MAKING & MARKETING

VERMONT ICE CIDER

A guide for Vermont orchards and wineries interested in adding ice cider production to their portfolio of value-added products

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Prepared for the
Vermont Agency of Agriculture, Food & Markets
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Introduction

Recent history of Vermont apple production

Apples have been an important part of Vermont's history for over 200 years. An important part of each nearly self-sufficient farm established by the first European settlers, by the late 1900's, production of apples had shifted to relatively large commercial orchards across the state. With increasing globalization of the world's apple production, since the early 1990's, the state's apple producers have become more focused on the importance of developing direct-to-consumer markets and production of value-added goods.

The apple industry is still an important part of Vermont agriculture, adding over $20 million annually to the state's economy. Apples are also an important part of the state's $1.57 billion tourism and agritourism industries.

The development of Ice Cider in Quebec, Canada

Just across the Canadian border in Southern Quebec, apple producers have created and developed a high-value apple product, ice cider, or *cidre de glace* in French. From its conception in the late 1990s, the ice cider industry in Quebec has grown to over 50 producers with annual production of more than 1 million bottles having a retail value of over $20 million.

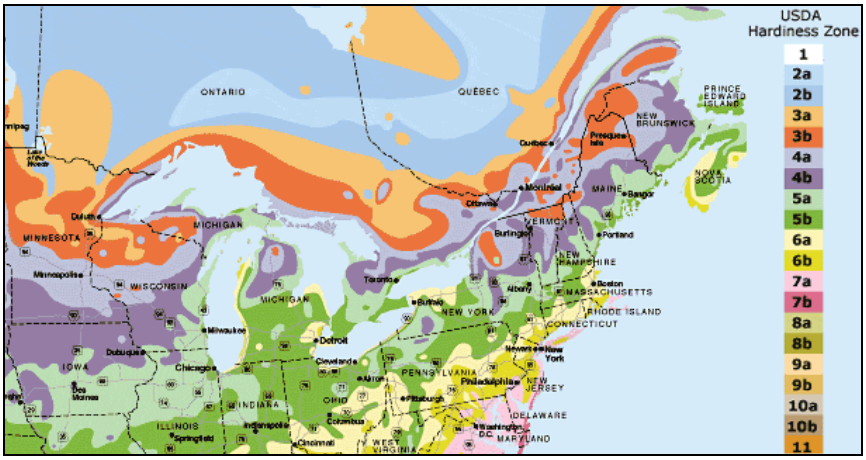
Ice cider is a sweet dessert wine made using natural cold temperatures to concentrate the sugars and flavors of apples. This concentrate is then partially fermented, yielding a wine with between 9 – 12 percent alcohol, and between 12 – 20 percent residual sugar. Ice cider is sold in small bottles of 125 to 375 milliliters in volume, with retail prices ranging from $19 to $45, depending on the process and quality of the wine. The product is delicious, and as a result the industry has grown. In addition to its popularity in Canada, ice cider producers in Quebec have found significant export markets in Europe and Asia.

There are several methods used to create the concentrate for ice cider. *Cryoconcentration* involves pressing fresh cider from stored apples and using natural cold to freeze the cider. The first 20 to 25 percent that melts is the concentrate. *Cryoextraction* relies on natural cold to freeze apples. The frozen apples are then pressed in a special basket press to express the concentrate. In rare instances, frozen apples remaining on the tree are picked and pressed. Only a few varieties of apples are suitable for this process.

The government of Quebec recently published regulations permitting only natural cryoconcentration or cryoextraction as allowed processes in the production of ice cider. Use of artificial refrigeration as the primary means of concentration is strictly prohibited.

The opportunity for ice cider production in Vermont

Like Southern Quebec, Vermont is ideally situated to develop a successful ice cider industry. A large part of the state is in the few climate zones (3b and 4a) that are warm enough for apple culture yet cold enough to reliably produce ice cider in the winter using naturally freezing temperatures. (See USDA climate map, below.) An ice cider climate zone analysis is provided in the attachments.



Ice cider provides a potentially excellent opportunity for Vermont apple growers and winemakers for the following reasons:

- It provides a high potential value for utility quality apples;
- It can be profitable at on-farm scale;
- It is a great complementary product for other Vermont specialties, especially artisanal cheeses;
- Capital investment requirements are relatively low (starting around $35,000); and
- It fits well with plans for developing culinary and farm tourism in Vermont.

Ice cider may provide an opportunity for growers to obtain higher value for utility grade apples than most other uses. The retail on-farm price for ice cider is typically 8- to 10-times the product value of the apples used to make it, compared to 1.0 to 1.5 times for fresh sweet cider.

Because ice cider is an artisanal product, it can be produced and sold profitably on-farm and at local farmers' markets, restaurants and wine retailers.

Ice cider is an additional enhancement to Vermont's growing culinary economy, offering restaurants, farmers' markets and festivals a new local specialty to highlight.

Rural Business Enterprise Grant awarded by USDA

In 2009, the United States Department of Agriculture awarded a Rural Business Enterprise Grant to the Vermont Agency of Agriculture to provide technical assistance to orchards and wineries in the state of Vermont wishing to develop ice cider production capability.

This guide fulfills one component of the technical assistance program. It is meant to provide hands-on, practical "how-to" advice for prospective ice cider producers. It is written with the assumption that the prospective producer is either an existing orchard in search of a value-added product for its apples, or an existing winery looking to make an additional product in its current facility.

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I. Product Characteristics

The basic characteristics of ice cider reflect the concentration of flavor and fruit sugars through the freezing and melting process. It has high residual sugar level in addition to its alcohol level which is typically in the range of a white wine.

Defining standards

In 2010, the Quebec government updated its published regulations specifying acceptable characteristics and production methods for ice cider. These regulations are excerpted below.[1]

> From "An Act respecting the Société des Alcools du Québec"
> (R.S.Q., c. S-13, s. 37)
>
> Section 1, paragraph (7):
>
> "ice cider": cider obtained by the fermentation of apple juice that has a pre-fermentation sugar content of not less than 30° Brix a chieved solely by natural cold, producing a finished product with a residual sugar content of not less than 130 g per litre and an actual alcoholic strength of more than 7% by volume but not more than 13% by volume;

Currently there are no similar regulations in the United States, and the level of production of ice cider is so small that the Tax and Trade Bureau, which regulates labeling at the federal level, is unlikely to focus on creating a standard soon.

In Vermont, we are concerned with defining a consistent approach with the objectives of 1) avoiding consumer confusion and 2) drawing on the unique characteristics of our climate 3) supporting our existing apple culture.

This guide takes as its premise that Vermont Ice Cider will follow the Quebec lead in the definition of product characteristics and production techniques:

- Pre-fermentation sugar concentration of at least 30 degrees Brix
- Concentration by natural cooling alone
- Residual sugar level of at least 130 grams per litre (13%)
- Alcoholic content of more than 7%, up to a maximum of 13% per volume
- No chaptalization (no added sugar)
- No added alcohol
- During the production of the ice cider, the use of artificial cooling is only permitted for purposes of malic precipitation and only if the temperature is not lower than -4℃.
- No artificial flavors or colors

- Ice cider can be infused artificially with carbon dioxide provided that the volume of dissolved carbon dioxide per volume of finished product is 1.5 to 2.5 or 3.5 to 5.5

Finally, US federal labeling regulations require that for a wine to have the state name in the appellation at least 75% of the fruit used must come from within the state. We hope producers will support the Vermont apple culture and use 100% Vermont apples in making their ice cider.

