Food Hub Logistics Model
User Guide

NC STATE UNIVERSITY

MBA 549 Supply Chain Management Practicum Project

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This user guide explains the features and functionalities of the Excel-based inventory and logistics model (available here: go.ncsu.edu/ncgt-food-hub-logistics-model) designed for a North Carolina food hub distributing fresh produce to various locations. By following the steps, the user will be able to record inventory, allocate produce to customers, and see transportation costs for the different legs of a route.

The first part of this document describes how to use the tool's front-end applications. The second part of the document focuses on back-end applications like changing the customer master data.

The tool was created by a team of North Carolina State University MBA students in the Spring of 2017 as part of work by the USDA-funded North Carolina Growing Together project at the Center for Environmental Farming Systems.

Some text and tables have been removed or modified to eliminate the inclusion of proprietary business information.

For Information on NC Growing Together and the work of the MBA supply chain teams, contact: rebecca_dunning@ncsu.edu

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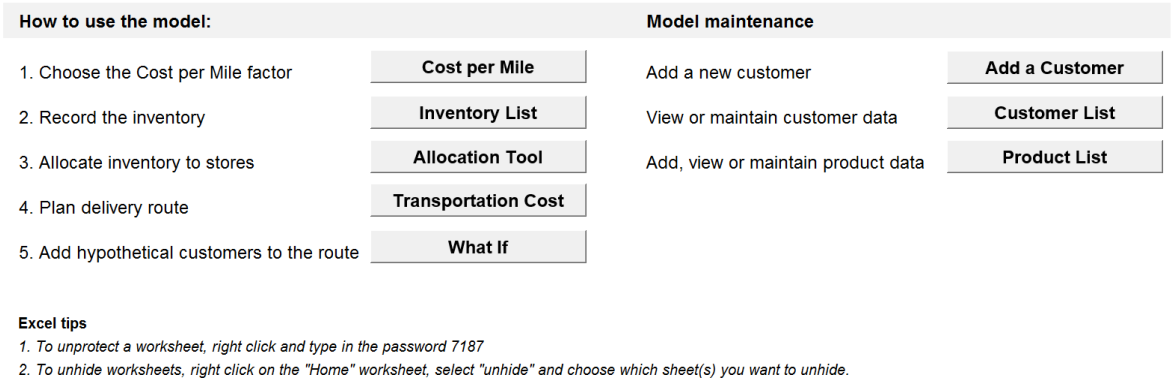
From the Home Tab of the Spreadsheet:

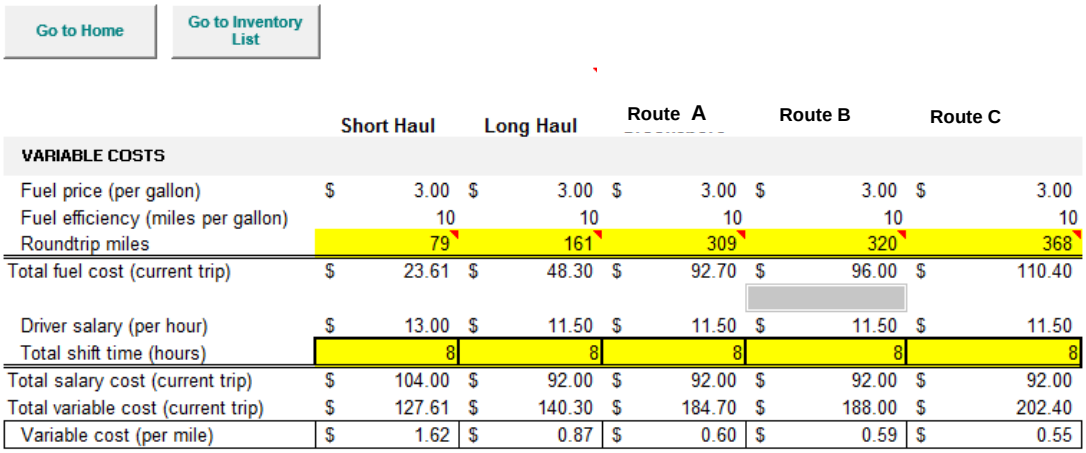


How to Use the Model

Step 1: Choose the Cost per Mile factor

Though this model was designed with short haul in mind, it can be used for long haul trips.

