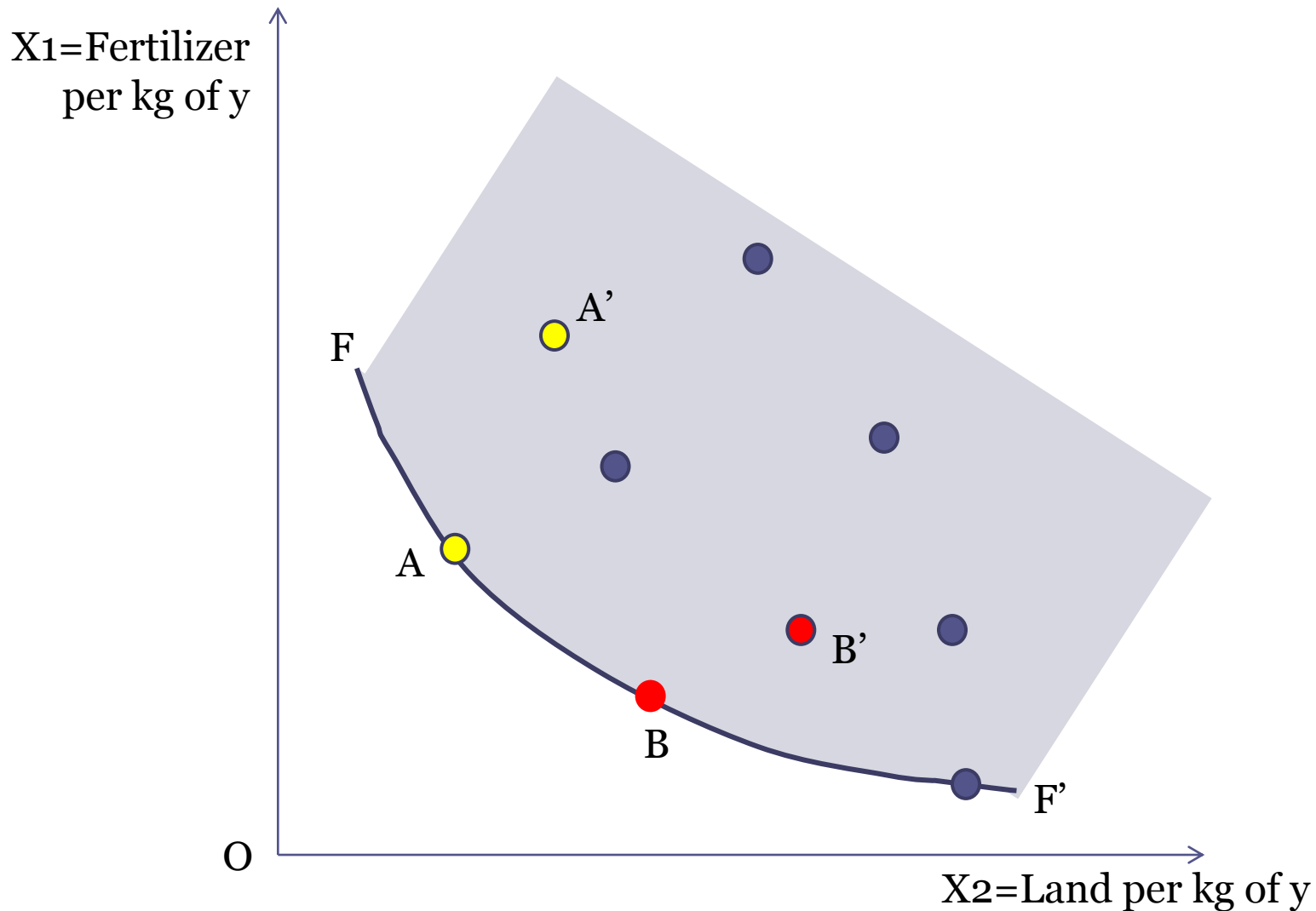
Motivation

- Global demand for meat is projected to increase by 85% from 2005/2007 to 2050 and this demand will have to be met from an increasingly scarce natural resource base.
- So:
 - Do we need to increase natural resource use efficiency?
 - How do we define it?
 - How do we measure it?

