

Welfare Implications of Mexico's Decision to Phaseout GM Maize Imports

Diego Maximiliano Macall, William Kerr, Stuart Smyth

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Introduction

- On December 9th 2020, a draft decree calling for the phase-out of both glyphosate and genetically modified (GM) maize was made public in Mexico (GAIN, 2020).
- On December 31st 2020, (22 days later!), the draft became a Presidential Decree (SEGOB, 2020). Maize will now be produced through agroecology and GM maize is banned.
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- Does this mean GMO maize at any point of the supply chain?

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Introduction

- Yellow maize is the **principal** ingredient in animal feed produced in Mexico, and practically all of it is imported from the US, where the adoption of GM maize is at **near full** (CONAFAB, 2021; ERS, 2021).
- Mexico has a complex relationship with GM Maize.
 - Quist and Chapela (2001) study found transgenes.
 - The Commission for Environmental Cooperation (CEC, 2004) found that living GM maize enters Mexico through imports, but it may also be carried by migrant workers returning from the US.

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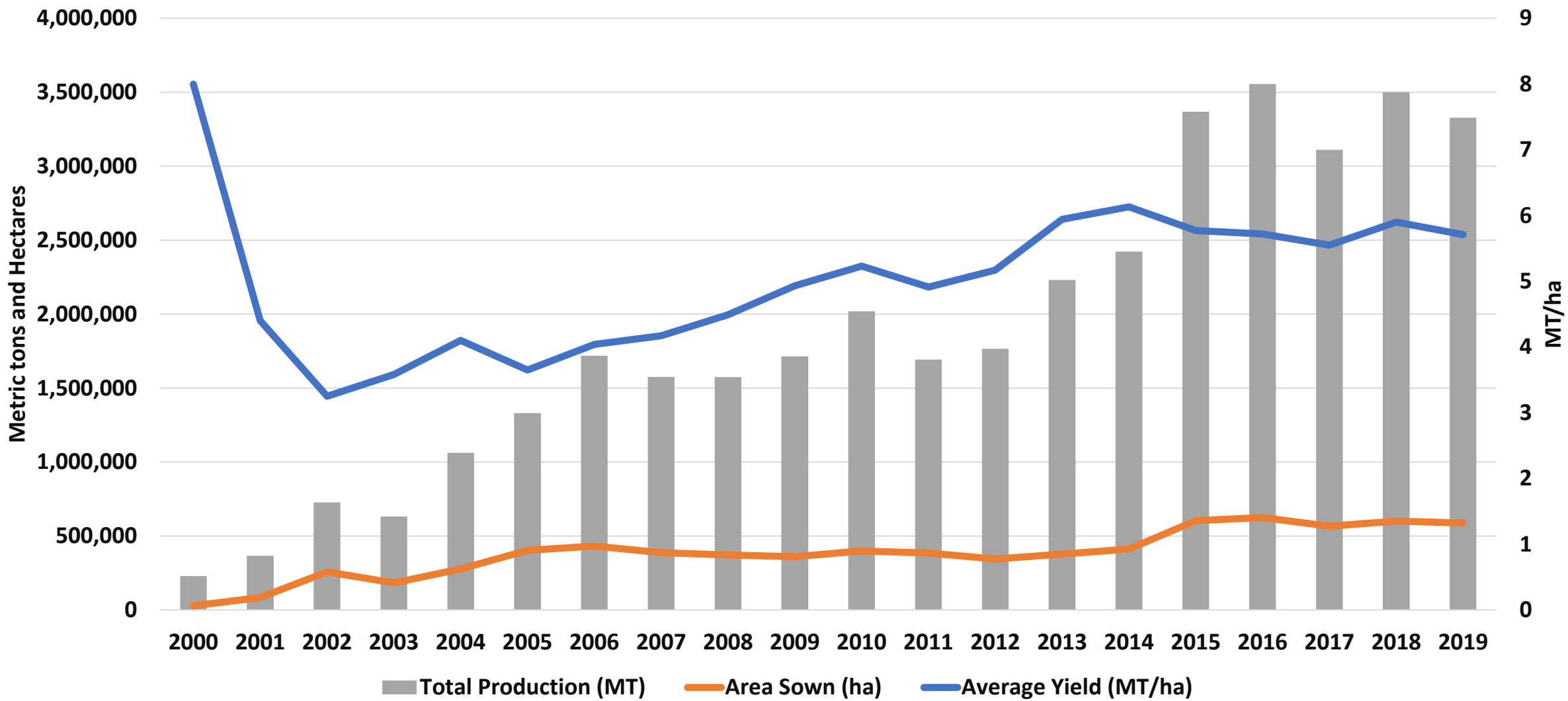
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What is the economic impact of this policy?

