

# Cost of Developing Value-added Food Products from Surplus Produce

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## Introduction

Value-added food products (VAFP) are foods that have been modified from their original form to enhance their consumer appeal. For fresh fruits and vegetables, adding value can be as simple as processing produce into jams, jellies, sauces or dried herbs. These types of products provide an opportunity for farmers to take unsold or lower quality produce and transform it into a product that has a longer shelf life and can be sold year-round. In addition, surplus produce can be aggregated from farms, farmers markets, roadside stands, or on-farm markets to develop new food products. However, making VAFP from fresh produce requires labor, equipment, facilities and other cost inputs. Determining the economic feasibility of producing VAFP should be evaluated prior to committing time and resources. This factsheet will discuss costs associated with developing VAFP from produce and will present an economic analysis from a project conducted at the University of Arkansas System Division of Agriculture (UA System) from 2018-2019. This project evaluated the potential of collecting surplus produce from a farmers market to produce a tomato sauce VAFP at a food manufacturing facility. Food manufacturing facilities are food production facilities (kitchens, food hubs, or food co-ops) that have a permit from the Arkansas Department of Health and comply with USDA Food and Drug Administration (FDA) regulations. Factsheet (FSA56) covers producing VAFP from surplus farm produce.

## Cost Considerations

### Labor

A significant amount of time is required to produce a VAFP. Collecting, washing and chopping fresh produce, followed by further processing, cooking and packaging may be required. The opportunity to freeze or dry certain produce may allow the farmer to hold the produce for processing during the off-season when time is more available. However, all of the time spent handling the produce in preparation for processing, including collecting produce from the farm or at the end of the market, taking produce to a manufacturing facility, preprocessing the produce, recipe development, the final processing steps and the sales of the product should be included in the cost analysis. Even if these tasks are performed by the farmer, or other employees, a fair wage should be assigned to the time spent completing these activities to determine if producing a VAFP is a cost-effective use of time and money.

### Equipment and Supplies

Equipment needs will vary based on the type of VAFP and where it will be produced (food manufacturing facility or home kitchen under Cottage Food Law). Food manufacturing facilities often have industrial-scale equipment that can speed up the production of large batches of product. Other equipment may need to be purchased if not available at the food manufacturing facility. Other supplies and materials may be needed for the development of VAFP, but the amount and types of materials will depend on the product.

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Packaging materials and labels constitute a major per unit cost. For example, jam, jellies, sauces or syrups require jars and lids. One 16-ounce jar and lid may cost 64 cents wholesale, while smaller jars (8 ounces) may cost 48 cents. The type of packaging (jars, bottles, bags, cans, boxes, etc.), size and packaging material (glass, plastic, cardboard, etc.) can vary depending on the type of product, the method of production, and how the product will be sold or marketed. It is important to consider the per-unit cost of packaging when choosing the size and type of packaging for a product so that you are able to present a value that is attractive to consumers.

Fees related to product labeling include a logo design for the label, purchasing a nutrition facts panel, and obtaining a Universal Product Code (UPC). Investment in a robust label design should be taken into consideration, as labeling will be important to successfully marketing the product. Private graphic designers can professionally design a label for \$100-\$300; however, designs developed using computer software on a home computer may be an option. A nutrition facts panel is a required element of the label that gives information to the consumer about the nutritional value of the product. Online, fee-based resources are available to help create a nutritional facts panel and may cost \$30-100 per panel. The UPC is a barcode used to identify packaged products mainly in retail or commercial markets. The UPC code is not a mandatory label component, but an individual code can be purchased from a broker for about \$6. The cost of printing the labels must also be considered. Labels for the product packages can be printed by custom label printing companies and may cost 50 cents or more per label. Factors such as the number of labels being printed, size or shape of labels, amount of color and label material will impact the cost per label. It is important to note that the FDA has specific requirements for food labeling, and all labels must comply with these requirements. If possible, the label should be reviewed by someone with food labeling experience prior to printing. This may incur extra initial cost but likely will save money in the long run. Any custom label printing company can be used for printing, but using a company with food label experience might help avoid printing non-compliant labels which is a costly mistake.

Produce may need to be stored or frozen until enough produce is collected for product development. This will require investment in storage materials such as food-grade storage bags and containers. If a freezer or other equipment is purchased, the cost should be included in the start-up cash outflows. Ongoing maintenance and operation fees related to the freezer should also be considered. There could be cost associated with renting or leasing storage or freezer space.

While surplus produce for the VAFP may be available at little or no cost, additional ingredients to produce the product may be required. The cost of these materials should be included when evaluat-

ing a potential recipe, particularly if the recipe will be scaled up for large-scale production.

