

LAYOUT AND EVALUATION OF CLAVEY WINERY FACILITY

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ABSTRACT

This senior project discusses the layout design and financial feasibility of constructing a wine facility for Clavey winery. The winery is initially designed to handle 2500 gallons and allows for expansion in the future. The facility features gravity flow which results in increased efficiency.

A financial analysis compares having Clavey's grapes custom crushed by an outside source or having a wine facility to make their wine themselves.

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INTRODUCTION

Background

Clavey winery is a small family owned operation located in Chicago Park, California. Established in 2005, Clavey currently produces six acres of grapes: Syrah, Cabernet Sauvignon, and Sangiovese. Clavey sells most of its grapes to other local wineries at \$1,200 dollars per ton. The rest of the grapes are sent to a private wine maker who produces 350 cases of Syrah for Clavey. Clavey is expanding its vineyard by adding six more acres which will include Zinfandel, Cabernet Sauvignon, and Temperanillo. Clavey is also planning to build a wine facility during the summer of 2010.

Justification

Clavey is forgoing an enormous financial opportunity by selling its grapes to local wineries instead of making wine with them. They are also forgoing a financial opportunity by paying another wine maker to make their wine instead of making the wine themselves. Establishing a winery will allow Clavey to capitalize on these financial opportunities by allowing them to make all their grapes into wine.

Objectives

Designing a winery facility takes an enormous amount of planning, especially in the layout and floor plan of the winery. Some major factors that need to be considered when designing Clavey's wine facility layout are: amount and type of grapes to be produced, gravity flow design, equipment needed, and storage of wine. Financial feasibility will also have to be figured out to justify the building of a winery. Analysis of all these factors will lead to a properly planned, energy efficient, and cost effective winery design.

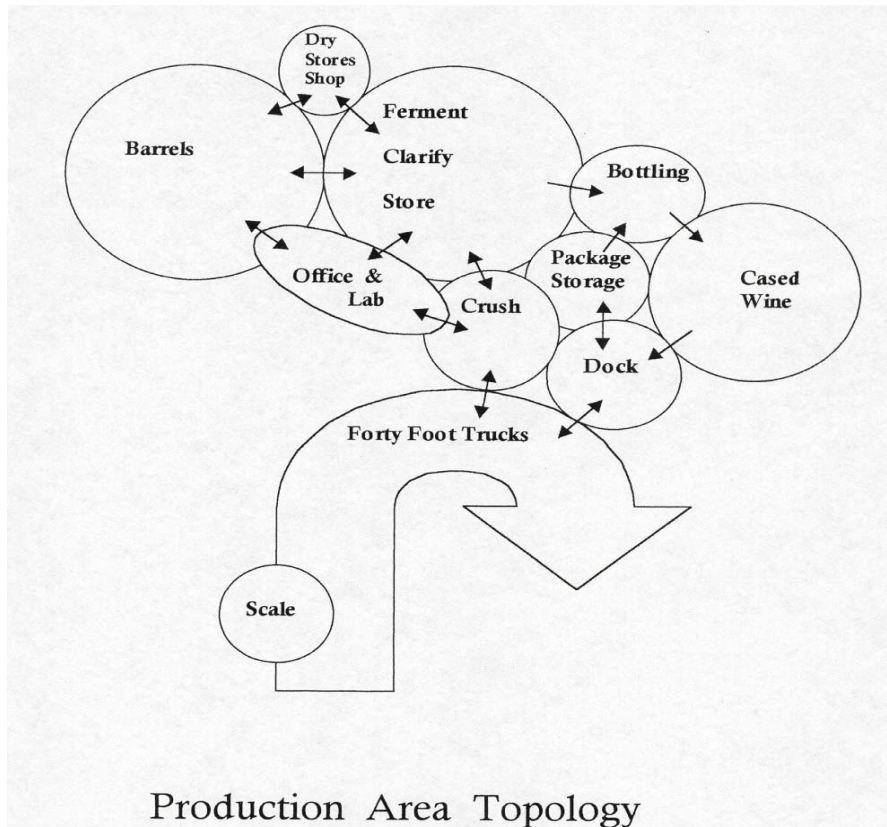
LITERATURE REVIEW

Winery design

Every winery is composed of several different components that work interconnected to produce wine.

- Raw product handling
- Fermentation
- Storage
- Laboratory
- Bottling
- Warehousing
- Tourism/tasting room

While many wineries do not have these as distinctly separate spaces, it may be easier to review them as such for design planning purposes. Each area should be designed with an understanding of present and future needs. Flexibility must be incorporated to facilitate to facilitate growth as well as changes in processing techniques. In planning these components, it is essential to understand how each relates to the other to help assure efficiency and a smooth product flow (Zoeklien, 2008).



Production Area Topology

Figure 1. Production area topology

Winery size can be roughly estimated by knowing the approximate gallons that the winery will be producing.

Table 1. Building size estimations

Winery Size, case (gal)	Square footage
2000 (4,760)	3,000
5000 (11,900)	4,000
10,000 (23,800)	7,500
50,000 (119,000)	28,000

Comfort in a building has two components, one physical and one emotional. The physical components are measured in terms of safety, thermal comfort, acoustical performance and lighting intensity. Emotional comfort is somewhat more elusive but ultimately depends on the extent to which the environment improves the quality of one's life (Zoeklien, 2008).

Raw Product Handling. Raw Product handling includes handling the following: grape receiving, inspection, fruit culling, weighing, dumping, de-stemming, crushing and pressing. This area must be designed to facilitate sanitation and easy movement of incoming and outgoing waste. The majority of the required raw product handling should occur outdoors, but under cover. This improves efficiency, cost, and sanitation ease. Floors in the raw product handling area should be sloped 3-8 degrees to a common full length drain (Zoeklien, 2008).

Fermentation. Settling and fermentation tanks should be elevated above the processing floor and/or sloped or conical, to facilitate dumping must or de-juiced pomace directly into the press or de-juicing unit. Some prefer to conduct red wine fermentation in bins or concrete tanks, or even in plastic bags. Floors in fermentation area should be sloped 3-8 degrees to a common full length drain. Space required for primary fermentation depends on the type and size fermentors and the expected time of fermentation. Red fermentors should have a height-to-diameter of 1-1.3. The ratio of fermentation to storage capacity needs depend on the average aging periods used (Zoeklien, 2008).

