

Sample Budget for Small-Scale Commercial Tomato Operations -2015

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Sample Budget for Small-Scale Commercial Tomato Operations in East Tennessee

East Tennessee is home to a growing culture of farm-to-table agriculture with numerous farmers' markets that allow consumers to purchase fresh foods directly from producers. These farmers' markets vend a wide variety of fresh produce, and fresh tomatoes are a popular seller in the East Tennessee area. Small-scale and/or part-time farming operations are well-suited for open field-grown tomatoes because of the relative low start-up cost and marketability through direct-to-consumer outlets of this vegetable crop (Orzolek, Bogash, Harsh, Kime, and Harper, 2006). According to the 2012 Census of Agriculture a large percentage of Tennessee producers growing tomatoes in the open operate less than 1 acre (70%). However, newer producers venturing into tomato production may be unfamiliar with production practices and effective budgeting.

Tomato budgets for large-scale commercial production are available for various states in the southeastern region (e.g., Mississippi, North Carolina, Florida), but only a few states have tomato budgets for small farm operations in this region. Producers looking to grow and market tomatoes on a small scale may not find information provided by large-scale tomato budgets useful; production practices, per-unit pricing, and production volume may not be the same for large-scale as for small-scale operations. For example, small-scale producers will likely sell tomatoes at direct-to-consumer outlets such as farmers' markets due to lower transaction costs, as well as the lack of requirements regarding minimum volume of sale. Finally, tomato producers operating at a smaller scale may face retail input prices rather than wholesale prices due to minimum order requirements at wholesale scale.

The objective of this sample budget is to *guide* small-scale tomato producers on things to consider when estimating their net returns. Given that the budget presented here is just an example, actual numbers *should not* be used to estimate net revenues. Every operation is unique; therefore, estimated costs and revenue may vary depending on soil conditions, tomato variety, production practices used, and various other factors.

Tomato Production in Tennessee

There are three primary tomato production areas in Tennessee: 1) West Tennessee; 2) Rhea, Bledsoe and surrounding counties; and 3) East Tennessee. In the East Tennessee area, growers produce tomatoes for early, mid-season, and late markets (Rutledge, Wills, and Bost, 1999).

Figures 1 and 2 display maps showing the number of operations producing open field-grown tomatoes for fresh market sale in 2007 and 2012 in the East Tennessee region.

