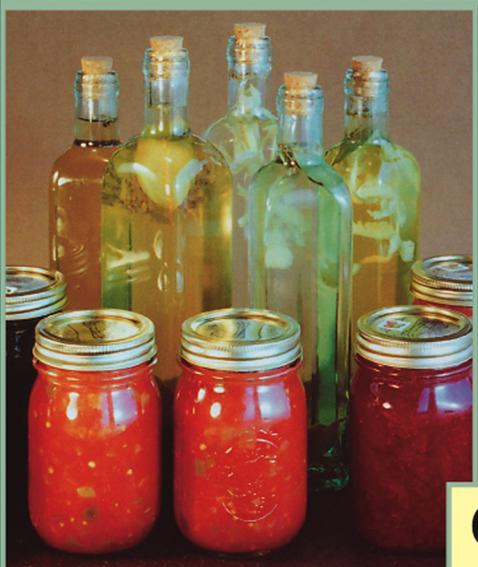
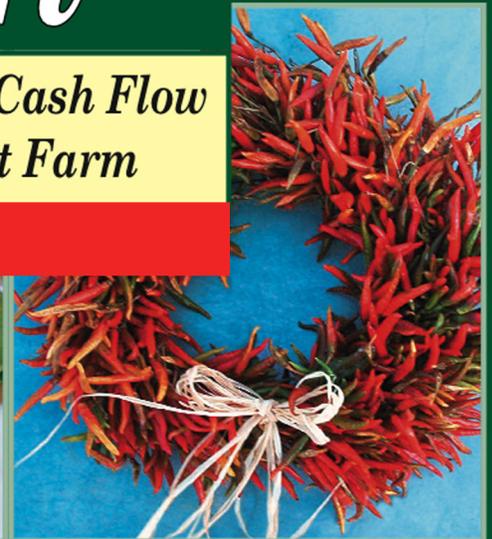




Extending the Season

*Six Strategies for Improving Cash Flow
Year-Round on the Market Farm*

Second Edition



Growing for Market

From the editor

Extending the Season was first published in 2003 as a printed booklet. When we ran out of printed copies a few years ago, we made it into a digital edition that has been free to *Growing for Market* subscribers. I was recently looking through that first edition and was struck, as always, by the fact that good ideas are pretty much timeless. What worked 10 years ago still works today. And the overall topic, season extension, is more important than ever as we attempt to grow local food systems. So I decided to republish this second edition of *Extending the Season* in the hope that it will provide growers with tools and inspiration for making more money over a longer season.

A few things have changed in the past decade as markets and trends have evolved. I tried to remove dated and irrelevant references; I deleted prices, for example, because (I hope) those have changed. I revised references to federal laws to reflect current realities. Some articles I left untouched even though they may seem a little out of date, simply because the practical information they contain is still so valuable. Finally, I substituted some very recent articles for some of the older ones on the same topic.

All the articles in this book first appeared in *Growing for Market* magazine. This collection represents just a tiny fraction of the useful, farmer-written articles published in GFM every year. In fact, the GFM Online Archive contains more than 1,500 articles, everything published from 2001 to the present. Every year, we publish 50 to 60 exclusive articles by growers, both veterans and rising stars of the market farming world. I am always looking for new writers, too, so I welcome inquiries from growers who have an idea or experience to share.

If you enjoy this collection of season extension articles, I hope you will subscribe to GFM. We offer several types of subscriptions (a complete explanation of options is on the back cover.) Whether you prefer to read print or online; whether you want just a subscription or you want to catch up on what you've missed in the past, we have subscription options for you. We also sell a carefully curated selection of excellent market farming books, including some that are not available elsewhere—references we know to be valuable to growers new and experienced. Book sales are an important revenue stream for our business, allowing us to keep our staff working year-round, so we thank you sincerely for buying your books from us. As an additional token of our appreciation, we give GFM subscribers a 20% discount on all the books we sell. Please visit our website, www.growingformarket.com, for a complete list.

Market farming can be a solitary business, and it's important for all of us to share information that will advance the cause of small-scale farming and local food systems. That sharing happens in the pages of *Growing for Market* every month. I hope you'll join us and become a subscriber.



With best wishes,
Lynn Byczynski
Editor and Publisher

Extending the Season

Six Strategies for Improving Cash Flow Year-Round on Your Market Farm
Second Edition
Revised and Expanded

Edited by Lynn Byczynski
Growing for Market

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Cover photos - clockwise from top left:
'Tempress' poppies in a hoophouse in spring by Lynn Byczynski
Winter squash and other storage vegetables by Paula Wheeler
Pepper wreath by Janna Field
Eliot Coleman's greenhouse by Ted Carey
Vinegars and salsas by Paula Wheeler
Snow-dusted greens by Brett Grohsgal

Introduction

When most people start market gardening, they grow the easiest and most abundant crops - summer vegetables, fruits, herbs or cut flowers. As a result, June through September becomes the most important marketing season, and the new farmer has to make as much money as possible in that brief window.

Soon, though, this single-season blitz shows itself to be unsustainable. For many growers, trying to make a year's worth of income in one-third of a year means long days, seven days a week. Physical and psychic exhaustion can set in, and some of the joy of farming dissipates.

The economic impact of single-season marketing is problematic, too. Prices are at their lowest when the supply is greatest in the summer. The serious market farmer has to compete not only with every other farmer's summer crops, but also with the hobby growers who drop into markets in midsummer (often content to practically give away their produce) and a reduced demand from people who have their own gardens. The farmer who has worked so hard to produce a bounteous summer crop often finds that it's hard to sell it all or that the going price is barely break-even.

In most cases, growing and selling in the summer alone is not going to produce enough income to sustain a farm family. Any enterprise that endeavors to be profitable or to provide a significant portion of a family income must have a longer season of sales. Season extension becomes a matter of financial viability.

Here are some of the benefits of extending the season on a market farm:



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- Crops harvested before the peak season bring in higher prices. After a long winter of hard, pink tomatoes, for example, people are willing to pay well for a vine-ripened summer tomato.

- Some of the most flavorful crops are those that are grown in the cooler seasons of spring and fall. Broccoli, lettuce, and carrots are examples of crops that taste dramatically better when grown early and late in the year.

- Good employees are hard to find, and virtually impossible to keep, if a farm can provide a job only half the year. Year-round cash flow makes it possible to hold on to good workers over the winter so they can help you make more money in the peak season.

- Farming in the slow season can be quite a bit more leisurely than in summer, leaving time for planning, reading, repairing tools and other fun chores.

- Adding income in the shoulder seasons and the off season will allow you to be calmer during the peak season. Yes, you'll still have to work hard - to make hay while the sun shines, so to speak - but you won't have to kill yourself. By adding a few months of shoulder-season sales, you can spread out your cash flow to be more steady and predictable.

Season extension is not difficult, but it does require some strategic planning and market research. This book will review six strategies that farmers use to spread out their workload and maintain cash flow through most or all of the year. Here are the strategies:

1. Protected early and late crops. Plastics make it possible to bring in summer crops weeks earlier than unprotected crops, bringing better prices before the summer rush hits. Tomatoes are the most famous example of crops that can be brought off early, but there are many others that require just a small amount of extra attention to get a head start. And you may not even need plastic. Greensprouting potatoes, for example, is one little trick of the trade we'll tell you about that can get your new potatoes producing early.

2. Greenhouse crops. To justify the cost of heating a greenhouse, you need to grow high-dollar crops. We'll tell you about some good choices for that precious heated space.

3. Cold-weather crops. You may be surprised at how cold-hardy some vegetables are. We'll tell you which crops are worth a try for winter gardening.

4. Storage crops. If you want to keep selling after hard frost, you should grow crops that are easy to store. We'll tell you the best crops to grow and how to harvest and store them.

5. Value-added products. Yes, you can make jams and jellies to sell all winter, but those are just the most obvious examples of farm products with a long shelf life. We'll tell you about other food and flower products you may not have thought of.

6. Winter markets. Of course, you need someplace to sell these off-season goodies, so we'll tell you what farmers elsewhere in the U.S. are doing to keep their cash flowing, such as starting holiday markets and winter subscription programs.

This book does not attempt to be a complete how-to on every topic mentioned. Instead, it's designed to stimulate ideas for products that you might want to consider for your market. Then we'll tell you where to go for more information about the ideas we propose here. We hope you'll find inspiration for developing your own set of season extension systems and products. Ultimately, we hope you'll make more money and enjoy farming more than ever before.

— *Lynn Byczynski*
November 2014

1. Protected early and late crops

The easiest and most obvious way to increase cash flow is to get into the market sooner and stay there later with your peak season crops. Not only will you have a longer selling season, you'll almost always be able to get better prices for early and late crops. And many crops taste better when grown in the cooler spring and fall seasons, even though they need a little help to thrive.

Bringing your crops in earlier or later is easily accomplished with horticultural plastic mulches and row covers. Mulches can be used to warm or cool the soil so that plants can get off to a good start even though the air temperature is not optimal for their growth. Row covers can protect from light frosts early and late in the season. It also can be used to get plants through periods of high insect pressure,



which might otherwise make the crop a bad candidate for a certain time of year. This chapter will explore the use of plastics in the field plus hoophouses and high tunnels.

Succession planting is equally important. Many beginning market gardeners plant once and expect to harvest until summer ends. With most crops, that just isn't possible. When grown expertly, most vegetables and flowers will grow quickly, bloom or fruit quickly and be harvested as soon as possible. Although most annual plants will continue to grow and bloom after harvest, the yield and quality often decline. The veteran farmer plans to have a second planting ready to harvest just after the first, and even more plantings following that. It is not unreasonable to expect to make four, five, or even more plantings of certain vegetable and flower varieties.

A third component of season extension into the shoulder seasons is simply variety selection. Nearly every kind of vegetable has cultivars that are better suited to the cooler spring and fall temperatures. Some are even frost tolerant. Similarly, some cool-weather vegetables have cultivars that are better adapted for growing into the heat of summer.

Although you'll find good guidelines in this book that will help you extend your season, the best teachers are experience and experimentation. Too often, the information you obtain from seed catalogs and vegetable texts will tell you what is sure to work, but not explore the outer limits of possibility. It's up to you to push the envelope. Plant earlier, plant later, play around. Keep good records of your experiments so you can replicate successes. You don't have much to lose, but you have much to gain.

Choose the right row cover

By Lynn Byczynski

Intermittent frosts during the spring and fall can keep you out of the market when you should be earning money. A variety of row covers (also called frost fabrics) are available that can protect your crops from light frosts and keep cold-hardy crops growing well into winter.

But there are so many weights and types of row cover that choosing one to fit your needs isn't simple. In general, you'll be faced with a tradeoff between the frost protection you need at night and the light transmission you need during the day. Cost, handling, and storage are other factors to consider, too.

The most commonly available row covers in the United States are Reemay, Typar, Agribon, Agro-Fabric, and Covertan, which are all lightweight, spunbonded fabrics. All come in several different thicknesses to provide different levels of frost protection. There is also a product called DIO-Betalon, made of a different material.

The lightest row covers weigh less than half an ounce per square yard, and provide very little frost protection. They are used to exclude insects during summer and can be "floated" or laid directly on top of crops. Moving up from there, weights can range from a half ounce to 2 ounce per square yard. As the weight increases, the level of frost protection increases, but light transmission decreases.

Using the Agribon products as an example, AG-19 weighs 0.55 ounce per square yard and provides 4 degrees of frost protection with 85% light transmission. AG-30 weighs 0.9 ounce per square yard and provides 6 degrees of frost protection with 70% light transmission. AG-70 weighs 2 ounces per square yard, provides up to 8 degrees frost protection, but transmits only 30% of the light.

The weight you should choose depends on what you're trying to protect and how low you expect the temperatures to go before you harvest the crop. For example, if you are growing fall spinach, which is very frost-tolerant, you can use one of the mid-weight

Frost protection versus light transmission of row covers			
Product name	Weight oz. / sq. yd.	Degrees of Frost protection	Percent light transmission
Agribon AG-19 AgroFabric Pro 17	0.55 0.50	4°	85% 95%
Covertan Pro 19	0.56	NA	85%
Agribon AG-30 AgroFabric Pro 34	0.90 1.00	6°	70%
Typar 5131 AgroFabric Pro 42	1.25	6°	70% 60%
Agribon AG-50 AgroFabric Pro 50	1.50	8°	50%
Agribon AG-70 AgroFabric	2.00	8°	30%
DIO-Betalon DT-650	NA	5-10°	90%

Source: Manufacturers' websites

row covers that allow adequate light for growth while providing a few degrees of frost protection at night. If nighttime temperatures routinely drop into the 20s, you may have to choose a heavier row cover and pull it off during the days to keep the plants growing.

Eliot Coleman, a pioneer in winter gardening, has been experimenting with various weights of row cover within his unheated hoopouses. He believes that light transmission is more important than a few degrees of cold protection, because row covers that allow the soil to warm more during the day seem to protect the plants as well at night as the heavier row covers.

A more expensive type of cover is made of polyvinyl alcohol (PVA) film. Formerly called Tufbell, the product now goes by the name Dio-Betalon. It is a strong, stiff cover that needs to be held above crops on hoops. The PVA film absorbs dew and frost, creating a sort of igloo effect that holds in heat at night. Yet it doesn't overheat on a sunny day, and it is 35% permeable, so crops can breathe better.

Dio-Betalon also does a much better job of balancing frost protection and light transmission. When it's held above the crop on wire hoops, it can warm the air 5 to 10 degrees. And it transmits up to 95% of the light.

It is more expensive than other row covers, but it may last much longer if used for a short period of time each year and stored carefully where rodents can't get it. Under favorable conditions, it can be reused for five years or more.

'Greensprouting' gives earlier potato harvest

By Lynn Byczynski

For the fresh market potato grower, a little extra time and effort in early spring can pay off with earlier potatoes that will sell for a higher price.

The technique to achieve earlier harvest, called greensprouting or chitting, is widely used in Europe, but rarely used commercially in the United States because it requires more labor and gentle handling of the sprouted potato seed. But market gardeners can usually accommodate the extra requirements.

Greensprouting can shave 10 to 14 days off a crop, says Jim Gerritsen of Wood Prairie Farm, an organic seed potato supplier in Maine. In short-season areas, that earliness could permit you to grow varieties that normally wouldn't have time to mature. There are other advantages to greensprouting as well.

"From an organic grower's standpoint, that's 10 to 14 days you don't have to contend with Colorado potato beetle pressure, early and late blight pressure, and drought pressure," Gerritsen said.

In addition, greensprouting has been shown to increase yields. That's because when seed potatoes are held at warm temperatures, as they are in greensprouting, the apical dominance of the top bud is broken and the secondary buds are able to develop as strongly.

"At 40 to 45 degrees, the apical sprout will bully out the other sprouts," Jim said. "When the bull sprout dominates, a couple of tubers will go over size, and there will be little tubers from the secondary sprouts. By warming the seed, you get uniform sprouting from all the eyes - uniformity with high set."

Here's how greensprouting is done:

- About 30 days before your usual potato planting date, bring the potatoes from their cool storage conditions into temperatures of 70-75°F, but keep them in the dark. After seven to 10 days, they should be starting to sprout.

- Keep a close eye on them and as soon as they start to sprout, lower the temperature to 50-55°F and expose them to light. Jim says that at Wood Prairie Farm, the tubers are placed two deep in stackable wooden trays with lattice bottoms. Plastic bread trays or bulb crates could also be used. The potatoes can be placed outside, but they must be protected from frost. They also can be exposed to incandescent or fluorescent light for 10-12 hours a day. The tubers will be in the trays for about three weeks.



Potatoes emerging in early spring.

- If done correctly, the sprouts on the potatoes should be about a half-inch long and wide and the tubers will be green. At that point, the potatoes should be cut into pieces. Some growers plant the newly cut tubers immediately; others leave them exposed to air for two or three days to let the cut sides develop a callus. Jim says that if you have light, sandy, well-drained soil, you can plant the cut pieces immediately, but should probably let the pieces get callused for heavier soil. You also can dip the pieces briefly in calcitic or dolomitic limestone, which helps prevent fungal diseases.

