Hunts Point Terminal Market: The Demand for Waterborne Transportation as a Part of the Distribution System

Shmuel (Sam) Yahalom, Camille Kamga
Changqian Guan, Eric Johansson

Research Funding: New York State Energy Research and Development Authority (NYSERDA), New York State Department of Transportation (NYSDOT, University Transportation Research Center – Region II (UTRC), and MetroFreight with grant from the Volvo Research and Education Foundation (VREF)
Discussion Paper: Outline

• Background and the HPTM facility
• The problem, research objectives and scope
• Proposed operations process
• Project benefits
• Findings
• Waterborne operations planning
• Waterborne operations challenges
• Conclusions
Background

- Deliveries include Hunts Point Peninsula to/from Hunts Point Terminal Market (HPTM).
- New York City roads and highways are congested.
- The daily food distribution in the New York Metropolitan area is primarily by truck to/from HPTM.
U.S. Food Consumption Facts

• In 2010 the average American consumed almost 1 ton of food per year (1,996.3 lb or 906 kg) or 2.43 lb (1.1 kg) per person per day.
  • From this total 44.5% are:
    • vegetables (415.4 lb or 188.4 kg)
    • fruit (273.2 lb or 124 kg)
    • meat (110 lb or 49.9 kg)
    • poultry (73.6 lb or 33.4 kg)
    • fish (16.1 lb or 7.3 kg)

• The number of food establishments in NYC (Est.)
  • Of the 23,705 (2014) restaurants, bars and cafes, 7,151 (2014) are fast food.
The HPTM Facility Profile

- HPTM is the largest fresh food distribution center in the US (60% of the food distribution in the New York Metropolitan area).
- 113 acres of approximately 1,000,000 square feet of interior space of which over 60% is refrigerated
- 42 vendors
- 270 storage units
- 210 million packages of fruit and vegetables handled a year
- 9.6 million pallets handled per year
- 5,500 buyers
- 15,000 truck movements daily
- 10,000 employees
- Produce source: 49 states and 55 countries
- Receives deliveries daily by: boat, rail, tractor trailer and air cargo
- Serving more than 22 million people within a 50-mile radius
- $ 2.4 billion in sales annually
- 86% of visitors visit every day or a few times per week.
- Vehicle class distribution: 50% box vehicles, 31% vans and 19% tractor trailers
- Selling hours: Sunday through Friday 9:00 PM to 3:00 PM
- Receiving hours: 24 hours a day, 7 days a week
The Problem

• The HPTM distribution center does not have simple and quick access.

• The geographical layout of the New York Metropolitan area complicates surface transportation delivery.

• Delivery takes:
  • more miles
  • more time

• Increase commute time

• Increase the cost of living in the City

• Reduce productivity

• Trucks increase:
  • congestion
  • wear-and-tear of the roads
  • excessive time waiting and idling
  • wasting fuel
  • pollution - emitting CO₂ and other gases

• Increase medical problems and medical cost

• Other
Delivery: Contemporary Supply Chain
Research Objective and Project Scope

• To explore an alternative to the primary use of trucks for outbound delivery or pick-up of food products in the Metropolitan area from HPTM

• To explore the alternative use of waterborne transportation, e.g., barges, as part of the food outbound distribution system

• To quantify the demand for waterborne services from which vehicle mile savings will be determined
Proposed Supply Chain Operation

- The waterborne vessel(s) will be loaded with produce at HPTM and moved (self-propelled or pulled) to a strategically located predetermined site(s) in the Metropolitan area.
- Customers will pick up their preordered produce from this site(s).
- After the waterborne vessel is discharged, it will be moved back to HPTM for the next day’s operations.

Proposed operation process:

1. **Vessel loading**
   - Vendors deliver produce to waterborne asset at HPTM (3rd party)

2. **Waterborne operation**
   - Waterborne asset transits to designated pier
   - When operation completed returns to HPTM

3. **“Last mile” delivery**
   - Businesses obtain delivery of produce via independents or own vehicle
Proposed Supply Chain Operation (Cont’d.)

- The barge becomes a local distribution hub.
- Food product pick-up is from the barge instead of HPTM.
- Pick-up sites will be determined in future studies.
Project Benefits

• A barge operation as part of the food distribution system is a low cost and fuel efficient operation reducing the number of miles vehicles drive and the number of truck trips.
  • Reduce demand for fuel, lower pollution (air & noise) and congestion, reduce wear-and tear on the roadway.

