Delaware Department of Transportation: Delmarva Agriculture Supply Chain Study

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Report contents

- **Overview**
- Macroeconomic Trends and the Delmarva Economy
- Delmarva Agriculture Market Analysis
- Primary Research
- Transportation Supply Chain Analysis
- Economic Development Opportunities and Investment Priorities

Project description and goal

- The Delmarva Agriculture Supply Chain Study conducted on behalf of the Delaware Department of Transportation analyzes regional trends in agriculture production, consumption, and distribution, estimating and forecasting industry freight flows and identifying the key transportation system requirements.
- The goal of this study is to develop an understanding of the supply chains supporting the agriculture industry in Delaware and on the Delmarva Peninsula and to identify possible infrastructure improvements and policies maximizing the industry's potential and its impact on regional economic development.

Summary of findings

- Macroeconomic trends and the Delmarva economy:
  - US GDP will grow by 2.7% in 2015 and 2.5% in 2016 increasing regional demand.
  - The United States' low cost position for agriculture output combined with increased demand in developing countries should increase US exports of agriculture and food products.
  - Agriculture, food, and paper industries account for 8.2% of the Delaware economy, and at $430 million in outbound trade trails only chemicals, computer/electronics, and transportation equipment sectors for greatest export value.
  - Delmarva has become an international center for fruit and vegetable trade and poultry production and should remain strong in these industries for the foreseeable future.
- Delmarva Agriculture Market Analysis
  - US broiler demand will grow to almost 90 lbs. per capita by 2030, which will be 50% higher than in 1990 (the fastest growth of all major meat sectors).
  - Major increases in food consumption in China, including demand for livestock feed, will drive significant gains in grain exports from the United States to Asia.
  - The increasing prices for domestic meat compared to feed prices in the United States should improve profits in the poultry sector.
  - Delmarva broiler production will continue to increase in absolute terms, although the region's share of total US production may remain flat or decline.

Summary of findings, continued

- Industry Feedback and Transportation System Analysis
  - Rail service throughout Delmarva is critical to regional agriculture supply chains, carrying grain and fertilizer onto the Peninsula and shipping grains to external markets during peak harvest season.
  - Freight rail bottlenecks entering northern Delmarva, especially in Cecil County Maryland over Amtrak tracks, reduces the capacity and reliability of freight service to and from the Peninsula.
  - The loss of inbound coal to the Indian River Power Plant has reduced revenues supporting Class 1 train service on the Delmarva Secondary line, which is operated by Norfolk Southern and runs the north-south length of Delaware and Maryland on the Peninsula. The loss of coal suggests potential long-term risks concerning the financial viability of the line.
  - Roadways are intensively used by all sectors involved in Delmarva agriculture supply chains.
  - Roadway congestion on Route 13 and 113 as well as along major east-west highways in southern Delmarva significantly increases freight travel times, especially during summer beach season.
  - Bottlenecks along the I-95 corridor and access points also increase travel times to final markets, especially on Sunday evenings during summer beach season.
  - Roadway safety on secondary roadways is a major concern, as many of these roads through agriculture areas are not well designed to accommodate heavy trucks.
  - The Nanticoke and Wicomico rivers provide access for inbound barge shipments of grains, supporting a significant share of inbound supplies for feed and offering a critical alternative modal option that contributes to a more robust overall supply chain and transportation network.

Summary of findings, continued

- Industry Feedback and Transportation System Analysis, continued
  - Reduced tonnage on the Nanticoke and Wicomico rivers threatens the availability of U.S. Army Corps of Engineers funding for dredging.
  - Ports, including the Port of Wilmington and other Mid-Atlantic ports (Baltimore, Norfolk, and Philadelphia), are identified as important to trade-related agriculture supply chains.
  - Regional airports are considered important for certain high-value supplies and outbound products, especially Baltimore-Washington International Airport.
  - Truck weight limits in all three Delmarva states are identified as competitive disadvantages vis-à-vis other nearby poultry industry centers (e.g., Pennsylvania and North Carolina). For exports, Delmarva-originating containers must often be reloaded to higher weights at outbound ports.
  - Interviewees suggested a need not only for increased truck weight limits in any single Delmarva state, but also coordination across all three states to cover all regional routing.
  - Integration of technology into truck regulations (e.g., electronic permitting for over-sized load transportation) can offer high-impact, low-cost transportation system efficiency solutions.

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Summary of key Delmarva economic trends impacting agriculture and related industry supply chains

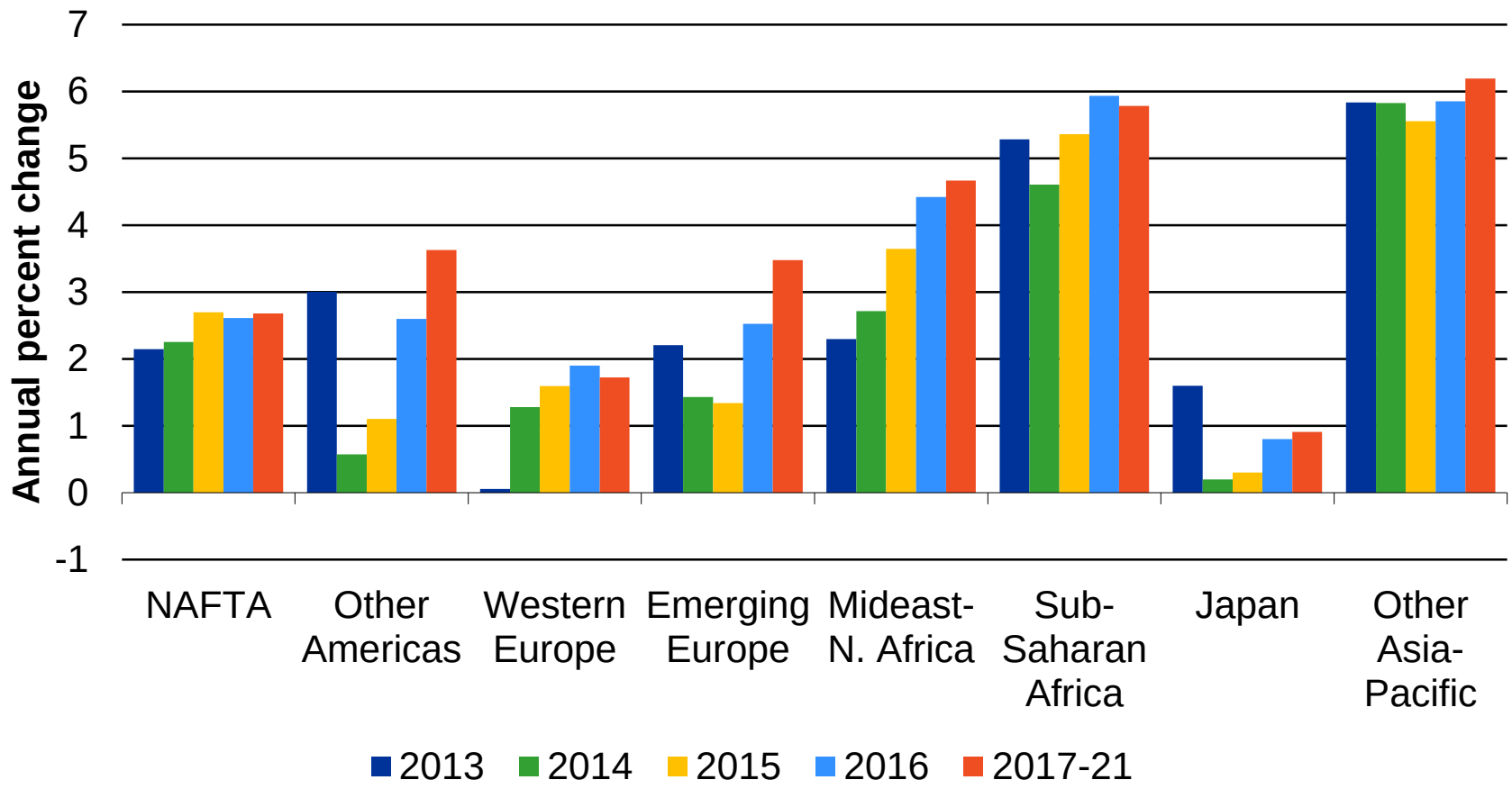
- Economic growth on the Delmarva Peninsula is generally growing on pace or faster than the national average due in part to expansion of agriculture production and export in southern regions as well as relatively large demographic growth (compared to the Mid-Atlantic).
- Nearby Mid-Atlantic states also provide important linkages in Delmarva agriculture supply chains, including port transportation infrastructure, chemicals and plastics supplies, poultry and dairy processing in southeastern Pennsylvania, and fruit and vegetable processing and cold storage in southern New Jersey. These states have grown less rapidly, but generally due to contraction or stagnation in other key industries in those locations.
- Agriculture, poultry, and food processing industries could benefit from anticipated economic growth in North America as well as from increased trade with growing consumer markets in the developing world. Expansion in consumption in the region and internationally will:
  - Support growth in transportation and logistics industries and a need for intermodal capacity throughout the state, particularly in southern Delmarva; and
  - Contribute to Port of Wilmington and other Mid-Atlantic port export trade volumes to the Caribbean, Latin America, the Middle East, and Russia.

Over the next several years the global economy will experience a gradual acceleration

- Global growth will pick up in 2015, supported by lower oil prices.
- The US economy will benefit from accelerations in consumer spending and homebuilding, along with continued strength in capital spending.
- The Eurozone's recovery will proceed at a slow pace.
- China's growth will slow further to 6.5% in 2015, restrained by imbalances in credit, housing, and industrial markets.
- Falling oil prices, sanctions, and capital flight are sending the Russian economy into a severe recession.
- Growth paths in emerging markets will depend on structural reforms that raise productivity and allocate capital more efficiently.

Asia-Pacific (excluding Japan) and Sub-Saharan Africa will achieve the fastest growth in real GDP

Real GDP



The United States economic expansion will continue

- With OPEC letting markets determine oil prices, the West Texas Intermediate (WTI) price has fallen from $93 per barrel in 2014 to $59 in 2015; IHS forecasts that the WTI will recover to $70 in 2016.
- Accelerations in consumer spending and homebuilding, along with continued robust capital spending, will support growth.
- Consumers will boost spending in response to declining gasoline prices and gains in employment, real disposable income, and net worth.
- The recovery in homebuilding will gain momentum as labor markets improve and credit standards ease.
- Global market growth, strong cash flow, replacement needs, and technological advances will drive growth in business investment.
- Interest rates will rise significantly over the next three years as monetary accommodation is withdrawn.

US economic growth by sector

Real GDP and its components

Percent change	2013	2014	2015	2016
Real GDP	2.2	2.2	2.7	2.5
Consumption	2.4	2.3	3.0	2.9
Residential investment	11.9	1.6	10.2	10.0
Business fixed investment	3.0	6.2	3.9	5.0
Federal government	-5.7	-2.0	-0.4	-0.4
State & local government	0.5	0.8	1.0	1.1
Exports	3.0	2.9	3.1	4.0
Imports	1.1	3.4	3.9	6.6

Other key US indicators

Key indicators				
Percent change	**2013**	**2014**	**2015**	**2016**
Industrial production	2.9	4.0	2.6	3.5
Payroll employment	1.7	1.8	1.9	1.4
Light-vehicle sales (Millions)	15.5	16.4	16.9	17.2
Housing starts (Millions)	0.93	0.99	1.17	1.33
Consumer Price Index	1.5	1.6	0.2	2.1
Core CPI	1.8	1.8	2.0	2.0
Brent crude oil price ($/barrel)	109	100	66	75
Federal funds rate (%)	0.1	0.1	0.4	1.6
10-year Treasury yield (%)	2.4	2.6	3.1	3.6

- Payroll, industrial production, and light-vehicle sales will rebound in 2015-2016.
- Low oil prices help moderate inflation, but the Fed will begin increasing interest rates by 2015-2016 as growth picks up.

Near-term economic conditions in the US suggest reasonable growth opportunities for the domestic agriculture and food industry

- Stable growth in GDP, employment, and production should support domestic demand for agriculture products.
- Increases in business investment, industrial production, and housing starts will also help drive the growth in GDP, employment, and production supporting increased demand for agriculture and food products.
- Low inflation and, in the short term, low interest rates support investment.
- Low energy costs will provide a competitive advantage for some agriculture and food manufacturing.
- Cost competitiveness advantages are increasing U.S. exports, and this trend is expected to continue in the future.

The Delaware economy is growing steadily; agriculture and food industries are a driving force for trade and manufacturing

- Employment grew steadily at 2.2% in 2014, returning the State to pre-Great Recession levels.
- Population increased 1% from 2013 to 2014, ahead of the national growth rate of 0.8%, making Delaware the 18th fastest growing state. Strong levels of in-migration will continue to push state population growth at a 1.1% rate from 2015 – 2020.
- **Food processing,** chemicals (including pharmaceuticals), financial services, and professional and business services are the top industries in Delaware.
- **Delaware has become a center for international fruit and vegetable trade and poultry production.**
- **In 2014, agriculture, food, and paper products made up about 8.2% of Delaware's total annual exports at $430 million, behind only the chemicals industry ($2.1 billion), computer/electronic products ($971 million), and transportation equipment ($522 million)**.
- Hospitality and defense (e.g., Dover AFB) are also key economic drivers in southern Delaware.
- Delaware's manufacturing sector has contracted in recent decades. For example, since 1985 Delaware has lost 5,000, or roughly half, of its automotive manufacturing jobs and 3,000 indirectly related jobs accounting for $350 million in gross state product.
    - Losses in manufacturing have been offset by growth and knowledge-based industries.
    - Delaware has the highest concentration in the financial services employment among 50 states at 10.7% of all nonfarm jobs.

The overall Maryland economy relies heavily on government and technology; Delmarva areas are driven by agriculture and hospitality

- Maryland returned to pre-recession peak employment levels in the third quarter of 2013 thanks to a cushion provided by federal employment and a healthy mix of burgeoning private-sector industries.
- With the federal budget sequester in effect, government employment has been stagnant since 2012, however robust private-sector job growth helped drive overall employment growth (1.4% in 2014).
- The federal government is still the largest employer in Maryland with 19.1% of total nonfarm employment. With the sequester in effect; however, the professional/business services sector will continue to grow and replace the public sector as the largest employer over the next ten years.
- Scientific and technological research plays an important role in Maryland's economy. The state is home to a number of internationally recognized federal research agencies, including the National Institutes of Health, NASA's Goddard Space Flight Center, and the National Oceanic and Atmospheric Administration.
- Maryland is also home to growing biotechnology, telecommunications, and computer-science industries, especially in the I-270 corridor. Maryland is among the top ten states in terms of concentration of high-tech employment, and it is among the top three in biotechnology.
- **Leading Eastern Shore industries include agriculture, fishing, and leisure/hospitality services. Agriculture production is supported in part by increasing trade to emerging economies.**

The Virginia economy is highly diverse, helping to withstand the sequester; Delmarva areas are mostly concentrated in agriculture

- The federal sequester hurt the Virginia economy, particularly in federal government employment and spending. This primarily affects Northern Virginia, but also other areas with high levels of economic linkages to the defense sector.

- The private service economy remained relatively unaffected as financial (5.0% y/y), information (3.0% y/y), and professional & business services (1.5% y/y) sectors all registered above-average growth.

- Professional and business services will recover fastest and expand vigorously, helping to drive average employment growth to 1.3% from 2015 – 2020 (about the national average) gross state product to 2.7% annually over the same period.

- Virginia is home to over 20% of the national workforce in both tobacco (Richmond area) and shipbuilding (Hampton Roads), as well as the largest concentration of military personnel in the country (Hampton Roads). Elsewhere in the State, major employers include the fabric, coal mining, and furniture manufacturing industries. Hospitality is also a major employer in Virginia.

- Virginia has the fifth largest concentration of high tech companies (mostly in Northern Virginia) in the US. The sector is at risk, however, due to declining investment trends in information technology.

- **Delmarva counties are mostly concentrated in agriculture, dominated by poultry and followed by fresh and processed vegetables and grains (corn, soybeans, and wheat).**

Dairy, poultry, and farming industries in southeastern Pennsylvania share critical linkages with Delmarva

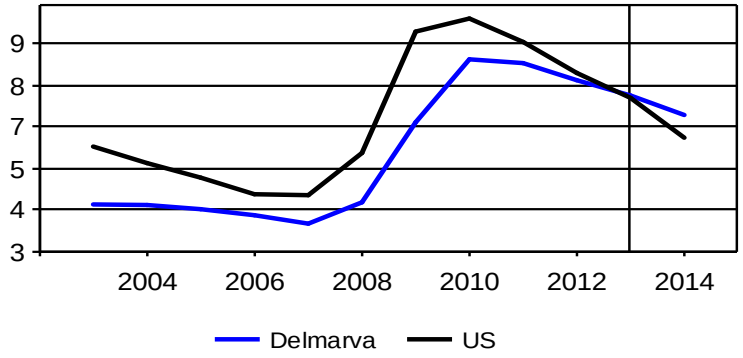
- Development of the Marcellus Shale natural gas deposit, and possibly eventually the Utica Shale play, promise economic and job growth. Pipelines and infrastructure are currently under construction to help realize the regional economic potential of oil & gas extraction as well as downstream industries, such as chemicals and fertilizer manufacturing.
- Oil price declines have, however, negatively impacted the economy, reducing oil exploration and decreasing the price competitiveness of regional natural gas liquids extraction (which competes with oil as a chemical feedstock). Low oil prices have also hurt the steel industry, reducing demand for steel (pipe for wells and pipelines).
- Pennsylvania's economy is expected to add jobs at a 0.8% average annual rate between 2014 and 2019. This growth rate ranks Pennsylvania in the bottom tier of all states.
- In addition to natural gas and downstream industries (e.g., chemicals), education, health care, and professional and business services are gaining an increasingly important share of the southeastern Pennsylvania economy, while a high-tech cluster is developing in the Pittsburgh area.
- **Dairy sourcing and production and poultry production in southeastern Pennsylvania counties represents a stable part of Pennsylvania economy, with supply chains for both industries extending into Delmarva.**
- **Southeast counties are significant recipients of straw baled on Delmarva and hauled to the mushroom industry in Kennett Square, Avondale, Oxford and other local areas.**

Southern New Jersey is also an important part of the Delmarva agriculture production value chain

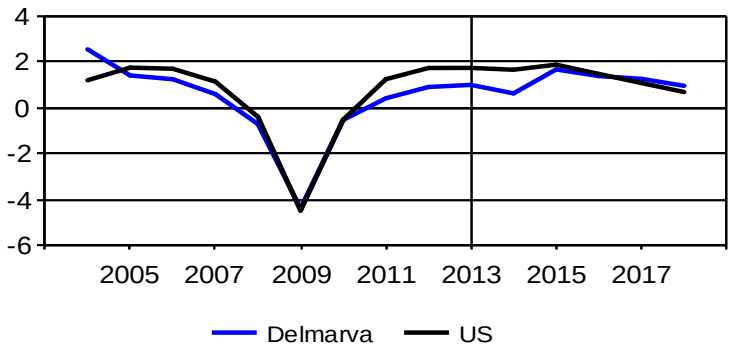
- New Jersey has experienced employment growth below 1% in recent years, but an uptick in scientific and technical services employment will support job growth at or above 1% over the next few years.
- New York firms eager to escape high costs historically relocate New Jersey in search of lower rents, but high labor costs and living costs have pushed many manufacturing industries, including automotive plants, to the US South.
- New Jersey still retains major industry clusters in financial services, telecommunications, and pharmaceuticals. However, reorganizations and relocations across these sectors have created headwinds for employment growth.
- Slow housing and government sector growth has also dampened employment, but major bridge and tunnel projects have helped support the construction sector.
- New Jersey has an extensive multi-modal freight and passenger transportation network, centered at Newark International Airport and Port Newark/Elizabeth.
- Important sectors to southern New Jersey's economy are chemicals (including pharmaceuticals), tourism, **fishing, farming, and food manufacturing**.
- **New Jersey ranks among the US's leading producers of fruit and vegetables and is home to large cold storage warehousing operations.**

Overall, Delmarva has experienced low unemployment for a decade, but jobs, income, and wage growth are slowing versus the US

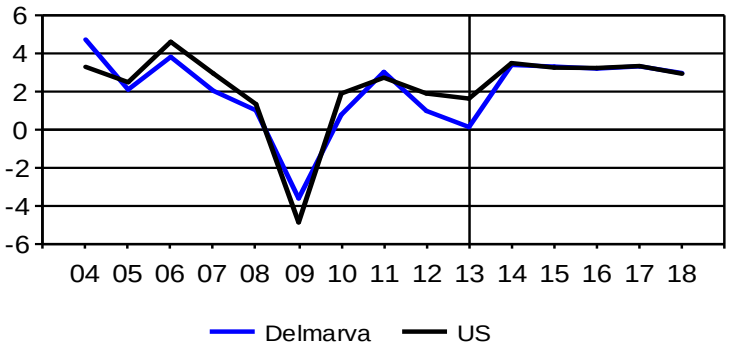
Unemployment Rate
(Percent)



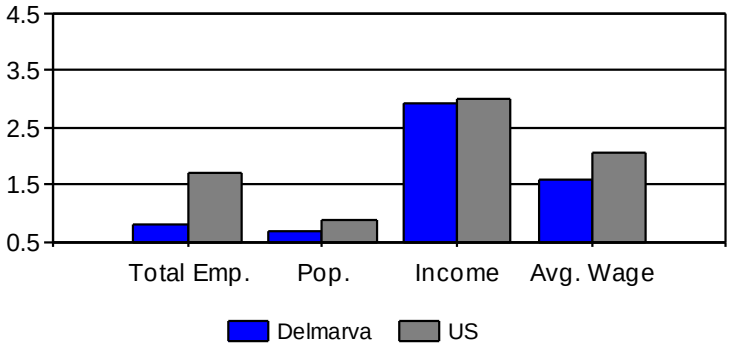
Total Employment
(Percent change, annual rate)



Real Personal Income
(Percent change, annual rate)



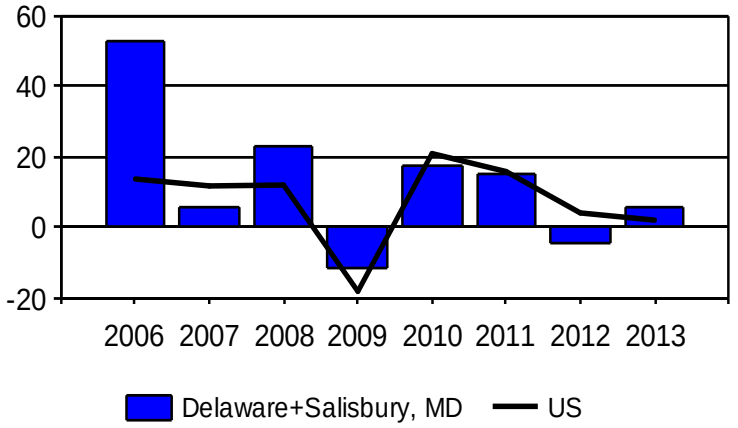
Growth Relative to US Average
(Average annual percent change, 2012 to 2014)



Exports are also critical to the Delmarva economy, and emerging markets will contribute significantly to demand for regional agriculture and food products

- Exports helped lead the Delmarva economy out of the Great Recession
  - Delmarva's export growth was twice the national rate from 2006 and 2010.
  - Key commodities: chemicals, electronics, transportation equipment, machinery
  - Key agricultural exports are broilers, corn, soybeans, and wheat
  - Key destinations: Canada, China, UK, Japan

Total Exports
(Percent change, annual rate)