1. Refer to the comments in rows 2 and 6 of the spreadsheet for further explanation
2. You should also plug in the estimated number of hours the driver will work. Overtime will be calculated should the driver work more than 8 hours.
3. Fixed costs are calculated by dividing expense data by the number of trips. Update this data as needed.
4. You should assign the Cost per Mile factor in cell C28. Short haul trips should use the “Total Cost per Mile” under the short haul column, while long haul trips will vary depending on the route. You can add more columns to the Cost per Mile page if more long haul routes are established.
5. You may also want to set a budget target for transportation costs based on your particular business needs.



	Short Haul	Long Haul	Route A	Route B	Route C
VARIABLE COSTS					
Fuel price (per gallon)	$ 3.00	$ 3.00	$ 3.00	$ 3.00	$ 3.00
Fuel efficiency (miles per gallon)	10	10	10	10	10
Roundtrip miles	79	161	309	320	368
Total fuel cost (current trip)	$ 23.61	$ 48.30	$ 92.70	$ 96.00	$ 110.40
Driver salary (per hour)	$ 13.00	$ 11.50	$ 11.50	$ 11.50	$ 11.50
Total shift time (hours)	8	8	8	8	8
Total salary cost (current trip)	$ 104.00	$ 92.00	$ 92.00	$ 92.00	$ 92.00
Total variable cost (current trip)	$ 127.61	$ 140.30	$ 184.70	$ 188.00	$ 202.40
Variable cost (per mile)	$ 1.62	$ 0.87	$ 0.60	$ 0.59	$ 0.55

2016 DISTANCE DATA					
Number of trips (per season)	40	25	25	25	25
Miles (per roundtrip)	210	161	161	161	161
Total miles (per season)	8,400	4,025	4,025	4,025	4,025

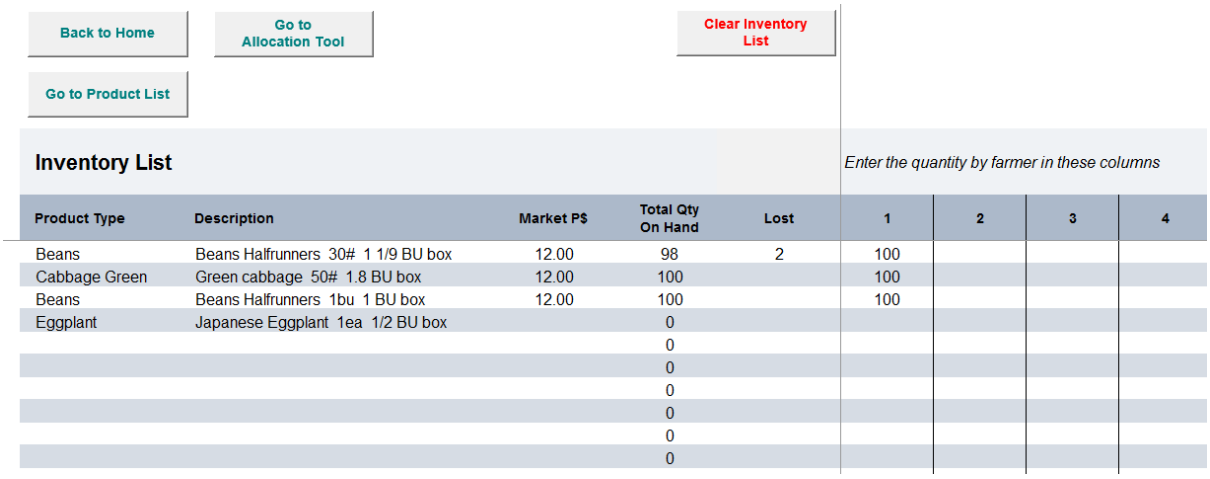
2016 FIXED COSTS					
Insurance	$ 1,180.00	$ 1,180.00	$ 1,180.00	$ 1,180.00	$ 1,180.00
Maintenance	$ 4,734.00	$ 4,734.00	$ 4,734.00	$ 4,734.00	$ 4,734.00
Total fixed costs (2016)	$ 5,914.00	$ 5,914.00	$ 5,914.00	$ 5,914.00	$ 5,914.00
Fixed cost (per mile)	$ 0.70	$ 1.47	$ 1.47	$ 1.47	$ 1.47
Total Cost (per mile)	**$ 2.33**	**$ 2.34**	**$ 2.07**	**$ 2.06**	**$ 2.02**

