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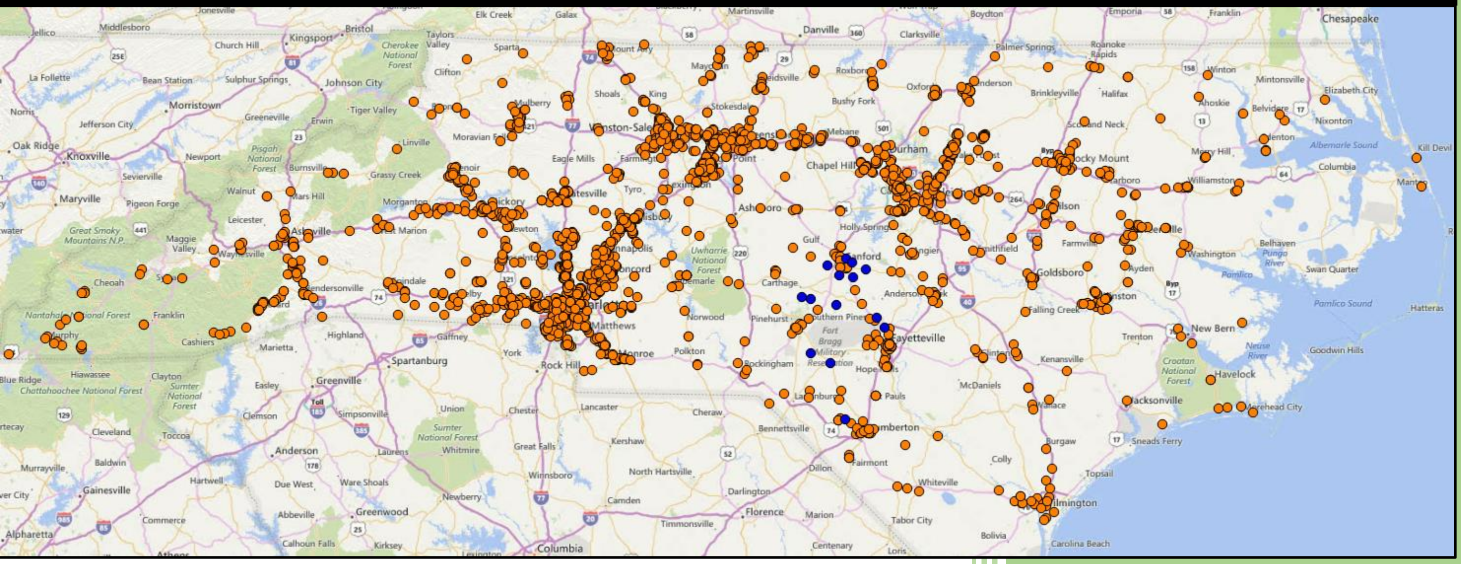
A Crossdock Consolidation Center for Local Produce: Investment and Operating Cost Estimates



Crossdock Consolidation Centers for fresh produce are a proposed type of local food distribution infrastructure consisting of loading docks and coolers for aggregation and storage of product. The Centers are designed as part of a food distribution network to incentivize large-scale wholesalers to purchase produce that has been consolidated from rural and remote farming communities.

This document gives estimates of startup and operating costs for a facility with 2000 square feet of cold storage, built into an existing warehouse structure. The information could be useful to food system advocates and researchers, as well as economic development officials seeking to repurpose underutilized infrastructure.

Also see: *A Crossdock Consolidation Center for Local Produce: Using QGIS to Select an Optimal Site Location*
(See: ncgrowingtogether.org/Research)

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Executive Summary

Cost-effective aggregation of product from small and mid-sized farmers, and the proper cooling of this product to extend shelf-life, are two prerequisites preventing successful local food supply chain linkages between smaller producers, intermediary wholesalers, and institutional and grocery markets. Food Hubs have emerged as one organizational form to aggregate and distribute local products. The typical Food Hub model subsumes the functions of the wholesaler, while ascribing to a mission of building value-chain linkages from producer to consumer that share risk and equitably and transparently compensate producers. County and regional economic development officials and foundations have turned to the model as a means to catalyze the economies of rural communities hurt by the decline of rural manufacturing and loss of farmers and farmland. Yet the all-inclusive Food Hub model has a costly investment and operating structure, and may only work for farms near the metropolitan areas where consumers and intermediaries are willing to pay higher prices for "locally-sourced" product.