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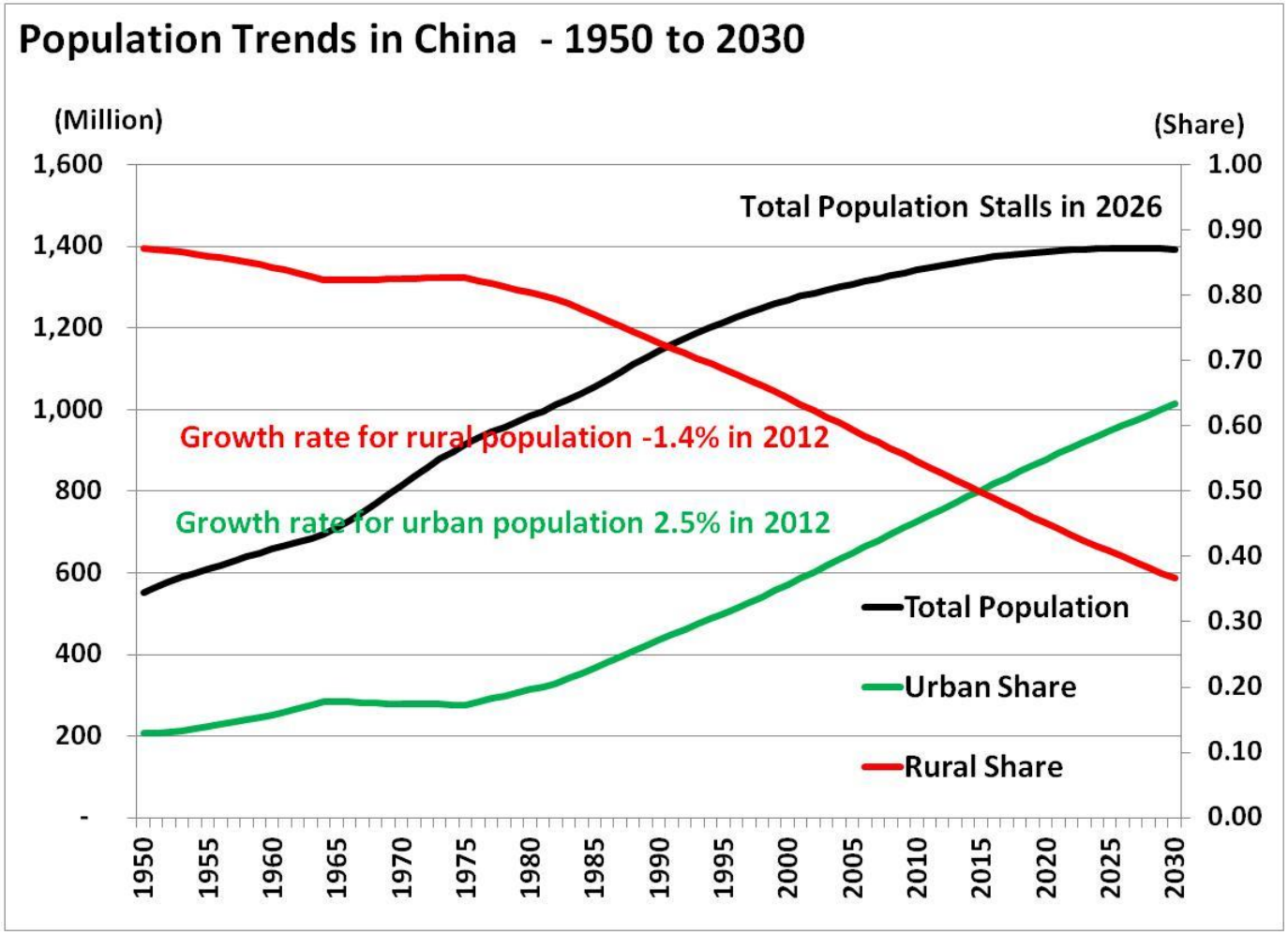
Summary of agriculture sector trends on Delmarva

- Income growth in China will increase demand for US grain exports, more than offsetting reduced corn demand in the US bio-fuels industry.
- Major forecasted increases in domestic broiler demand coupled with a forecasted widening spread between meat prices and feed prices will help support poultry industry growth in Delmarva.
- Delmarva has and will continue to benefit from expansion of broiler demand in the United States in absolute terms, although the region's share of total national output has been, until recently, declining.
- Increased consumption and yields for Delmarva grains production have not been sufficient to keep up with regional broiler feed demand. The region will continue to depend on external sources (primarily in the US Midwest) to supplement local grain supply.
- Increased grain yields result from improvements in irrigation, but diminishing returns on these improvements coupled with the loss of agriculture acreage to housing constrains the region's ability to increase production.

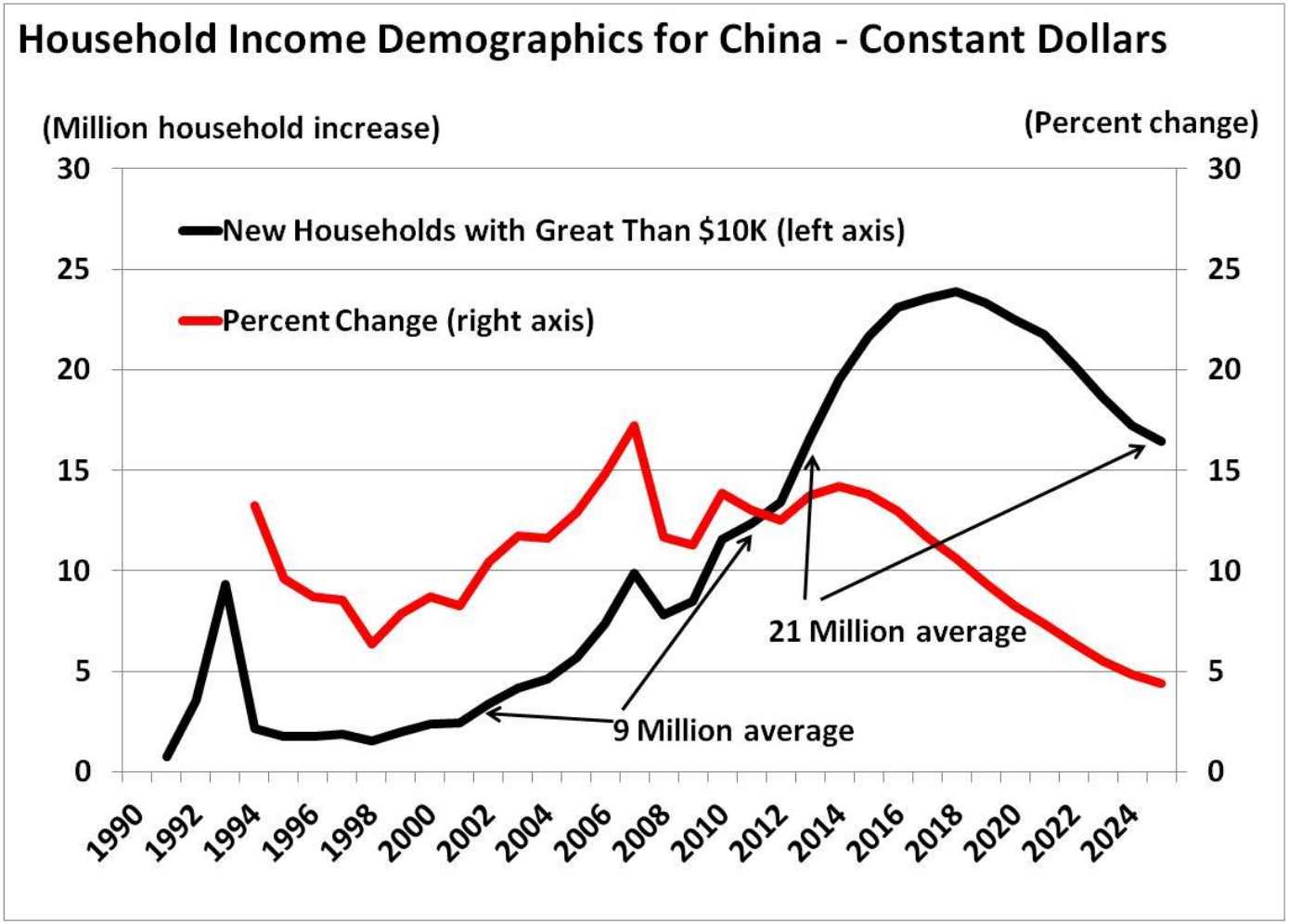
Some significant events that have and will shape US and Delaware agriculture

- Growth in China's middle class
- Bio-fuel production levels
- Persistent high feed cost in recent years had a significant impact on the meat production sector
- Reduced government spending / less acreage held in conservation reserve programs
- Environmental issues, including manure / nutrient management
- Irrigation and water availability

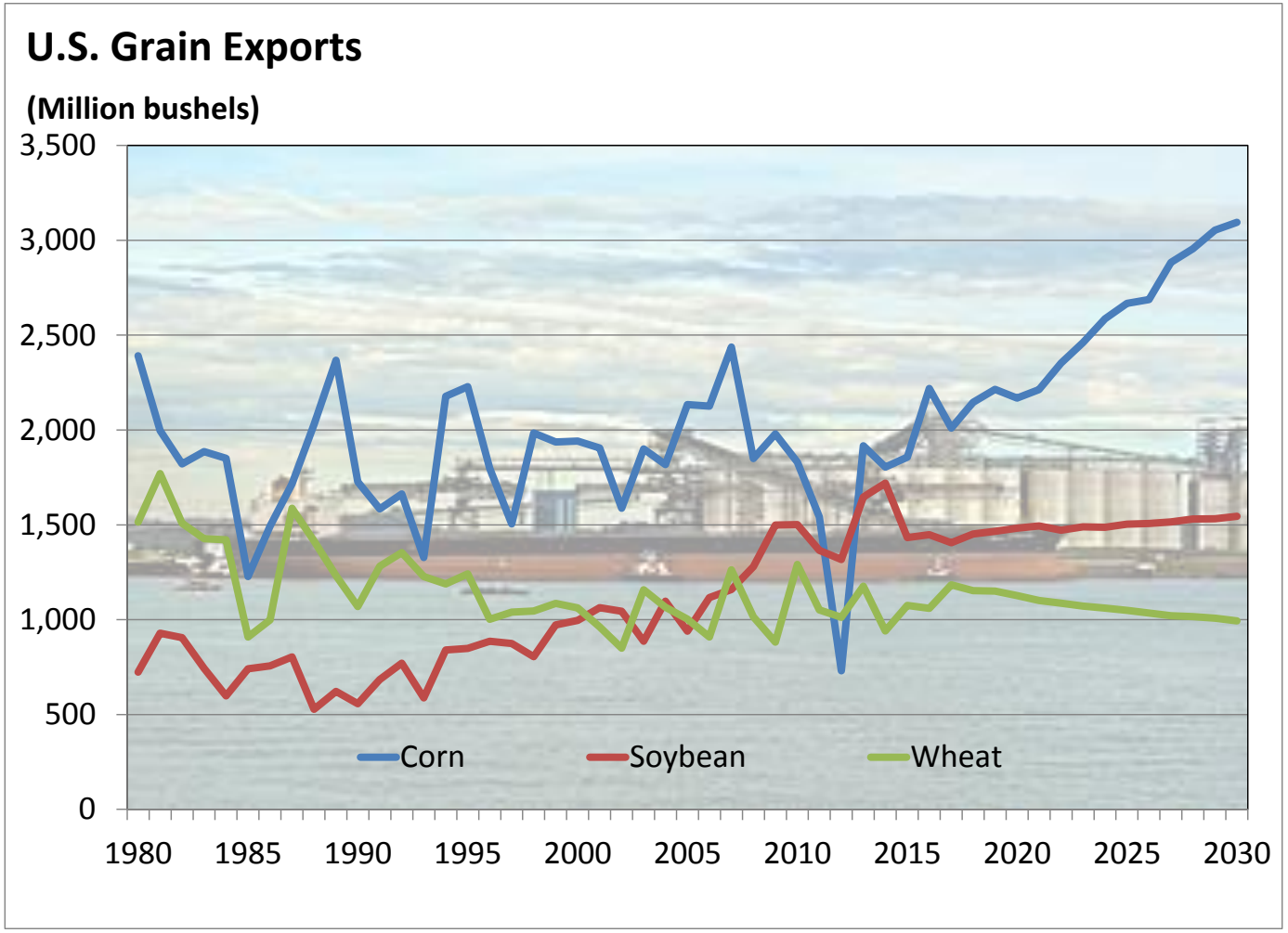
Chinese demographic changes are fueling in-country livestock production and demand for feed imports



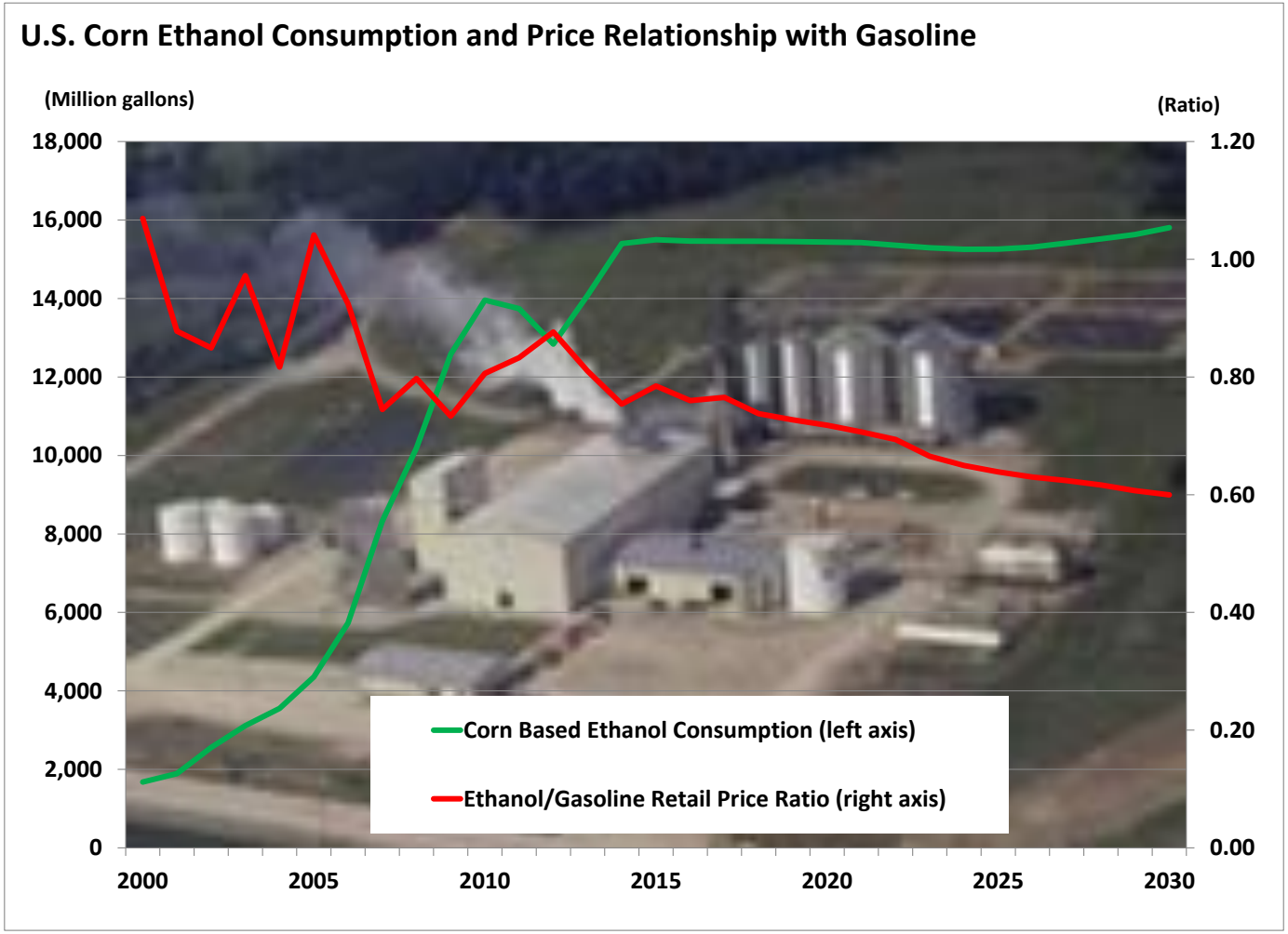
China household income trends are increasing food consumption and demand for agriculture imports



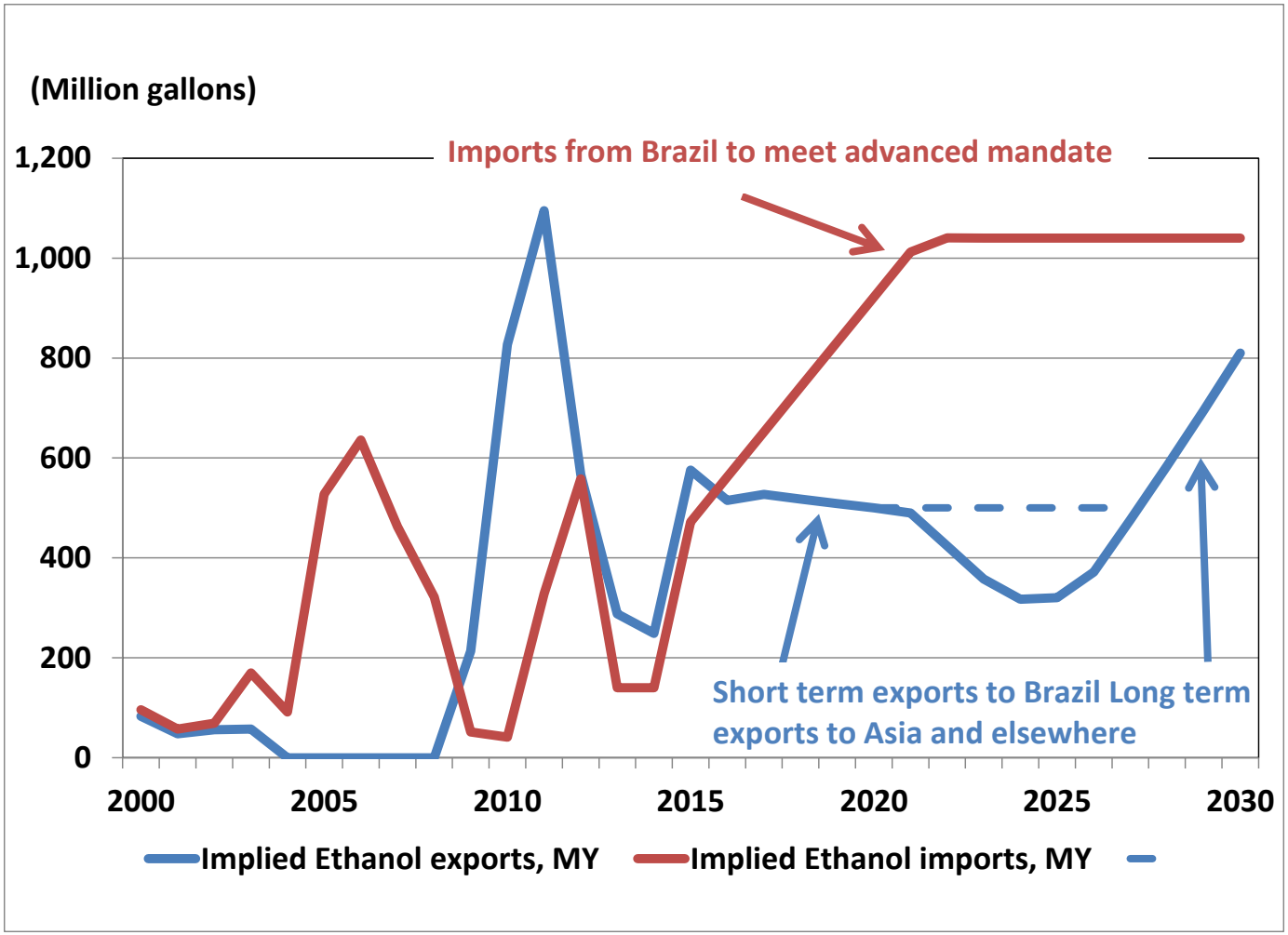
US corn exports will strengthen in the out-years due to a growing corn deficit in China, while Delmarva will contribute to stable soybean exports during peak harvest season when local supply exceeds demand



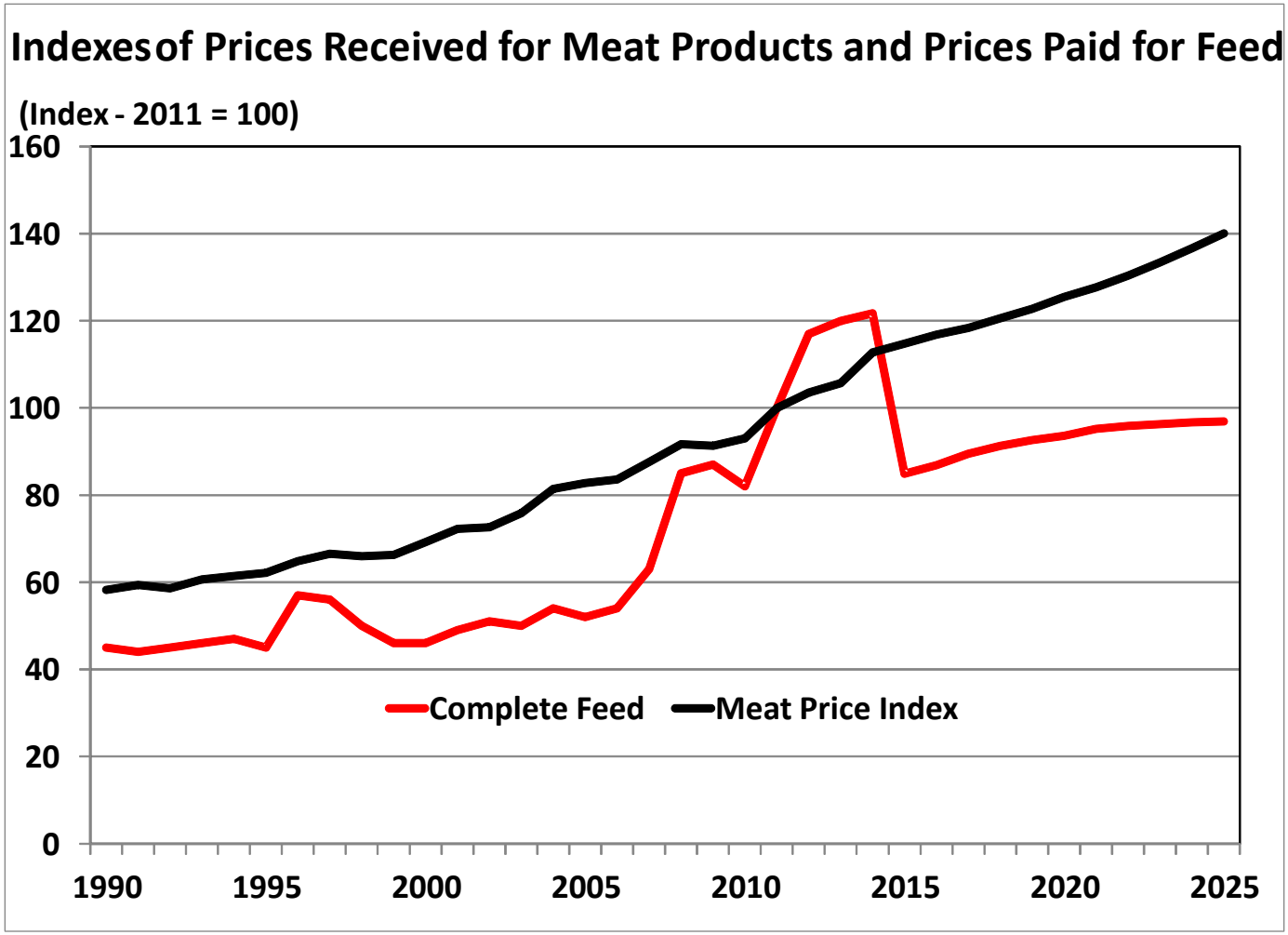
Challenges to future expansion in US starch based ethanol have lowered demand for corn, causing poultry feed prices to retract and profits to return to the poultry sector