Outline

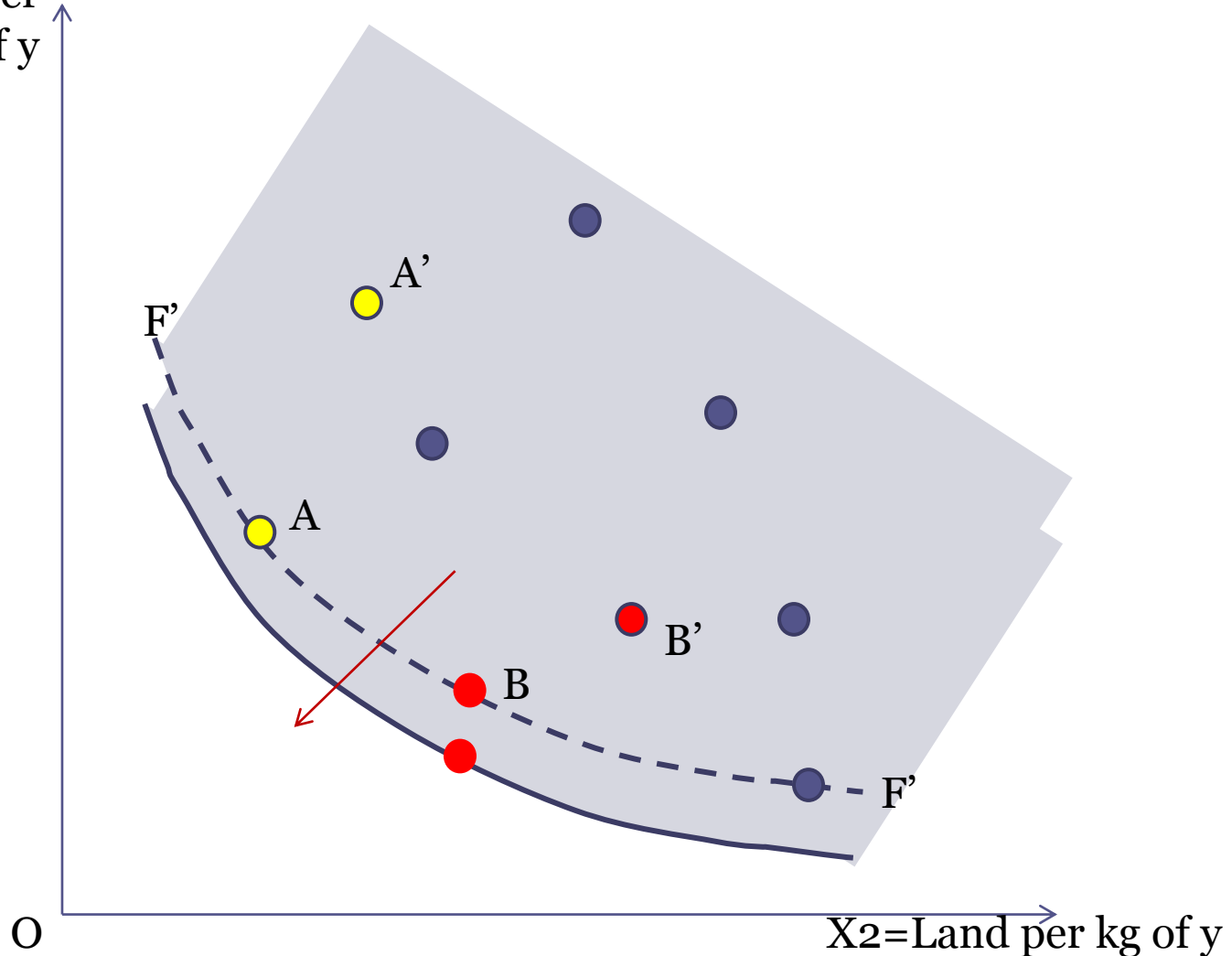
- Conceptual framework for the discussion:
 - Production possibilities
 - Technical change, efficiency and productivity
 - Yields and yield gaps
 - Economic efficiency and allocation efficiency, maximizing profits and minimizing costs
- Implications for the use of natural resource efficiency measures
- Conclusions

Production Possibility Space (PPS): Set of all feasible input combinations that can produce y