The Crossdock Consolidation Center (CCC) as discussed in this paper provides one low-cost alternative to sourcing local product, with the assumption that the costs of any re-packing, sales, marketing, and distribution fall to an existing produce wholesaler. The CCC is an infrastructure component that can enable more small and mid-sized farmers to sell their product locally. Those interested in exploring options in their own areas can work with a GIS-trained individual in a local planning or economic development office, or utilize the free online program QGIS (see *A Crossdock Consolidation Center for Local Produce: Using QGIS to Select an Optimal Site Location* at ncgrowingtogether.org/Research). Context-specific information, such as the existence of vacant warehouses or farms with existing infrastructure, can be input as siting criteria to yield an optimal location. It is important to note that the assumptions used in citing the facility, and those used in generating cost estimates for startup and operations, should be based on practical, not idealized, criteria. Additionally, questions about the legal structure of the facility, and the points at which ownership of product is transferred from producer to wholesaler, should be resolved in advance of a financial investment.

By efficiently siting a facility based on a set of criteria, and costing out different options based on these sites, producers and existing wholesalers may be able to create win-win cross-scale exchanges of product using the Crossdock Consolidation Center model. Additionally, government or foundation entities seeking to preserve working farm lands and the livelihoods of small and mid-sized farmers can use the CCC model as a relatively low-cost option to build local food supply chains. This type of infrastructure can provide economic opportunities for a new generation of smaller, diversified farms and their communities, and increase access to authentically local food for more consumers.

The analysis below finds an estimated startup cost (cold storage and equipment only) of $70,000 and annual (5 months operation) estimated operating costs of $69,000, with half of this comprised of labor costs. In the example given, below, per case cost is $4.16 based on 288 pallets (est. 16,565 cases) of product. At this level of operation, production from approximately 25 acres is utilized. The maximum throughput for a 5 month season is estimated at 2,064 pallets of product. Operating at full capacity, the operating costs per case are estimated to be $0.56.

Introduction

While interest in local food (source-identified products from geographically proximate family farms) continues to grow, challenges remain in cost-effectively aggregating and distributing these products from farm to end consumer. Food hubs have emerged over the past decade as an organizational model designed specifically to aggregate and distribute local food, primarily local fresh produce. Food hubs operate as supply chain intermediaries akin to wholesale distributors, but differ from distributors in that they explicitly incorporate a social mission, most often the mission to build the economic viability of smaller-scale farms integral to rural community well-being. Food hubs typically provide a suite of services to small and mid-scale growers. These can include production planning and farmer training, grading and packing, quality control, marketing, and distribution. While food hubs provide valuable services to individual growers and can buttress local and regional economic development initiatives, the cost of services often exceeds the income generated by the hub.

This paper analyzes a possible alternative or adjunct to the food hub model--a Crossdock Consolidation Center (CCC). This infrastructure alternative addresses the supply chain functions of aggregation and cooling, and thus is specifically designed to operate in conjunction with a food hub or wholesale produce distributor, or act in alignment with the planned needs of a specific partner grocery store chain or food service company. Like a food hub, a CCC can span the geographic distance, dispersion, and scale differences that exist between small and mid-scale farms and a marketplace organized around national and global procurement and distribution. Crossdock Consolidation Centers are one possible piece of infrastructure used to build local food systems and maintain rural livelihoods, while at the same time utilizing existing buildings. In North Carolina and other states, local officials are seeking to repurpose unused manufacturing facilities, such as those from the southern textile and furniture manufacturing industries. Utilization of existing buildings was thus one of the selection criteria for the facility siting analysis, as discussed below.

The availability of existing, underutilized rural infrastructure thus serves as an incentive for partnership between local governmental and non-governmental (non-profits, foundational) focused on rural economic development. The desire to make use of unused infrastructure should not be of highest importance when deciding whether to build a facility or when seeking a location. The existence of engaged and interested farmers and of a partner buyer must be in place to be able to make the business case, even if part of the business case includes grants for start-up and operation. As noted by those working in food hub development, a “build it and they will come” mentality, with “they” including farmers and buyers, is a recipe for failure, and the same goes for offering too many services for a small grower-buyer base. Proponents should identify willing and capable growers—those with the existing operations, food safety certifications, knowledge on wholesale packing and grading, and willingness to sell at wholesale prices (typically ½ of the direct-to-consumer price).

We consider CCC as a potential development initiative for rural southcentral North Carolina. Original cost estimates for such a facility were calculated by a team of North Carolina State University MBA students in 2014 who worked in partnership with the Center for Environmental Farming Systems and the NC Growing Together project (cefs.ncsu.edu; ncgrowingtogether.org). While the analysis was designed to address one particular scenario, the methodology can be applied to other locations and other end-markets. The costs information and facility citing example presented in the companion document, *A Crossdock Consolidation Center for Local Produce: Using QGIS to Select an Optimal Site Location* (at ncgrowingtogether.org/research) can be used by those seeking cost-effective options to develop local food systems, including farmers; food hubs and other produce intermediaries; and local food system advocates in government and non-profit sectors.