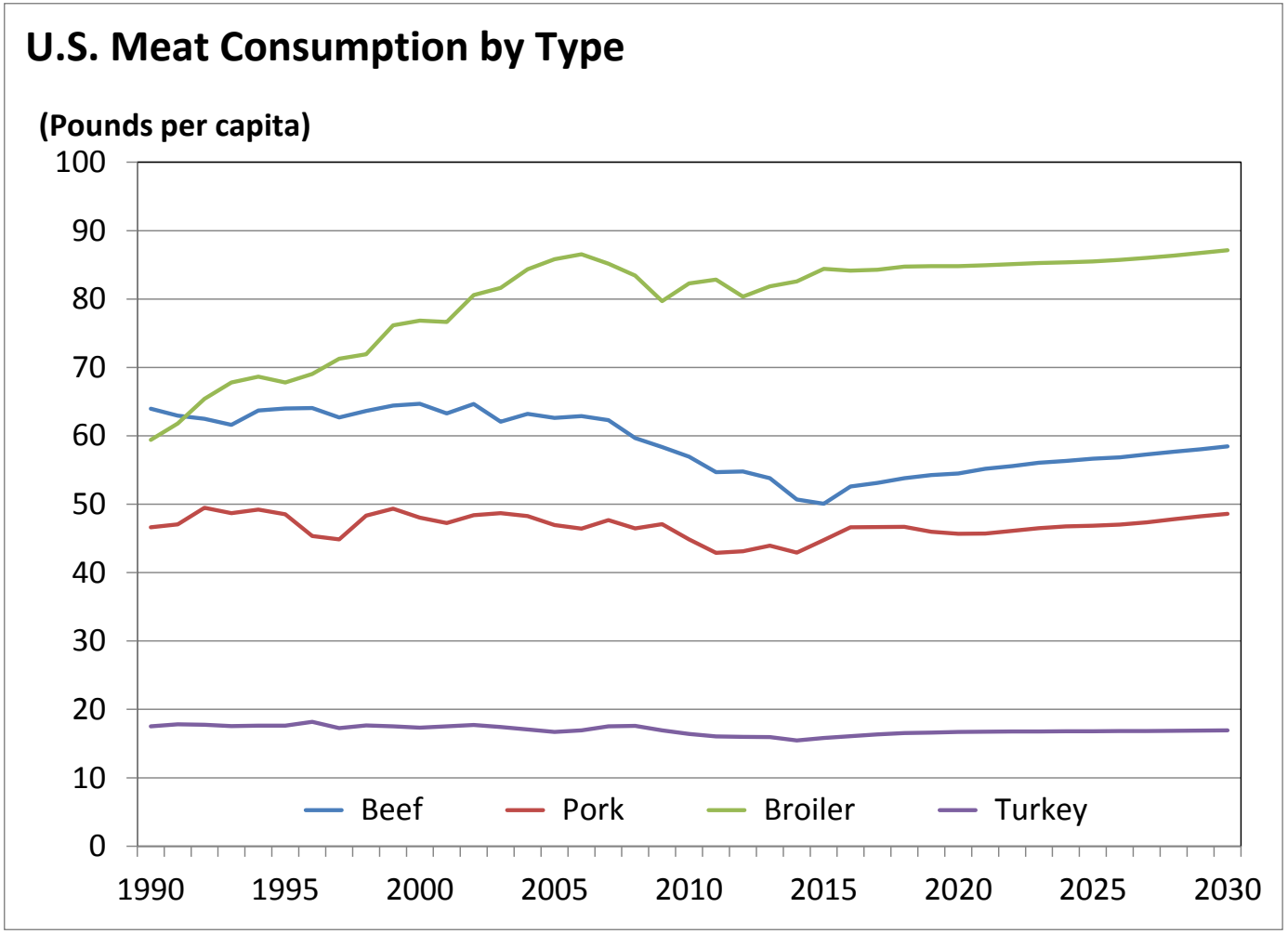
US ethanol export / import prospects



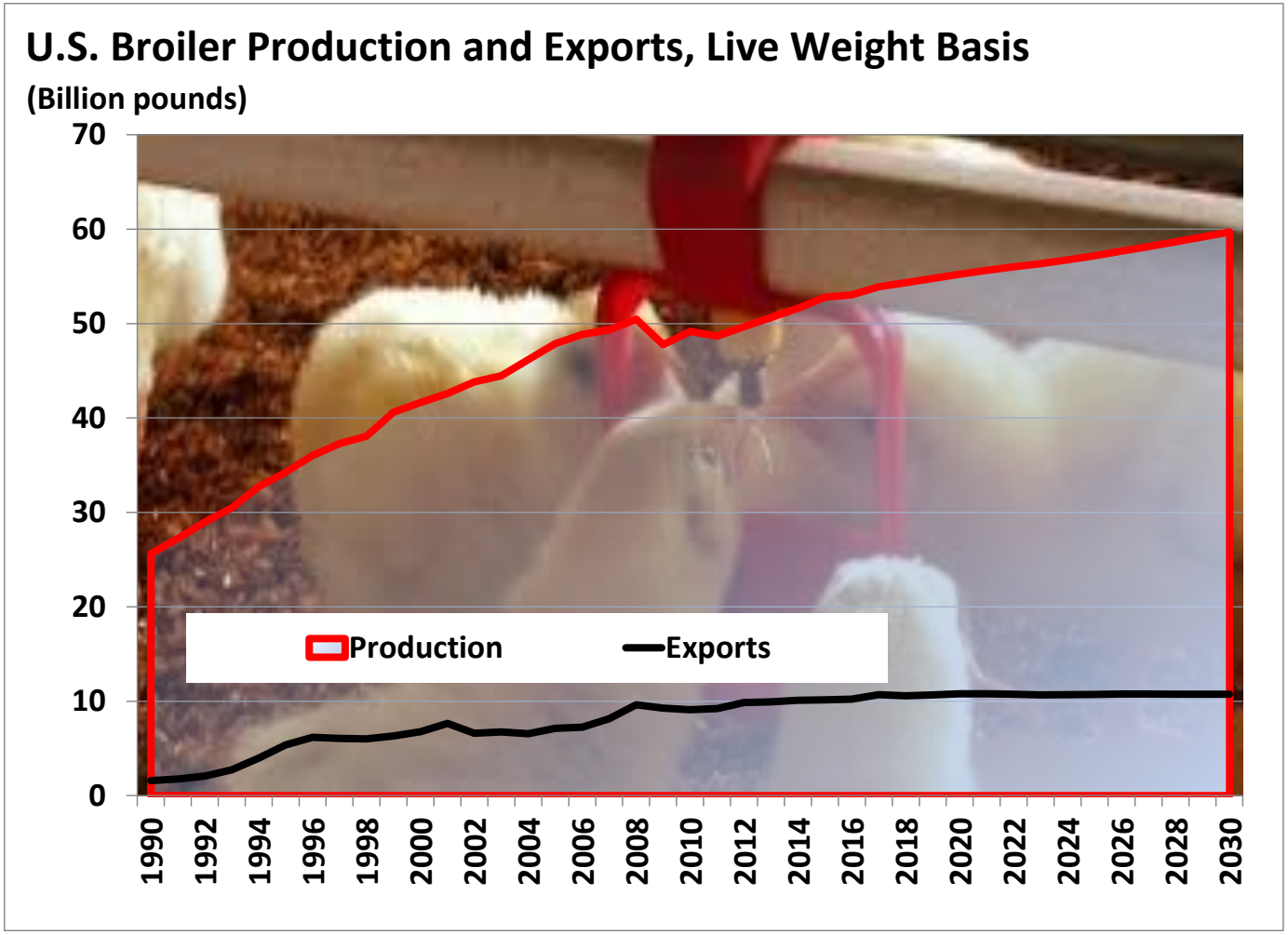
Meat price index increases compared to feed indexes provide the best opportunity for sustained profits in the poultry and other meat protein categories



Beef and broiler consumption will grow fastest from 2014 to 2030 allowing Delaware poultry production to grow even if market share contracts



US broiler exports will remain relatively flat while production is increasing – Delmarva production will continue to serve the needs of the Mid-Atlantic with some opportunities for export growth.



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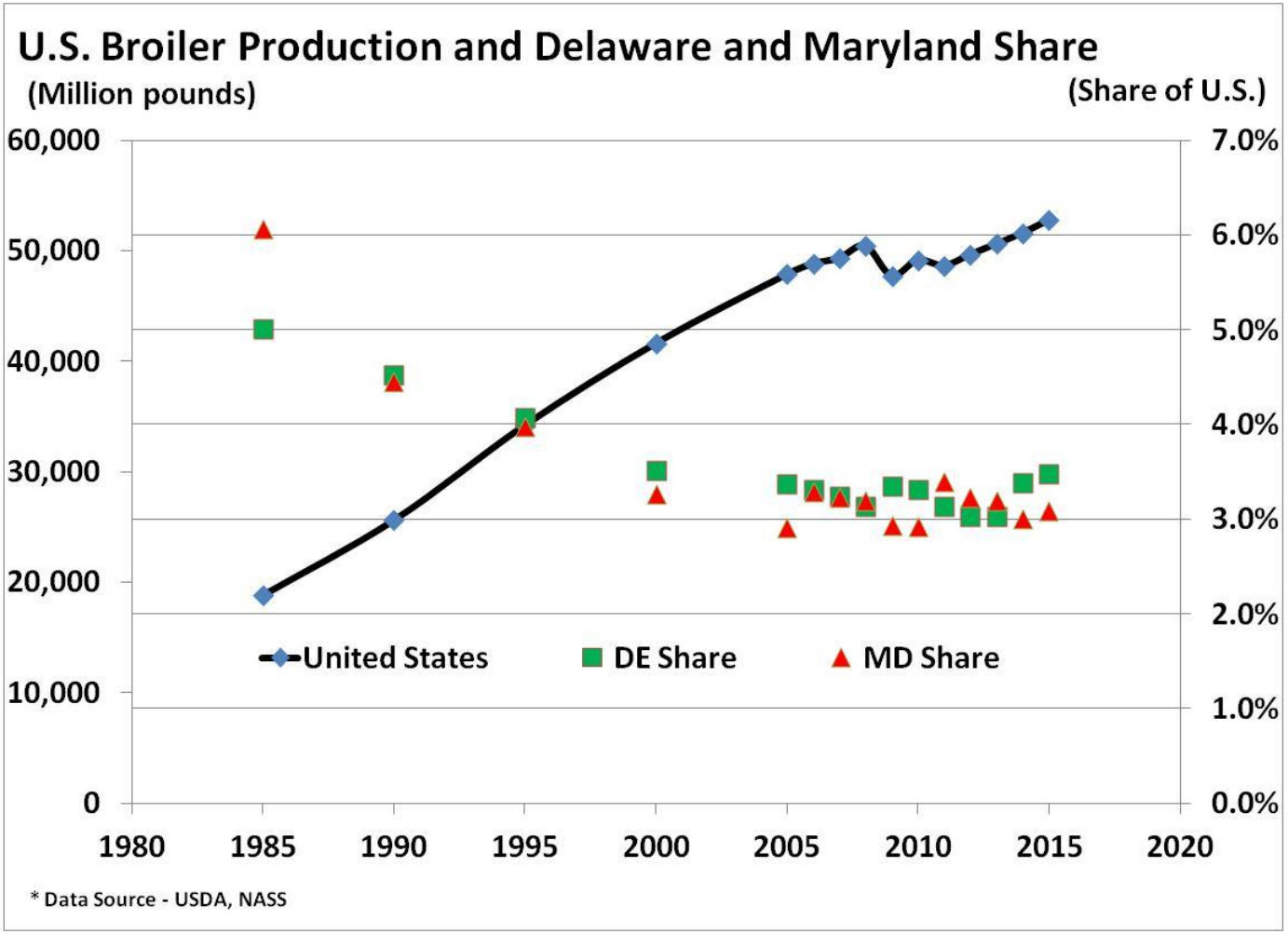
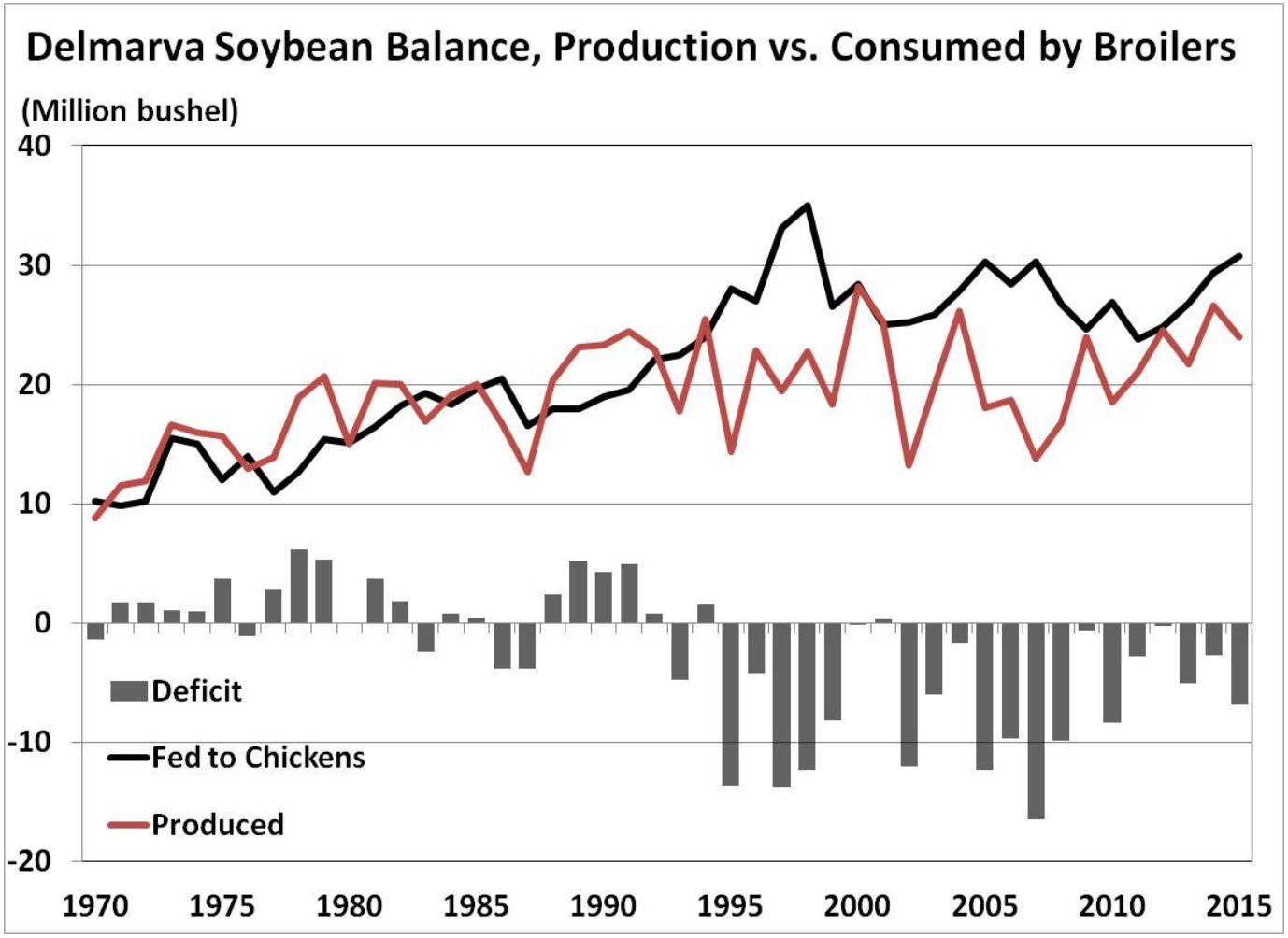
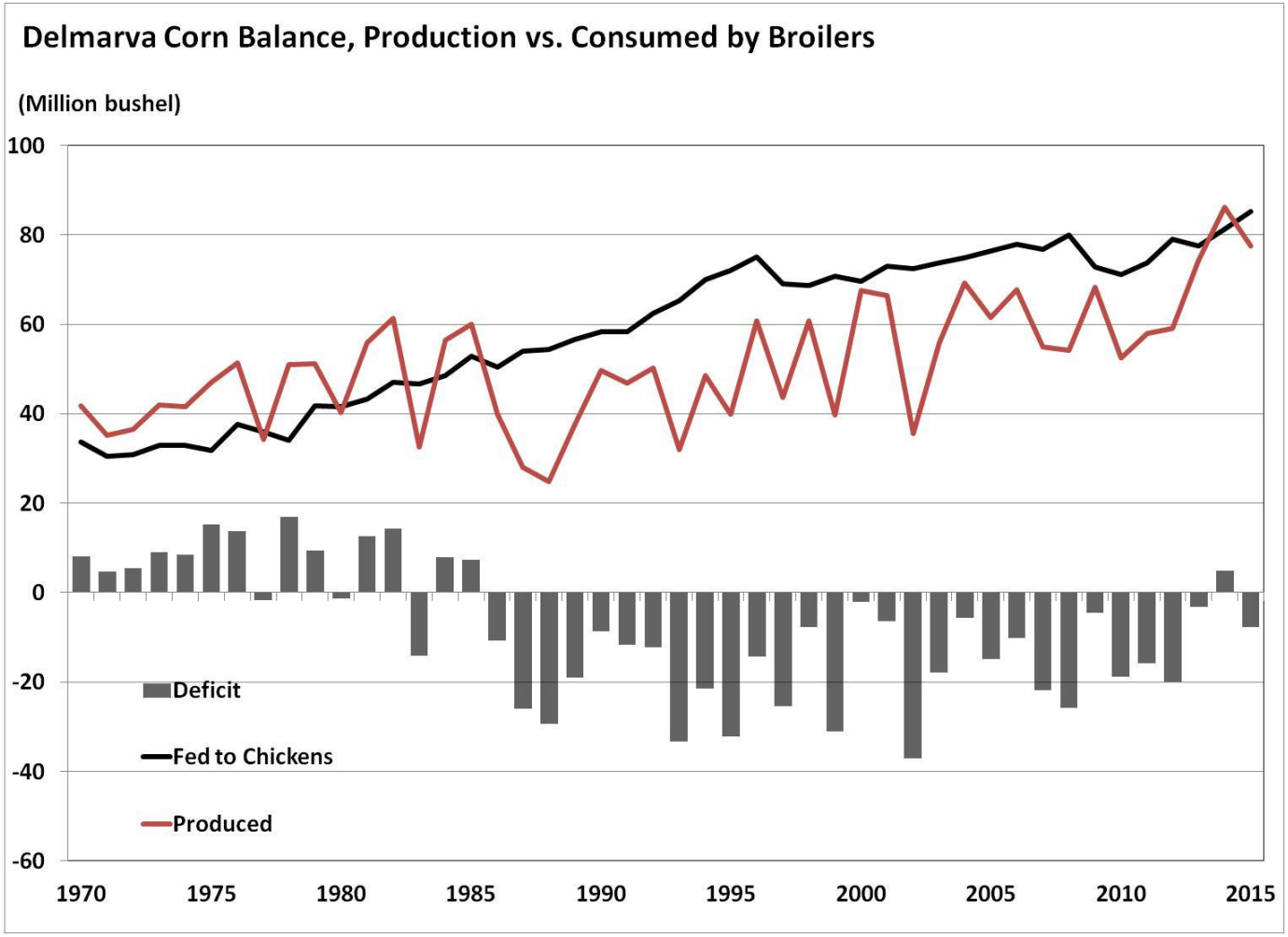
Delaware and Maryland's shares of national broiler production declined in relative terms (production in absolute terms remained flat), but recent investments are at least stabilizing (if not increasing) Delmarva's share



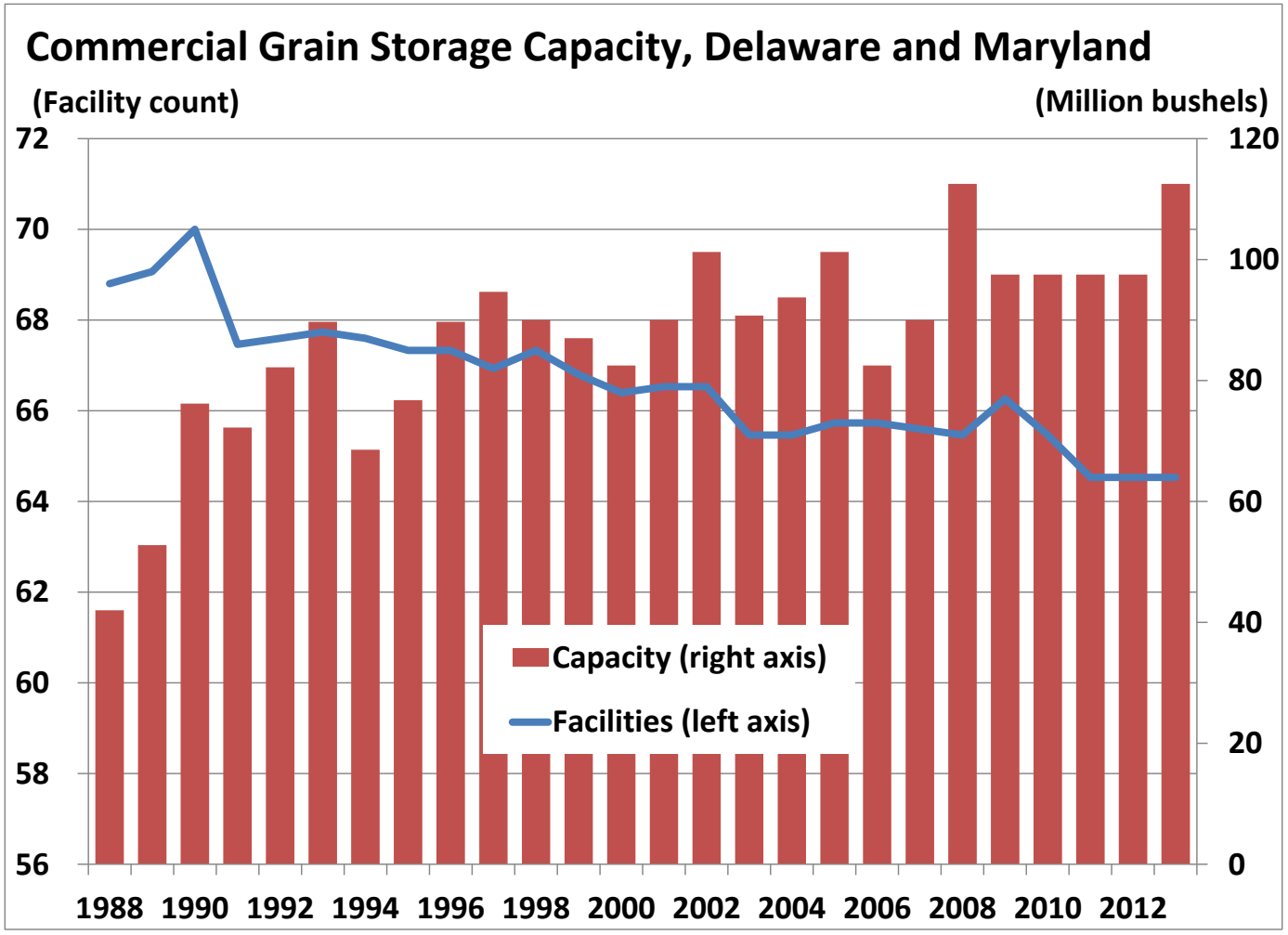
Delmarva produces less soybeans than required for local broiler feed, requiring external sourcing



