

Retaliatory Tariffs on U.S. Corn, Soybeans, Sorghum, Cotton and Rice Potential Impacts on Arkansas Agriculture

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U.S. and Arkansas agriculture are potentially likely targets for retaliation to the Trump administration’s import tariffs of 25% on steel and 10% on aluminum. Arkansas is a major oilseed and grain exporter to China, Canada and Mexico among others. This brief provides a preliminary analysis of the impact of a 25% retaliatory tariff on U.S. soybeans, corn, sorghum, cotton and rice. The soybean, corn, sorghum, and cotton analysis aggregates all importers and all other exporters into a rest-of-world (ROW) region and assumes a uniform tariff on all U.S. exports. A net trade, partial equilibrium model with the U.S. as the net exporter and the ROW as the net importer solves for a new equilibrium price and U.S. export level relative to the averages of the 2015 to 2017 marketing years. The rice analysis is more detailed. It allows for differential trade responses depending on likely and unlikely U.S. rice export flows that would face a tariff backlash from countries who export steel to the U.S.

Soybeans

The U.S. is a major exporter of soybeans. The dominant market for U.S. soybeans is China which imports approximately 60% of U.S. soybean export sales. Between 2015 and 2017, the average volume of U.S. net soybean exports is 55.7 million metric tons (MMT) or 49% of domestic production. In 2016, Arkansas ranked 11th in share of U.S. soybean sales of \$1,592 billion, 3.8% of total U.S. soybean receipts. As shown in Table 1, a 25% tariff on U.S. soybeans would result in a loss of value of 14% and loss in export volume of 10.4 MMT, a 19% decline.

Table 1. Estimates of the impacts of a 25% import tariff on U.S. agricultural exports.

	Soybeans	Corn	Sorghum	Cotton	Rice Long	Rice Medium
Price Effect	-14%	-14%	-18%	-18%	-3%	-5%
Export Effect	-19%	-44%	-12%	-6%	-3%	-3%

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Corn

The U.S. is also a major exporter of corn. The largest markets for U.S. corn are Mexico, Japan, Colombia, and South Korea. The average volume of corn exports from the U.S. for 2015-2017 is 52.9 MMT or 14% of domestic production. In 2016, with sales of \$400 million, Arkansas ranked 19th among states in value of corn production. Using the partial equilibrium net trade model, the price effect of a 25% tariff on U.S. corn exports is -14% and a loss of exports of 44%. The relatively large loss in export volume reflects the relative small share of exports to total use in the U.S. There are also a relatively large number of feed grain export competitors with the U.S.

Sorghum

The U.S. is the major exporter of sorghum with most of the shipments sold to China. In the second round of proposed tariffs, China has identified sorghum as well as corn, soybeans and cotton. The average volume of U.S. sorghum exports for the 2015-17 period is 7.12 MMT or 58% of domestic production. Among U.S. states, Arkansas ranked 9th in value of sorghum production in 2016 with a value of \$17 million. Using a similar model as for soybeans and corn, Table 1 presents the short-run impacts on sorghum from a 25% tariff. U.S. sorghum price declines by 18%, while volume of exports falls by 12%.

Cotton

The U.S. is the world's largest exporter of cotton. The average volume of U.S. exports for the 2015-17 marketing years is slightly more than 13 million bales (480 lbs./bale). The average share of exports as a share of U.S. production is 76.5% for the past three years. Among U.S. states, Arkansas ranked 5th in value of cotton production in 2016 with a farm value of \$167 million. Leading U.S. markets by rank are Vietnam, China, Turkey, Indonesia, India, and Mexico. Turkey, the 6th largest steel exporter to the U.S. and China have indicated their intentions to levy a 25% tariff on U.S. cotton. Our aggregate analysis of a 25% tariff on U.S. cotton, similar to the analyses for soybean, corn, and sorghum, is reported in Table 1. Despite a relatively large price decline of 18%, the volume of U.S. cotton exports are estimated to only decline by 6%, because of relatively inelastic U.S. export supply response.

Rice

The U.S. has traditionally ranked as the 5th largest exporter of rice in the world. Mexico, Japan, and Canada are major export markets for U.S. rice. Arkansas accounts for approximately 50% of the U.S. rice economy and exports 3.4 MMT or 54% of production. The analysis for rice takes advantage of the detailed global rice models maintained at the University of Arkansas. We use a spatial partial equilibrium model of the global rice economy, calibrated to the period 2013-15. For the analysis, we assume that only the countries listed in Table 2 retaliate against the U.S. implementation of import tariffs on steel and aluminum by imposing a 25% import tariff on U.S. rice. The table also shows that roughly 50% of U.S. rice exports go to countries that export steel to the U.S. and are likely to retaliate.

Table 2. Ranking of countries based on their share of steel exports to the U.S. and their rice imports from the U.S.