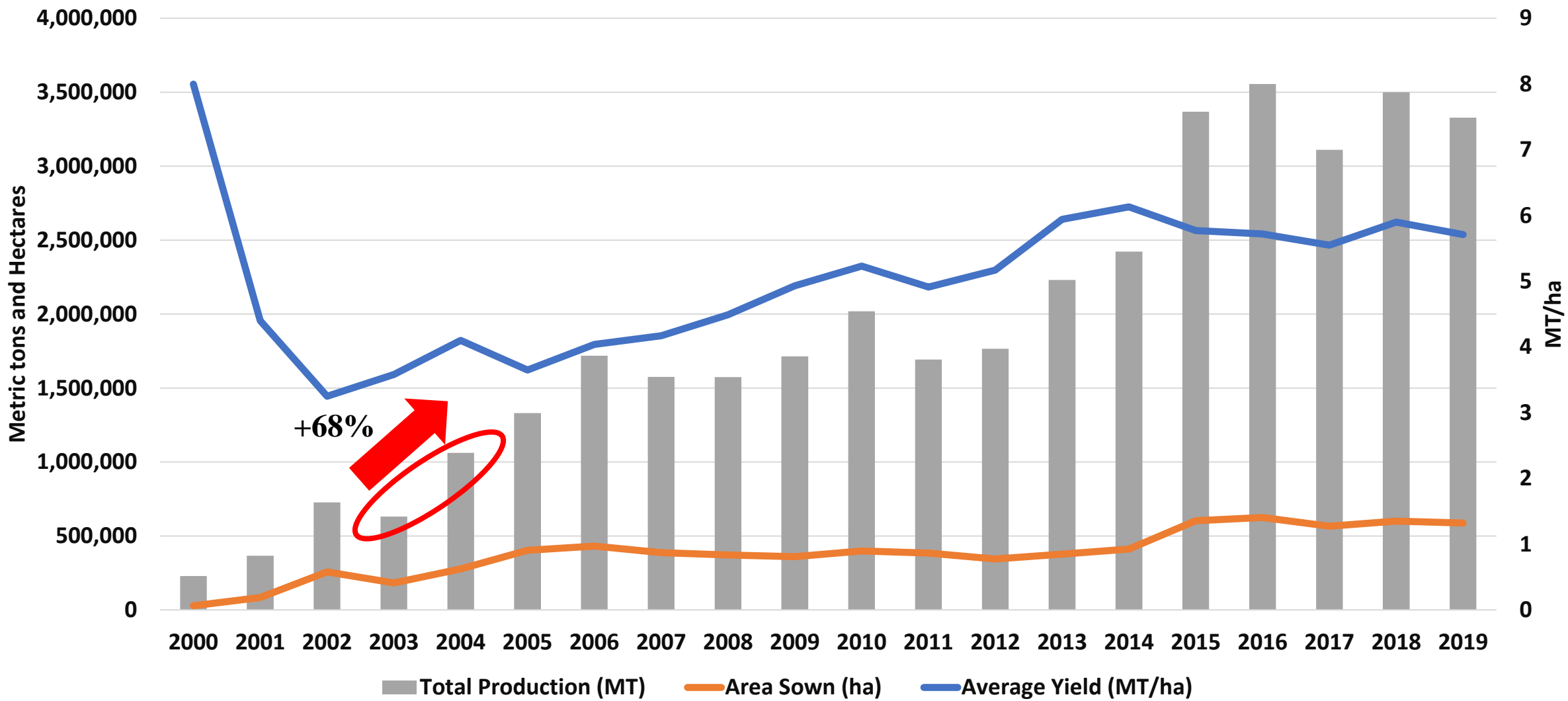
- Our approach:
 1. We use a *partial equilibrium* framework to measure the *welfare* generated by yellow maize trade between Mexico and the US over the last 20 years.
 2. We use the *economic surplus* method to project the *welfare* change from Mexico's decision to substitute conventional maize production with agroecological maize production.

Mexican Yellow Maize Sector

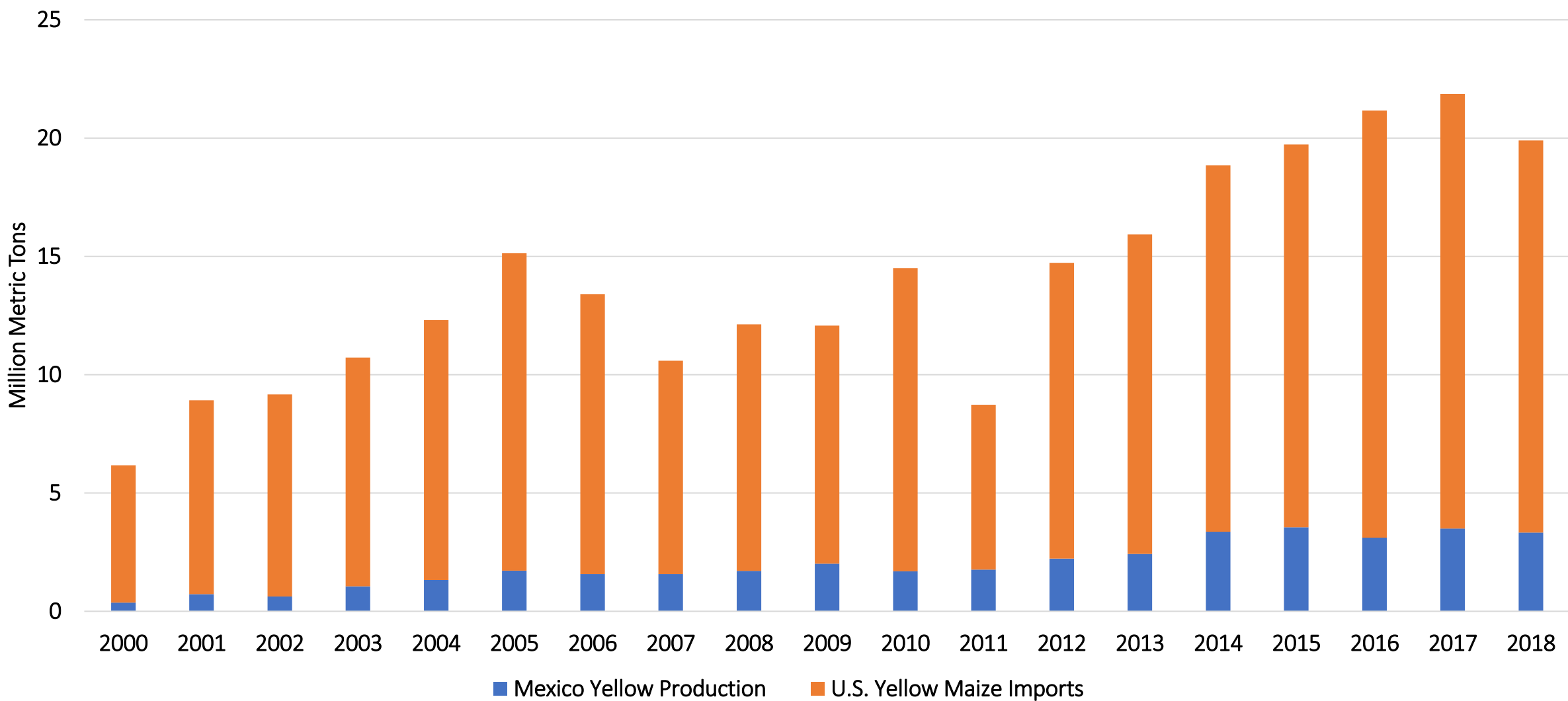
Mexican yellow maize production, area sown, and yield, 2000-2019