It's important to note that the sprouts are fragile, so the potatoes must be handled carefully; preferably, they should be planted by hand. If the sprout is accidentally knocked off, don't plant the tuber. If the spacing gets off kilter because seed pieces haven't sprouted, the result will be oversized tubers, reduced quality and reduced yield. Research shows that if less than 85 percent of your potatoes come up, you will lose yield.

Whether or not you have time to greensprout your potatoes, you should at least warm the seed before planting. Jim says that potatoes held for only two days at 75°F yielded 15 percent better than those taken directly from 40°F storage and planted.

Greensprouting doesn't have to be performed on all your potatoes, either. If you don't want your entire crop to mature at one time because you have inadequate storage or you market them as freshly dug, you can greensprout just a portion of your seed and leave the rest in storage. By planting them all on the same day, you should get a harvest spaced over several weeks for each variety.

For more information on Wood Prairie potato seed, call 800-829-9765 or visit www.woodprairie.com.

Hoophouses win the hearts of market farmers

Low-cost structures provide longer season, better quality and income

By Lynn Byczynski

Unheated greenhouses, known as hoophouses, high tunnels and cold frames, have long been used to produce horticultural crops all over Europe. In recent years, growers in North America have discovered their many benefits. Increasingly, the market farm is not complete without at least one of these low-tech, low-cost structures.

Like anything in farming, there are as many variations in hoophouses as there are people using them. In general, though, when we talk about hoophouses, we are talking about hoop-shaped structures covered with a single layer of poly. In general, they are erected right in the field and plants are grown in the soil rather than in containers. In general, they are not heated, although some people have been heating just enough to keep the temperature above freezing. And again in general, ventilation is by natural air movement, relying on roll-up sides and removable endwalls rather than fans.

Hoophouses have proven to be amazingly profitable for virtually everyone who has used them. In most cases, the cost of the structure can be earned back in a single season. Here are several reasons to use them:

- Season extension. Hoophouses provide the few degrees of frost protection needed to get crops started earlier in spring and keep them going longer in fall. They are especially useful in the north, where the growing season is short. Warm-weather crops such as tomatoes can get a head start and be producing several weeks before field crops. Crops such as fall-bearing raspberries can be harvested over a much longer season when protected from the light frosts of early autumn.

- Winter production. When a low tunnel of row cover held up on hoops is erected within a hoophouse, a climate is created that is the equivalent of moving two hardiness zones south. In most of the country, that means the soil doesn't freeze. As a result, many kinds of cold-tolerant vegetables and herbs can be grown throughout the winter. The key is to get the winter crops started in fall, when the days are long enough to allow for good plant growth before the short days of winter.

Eliot Coleman has explored winter vegetable production for many years and is the author of *The Winter Harvest Handbook*. Coleman has found that when the temperature is within a few degrees of freezing, there's not much difference between the air outside

the hoophouse and inside it. It's when it gets really cold outside that the moderating influence of the low tunnels within the high tunnel really kicks in. We have recorded temperatures of -12°F outside and 4°F inside. We've also found that even though some leafy greens freeze when it's really cold, they thaw out and are just fine as soon as it warms up.

- Wind protection. Some plants, particularly cut flowers, struggle in windy climates and never achieve the size they need to be marketable. A prime example is the gorgeous cut flower lisianthus. Outside, lisianthus may be 12 inches tall. In the hoophouse, they reach 30 inches tall. Delphinium are another example. Their tall, hollow stems can't stand windy weather, but they grow profusely in a hoophouse and can be harvested for six months of the year. All other factors being equal - water, soil quality, nutrition, weather - most flowers perform better inside a hoophouse than outside.

- Rain protection. Cut flowers are often ruined by rain on their petals at an open stage. Some vegetables



A Haygrove tunnel full of salad greens in fall at Kansas State University's research station.

can also be affected by untimely rains. Tomatoes, for example, are susceptible to foliar diseases caused by soil splashing onto them in heavy rains. They also may suffer cracking because of uneven watering. Hoophouses remove the variability of natural rainfall. Plants in the hoophouse are watered with drip tape, at a rate and time controlled by the grower.

•Income control. All these factors give the grower more reliable revenue. For a multitude of reasons - late spring, cool spring, wet spring, early fall frost, etc. - a farmer's income can be reduced. Often, farmers will report that they were saved by the hoophouses when the weather was difficult outside.

The reasons for growing in a hoophouse are many, but they will be different for every grower. In the Midwest, where tomatoes grow well in the field, it might not be cost effective to grow them in a hoophouse. But

in the Upper Midwest, where the season is barely long enough to produce a crop, a hoophouse might be the only way to make tomatoes profitable. The cut flower grower might not want to use them all winter to grow cold-hardy plants, but still will benefit from overwintering varieties that will bloom in early spring.

At my own farm, we have used the hoophouses in all the ways described above. Currently, we use them for cut flower production and a small amount of personal winter salad production. They have been extremely profitable for us, allowing us to get into the market by Mother's Day (one of the biggest floral events of the year) and making several flowers that we couldn't grow at all (delphiniums and lisianthus) into our biggest sellers. The hoophouses have allowed us to double our income from flowers with barely any extra work.



A low tunnel of row cover on hoops within a tall hoophouse make it possible to grow salad greens all winter. For more details on growing in hoophouses, see *The Hoophouse Handbook*, available at www.growingformarket.com.

Cut flowers in time for Mother's Day

By Gretel Adams

Mother's Day is the only major floral holiday that most local flower farmers can supply, whether they grow in the field or under cover. We put a lot of focus on having as many flowers as possible. When I worked at a florist's, they said that it was their busiest holiday. The owner of the shop said, "Not everybody has a valentine, but everybody has a mother."

Mixed bouquets are our top-selling item for Mother's Day, but we couldn't do it without the supporting cast of blooms. Our top 10 sellers for Mother's Day in order were:

bouquets, ranunculus, tulips, stock, anemones, snapdragons, plants, dusty miller, LA lilies, and ornithogalum. Below are some details about some of these crops and the conditions in which we grow them here in zone 5b/6a. There are additional options if you have a heated greenhouse, but let me start with the outdoor crops.

Tulips

In our zone, the latest blooming tulips available are ready close enough to Mother's Day that they can be stored for sale during that week. We extend the season by pulling the bulbs during harvest, and making sure to get them while they are still a little green. We store them upright, dry in Procona boxes for a maximum of two weeks. The varieties we like the best for late blooms are Spring Green (a lily flowering tulip), Black Parrot (which is a dark purple), and Blue Parrot (actually a pinky, lavender color, so don't let the name fool you). Tulips are a flower that florists can use a lot of for moms, and they do like having some that are cheery colored. If I were a mom, I would love black tulips, but apparently not everybody sees it that way.

Biennials and perennials

Dianthus that can be planted in fall for the following spring bloom can handle pretty cold temperatures, with or without snow cover over the winter. You just have to make sure you get it planted so it has enough



The author teaches a Mother's Day flower arranging class. Participants brought their mothers to make their own bouquets.

time to get established before the dead of winter. Last year we planted it way too late and had only a few tiny blooms, but the year before it was perfect timing for Mother's Day. The other nice thing about biennial dianthus is that you get an assortment of colors. It makes it harder for bunching to florists since the seed is sold as a mix, but it is nice to be able to offer something besides the standard Amazon colors we grow as annuals throughout the rest of the year. The varieties we choose to overwinter are the Sweet, Messenger, and Electron series. The seed gets started week 25, and then field planted in August.

For us, herbaceous perennials aren't blooming yet in May. We are just warming up enough for them to start putting on good growth, as our typical frost-free date is Mother's Day. We are still building up our repertoire of woody cuts, but Viburnum Roseum is one that blooms in time for Mother's Day sales, as well as Spirea 'Bridal Veil'. We used to have black pussy willows that we didn't harvest for the catkins, but we would let leaf out to fill in bouquets. Just be sure the foliage doesn't have new growth tips on them, otherwise they will wilt. (We have since dug them out to put in drainage next to the greenhouse.) There are growers who use unheated, covered space to speed up peonies for bloom on Mother's Day, which we have dreams of doing some day, but haven't experimented with yet.

Now on to those that require unheated, covered

space. Ours are high tunnels, but there are other growers that use low tunnels or caterpillar tunnels.

Ranunculus & anemones

Our second succession of ranunculus and anemones, which we plant around December 1, are the blooms that hit Mother's Day. For the coldest nights, they may need a floating row cover, depending on your zone and weather.

Bells of Ireland

Last year we tested bells in the heated versus unheated space and noticed only a few days difference bloom time. The bells in the unheated space actually seemed happier, so we figured why waste the heated space on something that didn't benefit that much from it. The bells that bloomed for Mother's Day were seeded in early October. I personally think they smell like musty basement, and they take a lot of work post harvest to get all of those leaves off, and beware of the thorns. But they work great in bouquets, especially if you can leave those top few sets of leaves on the stem, so are still worth the effort.

Sweet peas

We use a hand crank food processor to scar the sweet pea seeds, and then soak them overnight to soften the shell, all to help with germination. We used to direct seed them in February, but would end up with uneven germination and gaps in the bed, so now we start the seeds in the greenhouse and then plant out established plants. Our sweet peas typically start blooming around Mother's Day and go through 4th of July.

Dutch iris

When you buy pre-chilled iris, you can plant them to bloom on your timing, because the bulbs come to you from the supplier conditioned to think they have gone through winter. We get these beginning in November and then every two weeks through the winter. They aren't a very high-dollar crop, but you can really cram them into greenhouse space, they work well in bouquets, and are another thing we can have on the truck for florists. We plant them four per square using Hortonova as a planting grid; they could be planted tighter, but that is as close as we can get them without having to dig out the bed. The blooms for Mother's Day are grown unheated and planted week 7. Iris also work in the heated space, but heat isn't necessary here to get them by mid May.

And now for what can be grown in heated space.



Steve Adams with armloads of ranunculus coming out of the unheated greenhouse. All photos courtesy of Sunny Meadows Flower Farm.

We keep our heat very minimal, at 40°F most of the winter, and then we raise it to 50-55 degrees in March when the night temperatures get warmer. Everything grows really slowly, but it keeps it alive and works for our timing.

Dusty miller

We overwinter one patch of dusty miller in the heated house so we can cut it for Mother's Day (and for early spring weddings). This year instead of leaving an old bed in there, we started seeds so it will be a new patch to cut for spring. Those seeds were started week 15, allowing enough time for the plants to get large before winter.

Stock

This is our number one request from florists for Mother's Day, and each year we increase, but it is still not enough. They tend to use it in most arrangements, no matter their floral design style. Locally grown stock stays fluffy and smells amazing, characteristics that the boxed blooms may not have. White is nice to have, but the colorful stock sells best. Our Mother's Day crop is seeded week 48, and we plant a whole bed in the greenhouse. More about specific planting dates and our favorite varieties in my next article.

Snapdragons

Snapdragons are another florist staple, but it seems like every florist has the colors that they like or dislike. I have a hard time picking colors to grow, but we

decided it was better to have more of just a few colors than to have only a bunch or two of lots of different colors. For Mother's Day production, the 1-2 group of snaps are blooming in our zone: Overture, Chantilly, and Maryland are the varieties we choose. Next year we will narrow it down and grow: Overture White, Chantilly Salmon, Overture Magenta, Maryland Red, and a still undetermined pink one. For our timing, we start these seeds week 51 for Mother's Day blooms.

Ornithogalum

These get planted in October when the tulips come, and they grow very slowly. Last year ours were grown in crates, but for next year we have dedicated half a bed in the greenhouse for them. I will be sure to keep you updated on those trials.

Lilies

These are grown in crates in our propagation house which is a little warmer, set to 50°F through the winter, 58 once it warms up a bit. We pretty much use all our LA lilies in bouquets. The Orientals are for sale for florists and are the first ones of the season. Not all Orientals take the same amount of time to bloom, so be sure to consider that in your timing. The Crystal-blancas that we grow, for example, take longer than the Roselily. Also know that the cooler greenhouse temperatures will delay blooming a little longer than in the standard days to maturity that are tested in optimal conditions for lilies. We have found that growing them at cooler temperatures has reduced the need for supplemental lighting in the greenhouse. Before we would keep our greenhouse warmer, around 65°F, and the lilies would grow faster, meaning longer, thinner stems before budding. Now we keep the greenhouse cooler, so they grow slower (and we just use heat mats for germinating seeds in the prop house), which also helps keep heating costs down.

Other flowers worth mentioning, but that don't work for our timing: December planted freesia in a minimally heated greenhouse always gets too short in the warmer weather leading up to Mother's Day, although sometimes you will get lucky with a cooler spring and one last flush just in time. For those a little colder than us, your last succession of freesia may be right on target. Larkspur in our unheated space always starts blooming the week after Mother's Day. This year I got hopeful and even added it to our availability list, but it didn't make it in time. For those a little warmer, you may be able to have it soon enough. Digitalis could be grown unheated for Mother's Day,



Snapdragons in the heated greenhouse ready to be cut, with Overture Magenta in front.

but that trial was a few years ago, and I am not sure of exact timing. And lastly, hybrid delphinium, but we haven't figured out the timing on those. Fall planted delphinium would be a good choice for spring bloom. Growing them under cover or in the field just depends on your weather conditions.

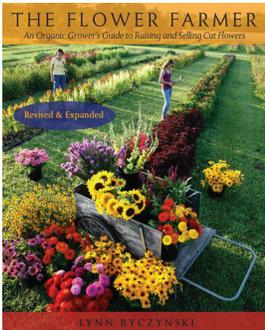
I also want to mention our herb plants. Herb plants help make spring our most profitable season at the farmers market. They require covered space, but it can be unheated for later plugs. Ours are grown in the minimally heated house, and we buy in plugs in mid March, potting them up to trays of 16. Since our frost free date is Mother's Day, it is also our biggest plant sale day. We sell them wholesale as well as retail at farmers markets. We always seem to run out of flowers for Mother's Day, but plants give us something else to offer for gift giving.

Gretel and Steve Adams own Sunny Meadows Flower Farm in Columbus, Ohio. They write about cut flowers regularly in Growing for Market.

Season extension for spring flowers

Variety	Schedule and location	First harvest
Ammi majus	Start in greenhouse in late January, plant into hoophouse in mid March.	May 10
Antirrhinum Rocket	Start in greenhouse in late January, plant into hoophouse in mid March.	May 10
Bells of Ireland	Direct seed in hoophouse in mid-September	May 10
Bupleurum	Direct seed in hoophouse in February	May 1
Delphinium bellamosum and hybrids i.e. Clear Springs	Order plugs in June to arrive mid-September; plant in hoophouse. In winter, keep watered and cover with row cover. Plants will stay green most of the winter and grow quickly in early spring.	April 15
Dianthus Electron and other Sweet William types	Same as delphiniums.	May 10
Foxglove, Apricot	Same as delphiniums	May 1
Larkspur	Direct seed in mid-September in hoophouse and field	May 15 in hoophouse; June 1 in field.
Lily, Asiatic and Oriental	Plant in heated greenhouse in crates from Jan. 21 through mid-February, depending on the number of days required to force them. We especially like the Orientals 'Acapulco' (pink) and 'Helvetia' (white) plus the Asiatics 'Dreamland' (yellow) and 'Elite' (orange).	May 1 - June 10
Saponaria	Direct seed in hoophouse in February	May 7
Tulips	Order bulbs in June, plant in October or November in hoophouse.	April

Source: Lynn Byczynski, *The Flower Farmer*



If you are new to flower growing, your best resource is *The Flower Farmer: An Organic Grower's Guide to Raising and Selling Cut Flowers* by Lynn Byczynski. This beautiful, full-color book is a comprehensive guide to every aspect of small-scale commercial production. You will learn the best flowers to grow for your region and the most profitable flowers you can grow. You will get extensive advice on ecological production methods, including pest and weed control. You'll learn how to harvest and care for cut flowers. And you'll gain an understanding of the many potential markets for your flowers, which will help you determine where to focus your efforts. You can purchase a signed copy at www.growingformarket.com.

2. High-dollar greenhouse crops

Running a greenhouse in winter is expensive, no matter what kind of fuel you use for heating. So crops that are produced in a heated greenhouse need to be able to sell for a high price, or there won't be any profit in growing them.