• Provide for new opportunities such as offsite distribution centers.
  • An offsite distribution center could also be a tradeoff: an investment reduction in existing facilities for an investment in an offsite facility.

• The development of offsite facilities will further reduce the number of truck miles driven.
Large and Intermediate Firms Operations

The outbound products distributors are divided into:

- large firms
- medium (intermediate) firms
- small firms

Large and some intermediate firms’ warehouses are located in New Jersey, Connecticut and Upstate New York.

Large and some intermediate firms:

- Get the produce shipped **inbound** directly to their distribution facilities
- Distribute **outbound** with their own vehicles
- Some intermediates are located in HPTM.
- Firms not located in HPTM use HPTM produce for outbound distribution regularly.
- Firms make stocking policy rely on HPTM to make up differences.
Small Distributers – 3\textsuperscript{rd} Party Distributers

Characteristics:

• many firms in this category
• depend exclusively on HPTM (probably 95%)
• obtain orders from customers
• fill the orders mostly from HPTM vendors
• might visit large distributors to fill orders if/when HPTM is short
• deliver the produce to the customers directly or through 3\textsuperscript{rd} party
Small HPTM Customers

• Regular customers
• Anyone can visit HPTM for an annual membership gate fee of $25.
• Small vendors do not use distributors.
• Prefer to See, Feel and Touch (SFT) the produce
• SFT is very important to the consumers in the food business in general and some of those who visit HPTM.
• About 50% of the customers are SFT types.
Packing

- Units sold by **package** (box, carton, bag, etc.)
- A number of packages make up a pallet (skid) (base = 48” x 40”)
- Each product has a different number of packages per pallet ranging from 9 to 118.
- Pallet weight ranges from 1100 lbs (499 kg) to 2300 lbs (1043 kilo).

<table>
<thead>
<tr>
<th>Produce Boxes per Pallet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Banana</td>
</tr>
<tr>
<td>Tomatoes</td>
</tr>
<tr>
<td>Apples</td>
</tr>
<tr>
<td>Grapes</td>
</tr>
<tr>
<td>Strawberry</td>
</tr>
<tr>
<td>Avocado</td>
</tr>
<tr>
<td>Cherry Tomatoes</td>
</tr>
</tbody>
</table>
## Load Per Truck Trip

<table>
<thead>
<tr>
<th></th>
<th>Annual</th>
<th>Week</th>
<th>Day (5-day week)</th>
<th>Average Load per outbound truck trip (12,000 truck trips a day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Packages</td>
<td>210,000,000</td>
<td>4,038,462</td>
<td>807,692</td>
<td>67.3 (packages)</td>
</tr>
<tr>
<td>Pallets</td>
<td>9,600,000</td>
<td>184,615</td>
<td>36,923</td>
<td>3.1 (pallets)</td>
</tr>
<tr>
<td>Packages/pallets</td>
<td>21.9</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Packages per pallets: 21.9
### Observed Produce Outbound Distribution from HPTM

(Zip code based)

<table>
<thead>
<tr>
<th>STATE</th>
<th>Weekly average number of packages</th>
<th>Relative share</th>
<th>Number of zip codes</th>
<th>Relative share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connecticut</td>
<td>354,595</td>
<td>9%</td>
<td>23</td>
<td>6%</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>146,193</td>
<td>4%</td>
<td>11</td>
<td>3%</td>
</tr>
<tr>
<td>Maryland</td>
<td>199,795</td>
<td>5%</td>
<td>7</td>
<td>2%</td>
</tr>
<tr>
<td>New Jersey</td>
<td>2,605,237</td>
<td>65%</td>
<td>125</td>
<td>33%</td>
</tr>
<tr>
<td>New York</td>
<td>681,496</td>
<td>17%</td>
<td>200</td>
<td>52%</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>51,144</td>
<td>1%</td>
<td>15</td>
<td>4%</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>4,038,462</strong></td>
<td></td>
<td><strong>381</strong></td>
<td></td>
</tr>
</tbody>
</table>
## NYS Weekly Produce Distribution By County