Vermont Ice Cider production options

Producers have many choices and techniques at their disposal to create a unique ice cider –

- Apple varieties and proportions
- Brix level of concentration and final alcohol and sugar levels (within the ranges defined above)
- Yeasts and fining agents
- Aging processes

While an individual apple variety will not have the flavor complexity of a vinifera grape, there are many varieties of apples grown in Vermont, each with its own flavor profile. These profiles vary greatly in sweetness, acidity, tannic and phenolic dimensions. Producers can choose to blend juices from different varieties to find a taste that is their unique offering. As part of the RBEG grant, sugar and acidity measurements for several apple varieties were made and are included in Appendix A of this guide. Producers can use the testing techniques outlined in section III of the guide to make their own measurements of apple varieties they are considering using. Don't forget that the most important test is how it tastes!

The higher the starting brix level of the cider concentrate, the greater the residual sugar and alcohol potential of the final product. Using the rule of thumb that 1% sugar converts to 0.55% alcohol, 30 brix means that an ice cider with the minimum 13% residual sugar will have at most (30-13)*.55 = 9.35% alcohol. Starting with higher brix means you can produce an ice cider with more residual sugar and/or more alcohol.

Yeasts do result in slightly different flavors even using the same apple variety. Fining agents like bentonite, gelatin and fining tannins can change the perceived body and flavor as well. These are discussed more in section II.

Finally, aging can also have an impact on flavor. Aging (in properly controlled conditions) can mellow out the flavor of a wine. Aging (and for that matter fermenting) in oak barrels will significantly change the flavor.

All of these tools are available to the ice cider producer. It's a great idea to experiment and find a set of choices that makes a unique, quality product worthy of your brand.

II. Distribution Regulations and Choices

Every state is different, and states are changing their laws all the time. The information provided below was current as of September, 2010 for the State of Vermont. It is a brief summarization. You should attend a manufacturers seminar as part of obtaining your Vermont license. You should contact the Vermont Department of Liquor Control with specific questions. They can help you figure out what permits will make sense for your situation: http://liquorcontrol.vermont.gov/home/contacts.html#licensing

There are several options for the maker of ice cider to sell it in Vermont. A producer can use more than one option, depending on where you believe your best opportunity is, and based on understanding the economics of each channel.

This all assumes you have applied for and received your federal and state winery manufacturing permits (see section X).

Selling direct to consumers in Vermont

There are four key regulatory requirements for selling your ice cider directly to the public:

- You must have the proper license or permit for the situation and location where you are selling
- You or anyone you hire to serve or sell must have the proper training from the State
- You must collect applicable sales tax or rooms and meals tax
- You will need to carry proper liquor liability insurance

Vermont permits and licenses

The simplest and most economical form of distribution is to sell your ice cider directly to consumers at your winery premises. Vermont requires you to obtain a 4th class license to do this. The 4th class license pertains to Vermont licensed manufacturers. It allows you to provide tastings, with or without charge, to sell your wine by the glass, and to sell it by the bottle.

The 4th class license also allows you to have up to 10 tasting room locations, including farmers markets, throughout the State. Each 4th class license costs $50.00, and is good for one year (or one farmers market season). Town approval is required as part of the application process.

Another direct-to-consumer sales opportunity is events, such as the Vermont Life Wine & Harvest Festival held every September at Mt. Snow, or a local festival in

your town. You can apply for a Special Event permit, which will cost $25. Town approval is required as part of the application process. Sometimes the holder of the event will obtain a Festival permit, or an Educational event permit, depending on the nature of the event. If you ever have any question about a particular situation, call the DLC.

Finally, you can apply for a permit to ship your ice cider direct to consumers within the state of Vermont. However this permit is very expensive - $300 every year.

Application forms for all relevant DLC licenses and permits can be downloaded from the DLC website: http://liquorcontrol.vermont.gov/licensing/applications.html

Educational training for you and employees

Anyone serving or selling your ice cider to the public must have taken the Department of Liquor Control training seminar. The seminars are free, and usually take 3 hours. They are given all over the state on a regular basis. You can find a schedule of these seminars on the DLC website: http://liquorcontrol.vermont.gov/education/seminars.html

At the conclusion of the seminar, you are given a training certificate, which you should keep in your wallet. You must have it with you whenever you are serving or selling alcohol.

The training certificate is good for 2 years, at which point you must attend another seminar to have it renewed.

Collecting taxes on consumer sales

As of 2010, sales of bottles of wine (or ice cider) are subject to 6% sales tax.

Sales of wine-by-the-glass, including tastings for which you charge a fee, are subject to 10% (alcohol) rooms and meals tax.

You are required to collect these taxes from the consumer, and to report and pay the taxes to the State of Vermont. The Vermont Department of Taxes can give you the information on applying for these tax accounts, and the processing options for reporting and payment. Your accountant should be able to assist with this as well.

Liquor liability insurance

You will need liquor liability insurance if you will be selling your ice cider directly to the public. Many events and towns will require certificates of insurance coverage in order to approve your permit applications. Work with your insurance

agent to get appropriate coverage (usually rated on the total $$ amount of sales you expect to receive from selling direct to consumers). There is also a package policy for wineries available from Great American Insurance called Winery Pak: http://www.winerypak.com/home.html

This will be expensive, particularly in your first years when you have little experience to demonstrate that you are a good risk.

Selling direct to consumers in other states

Direct shipping to out-of-state consumers is a complicated process. Every state has its own laws, and they are changing all the time. The best single source for understanding the current status of laws and permit requirements is The Wine Institute website: http://www.wineinstitute.org/initiatives/stateshippinglaws

Selling direct to stores and restaurants in Vermont

As long as you are producing a total of 2,000 gallons or less of wine, including ice cider, you can apply for a permit to distribute your products directly to licensed bars, restaurants and stores in Vermont. The direct-shipping permit costs $200 per year.

The typical retail store margin on a bottle of wine is 25% of the *retail* price. For example, if you think the retail price should be about $20, you will set the wholesale price at $20 x (1 - .25) = $15. Some small specialty stores will apply a larger mark-up. That is their prerogative. Note that stores will expect that you will not undersell the standard 25% mark-up in your own direct to consumer channels.

Restaurants vary greatly in their approach to wine pricing. Restaurant mark-ups can range from 30% to more than 100%. Again, that is their prerogative. You need to charge a consistent wholesale price across all types of accounts.

Note that stores and restaurants are required to pay cash on delivery for alcohol. You need to provide an invoice in advance, and collect a check when you deliver.

When you go on sales calls, you may bring samples as long as you let the DLC know 5 days in advance where you will be going. Typically you carry a chilled bottle with you and provide a tasting. You may not give free bottles of wine to stores or restaurants.

If you plan on making a significant portion of your sales to restaurants and stores, you will want to establish regular routes on a schedule, and plan on calling your accounts a couple of days in advance for orders.

Working with a distributor

No additional permit is required for you to sell your ice cider to a distributor. A distributor can provide a very efficient delivery system for your product. In addition, if they are really interested in your product they can do a lot to sell it into their accounts.