Mexican yellow maize production, area sown, and yield, 2000-2019



Mexican yellow maize imports, 2000-2019



Source: ERS (2021) & SIAP (2021)

Implications of agroecology adoption

- On average 384,000 ha are planted annually with yellow maize in Mexico.
- 20-year average yield is 5 MT/ha through conventional ag.
- With conventional ag 2.35 M ha will need to be planted annually (+512%).
- With agroecology, -31% yield, 3.95 M ha will need to be planted annually (+761%).

Mexican yellow maize production cost structure

Cost component	Conventional yellow maize	Agroecological yellow maize
Land Preparation	\$154	\$154
Planting	\$217	\$217
Fertilization	\$407	\$0
Plot management	\$118	\$118
Irrigation	\$610	\$610
Pest management (insects, weeds, diseases)	\$217	\$415
Harvest	\$133	\$133
Incidentals	\$129	\$129
Cost per MT	\$1,985	\$1,776

Source: Adapted from FIRA (2021).

Note: Prices are in USD at 2010 nominal USD/Peso exchange rate.

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Assumptions of Parameters Used

Parameter	Scenario 1	Scenario 2	Scenario 3
Initial Equilibrium Price	191	191	191
Agroecology Maize Seed Price	0	0	0
Equilibrium Quantity Metric Ton	13,636,908	13,636,908	19,899,882
% Change in Demand per year	0	1	0
Current Yield (MT/ha)	5	5	5
% Yield Increase	-31	-31	-31
% Cost Reduction	10.5	10.5	10.5
Supply Elasticity (ε)	0.22	0.22	0.22
Demand Elasticity, absolute value (η)	0.12	0.12	0.12
Initial Adoption Level (%)	100	100	100
Maximum Adoption Level (%)	100	100	100
Lag to maximum Adoption Level (years)	0	0	0