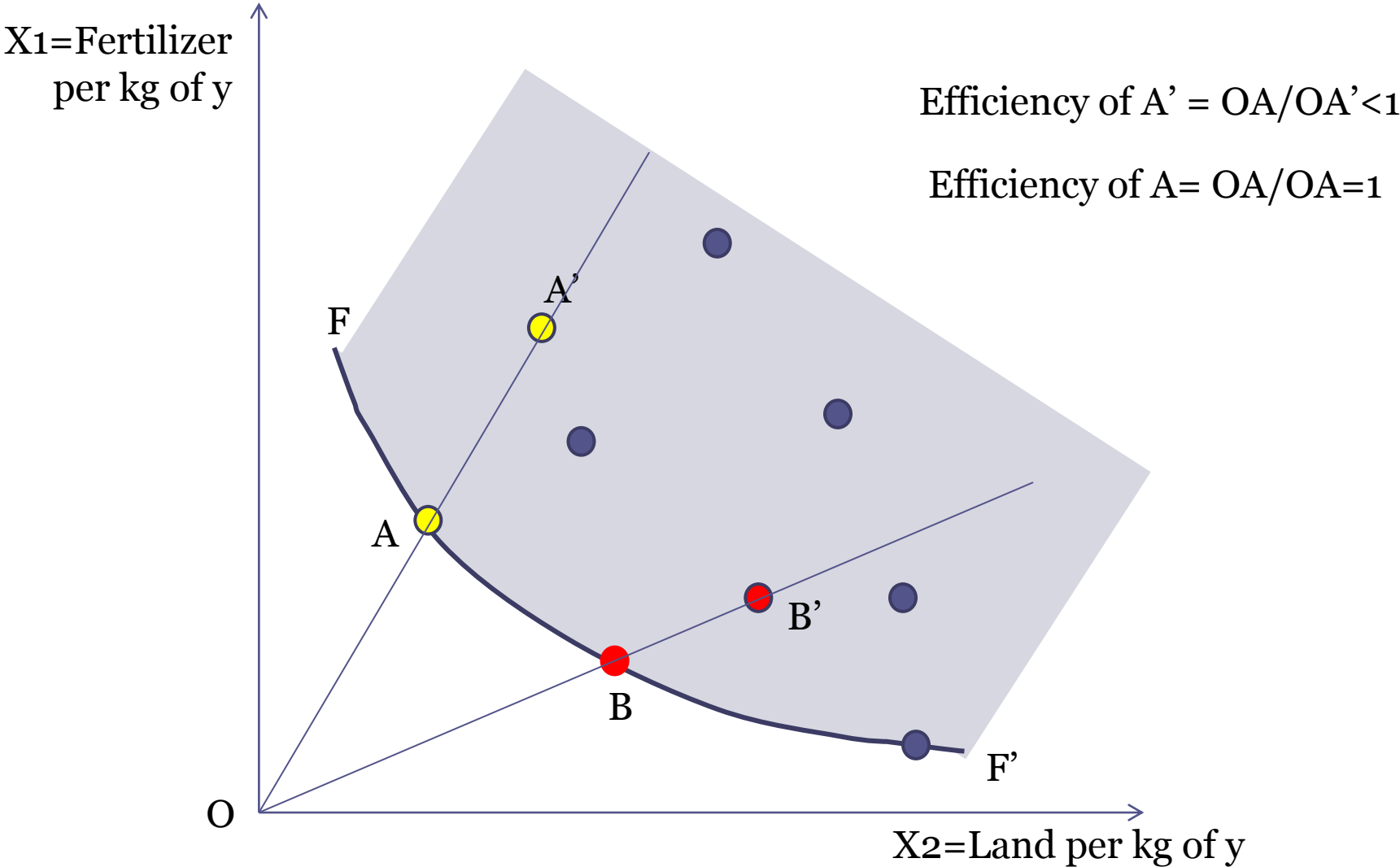


Technical Change and the technological frontier