The typical distributor mark-up in Vermont is 25-30% of the wholesale price they charge to stores and restaurants. For example, if the wholesale price is $15, and the distributor takes 25%, then your FOB (freight-on-board) price at your premises is $11.25. For the $3.75 per bottle that the distributor gets, they cover the freight to pick up from your premises and get the wine to their warehouse, the cost of taking orders, the delivery costs to the accounts, and the costs of their sales force.

Distributors are required to buy the ice cider from you on invoice. Once they pick-it up, they are obligated to pay you, regardless of whether they are successful in selling it all. They take the sales risk. You should be clear up front about payment terms (typically 30 days), and you may want to check references or credit history to make sure that the distributor has the financial wherewithal to pay you as expected.

Distribution channel trade-offs

Just looking at price, it would seem that selling your ice-cider direct to consumers will make you the most money, and often that is the case. If you have limited production capability and sufficient consumer traffic at your location to sell all you make, then that will surely be the best route for you. Farmers markets and events are also great economic options because you get full retail price with little incremental cost.

Other channels offer either higher costs (in the case of remote tasting locations where you have to pay rent and staff), or lower prices, but they also offer an opportunity to expand the quantity that you sell. Making the right choice involves estimating the impacts on price, quantity and costs and choosing options which will maximize your *total* profit (not just per bottle profit).

III. Pricing and Packaging

Packaging

Packaging has at least 4 components – the bottle, the label, the closure, and the capsule. Ice cider is usually packaged like an ice wine to help the customer understand visually what type of product it is. You can spend a lot or a little on packaging. If you are going to sell a good part of your production through retail wine stores, your packaging will have a significant impact on how well your product sells because the package is often the only thing the customer can use to decide. In your own tasting shop where customers can hear the story and taste the wine before deciding to buy, the packaging does not need to play so important a role.

Bottles

Ice cider is usually bottled in a 375ML format. The logic of this is that a standard serving of sweet wine is 1/2 the volume of a standard serving of table wine, 2 oz. instead of 4 oz. Therefore one 375ML bottle of sweet wine serves as many people as a 750ML bottle of table wine.

When choosing a bottle, it is a good idea to get samples and pricing from more than one source. Factors in the decision are not only price and presentation, but also what kind of closure and capsule you will use, and also your label design.

If you are using screw caps, you will need a stelvin-finished bottle. If you are using cork, a cork top or bar top bottle will work. There are a number of standard cork and capsule sizes available, but you want to make sure your bottle will work with them so that you don't have to make a custom order. Most suppliers require a minimum order size for custom orders that can be far larger than your planned production. Don't order a fantastic looking bottle and then find out you have to order 20,000 capsules to get one that will work with it.

Closure

There is endless debate in the wine world about types of closures. If you are interested in the history and details, there is a very well written book on the subject "To Cork or Not To Cork: Tradition, Romance, Science, and the Battle for the Wine Bottle", by George Taber. It is now out in paperback.

For the majority of artisanal producers, the most practical option is cork. Screw capping machines are quite expensive. While a hand-corker is very inexpensive, the disadvantages are that your arm can get really tired, and also the cork will sometimes come part way back out because of the pressure of the compressed

air or gas in the head space of the bottle. Most find that a semi-automatic vacuum corker is worth the investment.

Capsules

The most common, practical option for capsules to cover the cork is PVC. These are sold in standard colors and sizes by a number of suppliers, and the heat machines to apply them can be quite inexpensive. Tin capsules are another option but again often require a minimum order size, and a more sophisticated spinner to apply them.

Labels

Labels can be easily designed and printed in all kinds of shapes and sizes. If you plan to apply them by hand you can be quite inventive. If you plan to use a manual or semi-automatic labeler, you need to be aware of the interaction between your bottle shape, the labeling machine and your label. A slope-sided bottle can make labeling difficult if you expect the label to be put on the sloping part. Some labeling machines have limits on the diameter and height of the bottles that can be used.

Pricing

How much should a bottle of ice cider sell for at a retail store? Fortunately the Canadians have been in the market for over a decade and pricing is pretty well established there. A typical 375ML bottle of ice cider in Quebec will retail between $19 and $29. Oak-aged, sparkling, and ice-harvested versions command higher prices.

The logic of this pricing from the consumer point of view is as follows –
- It takes 4 times as much fruit to make the same quantity of ice cider as table wine. If a typical table wine is $12 for 750ML, then $24 for 375ML of ice cider makes sense.
- Ice cider is not as expensive as an artisanal icewine made from grapes. In general, the consumer does not expect an apple-based wine to command the same price as a similar quality grape wine. Some would also argue that harvesting frozen grapes at -10C is hard work and lower vineyard yields means that fruit cost is higher

Representative prices of Canadian and US ice ciders sold in the United States as of September, 2010

Producer	**Product Name**	**Price**
La Face Cachee de la Pomme, Hemmingsford, QC	Neige	$31.99
Eden VT Ice Cider	Calville Blend	$24.99
Eve's Cidery, Ithaca NY	Essence	$22.00
Domaine Pinnacle	Winter Gold Apple Ice Wine	$19.98

Production Processes

Ice cider gets its name from the use of natural cold winter temperatures to concentrate the sugars and flavors of apples before fermentation. The ice cider regulations in Quebec allow for two different methods of natural cold concentration, cryo-extraction and cryo-concentration:

- Cryo-extraction involves pressing apples that are frozen naturally to extract a small amount of very sweet juice.
- Cryo-concentration is where ripe apples are stored until winter, then pressed and the juice is put outside to freeze. Once frozen, the first 20 – 25% of juice that melts contains all the sweetness and flavor of the fruit.

A very small percentage of ice cider is made from apples that are left on trees to freeze during the winter. Only a few varieties of apples will actually stay on the trees, and avoiding rot is an issue for those that do. The vast majority of ice cider is made using cryo-concentration. That is the process that is described here.

For the purposes of this guide, we will assume a small commercial scale production quantity of ice cider between 3,000 and 5,000 bottles.

General production practices

Cleanliness is important to quality wine-making. Your licensed winery area should be thoroughly and regularly cleaned. Avoid accumulations of dust, mold, dirt and residues on floors, walls, ceiling and table surfaces.

You will spend a lot of production time just cleaning and sanitizing things before and after you use them. These are two different steps. Cleaning removes dirt, dust, and residues from surfaces. Disinfection kills microbes, including bacteria. You need to do both. One without the other is not sufficient. Winery supply companies provide a number of products for both purposes. A typical, cost-effective approach is Soda Ash for cleaning, followed by a rinse, followed immediately by citric acid solution for disinfecting, followed by a final rinse.

Water quality is really important. You want to use a water source that is not chlorinated, as any residual chlorine from washing equipment and tanks can have a bad effect on cider quality. You need to make sure that the water has no bacterial contamination as well. It may make sense to install a water filtration system.

Adding sulfites is recommended to preserve the ice cider, not only from microbiological spoilage but from oxidation. The amount of sulfites is measured in parts per million – ppm – of SO2 (Sulfur Dioxide). Be very careful to define

whether you are speaking of “Free SO2” or “Total SO2”. Total SO2 is the total amount you have added. Free SO2 is the proportion of what you added that remains to protect the juice or wine after some of the SO2 gets bound up with compounds in the liquid. There is a guide to adding sulfites using potassium metabisulfite in the appendix.