Almost anything can be grown in a greenhouse, given enough warmth (and possibly supplemental lighting), but you have to choose greenhouse crops carefully to be sure that you can make enough money to pay for your work and investment as well as your expenses. A market for your potential crop should always be your first consideration. Many greenhouse tomato growers have found they couldn't make any money when their only outlet was to sell them wholesale. Growers with a retail market, however, often do well with greenhouse tomatoes because they can get a much higher price than the wholesale grower.

A distinction also should be made between cool crops and warm crops. Salad mix can be grown all

winter with just enough heat to keep the temperature above freezing. Tomatoes require a lot more heat to produce fruit. Similarly, some flower varieties such as ranunculus, require little more than above-freezing temperatures while others, such as tuberose, need 70°F to bloom. Another distinction that needs to be made is the amount of time you'll be heating your greenhouse. Starting warm-season crops in March will not cost as much as starting them in January.

You have to consider your market, the prices you expect to be able to get, the amount of fuel you are likely to need and any other special expenses you will incur as the result of growing a greenhouse crop. If you experiment, be meticulous about keeping records - you need accurate numbers to be able to figure out whether a specific crop is worth your time and money.

This chapter will tell you about several crops that have been profitable for other growers. It is by no means a list of all possible greenhouse crops.



Heirloom vegetable plants can be a profitable crop in the right market. Good signs are important to catching the customer's attention.

Raspberries from February to May

By Marvin P. Pritts
Department of Horticulture
Cornell University

Navigating snowy, ice-covered roads on the way to market is among the challenges facing a new type of raspberry grower. A few innovative producers are harvesting up to 60 flats (720 half-pints) of fresh raspberries from a 20 X 30 ft. house between February and May, and selling them for \$2,000.

Greenhouses have been used for many years to produce tomatoes and cucumbers during winter, but these vegetables require relatively warm temperatures and high levels of light, making their production expensive. Raspberries, however, are uniquely suited for greenhouse production during the off-season. They grow best at a relatively cool temperature (70F) and do not require supplemental light to produce a crop, especially if production is targeted for May and June. In northern states, many greenhouses are empty during the winter months, but these could be used to grow raspberries with only moderate inputs, providing greenhouse owners with an opportunity to produce an extremely high value crop during a time of the year when they are realizing no return on their capital investment and when no domestic raspberries are available.

The vast majority of winter raspberries currently on the market are flown in from the Southern Hemisphere. Quality is generally poor because raspberries have an extremely short post-harvest life and bruise easily during shipping. As a result, consumers are willing to pay between \$3.00 and \$6.00 per half-pint for fresh fruit of superior quality, and restaurant chefs seem willing to pay even more.

Local raspberry production is now possible because of two accomplishments in the area of entomology. First, bumble bees have now been domesticated and are available in small hives for pollinating greenhouse crops. Bumble bees perform better than honey bees in greenhouses, especially under the cooler temperatures used for growing raspberries. Second, predatory mites are now available that feed on phytophagous mites, and these can keep populations of damaging mites at low levels.

Compared to field production, greenhouse-produced berries are larger, firmer and much less prone to fruit rot. Fruit tends to be slightly less sweet and more acid in the greenhouse, but well within the limits



of acceptability. Varieties differ in performance and flavor, and what might do well in the field will not necessarily perform well in the greenhouse. According to our research and work done in Belgium, the variety Tulameen from British Columbia is the best floricanefruiting raspberry in the greenhouse, although it will not survive most winters outdoors in northern climates. If temperatures drop from above freezing to below 10F, canes can be damaged.

Production basics

Tulameen tissue-cultured raspberry plugs are planted into 3 to 5 gallon pots after the danger of frost is over. Nursery matured plants can be used as well, but these will require the larger pots because of their greater root mass. Prior to planting, pots are filled with equal parts sand:peat:perlite:vermiculite. The proportion of sand can be reduced in the larger pots to reduce the weight. Plants are grown outdoors on a gravel bed with irrigation through the summer. While outdoors, plants are fertilized while irrigating with a complete soluble fertilizer solution containing 100 ppm N, and pest outbreaks are managed using conventional practices. Rows of pots need to be spaced at least 8 ft. apart so that sufficient light will be intercepted by the lower leaves on the canes. If the plants are too close together, the lower buds will not produce fruiting laterals once they are moved into the greenhouse. In October after leaf drop, pots are moved closer together and bales of straw are placed around the group of pots to help protect them from cold temperatures. Root systems are more

sensitive to cold temperatures than canes, so temperatures near 10F for an extended period of time will kill both roots and canes in pots that are setting on top of the ground. In late December, plants are moved into the greenhouse. (Plants may have to be moved earlier if late December temperatures are forecast to fall below 10F. In this case, move plants into an unheated greenhouse or garage/barn until the end of December.)

Late December is the normal time (for us) when plants have received a sufficient amount of chilling to break dormancy (between 800 and 1,000 hours). To ensure that a sufficient number of chilling hours has been achieved, plants can be moved into a cooler (that does not contain other fruit) for 8 weeks prior to moving them into a warm greenhouse. In our experience, buds on thicker canes and buds lower on the cane have a longer chilling requirement than buds on thin canes or near the top of canes.

Once in a warm greenhouse, canes are spaced pot-to-pot with 5.5 ft. between rows, trellised, and watered with a 100 ppm N complete fertilizer solution. Short or broken canes are removed. Canes should be supported by an I-trellis; spreading canes into a V-trellis is not an efficient use of greenhouse space. We have found that an application of horticultural oil to canes after several days in the greenhouse, but before bud break, can reduce mite problems later on. Household fans are used to circulate air down the rows to reduce pockets of high humidity (ideal is 65 – 75%) and reduce the subsequent risk of fungal infection. Temperatures are maintained at 65 - 70F during the day and can be as low as 50 - 55F at night - ideal for raspberries but too cold for most other plants. Supplemental light can accelerate development by 2 to 3 weeks and increase yield by 20 - 30%, but may not be economical, depending on markets. Night temperatures also can be maintained at 70F, if heating costs are not excessive.

Six weeks after moving plants into a lighted greenhouse, they flower. Bumble bees are used to pollinate the flowers, and fruiting can begin as early as late-February, about 10 weeks after moving plants indoors. Once flowering begins, the nutrient solution is reduced to 50 ppm nitrogen. With one-year-old plants in small pots, double rows (with row centers 5.5 ft. apart) and a pot-to-pot spacing can be used so that approx. 20 plants are contained in each 3 m (10 ft.) length of row. Each “baby” plant produces about two half-pints (350g) of fruit.

During fruiting, primocanes for next year’s crop will be growing. These will grow extremely tall if they are not managed properly. Our procedure for managing

primocanes is to remove all but 4 new canes (primocanes). These 4 will bear next year’s crop. When these primocanes reach about 3.5 ft. in height, the top 4 inches is removed. Primocanes temporarily stop growth, allowing fruit to be harvested without interference from primocanes.

After the first harvest is over (in April, May or June), floricanes are removed. If plants were first planted in pots less than 3 gal in size, they should be replanted into 5 gallon pots with primocanes intact and placed outside in full sun for the second growing season. Raspberry plants must be supported outdoors to prevent the wind from blowing them over. We use bamboo stakes to hold canes upright in the pots. When primocanes reach 6 ft. (1.8 m) they are topped again to retard growth. Plants are returned to the greenhouse in mid-December - after the chilling requirement had been fulfilled. Rapidly satisfying the chilling requirement is one advantage that northern growers have over more southern producers.

In the second production cycle indoors, plants are spaced 22 in. (0.6m) apart in single rows, with 5.5 ft. (1.7m) between rows, and canes are trellised upright to a single wire. In the second and third fruiting years, both fruiting laterals and primocanes will be growing and competing for limited light. In order to regulate self-shading yet have large primocanes for next year’s crop, we tip the largest 4 primocanes per pot at a 3 ft. (1 m) height; the remaining primocanes are removed at ground level. This allows the fruit to be harvested without significant interference from the primocanes. Primocanes will begin regrowth after several weeks, and will continue growing once they are moved outdoors again. Raspberry plants will fruit for three years before beginning a decline.

Digging canes

If producers do not want to take the time to grow their own plants, full-grown raspberry canes dug directly from the field in early winter can be used to produce fruit that same spring. These plants will be slower to flower and fruit than full-grown potted plants, but are nearly as productive. Such nursery stock is called “long cane.” Sakuma Brothers Farms (360-757-6611) in Washington sells long cane raspberries. If using “long-cane” plants, begin with 5 gallon pots and allow them to acclimate in pots in a cold greenhouse for two weeks before gradually warming the house to 70F.

Twospotted spider mites thrive in the warm, dry conditions of a greenhouse. To reduce the number of mites, we treat canes with horticultural oil within a

few days of being moved inside the greenhouse. Since no pesticides have been labeled for greenhouse raspberry production, biological controls must be used for twospotted spider mites after plants are moved inside. We release predatory mites once, after leaves emerge from the canes. Cool temperatures, high humidity, a release of predatory mites, and removal of infested leaves help reduce numbers of pests.

Artificial chilling

We have artificially chilled plants by moving them into 34F coolers as earlier as mid-August, with leaves intact. After 8 weeks in coolers and 8 weeks in the greenhouse, plants produced flowers by December. Defoliation of plants prior to chilling had no effect. This finding opens the possibility of significantly lengthening the fruiting season of greenhouse raspberries. Starting production earlier would have several advantages. Raspberry production would be complete before bedding plant season begins in April, allowing more greenhouse space to be available for use. Also, vents are closed when the outdoor temperatures are cold, allowing the grower to supplement the atmosphere with carbon dioxide, enhancing plant growth. Once temperatures warm in spring, houses have to be vented to cool them and the carbon dioxide escapes. Again, an earlier start would improve efficiency of carbon dioxide use.

Coolers for late spring crop

Dormant raspberry canes can be stored successfully for several months in a humid cooler maintained at about 34F. Pots should be watered when needed to maintain soil moisture. Approx. 12 weeks before fruit is desired, plants can be moved to a warm greenhouse. This allows the grower to produce fruit in late spring and early summer, up until the time field-grown fruit is available. The longer plants are stored in the cooler, the shorter will be the time between bud break and fruiting. This is because plants respond to warmer temperatures faster with more accumulated chilling, and because the day lengths are longer later in the spring when plants are growing.

Fall-fruiting varieties

Primocane-fruiting varieties will continue fruiting in the fall, well past the time that production would normally cease outdoors due to cold weather, if they are moved inside the greenhouse in early September. Pinching primocanes when they are about 3 ft. tall will delay flowering and fruiting, shifting the crop to late in the fall. This practice has been successful under high plastic tunnels, and well as in greenhouses. Bumble bees are used for pollination, and the fertility program is similar - 100 -150 ppm N until fruiting, then 50 ppm N in a complete fertilizer formula. Varieties that have performed well in the fall include Autumn Britten, Hertiage and Caroline.

Summary

It is now possible to produce raspberries close to market during most months of the year. Raspberries are the most perishable of all fruits, so even though they can now be grown close to market, they must still be handled with the utmost of care. Raspberries must be cooled quickly after harvest, and delivered to the customer as soon as possible. Most markets for winter raspberries are small, so a producer will need to line up and supply a larger number of smaller markets.

Despite these challenges, the opportunities for producers are great. At this point, there exist only a few winter raspberry producers, so the market is wide open. Furthermore, the quality that can be produced is very high. Consumers and restaurant chefs are willing to pay very high prices for high quality berries in winter. Several growers are already producing winter raspberries in northern states.

For more information on greenhouse raspberry production, download Dr. Pritts' Greenhouse Raspberry Production Guide from the Cornell website.

How to grow a quick crop of sprouts

By Charuth Loth

We grow sunflower sprouts and pea shoots in our propagation house during the summer months when it would otherwise stand empty. Since our customers demand that we keep growing salad mix even during hot Nebraska summers, it is nice to have one crop we can usually pull off every week all summer long. Growing sprouts has not always been easy for us. We have struggled with our methods. After nine years of growing them, we have learned a few things which we are more than happy to share. Here is a quick overview of our sprout production:

We grow our sprouts on tables in a heated hoop-house. We use only natural light. During the hot months we use 35% shade cloth. We grow sprouts in plastic 1020 flats with drain holes. Black-oil sunflower seed and field pea seed are both soaked for twelve hours prior to seeding. We spread the soaked and drained seed evenly over a layer of vermiculite for sunflower, or perlite for peas (About one quart of media per flat).

Seed should be spread to completely cover media but should not overlap. During very hot weather we cover seed with a thin layer of vermiculite to make sure the seed remains wet for the critical germination period. A misting system is a very good investment! Uniform watering equals uniform growth.

Sunflowers take seven days to reach desired maturity in the middle of the summer. Day length influences maturation, so we adjust our planting accordingly. The desired stage for harvesting sunflower shoots is when the cotyledons are fully open and lose their attached seed hulls, but before the first set of true leaves fully express. Optimal harvest occurs in a very narrow window.

We have had good luck holding uncut flats of sunflowers and peas in our walk-in cooler. Stems do elongate, but leaf development can be held for about a week in the desired stage. We have found that covering the growing shoots with a plastic bag before placing them into the cooler helps keep them from drying out.

Pea shoots take 10-12 days to reach a harvestable size during the main growing season. We have found that it is preferable to harvest the shoots when they are about four to seven inches tall. When they get much taller they begin to run out of food. At this point the bottom leaves start to turn yellow. As the tendrils begin to elongate your harvestable yield seems to go down.

Once again there is a perfect harvest window that we try not to miss. Pea shoots do best during our cooler spring and fall. With shade cloth we are able to keep growing pea shoots all through the summer.

To harvest the shoots we use a sharp knife to cut right above the growing media. It is a good idea to irrigate right before harvesting. This helps avoid wilting. We have found that the most labor intensive part of producing sunflower sprouts is removing the seed hulls. Right before we harvest we brush over each flat with the palms of our hand to brush off as many hulls as possible. Then we pick the sprouts. Pea shoots don't require this step.

We wash the sprouts in large stainless steel bulk tanks. We use a large grid mesh to separate sunflower sprouts from their hulls. Tedious hand picking is still required. In this regard pea shoots are much simpler. We use a commercial salad spinner to dry the sprouts. Over the years we have had a few bad seed lots. Sunflower seeds can carry some nasty fungal diseases causing stunted and deformed seedlings with poor vigor. Unfortunately, the only way to know if you have a bad seed lot is to grow out a batch. Ask for a sample before buying a large quantity of seed.

We market both our pea shoots and sunflower sprouts at Lincoln and Omaha farmers markets. We sell them bulk alongside our salad mix and arugula. Our customers love to mix and match ingredients. We sell all our mixes for the same price to keep it simple, currently \$8 per pound. We also sell our cut and washed sprouts to stores and restaurants. We sell to retail stores in 3 oz. bags with our label displayed on the front.

A few last lessons we have learned:

- Mouseproof tables are a necessity. We use only the two center tables for sprout production. We constructed our tables with legs made out of galvanized chain link fence pipe, which mice can't climb.

- Sparrows flying through our vents have been a problem. Wire hardware cloth keeps them out.

- We have tried growing both sunflower and pea shoots on compost as well as our own soil mix. We had more problems with seed rotting. Soil is also more messy and prone to mold. Because they are harvested so quickly they really don't need a secondary food source. The growing media is a substrate for the roots only.

Our sprouting seed source is Tiensvold Farms in Rushville, NE.

Herb plants sell well at spring markets

By Sandie Shores

Selling potted herbs at a busy farmers' market can be very profitable, not only during the spring but also throughout the season. Spring, of course, is the time when your customers want small herb transplants for their gardens. These early season sales will most likely bring you the largest volume of sales. However, potted herb sales can be quite profitable until the end of market season with a little insight into the customers' lifestyle and desires.

The herbs to grow

For the most part our customers are looking for herbs to plant in their gardens that they can harvest for culinary purposes. Those should be the ones that you should grow in volume. There may be some call for a few medicinal herbs such as Echinacea or St. John's wort and specimen plants such as angelica. If you have the space and time it would be to your advantage to have a few pots of these herbs available.