Barrel fermentation and storage. Storage of 200L (53 gallon) to 228L (60.4gallon) barrels is accomplished by permanent barrel racks, floor stacking, or barrel pallets. Space requirements for barrels can be calculated to be approximately 5.5 square feet per 200L barrel (Zoeklien, 2008).

Laboratory. Laboratory design must involve an understating of the in-house vs. contract analyses and equipment utilized, and whether this area is for tourist view. In designing the lab, space is needed for:

- Sample receipt
- Sample preparation
- Wet chemistry
- Possible sensory analyses
- Possible instrumentation
- Possible microbiological analyses
- Wash up/clean up
- Administration

Bottling. Because of space requirements and the cost of good bottling equipment, many small to medium-size wineries use contract bottling services (Zoeklien, 2008).

Gravity flow winery

Gravity flow designs use gravity for “free” flow or movement of grapes, must, or wine through descending levels within a winery. Gravity flow fits nicely with the concept of minimal processing. Gravity flow takes advantage of physics by using multiple levels in the winery to move must or wine without the use of pumps. Some wineries use gravity on the flats, which is through the use of forklifts to impose gravity flow (Zoeklien, 2008).

Some of the features of a gravity flow designed winery are:

- May lower non-soluble solids
- May eliminate the need for some processing equipment (pumps)
- May use less energy
- May make winery flow more compact
- May enhance tourist view

Advantages of gravity flow winery. Gravity flow can reduce the level of non-soluble solids and the need for some processing equipment, such as must pumps. Possible compactness of a winery flow system saves floor space by using vertical space. Gravity flow may also enhance the ease with which tourist view processing areas. This may improve the opportunity for visitors to participate in the winery experience (Zoeklien, 2008).

Gravity flow 4 level design. Gravity flow wineries can vary greatly depending on the building site, amount of production, and number of desired levels. A simple and practical gravity flow winery design uses four different levels:

1. De-stemming crushing, filling, and punching open fermentors.
2. ~11 feet below-press and unloading fermentors.
3. ~3 feet lower- the barrel cellar, main tank room, lab, wine library, storage.
4. ~4 feet lower-loading dock.

(Zoeklien, 2008)

Equipment

The following is a partial list of major equipment categories. Specific equipment should be selected based on production volume and stylistic winemaking considerations. The major difference between large-and small scale production equipment is the size, portability, and power sources (Zoeklien, 2008).

Crow (Wine Business Monthly, November, 2007) suggested the following products for consideration by small (under 10,000 case) wineries:

- Small Crossflow filter
- Air-operated diaphragm pump
- Portable heater and chiller
- Bulldog pump
- Macro-bins with covers
- Jacketed variable-capacity Tanks
- Chill able 500 gallon portatanks
- Forklift

Variable capacity tanks are the standard tanks for small wineries. These stainless steel tanks have a floating lid that sits on top of the wine. The advantage is these tanks can be filled only ¼ or completely full with no difference in the tank. Variable capacity tanks vary greatly in size and shape:

Table 2. Variable tank capacity dimensions

1,000L	264 gal.	41" dia. X 65" high
2,000L	528 gal.	52" dia. X 75" high
3,000L	792 gal	55" dia. X 95" high
4,000L	1,056 gal	63" dia. X 95" high
5,000L	1,320 gal	63" dia. X 119" high
6,000L	1,585 gal.	75" dia. X 119" high
8,000L	2,113 gal	75" dia. X 139" high

(Morris, 2004)

Financial

Costs. Wineries costs are broken into two categories, variable and fixed. Variable operating costs are broken in to the following categories:

- Grapes
- Cooperage
- Bottling
- Taxes and fees
- Full and part time labor
- Marketing
- Utilities, office supplies, and miscellaneous

These costs are all somewhat connected to one another and will vary year to year (Fickle 1996).

Fixed operating costs are separated into the following categories:

- Insurance
- Property tax
- Maintenance
- Depreciation
- Loan interest expense
- Cost of equity

These costs are generally predetermined and constant for a given period of time (Fickle 1996).

A modest list of cost estimates for a 5,000 case winery (Appendix B) is composed by Chris Stamp from Lockwood vineyards. The structure is estimated to only cost around \$60,000 dollars. To see a complete list see Appendix B. (Stamp,2000)

PROCEDURES AND METHODS

Design Procedure

Winery Capacity. The first variable to look at when starting the design of Clavey winery is the amount of grapes that they are going to produce now and in the future. The amount of grapes produced in a given year can vary year to year given the current weather; therefore, when estimating the tons of grapes assume various tonnages of 2, 3 and 4 tons per acre. Tables 5-7 shown in Appendix C show the present and future estimated tonnages per grape varietal. These numbers show that a current winery needs to have the capacity to handle 18 to 24 tons: while the winery in the future needs to have the capacity to handle 36 to 48 tons.

Winery Layout. When planning the layout of the winery the first factor to be determined was the allowable size of the facility. Surveying the site showed that Clavey can have a facility that is not to exceed a 40' width and 60' length. The site also has a natural slope of ten feet over the 60' length. The critical elements within the winery are grape receiving processing, fermenting, barreling, bottling, storage, office, lab, and tasting room. With these constraints and elements an effective floor plan is laid out giving the winery three different levels.

Top Level. This level 10'x40' consists of grape receiving, sorting, de-stemming, crushing, disposing waste and the tasting room. The grapes will be received via the 10'x40' covered unloading dock and sent straight to sorting. After being sorted the grapes will then be crushed, de-stemmed and sent to the next lower level. All the stems from the grapes will be sent to a waste bin and dealt with properly. The tasting room is also on the top level and overlooks the entire fermentation process of the facility.

Middle Level. The middle level 15' x 40' consists of the fermentation process of the grapes. After the grapes have been crushed are sent to ferment in either 1 ton open top plastic bins or one of the two 3 ton variable capacity tanks. This level also contains 108 square feet of storage for the various amounts of additives, nutrients, and yeast for the wine. This level also contains a 6'x9' roll up door to allow entry and exit.

Lower Level. The lower level 35'x40' consists of the pressing, racking, barrel storage, case wine storage, office, lab, bottling and unloading. The press is situated 5 feet below the fermenting wine and will allow for easy transfer of the fermenting must above. This level consists of two more 528 gallon variable capacity tanks to allow for racking and additional storage of wine. The barrel room is designed for 300 square feet and will hold 56 barrels on the cement level. The bottling area will be fairly minimal and can be stored

away during harvest. The storage for bottled wine will consist of 225 square feet. This level also contains utilizes 120 square feet to act as both the lab and the office. The end product is also shipped out on this level.

