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# **Mitigating Land Use Changes from Biofuel Expansion: An Assessment of Biofuel Feedstock Yield Potential in APEC Economies**

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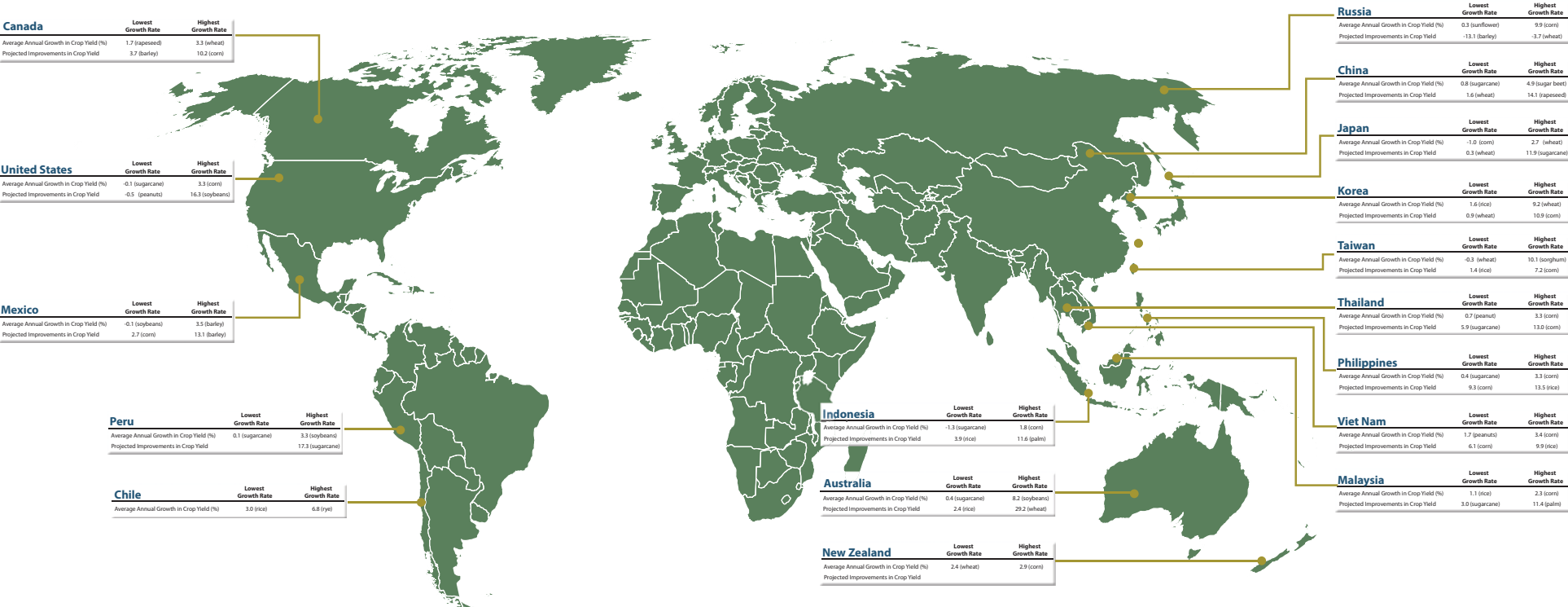
Introduction

**BIOFUELS EXPANSION GREATLY** impacts world agricultural markets, since the primary feedstocks for ethanol and biodiesel production are field crops and their derived products.

The expansion of biofuel sectors can be achieved in two ways: land extensification and/or land intensification. Since the former comes with a number of environmental challenges, land intensification through yield growth, is generally seen as one of the critical factors for sustainable development of biofuels and mitigation of land use changes.

Thus, it is essential to gain a better understanding of the yield trends and the future yield potential of biofuel feedstocks to help determine the impact of biofuel expansion on agricultural markets.

The aim of this analysis is to review and analyze historical and projected trends of crop yields, particularly for crops used in biofuels production (see map). Based on this analysis, we draw conclusions regarding the yield potential of biofuel feedstocks in APEC economies.<sup>1</sup>



Conclusions

**IN TERMS OF FIRST-generation** biofuels, yield growth is imperative for the long-term potential for biofuel expansion if land extensification is to be minimized.

Biofuel expansion may imply increased land use for feedstock production in the medium term, but growth in feedstock yields will tend to mitigate the impact on crop prices and land use over the longer term.