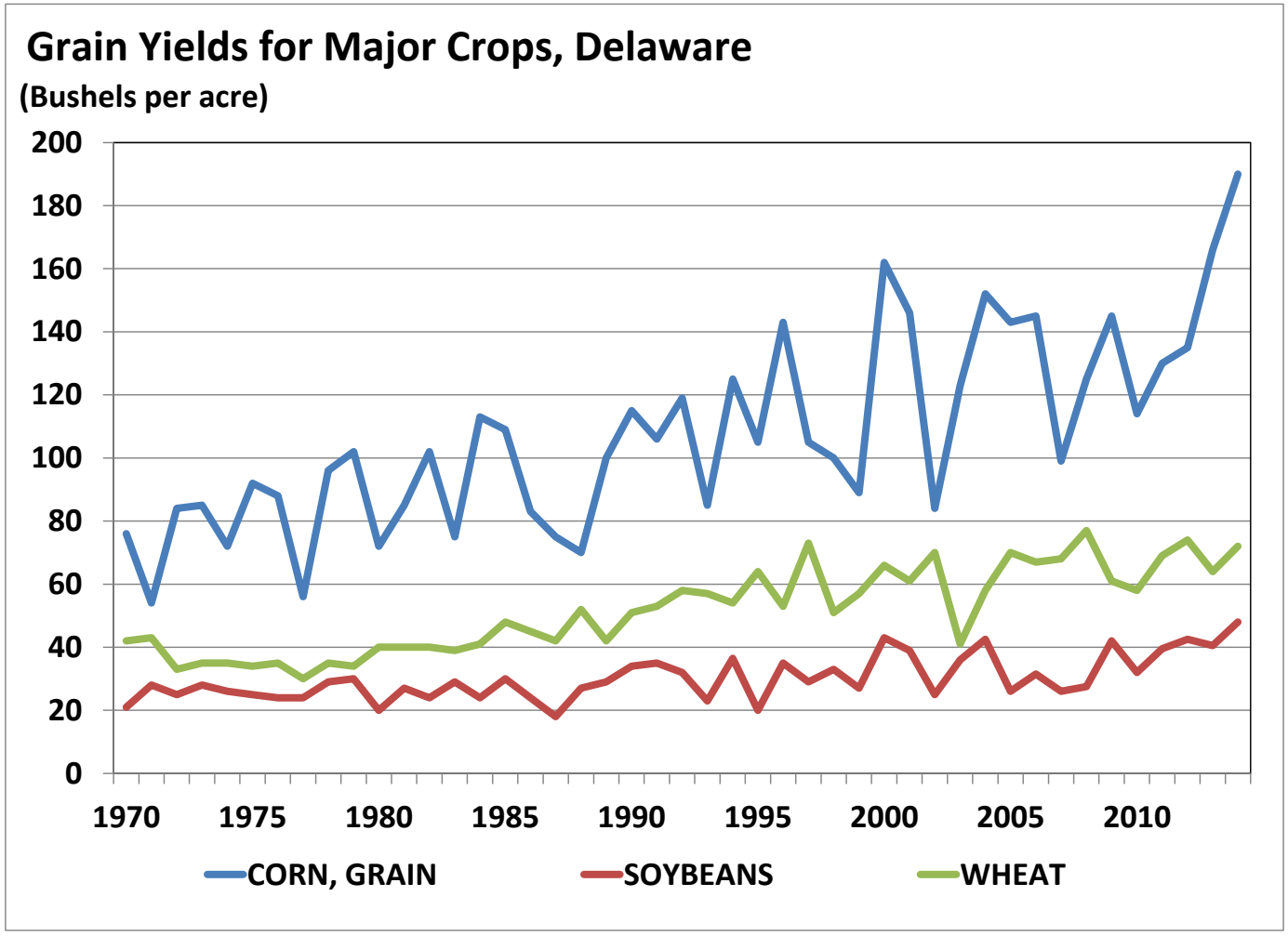
Delmarva currently produces less corn then consumed by broilers requiring imports from the US Midwest



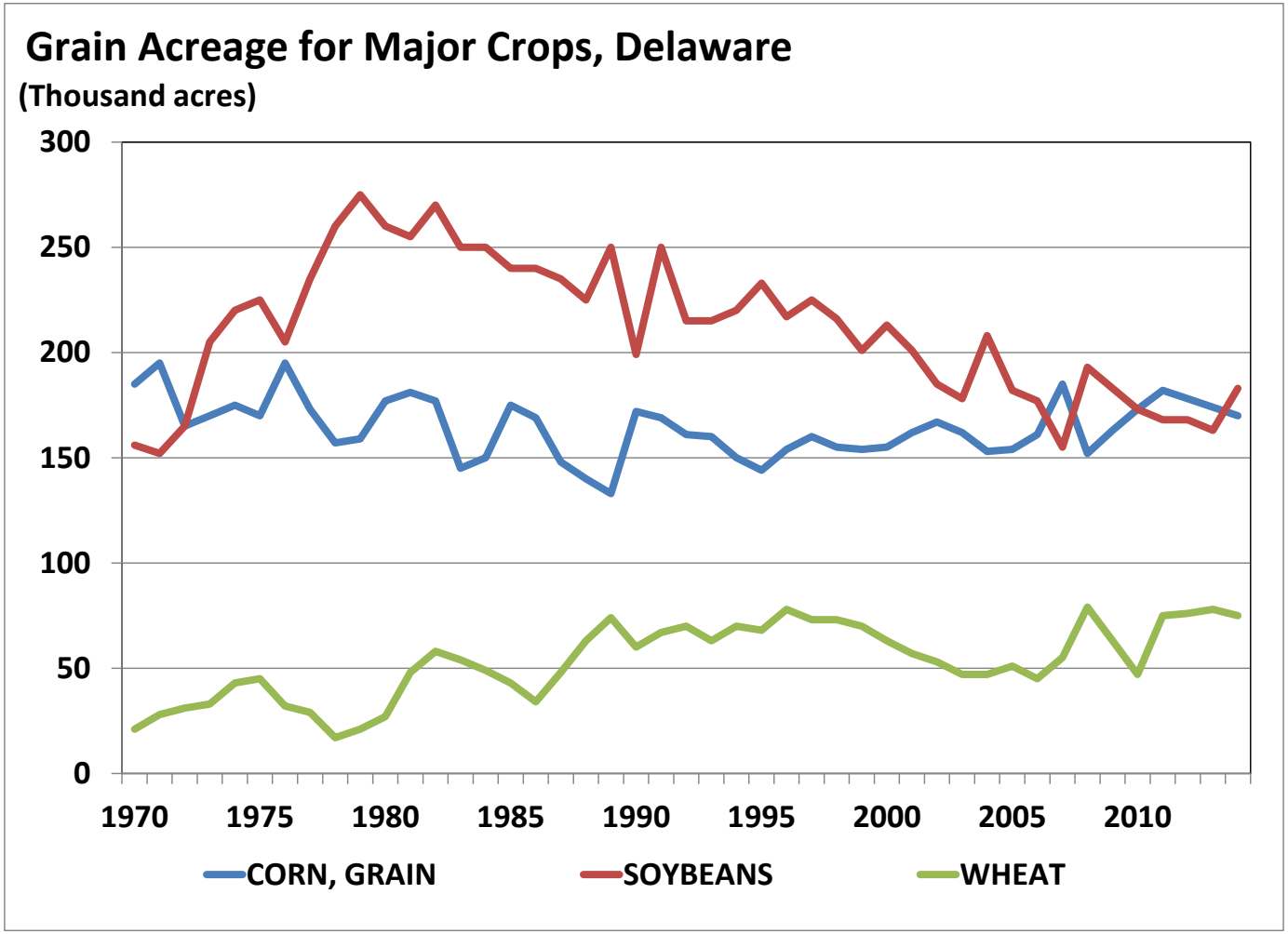
Commercial grain storage capacity on Delmarva is increasing, while the number of facilities is on the slight decline, illustrating a trend in growing storage facility sizes



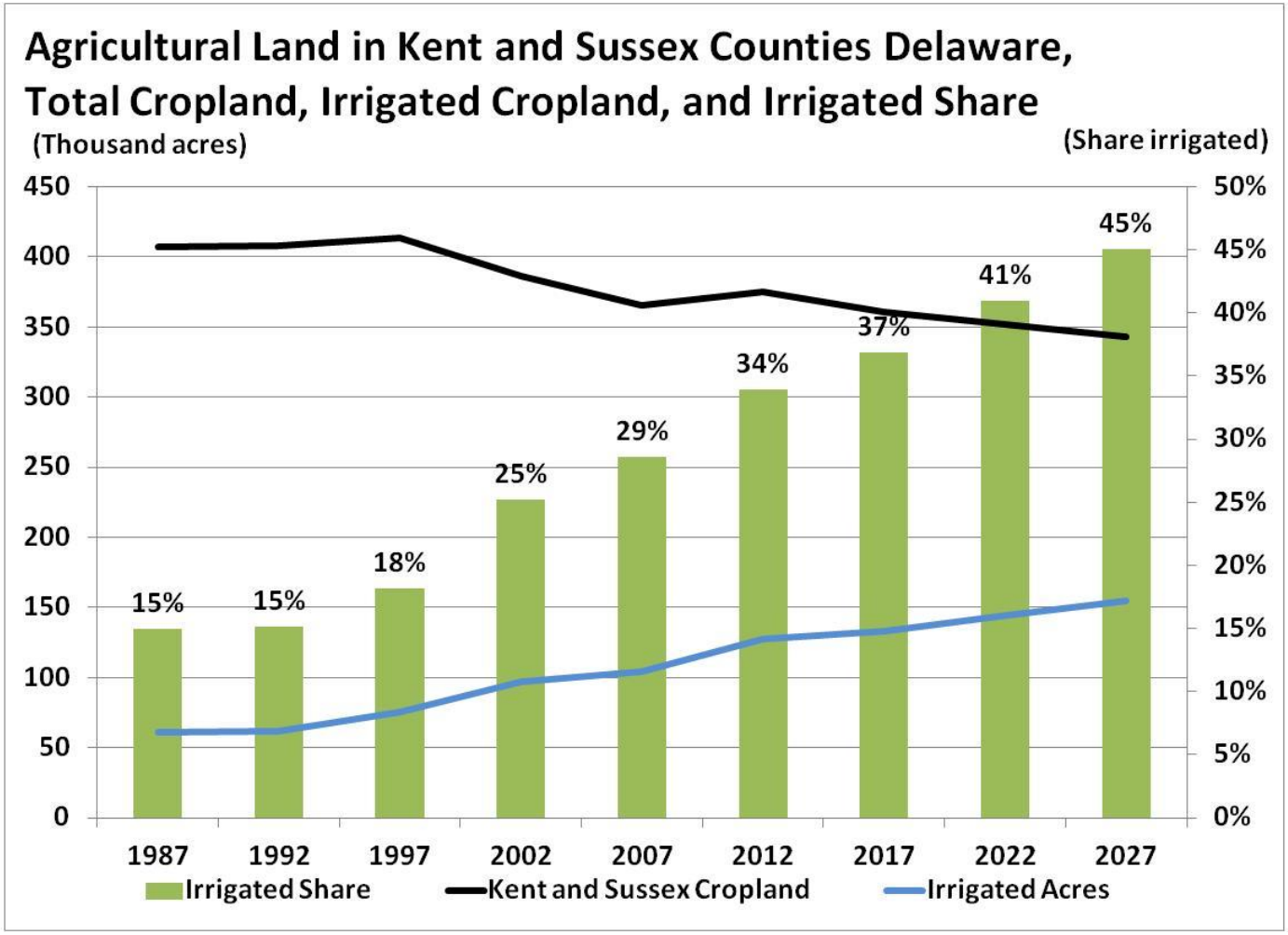
Corn yield in Delaware has been increasing exponentially since 2010, due in part to improvements in irrigation



Major grain acreage in Delaware is slowly declining do to encroachment of housing and other non-agriculture uses, suggesting a widening of the regional grains deficits without further yield gains



The continued expansion of irrigated acreage in Delaware should help stem, but not completely offset, declines in total cropland



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  - Agriculture Sector Interviews
  - Delaware Farm Bureau Survey
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Summary of industry outreach for primary research

Methodologies employed for industry feedback

	Date	Medium	Description
Industry Workshop	May 6th	Conference Meeting	• Two-hour session at the Delaware Department of Agriculture building in Dover, DE • Focus on poultry industry supply chains • Industry participation*: Large regional grains and poultry companies, railroads, and equipment providers • Public-sector participants: DelDOT, Wilmapco, and Dover/Kent County MPO
Interviews	April – June	Phone and in-Person	• Semi-structured phone and in-person interviews • Outreach to industries*: Transportation & Logistics**, Dairies, Fisheries, Forestry, Breweries, Food Processing & Packing, Suppliers, and Storage • 12 Interviews conducted
Survey	May 22nd – June 5th	Online Survey	• Conducted by the Delaware Farm Bureau through its weekly on-line news publication to Delaware farmers • Structured and open-ended questions concerning top concerns and priorities for Delmarva policymakers • Participation rate: 7 out of about 100 subscribers

* Participants identified by Delaware Department of Agriculture, Delaware Department of Transportation, and IHS Agriculture Consulting
** Includes public-sector entities not present at the Industry Workshop, and regional trucking and logistics companies

Summary of primary research: Transportation priorities

- Maintaining reliable rail freight service is critical to supplying feed and fertilizer for various agricultural sub-sectors, with emphasis on improving congestion in northern Delmarva (especially shared track with the Amtrak NEC) and maintaining reliable service on the Norfolk Southern Delmarva Secondary line
- Increasing truck weight limits to 90,000 lbs. for goods in the agriculture supply chain and coordinating weight limits with neighboring states will improve supply chain efficiencies and reduce costs (especially for exports)
- Extending north-south limited access roadway infrastructure (e.g., the Route 1 Bypass) further south and improving throughput at primary east-west highways and crossings would significantly reduce travel times and reduce congestion, especially with competing summer beach traffic
- Increasing road capacity and throughput at major bottlenecks connecting Delmarva to major Mid-Atlantic poultry consumer markets (e.g., I-95/295/495 corridor and tolls, and the Bay Bridge) would reduce travel times and lower costs, helping to make the industry more economically competitive
- Improving safety and accessibility on secondary roads by improving road designs to adequately accommodate both truck and passenger traffic, and conducting driver awareness education
- Continuing dredging, ice-cutting, and channel maintenance on the Nanticoke and Wicomico rivers
- Integrating new technologies to DelDOT processes (e.g., heavy-load permits) as relatively inexpensive but high-impact solutions to support supply chain efficiency
- Promoting the establishment of a large grain elevator and/or shuttle loading facility on Delmarva would create efficiencies by centralizing distribution, especially for grains loading/unloading
- Seaports (and access to seaports) are important nodes in agriculture trade, including the Port of Wilmington as well as other Mid-Atlantic ports (Baltimore, Norfolk, and Philadelphia)

Summary of direct consultant outreach to Delmarva agriculture and related industries

Consultant contacts by phone and/or email*

Sector	# of Contacts	# Attended Workshop	# Interviewed
Poultry	6	4	-
Farming: Grains, Vegetables & Horticulture	5	-	5
Vegetable/Meat Processing	6	-	-
Transportation, Logistics & Storage	9	4	2
Forestry	4	-	-
Fisheries	2	-	1
Dairies	3	-	2
Breweries	3	-	-
Equipment and Supplies	9	1	2

* Not including Farm Bureau survey

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  - Delaware Farm Bureau Survey
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- Economic Development Opportunities and Investment Priorities

Summary of industry workshop: Overview

- The industry workshop focused primarily on poultry industry supply chains for Delmarva, the largest driver for the regional agriculture economic activity.
- Individual companies provided detailed feedback and specific metrics about operations, which have been delivered to DelDOT in separate documents.
- Participants developed a list of priority transportation investments and policies to enhance Delmarva agriculture industry supply chains, which are summarized in this document.

Summary of industry workshop: Attendees

Attendees by sector

Sector	Company
Poultry	• Allen/Harim • Amick • Montaire Farms (multiple attendees) • Perdue Foods
Supplies	• Hoober, Inc. (multiple attendees)
Transportation (Private-sector)	• Norfolk Southern Railroad
Transportation (Public-sector)	• Delaware Department of Transportation (DelDOT) • Wilmington Metropolitan Area Planning Council (Wilmapco) • Dover/Kent Metropolitan Planning Organization (Dover/Kent MPO)

Summary of industry workshop: Findings

Industry workshop summary

Topic	Key Comments
Industry Macro-level Issues	• Recently there has been an expansion of chicken houses, pointing to more local production, including expansion of organic chicken production. • A bird flu epidemic in the western and central United States poses a potential threat to Delmarva poultry industry; keeping distance between chicken house operations can mitigate the risk of a wider epidemic.

Supply Chains	• The regional poultry supply chain is summarized as follows:
	  • Grains from Ohio and Indiana (~60%, all by rail), local farmers (truck) or from the Port of Norfolk via barge for feed to chicken houses
	  • Eggs from North Carolina via refrigerated truck to hatcheries, then specialized trucks transport chicks from hatcheries to chicken houses
	  • Other inputs to chicken houses: chemicals and plastics (truck from Wilmington/ Philadelphia), limestone (truck from PA), and micro-nutrients (truck from GA)
	  • Live birds from chicken houses by truck to processing plants (in Delmarva or PA)
	  • Processed poultry by refrigerated truck to Mid-Atlantic consumer markets or frozen for export to the Port of Norfolk
	• About 2/3 of feed is corn, and 1/3 is soybean meal
	• ~80% of poultry destined for US Mid-Atlantic metropolitan markets (refrigerated & delivered within 24 hours); 20% is exported (frozen) via the Port of Norfolk

Summary of industry workshop: Findings, continued

Industry workshop summary

Topic	Key Comments
Feedstock supply chain issues	• Lower credit and greater yields have helped increase regional agricultural production, but scarcity of feed is driving up production costs. • During most of the year, the poultry industry relies on inbound shipments of grains to the Delmarva peninsula to feed the animals. • The lack of multiple soybean crushing units and multiple grain wholesalers makes many poultry companies worry about supply chain risks and costs. • Without rail service, most believe the recent expansion of poultry production will ebb and, possibly, decline. • Some poultry producers have begun trucking in grains at higher costs (and congestion) as a hedge on regional availability. • Grains are also barged from the Port of Norfolk to Salisbury, typically by Perdue; beyond Purdue there are storage and processing capacity constrains (e.g., no other regional soybean crushing units). • Barge is the most likely alternative if rail service were discontinued to the Delmarva Peninsula, but there would be major disruptions (at least initially) to feed supplies that some believe could drive some poultry producers out of business.

Summary of industry workshop: Findings, continued

Industry workshop summary

Topic	Key Comments
Rail logistics	• Currently, about 6,000 rail cars per year of grains and soybean meal serve Delmarva inbound each year and relatively small amounts of agriculture are shipped outbound • Unit trains for Delmarva agriculture include about 85 cars per train, but it is difficult to get enough volume at individual poultry producer plants; some suggest the development of a consolidated grain elevator/shuttle terminal. • Congestion in northern Delmarva on lines shared/crossing Amtrak limits corridor train traffic to 8 cars/day maximum (~4 crude oil unit trains, and the rest are coal and agriculture). • Some trains must stand for 24-hours before passing through northern Delmarva. • On average about one train per day carries agriculture commodities into Delmarva. • Disruptions in service in recent years due to Norfolk Southern network congestion have been mitigated by recent system capacity investments (e.g., Bellevue Yard in Ohio).
Rail economics	• Rail becomes a competitive mode once origin-destination pair distance reaches 500 miles; most transport within 500 miles is by truck. • Millsboro's Indian River power plant's retiring of all but one coal-fired unit has significantly affected rail demand for the Norfolk Southern Delmarva Secondary line. • Norfolk Southern has no current plans to discontinue service on the Norfolk Southern Delmarva Secondary line, but the railroad will need to monitor whether traffic and revenues justify continued investment each time major scheduled maintenance is due (every ~9-10 years for this line).

Summary of industry workshop: Findings, continued

Industry workshop summary

Topic	Key Comments
Truck logistics	• Route 113 is a major bottleneck, as well as major east-west intersections with 113 and other north-south state highways south of Dover (at routes 8, 24, 26, & 404). • Many trucks elect to take local roads due to congestion, causing safety hazards. • Conflicts between freight and passenger traffic during the summer beach season create congestion on southern Delaware roadways and at interchanges and results in bottlenecks on northern Delaware highways. • Trucks average 1.5 hours of additional travel time on Sunday nights during beach season. • Lack of limited access highway south of the Route 1 bypass creates congestion at stop lights at state highway intersections.
Truck regulations	• The 80,000 lbs. truck weight limit (except for live animals) increases costs and difficulty for agriculture supply chains on Delmarva and provides neighboring states (NC and PA have 90,000 lb. limits) with a competitive advantage. • Weight limits cause containers to be underweight for export; they must be consolidated at ports to ensure maximum packing efficiency and cost savings for ocean freight. • Perdue processes poultry in PA so that it can pack refrigerated trucks to 90,000 lbs.
Oversized trucks	• Much of the farm equipment in Delmarva is transported by oversized trucks • State requires police escorts for loads wider than 16 feet, but local equipment suppliers also provide their own escorts for many wide loads under 16 feet. • Lack of electronic permitting makes it difficult to coordinate backhaul shipment of wide load requirements, creating multiple wide-load tours, contributing to congestion.

Summary of industry workshop: Priorities

Industry workshop summary of policy and funding priorities

Mode	Feedback
Investment	• Chesapeake Connector or similar investment to relieve conflict/congestion with Amtrak NEC tracks in northern Delmarva • Extending the Route 1 bypass further south • Reducing red lights/at-grade crossings on Route 113 from Dover to the south • Congestion mitigation improvements on east-west highways in southern Delaware (including routes 8, 24, 26, 404) • Enhancing shoulders and geometries of back roads to accommodate trucks and reduce accidents
Regulatory	• Allow truck weights of up to 90,000 lbs. • Work with Maryland and Virginia to create uniform (and higher) truck weight regulations • Use technology to improve oversize truck permitting and other administrative burdens
Other	• Maintaining Delmarva Secondary rail line service • Consider coordinated approaches to grain logistics such as a consolidated grain elevator and/or shuttle terminal in central Delmarva • Employ transportation funds and institute policies to mitigate summer traffic • Create driver awareness campaigns regarding agricultural equipment traffic

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Summary of industry interviews: Overview

- The consulting team reached out to industry representatives across all agriculture and related sectors, requesting in-person or phone interviews.
- In many cases invitees to the Industry Workshop declined attendance but agreed to interviews.
- A list of regional industry contacts was compiled jointly by the Delaware Department of Agriculture, DelDOT, and IHS Agriculture Consulting. Companies and groups contacted hailed from the following sectors: Transportation & Logistics, Dairies, Fisheries, Forestry, Breweries, Food Processing & Packing, Suppliers, and Storage.
- IHS worked with DelDOT to develop a menu of questions to use for semi-structured industry interviews, which were designed to learn about individual company's:
  - Production, consumption, and distribution activities
  - Supply chain configuration, risks, and challenges
  - Perspective on the adequacy of Delmarva transportation infrastructure and policies
- Overall, the feedback on infrastructure concerns and requirements was similar to the issues expressed in the Industry Workshop, but additional insight was gleaned on the specific challenges of other agriculture industries outside of the poultry supply chain.

Summary of industry interviews: Participants

Participants by sector

Sector	Company
Farming: Grains, Vegetables, and Horticulture	• Delaware Farm Bureau • Delaware Soybean Association • Perdue AgriBusiness • Fifer Orchards • Carlisle Farms, Inc.
Transportation, Logistics & Storage	• Burris Logistics • Choptank
Fisheries	• Delmarva Aquatic
Dairies	• Hy-Point Farms • Woodside Creamery
Equipment & Supplies	• Southern States • GrowMark

Summary of interviews: Findings and priorities

Farming: Grains, Vegetables, and Horticulture

Sector	Key Comments
Industry Trends	• The high cost of rail from the Midwest helps maintain higher spreads for Delmarva farmers, but causes high feed prices for poultry producers. Therefore, while farmers and poultry producers depend on one another in the big picture, their micro-level interests are not 100% aligned. • Corn is taking a greater share of local feed as irrigation has improved corn yields (up 7% of 15 years), while there is a scarcity of soybean supply and, especially, soybean crushers. • Perdue's Salisbury plant is the only soybean crusher on Delmarva, and there are worries about shortages of soybean meal. • Soybean meal is sometimes imported during times of scarcity (e.g., 2013 from Brazil), but otherwise first comes from Delmarva farmers then other domestic sources. • While Delmarva poultry production is growing, demand in the mid-Atlantic and Northeast consumer markets is flat, therefore products must be shipped longer distances to find markets.