## Rental Fees and Permits

For most products, the use of a food manufacturing facility may be required. Most VAFP that will be sold in commercial markets must be made in food manufacturing facilities, but some products can be made at home under the Arkansas Cottage Food Law. To determine what products can be made in home kitchens in Arkansas versus those that require a food manufacturing facility, refer to the fact sheet on *Arkansas' Cottage Food Law: What the Law Allows (FSPPC115)* (see website link in references).

The UA System's Arkansas Food Innovation Center (AFIC) located in Fayetteville, AR, is one example of a food manufacturing facility that can be used for VAFP development. This facility charges a service fee to clients based on the amount of time spent using the facility for production and the equipment involved. For more information about the AFIC, visit the website at <https://afic.uark.edu/>. Like all food manufacturing facilities, clients using the AFIC must comply with federal and state regulations for food manufacturing. In addition, food manufacturing facilities may have other mandatory requirements (waivers, liability insurance, contracts, etc.) for clients using the facility.

Clients using food manufacturing facilities must pay for permits and may be required to obtain food liability insurance. For most food manufacturing in Arkansas, clients must have a food manufacturing permit from the Arkansas Department of Health which costs \$85 the first year and \$35 every year thereafter. The AFIC requires clients to have food liability insurance that costs around \$300 per client annually. Shelf stable products packed in sealed containers must be reviewed by a processing authority (a person with knowledge and experience to review product formulation and process to ensure the product meets food safety standards) if the product will be sold commercially. In addition, these products have to be filed with the FDA. The process authority review of the product will be an additional cost.

## Marketing and Sales

There could be additional fees associated with marketing and sales of VAFP. It is important to determine how, where and to whom the product will be marketed. The producer may have to attend events or farmers markets to feature the product or set up demonstrations and tastings at commercial markets. Booth rental fees and time spent marketing the product should be included in the economic analysis. If the VAFP will be sold in existing farm stands or farmers market booths, these costs may be minimized. Seeking out shelf space in commercial grocery stores may require meeting with market managers and negotiating pricing.

## Example Cost Analysis for a Tomato Product

The example cost analysis presented in this fact sheet was developed from a project conducted by the UA System in conjunction with a local farmers market in Arkansas. Surplus produce was collected at the end of every market from May to September in 2018. The collected produce was taken to the AFIC, a food manufacturing facility, where it was preprocessed (peeled, chopped, cored, etc.), frozen and stored until processed in December 2018 into a tomato sauce. Figure 1 is a label for the product.



Figure 1. Example of a label for tomato sauce produced at the Arkansas Food Innovation Center, Fayetteville from farmers market surplus produce (2018)

The cost analysis presented in Table 1 under “year one” was based on actual surplus produce that was collected and a tomato sauce that was developed. Subsequently, a prediction of costs for a “year two” and “year five” of production of the VAFP were developed using the same model. For year one and year two, this cost analysis was based on using 893 pounds of preprocessed produce (peeled, chopped, cored, etc.) from the farmers market. In year five, the cost analysis was based on doubling the amount of produce to 1,786 pounds. Doubling the amount of produce collected would be possible if more farmers market vendors or multiple markets participated in the project.

	Year One	Year Two	Year Three
<b>Sales</b>	<b>\$3,600.00</b> (600 jars at \$6 each)	<b>\$3,600.00</b> (600 jars at \$6 each)	<b>7,200.00</b> (1,200 jars at \$6 each)
<b>Cost of Goods Sold</b>			
Jars and Lids	\$384.00	\$384.00	\$768.00
Freezer Storage Bags	\$97.54	\$97.54	\$195.08
Ingredients	\$33.39	\$33.39	\$66.78
Fresh Surplus Produce	\$0.00	\$0.00	\$0.00
Labels	\$300.00	\$300.00	\$600.00
<b>Total Cost of Goods Sold</b>	<b>\$814.93</b>	<b>\$814.93</b>	<b>\$1629.86</b>
<b>Gross Margin</b> (Sales minus total cost of goods sold)	<b>\$2,785.07</b>	<b>\$2,785.07</b>	<b>\$5570.14</b>
<b>Other Expenses</b>			
Insurance	\$300.00	\$300.00	\$300.00
Facility Rental	\$990.00	\$990.00	\$1,410.00
Labor	\$1,017.50	\$1,017.50	\$2,244.00
Freezer Storage (\$20/month for one pallet for four months)	\$80.00	\$80.00	\$160.00
<b>Total Other Expenses</b>	<b>\$2,387.50</b>	<b>\$2,387.50</b>	<b>\$4,114.00</b>
<b>Start-up Cost</b>			
Label Design	\$0.00	\$0.00	\$0.00
Nutrition Facts Panel	\$30.00	\$0.00	\$0.00
Process Authority Review	\$200.00	\$0.00	\$0.00
Arkansas Department of Health Permit	\$85.00	\$35.00	\$35.00
<b>Total Start-up Cost</b>	<b>\$265.00</b>	<b>\$35.00</b>	<b>\$35.00</b>
<b>Projected Net Income</b> (Gross margin minus total other expenses minus startup cost)	<b>\$82.57</b>	<b>\$362.57</b>	<b>\$1,421.14</b>

Table 1. Example cost analysis of a tomato sauce value-added food product developed from surplus produce collected from an Arkansas farmers market and produced at a food manufacturing facility.