Putting gas on top of wine also protects it from oxidation. You can use Nitrogen, CO2, or a mix of the two. It’s not hard to get a cylinder of gas from a local supplier (Airgas East in St. Johnsbury has routes around the state), with a regulator and hose.

Regular record keeping at each stage of production is required by your license. You need to keep track of quantities, from raw materials coming in, to finished ice cider going out. For each stage of the process, track what you did, when you did it, including lot numbers and amounts of things you added like yeast, potassium metabisulfite, etc. Track density measurements during fermentation. Track how many bottles you produced from each batch of ice cider.

Pressing and freezing

You will need to determine the best time to press in your area based on projected outdoor temperatures and your apple storage conditions. If you have good cold storage ability, you can afford to wait longer.

The size of containers that you will put the juice in for freezing also makes a difference. Smaller containers will freeze faster, but handling them can get labor intensive. A 5-gallon plastic “Better Bottle” brand carboy will freeze solid in a week at 25 degrees F. A 275 gallon plastic IBC (Intermediate Beverage Container) will take 4 weeks and need temperatures closer to 20 degrees F. You will also need a forklift or pallet jack to move it around when full.

Don’t forget, you need to press 4 - 5 times as much juice as you plan to have final product!

Apple presses are expensive. If you don’t have one already, it will likely be cheaper to rent one from an orchard near you, or take your apples to them to press. Looking for used presses is also an option. The smallest commercial press can do about 20 gallons an hour, or 150 gallons per day. (See equipment secton of this guide).

Steps:

1. Start each pressing day by cleaning and sanitizing the containers to be filled, and any pumps, tubes or funnels that you will use to get the juice from the press into the containers

2. Prepare your grinder and press according to the manufacturer's instructions. Make sure all pieces of equipment, along with any press bags or cloths, are completely cleaned and sanitized at the start of every day
3. Make sure everyone working wears a hairnet or cap and nitrile gloves
4. Wash apples thoroughly and pick through them as they go into the grinder. Do not allow any rot! Soft spots, slight scab and other surface blemishes and punctures are acceptable
5. Press the juice. Take a small sample for analysis (see testing section)
6. [Optional, see discussion below]. Enzyme treatment and filtration
7. Fill containers, leaving sufficient head space (10%+) at top for freezing expansion. Add preservative while filling. Recommended at least 25ppm Free SO2.
8. Fill the head space on top of the juice with gas for additional protection
9. Put containers immediately outside to freeze. Pick a place that is out of direct sunlight if possible. Wind also helps the freezing process.
10. Rinse and clean all equipment and your pressing area. Soak and wash press bags or cloths according to manufacturer's instructions. (Consider a separate, cheap, washing machine just for this purpose)

Some producers will collect the juice from the press into a tank, and treat it with pectic and other enzymes, then filter it and add preservative before putting it out to freeze. This may make for easier fermentation and quicker final processing. Others of us believe this removes a lot of color and flavor from the final product. Feel free to experiment and make your own choices.

Melting off the concentrate

You need to know your target brix (sugar level) for the concentrate before you start melting. You pick your target based on the profile of the ice cider you want to produce (see the earlier section on product characteristics).

You will need one or more refractometers for measuring the brix (sugar) level of the concentrate as it drains off of the ice in the container. It is hard to find one refractometer that allows you to measure from 20 – 60 brix. Usually there's one from 0 – 32 and one from about 30 – 60. (see Sources listing in the appendix)

It's not always easy to tell when your containers are thoroughly frozen. For 5-gallon carboys, you can just turn them upside down and see if there is any liquid movement. For large IBCs, you can open the drain carefully and see if anything comes out. It's good to wait for a couple of particularly cold days and then start. If you make a mistake and the juice is not frozen enough, you just put the container back outside and wait some more.

For carboys, it helps to construct some kind of rack for melting several at a time. Here's a picture of a rack we built with funnels underneath the mouths, connected to collection carboys using maple sap tubing.

For IBCs, you will need to get a fitting to connect the drain to a piece of tubing, and some kind of collection tank. Also you will need a way to have the IBC be higher than the collection tank so that the concentrate can flow from the IBC to the tank using gravity. This picture shows an IBC raised on a tote lifter, draining into a maple sap tank.

Steps:

1. Clean and sanitize your fittings and tanks at the beginning of each day
2. Open your container and start draining. If nothing comes out, don't worry, just wait. With an IBC it's good to keep the drain closed and just keep opening every 30 minutes or so to see if it's starting to melt. Occasionally if the juice is not frozen all the way in the center, a break can happen with a lot of low brix juice flowing out too fast. If you open the drain and get a flood, just close up your container and put it back outside
3. Use the refractometer to measure the brix of the juice when it starts to flow. As long as the brix is above your overall target you keep draining. Once it falls below your target, you can still use it until the overall average of the juice falls to your target level. Stir the juice in your collection tank and measure the brix of that relative to your target
4. Once the collection tank is full, or you've reached your target brix, you should put gas on top until the concentrate has warmed up sufficiently to start fermentation (minimum of 55 F)
5. At the end of the day, decide on a case by case basis whether you want to leave a container inside overnight or put it back outside. With carboys and rapidly melting IBCs, it's best to put them back outside. With an IBC that's very well frozen and just beginning to thaw, you can leave it overnight inside with only a small risk that it will melt too much before you start draining the next morning.
6. Rinse and clean all your fittings, tubes and any empty, used collection tanks.

If you are draining to several collection tanks that you plan to combine into one stainless steel fermentation tank, you will need to keep a record of gallons added, brix of gallons added, and calculate the cumulative weighted average brix of the concentrate in the fermentation tank. For example, say I've put the following into my 100 gallon fermentation tank:

- 50 gallons at 36 brix
- 30 gallons at 34 brix

If my target brix is 34 brix, what should the brix level be of the last 20 gallons I add to the tank? The current weighted average brix of the 80 gallons in the tank is [(36x50) + (34x30)]/80 = 35.25. My target is 34, so the last 20 gallons should be at [(34x100) – (35.25x80)]/20 = 29 brix.

Fermentation

Fermentation of the apple concentrate is very similar to wine fermentation. And there are many good books on winemaking. Two that we've found helpful are –

- “From Vines to Wines” by Jeff Cox
- “Modern Winemaking” by Philip Jackisch

Two things to keep in mind are that the concentrated cider is low in nitrogen and other yeast nutrients, and that you need a yeast that won’t die from stress before it gets to your target alcohol level. Be sure to start your yeast in a solution with plenty of added yeast nutrient.

You can use a basic champagne yeast from any wine hobby supply shop. Scott Lab has lots of different yeast varieties from major producers, and a very knowledgeable staff that can provide good advice. www.scottlab.com

You need to know your target alcohol level for the finished ice cider (see the earlier Product Characteristics section). A quick rule of thumb is that every 7 point drop in density means that 1% of alcohol has been created. Based on your starting density, you can calculate your stopping density level. For example, if your starting density is 1.165 and you want your final product to have 11% alcohol, then your stopping density would be 1.165 – 0.077 = 1.088.

What kind of fermentation vessel should you use? You can use plastic, stainless steel or oak barrels. The steps below assume stainless steel, but would be almost identical for the other two.

