

Three bright green apples are arranged in a cluster. One is in the foreground, slightly to the right, and two are behind it, one to the left and one to the right. The apples are set against a white background that transitions into a light green gradient at the bottom.

*Policy Design and
Economic Impact Analysis
For Managing Invasive Species*

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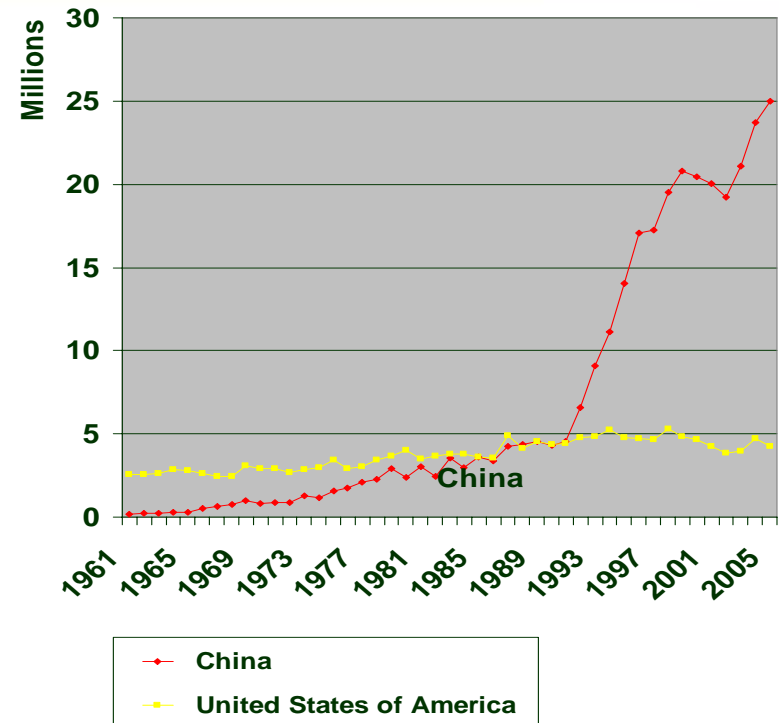
Incorporate Economic Assessment and Pest Risk Analysis

- ❖ Economic Impact from Invasive Species
- ❖ Pest Risk Analysis
- ❖ Systems Approach(SA)
 - *A set of phytosanitary procedures, at least two of which have an independent effect in mitigating pest risk associated with the movement of commodities (APHIS/USDA)*



The Case of Chinese Fresh Apples

- ❖ China is the world's largest apple production country, which accounts for almost one half of the world production
- ❖ China has recently asked for consideration to export fresh apples to the U.S
- ❖ Potential trade presents both opportunities and challenges for U.S. horticultural industries, natural environment, and national welfare



Objectives

- ❖ Identify and evaluate similar pest risk management policies from either the U.S or other countries and extrapolate a Potential U.S “Systems Approach” for Chinese fresh apples
 - Most likely pests
 - Phytosanitary measures to manage these pests

- ❖ Develop a conceptual framework for incorporating economic analysis with the SA policy for Chinese Fresh Apples



Data

- ❖ Regulations for **Australia** imports of Chinese pears and apples
- ❖ Regulations for **U.S.** imports of Chinese Ya pears and fragrant pears
- ❖ Regulations for **Canada** imports of Chinese apples and pears
- ❖ Regulation for **Argentina** imports of Chinese apples.



Preliminary Results

A potential U.S “Systems Approach” for Chinese fresh apples

❖ Pests of Concern

Eg: *Alternaria gaisen* (Nagano) Black Spot

Tetranychus viennensis (Zacher) Hawthorn spider mite

❖ Basic m steps common in existing policies

Eg: Bagging the apples, Monitoring program for specific pest

❖ An additional n optional steps

Eg: Fumigation, Cold Treatment



Results

A General Framework: A Partial Equilibrium Model

- ❖ Analyze the benefit and cost for a potential Systems Approach and also the pest risk reduction implied by implementing the SA
- ❖ Modification of Peterson and Orden's Model developed for Mexican Avocado

$$EW = p(\phi)W_D(\phi) + [1 - p(\phi)]W_N(\phi) - C(\phi) - W_0$$



Equation Table (1)

A Partial Equilibrium Model

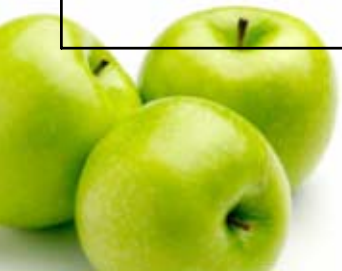
			Period 1	Period 2
Supply	China	Export to U.S	N/A	$Q^E_{CH-U} = S(\hat{p}_{CH-U}, PC_{CH-U}(\phi))$
		Export to Canada	$Q^E_{CH-C} = S(\hat{p}_{CH-C}, PC_{CH-C}(\phi))$	$Q^E_{CH-C} = S(\hat{p}_{CH-C}, PC_{CH-C}(\phi))$
	U.S	East	$Q^S_E = S(\hat{p}_E, N, PC_E(\phi))$	$Q^S_E = S(\hat{p}_E, N, PC_E(\phi))$
		Midwest	$Q^S_M = S(\hat{p}_M, N, PC_M(\phi))$	$Q^S_M = S(\hat{p}_M, N, PC_M(\phi))$
		West	$Q^S_w = S(\hat{p}_w, N, PC_w(\phi))$	$Q^S_w = S(\hat{p}_w, N, PC_w(\phi))$
	Canada		$Q^S_c = S(\hat{p}_c, N, PC_c(\phi))$	$Q^S_c = S(\hat{p}_c, N, PC_c(\phi))$



Equation Table (2)

A Partial Equilibrium Model

		Period 1	Period 2
Demand	U.S	$Q^D_U = D(\bar{p}_U, P_U, I_U)$	
	Canada	$Q^D_C = D(\bar{p}_C, P_C, I_C)$	
Frequency of pest outbreak	U.S	$N_U = prob_1 * prob_2 * prob_3 * prob_4 * prob_5 * Q^E_{U-CH}$	
	Canada	$N_C = prob_1 * prob_2 * prob_3 * prob_4 * prob_5 * Q^E_{CH-C}$	
Market Clearing Conditions	U.S	$(1 - \delta_E)Q^S_E + (1 - \delta_M)Q^S_M + (1 - \delta_W) + Q^E_{CH-U} + \delta Q^S_C = Q^D_U$	
	Canada	$(1 - \delta_C)Q^S_C + Q^E_{CH-C} + \delta_E Q^S_E + \delta_M Q^S_M + \delta_W Q^S_M = Q^D_C$	



Implications

- ❖ Results provide critical information for both U.S and Chinese policymakers seeking to manage the threat of invasive species spread while not unnecessarily constraining product trade
- ❖ The Partial Equilibrium model is a framework that can be used to link the economic assessment and phytosanitary measures of invasive species risk
- ❖ The model could be applied to other traded commodities



Three bright green apples are arranged on a white background. One apple is in the foreground, slightly to the right, and is in sharp focus. Two other apples are behind it, one to the left and one to the right, slightly out of focus. The apples have a natural green color with some lighter and darker green patches, and a small stem is visible on the top of the rightmost apple. The overall scene is clean and simple.

THANK YOU

VERY MUCH!

Lili Gao and Suzanne Thornsby