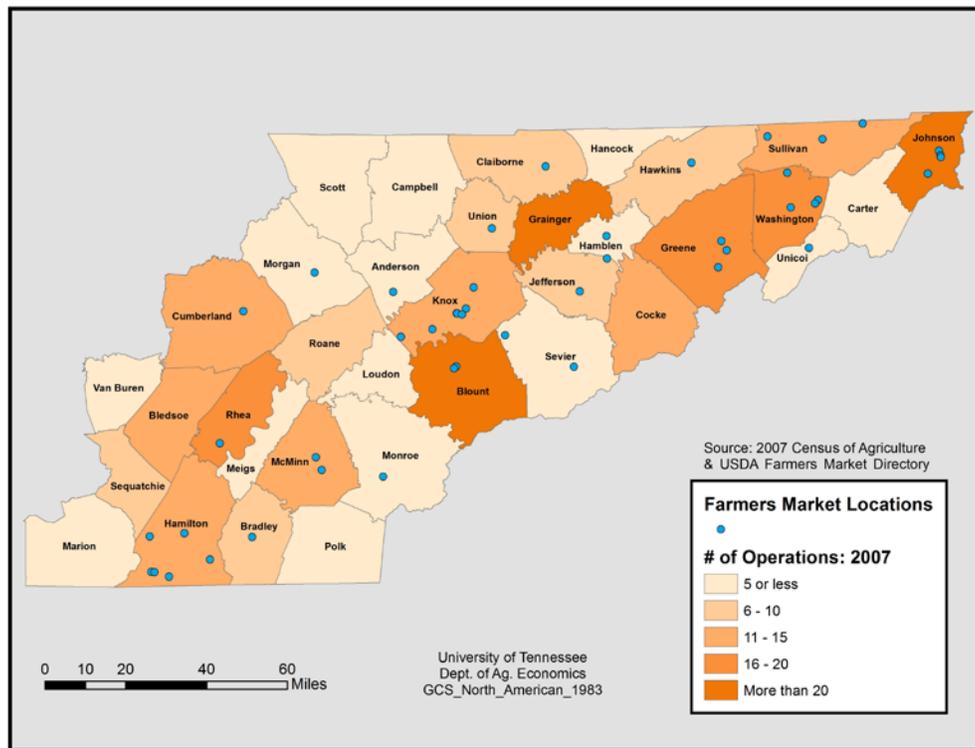


Figure 1. Number of operations growing open-field tomatoes for fresh markets in East Tennessee and farmers' markets locations in East Tennessee in 2007.

Additionally, locations of farmers' markets in this same region from the U.S. Department of Agriculture (USDA) Farmers Market Directory are overlaid for comparison purposes. From 2007 to 2012, it appears the number of operations producing open field-grown tomatoes has increased in areas of clustered farmers' market locations. This may indicate producers near these markets began tomato production in recent years, perhaps to take advantage of local fresh market demand.

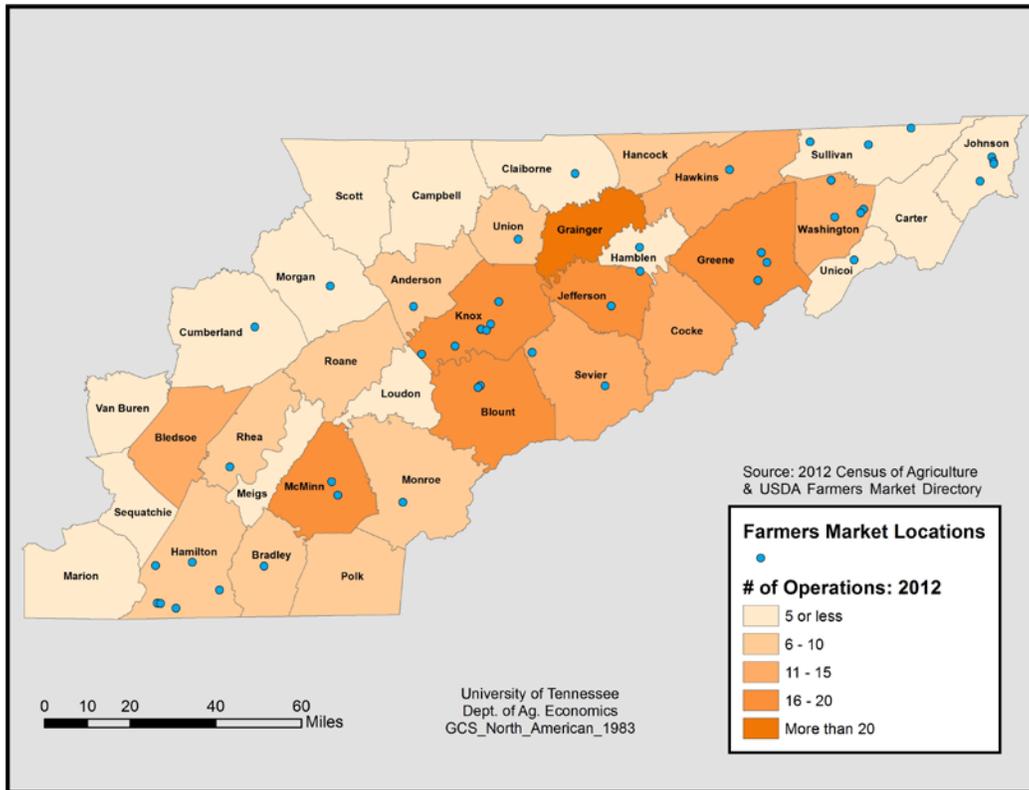


Figure 2. Number of operations growing open-field tomatoes for fresh markets in East Tennessee and farmers' markets locations in East Tennessee in 2012.