The most popular herbs are the same ones that are most favored for cooking and this can vary somewhat by region and the ethnic groups in your area. Basil is by far the most popular along with some of the basil varieties - lemon, purple, Thai - so be sure to plant as much of this as your space allows. Chives, garlic chives, Greek oregano, lavender (some varieties) parsley, rosemary, sage, sweet marjoram, sorrel, summer and winter savory, and thyme are all easy to start from seed and sell well in my area. Herbs such as epazote, fennel, lemon balm, burnet and lemongrass sell in limited quantities.

Bay (*Laurus nobilis*), some rosemary and lavender varieties, mint (spearmint) and French tarragon should be started from cuttings or division because they either do not produce viable seed or do not come true to seed. Liners (small rooted plants) can be purchased wholesale from various commercial nurseries.

Order liners early in the winter for shipment in late winter or early spring. If you wait too long the best varieties may be sold out. These should be potted into 4-inch or larger pots and allowed to grow on. Be sure to schedule your liner delivery early if your market has a rule, as ours does, that vendors must grow a plant for a certain number of days before being offered for sale. This voice of experience tells you that shipping delays do happen and you can lose sales by not receiving your liners on time!

I do not recommend selling arugula, cilantro or dill as potted plants. These simply do not transplant well. Although we, as commercial growers, may do so if they are transplanted when the seedlings are very small, we cannot expect our home gardener customers to be skilled in this procedure. Cilantro, for instance, if it were to survive transplanting will bolt almost immediately. It is such a short-lived annual that it is worthless to sell it potted.

These herbs are popular and you will get many requests for these as potted plants. If you take the time to explain why you will not sell these as potted plants for transplanting you will gain the respect of the customer - something you may lose if you sell them something that will be a loss to them.

Herb transplants should be young for optimum growth after transplanting. Herbs that are root bound or too large for their pots will have difficulty recovering from the transplant process. Take care to not over-fertilize the potted herbs. Those with soft, lanky growth will have problems acclimating to the soil conditions in their new homes.

The season for selling garden transplants can be as long as two or three months depending upon your location. It is wise to do succession plantings of the annual herbs every two or three weeks so that you can offer young transplants right into mid-summer. Older perennial herbs should be up potted as they outgrow the small pots.

The plants that are offered for sale should be roughly all the same size, especially if you are bringing a whole flat of one herb. They should be young, just 3 or 4 inches tall and basil should have only 3 or 4 sets of leaves.

Counsel your customers to have patience and delay transplanting the herbs until the weather conditions are right. Most of them will be eager to get their herb gardens planted but if done too early they may be lost due to late frost or heavy spring rains.

Containers

There are several schools of thought regarding pot sizes. For early transplant sales I recommend small sized pots for annuals and perennials started from seed. We use 2.5 or 3-inch pots (3.5 inches deep), which fit into press fit trays, 32 to a tray. These trays keep the pots upright for ease of transport and also are excellent for merchandising, as the pots don't fall over when



Herb plants in 4-inch pots at a farmers market in Maine in early spring. Signs with information about varieties and uses help sell herbs.

some are removed from the tray. We charge \$1.00 for annuals and \$1.50 for perennials in these size pots. This pricing is very attractive to the customer and there were many spring market days when we sold close to 1,000 of these pots in just four and one half hours!

Some growers plant all the herbs, even those started from seed, in 4-inch square pots and charge more for them. Often they will crowd several seedlings into a 4-inch pot with the idea that a full pot will be attractive to the customer. While they may look appealing for a short time crowded this way it will only be a week or two before they begin to stretch, become lanky and lose condition. Many times they will not survive the separation process. If the gardener transplants the herbs as they grew in the pot -crowded - the results will be less than desirable. This can make for a very unhappy customer and is a good way to lose her business for good.

It is best to plant a single herb in each pot. This way they can grow to their fullest potential, will transplant well without the need for separation and probable root damage. After transplanting, it will grow full, provide good yields and make your customer happy.

Plastic pots are convenient but also wasteful. They can be reused if washed and soaked in a 10% bleach

solution for 20 minutes and then rinsed well. Many of our customers return the pots to us for recycling. Yours will too if you let them know that you would be happy to take back the empty pots.

An alternative to using plastic pots would be to grow and sell the individual seedlings in soil blocks or peat pots. These work well for young plants but as the plants grow the roots will grow through the soil or peat and this can have a stunting effect on the plants. These types of containers also dry out quicker and require constant monitoring.

Offering herbs in 4 and 6 packs is a way to increase your sales. Give the customer some choices; you could plant these with all one herb such as basil or a variety of herbs per pack.

Marketing and display

Marketing and displaying your herbs is just as important as the plants themselves. If your customers can't see them or have to dig through an unorganized mess you will lose sales. Take a hint from the supermarkets. Put the items you most want to sell at the customer's eye level. This isn't always possible for us who sell at farmers' market since most everyone brings folding

tables that are meant for dining on and not display. Some vendors put the plants and flats on the ground. The customer then has to look down on the plants and bend over to pick them up or smell them. While it is true that the customer will see the nice new growth at the top of the plant it is not conducive to selling herbs. We also should consider those customers that have trouble bending and lifting.

We have folding racks specially made for us. These are ladder type racks with regular ladder spreaders (the metal locking device that holds the ladder open) holding them open. We use vinyl coated white metal racks suspended between the “ladder” rungs on two levels—one just above eye level and one just below. These metal racks are the type used in closets and can be purchased at any hardware store. They are wide enough to hold a flat and we are able to display 20 flats with room for some individual pots as well. It takes about two minutes to set up the ladders and racks and they fold flat for easy transport.

We also use six folding tables, all covered with the same solid color vinyl tablecloths. The many varieties of lavender and rosemary, all in 4-inch pots, are on two of these tables at a right angle to the line of wooden ladder racks.

Be sure that each individual herb has a plant tag. If you don’t want to buy preprinted “stick” tags you can make these yourself using wooden stakes or purchased blank plastic tags and write the information needed. It is quite frustrating for a customer to get home and not remember what herb they bought. I’ve even had customers bring unmarked herbs, purchased from another vendor, to me for identification because they had forgotten what the vendor said they were!

One of the most frustrating things for me is to go into a store to buy an item and not be able to find a price for it. It is the same way for our customers. If they have to search, or ask, for the price they very well may decide to buy elsewhere where it is easier to make their buying decision. Make sure that your prices are right there where the herbs are so they don’t have to look all over to find them. All of our herbs in the 2.5-inch pots are on the display racks. Computer printed signs on yellow paper are placed in clear sheet protectors and clipped to the racks every few feet. It is impossible for the customer to miss the pricing!

All the plants in 4-inch and larger pot sizes are priced with individual tags. I made price tags from old vinyl blinds cut to the appropriate sizes. These are pulled out at the time of the sale and reused. Removing the price tags also makes it easier to tally up the total sale, especially when we have helpers.

Sharing information

Many customers have an interest in growing herbs but don’t know where to start. You, as the herb expert, may find yourself spending much time teaching - not only about growing and using herbs, but also about the varieties and caring for them. I’ve found myself teaching mini-classes each Saturday morning!

One way to help ease this situation is to make up information sheets for some of the more unusual herbs. The sheets should contain information about the culture and care of the herb. We clip one sheet on the flat of the herb (housed in plastic for reuse each week) and then place the rest loose in a sandwich bag and hang it by the herb for the customer to take home. Sometimes I will also put a recipe for using that particular herb right there for the customer to have.

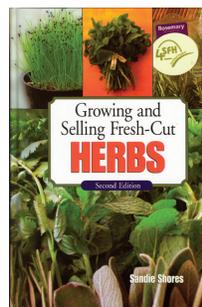
Place the herb plants in the same location in your display from week to week. This gives the returning customer some continuity and they won’t have to search your entire setup to find what they are looking for. Don’t you find it frustrating when you go to your usual grocery store and find they have moved everything?

Those of us who sell lots of plants should accommodate the customer with their shopping needs. Have places for them to set the plants, or their other purchases. We always have a card table in the middle of our display area. It has a calculator, a note pad, some business cards and plenty of boxes and bags stashed underneath. It is also a good spot to display a special plant or two that we wish to highlight.

Place stacks of cardboard flats in several places around your stall for your customers convenience—don’t make them ask if they can buy more than one or two plants!

Bring all the herbs plants you can – you can’t sell them if you don’t have them with you! We all know how much work it is selling plants at the market but if you have fun and love what you are doing it will show in your work, your plants and your attitude. Your customers will love you for it!

Sandie Shores is the author of *Growing and Selling Fresh Cut Herbs*, a comprehensive guide to small-scale commercial herb production. It’s available from Growing for Market.



Bulb crates useful for the greenhouse

One of the most useful tools on a market farm is the plastic bulb crate. Crates are stackable, breathable, lightweight, virtually indestructible and either free or inexpensive to acquire. They can be used for storing supplies, curing onions, transporting produce. They can even become display units at farmers markets, stacked up to form tables and benches.

Crates are also widely used for growing plants, especially cut flowers. In many commercial cut flower greenhouses, the beds of flowers are actually double rows of bulb crates, filled with growing medium and irrigated with drip tape.

Growing in crates has many benefits for the small-scale producer. They provide a space-efficient way to grow a crop in a greenhouse with a gravel, concrete or landscape fabric floor. They allow crops to be moved around as weather changes; for example, a crop can be started outside then brought into a greenhouse when the weather gets cool, or vice versa. They are a cleaner way to grow when soil-borne disease is a problem. Certain flowers can even be left in the crates, stacked and stored

for the winter in a corner of the barn or cooler.

Bulb crates measure approximately 15 by 23 inches and are either 7 or 9 inches deep. They are used for shipping and storing bulbs by many bulb suppliers.

At our farm, we have built up an ample supply of bulb crates over the years simply by purchasing bulbs in wholesale quantities. We also have purchased crates from wholesale greenhouses for \$1 to \$2 each. If you would like to get some bulb crates, we recommend that you find out where local supermarkets and discount stores buy their potted flowering indoor plants. Generally, that's going to be from a regional wholesale greenhouse. Then contact the greenhouse and ask if they have extra bulb crates they want to get rid of. Big greenhouses often have mountains of these crates because they buy so many bulbs, and storage gets to be a problem for them. You may find that you can get them for free if you'll pick them up, and if the greenhouse manager seems reluctant to let them go, you might offer a dollar or two each as an incentive. They will be well worth the price.



Tulip bulbs are shipped from Holland in plastic crates, top left. Empty crates are arranged on the gravel floor of a heated greenhouse and lined with newspaper then filled with potting mix. Above, a crop of crate-grown lilies ready for harvest.

How to force tulips in the greenhouse

By Frank and Pamela Arnosky

Last week we received a shipment of over 23,000 lily bulbs. Almost 60 crates! It sort of takes the wind out of you to look at two pallets of bulb crates and know that they all have to go into the ground in the next three weeks. Ugh! To make matters worse, rain was coming, and we had to get the first half planted right away. Thankfully, we have two women working for us this winter, and we set to planting. Standing in front of a quarter-acre section of beds, Frank started saying he wanted some varieties planted where they would get morning shade, and some where they would get afternoon shade, and some in the center of the shade all day long. Susan, who had just started with us the week before, looked puzzled. “Ah...I have a question,” she said. “What shade are you talking about?” As it happened, we were standing in the middle of an open, sunny field - not even any little trees around. “The shade house that we are going to build here, of course,” Frank said. “Can’t you see it?” It never occurred to him that although this shade house already existed in his mind, and it was as plain as day where the morning sun would fall, nobody else could see it. But we went ahead and planted the lilies anyway, just as if it were there.

We have a bad habit of planting greenhouse crops where no greenhouse yet exists. Several years ago we first experimented with lilies, and planted several thousand where we were going to build a new cold frame. The cold frame didn’t get built that spring, but the lilies did fine anyway, and we learned by default that we could raise field-grown lilies here in Texas. Who would have guessed. This year our greenhouse crop without a greenhouse is tulips.

At least this year the greenhouse frame is there. The entire greenhouse was there last summer, all shiny and new. We built a new, 144 foot long, 20 foot wide cold frame. The plastic hadn’t been on more than a month when a Texas dust devil tore it off, leaving the bright new frame shining in the sun and \$600 worth of plastic flying off into a clear blue sky!

But we planted the tulips anyway. Two 144-foot beds in the ground, and about 100 bulb crates. Bulb crates are those heavy, black plastic crates that the bulbs are shipped in. Many growers fill them with soil and grow the crops in those crates, but of course when you get 500 bulbs in a crate, you need more than the original crate to plant them in. We found that a good

source for empty crates are big greenhouse companies that grow potted crops for the florist trade. These companies typically grow crops such as Easter lilies, tulips, daffodils and hyacinths in 6 inch pots for holiday sales. They don’t usually have a use for the big black crates. They are bulky and hard to store, and actually become a disposal problem for some companies. We called a local greenhouse and they were glad to let us come and get as many as we could haul off. They even helped us load them! We made three trips, and picked up several hundred crates. Even if you had to pay a nominal charge, maybe a buck a piece, they are worth it. They will last a long time.

We ordered tulip bulbs for “forcing”. What that means is that the bulbs are chilled down artificially and forced to grow out of their normal season, as opposed to planting the bulbs in the fall in field beds and letting them bloom naturally in the spring. Forcing bulbs are prepared by chilling the bulbs for a set period of time (up to 16 weeks) before bringing them into the greenhouse to grow. Many spring bulbs such as tulips, iris, hyacinths and daffodils need this cooling period to produce high-quality flowers. It varies per crop, but every type has its minimum requirement. A typical symptom of insufficient chilling is short stems. This is particularly apparent in hyacinths. More chilling = longer stems.

There are two ways, or programs, to chill tulip bulbs for greenhouse cut production. They are called the 5 degree program, and the 9 degree program. This refers to the temperature, in Celsius, that the bulbs are stored at when being chilled. The biggest difference is that 9 degree tulips are planted in the pot or crate, and chilled for a long period. The bulbs root in the container, and once they are brought into the greenhouse, they grow rapidly. The chilling period can take up to 16 weeks, depending on the variety, but then the crops blooms in as little as three weeks after being brought into the greenhouse. This method is most often used by growers who grow potted bulbs for the holidays. (The guys you’ll go ask for crates from!)

How to chill

Growing tulips in a 9 degree program results in fast greenhouse crops, but it takes up a lot of space in the cooler. Frank once worked at a big greenhouse range that used a refrigerated tractor trailer just to chill their Valentine’s Day and Easter tulip crop!

We used bulbs chilled in the 5 degree program. With this program, the bulb supplier chills the bulbs dry, and the grower plants them upon receipt. The bulbs are stored loose in the crates for 8 or 9 weeks at 5 degrees, and then after planting the grower grows them for an additional 8 to 10 weeks. The overall production time is about the same, but the key here is that the cut flower grower can plant pre-chilled bulbs in ground beds, and bypass chilling the bulbs onsite. The cost for 5 degree bulbs is not significantly different.

The most important requirement for growing 5 degree tulips, however, is that the crop be grown cool. Essentially, the chilling process continues as the plants slowly grow. The soil temperature in the growing beds or crates needs to be between 50-55 degrees Fahrenheit. That can sometimes be a problem here in Texas, and it limits how early we can plant the bulbs. Temperatures warmer than than 55 degrees can cause the plants to bloom too short.

Because the bulbs arrive pre-chilled and should be planted immediately, we scheduled our bulbs to arrive in three shipments, two weeks apart. This staggers out the bloom time on the other end. If we were really big-time tulip growers we would probably get weekly shipments, but this was still an experiment, so to speak. (Ha! A 15,000-bulb experiment!) We received our first shipment in late November. Before then our temperatures here in the south are too warm.

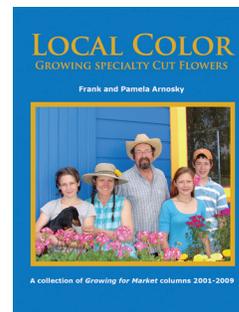
We planted most of our bulbs in ground beds under the soon-to-be-covered greenhouse. The bulbs should be planted as deep as possible, but they can be planted very close. We have less than 2 inches of space between the bulbs in all directions. The beds were fertilized with turkey-litter compost and a concentrated bat-guano fertilizer. The greenhouse remained uncovered, and the bulbs sprouted and have survived several freezes into the 20s. They are certainly being grown cool!