Total cost (per mile) in use on Transportation Tool	$ 2.33
target transportation cost (as % of revenue)	5%

Step 2: Record the inventory

Farmers will inform the sales planner about the produce and quantities they have available.

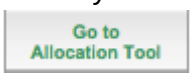
1. In the Inventory List tab, choose **Product Type** and **Description** from the drop down menu.
2. Manually type in the **Market P$** for the respective produce.
3. Fill in the name of the farmer in place of the number placeholders (1,2,3 etc.) and manually record the quantities for each of the produce items in the **Quantity by Farmer** section.
4. If any produce is lost, you may use the “lost” column or override the farmer’s quantity.
5. The total qty on hand will automatically calculate
6. **ALTERNATIVE SOLUTION** : a programmer could add a column between Description and Market $P for the Farmer Code, which would create more line items, but would potentially be easier to track which customer gets each farmer’s produce.



Product Type	Description	Market P$	Total Qty On Hand	Lost	1	2	3	4
Beans	Beans Halfrunners 30# 1 1/9 BU box	12.00	98	2	100			
Cabbage Green	Green cabbage 50# 1.8 BU box	12.00	100		100			
Beans	Beans Halfrunners 1bu 1 BU box	12.00	100		100			
Eggplant	Japanese Eggplant 1ea 1/2 BU box		0					
			0					
			0					
			0					
			0					
			0					
			0					

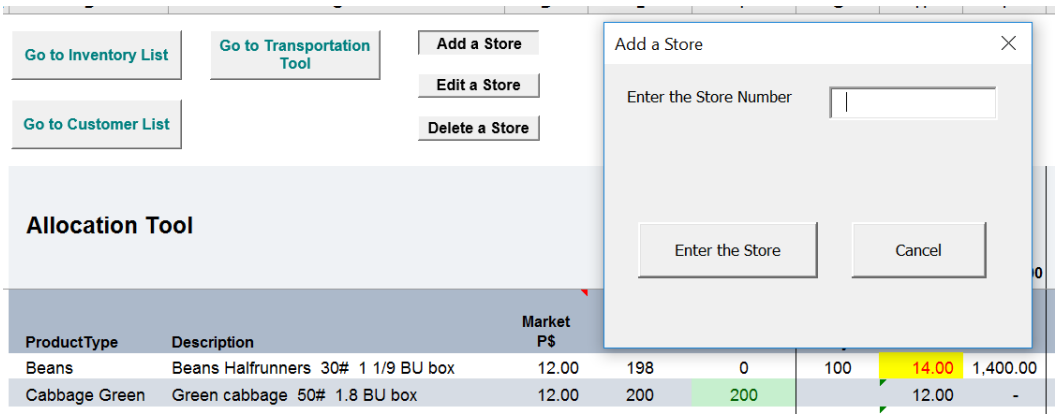
Step 3: Allocate the inventory to stores

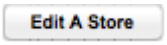
Now that available inventory has been recorded, inventory can be distributed to different customers. This step takes place while the sales person calls the different customers based on different core delivery routes.