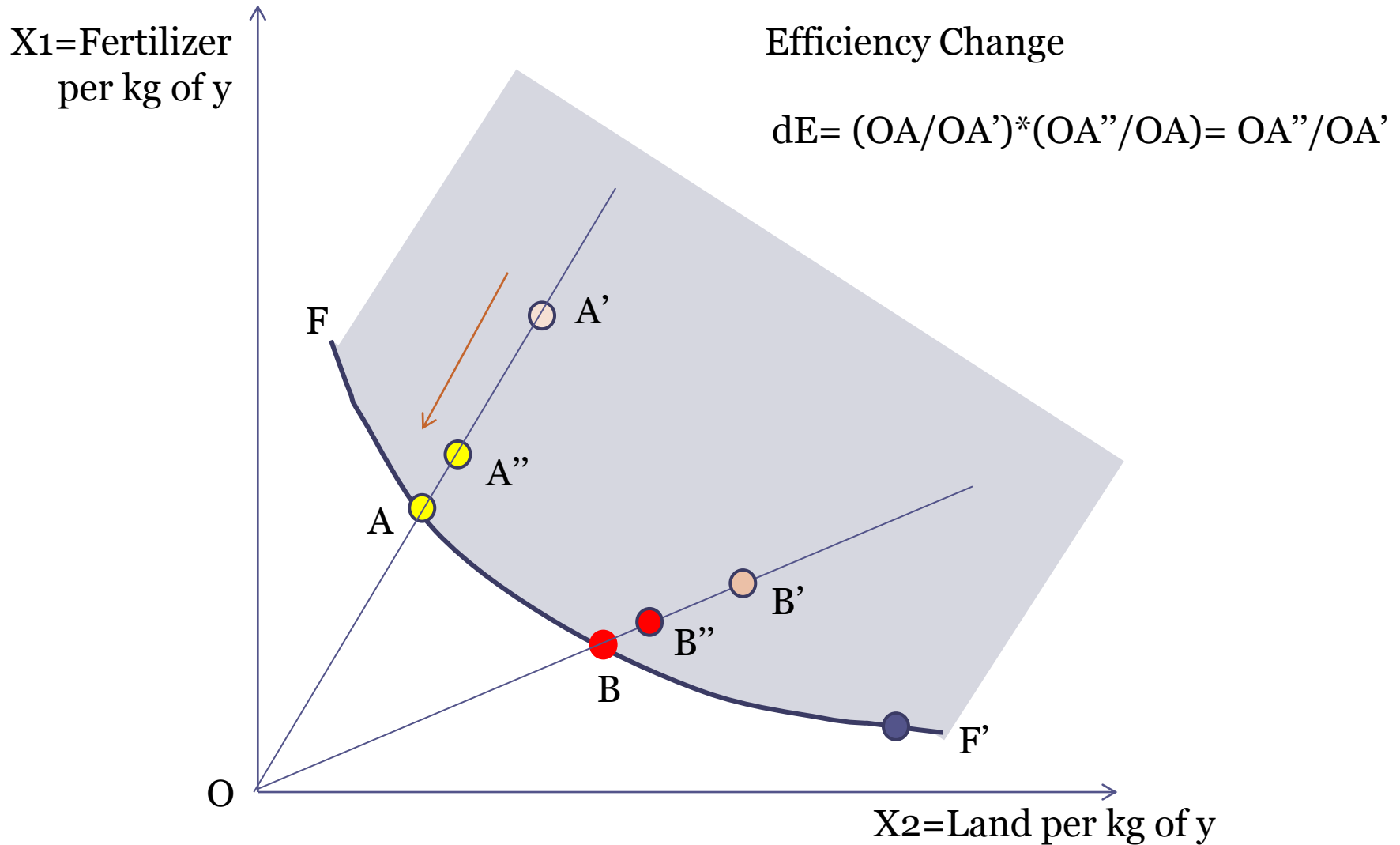
X_1 =Fertilizer
per kg of y



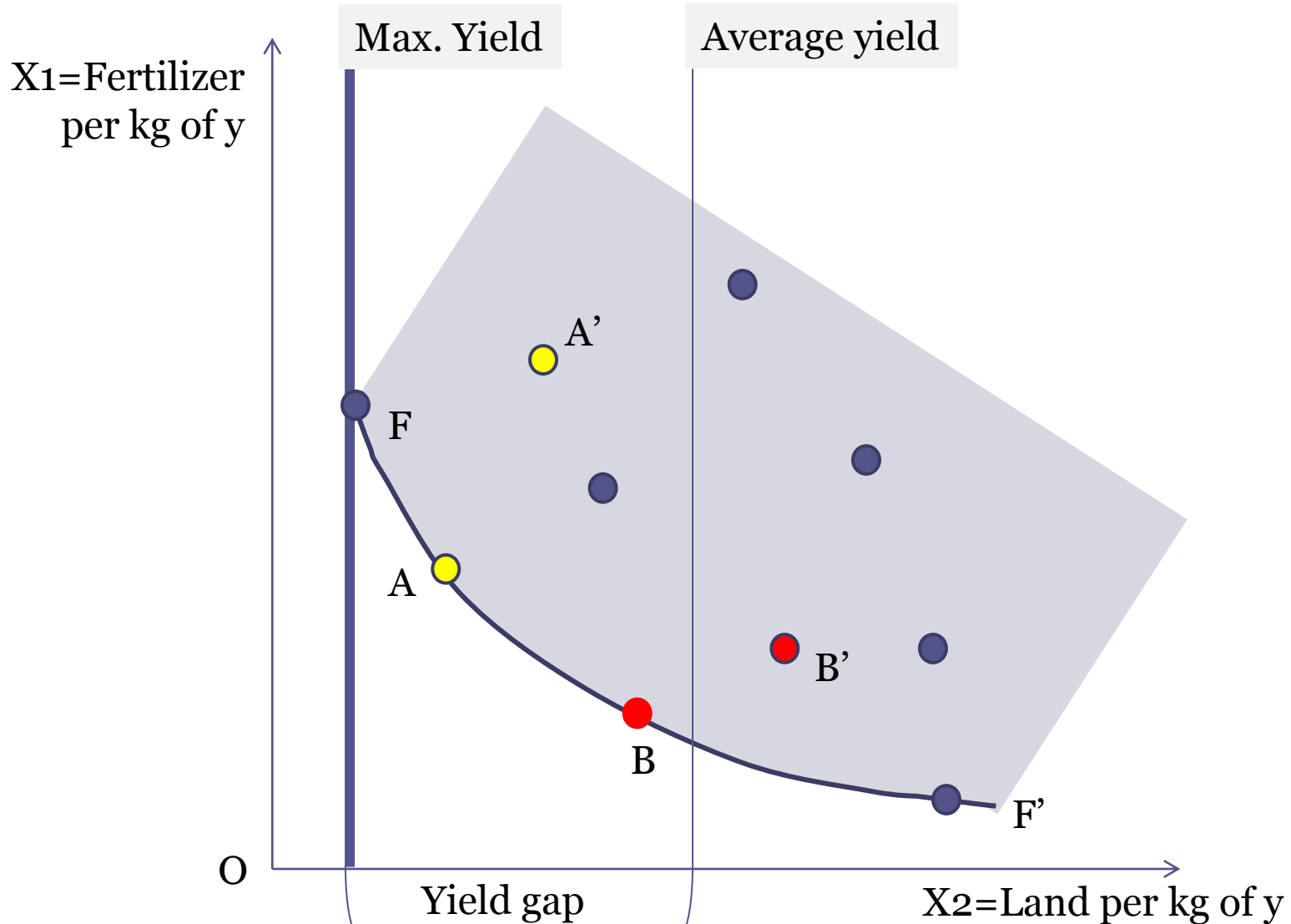