We also potted up some bulbs into bulb crates. A standard bulb crate is about 16 inches wide and 21 inches long. They can range in depth from 4 inches deep to about 8 inches deep, depending on what was originally shipped in them. We used crates that would hold at least 6 inches of soil. 3 inches of soil was put into the crates, then we gently pushed the bulbs into this soil and covered them with 3 more inches of soil.

Sometimes the bulbs can push themselves out of the soil as the roots grow if the soil is light, and it has been suggested that some sand be placed on the top of the soil in the crates to hold the bulbs down. We used a "Peat-lite" soil-less mix, with no sand on top, but we had no trouble with the bulbs pushing up.

We have been fertilizing our greenhouse tulips with a standard, non-organic water soluble fertilizer (the blue stuff!) along with an occasional application of calcium nitrate. Calcium is an important nutrient in tulips because it helps build strong stems (Just like Wonder bread--strong minds and bodies!) and overcome a problem known as "stem-topple" that can occur when the stems grow too long and weak and fall over before harvest. In our bright light conditions here in the South this is less of a problem than in more cloudy, darker regions. We don't worry about Calcium in our ground beds because our soil is limestone based. We'd like to get rid of some of the calcium!

We haven't had to use any fungicides or pesticides on our tulips, but because we grow them so close together, good airflow in the greenhouse is essential (The greenhouse with no plastic has no trouble!) Good airflow is the key to success in any greenhouse crop. Even if you can't open up your greenhouse because it is too cold outside, a regular, cheap window fan can move a lot of air around in a greenhouse. We hang them from the crossbars of the greenhouse. Our Ball Seed rep, Michael Henzler, told us that as little as 2 miles per hour air flow is enough to prevent spore germination in botrytis.



Pamela and Frank Arnosky are the owners of Texas Specialty Cut Flowers in Blanco, Texas. They wrote about flowers for many years in Growing for Market. Many of their articles are collected in the book Local Color, available from Growing for Market.

Their articles also are included in the Growing for Market Online Archive, which is available by subscription. For information about becoming an Online Archive member, please visit www.growingformarket.com.

3. Cold-weather crops

By Brett Grohsgal

It is the middle of summer and most of us are swimming in a sea of tomatoes, cucumbers, cut flowers, the works. The planting is done and harvesting and income over the next few months might determine how well many of us do for the whole crop year. So why am I writing, and *Growing for Market* publishing, an article on cropping during the winter? Though I cannot speak for the editor, I always hope that GFM will publish some really bizarre stuff, maybe even from me, when the stream of articles from fellow farmers slows to a mid-summer trickle. I write this for three additional reasons: first, because I lament the global influx of vegetables into East Coast markets in all months of the year (yes, I am talking about those imported tomatoes in our supermarkets in August). I yearn for the era when more food really was grown locally, when we knew the woman who grew the best asparagus or the man whose strawberries were always great. The second reason I tip my hand about winter cropping is because my deep love for growing in the frigid months has finally overcome my fear that gazillions of other local growers will flood the market. I have finally realized that even hundreds of other local winter-cropping farmers could not begin to feed all the nearby city people gobbling mesclun and collards. Finally, August really is the time to ponder a fall planting season, and September is the time to start it.

Our farm defines winter cropping in three ways. From the marketing perspective, winter is that time of year when our nearest serious competitor is at least 1500 miles away from our local customers. Such a nice com-

petitive advantage, that. Agriculturally, winter is that time of year when we dance around freeze, snow, and ice to harvest large quantities of adapted crops and sell them in a most welcoming market. And from an operations standpoint, winter crops are those sown between September and November, both in the fields and in the greenhouses, to bring in about 40% of farm income between late October and April. If any of these definitions appeal to you, please read on. If not, please return to the myriad duties of a market grower in peak summer.

I used to believe that winter cropping is simple, that to make it work required only a few steps and a few changes from summer cropping. Now, after periodically failing due to my complacency or oversimplifying assumptions, I realize that winter cropping mandates a whole package of practices. I stress this systems framework because I've seen a lot of failures, not only my own, in winter cropping. The failures nearly always stem from bad timing, from inappropriate soil management followed by too much precipitation, or from use of non-cold-hardy seed. But other factors in winter



At the author's farm in southern Maryland, Asian mustard survives a snowfall with no damage and is ready to be harvested as soon as the snow melts.

cropping can sap your spirits or your bank account, and so need to be addressed as well.

Our winter cropping system

We have two large greenhouses (totaling 5800 square feet) and 14 to 20 acres of fields that are planted to winter crops every year. The farm totals 104 acres, with 54 of these cultivated at some point annually. The greenhouses look like many other intensive mesclun factories, with wide harvesting beds of diverse greens running the lengths and alternating with narrow walkways (I'll briefly cover greenhouse management later). The fields are for me more interesting. It is from the fields that the highest quality and, potentially, the huge yields come. It is also where it is easier to fail and where knowing your crops and using a systems approach really count. The fields are pretty level but with some low spots and ridges. Winter sees 4-6-foot wide beds of direct-sown cash crops alternating with 8-foot wide traffic rows planted heavily to clovers, vetch, and rye (our nitrogen and tilth sources for the warm season crops that will follow). The beds average 650' in length and run north to south for contour purposes. Prevailing winds are strong and are usually westerly. Our cold-season unprotected cash crops are mostly brassicas: 4 cultivars of radishes, rutabagas, and turnips, totaling only an acre; 12 cultivars of kales, collards, mustards, and Asian greens, on between 7 and 13 acres; and about 5 acres of arugula. The rest of the cultivated acreage is in strawberries, perennials and overwintering annuals for warm-season cut flowers, and a large amount in either winter wheat or a winter fallow. We rarely have more than a half-acre of field lettuces past December, as nearly all winters see major freeze-kill of even the more hardy cultivars. Brassicas and cover crops rule.

Climatic limitations

Winter cropping is clearly not for every site. While well-managed greenhouses can be profitable far into the north, and our own greenhouses are very important players, our production and this article is about both protected and open-field winter cropping. I can only advocate the open-field component for USDA zones 6 through 10, a wide U-shaped swath covering much of the coastal, southern, and western US (our farm in Maryland is in zone 7). In the cropping system we use, heavy snows, ice, and freezes occasionally force the field crops into full dormancy, and we pick only from the greenhouses at that point. But the field crops survive to grow vigorously—and to be very harvestable—after the first thaw. For zone 6, this could be in March or

April. For us, after years of using practices fitted to the market goal of winter sales, all of our field brassicas are harvestable after nightly hard frosts and 30% are harvestable with only the leaves and top 1/2 " of soil thawed (i.e., with deeply frozen ground underneath).

While cold-season cropping is a strange idea to many, it has long been used by country people in suitable climates. People didn't always have shipped-in lettuce from the Sunbelt, and many of the weeds we now fight were brought over by the European settlers to stave off winter scurvy or to act as early spring tonics. A great book that every prospective winter cropper should have is the reprint of Peter Henderson's *Gardening for Profit* (available from Seed Savers Exchange, 563-382-5990). Henderson, farming and marketing in zone 6 between the Civil War and the early 1900s, was a master at integrating protected and unprotected winter crops on a very large scale. More recent authors also cover the topic, albeit with a heavier dependence on greenhouses than we have.

Right for you?

There is a lot of excitement about season extension among farmers and researchers who strive to serve the farm community. I greatly admire GFM, though, for printing counter-arguments (as Letters to the Editor) to the whole idea of extending our harvesting and sales periods. Farm work is a real grind, and maybe we need that winter down time to rebuild ourselves. I say this from experience. Our operation harvests and sells in every month, but a big part of me agrees with those who critique this nonstop production approach. Cropping all the time means that we earn income nearly every week of the year. It means that our customers very loyally stay with us. Both wholesale and retail seem to view us as miracle workers ("What?! Arugula when it's this cold outside? I'll take all you can give me!"). But it also means that we are hustling all the time and that our farm and our bodies are always under pressure. We lack the extended down time that lets other farmers undertake large construction projects, tune up their tractors, fix barn roofs, or vacation with loved ones. Instead, we have to fit in all those things around an intensive planting, harvesting, and delivery schedule. The big pluses are steady income and loyal buyers and the big minus is no time to regroup. You really need to weigh these factors before taking on large-scale winter cropping. On the other hand, small experiments in the cold season are inexpensive: 1-2 hours of labor, and \$25 spent on seed, and you're done with at least the September part.

What has made us into such devoted cold-season

farmers, though, are two final variables. Winter crops and markets are much more reliable than summer ones. Our farm has turned a profit and has grown in every year we've been in business. But in two of those years - one an extremely bad drought, the other a year with 72 inches of rain, rain, rain - it was only the winter crops that made up for poor summer sales and kept us in the black. I am risk-averse. I treasure any crops that always work and that are easy to sell.

The final factor that has kept us in winter cropping is passionate devotion to outstanding flavors. Winter greens are like August tomatoes: at their absolute peak of quality. Tender frost-bit collards, tat soi that's so sweet my daughter picks and gobbles it grit and all, Chinese mustards whose nose-tickling pungency is balanced and succulent rather than overwhelming, and cold-silvered arugula that is as perfectly composed and utterly complex as a Rhone wine in a vintage year - these are the stellar foods that we cannot produce in May or the warmer seasons. The market is flooded with insipid or harsh greens that never see any frost or freeze, and we are impassioned growers of what foods should be. That appreciation and passion make the winter wind seem a lot less biting, the winter grind a lot less disheartening.

Field crops

There are vegetable crops from at least five families that can reliably make it all the way through winter: the brassicas, or cole crops; the chenopodes (spinach, chard, and beets); the onions; the Apiaceae (carrots, parsnips, cilantro, etc.); and the Asteraceae (lettuces, dandelions, etc.). I hate gambling, and so focus both our winter cropping and this article on choosing winners from the families above.

Premier in durability are the brassicas. Across the globe farmers and backyard gardeners have and continue to use brassicas in the "off" season: collards in the Carolinas, winter cress as far north as New York, arugula and strap-leafed kales in Portugal and Italy, and mustards and loose-head cabbages in East Asia. Brassicas are the group that most likely come to the farmer with moderate to high levels of freeze-resistance already built in, and from this diverse group you are well advised to choose your first experimental plantings.

I need to present a few general cautions that the brassicas exemplify nicely. First, different crops and genetic lines present different responses to frosts and freezes. At the weakest are those with zero frost tolerance, for example some genelines of bok choy. At the next level are those that are good with frost but

that handle freezes by essentially sacrificing all their leaves and going dormant until spring. Both these levels are of scant interest and won't be discussed further. The penultimate level of cold tolerance are those genelines whose leaves get more sweet and succulent with repeated frosts but that will show "freeze hemorrhaging" at temperatures around or below 31° F (unimproved cultivars) or 24° F (our farm's genelines). Freeze hemorrhaging is where the cells in part or all of the leaf burst, so the limp leaf shows large spots of translucent juiciness. Any freeze hemorrhaging makes the leaf unsalable, but this penultimate group includes some outstanding mustard genelines that bounce back into vigorous growth with the barest hint of spring. The final level of winter hardiness is shown by nearly all cresses, most kales, many of the collards, and a few of the Asian cultivars. Here, frosts and repeated freezes cause loss of only a few of the outer leaves, little or no irreversible freeze hemorrhaging, and slow but steady growth throughout all but our worst winters. After a night where temperatures have dropped to 10-22° F, the fields with these genelines look as if they they were zapped with herbicide: all leaves are wilted and worrisome. But this last group are the real professionals, and the antifreezes in their systems protect against any major losses. In 13 years of playing the cold-season game, we've had 4 really nasty winters in which this group went fully dormant (temperatures of 5-18° F, and repeated ice storms or heavy blizzards). But survival was 90-100% and March regrowth was amazingly good. Most winters, though, we harvest kales and the other professionals nearly every week, often only 2-3 days after the snow has been melted off by one of the brief thaws that are typical for our region.

The second caution I make in choosing brassica crops is that the open-crowned cultivars like most collards, kales, and many Asian leafy brassicas may be better than the tight-heading types, as you can easily see and cull out any freeze damaged individuals.

The last caution concerns the root vegetables. Most turnips, radishes, and rutabagas we've worked with are in the penultimate freeze response group. The leaves really take a hit at 23° F or so. But the roots look fine, right? Wrong. Many times you'll be in an unpleasant gray area of quality, with some roots being superb and others with hemorrhage of the outer layers. Other varieties may develop an inner thin woody layer (essentially, a new skin) between the root core and the outer damaged layer. Any of these phenomena make the crop unfit for market. After big freezes, cut and taste a lot of roots, per cultivar, before you harvest en masse. And almost

no overwintered root brassicas are fit for humans once they leaf out in true spring, at least in this zone.

That's it for an overview of the brassicas. Play and experiment with these. They are the greatest companions and allies of the cold-season vegetable cropper. I stand in awe of their genetic strengths when Old Man Winter howls and I huddle in my Carhartts, wondering why on Earth I forgot to bring a hip flask out into the fields.

The second group, the spinaches, chard, and beets, have good cold tolerance but open-field plantings of these have not been profitable at our current site. Quality of cold-grown chenopodes can be incredibly high, with spinach especially being intensely sweet and a snap to sell. But growth rates under the system I detail here are too low for predictably good repeat harvests. I would plant a lot more were we in zone 8, where winters are really gentle. I've also had good harvests throughout winter on sites where I applied a thick layer of leaf mulch around all the plants. I would consider this again were our winter system intensive, rather than extensive, and if our farm were not so blowy that fallen tree leaves always disappear within two days. Gone with the wind takes on new meaning if you never have to rake the autumn leaves, and if field-installed Remy always tries to be reborn as a tattered kite rather than remain a crop-protection tool. A final hurdle with the chenopodes is that they draw deer like politicians draw lobbyists. Deer will hurdle fences to get to chard, and feeding those pests can be really expensive.

The onion family do well for us in some winters. Most reliably performing have been the perennial scallion types, with good harvests typically in November, March, and April. We are not very talented at growing leeks, regular bulbing onions, or garlics, so if you do these well I urge you to try this whole spectrum in the cold months.

The carrot family, the Apiaceae, does amazingly well in our winters. Parsnips were covered at length in the aforementioned book by Henderson, and here they make it through even the roughest winters to leaf out in March or April. I am ignorant of carrot performance in our winters, as winter weeding is reserved for high-value ornamentals and for the greenhouses. Carrots require more care than we want to give. Parsley, chervil, and dill often tolerate frosts and freezes down to about 28° F, with the heirloom strains performing better than the hybrids. But deeper winter freezes usu-

ally kill the lot. Better by far among the herbs of this family is cilantro, which seems to hunker down close to the ground and wait for the first breath of spring. A short-lived February thaw sees fast leaf development and marginally profitable harvesting, whereas March and April give great yields of high-quality cilantro. In mild winters overall survival approaches 100%; in severe ones we get about 65% mortality.

The final group to consider for unprotected winter cropping are the **Asteraceae, the foremost being lettuces, chicories, radicchios, and dandelions.** We grow an awful lot of lettuces but have had to adapt planting schedules to frequently hot Aprils. Our outside fall lettuce crops and greenhouse winter-long lettuce crops are much more profitable and reliable than the spring-sown batch. Autumn field lettuces in zone 7 can be outstandingly flavored, with 100% survival through the hard frosts and light freezes of November and early December. Then comes real winter. January usually sees full mortality of nearly all genelines of lettuces, with survival of about 0.2% of the hardiest cultivars. Useful for a breeding program, that, but not for most production farmers. When we grew near Raleigh, NC (zone 7b), well-managed lettuces easily had 80-100% survival through most winters. So we typically harvest field lettuces intensively, ahead of the looming deep freeze. Escaroles and endives do much better over winter here, especially the smooth-leaf types. They often perform almost as well as our brassicas. An experimental planting I did of six cultivars of heirloom radicchios was likewise encouraging, with 100% winter survival and only minor burning of leaf margins. But the real professional in the Aster family for overwintering is likely the dandelion. I am no fan of the bitterness of escarole or radicchio, having been fed way too many braised dandelion greens - in June - as a child. But the first tentative regrowth of dandelion in early spring is sweet, delicate, and wonderful. Were our farm in an area with higher demand for dandelion, escarole, and radicchio, we'd overwinter acres of these.