<table>
<thead>
<tr>
<th>County</th>
<th>Weekly average observed</th>
<th>% from NYS</th>
<th>Weekly average estimated*</th>
<th>% from NYC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albany</td>
<td>8,278</td>
<td>4%</td>
<td>26,398</td>
<td></td>
</tr>
<tr>
<td><strong>Bronx</strong></td>
<td>50,309</td>
<td>24%</td>
<td>160,433</td>
<td>33%</td>
</tr>
<tr>
<td>Brooklyn</td>
<td>41,587</td>
<td>19%</td>
<td>132,619</td>
<td>28%</td>
</tr>
<tr>
<td>Manhattan</td>
<td>19,244</td>
<td>9%</td>
<td>61,368</td>
<td>13%</td>
</tr>
<tr>
<td>Nassau</td>
<td>22,921</td>
<td>11%</td>
<td>73,094</td>
<td></td>
</tr>
<tr>
<td>Queens</td>
<td>37,850</td>
<td>18%</td>
<td>120,702</td>
<td>25%</td>
</tr>
<tr>
<td>Rockland</td>
<td>7,353</td>
<td>3%</td>
<td>23,448</td>
<td></td>
</tr>
<tr>
<td>Staten Island</td>
<td>1,910</td>
<td>1%</td>
<td>6,091</td>
<td>1%</td>
</tr>
<tr>
<td>Suffolk</td>
<td>8,236</td>
<td>4%</td>
<td>26,264</td>
<td></td>
</tr>
<tr>
<td>Westchester</td>
<td>13,827</td>
<td>6%</td>
<td>44,094</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>2,190</td>
<td>1%</td>
<td>6,984</td>
<td></td>
</tr>
<tr>
<td><strong>Total NYC</strong></td>
<td>150,900</td>
<td>71%</td>
<td><strong>481,214</strong></td>
<td>100%</td>
</tr>
<tr>
<td><strong>Total NYS</strong></td>
<td>213,705</td>
<td></td>
<td><strong>681,496</strong></td>
<td></td>
</tr>
</tbody>
</table>

* Estimate was extrapolated using 210 million packages a year reported before (Hunts Point, 2014).
# NYC Weekly Produce Distribution By Zip Code

<table>
<thead>
<tr>
<th>County</th>
<th>Town</th>
<th>Zip</th>
<th>Weekly</th>
<th>%</th>
<th>Estimate*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bronx</td>
<td>East Bronx</td>
<td>10462</td>
<td>48,930</td>
<td>22.9%</td>
<td>156,035</td>
</tr>
<tr>
<td>Brooklyn</td>
<td>Borough Park</td>
<td>11219</td>
<td>37,861</td>
<td>17.7%</td>
<td>120,738</td>
</tr>
<tr>
<td>Manhattan</td>
<td>Rockefeller Center</td>
<td>10111</td>
<td>14,937</td>
<td>7.0%</td>
<td>47,632</td>
</tr>
<tr>
<td>Albany</td>
<td>Schenectady</td>
<td>12306</td>
<td>8,255</td>
<td>3.9%</td>
<td>26,326</td>
</tr>
<tr>
<td>Queens</td>
<td>Ridgewood</td>
<td>11385</td>
<td>6,811</td>
<td>3.2%</td>
<td>21,721</td>
</tr>
<tr>
<td><strong>Sub total</strong></td>
<td></td>
<td></td>
<td><strong>116,794</strong></td>
<td><strong>54.7%</strong></td>
<td><strong>372,452</strong></td>
</tr>
</tbody>
</table>

## A. Leading distribution by zip code

## B. Remaining distribution by zip code

<table>
<thead>
<tr>
<th>Number of zip codes</th>
<th>Weekly average (range)</th>
<th>Weekly</th>
<th>% range</th>
<th>Estimate*</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>4,266</td>
<td>4,642</td>
<td>13,186</td>
<td>2.00%</td>
</tr>
<tr>
<td>7</td>
<td>2,455</td>
<td>3,810</td>
<td>21,585</td>
<td>1.15%</td>
</tr>
<tr>
<td>14</td>
<td>1,000</td>
<td>2,000</td>
<td>21,886</td>
<td>0.50%</td>
</tr>
<tr>
<td>171</td>
<td>-</td>
<td>1,000</td>
<td>40,254</td>
<td>0.00%</td>
</tr>
<tr>
<td><strong>Sub total</strong></td>
<td></td>
<td></td>
<td><strong>96,911</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>213,705</strong></td>
<td></td>
</tr>
</tbody>
</table>

*Estimate was extrapolated using 210 million packages a year (Hunts Point, 2014).
Potential Outbound Cluster Locations for Pick-ups
NYC Potential Demand for Waterborne Produce Pickup