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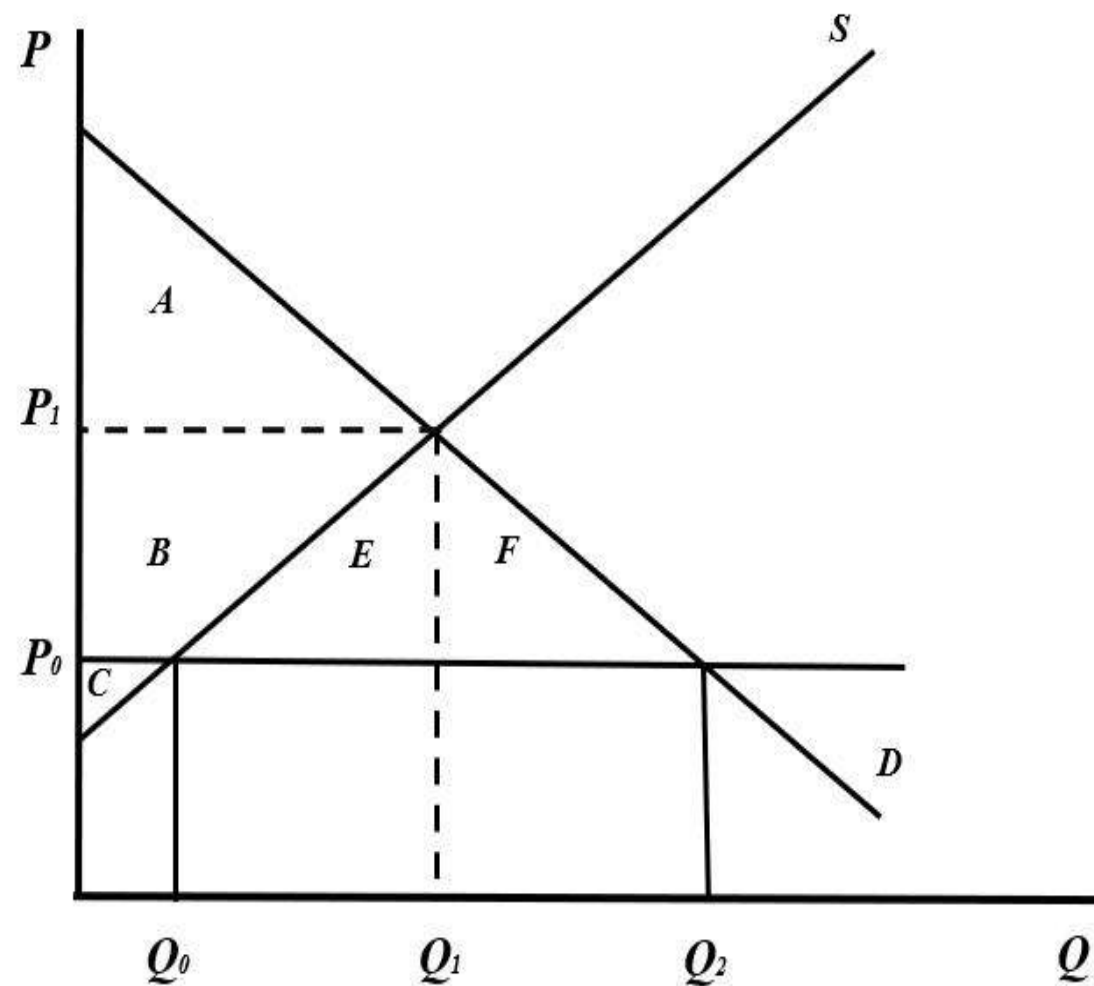
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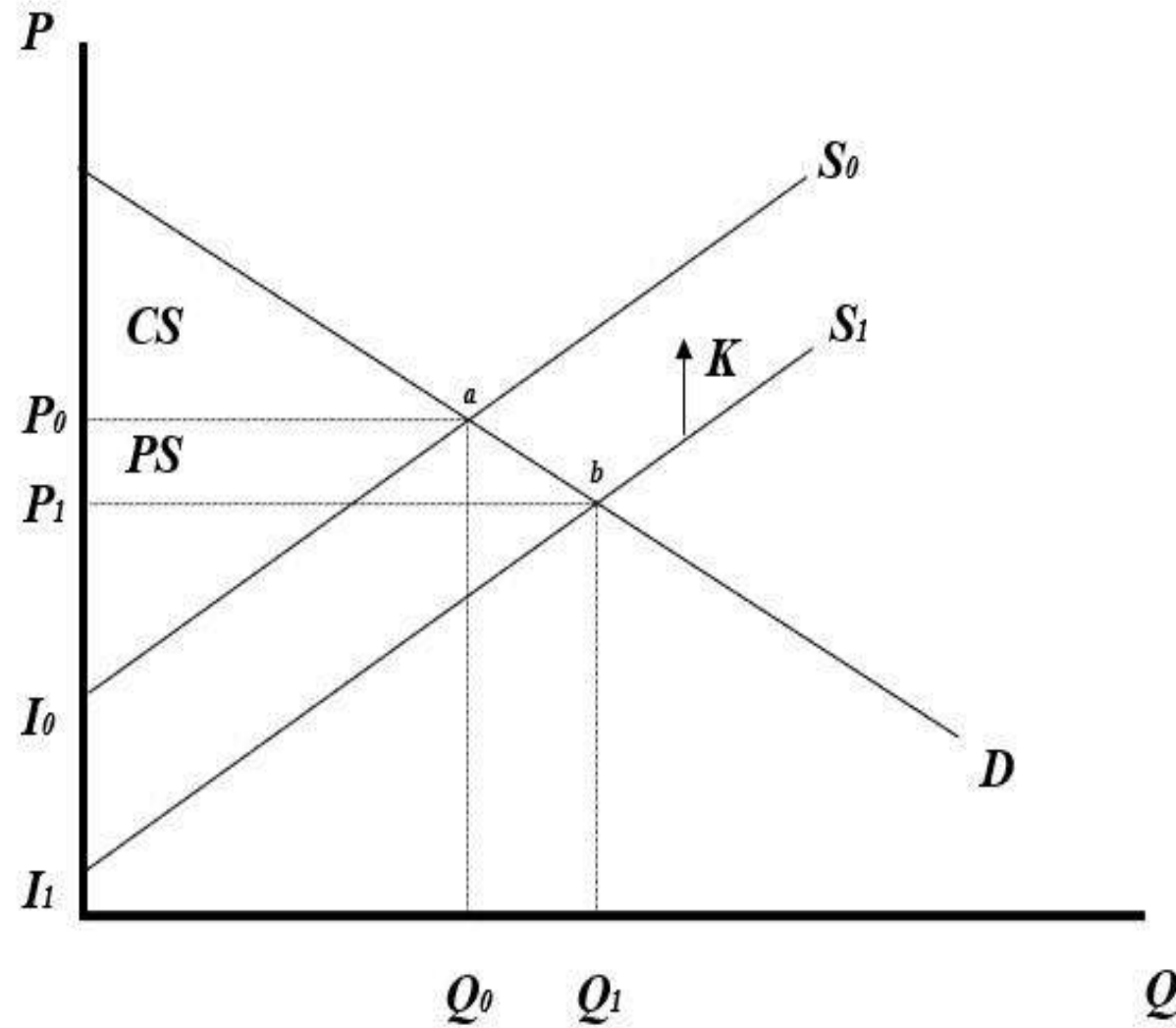
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Methodology