APEC economies have the capability and the capacity to increase feedstock yields for biofuel production, particularly the economies that have relatively lower yield levels and are further away from their yield plateau levels.

This requires targeting yield-enhancing activities including investments in agricultural R&D, better farm practices, extension services, and increased input use.

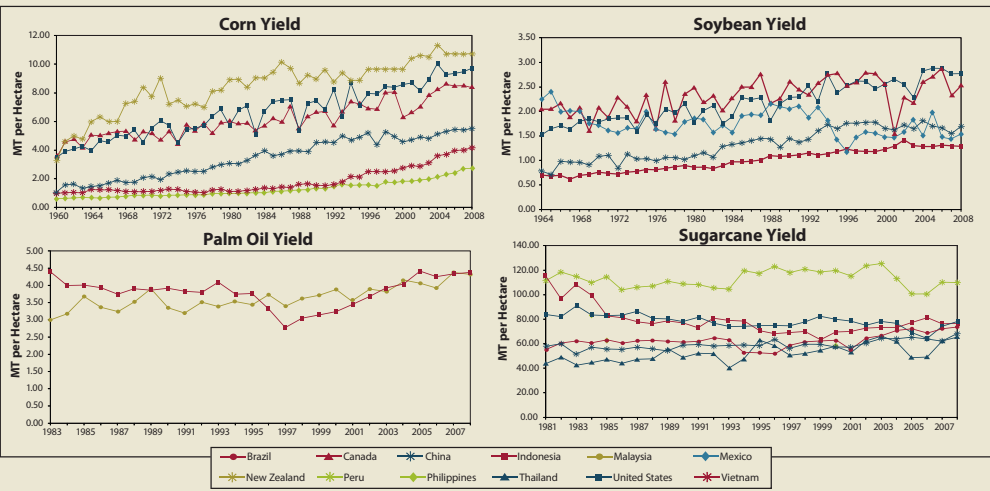
Countries could also provide incentives, such as tax reductions, government payments, and input subsidies, which have proven to be successful in inducing farmers to invest in yield-improving technologies.

Results

**COMPARING AVERAGE ANNUAL** growth in crop yields across APEC economies and across crops, we find that the crop yield growth rates vary significantly (see graph, right). An economy, like the United States, which already has high yield levels for the majority of crops, experiences relatively lower yield growth rates relative to other economies. On the other hand, economies like Philippines and Malaysia have relatively lower corn yields but high yield growth rates, which indicate a higher potential for increasing crop production through yield increases rather than land expansion.

Yield growth rates for most crops in most APEC economies fall in the lower to medium range although there is significant variance in yields among the economies.

We also compute yield elasticities with respect to a time trend variable for the major crops in APEC economies. For most, but not all, APEC economies, the coefficient estimates are statistically significant. There is wide variation in the magnitude of the elasticities among economies and crops, some even with a negative elasticity (see table, right).



Crop Yield Elasticities with Respect to Trend for APEC Economies								
Economy	Sugarcane	Corn	Wheat	Sorghum	Rice	Sugar Beet	Rapeseed	Soybeans
Australia	0.15	0.70	0.30	0.44	0.41	0.43	0.49	0.52
Brunei					0.23	0.60		
Canada		0.49	0.46			1.08	0.45	0.27
Chile		0.87	0.79		0.57		0.66	
China	0.48	0.85	0.83	0.92	0.68		0.78	0.55
Hong Kong						0.50		
Indonesia	-1.20	0.62			0.64			0.49
Japan	-0.10	-1.84	0.41		0.24		0.06	0.24
Republic of Korea		0.94	0.41	0.93	0.40		0.47	0.61
Malaysia	0.69	0.27			0.34			
Mexico	0.19	0.78	0.61	0.36	0.59	-0.11	0.59	-0.14
New Zealand		0.47	0.59				0.52	
Papua New Guinea	0.35							
Peru	-0.32	0.44	0.29	-1.07	0.46	0.50		0.39
Philippines	0.08	0.82			0.71			0.49
Russia		0.19	0.15		0.25		0.36	0.03
Singapore								
Taiwan		0.69		0.40	0.36	0.25		
Thailand	0.34	0.51		-0.04	0.37	0.43		0.44
United States	-0.24	0.57	0.39	0.32	0.43	0.60	0.11	0.42
Viet Nam	0.40	0.79	0.30		0.67	1.08	0.49	0.67

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