

P externalities from EU agriculture – The impact of their internalization and P depletion on the use of organic P sources, emission reduction and markets

Nikolinka G.Shakhrmany, Daniel J.Lang

Institute of Ethics and Transdisciplinary Sustainability Research, University of Lüneburg, Germany



Motivation

P fertilizers are indispensable for agricultural practices and food security. Europe possesses only limited domestic phosphate rock reserves and depends to the large extend of phosphorus import thus vulnerable to disruptions in the supply of phosphate rock. At the same time, continuous P application in EU agricultural sector via imported fertilizers currently leads to losses both during food production and consumption. Environmental protection experts suggest that the introduction of taxes on pollution or extended producer responsibility may improve crop management, reduce nutrient losses within the agricultural sector and make P recycling economic valuable. To test this assumption, we use Agricultural sector model to analyze the effects of hypothetical tax on P externalities has on agricultural producers, consumers, and the environment in 23 EU and 4 international production regions. We quantify the effects using both current prices of mineral phosphorus fertilizers and higher prices, which are likely to materialize as phosphorus depletion continues.

Results

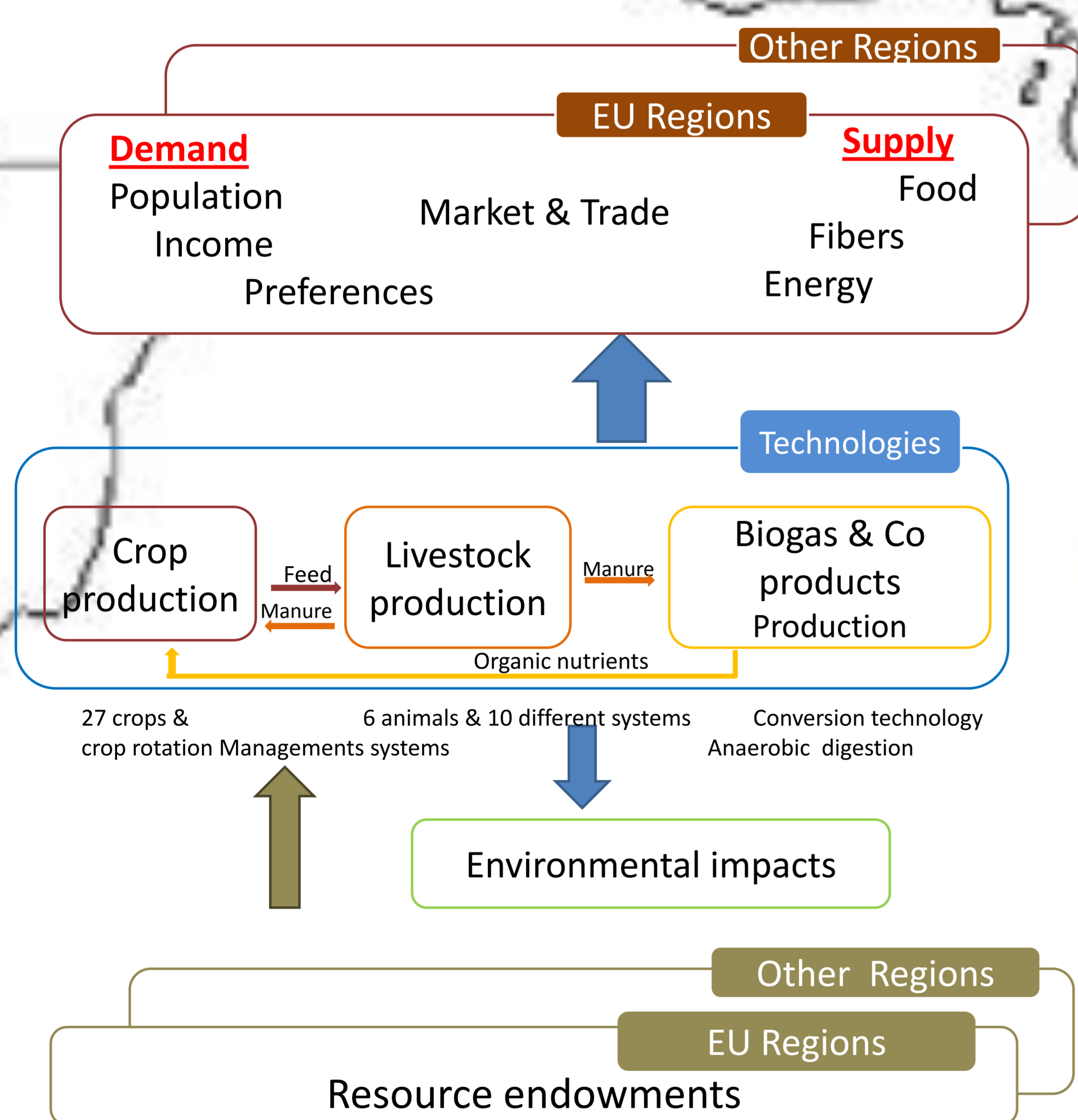


Figure 1 Effect of P prices and P externalities taxes on P emission. The values are relative to the current P emission

Table 1 Agricultural market and surplus changes in response to prices changes and externality taxation

Internalization of External P Fertilizers Cost					
Category		P Price 2007		P Price 2007x10	
		None	Taxes	None	Taxes
EU Crop Production	Fisher Index	100	96.5	92.6	92.1
EU Livestock Production		100	99.8	100.1	98.3
EU Crop Prices		100	107.1	105.5	111.8
EU Livestock Price		100	103.4	101.6	103.5
EU Exports		100	113.5	111.2	115.5
EU Producer Revenue Change		Billion EURO	0	-5.8	-6.5
EU Consumer Surplus Change	0		-3.8	-2.4	-5.3
Foreign Ag-Sector Surplus Change	0		-1	-0.7	-1.7

Agricultural Sector Model



The bottom-up design of a price-endogenous agricultural sector model of the EU allows to explicitly represent alternative fertilizer options which substitute phosphate rock based mineral phosphorous by organic phosphorous sources.

Conclusion

- Introduction to pollution pay taxes for P fertilizers may substantially reduce P emission.
- The higher cost for phosphate rock based fertilizers due to the resource depletion and externalities internalization will impact the share of renewable organic phosphorous from manure and biogas effluent.
- Substitution of the phosphate rock based fertilizers with organic phosphorous sources from manure and biogas effluent do not have substantial impacts on agricultural markets and welfare.
- Aggregated commodity price increases are minor. Commodity trade is largely unaffected. Increased agricultural production costs are transferred from farmers to consumers.