Data

Sources of information used to build the sample budget came from personal interviews with two farm operators in the East Tennessee area; information provided by vegetable, entomology, and plant pathology specialists at the University of Tennessee (UT); as well as information from some input suppliers in the U.S. Southeastern region.

Sample Budget Details and Explanation

This example represents a small operation located in the East Tennessee region growing three vegetable crops, including tomatoes, and selling produce only through farmers' markets (Table 1). The land unit of this sample budget is a 1,000-square-foot block rather than an acre. We assume tomatoes are grown in East Tennessee in the open field, and varieties grown are traditional round red determinate types such as Empire and Celebrity. Many small-scale operations use indeterminate varieties. This culture would entail a different trellis system and a longer harvest period. Budgets for indeterminate varieties would include greater yields but higher costs for trellising, labor (trellising and marketing), fertilization, and pest control. Market prices would be the same for the two types of varieties. Do not confuse indeterminate varieties with heirloom varieties, which would be associated with different costs and returns and therefore a different budget. Many indeterminate varieties are not heirlooms.

Table 1. Estimated Cost and Returns for a Small Scale Tomato Operation—An Example

	UNIT	QUANTITY	\$/UNIT	TOTAL
GROSS RETURNS				
Tomatoes*	lbs	700.00	\$2.00	\$1,400.00
VARIABLE COST				
Tomato plants-hybrid ¹	plant	100	\$0.67	\$66.58
Fertilizer ²				
Plant starter (20-20-20)	lb	9.2	\$1.16	\$10.63
Calcium nitrate	lb	6.5	\$0.40	\$2.60
Potassium nitrate	lb	13.5	\$0.80	\$10.79
Soil test ³				
	test	1	\$7.00	\$7.00
Fungicides ⁴				
Chlorothalonil 6SC	ml	43.3	\$0.01	\$0.38
Inspire Super	ml	32.5	\$0.06	\$1.84
Fontelis	ml	32.5	\$0.06	\$2.02
Mancozeb	lb	0.18	\$5.83	\$1.05
Copper	lb	0.11	\$7.95	\$0.87
Herbicide ⁵				
Metribuzin	oz	0.18	\$1.07	\$0.19
Poast	pt	0.03	\$12.50	\$0.37
Insecticide ⁵				
Dipel DF	oz	0.70	\$1.23	\$0.86
Radiant SC	ml	5.4	\$0.22	\$1.20
Montana 2F	ml	2	\$0.02	\$0.04
Plastic mulch ⁶	sq ft	800	\$0.01	\$9.01
Stakes ⁷	stake	48	\$0.70	\$33.60
Twine/string ⁷	box	1	\$7.43	\$7.43
Irrigation supplies ⁸				
Drip tape	linear ft	200	\$0.07	\$13.76
Hired labor ⁹				
Transplanting, bed preparation plastic and drip)	(lay hours	8	\$10.00	\$80.00
Pruning and Training	hour	10	\$10.00	\$100.00
Harvesting	hour	9	\$10.00	\$90.00
Other ¹⁰				
Machinery (maintenance and repairs)	1000 sq ft	1	\$2.00	\$2.00
Cash rent	1000 sq ft	1	\$3.80	\$3.80
TOTAL VARIABLE COST				\$446.03
INTEREST ON VARIABLE COST ¹¹	%	\$446.03	6.00%	\$26.76
MARKETING COSTS				
Annual fee ((1/No. of products sold) of total annual fee) ¹²				\$10.00
Booth fee ((1/No. of products sold) of total booth fee cost) ¹²	day	20	\$10.95	\$73.00
Hired labor ((1/No. of products sold) of total hired labor) ¹³	hour	80	\$10.00	\$266.67
Crates ¹⁴	crate	30	\$8.54	\$256.10
Gas/Fuel (driving to market, (1/No. of products sold) of total cost) ¹⁵	1000 sq ft	1		\$57.33
Other marketing costs ¹⁶				
TOTAL MARKETING COSTS				\$663.10
TOTAL VARIABLE AND MARKETING COST				\$1,135.89
RETURN ABOVE VARIABLE AND MARKETING COST				\$264.11