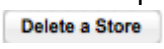
1. Click on 

to go from the Inventory tab to the Allocation tool tab.
2. The inventory information is automatically populated.
3. Clicking 

will pop up a form where you can type in the store number to start assigning inventory. You can add multiple stores, and these will be added to the right of an existing store in the spreadsheet. <u>If you do not know the customer number, click the “Go to Customer List” button and search for it. Typing in the wrong number can cause errors that require clearing the allocation sheet.</u>

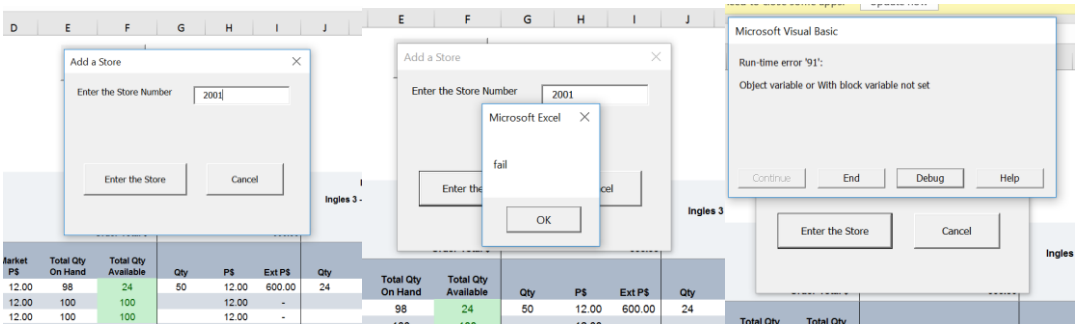


4. Type in the assigned **Qty** for each produce type for each store and change the price in **P$** cell in the event that a different sales price is negotiated with a specific customer. Note: this cell will turn yellow to alert you that the price to be billed is different from the market price.
5. If you want to replace an existing store with a new one, hit 

6. Click 

if you want to delete an individual store from this worksheet. If you want to clear data for the entire Allocation Tool tab, hit 

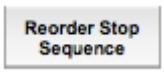
Be aware that this step cannot be undone, so only click this button if you are sure you want to start over.
7. If you type in a store number that does not exist, you will get an error message as pictured below.. Just click **End** and look up the correct number. Do not delete the customer information in the cells because this will cause errors.



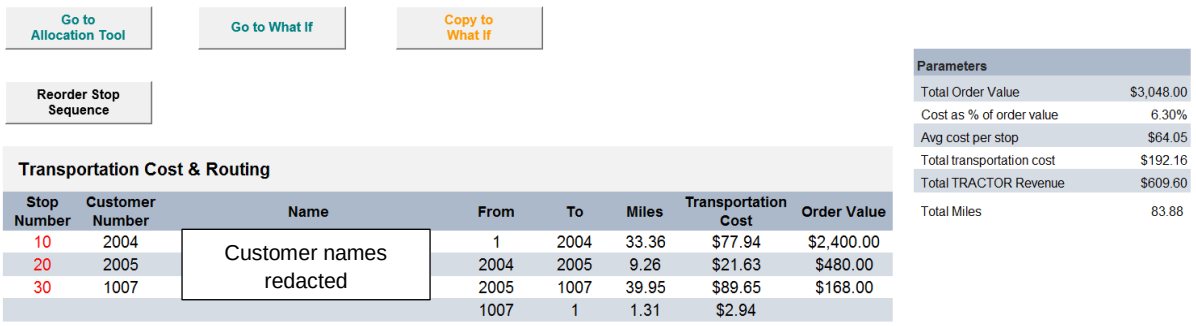
Step 4: Plan the delivery route

After the inventory has been allocated to the respective customer, you may rearrange the delivery route.

1. Click on 

to go from the Allocation tool tab to the Transportation Cost tab. Clicking this button will populate stop numbers and the information on the **Transportation Cost and Routing** table shown below.
2. The stop number sequence is counted in steps of 10 (10,20,30 etc.) If you want to change the order of a stop, type in an integer between one of the numbers to move the stop up or down. For example, if you want to move one store after 20 that was previously before it, type in the number 25. Next, click 

to change the order of the stops.
3. The main **Transportation Cost & Routing** table shows Transportation Cost and Total Revenue/Order Value for each leg of the trip.
4. The small table in the top right shows total order value, cost as % of order value, average cost per stop, total transportation cost, total Tractor revenue (20% * total order value) and total miles.



Step 5: Use the What If Analysis to add hypothetical customers to the route and compare the costs against the current route.

After seeing transportation cost and revenues for an established route, it may be interesting to compare that route to alternatives. For example, the user can check to see if it makes sense to deliver to an additional customer.