Technical efficiency



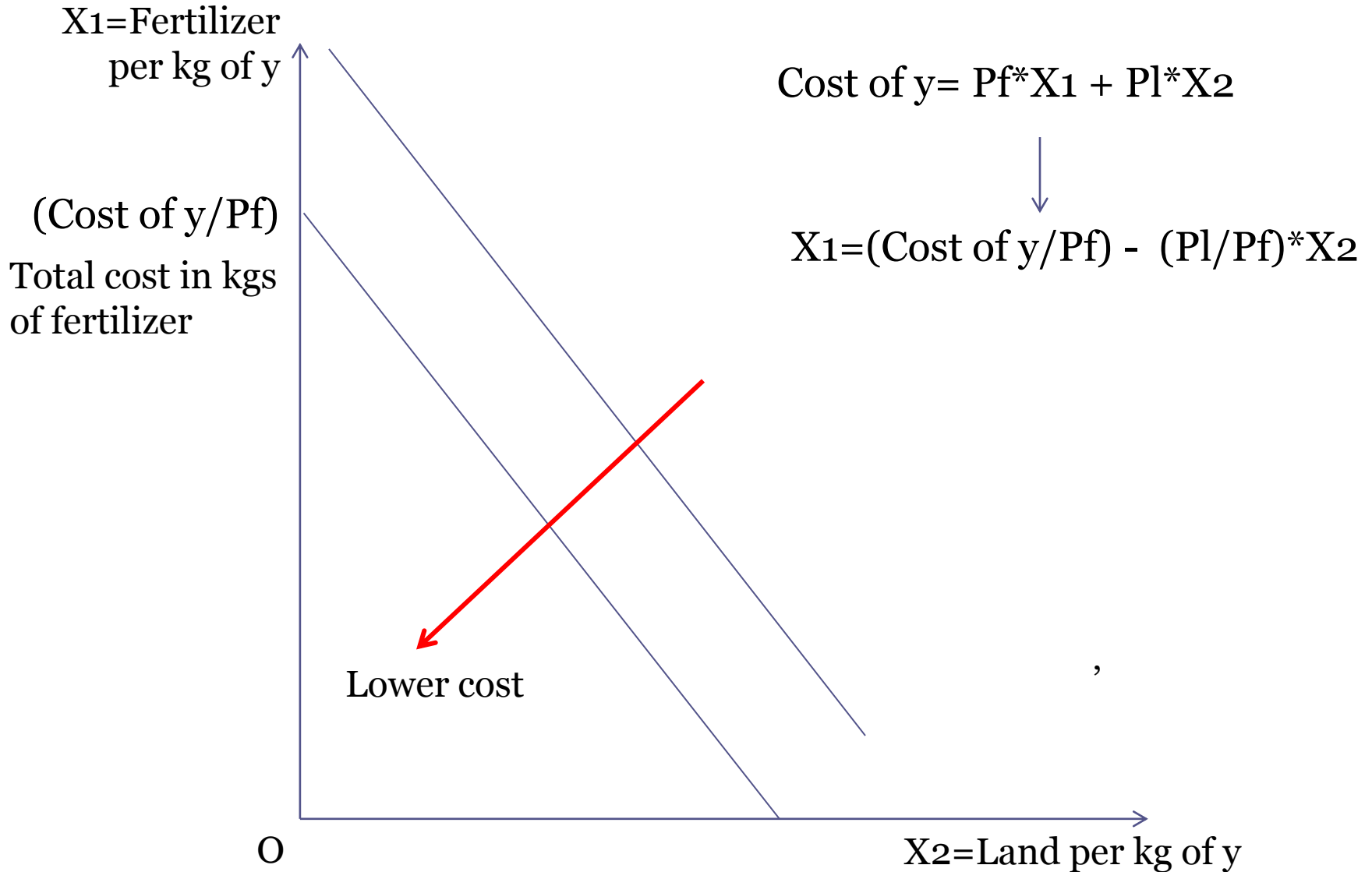
Efficiency change