Gravity Flow. The natural slope of the land allows for the winery to utilize gravity to move the wine. To utilize this slope each level steps down 5 feet.

Equipment

Selection. The selection of equipment for Clavey winery is dependent on the amount of grapes that will be produced. Using the same estimated tonnage number from Appendix C we can assume a current tonnage of between 18 and 24 tons.

Receiving and Processing Equipment. The following is a list of the equipment needed for the receiving and processing equipment:

1. Sorting table
2. Destemmer/Crusher 1.7 tons/hour
3. Waste bins
4. Must Pump
5. 2” hoses

Fermenting Equipment. The following is a list of equipment needed for fermentation:

1. Three 1 ton open top fermentation bins.
2. Two 2000L variable capacity stainless steel tanks
3. Forklift Jack
4. 79 gallon bladder press

Storage Equipment. The following is a list of equipment needed for the storage of wine:

1. Two 2000L variable capacity stainless steel tanks
2. 56 200L oak barrels

Financial Analyses

Current Expenses. Analyzing Clavey’s current expenses shows they currently pay \$50 per case to have their grapes made into wine by somebody else. They also average a cost of around \$3000 per acre of produced grapes and 156 cases per acre of grapes.

Table 3. Custom crush and vineyard expenses.

Custom crush costs 50\$/case		grapes cost	Total Cost
1 acre	\$7,800	\$3,000	\$10,800
2 acre	\$15,600	\$6,000	\$21,600
3 acre	\$23,400	\$9,000	\$32,400
4 acre	\$31,200	\$12,000	\$43,200
5 acres	\$39,000	\$15,000	\$54,000
6 acres	\$46,800	\$18,000	\$64,800
7 acres	\$54,600	\$21,000	\$75,600
8 acres	\$62,400	\$24,000	\$86,400
9 acres	\$70,200	\$27,000	\$97,200
10 acres	\$78,000	\$30,000	\$108,000
11 acres	\$85,800	\$33,000	\$118,800
12 acres	\$93,600	\$36,000	\$129,600

With their current six acres, Clavey produces 936 cases of wine which costs them \$46,800. The cost per year to produce the grapes costs \$18,000; which totals \$64,800. After future vineyard expansion to 12 acres, Clavey can expect costs to be \$129,600. See Appendix D for more detail.

Projected Winery Operating Expenses. With a winery facility Clavey could eliminate the cost of paying some else to make their wine. Using the operating cost from Appendix D and dividing it by the amount of wine produced we can assume a cost of \$24 a case. Since Clavey will have control of making the wine, they will be able to press their grapes and increase their yields to 58.33 cases per ton. The following table assumes 176 cases per acre and the same grape costs as before.

Table 4. Winery costs and vineyard expenses.

Winery Expenses \$24/case		Grape Costs	Total Cost
1 acre	\$4,224.00	\$3,000.00	\$7,224.00
2 acre	\$8,448	\$6,000	\$14,448
3 acre	\$12,672	\$9,000	\$21,672
4 acre	\$16,896	\$12,000	\$28,896
5 acres	\$21,120	\$15,000	\$36,120
6 acres	\$25,344	\$18,000	\$43,344
7 acres	\$29,568	\$21,000	\$50,568
8 acres	\$33,792	\$24,000	\$57,792
9 acres	\$38,016	\$27,000	\$65,016
10 acres	\$42,240	\$30,000	\$72,240
11 acres	\$46,464	\$33,000	\$79,464
12 acres	\$50,688	\$36,000	\$86,688

With their current six acres and own winery facility, Clavey can expect to produce 1056 cases which will cost them \$25,344. The cost to produce six acres of grapes will cost them \$18,000; which totals \$43,344. After future vineyard expansion to 12 acres, Clavey can expect costs to be \$86,688. See Appendix D for more detail.

Projected Winery Capital Costs. Using the costs from Appendix B and assuming an inflation rate of 25.08%, a list of capital cost is generated. For the structure a cost of \$150/square foot is assumed. The overall capital cost for the wine facility and equipment is \$441,563.82. See Appendix D for more detail.

Custom Crush Total Revenue. The total revenue currently generated by Clavey is shown by assuming different prices for the bottle of wine. The current total revenues can be found in Appendix D.

Winery Total Revenue. The total revenue the can be generated by Clavey if they were to have their own facility is estimated the same as above. However, there is an increase due to the fact that yields increase from 156 cases per acre to 176 cases per acre. See Appendix D for complete detail.

RESULTS

Winery Layout

Gravity Flow Design. To maximize gravity flow the winery was separated into four different sections and three different levels. Figure 2 shows the different sections and levels of the winery.

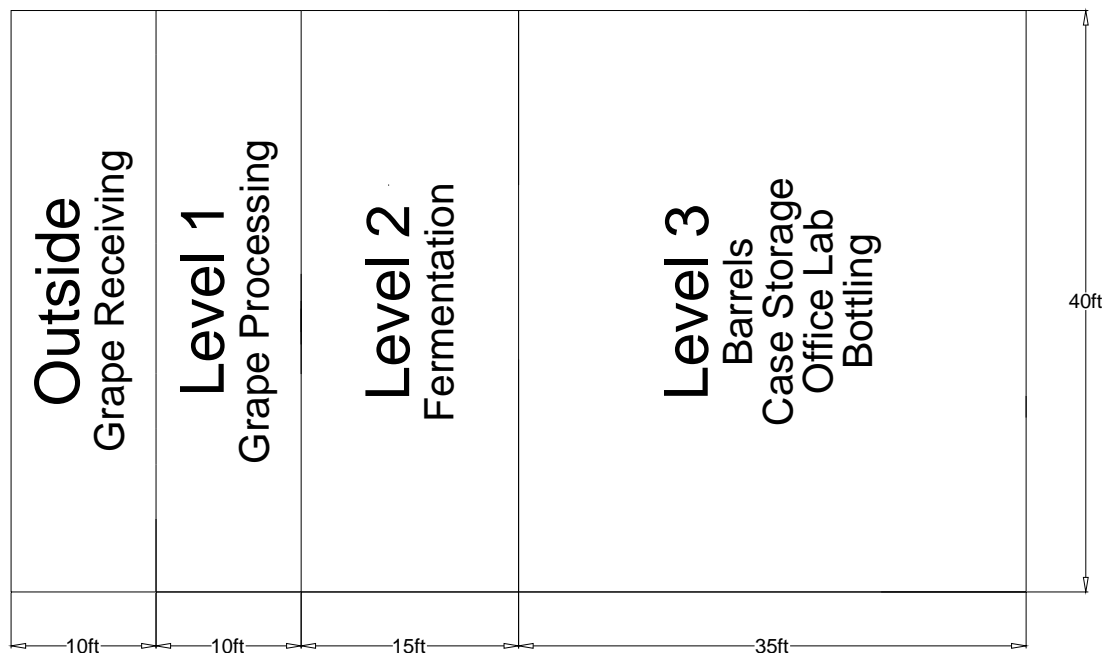


Figure 2. Sections and levels of winery

Using the design procedure resulted in a simple but affective general layout that gives each level the proper amount of working space.