Estimated Costs for the Facility

The investment estimates are based on the assumption that an existing vacant warehouse is upgraded to meet specifications. Major cost considerations were broken down into Building and Equipment Startup Costs, and Annual Operating Expenses.

Product Assumptions and Building Specifications

The CCC sources seasonal field-packed product delivered by individual farms in non-refrigerated trucks before 10 a.m. Field packing product with minimal handling reduces on-site labor costs. Early morning harvest and transport ensures product has a lower pulp temperature for faster cooling. All farmers use the same set of buyer-specified quality, product packaging, and labeling specifications. Inventory operates on a first-in first-out (FIFO) system and wholesalers pick up produce between specified hours three days per week. For this example we assume the facility is only operating during the spring/summer months, with a ¾-time manager. The manager performs quality checks, assists in unloading and loading of product, and records inventory in and inventory out. Ordering takes place directly between the end user or buyer (e.g., food service wholesale distributor) and the farmer. Both the farmers and distributors interviewed for this report expressed concern as to who would hold the liability for product stored at the facility, for example in the case of a power outage. This is a crucial point of discussion for those considering the CCC option.

The primary function of the building is thus to store and cool product. The facility will store various crops with different temperature and humidity requirements, and four coolers with different temperature points were selected. An elevated loading dock is required to reduce labor and time to move products in and out of storage. Table 1 gives temperatures for each cooler, and examples of products stored at these temperatures. Table 2 estimates the overall carrying capacity of the facility as 2,064 pallets, assuming two turns per week and 5 months of operation.

Table 1. Crossdock Consolidation Coolers (500 sq ft each), Temperatures, and Example Crops

Cooler #	Temperature Range	Products Stored, Examples
1	32-34 ° F	Lettuces, greens (e.g. spinach, kale, collards, chard)
2	34-38 ° F	Peppers, cucumbers
3	38-42 ° F	Strawberries, spring onions, root crops (turnips, radishes), yellow and green squash
4	50-55 ° F	Tomatoes, watermelon

Table 2. Estimated Facility Carrying Capacity

Pallets (40"W x 48"L) per each of 4 rooms (double stacked)	12 pallets per room
Number of rooms	4 cold storage rooms
Turns per week	2 turns per week
Weeks per year (April – August)	21.5 weeks
Total estimated capacity in pallets	**2,064 pallets**

Building and Equipment Startup Costs

We assume a leased warehouse, and have not included repairs and upgrades to the building facility itself, as this varies widely. A cost of $40,000 is included to cover construction of cold storage boxes, insulation, air conditioning units, and Coolbots[1] (storeitcold.com). Ideally, each room has a center drain for cleaning. Equipment includes shelving, office equipment, and a forklift. Smaller facilities could use a pallet jack in lieu of a forklift, but this is not recommended. The total startup investment for the facility is $70,000 (Table 3).

Table 3. Estimated Building & Equipment Start-up Costs for a Crossdock Consolidation Center in Southeastern North Carolina

Cold Storage and Equipment	Estimates
Cold storage	$40,000
Forklift	$22,500
Shelving	$5,000
Office Equipment	$2,500
Total	**$70,000**

Annual Operating Costs

Table 4 summarizes expected annual operating costs. Wholesalers typically require *liability insurance* of $1-$3 million, estimated at a cost of $1,500 annually. The annual operating expenses for *equipment maintenance* and *warehouse repair and maintenance* total $5,000 annually. *Utility costs* of $6,000 annually assume air conditioning units and Coolbots function for the five months of the year that the facility is in operation. *Property taxes* are listed as an expense but the cost is not included, due to variability based on building size and location and leasehold agreements. *Miscellaneous supplies* valued at $1,800 include office materials, boots, gloves, cleaning materials, etc. A *part-time employee* averages 30 hours per week during a seven month period (5 in operation, additional 2 as buffer) at $25/hour (including benefits) for an annual cost of $30,000. The facility must be Good Handling Practices (GHP) certified, with an estimated annual cost of $2,200 to

[1] Multiple air conditioning units with CoolBots may be needed to bring temperatures below 38°F in hotter weather.

maintain this certification. Total costs for the five months of operation, including $7,000 for equipment depreciation, are estimated to be $69,000 for the facility.