Gross Returns

1. **Yield** — tomato yields may vary by tomato variety and growing conditions. We use average yields from a UT roma tomato variety evaluation conducted in 2011.¹
2. **Prices** — Prices cannot go below \$1 or above \$3.5 per lb. This assumption is made base on observed average prices received by East Tennessee farmers at farmers' markets according to the 2014 Tennessee farmers' markets price reports.²

Variable Costs

1. **Tomato plants** — We estimated 100 tomato plants per 1,000 square feet. Assuming a production area of 10 feet by 100 feet with 6-foot spacing between rows and 24-inch spacing between plants, we calculated approximately 2 rows and 50 plants per row (2x50=100 plants). The cost per tomato plant is estimated as the average cost per plant in some nurseries and other farms from Tennessee and surrounding states who allow minimum orders of 150 plants or less.³ Small-quantity orders may represent a higher cost per plant.
2. **Fertilizer** — Based on interviews with two tomato producers located in East Tennessee, we included a plant-starter mixture, calcium nitrate, and, potassium nitrate as the fertilizer products for the tomato sample budget. We assume that no lime is needed, based on soil test results. We assumed a general-purpose plant starter N-P-K ratio of 20-20-20; however, appropriate N-P-K proportions are determined by soil test results and therefore may vary from operation to operation. Because of variability of fertilizer recommendations based on soil test results, suggested fertilizer quantities are based on recommendations for the absence of a soil test from the Southeastern U.S. Vegetable Crop Handbook 2015⁴ for tomato production. Additionally, prices of the fertilizers listed in this sample budget were gathered from some input suppliers in Tennessee and Kentucky.⁵ The minimum amount sold at local suppliers is 25-lb bags for plant starter, and 50-lb bags for both potassium and calcium nitrates. Fertilizer costs listed in the sample budget do not represent actual fertilizer expenses. For example, although only about 7 lb of calcium nitrate may be necessary for 1,000 square feet of tomatoes, the minimum amount of calcium nitrate sold at local suppliers is generally 50 lbs. It is important to notice that since the sample budget assumes a grower who produces multiple vegetables, calcium nitrate may be used for other vegetables. On the other hand, producers may be able to find

¹ vegetables.tennessee.edu/Tomato/tomato2011_1.html

² www.uky.edu/Ag/CCD/TNfarmersmarket.html

³ www.facebook.com/pages/Holden-Nursery/444258498995969; www.honeyrockherbfarm.com/index.html; www.evansvegetableplants.com; www.parkwholesale.com; clearspringsfarm.org; wolfriver.net.

⁴ http://www.thepacker.com/sites/produce/files/2015_SEVG_FEB6_web.pdf

⁵ www.facebook.com/pages/Jackson-Seed-Farm-Supply/112252972170652; ourcoop.com/ourcoop08/locator/storeDetail.aspx?storeID=37; www.mizeonline.com; www.facebook.com/pages/Deerfield-Supplies/159304630770116; www.griffins.com

fertilizer products for sale in smaller quantities but at a higher cost. For example, 5-lb bags of calcium nitrate are available online at \$8 per bag.⁶