Steps:

1. Make sure your fermentation tanks are cleaned, sanitized and set up with valves, thermometers, etc. the way you want them. (It’s a bummer to realize you don’t a valve where you want one *after* the tank is full!) For tanks 600 L and larger, we like a drain valve at the bottom, and a valve a few inches above the bottom for racking off the lees, e.g. pumping out the wine from above the dead yeast gunk that settles at the bottom of the tank
2. Fill the tank with concentrate at the target brix level
3. Keep a layer of gas on top while you wait for the concentrate to warm up to at least 55F. Sometimes we put a small space heater near the tank to speed that up
4. Take a sample from the tank and make your initial measurements of brix, density, total acidity and pH (see testing section)
4. Prepare your yeast using a yeast nutrient. We’ve found Fortiferm to work very well. The fermentation manual from Scott Lab gives precise instructions on how to do this: http://www.scottlab.com/pdf/2010ScottLabsHandbook.pdf
5. Add hydrated yeast to the tank.

6. The yeast will take a few days to multiply and get going
7. Measure density every few days, or more often if you are worried about the speed of fermentation. While some producers ferment warmer and faster, the risk of off-flavors can be higher. A good rule of thumb is that the density should drop no more than 2 points per day (e.g. from 1.145 to 1.143) and temperature should stay below 65F. Above all, keep smelling and tasting.
8. When you reach your target density, stop the fermentation (see discussion below)
9. Rack the ice cider off the lees into a tank for aging and fining
10. Take final measurements of density, total acidity, pH, and total and free SO2.

There are a couple of ways to stop fermentation, depending upon the yeast you are working with:

Method 1 – Cold. Some yeasts are not very cold tolerant, and will stop working if you pump the wine to a tank outside, assuming your exterior temperature at this point is somewhere between 27 and 38. To use this method, add 50ppm SO2 and put the wine outside for 5 days. Then rack off the lees into another tank.

Method 2 – Sulfites. Some yeasts, notably Sauternes yeast, are very sensitive to sulfites. Add 80 – 100ppm SO2, and get the wine to as cool a temperature as you can. Wait a day or two until you see that fermentation has stopped and most of the dead yeast has fallen to the bottom of the tank. Rack the wine immediately off the lees

In either case, if you are nervous about fermentation restarting, you can immediately filter the ice cider through coarse, medium and then fine (.45 micron) pads. The .45 micron level is the one that will catch residual yeast cells, but you need the first two to clear the ice cider enough to not jam the .45 pads.

Aging, Fining, Bottling

It is perfectly acceptable to filter and bottle right away after fermentation. You avoid any fermentation restart, and you can age in the bottle safely assuming you used good bottling practices.

Some aging is usually a good idea in order to allow the flavors, sugars and acidity to meld harmoniously.

Fining is the practice of adding clarifying agents to help particulates precipitate out of the ice cider, which aids in filtration. Again, Scott Lab sells a wide variety of fining agents and can provide good advice based on your needs.

If you choose to age in tanks, be sure to keep air off the ice cider, using gas or sealed tops on the tanks. We recommend keeping the free SO2 level at about 20 – 25 ppm. (In other words, measure free SO2 after you've racked the wine, and if it's lower than that, make an addition to bring it back to that level.)

If you decide to age in oak, make sure the barrel is properly prepared, and completely full. You will want to have a small reserve of ice cider in an airtight container to top off the barrel as the ice cider evaporates a little over time.

If you are blending ice ciders made from different apple varieties, you would usually blend before fining and filtering.

The day before you start bottling, measure and correct your Free SO2 level as necessary. You can also add 12 - 15 g/hL of Potassium Sorbate which acts as an inhibitor to any in-bottle re-fermentation.

The main goal for bottling is to get the ice cider into a sanitized bottle as quickly and cleanly as possible. The ideal process is one seamless line from tank to filter to filler to corker. You can either label and capsule at the same time, or save that for another date depending on how you manage your labor. For example, if you know you will have time to label and capsule yourself later, you can save money by hiring fewer people to help on bottling day.

Steps:

1. The week before bottling, make sure you have all the equipment and supplies you need, and that everything works. This is so you have time to order replacement parts, fix things etc. in time for bottling day.
2. The day before you bottle, clean and sanitize all your equipment and pipes, fittings, etc. Then set up your bottling line: tank to filter (which has the pump) to filler. You need a place for your rinsed or sparged bottles to be handy to the filler. The corker should be close enough to the filler on the other side for an easy, safe hand-off.
3. Early the morning of bottling day, put new pads in your plate and frame filter, and run water through for 20 minutes.
4. Connect the pipes from the tank to the filter, and from the filter into a bucket. Open the valve from the tank. Make sure that the lid of the tank is unsealed to allow air in as the liquid goes out. Pump cider through the filter to flush out the water into the bucket.
5. Connect pipe from the filter to the filler. Turn on the pump and fill the filler. Take the first two bottles filled on each spout of the filler and dump them back into the tank of ice cider.
6. Get your help in place. Make sure everyone has hairnets or caps, and is wearing nitrile gloves. Start bottling!

7. When you reach the end of the tank, you will end up losing some of the wine that is in the filter. You can use water to push this, but you run the risk of dilution.
8. At the end of the run rinse, clean and sanitize your tank, filter and filler and all pipes, fittings, etc. Clean and wipe dry the jaws of your corker and remove any cork dust. Put things away and mop the floor.

Bottles should stand upright for at least a week for the cork to form a good seal. Then you can put the cartons on their side for storage. It's a good idea to wait at least 2 weeks before starting to sell them, preferably more like 4.

IV. Testing Methods

Testing is really important for quality control, and to know whether you are meeting your product goals. Most of the critical tests are not that hard to do yourself. For more sophisticated tests, you can send samples out to a professional laboratory. However, at a cost of about $100 or more per sample, that can be quite expensive.

Here are the basic tests and when you do them:

	Pressing	Melting	Fermentation	Post - Fermentation	Pre-bottling
Brix	X	X	X		
pH	X	X		X	
Total Acidity	X	X		X	
Density		X	X	X	
Temperature			X	X	X
Free SO2				X	X
Total SO2				X	X

Brix

Equipment: Refractometer, disposable plastic pipette

Procedure:
1. Use a pipette to suck a small amount of juice and squirt it onto the surface of the refractometer
2. Close the lid and look through the eye-piece at a light source
3. Measure where the blue line hits the scale

Brix does vary with heat, so try to get a refractometer that is normalized to 20C degrees. If you don't have a normalized one, just realize that the warmer the temperature, the lower the brix reading and vice versa.

pH

Equipment: pH meter, 3 small flasks
Supplies: buffer solution Nos. 4 and 7

Procedure:

1. Calibrate the pH meter once per day. Put buffer solution 4 in one flask, 7 in another. Hold the probe in solution 4. Tune so that it reads 4.0. Rinse the probe, dry it. Then hold it in solution 7. Tune the meter so that it reads 7.0. Rinse the probe, dry it. Repeat.

2. Get a small sample of juice/wine in the third flask. Put the probe in. Read measurement. (Hopefully it is somewhere between 3.2 and 3.8!)

Temperature

Use a digital instand read thermometer to measure the temperature of samples you take during fermentation. It's also helpful to have a thermometer well on your tank so you can see at a glance how warm or cold the fermenting cider is.