Following the gravity flow design each level is differentiated by a vertical distance of 5ft. Figure 3 shows the side view of the winery facility.

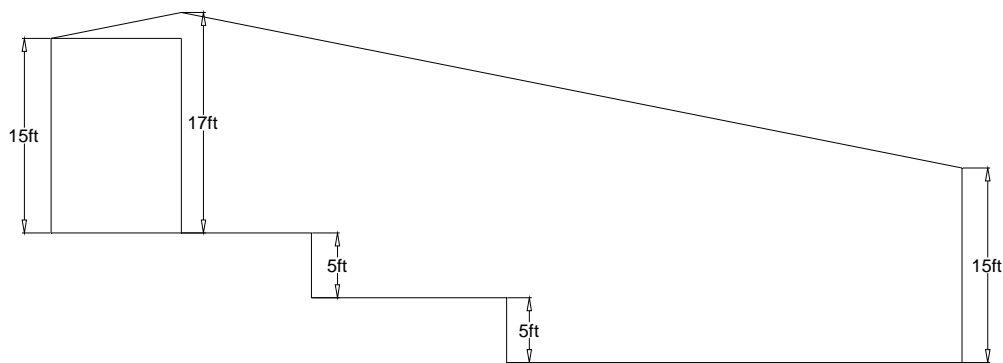


Figure 3. Side view of wine facility

With a 5ft difference between each level, the facility uses gravity to assist with the movement of the grapes, juice and wine. The side view also shows that the outdoor grape receiving is covered to help protect the grapes from the environment. The facility also allows ample ceiling space for the tanks, vertical barrel storage and vertically stacked pallets of packaged wine.

Production Flow. Following the design procedures, an efficient layout was designed to maximize the flow of the grapes. Figure 3 shows the production flow of the wine facility.

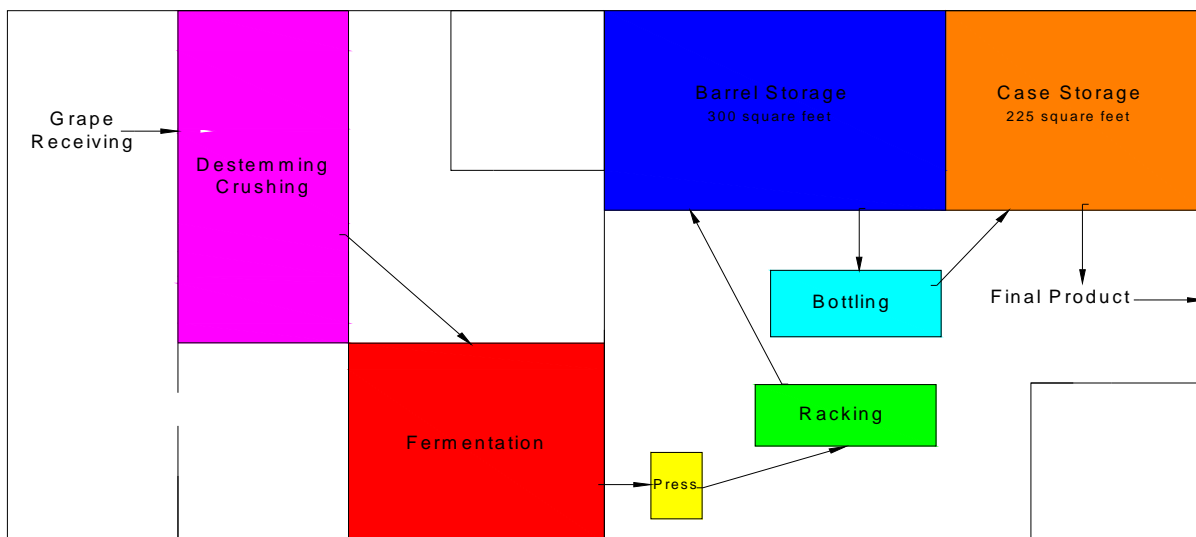


Figure 4. Production flow of winery

The grapes are received at the top level of the facility where they are sorted, de-stemmed and crushed. The juice then proceeds to the second level where they are put into either fermenting bins or variable capacity tanks. After fermentation, the grapes are racked into the third level tanks and the remaining must is pressed into the same tanks. The wine is then ready to be set in the oak barrels and eventually bottled into a finished product.

Master Layout. Considering the different design parameters and production flow, a master layout was developed for Clavey wine facility. The layout contains all of the necessary elements for a fully functional winery. The layout also includes the location of the tasting room; which, will over look the entire facility and allow for a more memorable experience for the tasting room clients. See Appendix E for the master layout.

Financial Analysis

Expense Comparison. Comparing the expenses between having a custom crush or owning a wine facility results in a huge difference. The main difference results in the price per case of each situation; with custom crush, Clavey is paying \$50 a case and with a wine facility they can expect to pay only \$24 a case. Table 13 in Appendix D shows that at their current 6 acres Clavey pays \$64,800 and at 12 acres they will be paying \$129,600. Table 9 in Appendix D shows that with a wine facility Clavey can expect to pay \$43,344 and \$86,688, respectively.

Profit Comparison. Comparing the profits of each situation does not result in a big difference. The difference arises because with a wine facility Clavey can expect to increase their yields by 20 cases per acre. At \$15 a bottle with custom crush Clavey can expect to make \$146,736 with their current 6 acres. Having a wine facility will result in profits of \$190,080. See Appendix D for complete tables.

Percent Return Comparison. Comparing the percent returns of both situations results in a big difference. At \$15 per bottle and custom crush Clavey will see a 160 percent return. With a wine facility Clavey will see 339 percent return. This big difference is because with a wine facility operating costs are drastically lower. See Appendix D for complete tables.