Mexican yellow maize market



Mexican decision to implement agroecology



Surplus Distribution Model

- $\Delta PS = P_t Q_t (K_t - Z_t) (1 + 0.5 Z_t \eta)$
- $\Delta CS = P_t Q_t Z_t (1 + 0.5 Z_t \eta)$
- $K_t = \{[E(Y)] / \varepsilon - [E(C)] / [1 + E(Y)]\} p A_t (1 - \delta_t)$
- $Z = K\varepsilon / (\varepsilon + \eta)$

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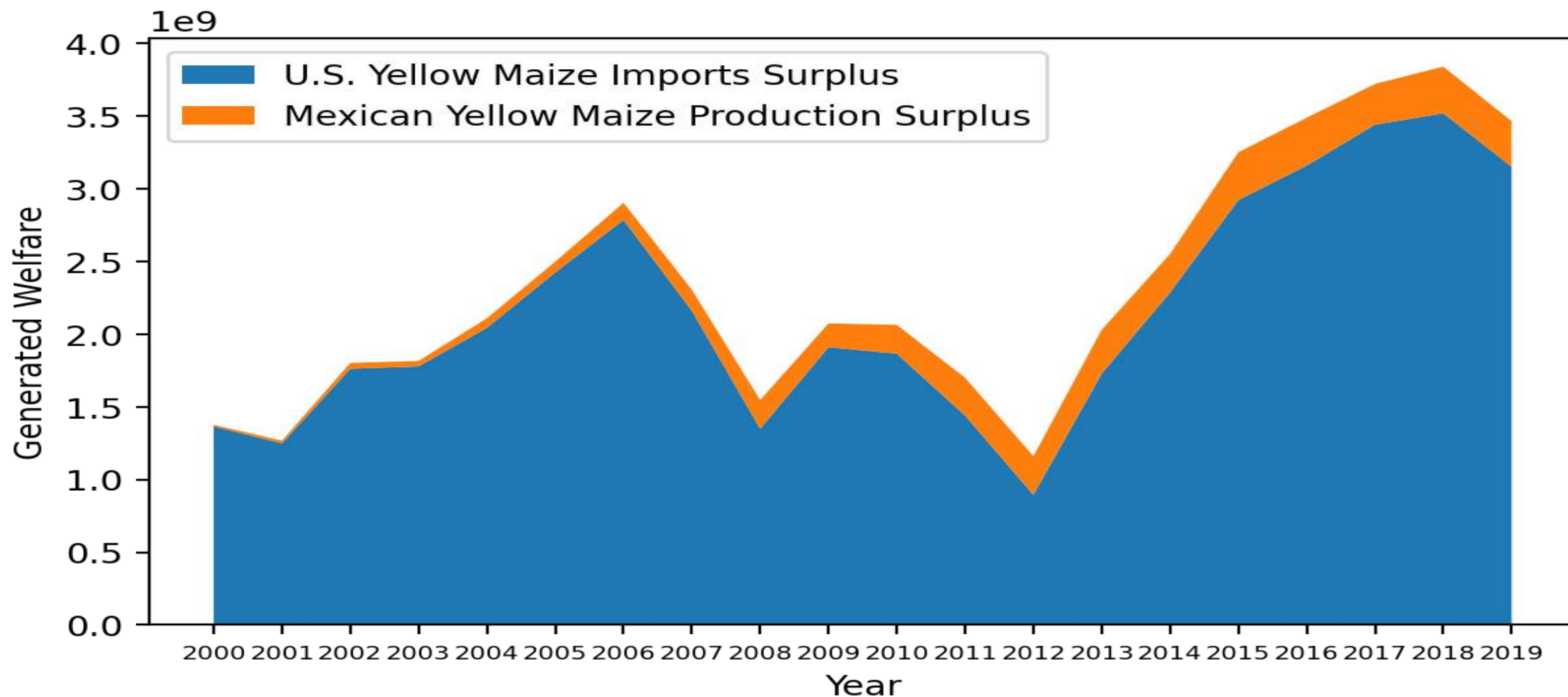
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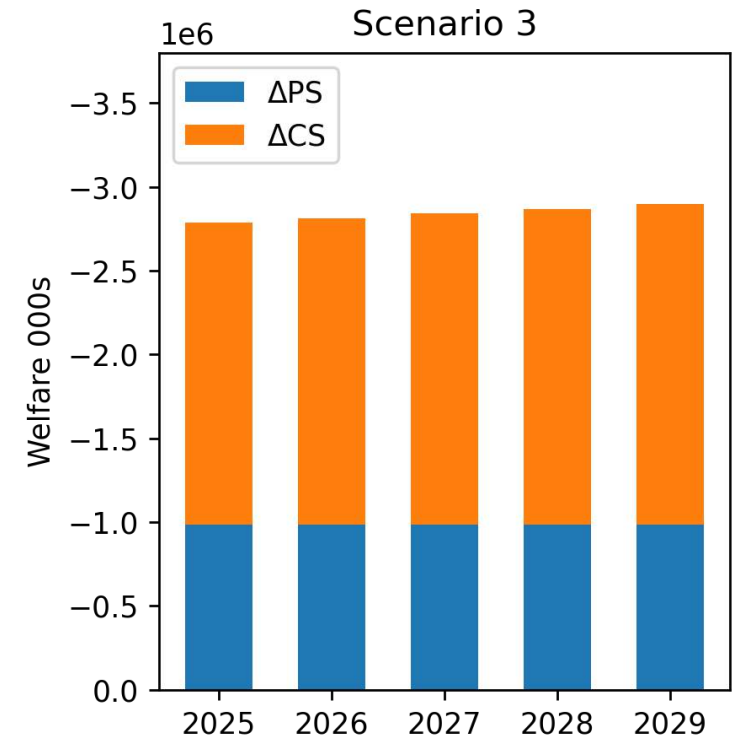
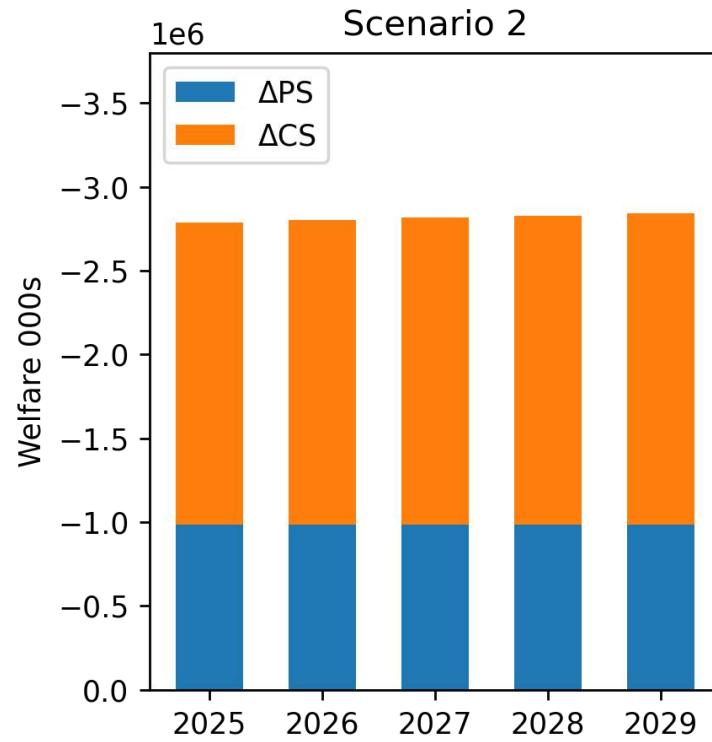
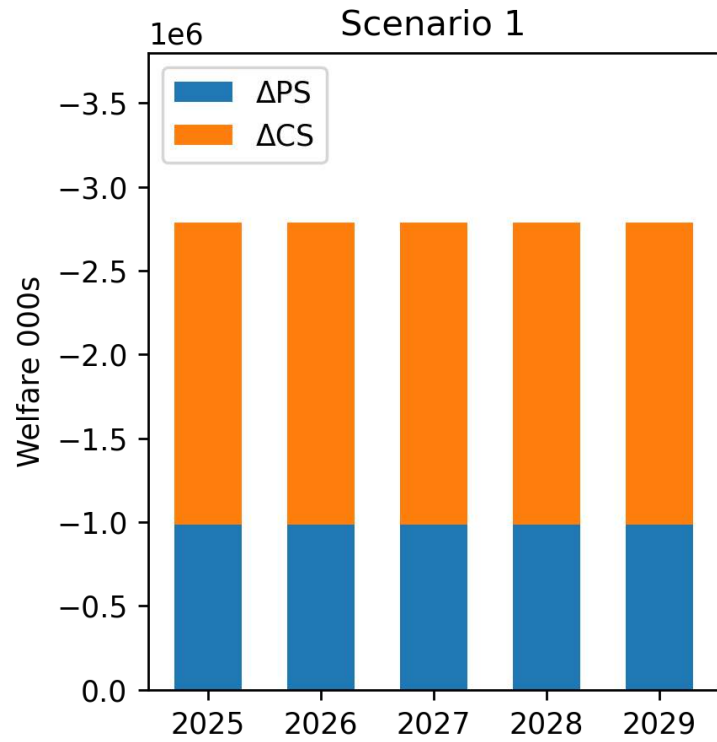
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Results