Density

Equipment: Hydrometer, 100ml graduated cylinder
Procedure:
1. Using a wine thief or sample valve on your tank, fill the graduated cylinder to 80ml
2. Drop the hydrometer in the cylinder and wait until it stops bobbing
3. Read the scale at the surface of the wine

Total Acidity, Free SO2 and Total SO2

These tests are not difficult, but they involve chemicals that can be dangerous to handle, and some specialized lab equipment. There are a number of wine-making books and online resources that spell out the procedures. The procedures were also covered in the Cider Making workshops given by Peter Mitchell as part of this grant effort in Vermont in 2009 and 2010. The best option is to ask a more experienced winemaker to teach you!

V. Facility Requirements

We've seen a lot of different wineries set up in all different manners. At the end of the day, you just need a place that will work for you, and meet basic requirements. Here are the basics –

- Access to hot and cold water
- Floor drain
- Washable floors, walls and ideally ceiling
- Convenient, water-protected electrical sockets
- Water-protected overhead lighting
- Separate access from any residential quarters
- Access doors should be exterior-type doors with locks
- Door to exterior should be large enough to accommodate equipment
- You need sufficient space for your tanks, plus the additional room needed for pressing, and for the melting process

Additional facilities better-to-have:

- A convenient 20V outlet (required for some pumps and presses)
- A sink to wash and places to drain and dry fittings, tubes, pipes, lab equipment
- A stainless steel table for lab equipment, writing notes, etc.
- A lockable storage cabinet for supplies, chemicals
- A dry storage place (doesn't have to be in the winery) for bottles, corks, labels, etc.

A well insulated building with heating and cooling is desirable. Cooling is particularly important in the late spring and summer if you still have finished ice cider on the premises. You want to keep it at 55 - 60F if possible.

VI. Recommended Equipment

These days you can find sources and ideas for equipment all over the internet. We've listed some recommended equipment below, but you might find something else that works better, or is cheaper, or both. Take this list as a starting point. Again, it's based on what might work for a production level of 3,000 – 5,000 bottles.

General

- Pump with sufficiently lengthy hoses and fittings that match your fermentation tanks
- Gas cylinder with regulator and hose
- Miscellaneous collection tanks – we like maple sap tanks
- Spray nozzles and hoses with adapters to fit your hot and cold water taps
- Pallet jack and a bunch of pallets that you can move things around on
- Large 5-gallon pails for mixing things, sanitizing things, general use
- Stainless steel spoons, sieves, a large funnel
- Plastic 1 and 2 liter mixing jugs
- Plastic wine thiefs
- Paper towels and rags

Pressing

- Squeeze-box press or rack press capable of 150 – 250 gallons per day with grinder
- Replacement press bags or cloths
- Juice collection tank

For freezing the juice

- Plastic freezing containers, anywhere from 5 gallons to 275 gallons. IBCs should have both a fill opening on top and a drain spout at the bottom

For melting

- Rack for smaller containers with funnels, tubes and tanks to collect the concentrate, or lift jack for IBCs with fittings and pipe to connect drain spout to collection tank

Fermentation

- Fermentation vessels of your choice (plastic, stainless steel, oak). Make sure that you have at least one extra tank that you can pump into, otherwise if all your tanks are full, you have nowhere to go when you need to rack the ice cider!

- Appropriate fittings. For variable capacity stainless steel tanks of 600L or more we recommend 2 butterfly valves, manway door, sample valve, thermometer well, and lid with vinyl gasket and pump and airlock.

Testing

- Stainless steel table
- Ehrlenmeyer flasks, beakers, burette with stand
- Gram balance (weight scale) – best to within .1 gram, up to at least 100g
- Plastic graduated cylinders – 10ml, 25 ml, 100ml, 500ml
- Plastic pipettes
- pH meter
- Hydrometers
- Digital thermometers

Filtering and bottling

- Plate and frame filter with pump – Buon Vino SuperJet, or for larger capacity a 20-plate plate and frame filter; coarse, medium and fine (.45 micron) filter pads to fit
- Pipes and fittings to connect tank to filter and filter to filler
- Bottle trees and rinser if you plan to rinse your bottles
- Sparger if you plan to sparge your bottles with gas
- Gravity filler – 2 or 4 spout is adequate
- Semi-automatic corker (You can do about 500 corks a day with a hand corker before it and you start to give out. Any more than that and you will be delighted to have the semi-automatic – or at least rent one.) You also need a small air compressor to run this
- Labeler – choose this when you are choosing your bottle shape. Some labelers have a hard time with tapered bottles, or taller bottles
- Capsuler – a heat-coil for PVC shrink capsules, or a spinner for tin capsules

VII. Production Costs – Variable and Fixed

Everyone's situation is unique. You may already have an orchard and thus a cheap supply of apples. You may have an existing winery which would allow you to order some things at larger quantities and greater savings, or use existing equipment. To help you estimate costs we've put together a list of what you will need, and a format for calculating total and per bottle costs.

Some basic parameters:

- 3 gallons of juice per bushel of apples (differs based on variety of apple and type of press)
- 1 gallon of concentrate for 4 gallons of fresh juice (differs based on variety of apple and the intensity of your melting efforts)
- Finished ice cider = 85% of the concentrate you started with (you lose less % if you work with larger quantities)
- 1 gallon fills just over 10 375ML bottles

So for example if you plan to make 3,000 bottles (375ML) you will need the following:

- 3,000/10 = 300 gallons of finished ice cider
- 300/.85 = 353 gallons of concentrate
- 353/.25 = 1,412 gallons of fresh juice
- 1,412/3 = 471 bushels of apples

Variable Production Costs	**Estimation method**	**Total**	**Per Bottle** (divide by bottles produced)
Apples	Cost per bushel * bushels	$	$
Pressing labor	cost per day x # gallons juice / gallons per day	$	$
Fermentation ingredients	Cost per unit x units per gallon x # gallons of concentrate	$	$
Filter pads	1 set each grade for every 100 gallons	$	$
Bottles and boxes	# bottles x bottle and box cost per bottle	$	$
Corks	# bottles x cost per cork	$	$
Labels	# bottles x cost per label	$	$
Capsules	# bottles x cost per capsule	$	$
Bottling labor	Cost per day x total bottles / bottles per day	$	$
Total variable		**$**	**$**

production costs			

Fixed Production Costs	**Estimation Method**	**Total**
Facilities expenses	Rent and utilities per month x 12 months	$
Production supplies	Cleaning supplies, gas cylinders, lab supplies, record keeping supplies, hoses, pails, small parts like clamps, spoons, funnel, paper towels	$
Equipment depreciation	Use 7-year straight-line depreciation – take the total from your equipment estimates below and divide by 7 for annual cost	$
Equipment rental	If you plan to rent any equipment instead, estimate rental cost	$
License	Annual VT license	$ 250
Total fixed production costs		**$**

Equipment Investment	**Total**
Pump, hoses and fittings	$
Collection tanks (2)	$
Pallet jack	$
Pallets (4)	$
Press with grinder and press bags or cloths	$
Freezing containers (plastic)	$
Melting rack or IBC lifter	$
Fermentation tank(s) with fittings	$
Lab table	$
Gram balance, pH meter	$
Plate & frame filter	$
Bottle trees / gas sparger	$
Gravity spout filler	$
Semi-automatic corker	$
Labeler	$
Capsuler	$
Total equipment investment	**$**

VIII. Sales and Marketing Costs

How you spend money on sales and marketing should be directly related to your distribution strategy. If you plan on selling 100% of your production directly to the public from your premises or at farmers markets, then you should focus your $ and activity on awareness building among wine drinkers who live in your area or are visiting your area. Putting an ad in a large state-wide magazine will not be cost-effective compared to your local paper, posters in key locations around town, or flyers at local hotels and resorts.