<table>
<thead>
<tr>
<th>County</th>
<th>Weekly packages (estimated average)</th>
<th>Packages per day (5-day week)</th>
<th>Number of pallets a day at 50 packages per pallet (number of 20ft box-trucks**)</th>
<th>Number of pallets a day at 40 packages per pallet (number of 20ft box-trucks**)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bronx*</td>
<td>160,433</td>
<td>32,087</td>
<td>642 (64)</td>
<td>802 (80)</td>
</tr>
<tr>
<td>Brooklyn</td>
<td>132,619</td>
<td>26,524</td>
<td>530 (53)</td>
<td>663 (66)</td>
</tr>
<tr>
<td>Manhattan</td>
<td>61,368</td>
<td>12,274</td>
<td>245 (25)</td>
<td>307 (31)</td>
</tr>
<tr>
<td>Queens</td>
<td>120,702</td>
<td>24,140</td>
<td>483 (48)</td>
<td>604 (60)</td>
</tr>
<tr>
<td>Staten Island</td>
<td>6,091</td>
<td>1,218</td>
<td>24 (2)</td>
<td>30 (3)</td>
</tr>
<tr>
<td><strong>Total NYC</strong></td>
<td><strong>481,214</strong></td>
<td><strong>96,243</strong></td>
<td><strong>1,925 (192)</strong></td>
<td><strong>2,406 (241)</strong></td>
</tr>
</tbody>
</table>

*The Bronx is not considered for waterborne alternatives

** This is the equivalent of the number of box-trucks.
Waterborne Operation Challenge

• Planning and executing the plan of a waterborne operation is complex:
  • Carry enough produce to take advantage of the economies of scale and reduce the number of trucks on the road.
  • A comprehensive benefit cost analysis to determine public sector support.
  • A reduction in HPTM vendors operations cost and higher return will encourage their participation and further economies of scale.

• Look into equipment, operations and finance
Hardware: Vessel

- Waterborne vessel size by destination site
- Waterborne vessel design by destination including different temperature control storage facilities (generators) to accommodate produce temperature requirement
- Safety facilities/instruments on board, during docking and undocking
- Tugboat size and operating characteristics and standards
- Inspections, licensing, and certification by the appropriate authorities
Hardware: Landing Site

• A designated pier for operations in both origin and destination
• The pier at origin needs to be long enough to accommodate more than one barge.
• Pier has to have appropriate equipment to facilitate the operation.
• Pier should maintain dredging status.
• Parking and access to waterborne vessel at destination
Operations Characteristics

• A dedicated party to load and discharge – a HPTM vender or an independent third party
• A fixed schedule of departure and arrival
• Comply with temperature requirement per product during loading and transit
• Segregate products as required
• Tugboat operator always ready to pull the waterborne asset to the discharge site
• Pull the barge back to HPTM after the discharge
• Waterborne asset's crew dedicated to this operation
• Optimal departure schedule from origin and destination
• Minimize waterborne asset duration for load and discharge
• Transit time to discharge location includes consideration of currant and tide.
• Maintenance schedule and contingency plans during maintenance
• Security considerations
• Training crew
• Contingency plans: weather impacts if operation is disturbed (emergency, snow, storms, ice, etc.)
• Develop a chain of responsibility
Finance

• Capital cost
• Operations cost (labor cost, fuel cost, insurance cost, security, fees, etc.)
• Maintenance costs including down time
• Charges for operating the system
• Government agencies support (State, Local, Coast Guard, Army Corps of Engineers, others)
• Government agencies regulations (State, Local, Coast Guard, Army Corps of Engineers, others)
• Training
• Contracting and monitoring
Other Challenges

- Consolidation – 3rd party distributors
- Trust
- Produce delivery requirements – temperature control, segregation, returns
- Scheduling
- Operations
- Change business model (own pickup, subcontract – 3rd party)
- Economies of scale
- Operation management
- Vessel design
- Produce characteristics
- Human factor
Conclusions

A waterborne answer to an operation should always be one of the options for consideration if possible for operational efficiencies and for a green solution.
Q&A

Camille Kamga – Ckamga@utrc2.org
City University of New York –
University Transportation Research Center (UTRC)

Shmuel (Sam) Yahalom - syahalom@sunymaritime.edu
State University of New York – Maritime College

Eric Johansson - safemariner@me.com
State University of New York – Maritime College

Changqian Guan - cguan68@gmail.com
United States Merchant Marine Academy