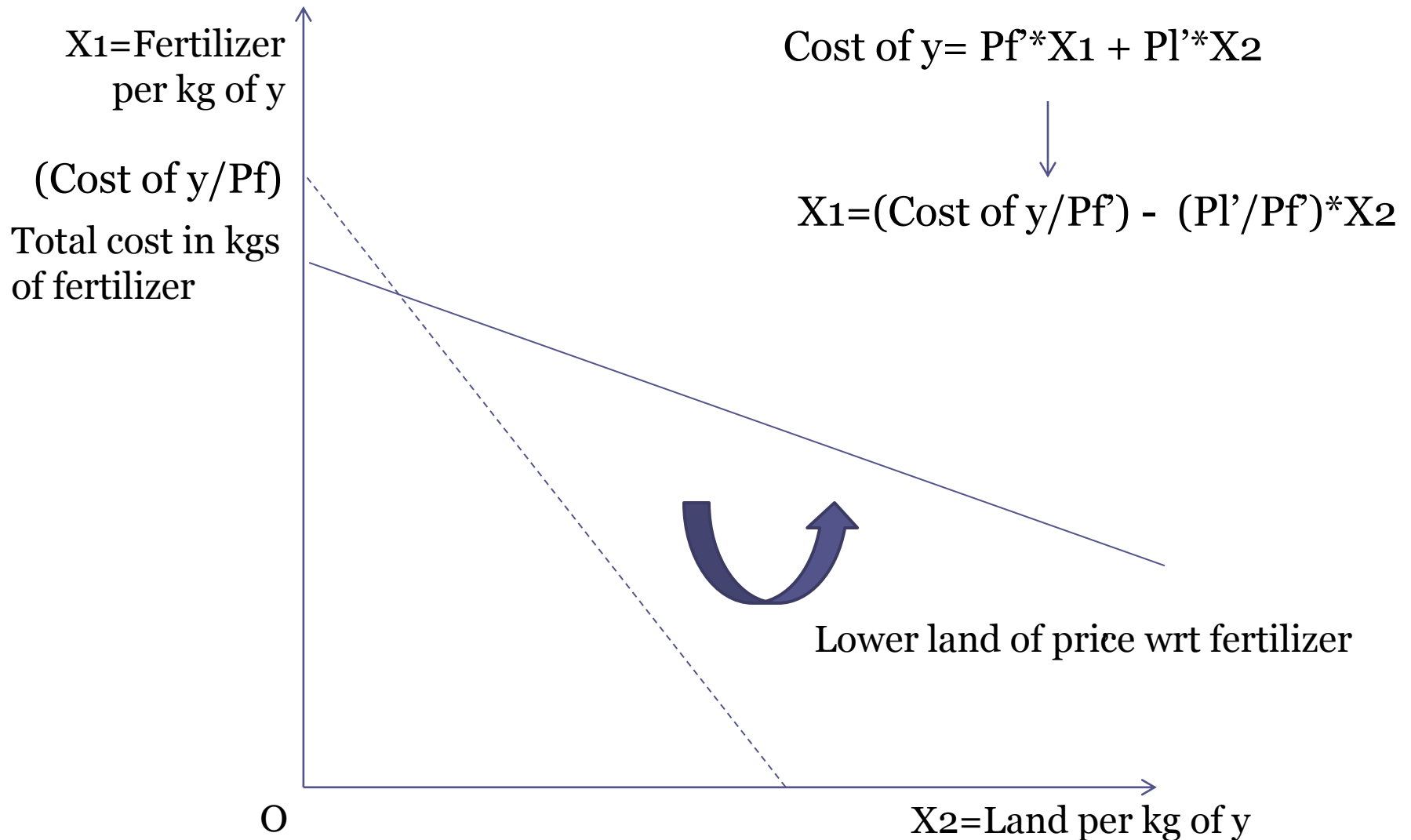
Yields and the yield gap



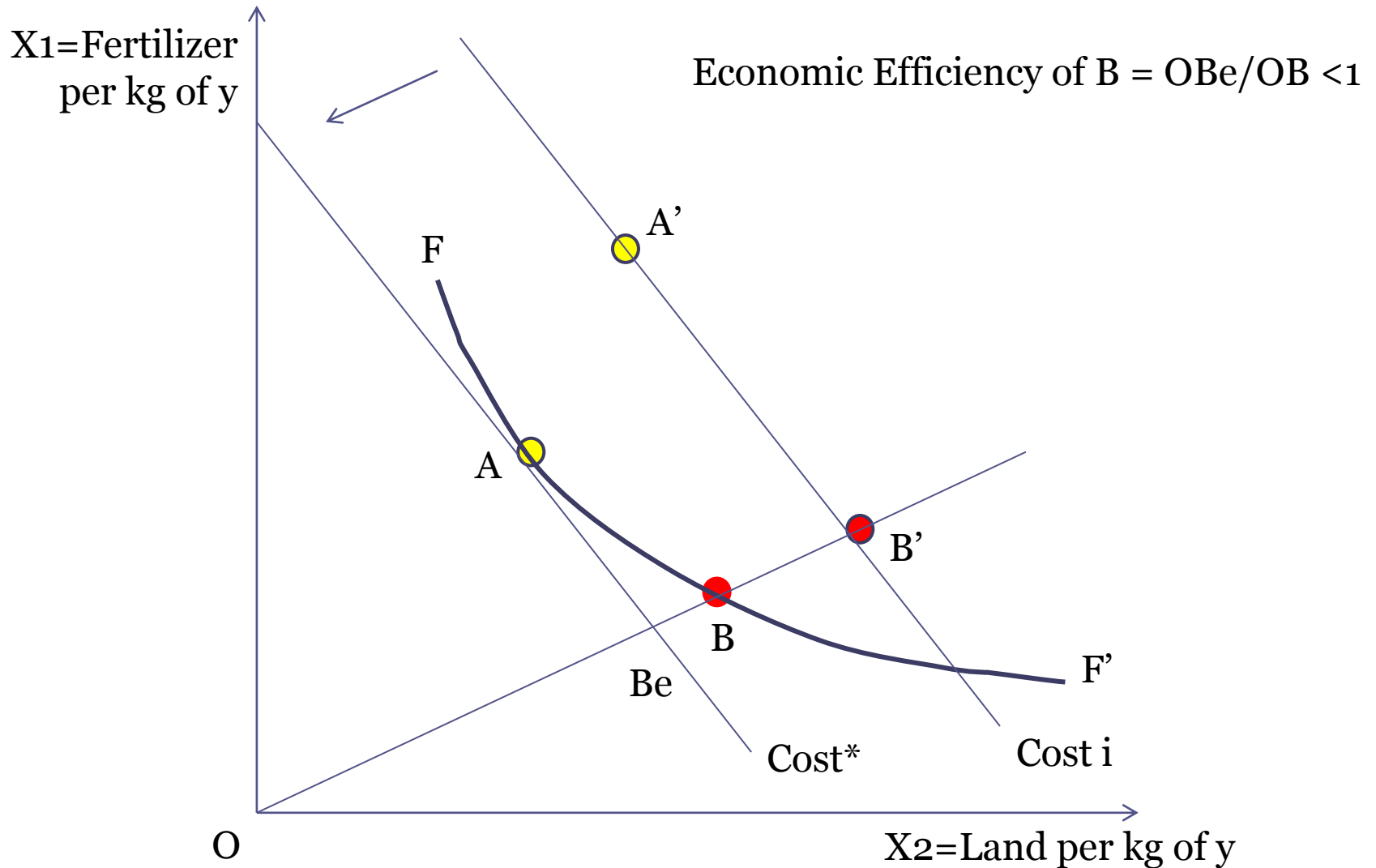