DISCUSSION

Overall, the facility layout and financial analysis serve as a solid foundation to start the construction of the wine facility. The winery layout will help with equipment selection and construction process of the facility. The financial analysis gives a good estimate of the costs and possible profits of owning a wine facility.

Winery Layout Design

When designing the winery there were a few difficulties in determining the size of the winery. Since Clavey is expected to increase their acreage of grapes, the winery has to have enough room to accommodate this expansion. The result of this is higher capital costs than normal because the winery is oversized for the current grape production.

The layout does not address the placement of walls in the winery which will be incredibly important when it comes to controlling inside air temperature and humidity. It also does not account for the drainage of the facility which will be vital for the winery.

Overall, the layout of the winery incorporated all of the key aspects of a successfully laid out gravity flow winery. Ideally there will be more vertical distance between the levels but with the lay of the land, five feet is the most practical.

Financial Analysis

Assumptions. The financial analysis of building the wine facility makes several assumptions. The first assumption is using the costs generated by Chris Stamp in 2000. Not all the capital costs generated by Stamp are used because some items the winery could do without or Clavey already currently owns. Since the costs generated by Stamp are in 2000 dollars, an inflation rate of 25.08% was used to convert the costs to 2009 dollars. In order to generate a cost per bottle the operating costs from Stamps costs are divided by the number of bottles he produced. This number is then multiplied by inflation and added to 15 cents to get \$2 per bottle. The cost per square foot for the winery is set at \$150 which can be completely subjective depending on the current economic condition.

Comparisons. The comparison between having a wine facility and making the wine themselves or having someone else make their wine is fairly straight forward. The cost per case of wine is almost cut in half when making it in their own facility. Also when making the wine themselves they can increase their yields by pressing the wine

themselves thus getting more juice out of the grapes. To generate income possibilities different price points are set for the bottles of wine which shows the different amount of income that can be generated for the winery.

RECOMMENDATIONS

There are many recommendations for the improvement of the design layout and financial analysis of Clavey winery. The recommendation is improvement to the financial analysis of the wine facility by doing a very thorough analysis of the operating costs for the facility. This will include doing a year by year operating cost analysis spanning over the next five years.

Recommendations for the winery layout are providing future layouts for the expansion of the facility in the future. This will include future equipment needed, tasting room equipment, and hiring of additional labor.

To continue the senior project the next step would be finding a way to finance the building of the winery. This will involve researching possible loans that can fund the capital costs involved with starting the winery. Once the loan percentage is known the loan can then be amortized over several years and the winery will know when it will start making money.

Also, projected sales of the wine itself will be an important aspect when starting the winery. The winery will fail if they are not selling their wine. To do this, a marketing plan will be needed giving target markets and projected sales over a given period.

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APPENDIX A

HOW PROJECT MEETS REQUIREMENTS FOR THE ASM MAJOR

HOW PROJECT MEETS REQUIREMENTS FOR THE ASM MAJOR

ASM Project Requirements

Agricultural systems management involves the application of quantitative, analytical processes for developing solutions to business or management problems associated with agriculture production, and processing of agricultural products. This project addresses these issues as follows.

Application of Agricultural Technology. The project will involve application of mechanical systems, and plant growth/culturing.

Application of Business and/or Management Skills. The project involves business/management skills in the areas of financial analysis such as initial cost and operating.

Quantitative, Analytical Problem Solving. These techniques apply to the financial analysis and its feasibility.

Capstone Project Experience

The ASM senior project must incorporate knowledge and skills acquired in earlier coursework (Major, Support and/or GE courses). This project incorporates knowledge/skills from these key course.

- AGB 212 Ag Economics
- AGB 310 Agbus Credit & Finance
- ECON 201 Survey of Economics
- AGB 444 Wine Compliance and Market Analysis
- FSN 341 Wines and Fermented Foods
- FRSC 231 Viticulture I, BUS 212 Business Accounting
- CSC 110 Computer applications
- BRAE 418/419 Ag Systems Management
- ENGL 148 Technical Writing

ASM Approach

Agricultural Systems Management involves the development of solutions to business, management, and processing of an agricultural product. This project takes an interdisciplinary and specialized agricultural knowledge.

Interdisciplinary Features. The project touches on the aspects of designing an agricultural system and analyzing a financial situation.

Specialized Agriculture Knowledge. The project applies specialized knowledge in the areas of agricultural systems, business development, and financial feasibility.

APPENDIX B

CAPITAL AND OPERATING COSTS FOR 5000 GALLON WINERY

CAPITAL COSTS OF WINERY

(Stamp, 2000)

Capital Costs.	Note: figures used are in year 2000 dollars 5,000 gallons	
Physical Plant		
structure	(1800 sq. Ft.)	\$55,000
heating system (gas)		\$2,500
plumbing (2 bathrooms)		\$1,000
septic	(1 system)	\$6,000
phones		\$200
well digging		\$3,000
Production Equipment		
press (used Willmes 2700)		\$19,000
destemmer	(good used)	\$7,000
must pump	(good used)	\$4,000
receiving hopper		\$3,500
jacketed tanks (5-1000 @ 6K)	(6-1000 @ 6K ea.)	\$36,000
refrigeration system	(used milk cooler & pump)	\$1,000
filter	(pad)	\$6,400
bottler	(6-spout gravity)	\$1,200
labeler	(gluer/hand)	\$600
corker (hand oper., floor)		\$500
hoses	(150 ft @ \$1.80/ft)	\$270
pallet jack		\$600
hose fittings	(6 @ \$30)	\$180
pump, vari-speed		\$1,200
lab equipment (pH meter, ebulliometer, burettes, chemicals)		\$850
tools		\$800
Grounds		
lawn (landscape/rake/seed)		\$400
sidewalk (40 ft.)		\$300
parking lot, crushed stone	(10,000 sq. ft.)	\$500
Tasting Room Equipment		
cash register		\$700
tasting glasses	(6cs @ \$42/cs)	\$252
dishwasher	(std. household)	\$500
refrigerator	(small)	\$150