3. **Soil test** — Soil testing is crucial for tomato crop quality and performance, as many of the causes of poor fruit development are associated with poor plant nutrition (Orzolek et al., 2006). Soil tests help define fertilizer requirements for new operations during the initial growing season. Any deficiency or overapplication issues are often identified, allowing an opportunity for fertilizer application adjustments in subsequent years. Soil test fees in the sample budget are from UT Extension's, Plant, and Pest Center Fee Schedule.⁷
4. **Fungicides** — The products listed are components of a spray program considered to be a minimum requirement for successful control of foliar diseases. Quantities in the sample budget are based on the following recommendations: a) Mancozeb – 4 applications at 2 lb per acre each time – which is equivalent to about 0.05 lb per application for a 1,000 square feet for a total of 0.2 lb; b) Copper – 4 applications at 1.25 lb per acre each time – which is equivalent to 0.03 lb per application for a 1,000 square feet for a total of 0.11 lb; c) Chlorothalonil 6SC - 2 applications at 944 ml per acre each time – which is equivalent to 21.7 ml per application for a 1,000 square feet for a total of 43.3 ml; d) Fontelis - 3 applications at 472 ml per acre each time – which is equivalent to about 10.8 ml per application for 1,000 square feet for a total of 32.5 ml; and e) Inspire Super - 3 applications at 472 ml per acre each time – which is equivalent to about 10.8 ml per application for 1,000 square feet for a total of 32.5 ml. Both Fontelis and Inspire Super are needed because their usage is limited by the labels, so both are needed to complete a full-season spray schedule. For bacterial disease control, both Mancozeb and Copper are needed; neither is satisfactory alone. Mancozeb substitutes for Chlorothalonil for fungal disease control. Because of the long pre-harvest interval for Mancozeb this one is replaced by Chlorothalonil during harvest, and Copper is also dropped at this time. Prices of the suggested fungicides were gathered from few local input suppliers.⁸ For additional information contact Steve Bost, scbost@utk.edu.
5. **Herbicides, Insecticides, & Fumigants** — Insect and weed plant pressure may vary from operation to operation. Therefore, different products may be applied based on the specific problems. In the sample budget, we suggest some products for weed and insect control that should be used as examples rather than recommendations. The products listed in the herbicides section are Metribuzin and Poast. The first product is used to control annual grasses and broadleaf weeds including jimsonweed, common ragweed, smartweed, and velvetleaf.⁹ This product can also be used as a post-emergent herbicide, but rates in the sample budget only represent rates to be applied before transplanting.¹⁰ Poast is used as a post-emergent herbicide to control annual and

⁶ www.ebay.com/bhp/calcium-nitrate

⁷ ag.tennessee.edu/spp/Documents/Soil%2c%20Plant%20and%20Pest%20Center%20Fee%20Schedule2014.pdf

⁸ ourcoop.com/ourcoop08/locator/storeDetail.aspx?storeID=37;

www.facebook.com/pages/Jackson-Seed-Farm-Supply/112252972170652

⁹ www.thepacker.com/sites/produce/files/2015_SEVG_FEB6_web.pdf

¹⁰ http://www.thepacker.com/sites/produce/files/2015_SEVG_FEB6_web.pdf

perennial grasses only. Application rates are taken from the Southeastern U.S. Vegetable Crop Handbook 2015¹¹; additional recommendations for application of this product can be found at the same publication. Insecticide products include Diepel DF, Radiant SC, and, Montana 2F. Dipel DF should be used for small caterpillars only for best results, and it should be used a couple times early in the fruiting cycle since it is not harmful to beneficial insects. The rate used for this sample budget is two applications totaling 0.7 oz per 1,000 square feet. Radiant SC is use for all sizes of caterpillars at a rate of 5.4 ml per 1,000 square feet. Finally, Montana 2F can be used to control for insects such as aphids, Colorado potato beetle, leafhoppers, and whiteflies. This product should be applied to the soil once per year at rate of 2 ml per 1,000 square feet. We are assuming fumigants are unnecessary for growers of this size. For more information on herbicides contact Annette Wszelaki (awszelak@utk.edu), and for information regarding insecticides contact Frank A. Hale (fhale1@utk.edu).