Table 4. Estimated Annual Operating Costs for a Crossdock Consolidation Center in Southeastern North Carolina

Operating Costs	Estimate	Proportion of Annual Operating Costs
$3 million liability insurance	$1,500	2%
Equipment maintenance	$1,000	1%
Cold storage maintenance	$4,000	3%
Utilities (April – Sept)	$6,000	9%
Misc supplies	$1,800	3%
Property taxes	NA	NA
Part-time employee (April – Sept)	$30,000	44%
Equipment depreciation	$7,000	10%
Warehouse lease	$16,000	24%
Total	$69,000	100%

Estimating Facility Usage and Cost per Case

Table 5 provides a suggested structure for calculating total demand in pallets, and the associated number of acres. This provides just one example, and additional crops and volumes can be added to this spreadsheet, which can be accessed here: https://cefs.ncsu.edu/ncgt/tables-for-final-ncgt-ccc-report-9-2016.xlsx. Translation of cases and pallets into acres of production is derived from *Estimated Rows and Acres of Production Per Case and Pallet at Wholesale*, and can be accessed here: https://www.cefs.ncsu.edu/ncgt/ncgt-product-row-and-acres-to-cases-and-pallets.pdf).

Based on demand estimated in Table 4, 288 pallets of produce move through the facility during the 5-month operating window. This translates into 16,577 cases of product. Dividing this into the operating costs, we find an aggregation/cold-storage cost of $4.16 per case. As a point of comparison, growers typically pay about $2.00 for each corrugated cardboard packing case. Note that if the facility is used at its maximum carrying capacity of 2,064 pallets, or 125,900 cases (using an average number of 60 cases per pallet, the average cases/pallet from the crops in Table 4), the cost per case falls to $0.56.

Table 5. Spreadsheet Template for Calculating Demand in Cases and Acres of Production

For the Crossdock Consolidation Center detailed in: ***A Crossdock Consolidation Center for Local Produce: Investment and Operating Costs and Estimates*** (at ncgrowingtogether.org)

			Weekly Demand				Monthly Demand			Demand in Acres of Production		
Month	**Produce Item**	Temp Room*	Case Demand	Pallet Demand	Total Cases	weeks	cases/month	cases per pallet	# pallets	acres needed per pallet	acres needed for demand	acres needed for demand including production buffer of 30% (risk of loss)
April	strawberries	3.0		4.0	200.0	4.3	860.0	50.0	17.2	0.03	0.52	0.7
	arugala	1.0	18.0		18.0	4.3	77.4	30.0	2.6	0.02	0.05	0.1
	chard	1.0	18.0		18.0	4.3	77.4	30.0	2.6	0.02	0.05	0.1
	spring onions	3.0	4.0		4.0	4.3	17.2	30.0	0.6	0.02	0.01	0.0
	cucumbers	2.0		4.0	280.0	4.3	1,204.0	70.0	17.2	0.07	1.20	1.6
May	strawberries	3.0		4.0	200.0	4.3	860.0	50.0	17.2	0.03	0.52	0.7
	blueberries	3.0		2.0	234.0	4.3	1,006.2	132.0	7.6	0.24	1.83	2.4
	kale	1.0	20.0		20.0	4.3	86.0	30.0	2.9	0.02	0.06	0.1
	arugala	1.0	12.0		12.0	4.3	51.6	30.0	1.7	0.02	0.03	0.0
	chard	1.0	12.0		12.0	4.3	51.6	30.0	1.7	0.02	0.03	0.0
	cucumbers	2.0		4.0	280.0	4.3	1,204.0	70.0	17.2	0.07	1.20	1.6
	kale	1.0		3.0	90.0	4.3	387.0	70.0	5.5	0.07	0.39	0.5
June	blueberries	3.0		1.0	132.0	4.3	567.6	132.0	4.3	0.03	0.13	0.2
	tomatoes	4.0		6.0	288.0	4.3	1,238.4	48.0	25.8	0.05	1.29	1.7
	cucumbers	2.0		4.0	280.0	4.3	1,204.0	70.0	17.2	0.07	1.20	1.6
	kale	1.0		3.0	90.0	4.3	387.0	30.0	12.9	0.02	0.26	0.3
July	tomatoes	4.0		6.0	288.0	4.3	1,238.4	48.0	25.8	0.05	1.29	1.7
	cucumbers	3.0		4.0	280.0	4.3	1,204.0	70.0	17.2	0.07	1.20	1.6
	watermelon	4.0		6.0	32.0	4.3	137.6	16.0	8.6	0.02	0.17	0.2
	squash	3.0		6.0	420.0	4.3	1,806.0	70.0	25.8	0.07	1.81	2.3
	corn	1.0		1.0	45.0	4.3	193.5	45.0	4.3	0.18	0.77	1.0
August	watermelon	4.0		6.0	32.0	4.3	137.6	16.0	8.6	0.02	0.17	0.2
	squash	3.0		6.0	420.0	4.3	1,806.0	70.0	25.8	0.07	1.81	2.3
	corn	1.0		4.0	180.0	4.3	774.0	45.0	17.2	0.18	3.10	4.0
TOTAL Per Year ==>							16,576.5		287.5		19.10	24.83

*Temps per room: #1 = 32-34 degrees; #2 = 34-38 degrees; #3 = 38-42 degrees; #4 = 50-55 degrees