Summary of interviews: Findings and priorities

Farming: Grains, Vegetables, and Horticulture

Sector	Key Comments

Transportation Issues	• Rail service is inconsistent due in part to congestion in Perryville, MD to cross the Amtrak NEC line.
	• Dredging of the Nanticoke and Wicomico rivers is compromised by potential loss of US Army Corp of Engineers funding if volumes fall below and average of one million tons/year on either waterway
	• Most agriculture products, including poultry, fresh vegetables, and fruits are distributed by truck to Mid-Atlantic metropolitan areas.
	• The use of trucks for grains (inbound and outbound) on Delmarva is increasing due to both increased local production and inconsistent rail service.
	• Delmarva is more reliant on truck than other parts of the country. Perdue AgriBusiness reports the following breakdown based on its large Delmarva presence:
	  • Truck: 70% on Delmarva vs. 50% nationally
	  • Rail: 15% on Delmarva vs. 30% nationally
	  • Water (barge to Seaford or Salisbury): 15% on Delmarva vs. 20% nationally
	• Lack of road shoulders, appropriate road capacity/geometry (e.g., road height clearances on some roads, single lanes on route 404 and 50, etc.) and road competition (e.g., with autos and bicycles) is a safety hazard.
	• Major road congestion and bottlenecks affecting supply chains reported at:
	  • Routes 13, 15, and 24 (in Millsboro)
	  • Bay Bridge

Summary of interviews: Findings and priorities

Farming: Grains, Vegetables, and Horticulture

Sector	Key Comments
Priorities	**Rail** • Improving rail throughput across northern Delmarva, including the Amtrak NEC segment used by freight railroads • Maintaining Delmarva Secondary rail infrastructure to industry standards and ensuring required levels of service **Roads** • Allowing heavier truck weights, at least for key high-volume agriculture products • Enhancing capacity and safety on all major highways • Developing service roads for congested urban areas • Maintaining and improving secondary roads, culverts, and bridges to safely accommodate trucks • Improving other regulatory-related processes, such as removing weigh stations from divided highways near merging traffic (e.g., Route 13 in Salisbury) and increasing parking at truck driver rest stops • Improving driver awareness of sharing road with farm vehicles **Water** • Maintaining Nanticoke and Wicomico river access through sustained dredging, maintenance, ice cutting, and spoils removal

Summary of interviews: Findings and priorities

Transportation, Logistics & Storage

Sector	Key Comments
Industry Trends	• The peak season for traffic is August – October. • The shift towards intermodal elsewhere is changing supply chains for long-distance freight, and Delmarva could benefit from an intermodal yard (estimated 25% savings on long haul). • Much of the agriculture products produced in Delmarva is shipped in truck (often refrigerated) to final destinations mainly in the Mid-Atlantic. • The reported truck driver shortage is a long-term issue; age restrictions (21) on licensing makes it difficult to recruit the next generation of drivers. • Driving regulations are getting more and more expensive.
Transportation Issues	• There is major congestions at the I-95/295/495 intersections. • Summer beach traffic makes weekends difficult for trucks (especially I-295 in the north and state highways in the south). • The toll plazas on I-95 cause back-ups. • The I-95/Route 896 interchange is also highly congested.
Priorities	• Improved rail service, including intermodal • Adding lane capacity to routes 13 and 113 • Route 1 Bypass road is a good model that should be employed elsewhere on Delmarva • Lessen regulatory costs and burdens

Summary of interviews: Findings and priorities

Fisheries and Dairies

Sector	Key Comments
Industry Trends	• Dairy products are sourced from farms all over Delmarva and into neighboring states such as Philadelphia, bottled locally, and distributed by truck to local markets. • Some value-added dairy products are produced and mostly sold locally, including ice cream and cheeses. • Fishery supply chains may have more disparate origins and destinations covering potentially longer-distances, sometimes requiring air cargo (e.g., inputs for farmed fish).
Transportation Issues	• Congestion on southern Delaware highways is major problem, especially during beach season. • To the extent that goods move through seaports, delays at ports (especially truck queuing at the Port of Baltimore) are problematic.
Priorities	• Reduction in congestion on southern Delaware roads and the I-95 corridor • Reduce regulatory burdens, generally

Summary of interviews: Findings and priorities

Equipment & Supplies

Sector	Key Comments

Industry Trends	• Fertilizer and other farm inputs tend to be distributed locally by trucks.
	• Inbound raw goods for fertilizer and farm inputs come from more disparate sources, mostly by truck but some by rail.
	  • Canadian potash by rail
	  • Nitrogen and other fertilizer materials sourced from numerous locations throughout the United States, mostly by truck

Transportation Issues	• Up until February 2015 reliability of rail shipments has been poor, but has improved lately. • Conflicts between farm vehicles and passenger vehicles causes a nuisance.
Priorities	• Reliable rail service to Delmarva • Driver education and training regarding farm vehicles, especially during planting and harvest seasons

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Summary of survey: Overview

- During its interview with the consulting team, the Delaware Farm Bureau offered to issue a survey to its members covering agriculture transportation and supply chain issues
- DelDOT authorized the consulting team to coordinate with the Delaware Farm Bureau on the survey design and questions
- The Delaware Farm Bureau advertised the online survey in its weekly electronic newsletter to members (approximately 100 recipients) as part of its May 22nd and May 29th issues.
- The survey asked respondents to:
  - Question 1: Identify the sub-sector best representing the respondent's business
  - Question 2: Estimate shares of production shipped in-state versus out-of-state
  - Question 3: Estimate share of production that is part of poultry supply chains
  - Question 4: Rate elements of Delmarva transportation infrastructure
  - Question 5: Rank the relative importance of proposed improvements and policy changes*
  - Question 6: Identify greatest threats poses by transportation to the respondent's business
  - Question 7: Identify other transportation issues not included among the survey options

* Proposed improvements included in the survey were based on feedback from the Industry Workshop, but before all Interviews had been completed. Therefore, key improvements/policies later identified in interviews were not included in the rankings.

Summary of survey: Participants

- Seven responses: Approximately 7% response rate; considered a low response rate
- Respondent identification*

Question 1

	Grains	Hay/ Straw	Vegetables	Poultry	Horticulture	Livestock
Identification of agriculture supply chain sector*	7	2	1	1	1	1

* Some respondents self-identified within multiple sectors

Summary of survey: Results

Question 2

	0-20%	20-40%	40-60%	60-80%	80-100%
Share of production delivered out of state	4	-	1	2	-

Question 3

	0-20%	20-40%	40-60%	60-80%	80-100%
Share of production supporting poultry	4	-	-	1	2

Summary of survey: Results, continued

Question 4

Rate importance of infrastructure	N/A	Not Necessary	Not Important	Needed	Priority	Vital
State & local highways	-	-	-	-	1	6
US Interstate highways	2	-	1	1	1	2
Rail freight service on Delmarva	1	1	-	2	2	1
Rail connections to/from Delmarva	2	1	-	3	1	-
Port of Wilmington	1	-	2	2	1	1
River Ports in Seaford and/or Salisbury	1	-	1	1	3	1
Port of Baltimore	2	-	1	2	1	1
Port of Norfolk	-	-	1	2	3	-
Philadelphia International Airport	2	-	2	2	-	-
Baltimore-Washington International Airport	1	-	2	2	1	-
New Castle Airport	2	1	2	1	-	-

Summary of survey: Results, continued

Question 5*

Rank the importance of the following (1 = least important; 9 = most important)	Lower Third (Rank# 1-3)	Middle Third (Rank# 4-6)	Top Third (Rank# 7-9)
Maintaining rail service down the Delmarva Peninsula	3	3	1
Reducing rail congestion across Amtrak NEC tracks in northern Delmarva	2	4	1
Increased weight limits for trucks	3	3	1
More limited access for east-west highways throughout the state	1	5	1
Enhanced roadway capacity and safety improvements (e.g., shoulders)	5	-	2
New centrally located agriculture bulk railroad loading/unloading terminal	2	4	1
Lengthening the Route 1 Bypass further south	2	1	4
Publicly-funded grain elevator	2	2	4
Enhanced or expanded rail service	2	1	4

* Improvements to ports and waterways, including dredging and channel maintenance of the Nanticoke and Wicomico rivers, were not included in the rankings. These issues more fully emerged during the concurrent Interview phase.

Summary of survey: Results, continued

- Question 6: Greatest threat posed by transportation issues to agriculture business:
  - Four responses concerned roadways infrastructure including weight limits, road congestion, limited secondary road access, and bridge conditions.
  - Two responses concerned general policy issues including transportation fees and the prioritization of Highway Trust Fund money for roadways.
  - One response concerned the availability of rail cars during harvest.

- Question 7: Identification of other transportation issues
  - No specific investment or policy was identified, except opposing diversion of highway funding program funds to airports.

Summary of survey: Findings and priorities

- Findings and Analysis
  - It is difficult to generalize with a small sample; however, combined with the Industry Workshop and Interviews, the survey helped provide a more complete and diverse picture of transportation issues and priorities for Delmarva agriculture supply chains.
  - In particular, the survey reached farmers, with all but one respondent self-identifying with farm-sector activities (and less than half directly supporting poultry supply chains).
  - The survey results generally substantiated the issues and priorities identified in the Industry Workshop and in the Interviews, but with particular priority attached to roadway policies and investments. This is consistent with the survey results suggesting overall more proximate markets for the respondents' products.
  - Respondents tended to react more favorably to general transportation issues and improvements (e.g., enhanced/ expanded rail service) than specific investment proposals (e.g., maintaining rail access on the Delmarva Secondary line). One exception was a high ranking associated with the extension southward of Route 1.
- Priorities
  - Respondents primarily identified road investments and policies as priorities.
  - Nonetheless, many respondents also identified rail and water (both seaport and river port) access as needed.
  - Regional airports were identified as important by a few respondents.

Summary of priorities: All primary research methods by industry sector

Priorities by sector (at least one mention)

Sector	Poultry	Farmers	Transport/ Logistics	Fisheries/ Dairy	Suppliers
Improve rail throughput across N. Delmarva (& Amtrak NEC)	X	X	X		X
Maintain safe, reliable Delmarva Secondary service	X	X	X		X
Improvements to reduce travel times on the I-95/295/495 corridor, tolls & interchanges and the Bay Bridge	X	X	X	X	
Enhance capacity of N-S Delmarva highways (Routes 1, 13, 113)	X	X	X	X	
Reduce congestion on east-west highways, interchanges, and at-grade crossings in southern Delaware (Routes 8, 15, 24, 26, 404)	X	X	X	X	
Permit truck weights up to 90,000 lbs.	X	X	X		
Maintain Nanticoke and Wicomico river channels		X			
Make improvements to secondary roads to permit safe co-existence of trucks and passenger modes	X	X			
Consolidated grain elevator/shuttle terminal	X	X			
Passenger vehicle driver education		X			X
Reduce regulatory burdens (e.g., electronic permitting)		X	X	X	X
Improve truck safety amenities (e.g., rest stop parking)		X			

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  - Regional Water Overview
  - Regional Air Overview
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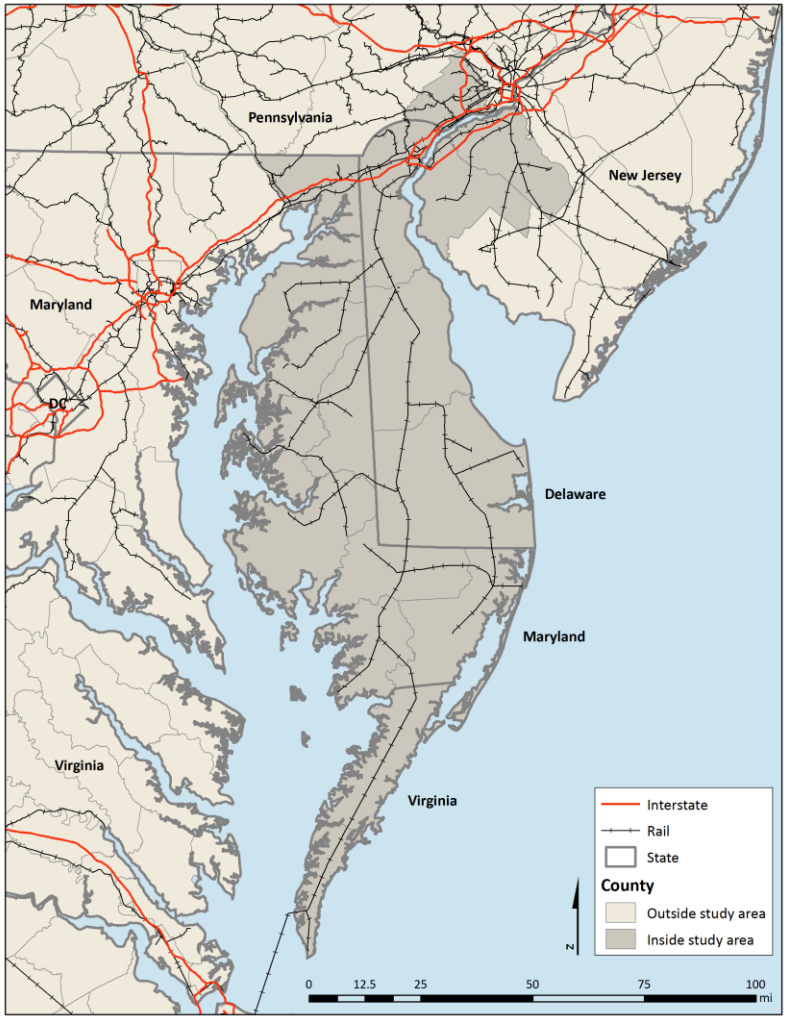
The Delmarva Agriculture Supply Chain Study region



Rail data uses the State of Delaware as the study region, all other modes use the highlighted area above.

Regional transportation assets for the Delmarva agriculture industry

Transportation Assets by Mode with Role Description

Mode	Assets	Role in the Regional Supply Chain
Roadways	I-95 System	• Primary point of entry and exit to the region by truck; includes I-295 and I-495 • Through route from South to Northeast of US and also to and around Wilmington • Fresh, northbound poultry transits I-95 to major out-of-state markets like Pennsylvania and New York • Grain and other chicken feed and vitamins coming from Pennsylvania, New York, and elsewhere in the Atlantic states also transit I-95
	State Highway System	• Primary north-south route is Delaware Route 1; US13 and US113 are vital spurs • I-50 across the Cheaspeake Bay is a critical corridor to/from Baltimore & Washington • Limited access in the more urbanized northern parts of the State
Seaports	Philadelphia	• Has an FDA foreign imports screening facility for food imports • Major foreign imports-exports site for agriculture products
	Norfolk	• Major site for containerized exports of frozen poultry • Grains consolidation and distribution to Delmarva
	Baltimore	• Some agriculture industry use for the Delmarva Peninsula
	Wilmington	• Inbound fresh fruit products (bananas and juices)
Freight Rail	Norfolk Southern	• The only Class I rail serving the Peninsula south of Wilmington via its Delmarva Secondary line, which runs north-south through Delaware and Maryland • Limited to 8 trains ingress or egress per day due to bottleneck at Amtrak NEC
	Shortlines	• Connect the Delmarva Secondary to the Atlantic coast (DCLR and MDDE), Maryland (MDDE) and Virginia (BCRR)
Airports	PHL & BWI	• Limited use for inbound farm products and vegetables plus outbound hatched fish
Inland Waterways	Seaford	• Primarily handles inbound grain for chicken feed but also some outbound grain
	Salisbury	• Primarily handles inbound grain for chicken feed but also some outbound grain

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Freight flows analysis approach

- The data presented in this section are extracted from Transearch 2013, IHS's proprietary database of domestic commodity flows. All data shown is for 2013 or else is a forecast.
- Transearch combines econometrics and transportation industry data to forecast commodity flows of domestic goods movement at the county-by-county level.
- Data is reported at the Standard Transportation Commodity Code (STCC) 4 level and the geographic unit is the Business Economic Area (BEA).
- Commodity flow forecasts are assigned to modes of transportation (truck, railroad, inland-waterway barge, and air) and routed on the transportation network.
- Forecasts are based on historical data, but the current-year Transearch version forecasts begin in 2014. More recent shifts in market trends may not yet be captured in these baseline estimates, but are discussed in the narrative.
- Forecasts in this study will be referred to as the "**baseline case**." More recent trends not reflected in these numbers, such as increased availability of covered hopper railcars to the study region, will be covered in the narrative.

Freight flows analysis approach, cont'd.

- Railway figures are estimated using private rail waybill carload data for Delaware provided by the US Department of Transportation Surface Transportation Board (STB). Estimates for study areas outside of Delaware utilize less-detailed public waybill data.
- Goods covered in flow forecasts include domestic legs of exports and imports, but only those links to and from the points of exit/entry. Imports and exports destined or originating in Canada or Mexico are also included.

Business Economic Area (BEA) description

- Business Economic Areas (BEA) are the basic geographic units of measure for freight transportation. IHS has estimated study area forecasts from BEA data.
  - BEAs define the relevant regional markets surrounding metropolitan or micropolitan statistical areas, wholly partitioning the lower 48 states.
- For freight forecasting purposes, the study area includes all of the Salisbury, MD BEA and parts of the Philadelphia, PA and Washington, DC BEAs.
- Commodity and transportation flows associated with counties corresponding to the study area include:
  - *Philadelphia BEA*: Kent and New Castle (DE); Cecil (MD); Gloucester and Salem (NJ); and Delaware (PA)
  - *Washington BEA*: Caroline; Dorchester, Kent, and Talbot County, MD
  - *Salisbury BEA*: Sussex (DE); Somerset, Wicomico, and Worcester County (MD); Accomack and Northampton County (VA)

Agricultural commodity descriptions in Transearch (STCC 4 Codes)

Commodity Descriptions for included Commodity Groups

Farm Products	Fresh Fish or Other Marine Products	Food or Kindred Products	Chemicals or Allied Products
Cotton, raw	Fresh Fish or Whale, unpackaged	Meat, fresh and chilled, unsalted	Fertilizers exc. Milled or Mined
Grain	Fresh Fish or Other, packaged	Meat, fresh-frozen	
Oil Kernels, Nuts or Seeds		Meat Products	
Field Seeds		Animal by-Products	
Misc. Field Crops		Dressed Poultry, fresh or chilled	
Citrus Fruits		Dressed Poultry, frozen	
Deciduous Fruits		Processed Poultry, Game or Eggs	
Tropical Fruits		Creamery Butter	
Misc. Fresh Fruits/Nuts		Condensed Milk	
Bulbs, Roots and Tubers		Ice Cream	
Leafy Fresh Vegetables		Cheese or Specialty Prod.	
Field Ripe Vegetables		Processed Fluid Milk	
Misc. Fresh Vegetables		Frozen Processed Fish, packaged	
Livestock		Soybean Oil or By-Product	
Dairy Farm Product		.	
Animal Fibers			
Poultry Eggs			
Horticultural			
Farm Products, NEC			

Overview of agriculture freight flows in the study region

- Trucking is the dominant form of transportation, particularly by value.
  - Outbound and through traffic account for about 67% of trucking tonnage and value.
  - Commodities like citrus fruits from Florida and milk are major share of through traffic (27% by tonnage).
  - Outbound flows rely on tropical fruits from Philadelphia BEA, which are imported via the Port of Philadelphia; 56% of outbound tonnage is tropical fruit, live and processed poultry and grain.
  - I-95 is the primary truck route from linking major economic centers along the Atlantic.
- Poultry production is vital to Delmarva's agricultural sector and moves by truck.
  - Live poultry is brought in (31% by value) and sent out (17% by value) to processing plants.
  - Processed poultry, dressed poultry both fresh and frozen are sent out (39% by value).
    - Fresh poultry is destined largely for New York metro area and frozen poultry for export via Norfolk.
- Grain and other field crops form primary inputs to chicken feed.
  - Approximately same amount of grain moves outbound and inbound, but outbound traffic exists for only 3 months at harvest.
  - In Delaware, grains moves 78% by truck, 5% by rail and 17% by barge (including intra-State traffic).
- The Port of Philadelphia has the largest produce import terminal in the US, and the Port of Wilmington also specializes in fruit and vegetables trade.
  - These goods are typically distributed throughout the Northeast and Midwest.
- Dairy products are a major contributor to truck freight flows (12% of through tons).

Total agriculture commodity flows for the study area

Mode Tonnages, Tonnage Share and Projected Growth Rates, thousands of tons

Mode	2013	Share	2030	Share	CAGR 2013-2030
Truck	21,270	91.7%	32,481.3	90.8%	2.5%
Rail	926	4.0%	1,555	4.3%	3.1%
Water	998.3	4.3%	1,749.4	4.9%	3.4%
Air	0.4	0.0%	0.6	0.0%	1.9%
Total	23,194.8	100%	35,786.3	100%	2.6%

Mode Value, Value Share and Projected Growth Rates, millions of dollars

Mode	2013	Share	2030	Share	CAGR 2013-2030
Truck	33,064.5	97.5%	47,491.3	97.0%	2.2%
Rail	540	1.6%	916	1.9%	3.2%
Water	320	0.9%	544.8	1.1%	3.2%
Air	3.2	0.0%	4.2	0.0%	1.6%
Total	33,927.7	100%	48,956.3	100%	2.2%

Analysis of Delmarva grain and soybean supply chains

Inbound Feed-Stocks by Mode, thousands of tons

	Grain	Soybeans	Total	Share
Truck	564	195	759	43%
Rail	310	254	564	32%
Barge	451	12	463	26%
Total	1,325	462	1,786	

- Delmarva relies more upon trucking transportation for it's feed-stocks than the nation as a whole.
  - This is largely a function of supply chains under 500 miles.
- Inbound movements (excluding intra-regional traffic) are disproportionately weighted toward barge and rail traffic, compared to the nation.
  - This is largely a function of significant demand, geography and the transportation network available.
- Limited storage and less production than total demand necessitates significant inbound traffic most of the year.
  - Feed-stocks flow out from Delmarva for a few months after harvest.
- Despite the relatively modest market share of rail, feed-stock prices are impacted by the availability of rail.
- "Soybeans" includes soybean meal. "Grain" includes distillers dried grains (DDG).