Fax machine - optional		\$450
furnishings	(desk, chair)	\$200
file cabinets		\$500
copier		\$600
computer system		\$3,500
air conditioner		\$400
package design		\$1,200
Fees and Licenses		
<hr/>		
incorporation fee - optional		\$2,000
label approval	(5@ \$50 ea.)	\$250
Total Capital Costs:		\$160,252
<hr/>		
Operating Costs.		
<hr/>		
Grapes and Bottling Costs		
<hr/>		
grapes	(31tons @\$600/ton)	\$18,600
glass	(750ml@ \$54.85/gross)	\$9,610
corks	(26K @ \$115/K)	\$2,990
labels	(28K @ \$.065 ea.)	\$1,820
capsules	(26K @ \$.055ea.)	\$1,430
labor		\$12,000
cleaning chemicals		\$250
<hr/>		
Annual Fees		
<hr/>		
water		
electricity @\$.16/KWH	(1,100 KWH/Mo.)	\$2,112
gas		\$900
phones		\$1,450
insurance (fire/liability/bond)		\$2,000
special occupational tax		\$500
state license	(farm winery & Dept. Ag.)	\$200
federal license		\$100
Administrative		
accounting	(taxes only)	\$700
office supplies		\$450
postage		\$500
Sales		
advertising	(print, signs, fees, dir.mail)	\$1,500
equipment (cork pullers, tasting wine	(cork pullers, dispossable cups, ice, shirts)	\$250
travel reimbursement	(7% vol.)	
\$.25/mi	(2800mi)	\$700

tasting room supplies (soap, paper prod.)	\$200
credit card fees	\$1,200
miscellaneous	\$500
<u>Total Operating Costs</u> (First Year)	\$88,962
<u>Total Costs</u> (First Year Operating +Capital)	\$249,214

APPENDIX C

**PRESENT AND FUTURE ESTIMATED ACRES, TONNAGE AND GALLONS
FOR CLAVEY WINERY**

Table 5. Current vineyard size and estimated gallons

Variety	Yield		Total/variety(tons)	Gallons (140gal/ton)	Cases (750ml)	Bottles
	Acres	(ton/acre)				
Syrah	2.75	2	5.5	770	324	3886
Cabernet	0.25	2	0.5	70	29	353
Sangiovese	3	2	6	840	353	4240
Total	6		12	1680	707	8479
Syrah	2.75	3	8.25	1155	486	5830
Cabernet	0.25	3	0.75	105	44	530
Sangiovese	3	3	9	1260	530	6360
Total	6		18	2520	1060	12719
Syrah	2.75	4	11	1540	648	7773
Cabernet	0.25	4	1	140	59	707
Sangiovese	3	4	12	1680	707	8479
Total	6		24	3360	1413	16959

Table 6. Additional vineyard size and estimated gallons

Clavey's Added Vineyard (table 2)						
Variety	Yield		Total/variety(tons)	Gallons (140gal/ton)	Cases (750ml)	Bottles
	Acres	(ton/acre)				
Zinfandel	2	2	4	560	236	2826
Cabernet	3	2	6	840	353	4240
Tempranillo	1	2	2	280	118	1413
Total	6		12	1680	707	8479
Zinfandel	2	3	6	840	353	4240
Cabernet	3	3	9	1260	530	6360
Tempranillo	1	3	3	420	177	2120
Total	6		18	2520	1060	12719
Zinfandel	2	4	8	1120	471	5653
Cabernet	3	4	12	1680	707	8479
Tempranillo	1	4	4	560	236	2826
Total	6		24	3360	1413	16959

Table 7. Combined vineyard size and estimated gallons

Variety	Acres	Yield		Gallons (140gal/ton)	Cases (750ml)	Bottles
		(ton/acre)	Total/variety(tons)			
Syrah	2.75	2	5.5	770	324	3886
Cabernet	3.25	2	6.5	910	383	4593
Zinfandel	2	2	4	560	236	2826
Tempranillo	1	2	2	280	118	1413
Sangiovese	3	2	6	840	353	4240
Total	12		24	3360	1413	16959
Syrah	2.75	3	8.25	1155	486	5830
Cabernet	3.25	3	9.75	1365	574	6890
Zinfandel	2	3	6	840	353	4240
Tempranillo	1	3	3	420	177	2120
Sangiovese	3	3	9	1260	530	6360
Total	12		36	5040	2120	25438
Syrah	2.75	4	11	1540	648	7773
Cabernet	3.25	4	13	1820	766	9186
Zinfandel	2	4	8	1120	471	5653
Tempranillo	1	4	4	560	236	2826
Sangiovese	3	4	12	1680	707	8479
Total	12		48	6720	2826	33918

APPENDIX D
FINANCIAL ANALYSIS

COSTS OF STARTING A WINE FACILITY

Assumptions.

Cost per square foot is \$150.

Using "The Dollar and Sense of Starting a Small Winery" by Chris Stamp as a reference.

Using 25.08% inflation rate between 2000 and 2009.

Cost/bottle of wine=(operating cost/bottles produced) x inflation + 15 cents/bottle.

Capital Costs

Physical Plant

Structure (\$150/sqft)	\$360,000.00
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Production

Equipment/Storage

Press	\$6,000.00
Destemer/crusher	\$2,000.00
Must pump	\$3,000.00
Sorting Table	\$7,000.00
Tanks (Four 2000L)	\$28,000.00
Fermenting Bins (3)	\$1,300.00
Hoses (100 ft @ \$180/ft)	\$1,800.00
Lab equipment	\$1,500.00
Chemicals	\$1,063.18
Tools	\$1,000.64
Barrels (56@\$500)	\$28,000.00

Tasting Room

Tasting Glasses	\$300.00
dishwasher	\$400.00
refridgerator	\$200.00

Total	\$441,563.82
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Cost/bottle of wine

	\$2.00
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WINE FACILITY FINANCIAL ANALYSIS

Table 8. Income possibilities with wine facility (assuming 58.33 cases per ton and 3 tons per acre)