1. Click **Copy to What-If?** to copy the existing delivery route from the transportation cost tab to the What if tab.
2. In the What if tab, you can manually add a customer below the delivery route that you copied over from the transportation cost table. Type the desired stop number and their customer number into the next available row as done below:

Reorder Stop Sequence

Stop Number	Customer Number	Name	From	To	Miles	Transportation Cost	Order Value	Minimum Order Value
10	1007	Customer names redacted	1	1007	1.31	$2.94	$2,400.00	$0
20	2004		1007	2004	34.14	$76.60	$480.00	$0
30	2005		2004	2005	9.26	$20.77	$168.00	$0
9	1011		2005	1	38.99	$87.48		$707.73

3. Click **Reorder Stop Sequence** to change the stop order the same way as explained for the Transportation Cost tab.

Reorder Stop Sequence

Stop Number	Customer Number	Name	From	To	Miles	Transportation Cost	Order Value	Minimum Order Value
10	1011	Customer names redacted	1	1011	12.15	$27.27	$2,400.00	$0
20	1007		1011	1007	11.15	$25.01	$480.00	$0
30	2004		1007	2004	34.14	$76.60	$168.00	$0
40	2005		2004	2005	9.26	$20.77		$1,694.64
			2005	1	38.99	$87.48		

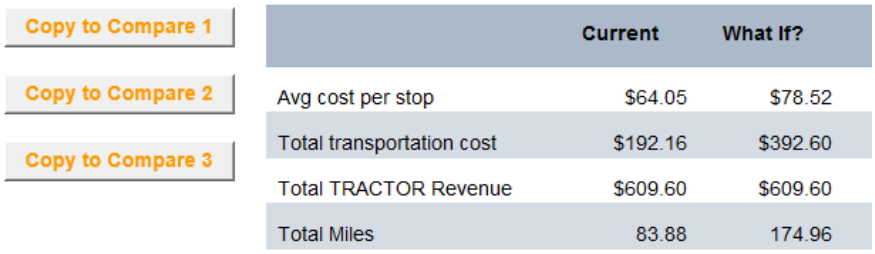
4. The small table in the upper right compares the current costs from the established route as determined in the Transportation Cost tab with the costs as determined in the What If scenario. This comparison illustrates how adding a new customer impacted cost.

	Current	What If?	- / +
Avg cost per stop	$64.05	$59.28	-$4.77
Total transportation cost	$192.16	$237.13	$44.97
Total TRACTOR Revenue	$609.60	$609.60	$0.00
Total Miles	83.88	105.68	21.80
Total Minimum Order Value		$4,742.64	

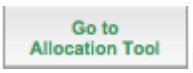
Stores:

1011, 1007, 2004, 2005, ,

5. The Total Minimum Order Value suggests what the Total Order Value should be in order to keep transportation costs at 5% (or the set target) of Total Revenues. The model then suggests what the order value should be for the hypothetical customer(s).
6. You have the option to save up to 3 of these comparison tables by clicking the “Copy to Compare” buttons. “Copy to Compare 1” sends the information to the first table. After doing this, you may rearrange the route or add more customers.



7. Click 

to go back to the previous established route tab or 

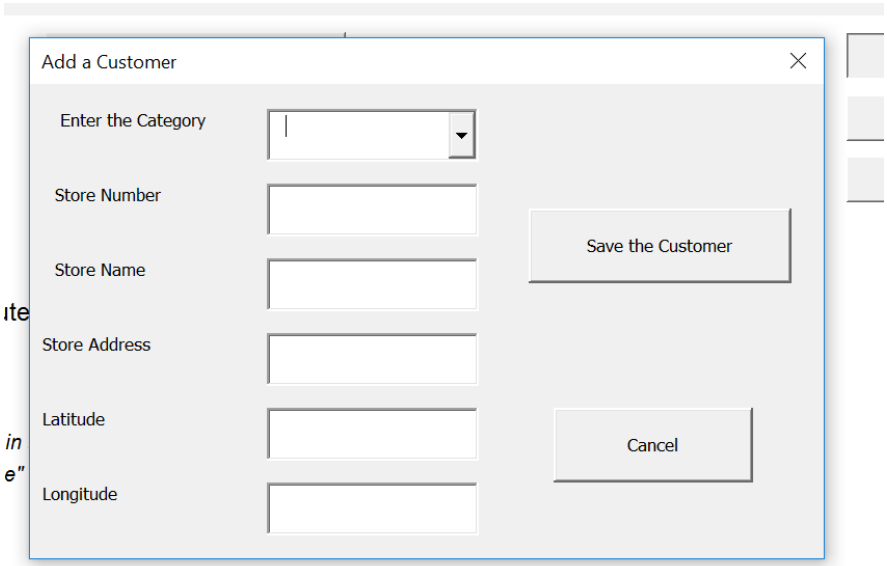
if you want to actually assign inventory to a new customer and add to the real transportation route.
8. Click 