Economic efficiency



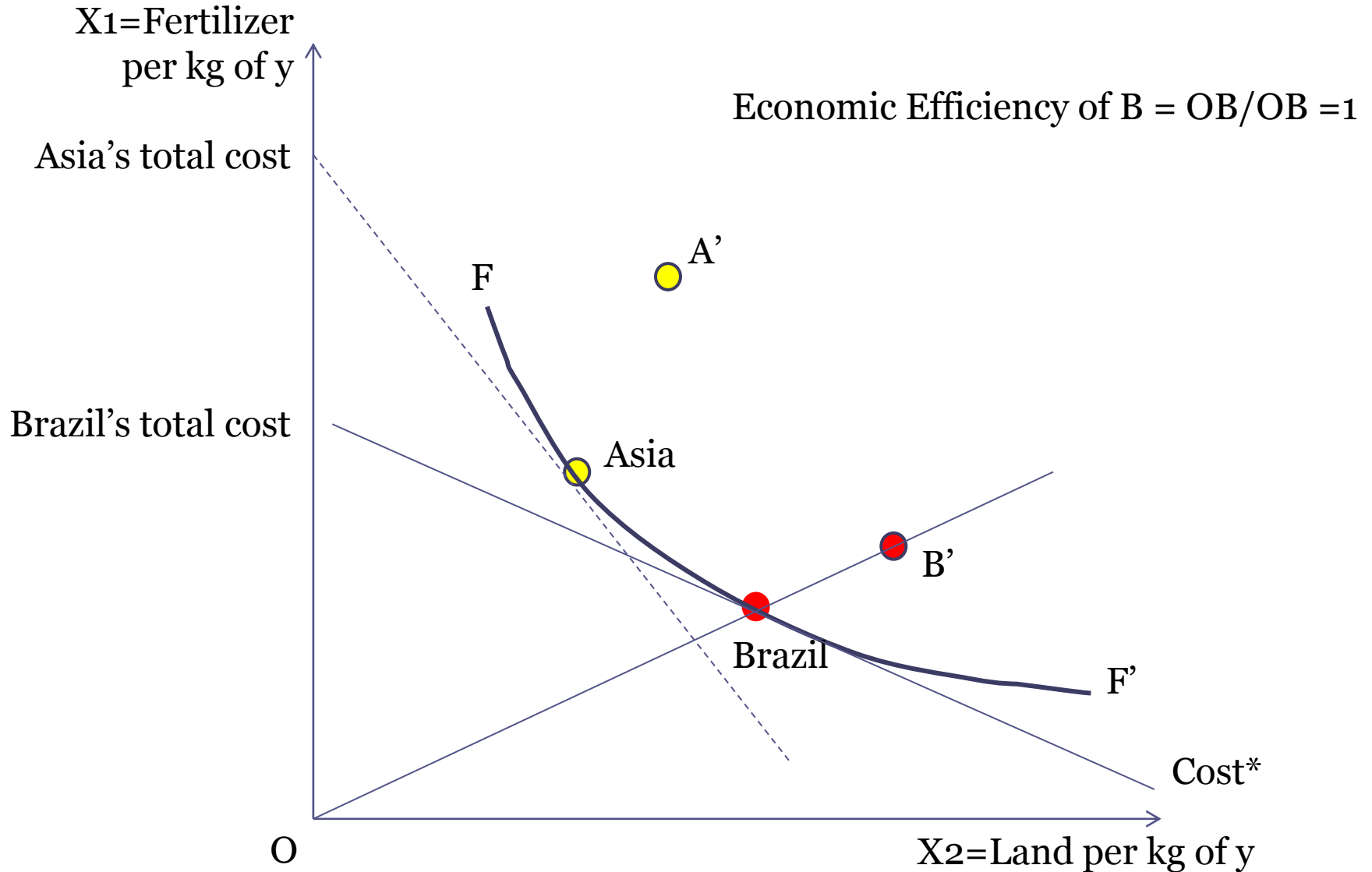
Economic efficiency: change in relative prices