\$/acre							
176 cases per acre	10\$/bottle	12\$/bottle	15\$/bottle	\$20/bottle	\$25/ bottle	\$8 /bottle	cases
1 acre	\$21,120	\$25,344	\$31,680	\$42,240	\$52,800	\$16,896	176
2 acre	\$42,240	\$50,688	\$63,360	\$84,480	\$105,600	\$33,792	352
3 acre	\$63,360	\$76,032	\$95,040	\$126,720	\$158,400	\$50,688	528
4 acre	\$84,480	\$101,376	\$126,720	\$168,960	\$211,200	\$67,584	704
5 acres	\$105,600	\$126,720	\$158,400	\$211,200	\$264,000	\$84,480	880
6 acres	\$126,720	\$152,064	\$190,080	\$253,440	\$316,800	\$101,376	1,056
7 acres	\$147,840	\$177,408	\$221,760	\$295,680	\$369,600	\$118,272	1,232
8 acres	\$168,960	\$202,752	\$253,440	\$337,920	\$422,400	\$135,168	1,408
9 acres	\$190,080	\$228,096	\$285,120	\$380,160	\$475,200	\$152,064	1,584
10 acres	\$211,200	\$253,440	\$316,800	\$422,400	\$528,000	\$168,960	1,760
11 acres	\$232,320	\$278,784	\$348,480	\$464,640	\$580,800	\$185,856	1,936
12 acres	\$253,440	\$304,128	\$380,160	\$506,880	\$633,600	\$202,752	2,112

Table 9. Winery Expenses (assuming \$3000 per acre grape costs and \$24 per case)

Expenses \$24/case		Grape Costs	Total Cost
1 acre	\$4,224.00	\$3,000.00	\$7,224.00
2 acre	\$8,448	\$6,000	\$14,448
3 acre	\$12,672	\$9,000	\$21,672
4 acre	\$16,896	\$12,000	\$28,896
5 acres	\$21,120	\$15,000	\$36,120
6 acres	\$25,344	\$18,000	\$43,344
7 acres	\$29,568	\$21,000	\$50,568
8 acres	\$33,792	\$24,000	\$57,792
9 acres	\$38,016	\$27,000	\$65,016
10 acres	\$42,240	\$30,000	\$72,240
11 acres	\$46,464	\$33,000	\$79,464
12 acres	\$50,688	\$36,000	\$86,688

Table 10. Winery profits

	10\$/bottle	12\$/bottle	15\$/bottle	\$20 / bottle	\$25 per bottle	\$8 /bottle
1 acre	\$13,896	\$18,120	\$24,456	\$35,016	\$45,576	\$9,672
2 acre	\$27,792	\$36,240	\$48,912	\$70,032	\$91,152	\$19,344
3 acre	\$41,688	\$54,360	\$73,368	\$105,048	\$136,728	\$29,016
4 acre	\$55,584	\$72,480	\$97,824	\$140,064	\$182,304	\$38,688
5 acres	\$69,480	\$90,600	\$122,280	\$175,080	\$227,880	\$48,360
6 acres	\$83,376	\$108,720	\$146,736	\$210,096	\$273,456	\$58,032
7 acres	\$97,272	\$126,840	\$171,192	\$245,112	\$319,032	\$67,704
8 acres	\$111,168	\$144,960	\$195,648	\$280,128	\$364,608	\$77,376
9 acres	\$125,064	\$163,080	\$220,104	\$315,144	\$410,184	\$87,048
10 acres	\$138,960	\$181,200	\$244,560	\$350,160	\$455,760	\$96,720
11 acres	\$152,856	\$199,320	\$269,016	\$385,176	\$501,336	\$106,392
12 acres	\$166,752	\$217,440	\$293,472	\$420,192	\$546,912	\$116,064

Table 11. Winery percent return_(profit/expenses)

	At 10\$/bottle	At 12\$/bottle	At 15\$/bottle	At 20\$/bottle	At 25\$/bottle	At \$8/bottle
1 acre	192%	251%	339%	485%	631%	133.9%
2 acre	192%	251%	339%	485%	631%	133.9%
3 acre	192%	251%	339%	485%	631%	133.9%
4 acre	192%	251%	339%	485%	631%	133.9%
5 acres	192%	251%	339%	485%	631%	133.9%
6 acres	192%	251%	339%	485%	631%	133.9%
7 acres	192%	251%	339%	485%	631%	133.9%
8 acres	192%	251%	339%	485%	631%	133.9%
9 acres	192%	251%	339%	485%	631%	133.9%
10 acres	192%	251%	339%	485%	631%	133.9%
11 acres	192%	251%	339%	485%	631%	133.9%
12 acres	192%	251%	339%	485%	631%	133.9%

CUSTOM CRUSH FINANCIAL ANALYSIS

Table 12. Income possibilities with custom crush (assuming 52 cases per ton and 3 tons per acre)

\$/acre							
156 cases per acre	10\$/bottle	12\$/bottle	15\$/bottle	\$20 / bottle	\$25/bottle	\$8 /bottle	cases
1 acre	\$18,720	\$22,464	\$28,080	\$37,440	\$46,800	\$14,976	156
2 acre	\$37,440	\$44,928	\$56,160	\$74,880	\$93,600	\$29,952	312
3 acre	\$56,160	\$67,392	\$84,240	\$112,320	\$140,400	\$44,928	468
4 acre	\$74,880	\$89,856	\$112,320	\$149,760	\$187,200	\$59,904	624
5 acres	\$93,600	\$112,320	\$140,400	\$187,200	\$234,000	\$74,880	780
6 acres	\$112,320	\$134,784	\$168,480	\$224,640	\$280,800	\$89,856	936
7 acres	\$131,040	\$157,248	\$196,560	\$262,080	\$327,600	\$104,832	1,092
8 acres	\$149,760	\$179,712	\$224,640	\$299,520	\$374,400	\$119,808	1,248
9 acres	\$168,480	\$202,176	\$252,720	\$336,960	\$421,200	\$134,784	1,404
10 acres	\$187,200	\$224,640	\$280,800	\$374,400	\$468,000	\$149,760	1,560
11 acres	\$205,920	\$247,104	\$308,880	\$411,840	\$514,800	\$164,736	1,716
12 acres	\$224,640	\$269,568	\$336,960	\$449,280	\$561,600	\$179,712	1,872

Table 13. Custom crush expenses (assuming \$3000 per acre grape cost and \$50 per case)

Custom crush Expenses 50\$/case	grapes cost	Total Cost	
1 acre	\$7,800	\$3,000	\$10,800
2 acre	\$15,600	\$6,000	\$21,600
3 acre	\$23,400	\$9,000	\$32,400
4 acre	\$31,200	\$12,000	\$43,200
5 acres	\$39,000	\$15,000	\$54,000
6 acres	\$46,800	\$18,000	\$64,800
7 acres	\$54,600	\$21,000	\$75,600
8 acres	\$62,400	\$24,000	\$86,400
9 acres	\$70,200	\$27,000	\$97,200
10 acres	\$78,000	\$30,000	\$108,000
11 acres	\$85,800	\$33,000	\$118,800
12 acres	\$93,600	\$36,000	\$129,600