Greenhouse crops

Lettuces reign in our greenhouses, occupying 60-70% of planted space from September until March. Tender and fast growth is what the lettuces offer, and these are nearly always blended with the much higher quality baby field leaves to produce a truly elite mesclun. We also plant arugula, spinach, and two Asian mustards in 20% of prized greenhouse space to be able to keep our customers supplied with mesclun when the

fields are locked in deep freeze. This purely greenhouse mix is better than the shipped-in competition, yes, but it lacks the sweetness and complexity of the field-plus-greenhouse blend. About 5% of greenhouse space is planted to cilantro, chervil, parsley, and dill, as a source of diversity for our CSA customers when the outside cold is unbearable. We let frost and even light freezes occur in the greenhouses to improve flavors, and have found most cultivars tolerate this quite well. By early February, though, we heat the greenhouses much more in order to keep healthy our newly-germinating transplants for the upcoming summer season. The lettuces really take off at that point.

Seed sourcing

Let's be really clear here. Winter cropping in any zones colder than 8 is risky. Seed quality and genetic potential become increasingly vital as the sowing window shrinks with summer crops still in the field but with winter crops queuing up for planting. The big crunch for our current site is September 1 through October 7, and this means that slowly germinating purchased seed may well grow plants that are too small to stand even a mild freeze. I'll cover planting in more detail in the next GFM.

So we need good or very good seed, and we need the strains for outside to have at least some - and ideally a stacked deck - of the genes for winter hardiness. Just as all strains of Brandywine tomato are not created equal, so all strains of curly kale aren't at all the same in the arena of freeze-tolerance. Part of our farm's winter cropping system is recurrent selection of and seed saving from the winter survivors, but we still choose to buy some seed every year. I do not believe that freeze tolerance is a primary or even secondary goal of most U.S. seed companies. Instead, I suspect that the NEW!! IMPROVED!! GOLLY GEE WHAT A LIFE-SAVING HYBRID!! approach that dominates even the commercial seed trade has diluted or outright lost much of the cold hardiness for which nature and farmers selected over millennia. Rereading Peter Henderson's work, it seems he may have had more trustworthy hardy cultivars to choose from a century ago, before the onset of utter farmer dependence on seed companies and the global shipping of produce all winter.

There is at least one positive exception for sourcing cold-hardy seed. Wyatt-Quarles Seeds (Garner, NC; 919- 772-4243; wholesale only) has consistently supplied our operation with excellent seed. And their brassica and even lettuce cultivars are not glitzy, not over-hyped, and absolutely come to the winter farmer

with more built-in potential than any of the competition. In descending order of apparent genetic loading for freeze tolerance, we also use Fedco, Turtle Tree, High Mowing, Seed Savers Exchange, Johnny's, and Shumway. The first four companies should also be commended for trying to grow as much of their seed as locally as possible, a huge step in the right direction for winter hardiness. This year, our farm is also selling limited quantities of our own cold-bred genelines for other farmers and seed companies to reproduce (call 301- 866-1412 for an informational packet). But for you right now, for plenty of off-the-shelf affordable seed that may well give you cold-season harvesting, Wyatt-Quarles is the company to call first. I propose here the counter-intuitive idea that some southern-tier seed companies may well be a better reservoir for cold hardiness than most northern companies. The northern growers seem to mostly assume (often correctly) that nothing can make it through winter. In contrast, a seed supplier in the Carolinas who sold collards that died at the first freeze would rapidly lose both face and customers. And we farmers can be a gossipy lot.

Soil management and planting

Proper soil management for successful winter cropping revolves around two core goals: drainage and tilth. Winter and spring across much of the U.S. are the times of year when soils have the greatest chance of being saturated with water. Sodden soils over long periods threaten plant roots with anaerobic conditions, a sure way to stunt the great majority of crops. And harvesting in poorly draining soils can become a discouraging waltz with mud.

Tilth is, very crudely, the degree of fluffiness, cloddiness, or aggregation that lets a soil drain and breathe. Good tilth and good drainage permit plants roots to properly thrive, respire, and search for nutrients. Both also promote faster departure of all that water from a winter system once the ground has thawed.

A sure way to make winter harvesting a misery and to increase the chances for full-blown crop failure is to ignore drainage and tilth while preparing your ground for planting. We, our tractors, and our misconceived notions of how smooth a seed bed should be are, in my view, prime enemies of good tilth and good drainage. Overwork your soils and you will greatly decrease your odds for a successful winter crop. For winter, we use an extensive approach out in the fields: minimal investment of tractor and human time per acre, and lots of acres planted with diverse crops in order to have plenty of

plants to choose from after particularly hard freezes. Over 18 to 20 acres, we prep the 4'-6' wide crop beds by mowing the summer fallow, plowing, and lightly disking once or at most twice. We direct sow using a push seeder when the clods are small enough, or by broadcasting between the above two light diskings if the field is still really rough after our permitted tillage and if the cultivar isn't picky about spacing. The 8' wide traffic beds between the cash crop beds are not plowed, only disked, broadcast generously with an appropriate cover crop, and lightly disked once more. I decide on particular cover crops based on that soil's needs (e.g., a blend to produce lots of biomass for our sandier soils) and on the specific warm-season crop that will follow seven or eight months hence in our planned rotation. If we weren't certified organic and so barred from using herbicides, I'd till even less.

What does this acreage-extensive, rough-till approach do for us? It gives us aerobic soils in which plant roots can easily do their jobs. It gives us traffic beds that don't puddle, that let the whole system drain superbly, and that are pleasing to harvest from when the fields are wettest. And the approach repairs and builds the soil tilth that can suffer under more intensive summer cropping. Driving this system are the soils and the plant roots, not the tractor nor any dangerous goal of smooth planting beds. I can't sell beautifully weed-free, over-tilled soils; I can't market lovely fine seed beds or their flip side, muddy anaerobic fields when we get too much rain. What I do sell are outstanding crops in more months and far more reliably than do any of my competitors.

The prices we pay are small indeed: uneven, cloddy walking through rough fields, and, in the traffic beds, mowed but unsightly summer weeds that persist until the freezes and the clovers finish them off. And we develop really strong ankles.

A different soil management system with high potential for cold-season success combines raised beds, intensive tillage, and lots of animal manures. The manures not only generously supply nutrients for crops but also build outstanding tilth in what would otherwise be an over-worked soil system. This was described by Henderson for very successful winter cropping more than a century ago. The most eloquent and insightful modern farmer that I know that uses the intensive system (not necessarily for winter cropping) is Polly Armour of Four Winds Farm in Gardiner, NY. Our farm would use this second approach for high-value crops if we had more ruminants and if our soils were lower in phosphorus. Nutrient excesses remain a threat in

manure-based systems.

We no longer plant any outside winter food crops by transplant. All are direct sown. This is because the added work of transplanting seems to have a negative effect on over-wintering in experimental same-year, side-by-side plantings. In lettuces, cabbages, spinach, broccoli, and Brussels sprouts, the first deep soil freeze usually kills 30% to 80% of transplants. And winter has only just begun. I suspect that this higher mortality stems from a transplant's frequent loss of the tap root, with its apical dominance and drive to go deep. Many transplants instead re-initiate root growth with laterals that are more superficial – a dangerous approach when the upper soil freezes early and often.

Harvesting

We harvest outside winter crops in four main ways. Smaller leaves for mesclun are cut-and-come-again on a weather-dependant 10-day to 35-day cycle. Whole-plant harvesting is reserved for baby lettuces, tat soi, and root crops. The vast majority of cooking greens are harvested selectively, leaf by leaf, choosing the best-looking leaves but never cutting more than 40% of each plant. The final technique is rogueing, the intentional destruction of runts and off-types, with sale of their leaves. This makes the crop pay for its own genetic improvement. Beds that will eventually be harvested for seed are always subjected both to rogueing and to between four and twelve cycles of either cut-and-come-again or selective leaf harvesting. Routine whole-plant harvesting would in contrast tend to remove the best individuals from a breeding population – a real mistake if you want superior parents for next year's seed.

Saving seed

Seed saving and genetic management are keystones of our winter cropping system. Yes, we start with seed purchased from good companies. But then we harvest the seed, during April, May, and June, of the best plants among the larger group of survivors. I covered this in detail in GFM August 2002 through October 2002 (Editor's note: The articles are now available in the 106-page compilation of 2002 issues; the cost is \$20. Ordering information is on page 2.) and urge you to consider the arugula example as one template for improving seed for winter profits. I will here much more briefly outline the ideas and central details of genetic management of winter crops.

The core concept is that winter is tough, and after sowing unimproved seed you are going to see some and maybe a whole lot of plant death caused by freezes, ice,

and wind. But if all conditions in your field were equal across that stretch of frozen ground, then any plants that survived would likely have some genetic advantage. You want to let these survivors breed, and save that seed. By doing so you are increasing the frequency of genes for winter survival in your new batch of seed. If the next winter is equally or less severe, the newly improved crop will have a higher level of survival. And of profit: genes for freeze tolerance enable harvests and harvests mean money. The results of such a simple process can be fast and dramatic: purple Asian mustard that came to our farm with 80% winter mortality now loses 0-5% in normal winters and about 10% in the most severe seasons. After 3 to 12 years of selection, our main kales, arugula, collards, and three other Asian mustards have 100% survival regardless of winter severity.

You can attain the same. The steps are:

1. Choose a cultivar likely to have some cold tolerance already built in, eg. curly kale, old-fashioned cilantro, or Rouge d' Hiver lettuce, and choose a seed provider likely to sell you the best in winter-hardiness.

2. Isolate beds or fields for eventual seed harvesting by as great a distance as you can from potential cross-pollinators. We assume that the cresses form one pollination group (i.e., they cross-pollinate each other but won't cross with other groups); arugula is not at all a contaminator; kales, collards, Brussels sprouts, cauliflower, and broccoli form a third group; typical mustards a fourth; and turnips can contaminate the third group readily.

3. Direct-sow a minimum of 1 oz. and preferably 8-16 oz. of this seed between late August and early October, depending on your zone.

4. Treat normally with irrigation, soil fertility, weed control, etc.: do not baby this crop. Do NOT destructively harvest any of this first crop before spring. Instead, harvest all plants using cut-and-come-again or selective leaf cutting (see Harvesting section), leaving the crown intact.

5. Once real spring occurs, assess survival. You'll want a minimum of 30 to 50 superior plants to be the progenitors of your new improved line. Thousands of superior "mother plants" is better and is our farm's path. Rogue (destructively harvest) the runts, the off-types, and any diseased individuals before flowering begins.

6. Once seed-setting begins, stop harvesting any leaves. Let them ripen their seed unharassed.

7. Save, process, and store this seed correctly (see reprints; not covered here).

What you can end up with is really fine seed adapted to the harshness of winter as well as to your local environment. These are agricultural assets far superior to seed-company materials grown where deep freezes and frequent leaf harvesting don't hit most seed crops.

Greenhouse management

We manage our winter greenhouses by sticking to three simplifying principles: keep N low, use chickens to destroy large insects and slugs before any planting begins, and keep heating affordable.

We no longer overly fertilize our greenhouse lettuces. We used to want beds loaded with nitrogen to maximize yields, but aphids became a nightmare. Keeping N low means that we haven't sprayed the greenhouse greens in over three years. The crops do get some residual fertilizer that presumably leached the preceding spring, from all the flats of warm-season transplants that we start. Briefly running chickens in the greenhouses also adds fertilizer, but we usually only give the birds 5-14 days of August access before the September lettuce sowing. We pay a high price if we skip this step: slugs and especially grasshoppers and crickets can whack many an emerging lettuce crop. And organic heirloom lettuce seed isn't cheap. Keep in mind that chickens can bake in an unventilated August greenhouse: give the birds free access to the outside, and they'll clear the greenhouse of many pests in the cooler morning hours.

Our final principle for profitable all-winter greenhouse use is to keep heating affordable. Our period for really intensive greenhouse heating is January to March, when we are starting the majority of our warm-season transplants. While we have huge propane heaters in our oldest greenhouse, wood has fully supplanted purchased fuels. We had our welder use a secondhand 280-gallon oil tank to make the body for an airtight, large-volume wood stove. A large industrial fan circulates the warmth. This is not nearly as efficient as more expensive wood-fueled systems that circulate hot water, but it cost less than \$600. We have 50 acres of woods and our farm is beset by hurricanes and windstorms often enough that cleanup and firewood go hand in glove. Further, this thrift extends even to vital crop fertilizer needs: all potassium used by our crops over eight years has come from broadcast wood ash plus low initial residual K. Many tons of tomatoes leave our farm every summer to feed urban customers, but our soils test adequate for K if I keep the house and greenhouses warm. I avidly read and re-read the GFM article by Carl Benson (January 2004) on heating with converted old cooking oil. That is creative thinking and skillful resource management, and I urge any readers who want to run greenhouses all winter to consider all such alternatives to fossil fuels. Propane costs \$110 per frigid night to keep one greenhouse as warm as does the wood stove, and January's frigid nights can be followed by February ice storms.

Human comfort and safety

Winter cropping is glorious, invigorating, and rewarding. But dressing appropriately is the only way to look forward to each day. Above 38° F regular clothing will do. From 34° to 38° F, or in cold driving rains, we are addicted to Carhartt coveralls (the quilted full body suit). Knock-offs usually lack Carhartt's long-lasting insulation and triple-stitching. Below 34°, we layer underneath the Carhartt's, as well as wear stocking caps. Having no seam for the icy winds to plague one's backside makes a huge difference. In Carhartt's, I am impervious. I urge you to spend the money for such superior protection. We are all more efficient harvesters when we are toasty.

Gloves are crucial. We use both nitrile and leather. Nitrile gloves are tight-fitting surgical-type gloves much superior to latex. These act as do wetsuits for scuba diving. Nitrile gloves cost more (about \$6.50/hundred) but last a lot longer than latex and are available at plumbing supply houses. Between 38° and 45° F, we use one per hand, maybe with a leather glove as well (fingertips cut off for dexterity). Below 38° F, we use two nitriles per hand. Below 30° F or in freezing rains, leather usually goes over the nitrile pair. Nitrile plus leather with fleece works nicely to about 22° F, but at that temperature you shouldn't be harvesting greens. All this may sound obsessively preoccupied with layering, but the sheer grind of meeting January and February crop delivery deadlines needs to be softened by hand and body comfort.

Finally, greenhouses are not just for crops. They can warm you quickly when you are on the edge of freezing. I burn that wood furnace in part just to have a hot surface for iced fingers. Greenhouses let you thaw and be productive.

Marketing

The most cherished part of winter cropping for me is the walk back to the house from the greenhouses and barns. The sun has fully set, the velvet night sky is bejeweled with the constellations, and behind me, loaded for tomorrow's delivery, are many many cases of about the best frost-bit greens grown anywhere.

The second-most cherished part of cold-season cropping is the market. We are utterly alone in the field: in our region, I know of no other farmers who, even in the gnarled heart of winter, do this on our scale. A thousand acres of winter greens could enter the production stream from every state in USDA zones 6, 7, and maybe 8 and the market would barely be dented. This contrasts most strongly with summer cropping, where glut is the dispiriting rule and we all race for diminishing returns in what is, by August, a buyers' market. Summer is not very kind. But if you are willing to crop in winter, you should set your own terms. The customer can and should pay for your shivering and for those clearly elite greens.

What this means for us is that we do not negotiate or bend on prices for our core items, notably mesclun and arugula. While we strive to help our restaurant, grocery, and university accounts make money on all their purchases from us, this doesn't mean that we are going to sink to the abysmal, economically untenable prices of Mexican or Californian low-end salad mix. This resonates with the observations of Alison and Paul Weidiger in the most recent issues of GFM. Grow an absolutely superior crop, price it fairly, and you should have little challenge in selling it.

So winter marketing is easy. But after years of being a wholesale operation, of being married to the vagaries of the restaurant scene, we have come to treasure our newest marketing approach, a winter subscription service for retail customers. Why? Because in spite of our greens being so clearly superior, in spite of being alone among local growers, the nationwide wholesale trend for organic and conventional mesclun prices is deflationary. Prices are sharply and consistently downward. This can drag down prices and profits for all of us, even those at the top of the quality spectrum. I see no such problems at the retail end. When the flood of \$8/case Mexican mesclun hits our region's wholesale markets in deep winter, I experience a two-week slack period when our mesclun sales decrease by 25% until everyone re-learns the joys of locally grown quality and shelf life. Retail customers, though, treasure anything and all things local. Unlike restaurants, they aren't subject to the pressures of maintaining really low food costs or to the arbitrary mandates of distant corporate execs who care not a whit for outstanding quality. We will continue to sell to our most loyal, core wholesale accounts, who always want more, more, more. But the retail dollar is both present and appreciative in the winter. So I advise you to feel out your own market. Just remember that you negotiate from strength as the days shorten and your competitors become more and more distant.