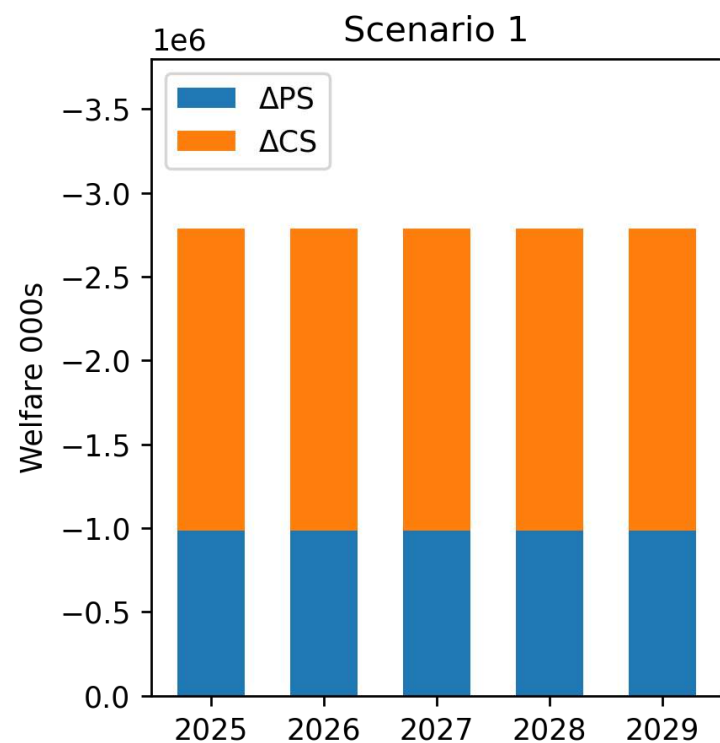
Mexican yellow maize production and imports surplus (2000-2019)



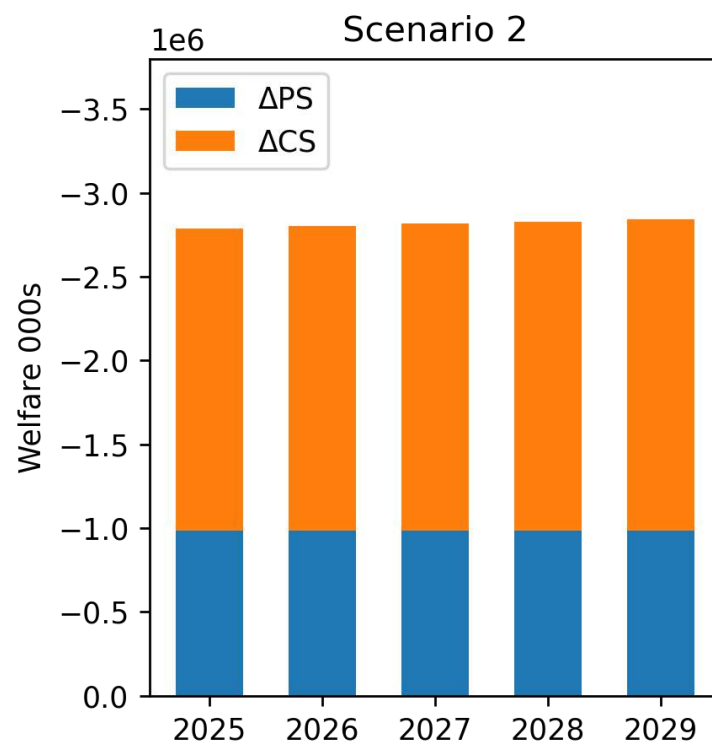
Economic surplus from agroecology adoption results



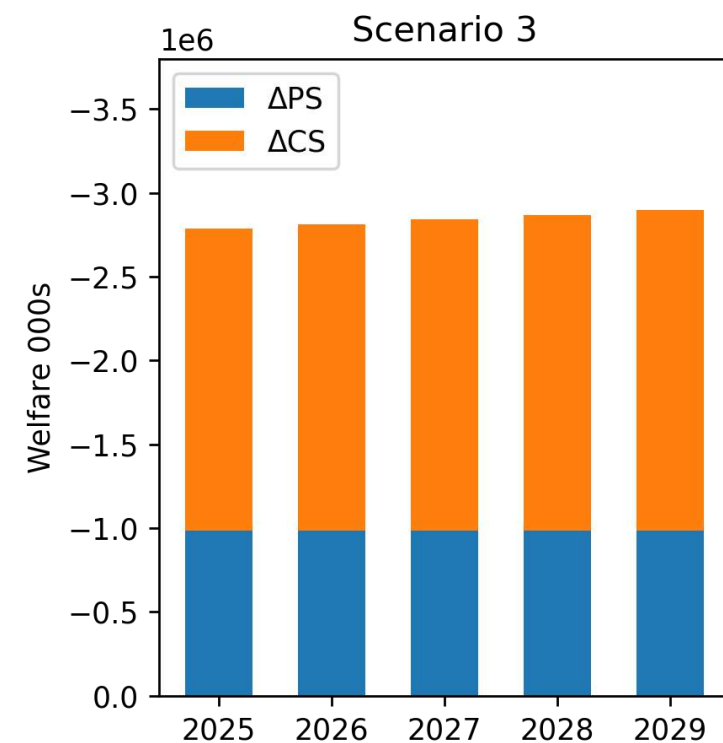
Economic surplus from agroecology adoption results