Here are the types of expenses you can expect to incur in some form:

Marketing and Sales Costs	**Total**
Logo and label design	$
Website design and hosting	$
Email service	$
Tent, banner, and table for farmers markets	$
Business cards	$
Rack cards or brochures	$
Event Fees	$
Farmers Market Fees	$
Event and farmers market permits	$
Advertising	$
Shopping bags	$
Cash box, register	$
Credit card fees and swiper	$
Automobile expense and gas for self-distribution	$
Payroll costs for any sales or distribution staff you need	$
Shipping materials	$
Total marketing and sales costs	**$**

IX. Alcohol Permits and Taxes

Ice Cider is considered a fruit wine by the federal government. In order to manufacture it, you need to get a Basic Wine Permit from the Tax & Trade Bureau (TTB). In addition, you will need a Wine Manufacturer's License from the Vermont Department of Liquor Control. You need the TTB Permit before you can apply to Vermont for the state permit.

You should plan on obtaining both licenses *before* you begin fermentation!

Both TTB and Vermont require that you file a production report and pay excise taxes on the amount of wine you produce and remove from your premises. All bottles removed from your premises are subject to this tax except for family use, breakage, and lab testing.

TTB

Getting your Basic Wine Permit can take several months. All of the materials needed are described on the TTB website and application forms and instructions are downloadable there. You want the instructions and documents in order to file Form 5100.24. http://www.ttb.gov/applications/winery_packet.shtml

Note that you will need to provide some kind of bond as surety that you will pay the taxes you will owe. For a small operation, the requirement is a $1,000 bond. You can try to get a surety bond from a bond company, or you can send a check for the full amount.

As a small winery of less than 2,000 gallons, you will only need to report and pay taxes once per year. See TTB website for instructions and forms for 5120.17 – http://www.ttb.gov/wine/wine_premises_reminder.shtml

Vermont DLC

Once you have your federal Basic Wine Permit, you may apply for a Vermont Manufacturer's license. The application for the manufacturers license can be downloaded at the DLC website here- http://liquorcontrol.vermont.gov/licensing/applications/manufacture.pdf

As part of the application process, you will need to take a manufacturers training seminar. In addition, your premises will be visited by the DLC's license investigator.

Depending on your distribution strategy, you will be subject to various tax collection, reporting and payment regulations:

Type of Tax	Who must pay	When	How
Excise Tax	All licensed wine manufacturers	Every month, before the 10th day of the subsequent month	Send completed Vermont Vinous Beverage Tax Return and payment to VT Dept of Taxes
Sales Tax – 6%	Those who sell wine directly to consumers	Depends on your volume. Small wineries are usually on an annual basis, but check with VT Dept. of Taxes	Recommend using eBiz File. Sign up for Sales Tax Account with VT Dept of Taxes.
Rooms & Meals Tax – 10% (alcohol)	Those who charge money for consumer tastings or sell wine by the glass directly to consumers	Monthly, before the 10th of the subsequent month.	Recommend using eBiz File. Sign up for Rooms & Meals Tax Account with VT Dept of Taxes
Direct Shipment Report	Those who get a permit to ship directly to stores and restaurants.	Annually, in January for the previous year.	Complete and send the report to Vermont DLC

For information about applying for Vermont business tax accounts and signing up for eBiz File online filing, check the Vermont Department of Taxes website: http://www.state.vt.us/tax/business.shtml

They also publish a guide to business taxes - http://www.state.vt.us/tax/pdf.word.excel/business/guidetobustaxes.pdf

X. Capital Planning

There are several key issues to consider as you plan your investment in creating an ice cider business:

- Equipment and production facilities
- Working capital
- Sales and distribution capital needs
- The capital requirements of growth

Equipment and production facilities

These are the obvious capital investments that people think about when starting a winery. For ice cider in addition to winery equipment and facilities, you will also need freezing containers and melting equipment. Know how much ice cider you want to make, and size your equipment appropriately. Don't forget you need an extra tank for pumping into.

Use the sections in this document on Recommended Equipment, Production Costs, and Appendix C: Equipment and Supply Sources, to come up with your list of equipment and estimated costs. Enter these costs in the capital investment area of the economic model in the next section. Note, if you are renting a facility that cost would go in the expenses area, not the capital investment area.

Sales and distribution capital needs

In addition to your plant and equipment, you need to plan for capital investment related to your distribution strategy.

Will you have a tasting room open to the public? It will need some kind of bar, a sink, a rest room facility, decoration, glassware, and a cash register.

Will you be going to farmers markets and events? You will need a table, signage and a tent at minimum.

Will you be self-distributing to stores and restaurants? You will need a vehicle.

Use the list in the earlier section of this document, Sales and Marketing Costs, to develop your own list and cost estimates. Enter these costs in the capital investment area of the economic model in the next section. You only need to count items that cost more than $200 as capital investment. Other small items can be counted as a sales or marketing expense.

Working capital

Working capital refers to the expenses that you will make before you get any revenue back from selling your product. The down-side of the ice-cider business is that, like all wineries, you spend all the money to make the product before you ever sell any of it. You need to be sure you have enough at the start to make it through to the sales season.

Use the sections in this document on Production Costs and Sales and Marketing Costs to estimate your total expenses. Enter these costs in the appropriate expense areas of the economic model in the next section.

Growth requires more working capital

If you plan to start small and produce more every year, you will need to make sure that you plan for larger and large requirements of working capital. The need for more, larger equipment is only one part of the issue with growth. The financial hole that you dig while you make the product gets bigger as your production gets bigger. This is why it is very important to make your financial plan a monthly plan, so that you can see how the timing of expenses and revenues is going to impact your needs for cash during the year.

Make several copies of the economic model in the next section and use one for each year for the first three to five years of your ice cider business. Make sure that your ending amounts for one year equal your starting amounts for the next year.

XI. Sample Pro-Forma Economics

If you've researched your costs and capital needs, the final step is to put it all together in a model that will allow you to see what kind of investment you will need to make, and also allow you to adjust the parameters and see the impact of different scenarios.

Included with this guide is an Excel spreadsheet model that provides a format for economic evaluation on a monthly basis for the first 2 years of operation. To evaluate economics beyond 2 years, you can just make more copies of the second worksheet.

A blank copy of the spreadsheet is included in case you prefer to use pencil, paper and calculator.