I urge you to try a bit of winter cropping. At the worst you'll have some dead collards and turnip jerky come spring. In the middle arena of success you'll have generous regrowth of greens with the first real thaw, when neighbors cannot even get in their muddy fields to plant seed. And at the best you'll come to treasure frost-bit harvesting, quilted coveralls, and a wide-open marketplace. Enjoy!

Brett Grohsgal co-owns Even' Star Organic Farm with his wife, Dr. Christine Bergmark, in southern Maryland.

These articles appeared in the August and September 2004 issues of Growing for Market.

4. Storage crops to sell later

Many growers extend their selling seasons for months by growing big crops of vegetables that store well, then bringing them to market after frost puts the fields to rest. Winter shares in Community Supported Agriculture (CSA) projects, late-running farmers' markets, and restaurants with seasonal menus are all good venues for selling storage crops.

The trick is to keep the crops in top shape. Most storage crops require low temperatures and high humidity, two factors that don't come together easily. Several others require low humidity and low temperatures. And then there are a few that fall in between. So what's a commercial grower to do?

Basically, there are two options: a root cellar or a cooler. In each case, special provisions have to be made for the scale and type of crops that will be held in storage. As an example of how these two features can be incorporated into a produce farm, consider the system at a farm in Wisconsin that sells until January. The farm is able to hold potatoes, carrots, onions, beets, cabbage, leeks, rutabags, garlic and winter squash. Combined with lettuce, spinach and greens from unheated hoop-houses, this farm's offerings in December are more plentiful than in spring.

In this case, storage space is allocated in a bank barn, which has the bottom floor built into a hillside. It doesn't freeze until January, and can be kept above freezing even then by the minimal heat from an electric light bulb. The farm has both coolers and a dry storage room into the lower floor to provide different combinations of temperature and humidity for different vegetables.

Root crops such as beets, carrots, turnips, rutabagas and leeks store best at 32°F and 90 percent humidity. Potatoes prefer temperatures of 40-60°F and 90 percent humidity. Onions and garlic like it cool - 32°F - but require less humidity - about 65-75 percent. Winter squash prefer temperatures of 50-60°F, but dry.

That's four different types of storage for vegetables that will hold a month or more: cold and humid; cold and dry; cool and humid; cool and dry.

Coolers and root cellars

A walk-in cooler is certainly a good option for long-term vegetable storage, but most coolers dehumidify the air. So with crops that require high humidity, you may have to add water to the air. A humidifier can be put in the cooler, and even buckets of water near the fans will add moisture. Humidity can be monitored with a hygrometer, which is available from many farm supply catalogs.

Long before farmers had coolers, they had root cellars that used the cool, even temperatures of the earth to keep produce cool. Dirt-floored cellars were especially good at keeping perfect storage conditions, but even modern concrete basements can serve the purpose if they can be closed off from heat and have windows or a vent to bring in cold winter air.

At the Camp Hill farm in Minnesota, a root cellar was constructed by burying a piece of culvert under a hill with a door in the hillside. At a farm in Pennsylvania, vegetables are stored in a shed with a highly insulated room inside. In summer, the room is cooled with an air conditioner and in winter the door is opened to let in cool air.

Whatever the method of storage, it's important to remember that only perfect produce is a candidate for long-term storage. Anything that is bruised, cut or damaged in any way is going to spoil and cause the spoilage of the rest of the crop. So inspect produce carefully and choose only the best for storage.

Either rub off soil and leave the crops somewhat dirty, or wash and dry them thoroughly before putting into storage. With onions, garlic, winter squash, pumpkins and sweet potatoes, it's important to cure them thoroughly before storage.

Storage requirements for produce that can be held a month or more			
Vegetable	Best temp. (°F)	Humidity (%)	Storage life
Artichoke, Jerusalem	31-32	90-95	4-5 months
Beets, topped	32	98-100	4-6 months
Brussels sprouts	32	95-100	4-6 months
Cabbage, late	32	98-100	5-6 months
Cabbage, Chinese	32	95-100	2-3 months
Carrots, mature	32	98-100	7-9 months
Carrots, immature	32	98-100	4-6 weeks
Cauliflower	32	95-98	3-4 weeks
Celeriac	32	97-99	6-8 months
Celery	32	98-100	2-3 months
Garlic	32	65-70	6-7 months
Horseradish	30-32	98-100	10-12 months
Kohlrabi	32	98-100	2-3 months
Leeks	32	95-100	2-3 months
Onions, green	32	95-100	3-4 weeks
Onions, dry	32	65-70	1-8 months
Parsley	32	95-100	2-2.5 months
Parsnips	32	98-100	4-6 months
Peppers, chili, dry	32-50	60-70	6 months
Potatoes	45-50	90	2-5 months
Pumpkins	50-55	50-70	2-3 months
Radishes, winter	32	95-100	2-4 months
Rutabaga	32	98-100	4-6 months
Salsify	32	95-98	2-4 months
Squash, winter	50	50-70	1-6 months
Sweet potatoes	55-60	85-90	4-7 months
Turnips	32	95	4-5 months

Source: USDA Publication #668

5. Value-added products

The most challenging strategy for extending the marketing season is to create products that can be sold at any time of the year. Those can be processed food products such as jams, vinegars and salsas. Or they can be craft items made from your farm products.

In the case of food products, you will need a certified kitchen inspected by local health officials. You may also need nutrition and ingredient labels that meet certain federal requirements. If you intend to make low-acid foods, you may need to take a food-safety course. The requirements for processed food products will vary from state to state, so you should do some research first. Depending on the scale of your enterprise or requirements by wholesale customers, you may need to get a third party certification for the federal rules known as Good Handling Practices. Start with your local Extension agent, who will be able to put you in touch with a university specialist familiar with processing requirements in your state.

With crafts, the primary issue will be whether you can sell them at your farmers market. Many markets have strict rules about crafts, so it pays to be sure that the product you have in mind will meet the requirements. In this chapter, we'll tell you how to make two products, garlic braids and pepper wreaths, that are strictly farm products, so they should comply with your market rules.

The main consideration for farmers with any kind of value-added product is timing. You need to choose a product that can be made when you have time yourself or when you have employees available. Fruits and vegetables won't wait for you to find time to process



them, so be sure you have your system completely lined up and ready to go when your produce is ripe. Kitchen inspections or rental agreements, packaging and bottling supplies, labels - these all need to be organized long before you are ready to harvest. And don't forget to have your marketing planned: don't waste time making a thousand bottles of vinegar if you only have the market for 100 bottles.

Savvy planning can help you add products that will bring in money year-round, especially when your fresh produce is sparse in late fall (when value-added products become attractive gift items for the holidays) and again the next spring before warm weather arrives. Value-added products aren't for every farmer, but those who do figure them out learn to love the extra cash!

Crafts make winter markets profitable

By Janna Field
Fieldfarms
Dexter, Michigan

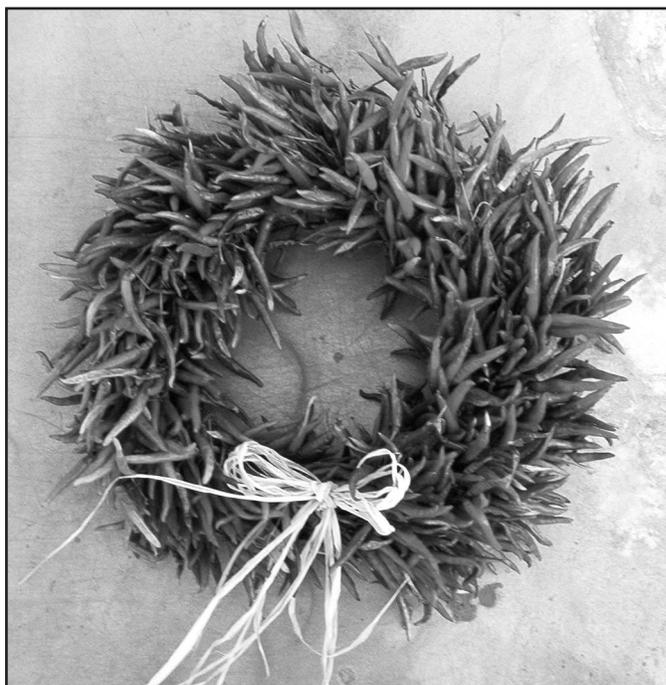
I have been a market grower for 10 years at the Ann Arbor Farmers' Market. I grow bedding plants in the spring, cut flowers through the summer, mums in the fall and value-added products at Christmas. My husband works at Ford Motor Company and I manage the farm. We own 14 acres, but I farm only about 2 acres. We also have four hoopouses, which are used to start bedding plants.

Our farmers market is exceptional. It is located in downtown Ann Arbor and on a peak Saturday in spring or summer there are easily 150 vendors. There is overhead shelter with parking, and the market master schedules many special events such as ice cream socials, cooking with seasonal food, and live entertainment. Parking can sometimes be a problem for customers because the market is so popular.

I am continually amazed at how vibrant our market is from the Saturday after Thanksgiving until Christmas. Approximately 100 vendors participate at this time of year. You can find every kind of fresh holiday greenery, including trees, wreaths, roping, table arrangements, and kissing balls. The market still has plenty of produce, such as apples, squash and kale. Many crafters also sell at the market this time of the year.

I have been going to the market during the Christmas season for seven years now, and it has become my second biggest money making time (bedding plants in spring bring in the most). Our market has a policy that vendors can sell only what they produce; at least 66% must be products that are grown or raised, and the rest can be crafts. I take pride in selling many items that I have grown, and Christmas is no exception. In fact, most of what I sell at Christmas originated from what I grew.

I make and sell olive oil based herbal soaps, with each variety made for a specific purpose. I make 15 varieties of soap, including tea tree and lavender, which is very healing; calendula soap, in which I grow a high oil content calendula (Erkfurter), make an infusion, and then make soap with it; Aloe and comfrey soap, which is wonderful for the face; and



Wreaths and swags of peppers are among the many gift items that have made winter farmers' markets Janna Field's second biggest season. You can read her article on how to make a chili pepper wreath and swag at www.GrowingForMarket.com.

peppermint soap, which is invigorating, just to name a few. I sell these soaps all year long (my customers would be bummed if I didn't have them year round). These soaps have become the base of my Christmas sales, but I still wanted more products to go with my soaps.

I decided to stick with the herbal theme, and created bath salts, which I sell in single bath size. I find that when you have things priced like this, people tend to buy more. I also make herbal bath bombs, which are the type you throw into the tub. Like a giant fizzy bubbling in the bath water, they fill the air with herbal aromatherapy. I package these in colorful cellophane wrap. They catch the customer's eye and sell like crazy. For the record, I use only pure essential oils in all my products which I order in bulk from Liberty Natural Products. Keeping with the bath theme, I also make herbal tea bags for the bath. These are giant tea bags which I get from Lavender Lane. I fill them with herbs I grow, oatmeal (to soften the skin), and various essential oils. I make five different recipes, including muscle relief, stress relief, p.m.s. blend (my customers get a kick out of this one), and cold & flu. I make sachets using these same giant tea bags covering them with fabric.

One of my best selling products at this time of the year is potpourri. I dry flowers grown throughout the season, and chop some up to make potpourri. I make 10 different kinds of potpourri with various herbal themes. I color coordinate my potpourri, such as purple for lavender potpourri, romantic is pink, blue for stress and my popular Christmas potpourri, white with pinecones, berries, spices such as star anise. I sell them in small, 5" x 7" ziploc bags. I have to make more every week, because it's the kind of thing people don't buy just once. I also package essential oils in .5 ml bottles for resale. People like to purchase these to freshen potpourri or for other personal uses, and I have priced them affordably.

Keeping with the herbal theme, (you can see how this can get out of control!) my new product this year is catnip mice, I always try to add a new item every year. They are quick to make out of felt and, filled with catnip, just too cute.

I also sell pressed flower pictures. I gather flowers throughout the season and put them into phone books to press and dry. I use sticky notes to label pages of the phone books as to what flowers are being pressed so that I may find them quickly when I am creating. One of my best sellers in this area are bookmarks. I have a big basket of bookmarks priced at \$3 each. I laminate the bookmarks, which brings out the color of the pressed flowers. I use my laminating machine often. I make all my signage on my computer and then laminate them for a professional look. They last all season and then some. Laminating machines are quite affordable now and I highly recommend one. I also sell pressed flower cards, suitable for framing, and these prices vary.

One of the hottest items I bring to the market are my Thai pepper swags and wreaths, but I only have them for one week, because I quickly sell out. This idea came about out of sheer laziness. I grow 16 varieties of hot peppers in the summer and I hate to pick Thai peppers; it just takes sooo long! I turn them into swags and wreaths. They dry beautifully and are useful in the kitchen. I now plant several hundred feet of Thai peppers. On that first Saturday after Thanksgiving I bring these to the market and sell out in no time. What a colorful sight, piled high on the table!

The product I take the most pride in that I sell at this time of the year, are my beloved gourds. I love gourds. I grow them every year and have a huge stash of many kinds. I clean the gourds and turn them into useful

items. Christmas ornaments are my best selling gourds, and they sell for \$15 each. I clean the gourds, drill a hole in the top, insert a gold string for hanging, and paint them. I also sell gourd birdhouses and gourd bowls. I will do custom work for customers who request it. My husband built a wonderful display for these gourds and it really catches the customer's eye. Most don't even realize how many varieties there are and what can be done with them. It creates a very unique display that helps me stand out at the market.

To round out my Christmas inventory, I sell dried flowers and dried arrangements. With all this color at Christmas and the uniqueness of the product, I do very well at Christmas. Rarely does a customer buy just one item. They tend to get caught up in the herbal theme themselves. Most of my items make great Christmas presents and are not readily available anywhere else.

There is one caveat to all this wonderfulness: the cold weather. I am a warm-weather person and thought I would never be able to stand around for eight hours outside in the elements. Well, I learned to dress for the cold. Most of my customers barely recognize me in my full Carhart ensemble. I also wear L.L. Beans -60 degree boots and stand on a mat to keep my feet warm. We are fortunate to have electricity at our market so I bring in my salamander heater and heat about 6 stalls around me. But the thing that keeps me the warmest is money coming in.

Janna Field is the owner of Fieldfarms in Dexter, Michigan. She sells at the Ann Arbor Farmers' Market.

No need to pick pepper leaves

According to the Fred Gloeckner Seed Co., pepper branches don't have to be defoliated by hand. Here is a more efficient way to get the leaves off before crafting:

“When stems are cut, they must go into water-filled cans into storage in complete darkness at a Fahrenheit temperature of 68° for three days, after which the stems can be shaken and all foliage (not the fruit) will drop to the ground.”

Make wreaths and garland for holidays

By Erin Benzakein

Long after the flower garden has been destroyed by rain, wind and frost, I am surprised to find many opportunities to make more money before winter officially arrives. From mid November until Christmas Eve, we stay busy fulfilling orders for centerpieces, arrangements, garlands, and wreaths. A few trips into the woods, an afternoon or two of scouting for wild rosehips, and generous friends who allow pruning from their gardens provide an abundant stock of material. The thing I love most about this season is people's enthusiasm and generosity. Our customers, while a bit harried by all that accompanies the holiday season, seem genuinely thankful for an infusion of nature in their busy lives. For very little capital I've been able to generate a nice chunk of cash before the true closing of another flower year. If you're interested in extending your season as well, read on for my list of ingredients, sources and prices for hard goods, and some tips for making wreaths and centerpieces. Once you know the basic technique, making holiday decor is a breeze!