Produce was collected from May to September 2018 and processed into a product in December 2018. For year one and year two, this cost analysis was based on using 893 pounds of preprocessed (peeled, chopped, cored, etc.) produce and 1,786 pounds in year five.

## Sales

The cost analysis for years one and two are for the production of 600 jars (16 ounce) of tomato sauce to be sold at \$6 per jar. It was estimated that by year five production would be doubled to 1,200 jars that would be sold at \$6 per jar.

## Cost of Goods Sold

The cost of goods sold is the material directly used in the production of the tomato sauce. This includes jars/lids, freezer storage bags, ingredients, fresh produce and labels. It is important to note that the price per item can decrease if the quantity of items purchased is increased substantially.

### Jars and Lids

For years one and two, the price of purchasing 600 jars/lids (64 cents per jar/lid) at a wholesale cost was **\$384**. For year five, the cost of jars/lids was estimated to be **\$768** (64 cents per jar/lid). As an example of potential price per item reduction, the cost of jars/lids can be reduced (55 cents per jar/lid) if more pallets of jars/lids are purchased as compared to one pallet. Figure 2 shows jars being filled with sauce.

### Freezer Storage Bags

In years one and two, the wholesale cost of freezer storage bags was **\$97.54** (enough to store 2,000 pounds of preprocessed produce). For year five, production was estimated to double (4,000 pounds of preprocessed produce), and the cost of freezer storage was anticipated to be **\$195.08**. Figure 3 shows frozen produce.

### Ingredients

The additional ingredients (vinegar, salt, sugar and dried basil) needed for production of the tomato sauce cost **\$33.39**, and these costs were predicted to remain the same in years one and two. With production doubled in year five, the cost of additional ingredients was expected to be **\$66.78**.



Figure 2. Filling jars of tomato sauce produced at the Arkansas Food Innovation Center, Fayetteville from farmers market surplus produce (2018)

## Fresh Surplus Produce

For years one, two and five, there were no fresh produce costs (\$0.00) because the produce used in this model would have been discarded or was assumed to be donated.

## Labels

The cost of purchasing labels for years one and two was the same **\$300** (50 cents per label for 600 jars). For year five, the cost of purchasing labels was doubled to **\$600** (50 cents per label for 1,200 jars).

## Other Expenses

Other expenses are expenses that are required for tomato sauce production outside of costs related to actual product development such as insurance, facility rental, labor and freezer storage. The facility rental fee and freezer storage fees at AFIC are lower than other comparable facilities in Arkansas.

### Insurance

Food liability insurance must be purchased yearly for AFIC clients and other food manufacturing facilities in Arkansas. The yearly rate for food liability insurance is **\$300 per client**.

### Facility Rental

In years one and two, the cost associated with renting the food manufacturing facility, in this case the AFIC, was estimated at **\$990**. This was calculated based on a rate of \$15 per hour to rent the facility. Facility rental for preprocessing the produce constituted the largest part of this cost at an estimated \$840. This was based on an estimated two hours per week, twice a week, for 14 weeks for a total of 56 hours spent preprocessing (chopping, coring, slicing, packaging, etc.) the collected produce. Later facility rental fees included two hours prepping frozen produce for processing (\$30) and eight hours on the final production (\$120) of the tomato sauce.

For year five, the rental hours to implement this project at the AFIC were estimated at **\$1,410**. This was calculated on a rate of \$15 per hour to rent this facility. Facility rental for preprocessing was estimated at \$1,260. This was based on an estimated three hours per week, twice a week, for 14 weeks for a total of 84 hours. Later facility rental fees included two hours prepping frozen produce for processing (\$30) and eight hours on the final production (\$120) of the tomato sauce.