if you want to start over on this tab. All the information on the What If scenario table will be deleted. The other tabs--Allocation tool and Transportation tool, will not be impacted.

Model Maintenance

Add a Customer

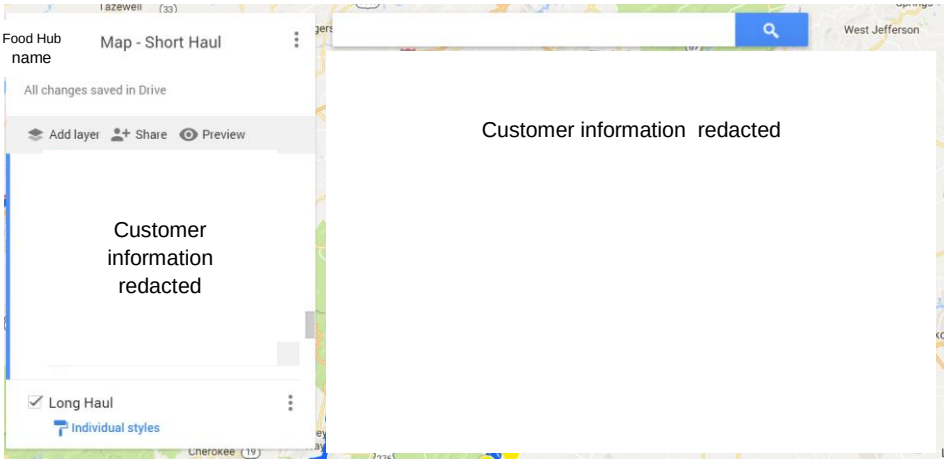
1. Go to the Home page/tab
2. Click the “Add a customer” button under Model Maintenance
    a. For non-grocery stores, a number will be automatically assigned, so it should be left blank
    b. For any chain grocery store, the user must assign the number that corresponds with the chain’s official store number/ID.



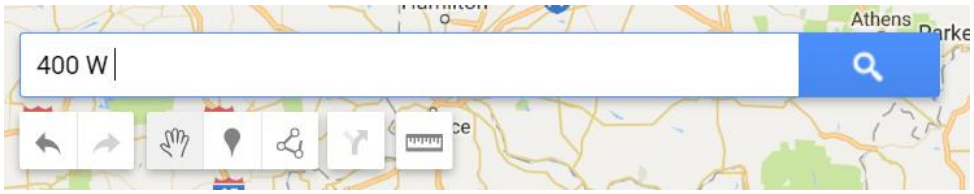
    c. Refer to the Customer List for formatting guidance on how to enter the Store Name and Store Address
    d. Check Google Maps for the latitude and longitude using the address.

i. Go to Google Drive and search for the saved customer maps called “Food Hub Map - Short Haul” and “Food Hub Map - Long Haul”