6. **Plastic Mulch** — A large number of farmers use plastic mulch for growing tomatoes. Black plastic mulch retains moisture and has a positive impact on yield, fruit size, and fruit quality in tomatoes planted in the spring. Black plastic mulch also aids in controlling weed growth and certain diseases (Rutledge et al., 1999). Black plastic mulch is commonly sold in rolls of 4 by 4000 feet. However, only about 200 linear feet of plastic mulch, or 800 square feet, is needed for 1,000 square feet of tomato production (2 rows of 4x100 sections or 2x4x100=800 square feet). Some input suppliers sell smaller quantities of plastic mulch rolls but at a higher price. Nonetheless, if a farmer is growing other vegetables, plastic mulch may also be used in the production of other vegetables, and therefore the cost of a 4x4000 plastic mulch roll can be split among the total area of vegetables grown using plastic mulch. Unused material may also be used in subsequent growing seasons.
7. **Stakes and String** — The purpose of staking and stringing tomato plants is to maintain plant foliage and elevate fruit off the ground, which will have an impact on the fruit quality and will facilitate harvesting (Ivors, 2010). Wooden stakes of 1 square inch by 4 to 4.5 feet long are commonly used. Stakes are usually placed every other plant. Given the estimated 100 tomato plants per 1,000 square feet, approximately 50 stakes are required for a 1,000-square-foot area (25 stakes x 2 rows). A box of string is assumed to be more than enough to cover 1,000 square feet of tomatoes.
8. **Drip irrigation system** — We assume this operation uses a drip irrigation system. Costs associated with irrigation in this sample budget include only drip tape. Similar to plastic mulch, drip tape is commonly sold in rolls of 1,000 linear feet. Approximately 200 linear feet of drip tape are needed for 1,000 square feet of tomato plants. Drip tape is also used for the production of other vegetables, and the remaining drip tape can be used for the production of other vegetable crops or in subsequent growing seasons. Although the sample budget only reflects the cost associated with 200 linear feet of drip tape, actual expenditures can be higher because of the minimum amount of drip tape sold by input suppliers. Smaller quantities of drip tape may be sold at a premium. Installation

¹¹ http://www.thepacker.com/sites/produce/files/2015_SEVG_FEB6_web.pdf

cost is not included in the sample budget but should be considered. Although the cost of water is not included in this budget, if a farm has no access to a well, the cost of using municipal water can be fairly high as there are no special fees for water used for agricultural purposes in the East Tennessee region.

9. **Hired labor** — Tomatoes, similar to most of the other vegetables, are a labor-intensive crop; therefore, a separate section for labor is included in the sample budget. Estimated hours associated with pre-harvest, harvest, and post-harvest activities comprise the labor expenses. Labor requirements were estimated based on farmer interviews and conversations with UT vegetable specialist, Annette Wszelaki (awszelak@utk.edu). Additional labor associated with plastic removal and other end-of-season cleanup is not included in the sample budget but should be considered when estimating net returns over variable costs.
10. **Other** — Other costs include machinery maintenance and repairs, and cash rent. Machinery maintenance and repairs cost for 1,000 square feet is estimated based on estimated machinery variable cost from the 2013 tomato budgets from University of Kentucky (\$85/acre)¹². Cash rental rates are based on the 2014 USDA-NASS reported cash rental rates for cropland in Tennessee (\$165/acre). Substantial differences may exist in cash rental rates reported by NASS and the prevailing rate in each location. Small operations may consider renting equipment, as they may not have initial capital to invest in any type of equipment.
11. **Interest on variable cost** — There is a time delay between some production expenses and the time tomatoes are sold. These expenses may be covered from savings but borrowing may be necessary to cover all expenses. We assume a 6% annual interest is paid on 50% of the variable cost listed in the sample budget.
12. **Marketing Costs (farmers' market fees)** — There are costs associated with using farmers' markets as an outlet to sell tomatoes (e.g., annual membership and booth fees). The sample budget assumes there are three vegetable crops sold at the farmers' market; therefore, costs associated with farmers' markets participation only represent a third of the actual costs, as fees are split among the three vegetable crops sold at the market. We use the average-annual participation fees and booth fees from 16 farmers' markets¹³ randomly selected in the East Tennessee region.
13. **Marketing Costs (hired labor)** — Farmers' markets in East Tennessee last, on average, three hours although there are some that can last up to five hours; therefore, three hours of labor are calculated per market day. Additionally, approximately one hour for booth setup and take-down are included in the marketing hours for a total of four hours per market day. Assuming a grower