### Labor

In years one and two, labor cost was calculated as **\$1,017.50**. Labor for preprocessing made up the largest part of this cost at \$777. This was calculated based on one person spending 30-45 minutes collecting the produce at the end of the farmers market, driving to the AFIC and preprocessing the produce to be frozen. It was estimated this would take three hours at

the end of every market. For the entire season, this cost was based on one person paid \$9.25/hour spending three hours twice a week transporting and pre-processing the produce for 14 weeks. The hourly rate was based on the minimum hourly rate in Arkansas of \$8.50/hour in 2018 and \$9.25/hour in 2019 during the project. At the end of the season, one person prepped the produce for two hours the day prior to production (\$18.50). On the day of production, three people (paid \$9.25/hour each), cooked and bottled the tomato sauce over eight hours for an estimated cost of \$222.

In year five, labor was calculated as **\$2,244**. This was estimated for two people spending 30-45 minutes collecting the produce at the end of the farmers market, driving to the AFIC and preprocessing the produce. It was estimated that it would take two people three hours at the end of every market. For the entire season, this cost (\$1,848) was based on two people (paid \$11/hour each) spending three hours twice a week transporting and preprocessing the produce for 14 weeks. The hourly rate was based on the projected minimum hourly rate in Arkansas of \$11/hour project. At the end of the season, it was anticipated that two people (paid \$11/hour each) would need two hours to prepare the produce (\$44). The day of production was anticipated to take four people (paid \$11/hour each) for eight hours to produce the tomato sauce (\$352). The price per jar sold in year five could be increased to account for the increase in hourly labor.



Figure 3. Flash frozen produce used for tomato sauce produced at the Arkansas Food Innovation Center, Fayetteville from farmers market surplus produce (2018)

### *Freezer Storage*

In years one and two, freezer storage was calculated as **\$80** based on the cost of storing two pallets (\$20 per month per pallet) of preprocessed product in the AFIC freezer for four months. Freezer storage was necessary as produce was collected during the market season (May to September) for tomato sauce production in December.

In year five, double the amount of freezer storage would be necessary. Freezer storage for year five was calculated as **\$160** based on the cost of storage for four pallets (\$20 per month per pallet) of product stored in the AFIC freezer.

### **Startup Cost**

Startup costs are the up-front costs that are required to meet state and federal food manufacturing requirements associated with production of VAFFP.

### *Label Design*

For years one, two and five, label design was calculated at **\$0.00** because an individual can create a label design using free or low-cost software packages. A local graphic artist was used to design the tomato sauce label developed for this product (Figure 1) and was paid \$300 since this was a pilot project.

### *Nutritional Facts*

The nutritional facts panel is a one-time cost that is required for the label. The AFIC provides this service at a cost of **\$30** per panel.

### *Process Authority Review*

The process authority review is required for certain VAFFP to ensure the product meets food safety standards. This is a one-time cost of **\$200** incurred in year one for process authority review of a self-stable, hot-filled product.

### *Arkansas Department of Health Permit*

The Arkansas Department of Health permit is required for the production of a commercial food product and has an initial cost of **\$85** and **\$35** for each year thereafter.

### **Projected Net Income**

Projected net income is calculated as all revenue minus all costs. Under this model, for the use of surplus produce from a farmer market to create a VAFFP, there would be an anticipated projected profit of **\$82.57** in the first year, **\$362.57** in the second year, and **\$1,421.14** in year five.

### **Economically Feasible Products**

The economic feasibility analysis of the tomato sauce presented in this factsheet is meant to be used only as a broad example, and the specific costs and required inputs will vary by product. By using

this cost model as an example, it was determined that jams, jellies and sauces could also be economically feasible VAFP as they have similar input costs (labor, ingredients, materials and fees) and could produce roughly the same output (number of jars) as the tomato sauce evaluated.

Other VAFP (flour made from dried squash and herb packets) from the surplus produce were also evaluated for this project but were not determined to be economically feasible. This is because the quantity of material obtained from dehydrating the produce to make these products did not exceed the cost to produce (materials, labor, production costs, etc.). These products would have to be produced on a large scale to be economically feasible.

## Potential to increase economic feasibility of VAFP from surplus produce

The cost analysis presented in this factsheet is an example of costs for producing a VAFP from surplus produce at a food manufacturing facility. Additional considerations to increase the economic feasibility of VAFP from surplus produce include:

- Using a food manufacturing facility with lower or no cost (church kitchen, school kitchen, restaurant, or co-op kitchen)
- Obtaining student interns or volunteers to reduce labor costs
- Creating different products (jams, jellies or dried produce) to reduce production costs or increase sale price per unit
- Engaging farms or farmers markets with diverse produce
- Aggregating produce from multiple farms or farmers market

## Conclusion

The economic feasibility of VAFP from surplus produce should be considered before implementing production. Products that minimize costs for labor, equipment and supplies, fees and permits and marketing and sales should be explored to implement VAFP development. Not only did this project prevent the waste of produce, it demonstrated that a VAFP made from surplus produce from a farmers market was possible and could be profitable.

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