Role of Agriculture in Green Transition in Türkiye

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What would be the effect of green policies in agriculture at the macro level?

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Current state of Turkish agriculture

- Share of GDP: 6-7 (2021)
- Employment: 15-16% of labor force
- Structure: 1.5-2 million small/medium-scale farmers
- Environmental Impact: 12.3% of total GHG emissions

- Breakdown of agricultural emissions (2021):
 - 19.23 MtCO2: Enteric fermentation
 - 5.14 MtCO2: Fertilizer consumption
 - 16.87 MtCO2: Land use

Structural challenges

- Declining arable land, and land degradation
- Aging population as a demographic challenge
- Heavy reliance on fertilizers and increasing energy intensity

Energy and fertilizer use



- Energy consumption per area - · Fertilizer consumption per area

EU's strategy of green transition in agriculture

- Farm-to-Fork and Biodiversity strategies
- Targets for 2030:
 - Organic areas up to 25% of arable land
 - Biodiversity areas at 10%
 - 50 percent reduction in hazardous pesticides and anti-microbials

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- Reduction of nutrient loss by 50 percent
- Reduction in fertilizers by 20 percent

Effects of EU Strategies

- Macro effects based on general or partial equilibrium analysis: Beckman et al. (2020), Barreiro-Hurle et al. (2021), Bremmer (2021), Henning (2021).
- Wide ranging effects depending on the extent of adoption outside the EU, products and regions.
- **Common findings**: Fall in agricultural output, higher prices, reduced competitiveness of EU, greater need for imports.
- Assuming no change in technology and food regime.
- Negative effects are less pronounced in the case of global adoption.

Data and methods

- We use a CGE model to simulate the effects of several green policy alternatives
- Based on 2021 macroeconomics balances with detailed focus on carbon emissions
- Data sources: Global Trade Analysis Project & Turkiye's 2012 IO table
- Includes 31 sectors, most of which are agricultural sectors
- Distinguishes fossil fuel energy sources explicitly
- Base year 2014 is the benchmark for the policy scenarios.

Policy scenarios

- Scenario 1: Reduced use of chemicals by 50 percent
- Scenario 2: Scenario 1+ Carbon tax at 10 percent
- Scenario 3: Scenario 2+ Reduced fossil fuel use + increase in productivity by 1 percent

Aggregates

Macroeconomic Aggregates (Millions US\$)				
		Ratios to Base Equilibrium		
	Base Equilibrium	Scenario 1	Scenario 2	Scenario 3
Real Output (Millions US\$)				
Agriculture	55,241.0	0.983	0.968	1.141
Industry	538,025.7	0.997	0.960	0.945
Services	898,400.7	0.999	0.996	0.992
Index Total Employment (Thousand persons)				
Agriculture	100.00	98.96	98.71	107.95
Industry	100.00	99.99	98.70	97.31
Services	100.00	100.10	100.47	99.96
Total Rural Income (Millions US\$)	31,657.8	1.016	1.006	1.107
Average Wage Rate Index	1.00	1.00	0.99	1.00
Average Profit Rate Index	1.00	1.00	0.99	1.00
Total GDP	798,536.3	1.000	1.000	1.006
Pivate Disposable Income	672,666.4	1.000	1.000	1.006
Aggregate Investment	165,487.5	1.000	1.000	1.004
Aggregate Private Consumption	566,472.8	0.999	0.995	0.999
Aggregate Government Consumption	125,869.9	1.000	0.998	1.007
Public Sector Revenues	280 476 9	0 000	1 016	1 019

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Environmental responses

Environmantal Indicators				
	Base			
	Equilibrium	Scenario 1	Scenario 2	Scenario 3
Index of Chemicals Use In Ag-Sectors	100.00	50.00	50.00	50.00
Total CO2 Energy Related (Mill Tons)	260.183	259.575	227.929	216.368
Total CO2/GDP(kg/\$GDP)	325.825	325.162	285.503	269.463
CO2 Emissions in Agriculture (Mill tons)	9.937	9.793	8.250	7.933
CO2 Emissions in Industry&Services (Mill tons)	250.246	249.782	219.680	208.435
CO2 Emissions Intensity in Agriculture (kg/\$)	179.9	180.4	154.3	125.9
CO2 Emissions Intensity in Industry&Services (kg/\$)	174.2	174.1	155.7	148.9
Total CO2 Taxes (Millions US\$)			6,252.43	5,901.411
Total CO2 Taxes to GDP			0.008	0.007
Marginal Abatement Cost of CO2 taxes in US\$ per ton			0.194	0.135

Output in sub-sectors in agriculture

Paddy rice	100.000	99.425	99.340	104.424
Wheat	100.000	99.741	100.056	103.462
Cereal grains nec	100.000	99.660	99.795	103.178
Vegetables, fruit, nuts	100.000	97.880	96.910	108.823
Oil seeds	100.000	98.748	98.373	110.542
Sugar cane, sugar beet	100.000	99.995	100.487	100.828
Plant-based fibers	100.000	96.758	94.496	97.853
Crops nec	100.000	94.691	92.469	202.946
Bovine cattle, sheep and goats	100.000	100.052	100.487	101.844
Animal products nec	100.000	99.969	100.364	105.330
Raw milk	100.000	100.105	100.693	100.670
Wool, silk-worm cocoons	100.000	96.042	87.301	157.325
Forestry	100.000	100.041	99.740	99.834
Fishing	100.000	100.074	99.976	103.313

Rethinking agricultural policy

- Integrate productivity gains with strategic input reduction
 - Start with optimizing current chemical and energy use
 - Systematic effort towards transformative practices: Regenerative agriculture, reduced tillage systems, smart farming technologies, expanded organic and biodiversity zones
- Investment can be financed with carbon tax
- Should also integrate **industrial policy** to avoid the rise in labor costs
- Requires a policy reversal towards **rural revitalization**: Invest in education, health, transport, so that young and skilled people remain.