Table 14. Custom crush profits

	At 10\$/bottle	At 12\$/bottle	At 15\$/bottle	At 20\$/bottle	At 25\$/bottle	at \$8/bottle
1 acre	\$7,920	\$11,664	\$17,280	\$26,640	\$36,000	\$4,176
2 acre	\$15,840	\$23,328	\$34,560	\$53,280	\$72,000	\$8,352
3 acre	\$23,760	\$34,992	\$51,840	\$79,920	\$108,000	\$12,528
4 acre	\$31,680	\$46,656	\$69,120	\$106,560	\$144,000	\$16,704
5 acres	\$39,600	\$58,320	\$86,400	\$133,200	\$180,000	\$20,880
6 acres	\$47,520	\$69,984	\$103,680	\$159,840	\$216,000	\$25,056
7 acres	\$55,440	\$81,648	\$120,960	\$186,480	\$252,000	\$29,232
8 acres	\$63,360	\$93,312	\$138,240	\$213,120	\$288,000	\$33,408
9 acres	\$71,280	\$104,976	\$155,520	\$239,760	\$324,000	\$37,584
10 acres	\$79,200	\$116,640	\$172,800	\$266,400	\$360,000	\$41,760
11 acres	\$87,120	\$128,304	\$190,080	\$293,040	\$396,000	\$45,936
12 acres	\$95,040	\$139,968	\$207,360	\$319,680	\$432,000	\$50,112

Table 15. Custom crush percent profit (profit/expenses)

	At 10\$/bottle	At 12\$/bottle	At 15\$/bottle	At 20\$/bottle	At 25\$/bottle	at \$8/bottle
1 acre	73%	108%	160%	247%	333%	38.7%
2 acre	73%	108%	160%	247%	333%	38.7%
3 acre	73%	108%	160%	247%	333%	38.7%
4 acre	73%	108%	160%	247%	333%	38.7%
5 acres	73%	108%	160%	247%	333%	38.7%
6 acres	73%	108%	160%	247%	333%	38.7%
7 acres	73%	108%	160%	247%	333%	38.7%
8 acres	73%	108%	160%	247%	333%	38.7%
9 acres	73%	108%	160%	247%	333%	38.7%
10 acres	73%	108%	160%	247%	333%	38.7%
11 acres	73%	108%	160%	247%	333%	38.7%
12 acres	73%	108%	160%	247%	333%	38.7%

APPENDIX E

MASTER LAYOUT OF CLAVEY WINERY

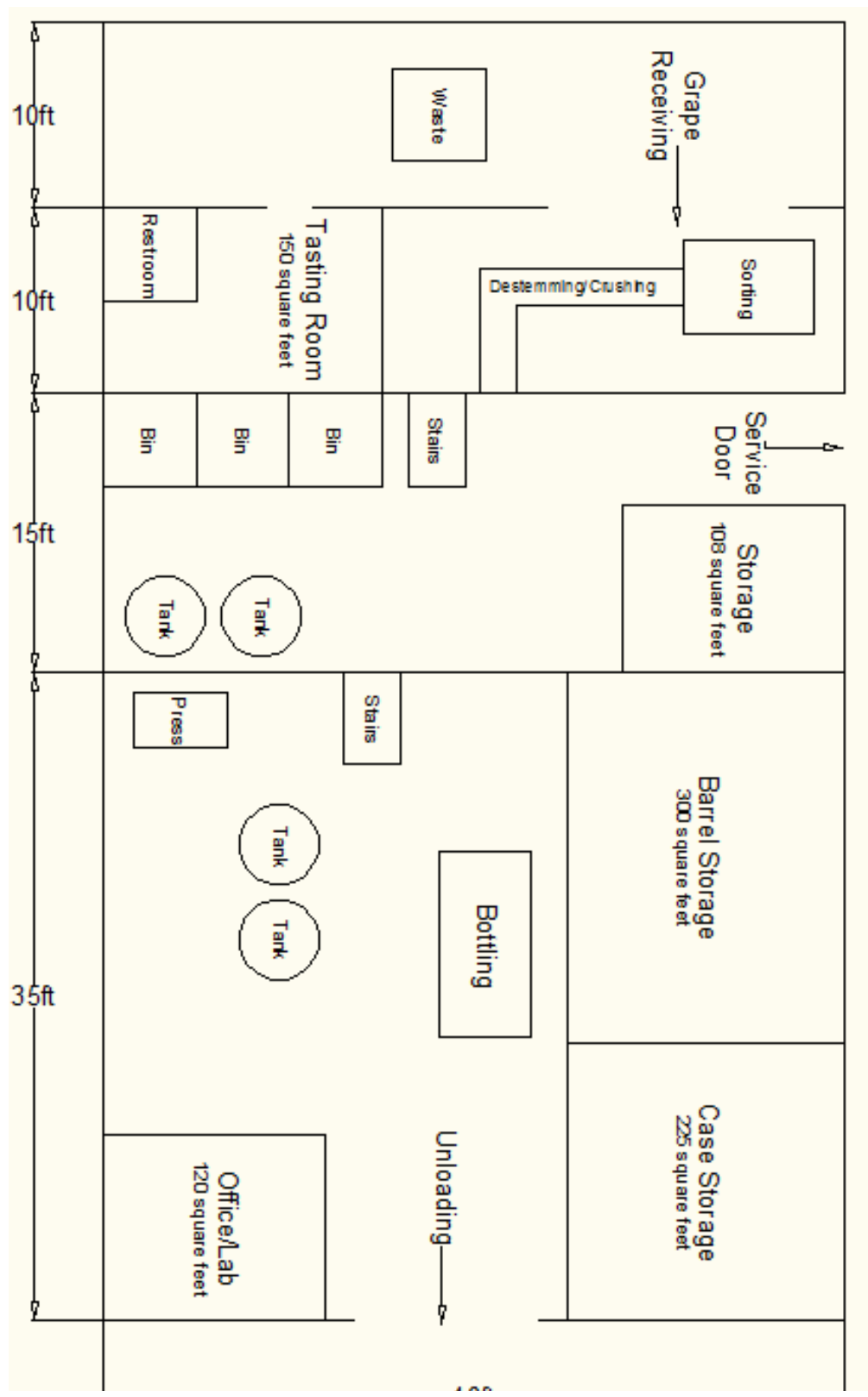


Figure 5. Winery master layout