Things to note about how the model works:

1. All monthly numbers for bottles removed, variable and fixed expenses, and capital investments should be estimated and entered by you, based on your particular situation and plan. The monthly and annual totals calculate automatically, which allows you to change individual costs and see the overall impact. Cells with formulas in them are shaded pale gray as a warning not to type into them and overwrite the formula
2. The monthly revenue and the excise tax will calculate automatically based on what you enter for monthly bottles removed (sold or sampled) in rows 10 - 14, and prices in cells C21 – C23. These areas are also marked in pale gray as a reminder not to type into these cells and overwrite the formula
3. The cash flow numbers in rows 76-79 calculate automatically. Based on the financial results of your plan, you will be able to tell how much cash you will need to start with by looking for the biggest red number in the Cumulative Cash Flow row 79. It's also good to have a cushion for unplanned expenses or slower than expected sales. Put your starting cash number in Cell B76 and check your Ending Cash row 78 to make sure you don't hit red
4. The second year worksheet takes starting numbers from the 'Ending' column of the first year worksheet for the following: Beginning Inventory B6, Starting Capital Assets B66-74, and Starting Cash B76. These cells are shaded pale gray again so that you avoid typing over the formulas

A sample completed model is completed and included here. It assumes the following situation:

- An existing orchard with utility apple supply adequate to make 3,000 bottles of ice cider per year. This would require about 480 bushels of apples.
- The orchard already has cider pressing equipment
- The orchard already has a farm stand open to the public which can be modified to use as a tasting room, subject to DLC licensing requirements
- The orchard has sufficient traffic between its tasting room and one or two local farmers markets to sell out of its annual production
- The orchard has a pallet jack or forklift
- The orchard has flexible labor available to help with pressing, concentration, fermentation and bottling
- No new facility or office investment or expense is required
- Production starts in December, and ice cider is bottled and ready for sale in June
- New winery and bottling equipment is purchased at the time of use or slightly before
- Packaging is of good to very good quality
- Target retail price is $25.00

From this scenario you can see the following results –

- Revenue of $52,000 - $55,000, incremental operating profit of $28,000 - $30,000
- Initial cash investment of $40,000 is required to cover $18,700 of capital expenditure, $14,700 of working capital and a 'cushion' of $6,600
- On cash basis the operation is cash positive by the end of the first year. In year two it produces over $27,000 in free cash flow, incremental to the existing orchard business

Your specific situation and goals may be completely different. Nonetheless you should be able to use this model to carefully estimate various scenarios and make good business decisions about how to get started making Vermont Ice Cider.

For questions about this planning tool, please contact:

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Appendix A: Apple Variety Characteristics

The types of apples you choose to use will have the greatest influence on the taste of your ice cider. One of the benefits of ice cider is that pretty much all dessert apples work well. The Canadian producers use MacIntosh and its off-spring Cortland, Liberty, Spartan as well as Empire, Lobo, Wolf River, Golden Delicious and others. While the resulting taste of the ice ciders from these apples may differ, they are pretty much all delicious when made well.

If you have them available, you may also wish to experiment with some heirloom and cider varieties. In all cases, it's a good idea to juice some apples in a home juicer, taste the juices, and measure brix, pH and TA before you begin. If you are going to ferment only one batch of ice cider, it's a good idea to make sure you have a balanced blend. We've found that TA is best between 5.0 and 7.0 grams per liter. Higher brix varieties yield more concentrate and therefore more final product, but some of the sweeter apples have very low acidity and need to be blended for balance.

On the following page are test results from a variety of apples we juiced and tested in the fall of 2009. You can see that there is substantial variation in the profile of these apples!

Apple Variety	Juice Color	Brix	pH	TA [g/L]
Ashmead's Kernel	yellow-brown	15.0	3.3	9.1
Winesap	light pink brown	12.0	3.5	5.6
Black Oxford	tan	12.0	3.5	5.6
Calville Blanc	light yellow	11.0	3.2	6.4
Cox's Orange Pippin	yellow	11.5	3.4	7.1
Esopus Spitzenburg	light pink tan	12.5	3.3	6.6
Ananas Reinette	light yellow	11.0	3.1	7.5
Northern Spy	light tan	11.5	3.2	6.1
Black Gilliflower	light green	12.0	3.7	2.9
Lamb Abbey	light tan	10.0	3.4	5.1
Blue Pearmain	tan-green	10.0	3.6	2.7
Roxbury Russet	light yellow	15.5	3.4	5.6
Hudson's Gem	tan	13.0	4.0	2.7
Honeycrisp	pink-brown	9.6	3.3	8.5
Empire	light tan	11.0	3.3	7.3

Appendix B: Sulfite Addition

Sulphur has been used in wine-making for thousands of years. Humans learned early on that sulphur's strong anti-oxidation properties kept wine from going bad and turning into vinegar or worse. However, there is a very small percentage of the population that does have a severe respiratory reaction to sulphur. In addition, the overuse of sulphur in a wine does seem to be associated with headaches (but so does the over-consumption of alcohol).

The easiest way to add Sulphur Dioxide [SO2] to wine is using a salt form such as Potassium Metabisulfite. In salt form only a little over 50% of the salt is actually SO2, so when you calculate your addition, you need to take into account that you need to add twice as much salt to get the desired SO2 addition.

We've found it also helps to dissolve the salt in distilled water before adding it to the ice cider. This helps it mix more thoroughly.

Here's the basic approach:

1. Create a 5% solution of SO2 in distilled water. For every 10 parts of water, add 1 part of the potassium metabisulfite. [It's 5% because the sulfite salt is only a little more than 50% SO2]

2. Figure out how much Free SO2 you want to add to the juice. If you want the Free SO2 level (the amount available to fight oxidation and microbiological infections) to be 35ppm (parts per million), and your juice or wine currently measures at 10ppm, then you need to add 25ppm Free.

3. Here's the formula for the amount of 5% solution to add:

[[[#ppm freeSO2 to add] x [Liters of cider]] /50] x 1.5 = Number of ML of solution

So for our example of adding 25ppm Free, to a batch of say 100 Litres (about 25 gallons), you would add:

[[[25]x[100]]/50] x 1.5 = 75ML of 5% solution.

Appendix C: Equipment and Supply Sources

Sources for equipment and wine supplies:

G.W.Kent – www.gwkent.com Ypsilanti, MI
Tanks, pumps, hoses, lab equipment, bottling equipment

St. Patricks of Texas – www.stpats.com Austin, TX
Tanks, pumps, hoses, lab equipment, bottling equipment

Presque Isle Wine – www.piwine.com North East, PA
Full line of equipment and supplies, including yeasts, cleaning and sanitizing, lab equipment and supplies, bottles, corks, capsules, etc.

More Wine Pro – www.morewinepro.com Concord, CA
Smaller scale winery equipment, and supplies

Scott Laboratory – www.scottlab.com Petaluma, CA
Full line of yeasts, yeasts nutrients and winemaking supplies. See their annual fermentation handbook with "how tos". Sales people are very knowledgeable. Also a source for good quality corks of various types. Finally, they do fast and reliable analytical wine testing.

Sources for glass bottles:

Bruni Glass – www.bruniglass.com East Coast office is in Montreal

Dominion & Grimm – www.dominiongrimm.ca/en U.S. office is in Fairfax, VT

Sources for apple presses:

OESCO – www.orchardsupply.com MA

Good Nature, Inc. – www.goodnature.com Buffalo, NY

Sources for laboratory equipment and supplies:

Flinn Scientific, Inc. – www.flinnsci.com Batavia, IL

AFAB Enterprises – www.refractometer.com Eustis, FL