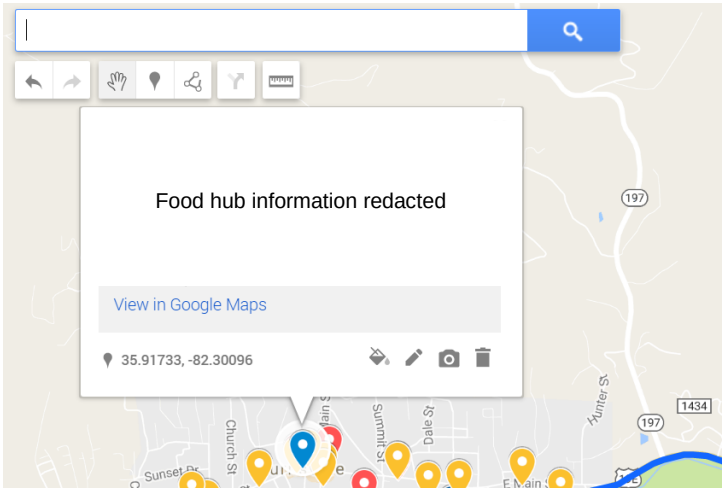
ii. Click within the layer on the map, for example, “Restaurants”, then click anywhere on the map to drop a pin.



iii. Type the customer’s address in the search bar that you wish to add. A box will come up ready to be pinned to the map. Click the “+ Add to Map” link in the box.

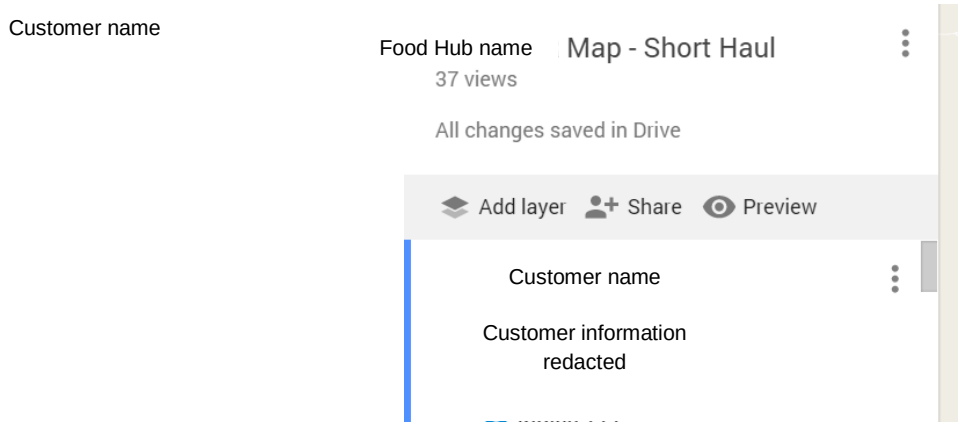


iv. Then you will have the coordinates and the new customer will be saved in the Google map.

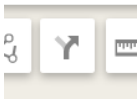


v. You can also just use this website: http://www.latlong.net/

vi. To map a route on this Google map, click the “Add Layer” link



vii. To map a route on this Google map, click the “Add Directions”

 link. A new layer will be created

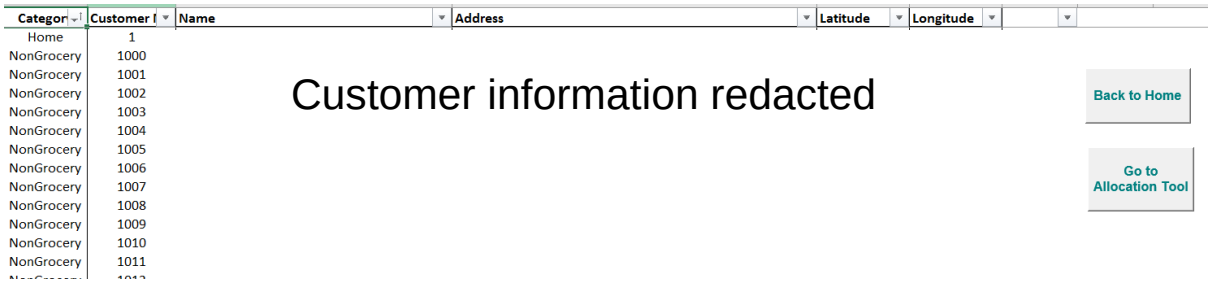
viii. Start and end with the food hub’s warehouse location and choose stops in between. A max # of 8 stops can be added within a layer, so if you have more, click “add directions” again and end with the food hub in this layer.

ix. Then click “Layer options”  and choose “Step by Step Directions”. Then you can note the time and mileage. Do this twice and add it up if your route spills over to multiple layers.

e. Click “Save the Customer” and the new customer will be added to the “Customer List” master data.