¹² <http://www.uky.edu/Ag/CCD/vegbudgets13.html>

¹³ marketsquarefarmersmarket.org; www.easttnfarmmarkets.org; www.dixieleafarmersmarket.com; www.knoxcounty.org/farmersmarket; www.maryvillefarmersmarket.org; www.bradleyco.net/farmersmarket.aspx; <http://www.greenevillefarmersmarket.com/vendor-agreement-submit-on-line.html>; chattanoogamarket.com/2015/02/13/become-a-vendor-2; www.lookoutfarmersmarket.com/index.html; mainstfarmersmarket.com; www.mainstreetdandridge.com; sites.google.com/site/mcfarmmarket; www.gatlinburgfarmersmarket.com; kingsporttn.gov/kingsport-farmers-market

offers tomatoes throughout the growing season (June 15 to November 1) and attends farmers markets each week of the season, a total of 20 days x 4 hours totals to 80 hours for selling tomatoes at a farmers' market. Only a third (1/3) of this cost is included in the sample budget, as we assume the operation from the sample budget sells two more vegetable crops at the farmers' market, and therefore total hired labor cost is split between these three crops. Additionally, travel time from farm to farmers' market may vary by location but should be considered when estimating costs associated with selling produce at farmers' markets.

14. **Crates** — Plastic crates of 30-lb capacity are assumed to be used for taking tomatoes to market.
15. **Gas (driving to market)** — This cost is estimated based on the assumption that the farm is 30 miles away from the farmers' market. Gas prices were estimated using average gas prices in Tennessee as of May of 2015 (\$2.15/gal). Assuming a vehicle with a gas mileage of 15 miles per gallon, we estimated a total of 4 gallons required to cover 60 miles (round trip)¹⁴. If this farmer attends all 20 days of the season, that means a total of 80 gallons required to cover 1200 miles. The total cost of gas necessary for transportation from and to the market is divided by three, as this cost is split among the three vegetable crops sold at the market.
16. **Marketing Costs (other)** — There may be additional costs associated with marketing such as business cards, bags, signage, tents, tables, and other marketing materials that are not included in the sample budget but should be considered when selling produce at farmers' markets.
17. **Fixed costs** — Costs associated with land taxes (if land is owned), insurance, depreciation (if equipment is owned), and management labor are not included in these sample budgets but should be considered when estimating net returns.

Excel Sample Budget

An Excel spreadsheet version of the sample tomato enterprise budget (Table 1) is available on the Agricultural & Resource Economics, University of Tennessee website at <http://economics.ag.utk.edu/budgets.html>. Growers can modify values and details in this Excel Workbook highlighted in grey and thus use it to evaluate their own production costs and returns. If quantities and details of the sample budget are modified, original values can be restored when clicking on the "Reset Defaults" button on the bottom right of the sample budget. The "Print" button allows the user to print a one page summary of the sample budget.

Users should note that input prices used in this sample budget were current as of January 2015 and are subject to change. Input prices were collected from a handful of randomly selected businesses; therefore, users are encouraged to conduct a thorough search when sourcing input suppliers.

¹⁴ <https://www.fueleconomy.gov/trip/#?> – My trip calculator can be used to estimate fuel cost.

References

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