-12%

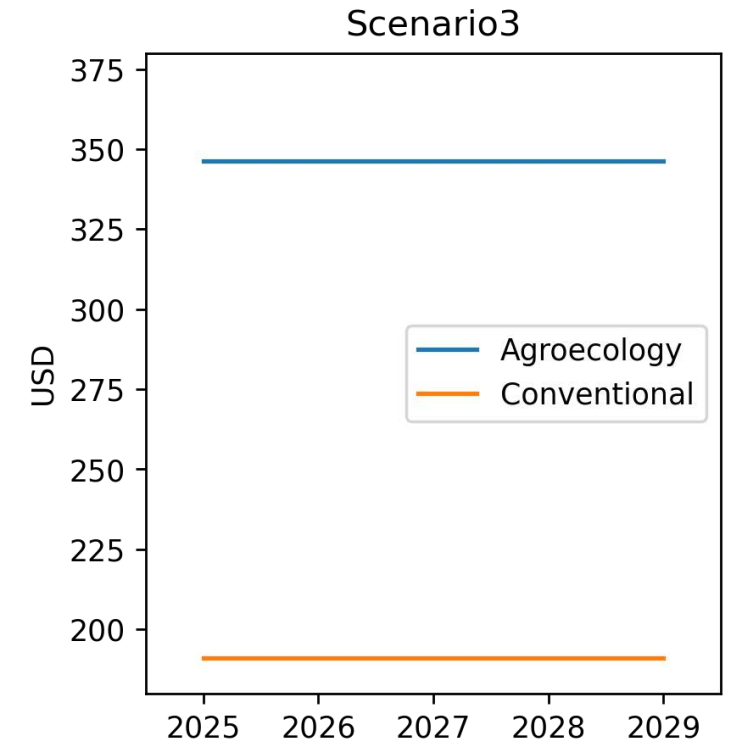
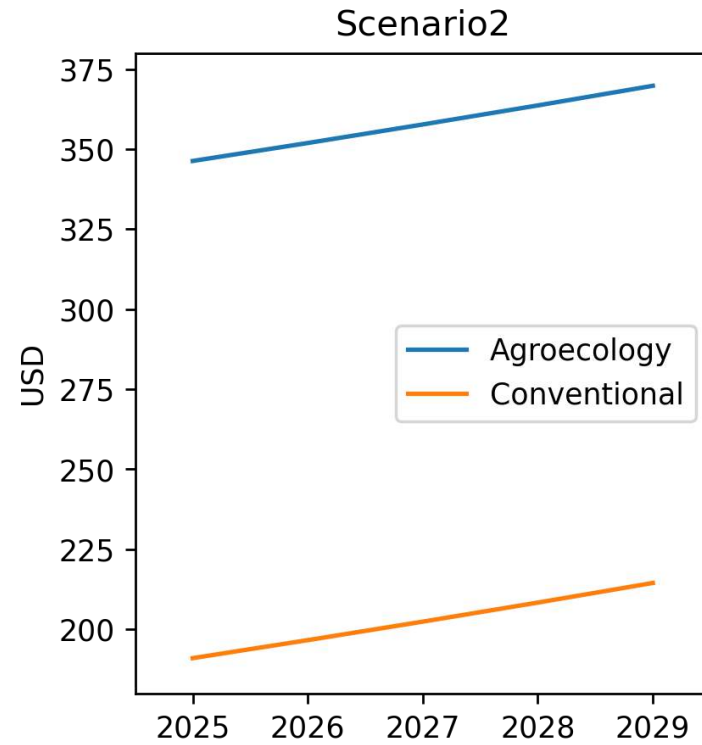
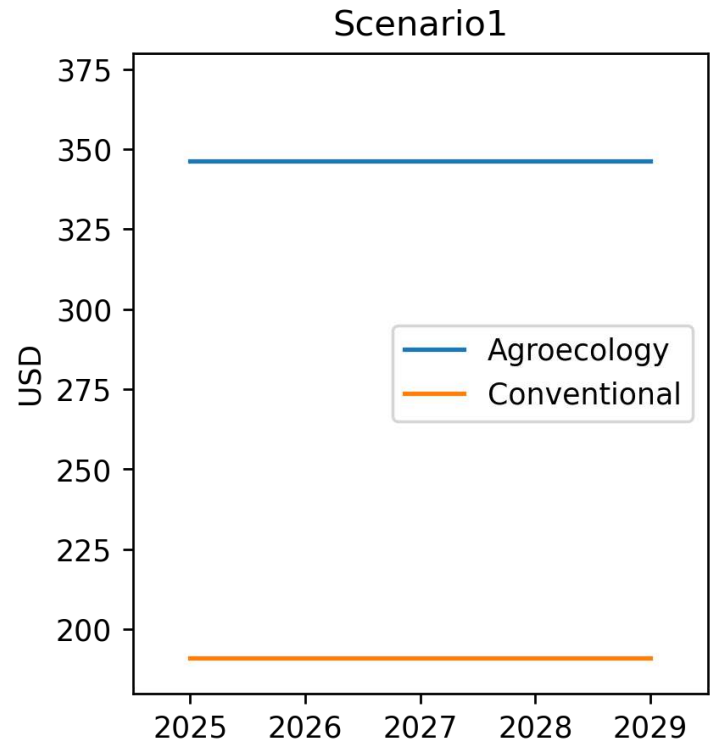


-13%



-18%

Yellow maize equilibrium price per metric ton



Conclusion

- Banning GM Maize will be **costly**!
- Being conservative, the **Price** for 1 MT of yellow maize will **increase** by **81%**.
- Does Mexico have the agroclimatic conditions necessary to produce yellow maize for its domestic feed industry?

Thank You!

Questions?

Slides Available at: <https://diegomacall.github.io/presentations.html>

Email: diego.macall@usask.ca