Report contents

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  - Delaware Goods Movement Overview
  - **Regional Truck Overview**
  - Delaware Rail Overview
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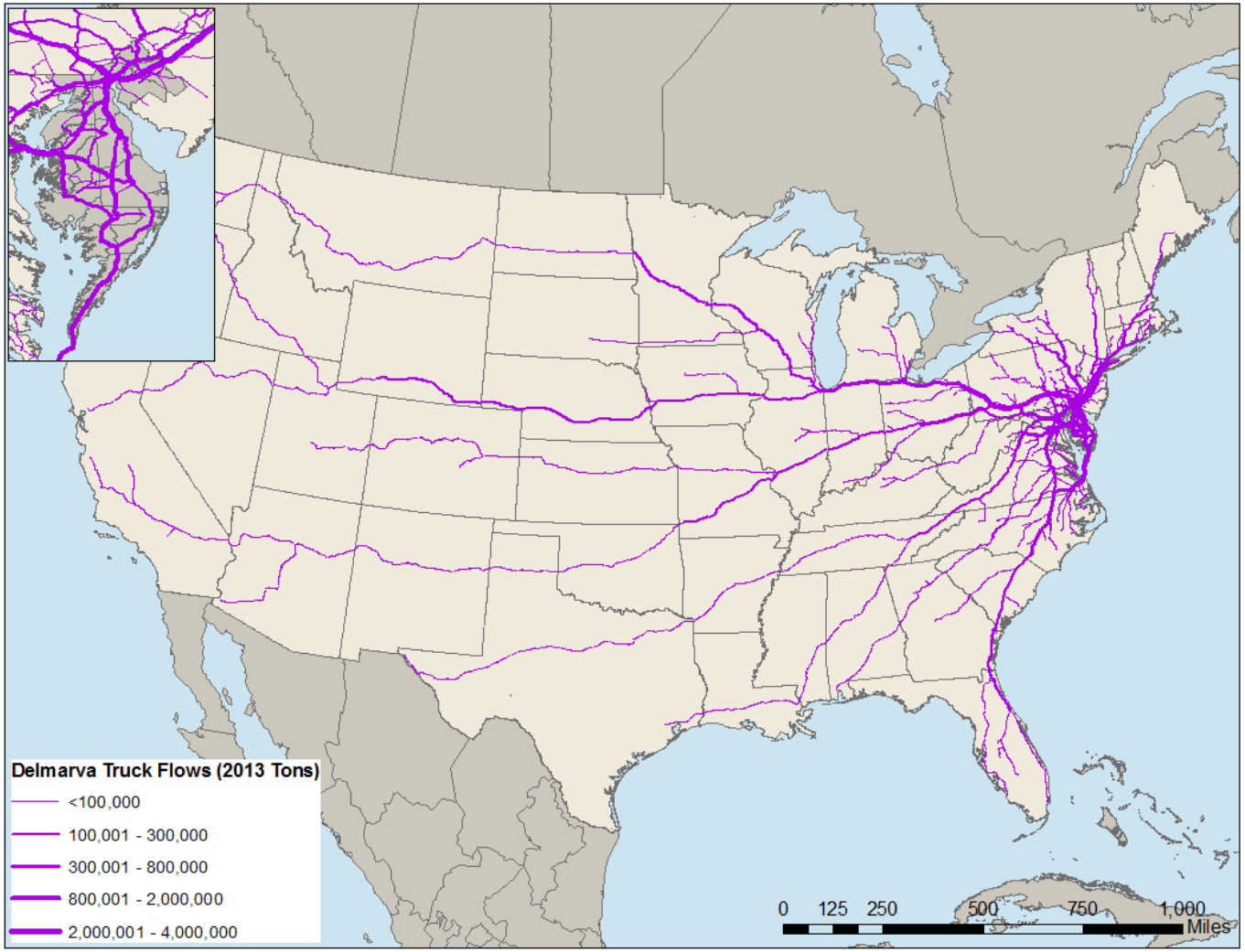
  - Regional Air Overview
- Economic Development Opportunities and Investment Priorities

Total Delmarva truck flows: *Strong ties to the Midwest, the Gulf Coast, and Canada*



Total Delmarva agriculture truck flows

Truck Tonnage by Traffic Type, thousands of tons

Type	2013	Share	2030	Share	CAGR 2013-2030
Through	8,045	37.8%	10,987	33.8%	1.9%
Outbound	6,070	28.5%	9,916	30.5%	2.9%
Inbound	3,438	16.2%	5,487	16.9%	2.8%
Local	3,717	17.5%	6,092	18.8%	2.9%
Total	**21,270**	**100.0%**	**32,481**	**100.0%**	**2.5%**

Truck Tonnage by Traffic Type, millions of dollars

Type	2013	Share	2030	Share	CAGR 2013-2030
Through	12,357	37.4%	16,240	34.2%	1.6%
Outbound	11,549	34.9%	18,687	37.9%	2.6%
Inbound	5,329	16.1%	7,418	15.6%	2.0%
Local	3,830	11.6%	5,146	12.3%	2.5%
Total	**33,065**	**100.0%**	**47,491**	**100.0%**	**2.2%**

Overview of Delmarva inbound truck flows

- Grain is delivered to grow-houses from elevators in Philadelphia and Harrisburg, both of which have major railroad terminals.
- Live poultry is brought from North Carolina, Maryland, and Virginia for processing.
- Processed milk is consumed and packaged in northern Delmarva.
  - Dairy products generally flow into the region for processing.
- Other farm related commodities such as fertilizer and oil kernels, nuts or seeds come from areas, such as Norfolk, Baltimore, and Washington where there are ports and/or major rail facilitating intermodal connectivity.
- Inbound truck tonnage is likely to grow at a 2.8% CAGR and by value at a 2.0% CAGR through 2030.

Inbound Delmarva agriculture truck flows

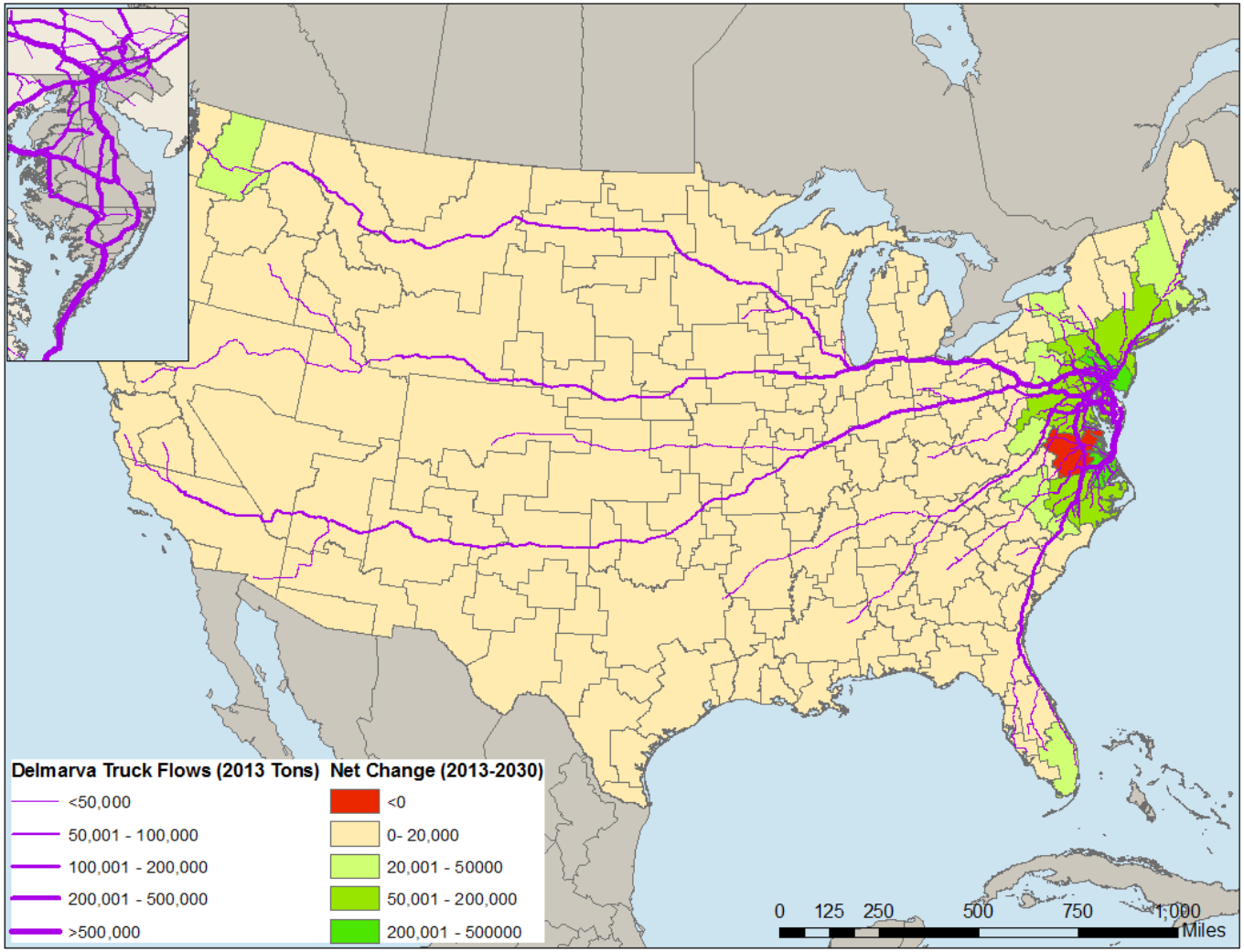
Top Commodities, thousands of tons

Commodity	2013 Tons	2030 Tons	CAGR 2013-2030
Live Poultry	634	761	1.1%
Grain	564	1,177	4.4%
Misc. Field Crops	293	394	1.8%
Fertilizers	283	465	3.0%
Poultry Eggs	217	288	1.7%
Processed Milk	203	287	2.1%
Oil Kernels, Nuts or Seeds	195	590	6.7%
Processed Poultry or Eggs	125	183	2.3%
Dairy Farm Products	98	165	3.1%
Livestock	87	119	1.9%
All Others	739	1,058	2.1%
Total	**3,438**	**5,487**	**2.8%**

Top Commodities, millions of dollars

Commodity	2013 USD	2030 USD	CAGR 2013-2030
Live Poultry	1,634	1,961	1.1%
Processed Poultry or Eggs	534	782	2.3%
Fresh Fish or Whale Products	355	406	0.8%
Dressed Poultry, Fresh	267	388	2.2%
Meat Products	252	359	2.1%
Poultry Eggs	210	279	1.7%
Misc. Field Crops	206	277	1.7%
Processed Milk	206	291	2.1%
Livestock	203	277	1.9%
Meat, Fresh or Chilled	173	244	2.1%
All Others	1,290	2,121	3.0%
Total	**5,329**	**7,418**	**2.0%**

Inbound Delmarva agriculture industry truck flows map



Inbound agriculture truck flows: Top ten commodity and origin-destination combinations by tonnage, 2013

Inbound Top 10 Truck Commodity OD Pairs, thousands of tons

Origin BEA	Destination BEA	Commodity	Tons	Share
Philadelphia, PA	Philadelphia, PA	Grain	75	2.2%
Philadelphia, PA	Philadelphia, PA	Fertilizers	74	2.2%
Greenville, NC	Salisbury, MD	Live Poultry	66	1.9%
Raleigh, NC	Salisbury, MD	Live Poultry	64	1.9%
Washington, DC	Salisbury, MD	Live Poultry	63	1.8%
Norfolk, VA	Salisbury, MD	Live Poultry	59	1.7%
Norfolk, VA	Washington, DC	Oil Kernels, Nuts or Seeds	56	1.6%
Philadelphia, PA	Philadelphia, PA	Processed Milk	50	1.5%
Harrisburg, PA	Philadelphia, PA	Grain	50	1.5%
Staunton, VA	Salisbury, MD	Live Poultry	50	1.5%
Total			**3,438**	

BEA Geographical Definitions

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Inbound agriculture truck flows: Top ten commodity and origin-destination combinations by value, 2013

Inbound Top 10 Truck Commodity OD Pairs, millions of dollars

Origin BEA	Destination BEA	Commodity	Dollars	Share
Greenville, NC	Salisbury, MD	Live Poultry	169	3.2%
Raleigh, NC	Salisbury, MD	Live Poultry	166	3.1%
Washington, DC	Salisbury, MD	Live Poultry	163	3.1%
Norfolk, VA	Salisbury, MD	Live Poultry	152	2.9%
Staunton, VA	Salisbury, MD	Live Poultry	129	2.4%
Philadelphia, PA	Salisbury, MD	Live Poultry	112	2.1%
Richmond, VA	Salisbury, MD	Live Poultry	65	1.2%
Washington, DC	Washington, DC	Live Poultry	56	1.0%
Philadelphia, PA	Philadelphia, PA	Meat, Fresh Frozen	55	1.0%
Greenville, NC	Salisbury, MD	Livestock	51	1.0%
Greenville, NC	Salisbury, MD	Live Poultry	169	3.2%
Total			5,329	

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Inbound agricultural truck flows: Top ten commodity origin-destination combinations by tonnage, 2030

Inbound Top 10 Truck Commodity-OD Pairs, thousands of tons

Origin BEA	Destination BEA	Commodity	Tons	Share
Philadelphia, PA	Philadelphia, PA	Fertilizers	159	2.9%
Philadelphia, PA	Philadelphia, PA	Grain	157	2.9%
Norfolk, VA	Washington, DC	Oil Kernels, Nuts or Seeds	156	2.8%
Norfolk, VA	Washington, DC	Grain	123	2.2%
Harrisburg, PA	Philadelphia, PA	Grain	86	1.6%
Greenville, NC	Salisbury, MD	Live Poultry	82	1.5%
Philadelphia, PA	Washington, DC	Grain	81	1.5%
Raleigh, NC	Salisbury, MD	Live Poultry	78	1.4%
Greenville, NC	Washington, DC	Grain	73	1.3%
Washington, DC	Philadelphia, PA	Grain	72	1.3%
Total			5,487	

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Inbound agricultural truck flows: Top ten commodity and origin-destination combinations by value, 2030

Inbound Top 10 Truck Commodity-OD Pairs, millions of dollars

Origin BEA	Destination BEA	Commodity	Dollars	Share
Greenville, NC	Salisbury, MD	Live Poultry	211	2.8%
Raleigh, NC	Salisbury, MD	Live Poultry	201	2.7%
Norfolk, VA	Salisbury, MD	Live Poultry	174	2.3%
Philadelphia, PA	Salisbury, MD	Live Poultry	154	2.1%
Washington, DC	Salisbury, MD	Live Poultry	115	1.6%
Staunton, VA	Salisbury, MD	Live Poultry	89	1.2%
Philadelphia, PA	Philadelphia, PA	Meat, Fresh Frozen	83	1.1%
Philadelphia, PA	Washington, DC	Live Poultry	78	1.1%
Norfolk, VA	Washington, DC	Oil Kernels, Nuts or Seeds	74	1.0%
Greenville, NC	Washington, DC	Live Poultry	73	1.0%
Total			7,418	

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Summary: Key Delmarva inbound truck supply chains

Key Inbound Truck Supply Chains

Commodity	Origin	Expected Use
Live Poultry	North Carolina Maryland Virginia	For grow-houses and to be processed into dressed poultry, fresh or frozen to Salisbury BEA, including Sussex County in Delaware
Grain	Midwest Mid-Atlantic	Chicken feed trucked from rail terminals and directly from the Midwest and other Mid-Atlantic locations
Processed Milk and Dairy	Pennsylvania	Bottled and distributed to surrounding states
Fertilizers	Pennsylvania New York	Farming fertilizer
Citrus Fruits	Florida	Local consumption

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Overview of Delmarva outbound truck flows

- Tropical fruits, live poultry and grain dominate outbound shipments.
  - Major destinations include New York, Washington, and Philadelphia BEAs.
  - Major originations include Salisbury and Philadelphia BEAs.
- Tropical fruits imports through the ports of Philadelphia and Wilmington are a top outbound commodity.
  - Major destinations include the Washington, New York, and Chicago BEAs.
- Live poultry, though a major inbound commodity, is also a significant outbound commodity.
  - Major destination states include Maryland, Pennsylvania, Virginia, and New York.
- Grain is a dominant inbound flow 9 months of the year, but at the harvest time a smaller percent of grain leaves the Delmarva area due to surplus and lack of available storing area.
  - Major destinations include the New York and Philadelphia BEAs.
- Oil kernels, nuts, and seeds originate throughout the region and are largely destined for New York, Washington, and Norfolk BEAs.

Outbound Delmarva agriculture truck flows

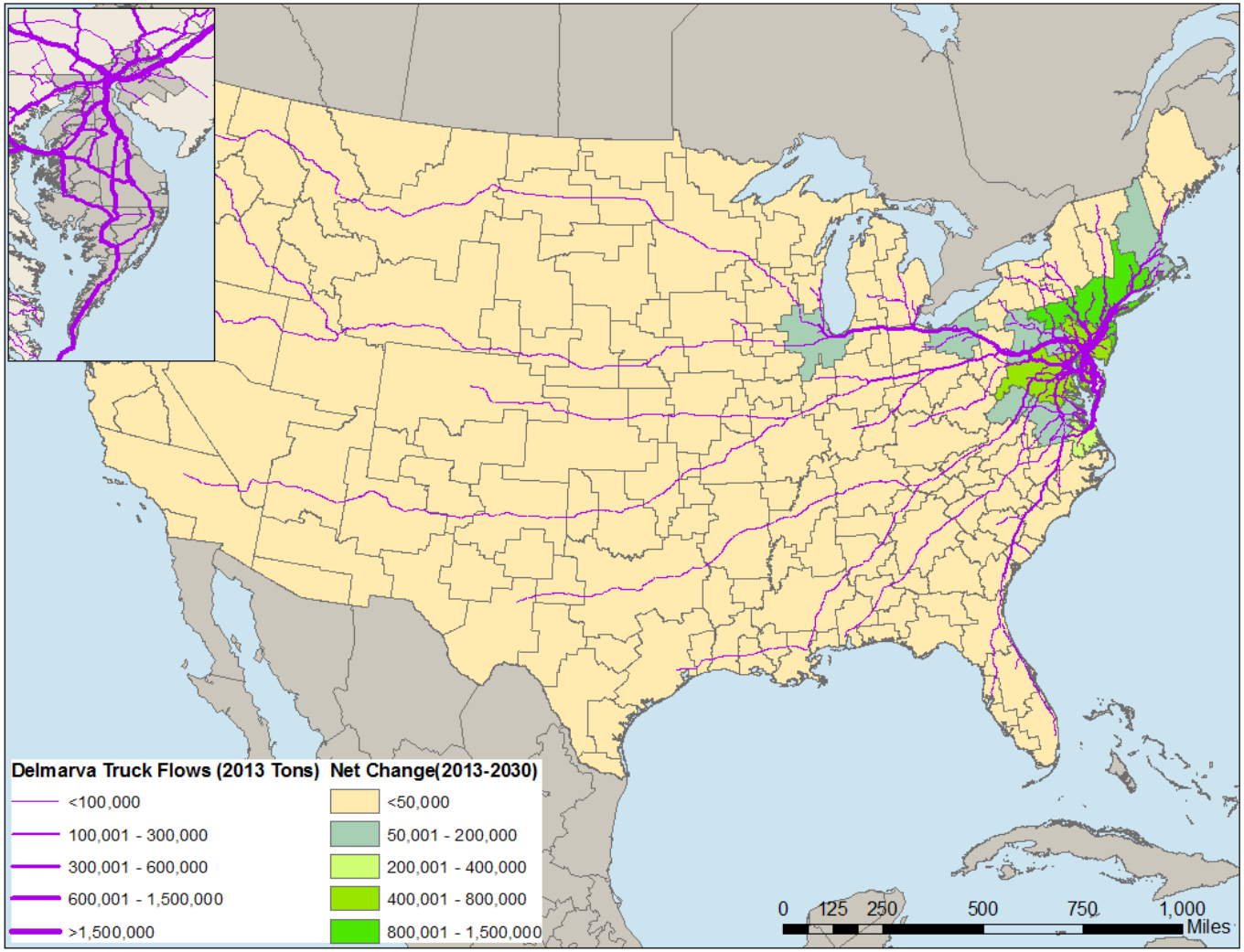
Top Commodities, thousands of tons

Commodity	2013 Tons	2030 Tons	CAGR 2013-2030
Tropical Fruits	1,244	2,559	4.3%
Live Poultry	790	1,025	1.5%
Grain	562	869	2.6%
Oil Kernels, Nuts or Seeds	509	1,129	4.8%
Processed Poultry or Eggs	483	644	1.7%
Dressed Poultry, Frozen	394	654	3.0%
Dressed Poultry, Fresh	387	542	2.0%
Fertilizers	337	479	2.1%
Deciduous Fruits	289	610	4.5%
Misc. Field Crops	218	257	1.0%
All Others	858	1,149	1.7%
Total	**6,070**	**9,916**	**2.9%**

Top Commodities, millions of dollars

Commodity	2013 USD	2030 USD	CAGR 2013-2030
Tropical Fruits	2,306	4,743	4.3%
Processed Poultry or Eggs	2,065	2,755	1.7%
Live Poultry	2,035	2,640	1.5%
Dressed Poultry, Fresh	1,348	1,840	1.8%
Dressed Poultry, Frozen	1,236	2,046	3.0%
Fresh Fish or Whale Products	529	715	1.8%
Deciduous Fruits	343	728	4.5%
Misc Fresh Vegetables	257	373	2.2%
Oil Kernels, Nuts or Seeds	243	539	4.8%
Misc. Field Crops	154	181	1.0%
All Others	1,032	1,420	1.9%
Total	**11,549**	**17,994**	**2.6%**

Outbound Delmarva agriculture industry truck flows map



Outbound agriculture truck flows: Top ten commodity and origin-destination combinations by tonnage, 2013

Outbound Top 10 Truck Commodity OD Pairs, thousands of tons

Origin BEA	Destination BEA	Commodity	Tons	Share
Salisbury, MD	New York, NY	Live Poultry	214	3.5%
Philadelphia, PA	Washington, DC	Tropical Fruits	142	2.3%
Salisbury, MD	New York, NY	Processed Poultry or Eggs	134	2.2%
Philadelphia, PA	New York, NY	Tropical Fruits	128	2.1%
Philadelphia, PA	New York, NY	Deciduous Fruits	119	2.0%
Salisbury, MD	New York, NY	Dressed Poultry, Fresh	105	1.7%
Philadelphia, PA	Chicago, IL	Tropical Fruits	99	1.6%
Salisbury, MD	Philadelphia, PA	Live Poultry	89	1.5%
Salisbury, MD	New York, NY	Oil Kernels, Nuts or Seeds	89	1.5%
Salisbury, MD	Washington, DC	Live Poultry	76	1.3%
Total			**6,070**	

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Outbound agriculture truck flows: Top ten commodity and origin-destination combinations by value, 2013

Outbound Top 10 Truck Commodity OD Pairs, millions of dollars

Origin BEA	Destination BEA	Commodity	Dollars	Share
Salisbury, MD	New York, NY	Processed Poultry or Eggs	573	4.8%
Salisbury, MD	New York, NY	Live Poultry	552	4.6%
Salisbury, MD	New York, NY	Dressed Poultry, Fresh	378	3.2%
Philadelphia, PA	Washington, DC	Tropical Fruits	262	2.2%
Philadelphia, PA	New York, NY	Tropical Fruits	237	2.0%
Salisbury, MD	Philadelphia, PA	Live Poultry	230	1.9%
Salisbury, MD	Washington, DC	Live Poultry	197	1.6%
Salisbury, MD	New York, NY	Dressed Poultry, Frozen	185	1.5%
Philadelphia, PA	Chicago, IL	Tropical Fruits	184	1.5%
Washington, DC	New York, NY	Live Poultry	177	1.5%
Total			**11,998**	

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Outbound agriculture truck flows: Top ten commodity and origin-destination combinations by tonnage, 2030

Outbound Top 10 Truck Commodity OD Pairs, thousands of tons

Origin BEA	Destination BEA	Commodity	Tons	Share
Philadelphia, PA	Washington, DC	Tropical Fruits	346	3.5%
Philadelphia, PA	Chicago, IL	Tropical Fruits	291	2.9%
Salisbury, MD	New York, NY	Live Poultry	290	2.9%
Philadelphia, PA	New York, NY	Deciduous Fruits	229	2.3%
Washington, DC	New York, NY	Oil Kernels, Nuts or Seeds	211	2.1%
Salisbury, MD	New York, NY	Oil Kernels, Nuts or Seeds	199	2.0%
Philadelphia, PA	New York, NY	Tropical Fruits	182	1.8%
Washington, DC	Washington, DC	Oil Kernels, Nuts or Seeds	160	1.6%
Philadelphia, PA	New York, NY	Oil Kernels, Nuts or Seeds	160	1.6%
Philadelphia, PA	Detroit, MI	Tropical Fruits	145	1.5%
Total			**13,008**	

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Outbound agriculture truck flows: Top ten commodity and origin-destination combinations by value, 2030

Outbound Top 10 Truck Commodity OD Pairs, millions of dollars

Origin BEA	Destination BEA	Commodity	Dollars	Share
Salisbury, MD	New York, NY	Live Poultry	747	4.0%
Philadelphia, PA	Washington, DC	Tropical Fruits	641	3.4%
Salisbury, MD	New York, NY	Processed Poultry or Eggs	611	3.3%
Philadelphia, PA	Chicago, IL	Tropical Fruits	540	2.9%
Salisbury, MD	New York, NY	Dressed Poultry, Fresh	413	2.2%
Washington, DC	New York, NY	Processed Poultry or Eggs	399	2.1%
Philadelphia, PA	New York, NY	Tropical Fruits	337	1.8%
Salisbury, MD	Philadelphia, PA	Live Poultry	295	1.6%
Salisbury, MD	Washington, DC	Live Poultry	275	1.5%
Philadelphia, PA	Detroit, MI	Tropical Fruits	269	1.4%
Total			**18,687**	

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Summary: Key Delmarva outbound truck supply chains

Key Outbound Truck Supply Chains

Commodity	Destination BEA	Expected Use
Dressed Poultry, Fresh	New York, NY Southeast Mid-Atlantic	Consumption
Dressed Poultry, Frozen	New York, NY Norfolk, VA	Export and some consumption
Live Poultry	New York, NY	Consumption
Tropical Fruits	Washington, DC	Consumption
Processed Poultry and Eggs	New York, NY	Consumption
Field Crops	New York, NY	Consumption
Grain	New York, NY Philadelphia, PA Washington, DC	Animal feed and consumption