Country	Steel exporters to the U.S. (2017)		Export market for U.S. rice (2013-15)	
	Ranking	Import share	Ranking	Export share
Canada	1st	16.7%	4th	7.0%
South Korea	3rd	9.7%	11th	3.5%
Mexico	4th	9.4%	1st	19.6%
Turkey	6th	5.6%	8th	3.8%
Japan	7th	4.9%	3rd	9.7%
EU	8th	3.7%	19th	1.6%
Taiwan	9th	3.2%	17th	1.7%
Total		53.2%		46.9%

Rice results without exceptions for Canada and Mexico

Both the U.S. long and medium grain rice markets stand to lose from the retaliatory measures of the selected importing countries. We estimate total U.S. rice production and exports drop 1.3 percent and 3 percent, respectively, and domestic consumption increases marginally, as a result of the implementation of import tariffs on U.S. rice (Table 3). The total value of U.S. rice production decreases by \$151 million due to a combination of lower producer prices and output. Rice producers' welfare, measured by the producer surplus, decreases by \$118 million. U.S. consumers benefit from the trade restrictions through lower consumer prices, which results in an increase in their welfare estimated at \$66 million.

Exports to Mexico and Canada decrease significantly because of the 25% import tariff imposed on U.S. rice. The impact is much smaller in Japan because it already imposes high restrictions on rice imports, reducing the relative impact of the import tariff increase. Other importers of U.S. rice such as Haiti and Colombia benefit from the decrease in U.S. rice prices and expand their imports, which partially offsets the decrease in trade with the countries imposing the retaliatory import tariff on U.S. rice.

Table 3. U.S. market impact of retaliatory import tariffs on U.S. rice exports.

Variable	Long Grain Rice	Medium Grain Rice	Total
U.S. Production	-1.2%	-1.6%	-1.3%
U.S. Exports	-2.9%	-3.4%	-3.0%
Mexico	-16.3%	0.0%	-15.6%
Japan	0.0%	-1.4%	-1.4%
Canada	-16.9%	-3.1%	-13.1%
Haiti	2.0%	0.0%	2.0%
Colombia	4.5%	0.0%	4.5%
U.S. domestic demand	0.1%	0.1%	0.1%
Producer price	-2.9%	-5.1%	-3.5%
Consumer price	-2.6%	-4.8%	-3.4%
Change value production (\$ million)	-83.2	-67.9	-151.1
Producer surplus (\$ million)	-62.0	-55.7	-117.7
Consumer surplus (\$ million)	36.3	29.6	65.5

Rice results with exceptions for Canada and Mexico

If we exclude Mexico and Canada from the list of countries that apply retaliatory tariffs on U.S. rice, then as expected the impact of such measures on the U.S. rice sector decreases significantly (Table 4). Total U.S. rice production and exports only decrease by 0.7% and 1.5%, respectively, while domestic consumption remains unchanged. The total value of U.S. rice production decreases by \$91 million, while rice producers' surplus decreases by \$72.9 million. U.S. consumers still benefit some from the trade restrictions, and their welfare increases by \$39 million.

Mexico and Canada now benefit from the decrease in U.S. rice export prices and slightly expand imports of U.S. rice. Haiti and Colombia expand their imports of U.S. rice, but not as much as when Canada and Mexico also retaliate (Table 2). Excluding NAFTA from the list of retaliatory countries impacts primarily the U.S. long grain rice sector, but introduces only marginal changes to the medium grain rice market.

Table 4. U.S. Market impact of retaliatory import tariffs on U.S. rice exports from EU, Japan, South Korea, Taiwan and Turkey (exemptions for Canada and Mexico).

Variable	Long Grain Rice	Medium Grain Rice	Total
Production	-0.3%	-1.5%	-0.7%
Exports	-0.8%	-3.3%	-1.5%
Mexico	0.6%	0.0%	0.5%
Japan	0.0%	-1.6%	-1.7%
Canada	0.5%	0.6%	0.5%
Haiti	0.6%	0.0%	0.6%
Colombia	1.3%	0.0%	1.3%
Domestic demand	0.0%	0.0%	0.0%
Producer price	-0.8%	-5.0%	-2.0%
Consumer price	-0.8%	-4.8%	-1.5%
Change value production (\$ million)	-24.1	-66.9	-91.0
Producer surplus (\$ million)	-18.0	-54.9	-72.9
Consumer surplus (\$ million)	10.0	29.0	39.0

Impact on Arkansas economy

If the value of Arkansas' oilseed, cotton and grain sectors each fell by 14% from the 2017 preliminary estimates reported by NASS, the result would be a loss of \$243,652,500 in the oilseed farming sector, \$51,744,000 in the cotton sector, and a \$190,931,440 loss in the grain farming sector.

It is estimated that these losses could adversely affect Arkansas employment by around 5,110 jobs, reduce labor income by \$299 million and reduce overall value-added to the state economy by \$435 million. (Table 5)

Table 5. Impact of retaliatory oilseed, cotton and grain tariffs on Arkansas state economy.

Impact Type	Employment	Labor Income	Total Value Added	Output
Direct Effect	-2,035.8	\$(171,335,658.16)	\$(201,070,532.16)	\$(486,327,920.63)
Indirect Effect	-1,417.0	\$(62,394,681.77)	\$(114,875,344.21)	\$(202,106,854.64)
Induced Effect	-1,657.4	\$(65,452,959.29)	\$(119,246,884.42)	\$(203,466,090.76)
Total Effect	-5,110.2	\$(299,183,299.23)	\$(435,192,760.79)	\$(891,900,866.03)



Direct effects are changes in the oilseed, cotton and grain farming sectors. Indirect effects are changes to sectors that supply inputs to the oilseed, cotton and grain industries. Induced effects are caused by changes in spending by employees of oilseed, cotton, grain sector and their suppliers. Copyright 2018 Minnesota IMPLAN Group, Inc.