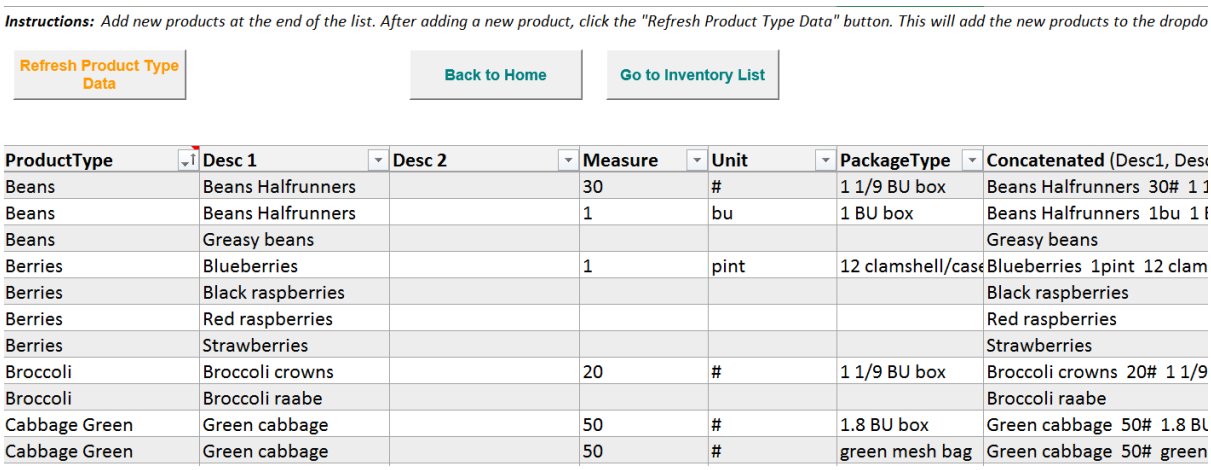
View or maintain Customer List

Correct any mistakes by editing the data directly in the “Customer List” sheet.



Add, view or maintain Product List

Add new products directly in the “Product List” sheet at the end of the list. When you’re done, click “Refresh Product Type Data”.



ProductType	Desc 1	Desc 2	Measure	Unit	PackageType	Concatenated (Desc1, Des
Beans	Beans Halfrunners		30	#	1 1/9 BU box	Beans Halfrunners 30# 1 1
Beans	Beans Halfrunners		1	bu	1 BU box	Beans Halfrunners 1bu 1 E
Beans	Greasy beans					Greasy beans
Berries	Blueberries		1	pint	12 clamshell/case	Blueberries 1pint 12 clam
Berries	Black raspberries					Black raspberries
Berries	Red raspberries					Red raspberries
Berries	Strawberries					Strawberries
Broccoli	Broccoli crowns		20	#	1 1/9 BU box	Broccoli crowns 20# 1 1/9
Broccoli	Broccoli raabe					Broccoli raabe
Cabbage Green	Green cabbage		50	#	1.8 BU box	Green cabbage 50# 1.8 BU
Cabbage Green	Green cabbage		50	#	green mesh bag	Green cabbage 50# green

Edit products directly in the cells. To erase a product, highlight the cells in the row up to the locked “concatenated” column, then go to the Excel menu and click > Home > Clear > Clear contents. Then click the “Refresh Product Type Data” button on the spreadsheet.

“Drop Down 1” and “Drop Down 2” sheets

You shouldn’t need to touch these, but they cannot be hidden. See troubleshooting for further information.

Troubleshooting

I’m getting a runtime error when I click the some buttons

1. *Make sure the worksheets called “Drop Down 1” and “Drop Down 2” aren’t hidden.*

I’m getting a runtime error when I click the “Clear Allocation Plan” button

1. Highlight the cells with numbers under the “Allocate Stores” header
2. Go to the Excel menu > Home > Clear > Clear contents
3. Return to Allocation page and click the “Clear Allocation Plan” button again.

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