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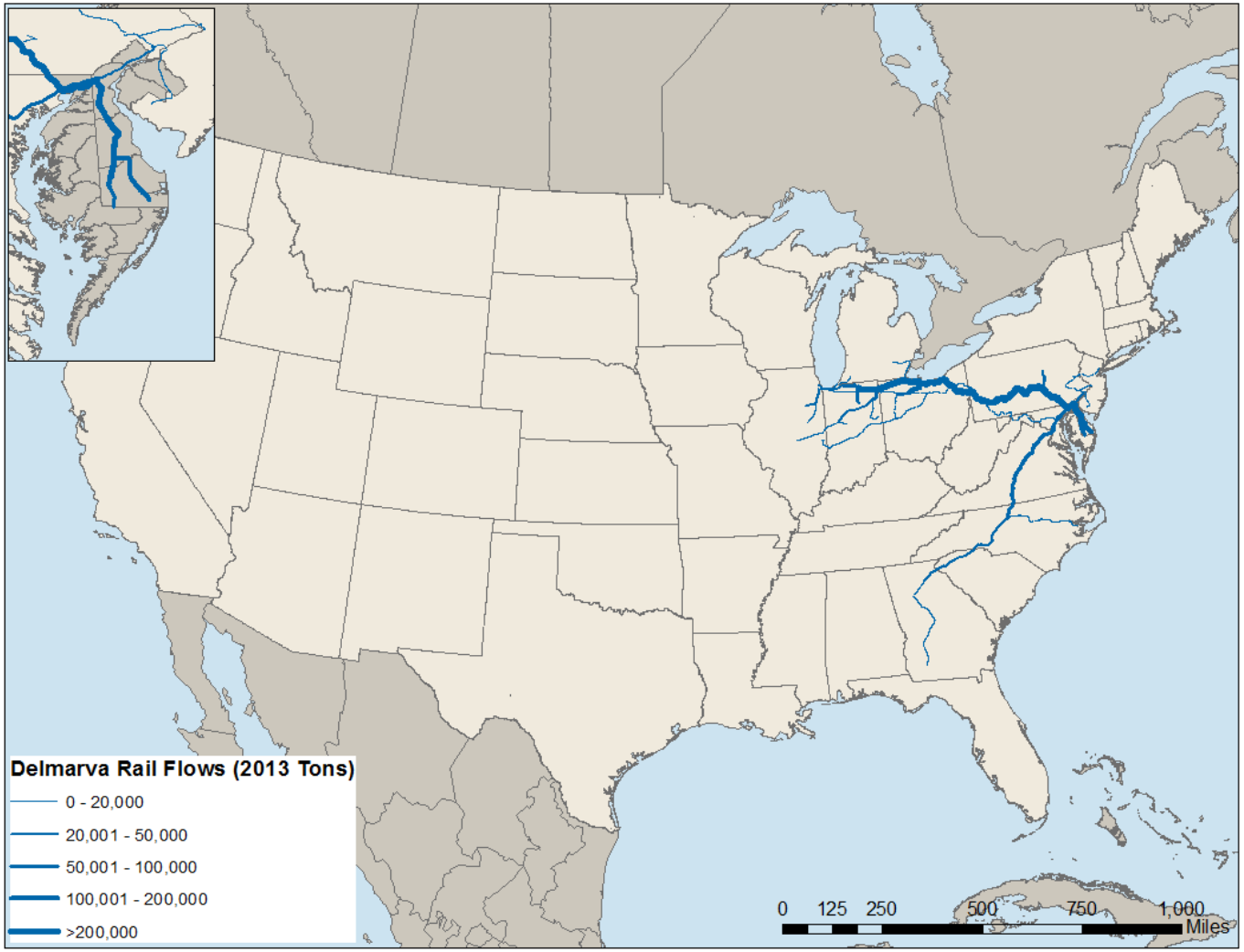
Total rail flows: *Strong ties to the Midwest, New York, and the South Atlantic*



Total Delaware agriculture rail flows*

Rail Tonnage by Traffic Type, thousands of tons

Type	2013 Tons	Share	2030 Tons	Share	CAGR 2013-2030
Outbound	41	4.4%	109	7.0%	5.9%
Inbound	469	50.6%	704	45.3%	2.4%
Through	416	44.9%	742	47.7%	3.5%
Total	926	100.0%	1,555	100.0%	3.1%

Rail Tonnage by Traffic Type, millions of dollars

Type	2013 USD	Share	2030	Share	CAGR 2013-2030
Outbound	20	3.7%	52	5.7%	5.8%
Inbound	254	47.0%	417	45.5%	3.0%
Through	266	49.3%	447	48.8%	3.1%
Total	540	100.0%	916	100.0%	3.2%

Note: All rail data presented in this section uses the State of Delaware rather than Delmarva as the study region due to limitations in the format of data. Nonetheless, IHS believes the trends closely represent the dynamics of rail flows throughout the region.

Overview of Delaware inbound rail flows

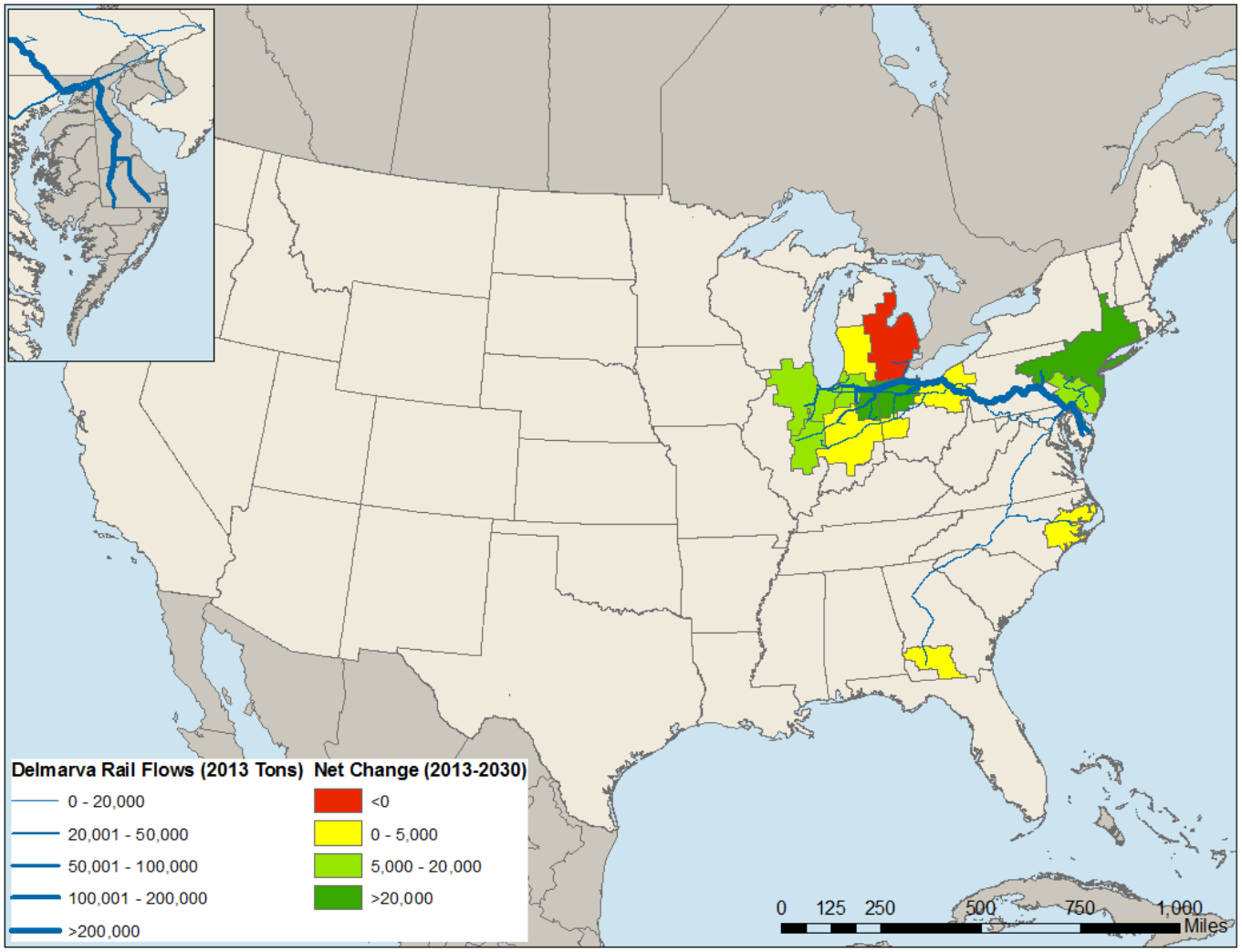
- Most agriculture products shipped to Delmarva by rail are chicken feed-stocks.
- Grain, distilled or blended liquors, and soybean oil or by-products dominate inbound rail volume with almost 97% of all tonnage.
  - Blended liquors include spent grain mash, which is used for chicken feed.
- Products are generally brought to Salisbury BEA, more specifically Sussex County, DE.
- Almost all chicken feed-stocks brought by rail originate in the Midwest.
  - New York BEA makes the largest contribution outside the Midwest with 10.5%.
- Tonnage is expected to grow at a 2.4% CAGR through 2030.
- Some fertilizer and animal by-products are also delivered by rail.

Inbound Delaware agriculture rail flows

Top Commodities, thousands of tons – millions of dollars

Commodity	2013 Tons	2030 Tons	CAGR 2013-2030	2013 Dollars	2030 Dollars	CAGR 2013-2030
Grain	180	316	3.4%	40	69	3.3%
Soybean Oil or By-products	167	145	-0.8%	76	67	-0.8%
Distilled or Blended Liquors	107	221	4.4%	131	272	4.4%
Fertilizers	12	16	2.2%	5	6	1.2%
Animal By-prod, inedible	4	6	0.9%	2	4	4.0%

Inbound Delaware agriculture industry rail flows map



Note: Rail data uses the State of Delaware as the study region due to limitations in the format of data.

Inbound agriculture rail flows: Top ten commodity and origin-destination combinations by tonnage, 2013

Inbound Top 10 Rail Commodity OD Pairs, thousands of tons

Origin BEA	Destination BEA	Commodity	Tons	Share
Toledo, OH	Salisbury, MD	Distilled or Blended Liquors	70	14.8%
Fort Wayne, IN	Salisbury, MD	Soybean Oil or By-products	54	11.5%
New York, NY	Salisbury, MD	Grain	49	10.5%
Fort Wayne, IN	Salisbury, MD	Distilled or Blended Liquors	37	7.9%
Elkhart, IN	Salisbury, MD	Soybean Oil or By-products	37	7.8%
Toledo, OH	Salisbury, MD	Grain	29	6.3%
Chicago, IL	Salisbury, MD	Grain	25	5.4%
Toledo, OH	Salisbury, MD	Soybean Oil or By-products	22	4.6%
Philadelphia, PA	Salisbury, MD	Grain	19	4.2%
Champaign, IL	Salisbury, MD	Soybean Oil or By-products	17	3.7%
All others			110	23.4%
Total			**469**	

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Inbound agriculture rail flows: Top ten commodity and origin-destination combinations by value, 2013

Inbound Top 10 Rail Commodity OD Pairs, millions of dollars

Origin BEA	Destination BEA	Commodity	Dollars	Share
Toledo, OH	Salisbury, MD	Distilled or Blended Liquors	85	33.6%
Fort Wayne, IN	Salisbury, MD	Distilled or Blended Liquors	46	17.9%
Fort Wayne, IN	Salisbury, MD	Soybean Oil or By-products	25	9.7%
Elkhart, IN	Salisbury, MD	Soybean Oil or By-products	17	6.6%
New York, NY	Salisbury, MD	Grain	11	4.3%
Toledo, OH	Salisbury, MD	Soybean Oil or By-products	10	3.9%
Champaign, IL	Salisbury, MD	Soybean Oil or By-products	8	3.1%
Cleveland, OH	Salisbury, MD	Soybean Oil or By-products	8	3.1%
Toledo, OH	Salisbury, MD	Grain	6	2.5%
Indianapolis, IN	Salisbury, MD	Soybean Oil or By-products	6	2.2%
All others			33	12.9%
Total			**254**	

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Inbound agriculture rail flows: Top ten commodity and origin-destination combinations by tonnage, 2030

Inbound Top 10 Rail Commodity OD Pairs, thousands of tons

Origin BEA	Destination BEA	Commodity	Tons	Share
Toledo, OH	Salisbury, MD	Distilled or Blended Liquors	144	20.5%
New York, NY	Salisbury, MD	Grain	87	12.3%
Fort Wayne, IN	Salisbury, MD	Distilled or Blended Liquors	77	10.9%
Toledo, OH	Salisbury, MD	Grain	52	7.3%
Fort Wayne, IN	Salisbury, MD	Soybean Oil or By-products	47	6.6%
Chicago, IL	Salisbury, MD	Grain	44	6.3%
Philadelphia, PA	Salisbury, MD	Grain	34	4.9%
Elkhart, IN	Salisbury, MD	Soybean Oil or By-products	32	4.5%
Fort Wayne, IN	Philadelphia, PA	Grain	24	3.4%
Grand Rapids, MI	Salisbury, MD	Grain	21	2.9%
All others			142	20.2%
Total			**704**	

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Inbound agriculture rail flows: Top ten commodity and origin-destination combinations by value, 2030

Inbound Top 10 Rail Commodity OD Pairs, millions of dollars

Origin BEA	Destination BEA	Commodity	Dollars	Share
Toledo, OH	Salisbury, MD	Distilled or Blended Liquors	177	42.8%
Fort Wayne, IN	Salisbury, MD	Distilled or Blended Liquors	94	22.8%
Fort Wayne, IN	Salisbury, MD	Soybean Oil or By-products	21	5.2%
New York, NY	Salisbury, MD	Grain	19	4.6%
Elkhart, IN	Salisbury, MD	Soybean Oil or By-products	15	3.5%
Toledo, OH	Salisbury, MD	Grain	11	2.7%
Chicago, IL	Salisbury, MD	Grain	10	2.4%
Toledo, OH	Salisbury, MD	Soybean Oil or By-products	9	2.1%
Philadelphia, PA	Salisbury, MD	Grain	8	1.9%
Champaign, IL	Salisbury, MD	Soybean Oil or By-products	7	1.7%
All others			43	10.3%
Total			**414**	

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Summary: Key Delmarva inbound rail supply chains

Key Inbound Rail Supply Chains

Commodity	Origin	Expected Use
Grain	Midwest Northeast	Chicken Feed
Distilled or Blended Liquors	Midwest	Spent Grain Mash, Feed
Soybean By-Products	Midwest	Chicken Feed

Overview of Delaware outbound rail flows

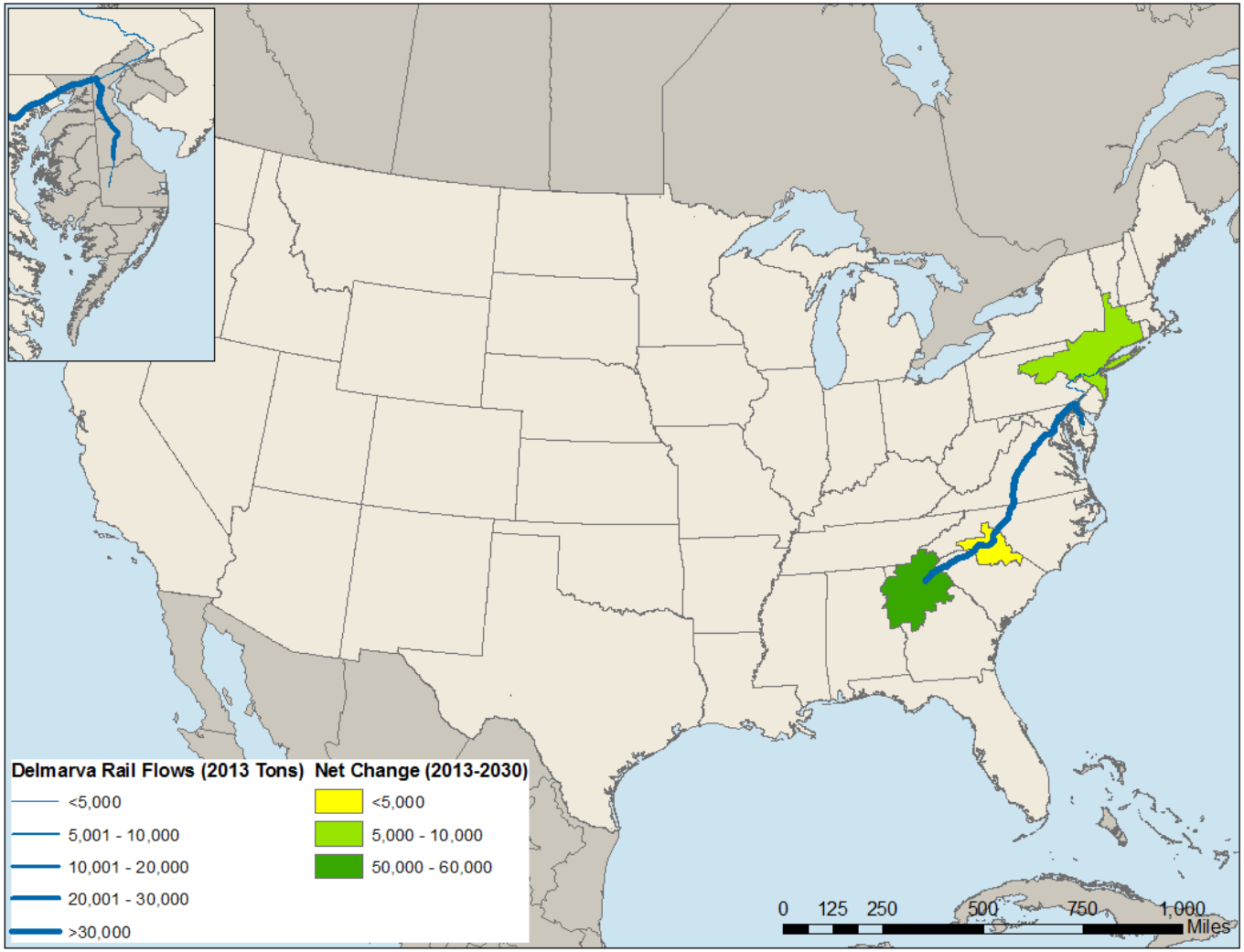
- Outbound traffic forms the “backhaul” of regional rail operations and is particularly under-utilized.
- Oil kernels, nuts, and seeds are more than 90% of tonnage.
  - These goods are destined for Atlanta and New York BEA
  - The volume originates in Philadelphia.
- Fertilizer is sent to the Charlotte, North Carolina BEA.
  - This volume originates in Salisbury BEA.
- Tonnage is expected to grow at a 5.9% CAGR through 2030.

Outbound Delaware agriculture rail flows

Top Commodities, thousands of tons – millions of dollars

Commodity	2013 Tons	2030 Tons	CAGR 2013-2030	2013 Dollars	2030 Dollars	CAGR 2013-2030
Oil Kernels, Nuts or Seeds	38	104	6.2%	18	50	6.2%
Fertilizers	4	5	1.6%	2	2	1.6%

Outbound Delaware agriculture industry rail flows map



Note: Rail data uses the State of Delaware as the study region due to limitations in the format of data.

Outbound agriculture rail flows: Top commodity and origin-destination combinations by tonnage, 2013

Outbound Rail Commodity OD Pairs, thousands of tons*

Origin BEA	Destination BEA	Commodity	Tons	Share
Philadelphia, PA	Atlanta, GA	Oil Kernels, Nuts or Seeds	33	78.9%
Philadelphia, PA	New York, NY	Oil Kernels, Nuts or Seeds	5	11.5%
Salisbury, MD	Charlotte, NC	Fertilizers	4	9.6%
Total			**42**	

* There are only 3 commodity origin and destination pairs

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Outbound agriculture rail flows: Top commodity and origin-destination combinations by value, 2013

Outbound Rail Commodity-OD Pairs, millions of dollars

Origin BEA	Destination BEA	Commodity	Dollars	Share
Philadelphia, PA	Atlanta, GA	Oil Kernels, Nuts or Seeds	16	79.9%
Philadelphia, PA	New York, NY	Oil Kernels, Nuts or Seeds	2	11.7%
Salisbury, MD	Charlotte, NC	Fertilizers	2	8.4%
Total			**20**	

* There are only 3 commodity origin and destination pairs

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Outbound agriculture rail flows: Top commodity and origin-destination combinations by tonnage, 2030

Outbound Rail Commodity-OD Pairs, thousands of tons

Origin BEA	Destination BEA	Commodity	Tons	Share
Philadelphia, PA	Atlanta, GA	Oil Kernels, Nuts or Seeds	91	83.1%
Philadelphia, PA	New York, NY	Oil Kernels, Nuts or Seeds	13	12.2%
Salisbury, MD	Charlotte, NC	Fertilizers	5	4.8%
Total			**109**	

* There are only 3 commodity origin and destination pairs

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Outbound agricultural rail flows: Top commodity and origin-destination combinations by value, 2030

Outbound Rail Commodity-OD Pairs, millions of dollars

Origin BEA	Destination BEA	Commodity	Dollars	Share
Philadelphia, PA	Atlanta, GA	Oil Kernels, Nuts or Seeds	43	83.6%
Philadelphia, PA	New York, NY	Oil Kernels, Nuts or Seeds	6	12.2%
Salisbury, MD	Charlotte, NC	Fertilizers	2	4.1%
Total			**52**	

* There are only 3 commodity origin and destination pairs

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Summary: Key Delmarva outbound rail supply chains

Key Outbound Rail Supply Chains

Commodity	Destination	Expected Use
Oil Kernels, Nuts or Seeds	Atlanta, Georgia New York, New York	Local consumption
Fertilizers	Charlotte, North Carolina	Agricultural use

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  - Delaware Rail Overview
  - **Regional Water Overview**
  - Regional Air Overview
- Economic Development Opportunities and Investment Priorities

Total Delmarva agriculture water flows

Water Tonnage by Traffic Type, thousands of tons

Type	2013	Share	2030	Share	CAGR 2013-2030
Outbound	385	38.6%	616	35.2%	2.8%
Inbound	575	57.6%	1,020	58.3%	3.4%
Local	39	3.9%	113	6.5%	6.5%
Total	**998**	**100.0%**	**1,749**	**100.0%**	**3.4%**

Water Tonnage by Traffic Type, millions of dollars

Type	2013	Share	2030	Share	CAGR 2013-2030
Outbound	141	44.1%	225	41.2%	2.8%
Inbound	143	44.7%	261	48.0%	3.6%
Local	36	11.2%	59	10.8%	3.0%
Total	**320**	**100.0%**	**545**	**100.0%**	**3.2%**

Overview of Delmarva inbound water flows

- Grain from Virginia dominates tonnage volume with fertilizers forming a secondary commodity being shipped from Virginia.
  - These goods are brought into ports in Washington and Salisbury BEAs.
- Tropical fruits compose more than 13% of tonnage and almost 17% of value.
  - The freight originates in Mexico, almost entirely from Quintana Roo and Veracruz.
  - These goods enter the United States through Philadelphia, which has the largest produce terminal in the United States.
- Virginia (primarily the Port or Norfolk) accounts for some 83% of total tonnage.
- Mexico accounts for about 12% of total tonnage (most of which is produce).
- Tonnage is expected to increase 3.4% CAGR through 2030 with value growing at 3.6% CAGR.