Economic efficiency: South Asian prices



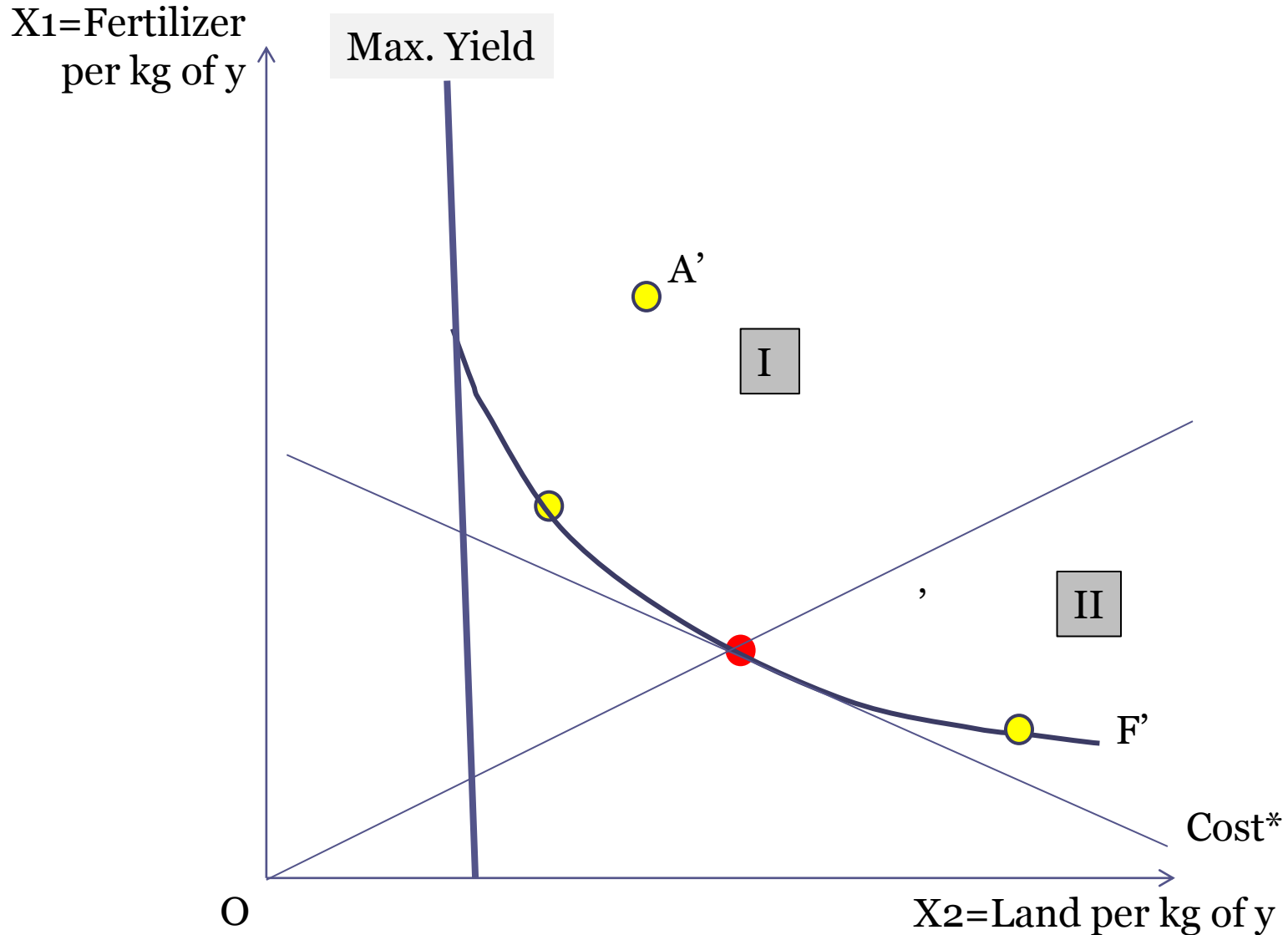
Economic efficiency: Brazilian prices



Implications

- What are the problems with this definition?
 - Natural resource use efficiency is the “optimum” or “minimum” amount of natural resource inputs used to produce a given quantity of output

Natural resource efficiency and the yield gap



Conclusions

- Partial measures of efficiency of natural resource use have similar problems to those of a partial productivity measure like “yield”
- Could be useful as a proxy indicator in particular cases:
 - Select the relevant indicator according to the problem at hand
 - Applied within homogeneous agroecological and economic conditions

Conclusions

- Ideally, total factor efficiency measures should be used
- E.g. the ***material balance condition*** (Coelli and others) is a multifactor measure that can be used to analyze a wide variety of situations.