Inbound Delmarva agriculture water flows

Top Commodities, thousands of tons – millions of dollars

Commodity	2013 Tons	2030 Tons	CAGR 2013-2030	2013 Dollars	2030 Dollars	CAGR 2013-2030
Grain	451	741	3.0%	99	163	3.0%
Tropical Fruits	77	182	5.2%	24	57	5.2%
Fertilizers	34	68	4.1%	14	28	4.1%
Oil Kernels, Nuts or Seeds	12	29	5.2%	6	14	5.2%
Total	**575**	**1,020**	**3.4%**	**143**	**261**	**3.6%**

Inbound agriculture water flows: Top ten commodity and origin-destination combinations by tonnage, 2013

Inbound Top 10 Water Commodity OD Pairs, thousands of tons

Origin BEA	Destination BEA	Commodity	Tons	Share
Norfolk, VA	Salisbury, MD	Grain	194	35.1%
Norfolk, VA	Washington, DC	Grain	167	30.3%
Quintana Roo	Philadelphia, PA	Tropical Fruits	64	11.7%
Richmond, VA	Salisbury, MD	Grain	44	8.0%
Richmond, VA	Washington, DC	Grain	29	5.2%
Richmond, VA	Washington, DC	Fertilizers	17	3.1%
Norfolk, VA	Washington, DC	Fertilizers	11	2.1%
Greenville, NC	Salisbury, MD	Grain	11	2.1%
Veracruz	Philadelphia, PA	Tropical Fruits	7	1.3%
Washington, DC	Salisbury, MD	Oil Kernels, Nuts or Seeds	6	1.2%
Total			**575**	

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Inbound agriculture water flows: Top ten commodity and origin-destination combinations by value, 2013

Inbound Top 10 Water Commodity OD Pairs, millions of dollars

Origin BEA	Destination BEA	Commodity	Dollars	Share
Norfolk, VA	Salisbury, MD	Grain	42	31.5%
Norfolk, VA	Washington, DC	Grain	37	27.2%
Quintana Roo	Philadelphia, PA	Tropical Fruits	20	14.9%
Richmond, VA	Salisbury, MD	Grain	10	7.2%
Richmond, VA	Washington, DC	Fertilizers	7	5.3%
Richmond, VA	Washington, DC	Grain	6	4.7%
Norfolk, VA	Washington, DC	Fertilizers	5	3.5%
Washington, DC	Salisbury, MD	Oil Kernels, Nuts or Seeds	3	2.3%
Greenville, NC	Salisbury, MD	Grain	3	1.9%
Veracruz	Philadelphia, PA	Tropical Fruits	2	1.6%
Total			143	

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Inbound agricultural water flows: Top ten commodity and origin-destination combinations by tonnage, 2030

Inbound Top 10 Water Commodity OD Pairs, thousands of tons

Origin BEA	Destination BEA	Commodity	Tons	Share
Norfolk, VA	Washington, DC	Grain	307	32.1%
Norfolk, VA	Salisbury, MD	Grain	244	25.6%
Quintana Roo	Philadelphia, PA	Tropical Fruits	151	15.9%
Richmond, VA	Salisbury, MD	Grain	72	7.5%
Richmond, VA	Washington, DC	Grain	46	4.8%
Greenville, NC	Salisbury, MD	Grain	45	4.7%
Richmond, VA	Washington, DC	Fertilizers	37	3.9%
Norfolk, VA	Washington, DC	Fertilizers	21	2.2%
Veracruz	Philadelphia, PA	Tropical Fruits	17	1.7%
Washington, DC	Washington, DC	Grain	15	1.5%
Total			**945**	

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Inbound agriculture water flows: Top ten commodity and origin-destination combinations by value, 2030

Inbound Top 10 Water Commodity OD Pairs, millions of dollars

Origin BEA	Destination BEA	Commodity	Dollars	Share
Norfolk, VA	Washington, DC	Grain	67	28.0%
Norfolk, VA	Salisbury, MD	Grain	54	22.4%
Quintana Roo	Philadelphia, PA	Tropical Fruits	47	19.7%
Richmond, VA	Salisbury, MD	Grain	16	6.6%
Richmond, VA	Washington, DC	Fertilizers	15	6.3%
Richmond, VA	Washington, DC	Grain	10	4.3%
Greenville, NC	Salisbury, MD	Grain	10	4.1%
Norfolk, VA	Washington, DC	Fertilizers	8	3.5%
Washington, DC	Salisbury, MD	Oil Kernels, Nuts or Seeds	7	2.9%
Veracruz	Philadelphia, PA	Tropical Fruits	5	2.2%
Total			**240**	

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Summary: Key Delmarva inbound water supply chains

Key Inbound Water Supply Chains

Commodity	Origin	Expected Use
Grain	Virginia	Chicken Feed
Fertilizer	Virginia	Grain and Soybean farming
Tropical Fruits	Mexico	Local consumption or regional consumption

Overview of Delmarva outbound water flows

- During harvest season grain is shipped from Delmarva; grain accounts for about 62% of outbound tonnage.
  - The remainder is primarily oil kernel, nuts, and seeds.
- All traffic originates in Washington or Salisbury BEA ports.
- About 86% of tonnage is destined for Norfolk, Virginia.
  - The remainder goes to Wilmington, NC (10%), New York, (2%) and Richmond, VA (2%).
- Tonnage is expected to grow 2.8% CAGR through 2030.

Outbound Delmarva agriculture water flows

Top Commodities, thousands of tons – millions of dollars

Commodity	2013 Tons	2030 Tons	CAGR 2013-2030	2013 Dollars	2030 Dollars	CAGR 2013-2030
Grain	238	352	2.3%	67	123	3.6%
Oil Kernels, Nuts or Seeds	140	257	3.6%	52	78	2.3%
Marine Products	7	8	0.7%	22	24	0.7%
Total	385	616	2.8%	141	225	2.8%

Outbound Agriculture water flows: Top ten commodity and origin-destination combinations by tonnage, 2013

Outbound Top 10 Water Commodity OD Pairs, thousands of tons

Origin BEA	Destination BEA	Commodity	Tons	Share
Washington, DC	Norfolk, VA	Grain	174	45.3%
Washington, DC	Norfolk, VA	Oil Kernels, Nuts or Seeds	140	36.3%
Washington, DC	Wilmington, NC	Grain	37	9.7%
Salisbury, MD	Norfolk, VA	Grain	17	4.5%
Salisbury, MD	New York, NY	Grain	7	1.8%
Salisbury, MD	Washington, DC	Marine Products	6	1.4%
Salisbury, MD	Washington, DC	Grain	1	0.3%
Salisbury, MD	Richmond, VA	Marine Products	1	0.3%
Washington, DC	Washington, DC	Oil Kernels, Nuts or Seeds	1	0.2%
Salisbury, MD	Richmond, VA	Grain	1	0.1%
Total			**385**	

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Outbound agriculture water flows: Top ten commodity and origin-destination combinations by value, 2013

Outbound Top 10 Water Commodity OD Pairs, millions of dollars

Origin BEA	Destination BEA	Commodity	Tons	Share
Washington, DC	Norfolk, VA	Oil Kernels, Nuts or Seeds	67	47.2%
Washington, DC	Norfolk, VA	Grain	37	26.6%
Salisbury, MD	Washington, DC	Marine Products	18	12.8%
Washington, DC	Wilmington, NC	Grain	9	6.5%
Salisbury, MD	Norfolk, VA	Grain	4	2.7%
Salisbury, MD	Richmond, VA	Marine Products	4	2.7%
Salisbury, MD	New York, NY	Grain	2	1.1%
Washington, DC	Washington, DC	Oil Kernels, Nuts or Seeds	0	0.2%
Salisbury, MD	Washington, DC	Grain	0	0.2%
Salisbury, MD	Richmond, VA	Grain	0	0.1%
Total			**141**	

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Outbound agriculture water flows: Top ten commodity and origin-destination combinations by tonnage, 2030

Outbound Top10 Water Commodity OD Pairs, thousands of tons

Origin BEA	Destination BEA	Commodity	Tons	Share
Washington, DC	Norfolk, VA	Oil Kernels, Nuts or Seeds	255	41.5%
Washington, DC	Norfolk, VA	Grain	245	39.8%
Washington, DC	Wilmington, NC	Grain	61	9.8%
Salisbury, MD	Norfolk, VA	Grain	31	5.1%
Salisbury, MD	New York, NY	Grain	12	2.0%
Salisbury, MD	Washington, DC	Marine Products	6	1.0%
Salisbury, MD	Washington, DC	Grain	2	0.3%
Salisbury, MD	Richmond, VA	Marine Products	1	0.2%
Washington, DC	Washington, DC	Oil Kernels, Nuts or Seeds	1	0.2%
Washington, DC	New York, NY	Grain	1	0.1%
Total			**616**	

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Outbound agriculture water flows: Top ten commodity and origin-destination combinations by value, 2030

Outbound Top 10 Water Commodity OD Pairs, millions of dollars

Origin BEA	Destination BEA	Commodity	Dollars	Share
Washington, DC	Norfolk, VA	Oil Kernels, Nuts or Seeds	122	54.4%
Washington, DC	Norfolk, VA	Grain	53	23.4%
Salisbury, MD	Washington, DC	Marine Products	20	9.0%
Washington, DC	Wilmington, NC	Grain	15	6.6%
Salisbury, MD	Norfolk, VA	Grain	7	3.0%
Salisbury, MD	Richmond, VA	Marine Products	4	1.9%
Salisbury, MD	New York, NY	Grain	3	1.2%
Washington, DC	Washington, DC	Oil Kernels, Nuts or Seeds	1	0.2%
Salisbury, MD	Washington, DC	Grain	0	0.2%
Washington, DC	New York, NY	Grain	0	0.1%
Total			**225**	

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Summary: Key Delmarva outbound water supply chains

Key Outbound Water Supply Chains

Commodity	Destination	Expected Use
Grain	Virginia and North Carolina	Animal Feed
Oil Kernels, Nuts or Seeds	North Carolina	Animal Feed
Marine Products	Washington, DC Area	Unknown-Varied

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Total Delmarva agriculture air flows

Air Tonnage by Traffic Type

Type	2013	Share	2030	Share	CAGR 2013-2030
Inbound	424	100%	586	100%	1.9%

Air Tonnage by Traffic Type

Type	2013	Share	2030	Share	CAGR 2013-2030
Inbound	3,211,404	100%	4,226,886	100%	1.6%

Overview of Delmarva inbound air flows

- Inbound air flows are dominated by farm products (93%).
  - These goods originate in Columbia, SC (92.8%) and Wilmington, NC (0.3%).
- Some miscellaneous fresh vegetables come from Mexico (7%).
- For the purposes of this study, most air cargo recorded for the Delmarva region actually deplanes at Philadelphia International (PHL)*. This is due to the inclusion of northern Delmarva in the Philadelphia BEA.
- Freight is expected to grow at a 1.9% CAGR through 2030.
- Outbound agriculture air flows are negligible; therefore, this section coves only inbound flows.

*Note: Baltimore-Washington International Airport (BWI) is also an important airport serving the Delmarva region. However, since BWI is outside the boundaries of Delmarva, these goods generally enter the Peninsula as truck flows.

Inbound Delmarva agriculture air flows

Top Commodities

Commodity	2013 Tons	2030 Tons	CAGR 2013-2030	2013 Dollars	2030 Dollars	CAGR 2013-2030
Farm Products	395	514	1.6%	3,174,593	4.1	1.6%
Misc Fresh Vegetables	29	72	5.4%	36,811	0.1	5.4%
Total	424	586	1.9%	3,211,404	4.2	1.6%

Inbound agriculture air flows: Top commodity and origin-destination combinations by tonnage, 2013

Inbound Commodity OD Pairs

Origin BEA/Country	Destination BEA	Commodity	Tons	Share
Columbia, SC	Philadelphia, PA	Farm Products	394	92.8%
Mexico	Philadelphia, PA	Misc Fresh Vegetables	29	6.9%
Wilmington, NC	Philadelphia, PA	Farm Products	1	0.3%
Total			**424**	

* There are only 3 commodity origin and destination pairs

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Inbound agricultural air flows: Top commodity and origin-destination combinations by value, 2013

Inbound Air Commodity OD Pairs

Origin BEA/Country	Destination BEA	Commodity	Dollars	Share
Columbia, SC	Philadelphia, PA	Farm Products	3,164,585	98.5%
Mexico	Philadelphia, PA	Misc Fresh Vegetables	36,811	1.1%
Wilmington, NC	Philadelphia, PA	Farm Products	10,008	0.3%
Total			**3,211,404**	

* There are only 3 commodity origin and destination pairs

BEA Geographical Definitions

Philadelphia BEA: Kent and New Castle (DE); Cecil (MD); Gloucester and Salem (NJ); and Delaware (PA)
Washington BEA: Caroline; Dorchester, Kent, and Talbot County, MD
Salisbury BEA: Sussex (DE); Somerset, Wicomico, and Worcester County (MD); Accomack and Northampton County (VA)

Inbound agriculture air flows: Top commodity and origin-destination combinations by tonnage, 2030

Inbound Top 10 Air Commodity OD Pairs

Origin BEA/Country	Destination BEA	Commodity	Tons	Share
Columbia, SC	Philadelphia, PA	Farm Products	513	87.4%
Mexico	Philadelphia, PA	Misc Fresh Vegetables	72	12.3%
Wilmington, NC	Philadelphia, PA	Farm Products	2	0.3%
Total			**586**	

* There are only 3 commodity origin and destination pairs

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Inbound agriculture air flows: Top commodity and origin-destination combinations by value, 2030

Inbound Top-10 Air Commodity-OD Pairs, millions of dollars

Origin BEA/Country	Destination BEA	Commodity	Dollars	Share
Columbia, SC	Philadelphia, PA	Farm Products	4,123,155	97.5%
Mexico	Philadelphia, PA	Misc Fresh Vegetables	90,727	2.1%
Wilmington, NC	Philadelphia, PA	Farm Products	13,005	0.3%
Total			**4,226,886**	

* There are only 3 commodity origin and destination pairs

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Salisbury BEA: Sussex (DE); Somerset, Wicomico, and Worcester County (MD); Accomack and Northampton County (VA)

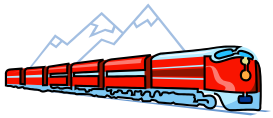
Summary: Key Delmarva inbound air supply chains

Key Inbound Air Supply Chains

Commodity	Origin	Expected Use
Farm Products	Columbia, South Carolina	High-value consumption
Vegetables	Mexico	High-value consumption
Farm Products	Wilmington, North Carolina	High-value consumption

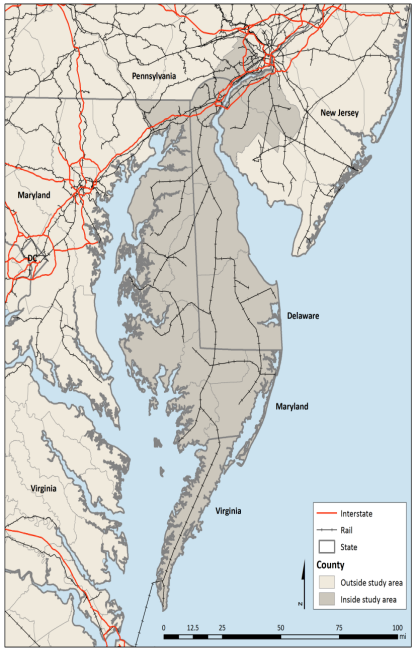
Summary of key transportation elements of the Delmarva agriculture supply chain

- Grain
- Tropical fruit
- Fertilizer

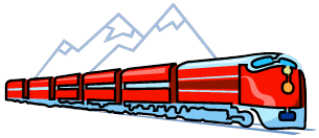


- Grain
- Soybean meal
- DDGs

- Chickens, Eggs
- Grain
- Vegetables, Field Crops
- Fertilizer
- Milk



- Grain
- Soybeans



- Soybeans

- Grain
- Tropical fruit
- Poultry, Chickens, Eggs
- Soybeans
- Fertilizer

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Summary of Delmarva agriculture supply chain strengths and weaknesses

Strengths	Weaknesses
Infrastructure	**Infrastructure**
• Proximity to Mid-Atlantic and Northeast poultry markets gives local producers an edge on shorter transportation distances	• Rail bottlenecks in northern Delaware, particularly on trackage moving over the Amtrak Northeast Corridor in Cecil County, contribute to reliability issues
• Rail accessibility permits sourcing of key input materials sourced from long-distances in a relatively cost-effective manner (vis-à-vis truck)	• The decline in coal demand for the Norfolk Southern Delmarva Secondary line decreases the revenue available for maintenance and levels of service
• From the grain farmers' perspective, rail transportation costs allow for a significant spread supporting higher local prices to the poultry industry	• From the poultry producers' perspective, rail (and, ostensibly, barge) freight rates contribute to higher operating costs, lowering regional competitiveness for poultry
• Route 1 Bypass is considered a success for alleviating congestion for agriculture supply chain freight in southern Delaware	• Congested state highways, particularly near junctions of major east-west highways with routes 13 and 113, significantly increases truck travel times, especially during summer beach season
• Barge access on the Nanticoke and Wicomico rivers provides critical additional capacity for inbound grain bulk and serves as an important redundancy to mitigate rail and general supply chain risks	• Congestion at major interchanges, tolls, and bottlenecks along the I-95 and Highway 50 corridors, especially during weekends during summer beach season, increases truck travel times to Mid-Atlantic consumer markets
• Proximity to seaports (Baltimore, Norfolk, and Wilmington) supports agriculture exports, including frozen poultry and other regional agriculture (and processed agriculture) exports	• Many secondary roads are not designed to safely handle truck traffic, and are fraught with numerous safety hazards (e.g., lack of shoulders, height clearances, lane width, etc.)
• Access to airports (principally PHL and BWI) is important for certain high-value flows within Delmarva agriculture supply chains	• Lack of sufficient efficient safety amenities for trucks (e.g., locations of weigh stations, parking for rest stops, etc.)
Policy (Transportation and other Domains)	**Policy (Transportation and other Domains)**
	• Truck weight limits makes Delmarva agriculture products less competitive
	• Inadequate driver education on sharing roads with farm vehicles
	• Technological innovation can be better leveraged for regulatory efficiency

Summary of Delmarva advantages and challenges for agriculture and related industries

Opportunities

- Continued advances in irrigation and other farming technologies helps contribute to more local (and, hence, more reliable) sourcing of grains for poultry and livestock operations
- The Trans-Pacific Partnership trade deal is believed to offer Delaware farmers new export markets for local agriculture and agriculture products
- Rising demand for organic poultry is recently generating expansion of poultry houses, including in northern Delaware
- Economic growth in other parts of the United States and in the Caribbean region could open new markets for Delaware poultry

Threats

- Risk of rail bottlenecks (northern Delmarva) or rail availability (southern Delmarva) place risk on feedstock procurement
- Loss of coal demand due to power unit closures at the Indian River Power Plant, could threaten the financial viability of Class 1 rail service on the Delmarva Secondary line, which could lead to poultry sector downsizing
- Truck weight limits of 80,000 lbs. could cause poultry and other agriculture processing/exporting companies to relocate or expand in states with higher limits
- The lack of soybean crushing units leaves farmers dependent on one facility (Perdue in Salisbury, MD) for locally-produced soybean meal
- Inadequate volumes on the Nanticoke and Wicomico rivers could lead the US Army Corps of Engineers to eliminate funding for dredging
- Growth in Delaware's tourism sector could conflict with the efficient operation of goods movement
- The latest bird flu migrating east across North America poses a threat to the Delmarva poultry industry, particularly where poultry houses are densely concentrated
- Emerging poultry agribusinesses in other states, such as North Carolina and West Virginia

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Summary of priorities: All primary research methods by industry sector

Priorities by sector (at least one mention)

Sector	Poultry	Farmers	Transport/ Logistics	Fisheries/ Dairy	Suppliers
Improve rail throughput across N. Delmarva (& Amtrak NEC)	X	X	X		X
Maintain safe, reliable Delmarva Secondary service	X	X	X		X
Improvements to reduce travel times on the I-95/295/495 corridor, tolls & interchanges and the Bay Bridge	X	X	X	X	
Enhance capacity of N-S Delmarva highways (Routes 1, 13, 113)	X	X	X	X	
Reduce congestion on east-west highways, interchanges, and at-grade crossings in southern Delaware (Routes 8, 15, 24, 26, 404)	X	X	X	X	
Permit truck weights up to 90,000 lbs.	X	X	X		
Maintain Nanticoke and Wicomico river channels		X			
Make improvements to secondary roads to permit safe co-existence of trucks and passenger modes	X	X			
Consolidated grain elevator/shuttle terminal	X	X			
Passenger vehicle driver education		X			X
Reduce regulatory burdens (e.g., electronic permitting)		X	X	X	X
Improve truck safety amenities (e.g., rest stop parking)		X			

Summary of primary research: Transportation priorities

- Maintaining reliable rail freight service is critical to supplying feed and fertilizer for various agricultural sub-sectors, with emphasis on improving congestion in northern Delmarva (especially shared track with the Amtrak NEC) and maintaining reliable service on the Delmarva Secondary line. In comparison to neighboring states, including North Carolina, the level of rail service result in higher premiums being paid for inbound feed.
- Increasing truck weight limits to 90,000 lbs. for goods in the agriculture supply chain and coordinating weight limits with neighboring states will improve supply chain efficiencies and reduce costs (especially for exports).
- Extending north-south limited access roadway infrastructure (e.g., the Route 1 Bypass) further south and improving throughput at primary east-west highways and crossings would significantly reduce travel times and reduce congestion, especially with competing summer beach traffic.
- Increasing road capacity and throughput at major bottlenecks connecting Delmarva to major Mid-Atlantic poultry consumer markets (e.g., I-95/295/495 corridor and tolls, and the Bay Bridge) would reduce travel times and lower costs, helping to make the industry more economically competitive.
- Improving safety and accessibility on secondary roads by improving road designs to adequately accommodate both truck and passenger traffic, and conducting driver awareness education, would improve the safety and efficiency of Delmarva agriculture supply chains.
- Continuing dredging, ice-cutting, and channel maintenance on the Nanticoke and Wicomico rivers is critical to support existing supply lines and to mitigate any potential loss of rail service, lower domestic feed-stock availability, and other supply chain risks.

Summary of primary research: Transportation priorities cont'd.

- Integrating new technologies to DelDOT processes (e.g., heavy-load permits) offers a relatively inexpensive but high-impact solutions to support agriculture industry supply chain efficiency.
- Promoting the establishment of a large grain elevator and/or shuttle loading facility on Delmarva would create efficiencies by centralizing distribution, especially for grains loading/unloading.
- Seaports (and access to seaports) are important nodes in agriculture trade, including the Port of Wilmington as well as other Mid-Atlantic ports (especially Norfolk, Philadelphia, and Baltimore).

Key policies and investments identified in the 2015 Delmarva Freight Study for regional agriculture supply chains

- The Delmarva Agriculture Supply Chain Study supports the recommendations for investments to improve rail throughput in northern Delmarva, possibly including bridge replacement, the development of a third rail along the Amtrak NEC, and other proposed rail corridor improvements.
- The Delmarva Agriculture Supply Chain Study similarly identifies the loss of coal tonnage by rail to the Indian River Power Plant as a risk to maintaining Delmarva Secondary line rail service. Agriculture and related food manufacturing industries are likely to be among the sectors most critically affected by any disruption of this service, as rail is critical to sourcing of grains for the poultry industry.
- The Delmarva Agriculture Supply Chain Study concurs that the Nanticoke and Wicomico rivers dredging is important to support inbound grain flows for poultry feed mills.
- The Delmarva Agriculture Supply Chain Study also recognizes the importance of both the Port of Wilmington as well as several Mid/South-Atlantic ports (and road and rail access to those ports). This study concludes that the seaport needs of agriculture supply chains are diverse, and it is important to also look beyond Delmarva to other ports, in particular Baltimore, Norfolk, and Philadelphia.
- The Delmarva Agriculture Supply Chain Study identifies several highways and corridors as both critical for regional truck freight and often subject to heavy congestion. However, it is important to recognize that specific roadway segments identified by stakeholders for this study need to be considered in the system-wide context established by the Delmarva Freight Plan.
- The Delmarva Agriculture Supply Chain study also identifies numerous regulatory issues important to the agriculture sector. These include but are not limited to road safety education, increasing regional truck weight limits, and improving the ease of regulatory compliance (e.g., electronic permitting).

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Cost Comparison of Regional Agricultural Supply Chains

- A price premium is associated with shipping grain and soybeans to Delmarva.
  - This is evident when comparing the per bushel price of corn in Delmarva with nearby states – Pennsylvania, Maryland, North Carolina and Virginia.
  - Other states are advantaged in their price spread due to their geography and transportation network.
- Due to rail capacity constraints, Delmarva can move a limited quantity of feed stocks into the region. Other states do not suffer from the same rail constraints, and this is reflected in their price spread.

Comparison of Corn Spreads Across States

State	Price Spread	Quantity Shipped
Delaware	$0.50	-
Maryland	$0.36	119 thousand tons
North Carolina	$0.35	77 thousand tons
Virginia	$0.24	640 thousand tons
Pennsylvania	$0.34	265 thousand tons