Hand-wired wreaths

Most designers I know hand-wire their holiday wreaths onto simple wire frames. I wanted to see what the process was like compared to the clamp wreath maker that I usually use, so I made one of each. Hand-wiring, while a bit more time consuming, does produce a very lovely, full wreath. It also does not require a large output of money to get started so is ideal for beginners or growers who'd like to test their market before investing any capital. Nearly any large craft store should stock this type of wreath frame. I paid \$2.50 for an 8" diameter and \$2.99 for a 12" diameter. Most wholesale sources sell them in packs of 50 for around 80 cents each.

In order to provide a solid back to build the wreath on, I was advised to wire moss onto the frame first. It takes only a few minutes and greatly improves the strength of the frame. After attaching the moss, I be-



The author holds two types of wreath frames, above. On the left is a hand-wired wreath frame covered with moss for added strength. On the right is the frame used in a wreath-clamping machine.

At left, the hand-wired wreath is half finished.

Below, the completed wreath with flower and fruit accents on mixed greenery.



gin wiring on greens. I start with a few sprigs of evergreen foliage slightly fanned toward the outside edge, wire it in place with paddle wire, add more material, and repeat the process until the entire frame is covered. After the wreath is completely greened up, I wire in the decorative accents. For the wreath pictured at right, I used pinecones, dried fruit slices, crabapples, strawflowers and peppers. I find the process to be simple, straightforward and enjoyable.

Clamp wreaths

Nearly all the wreaths I've made have been on a clamp wreath machine. After comparing both methods, it's still my favorite, mainly due to speed! You can buy the machine for about \$130. Frames cost between 40 cents and 80 cents each, depending on diameter. With someone helping prep material, I can whip out between four and six wreaths an hour. Once the frame is set in between the clamps, I add generous bundles of evergreens, rosehips, twigs and berries. When the claws are full, I clamp the greens in place and repeat again until the entire wreath is complete. Like the hand-wired method, I also add in the main decorative elements at the end. For the wreath pictured, I used crabapples, rosehips, peppers, dried hydrangeas and ribbon. If you are interested in mass production I'd definitely recommend the clamp machine. Our wreaths sell for \$45-75 depending on size, so the cost of the machine is quickly recouped in sales.

Garland

While most box stores sell inexpensive cedar or mixed greens garland for the holidays, I've found quite a demand for something different. The last two years I've had to hand wire my garland and it's an awkward and time consuming process. This year I'm biting the bullet and buying a garland maker, which should transform the entire experience! They run around \$195 for the machine plus another \$10 for lead



A clamped wreath half finished, above, and completed, top right. Notice how the berries are included with the greens and the fruits and hydrangeas are wired on later.



cord and wrapping wire. My local wholesaler has one and uses it every week of the year. She sells garland not only for the holidays but also to florists and brides for their events. She charges \$2.75 a foot wholesale. Last year to retail customers I was fetching around \$6 a foot.

Sources for supplies

Floral Supply Syndicate, www.fss.com — They have an incredible selection and the best prices anywhere on hard goods. All of my florist friends swear by this company.

Terra Tech, www.terratech.net — They sell wreath makers, garland makers, wreath frames, wire and cord. A very nice company with good prices and fast shipping.



Erin Benzakein runs Floret, a small organic flower farm and floral design studio in Washington State. www.floretflowers.com. She is the co-author of *Fresh from the Field Wedding Flowers*, which features 75 minutes of video tutorial in which Erin teaches how to make wedding florals. Available from *Growing for Market*.

6. Winter markets

By Lynn Byczynski

One of the biggest trends in market farming today is the growth of winter farmers markets. According to new USDA figures, the number of markets held at least once between November and March grew 38 percent from 2010 to 2011. About 17 percent of the nation's 7,222 markets operate in winter.

The statistics encompass many variations of winter markets, from a one-day holiday market to markets that are open twice a week all winter long. The growth in winter markets is attributed in part to increased direct marketing of agricultural products including meat, cheese, and honey, plus value-added products such as soaps, jams, salsas, wreaths, dried flowers, bread, wool, and locally roasted coffee.

But it's an increase in fresh produce in winter that has really lit the fire under winter markets. Growers have dramatically increased production of winter vegetables in high tunnels, thanks in particular to the NRCS high tunnel grant program. Once high tunnel production makes winter marketing possible, many growers also increase production of storage crops such as root crops and winter squash. When customers realize they can purchase many types of groceries from local vendors, winter markets take off.

As you begin planning for your 2012 season, you might also be thinking about next winter. Is there a market where you could be selling? If not, do you want to start one? What could you be selling in January 2013? What would be required to get sufficient production to make it worth your time to go to market?

In this issue of *Growing for Market*, you'll read about two growers with long experience selling at winter markets. You'll also find separate articles about building low-cost caterpillar low tunnels for season extension of cut flowers, and a CSA that quit selling in summer and now offers only winter shares.

Winter sales boom

Paul and Sandy Arnold at Pleasant Valley Farm sell at the year-round markets in Glens Falls and Saratoga Springs, NY. They grow in two unheated high tunnels,



Paul and Sandy Arnold at market in late November. The winter market is held in an elementary school gym. Between storage crops and high tunnel crops, shown below, the Arnolds are able to sell almost as much in winter as summer.



a 30 x 144' and a 34 x 144'. They also got an NRCS grant for a third tunnel they hope to have up for next season. At their latitude, they have a planting window of Sept. 20 to Oct. 10 for direct seeding high tunnel crops.

"We do high tunnel greens and get better at it every year," Sandy said. "We do a wide range of Asian greens, kale, swiss chard, and lettuce all winter. We use no heat at all in the high tunnels. Our tunnels yield some \$1,200 to \$1,400 a week in product, so that really increases our winter market sales. Normally, we also have 20 different items from the root cellar. We harvested field

stuff until Christmas this year, although by Dec. 1 we're usually done."

Sandy was involved in starting the winter market in Saratoga Springs. From the Salvation Army gym, where the market paid just \$60 a week, it recently moved to a bigger space in an elementary school, with \$700 a week rent. "It was a huge move and a great expense, and it didn't go over real well with everyone," Sandy said.

But it has proved to be a financial benefit to many farmers. Currently there are 35 vendors and a waiting list.

Sandy and Paul have differing opinions about the winter market.

"I'm not as in favor of it as Paul is," she said. "Paul just loves farming and would do it 365 days a year. For me, I liked the break. One of the effects is that it has reduced task completion, where we used to be able to get things cleaned up during winter. We now have workers year-round, and there's good and bad to that. I don't like the cold, I don't like to be out there with my fingers freezing while I'm harvesting. We never thought we'd go past Oct. 31. Now we have an insulated, heated washing station. We used to say we had more time than money, and now we have more money than time."

The winter work did inspire the Arnolds to apply for grants to install a hot water solar system, which they accomplished last fall.

Growing pains

Linda Chapman of Harvest Moon Farm in southern Indiana got on the Bloomington farmers market board seven years ago with a goal of extending the market season.

"Bloomington, Indiana, has a fantastic warm weather market," she said. "The city has been very supportive, and built open air structures several years ago. It's a lovely market, and well situated in downtown Bloomington."

But her farm was producing a lot of food beyond the April to November market season, and, Linda says, "I was really getting tired of the winter economic drought."

So in collaboration with the local Slow Food chapter, the market found an old school that had a gym with big windows and got permission to hold an indoor winter market. The first year, the market was open every other Saturday, and had 22 vendors. Now in its seventh year, the winter market is open every Saturday and has 30-35 vendors. The result is that Bloomington now has a farmers market 50 weeks of the year.

The market attracts about 600 customers a week, which makes for a crowded situation in the school gym. But at the same time, it's not enough customers to buy up all the fresh produce growers are bringing.

"It has been such a warm November and December and farms are still bringing things from the field, let alone hoopouses," Linda said. "We've had a glut of produce and vendors are getting discouraged."

Location is so important for a winter market, she said. Having outgrown the school, her ideal location would be one with more indoor space and plenty of nearby parking.

Despite this winter's imbalance, she believes local produce is the key to a successful winter market.

"People have to be able to go in there and get fresh produce," she said. "We have a lot of value-added food. We have pretty strict policies about it — they have to be using local ingredients."

Because space is so limited, the market board chooses vendors carefully so that there is a good selection of products for customers and greater income potential for vendors.

For example, there is only one honey vendor because the board believes that's all the market can support. Other products at the market include plants, alpaca wool, meat, eggs, two dairies, root crops, and greens.

Linda's farm specializes in microgreens, salad mix, carrots, and cut flowers. She has one hoopouse, 26 x 60, and plans to put up another in spring with help from an NRCS grant. She also has a solar greenhouse attached to the barn that stays between 55° and 85°F. For cut flowers, she grows lilies in crates, snapdragons, calendula, ranunculus, anemones, and tulips. She also sells a lot of wreaths in November and December. A popular bouquet in December consists of white lilies, red winterberries, and evergreen branches.

Linda says that local chefs could absorb all of the produce she grows in winter, but they can't take enough flowers, so the market is a better financial solution for winter revenue. Plus, she likes the winter market.

"A winter market doesn't consume you like the summer market," she said. "You can put in two to three hours of work a day, and we get to eat well the entire year."

She also finds the work to be "pretty challenging and interesting...it gives you another roster of crops you wouldn't grow any other time of the year."

Covered markets extend the season

Jim LeTendre of Bear Creek, North Carolina, sells at five farmers' markets a week, some of them in parking lots and some under covered structures. From his own sales records, he can attest to the value of covered markets.

"In an uncovered market on a rainy day, you can expect to do 60% of your usual business," Jim said. "With a covered farmers' market, you can expect 85%. It's a big difference - 25% of the trade you could do in a day."

Sandy Arnold of Argyle, New York, has found that rain can decrease sales for a produce grower from 30% to 50% in an open market. "But the buildings keep customers coming and keep customers happy," she said. "They will come in the rain because they know they can stand in here and shop and socialize."

Covered markets also benefit farmers by allowing them to start selling earlier in spring and keep selling longer into the fall.

"It was 37 degrees and snowing and raining here today, and we were still able to go to market. It's really fantastic to have a closed structure," said Jen Bokaer-Smith on May 18, after selling that day at the covered market in Ithaca, New York.

Although the vast majority of farmers' market sellers in the United States are still at the mercy of the weather for their sales, covered markets are becoming increasingly popular. As markets succeed and mature, many communities are seeing the value of providing a permanent building for them.

Covered markets that have been built in the last decade range from simple pole barns covering a few dozen stalls to elaborate, multi-use facilities built as part of extensive urban redevelopment projects. Here's a look at some examples, in the order of their cost, beginning with the least expensive:

Simple but adequate

The farmers' market in Pittsboro, North Carolina, started with just a few growers six or seven years ago, but quickly grew to about 20 regulars. Chatham County, where Pittsboro is located, is one of the few places in the nation where the number of farms is growing - a 10% increase in the past decade, Jim LeTendre said. So the state department of agriculture was willing to invest \$10,000 in a market structure, and the market association had \$2,500 to spend.

The vendors called around to see what they could

build with that amount of money, and they ended up with a pole barn that is about 30 feet wide and 120 feet long. It provides 10 covered stalls on each side, for a total of 20, with a 12-foot-wide aisle for customers. A concrete floor would have more than doubled the cost, so the vendors settled for a packed pea gravel floor. The structure is on the county fairgrounds, and there are public restrooms nearby. The building has open sides and closed eaves, and is roofed with green metal. It didn't have electricity, although that was added later by the fair board. It is admittedly a bare-bones structure, but Jim says it was good value for the money.

"It's very adequate," Jim said. "It keeps the heat off you, and on a rainy day you'll see little decrease in traffic."

If they should have done anything differently, Jim said, it would be to make the stalls narrower to accommodate more vendors. The stalls are 12 feet wide, because of the 12-foot spacing of the 6x6 wooden poles that hold up the metal trusses. Jim said they could have put the posts 10 feet apart, which would have added a bit to the cost but provided an extra four stalls.

Perhaps the best feature of the structure, apart from its low cost, was that it was built in a matter of days, without having to close or relocate the market during construction.

Style and substance

The farmers' market pavilions in Saratoga Springs, New York, can accommodate up to 52 vendors. A full



A new pavilion covers the Fulton Street Farmers Market in Grand Rapids, Michigan. Vendors' tables are also permanent, and designed to tilt toward customers. Farmers are able to pull their trucks up directly behind their spaces.

stall is 16 feet wide, between the poles, but 8-foot-wide half stalls are also available. This year, about 32 vendors are expected, Sandy Arnold said.

The pavilions were built in 1999 on city land behind City Hall in Saratoga's historic downtown. The land is parkland, so the city didn't want to pave it for the market. Instead, the floors in the buildings are crushed stone. It does not have electricity, but does have a bathroom.

The 32-foot-width of the pavilions allows for 16-foot-wide center aisles, which vendors considered necessary so that customers would have room to socialize, which is an essential component of the success of most farmers' markets. That leaves 8 feet for each vendor's display. Farmers back up to the stalls, and only part of the truck is under the roof, but the vendors, their tables and the customers are all protected from wind and sun.

The Saratoga farmers' market pavilions cost about \$50,000. The money came from a private foundation and a local environmental organization, said Carl Deppe, a produce farmer who helped develop the market plans. Because the market association didn't have a 501(c)3 tax status enabling it to accept charitable donations, the money had to be given to the city. Now the city owns the buildings and the market association pays about \$5,000 a year rent.

"It's been a fantastic success," Carl said. "It allowed the market to grow. We doubled the size of the market in terms of number of vendors and it made for a big increase in business. We have a much broader diversity of products than ever before. The market really became something special."

More money, more style

In Carrboro, North Carolina, 15 miles from Pittsboro and next to the university town of Chapel Hill, the popular farmers' market has been under cover since 1996, said Alex Hitt of Peregrine Farm, who sells there. The structure was built by the town government as part of a multi-use complex that includes the town bandstand. Picture the city land as a baseball diamond; the farmers' market pavilions are along the first and third baselines, and the bandstand is home plate.

The pavilions are open sided, with skylights at the eaves to increase natural light. Stalls are 10 feet wide and provide coverage for 32 of the 80 vendors who sell at the Carrboro market.

The structure cost more than \$300,000, Alex said, most of it from the town, but with significant contributions from the vendors' association.

Keeping costs down

Ithaca's covered market was built in 1989 by a forward-looking vendors' association. It's a tall, clerestory style structure with 96 stalls, restrooms and a small market manager's office. The building was erected with volunteer labor - mostly the vendors themselves but also some community members, said Monica Roth of Cornell Cooperative Extension. The market association got an \$88,000 grant from the state and contributed some of its own funds for the first phase of the building.

In the years since, many additional improvements have been made. A dock was added to the site, which is on the waterfront of Cayuga Lake. Electricity, lights and a floor were added. Monica estimates that the cost, excluding labor, now totals \$160,000. If the market association had paid someone else to build it, it would probably have cost \$400,000, she said.

The style of building has worked well, Monica said. "It's the best market building I've seen."

Carl Deppe agreed. "Ithaca sets the standard for all these covered markets," he said.

Urban redevelopment

At the expensive end of the spectrum is the farmers' market in Little Rock, Arkansas, built as part of a \$300 million redevelopment project along the Arkansas River. Overlooking the river are two pavilions, each 58 by 118 feet and able to accommodate a total of 80 growers. The open-sided pavilions have wooden trusses, with hanging fans and lights. The farmers' market is held every Tuesday and Saturday from the end of April to the end of October. The pavilions are also rented out for other events such as class reunions, wedding receptions and corporate picnics. More than 200 such events are scheduled each year. In winter, an ice rink is set up on one of the pavilions.

Near the pavilions is an indoor market hall with permanent food vendors such as a fish market, meat market, Middle Eastern and Mexican grocery stores, coffee shops and restaurants.

The combination of year-round market and seasonal farmers' markets has gone a long way toward revitalizing the Little Rock riverfront, organizers say.

Winter CSA gives farmers a summer break

By Ben Hartman

Ever feel tired after the four-month sprint from June to September? For most CSA farms, summer is where the work (and money) is.

In an attempt to level our workload, two years ago we decided to try extending our CSA season from March to November.

To our customers, we offered two seasons, Spring (March to July) and Fall (July to November). We take off for two weeks in July between seasons to give ourselves a break. Customers love getting food earlier and later, and with some careful planning (growing less in summer and more in the off-season) our work has indeed spread out.

Some farms go a step further and offer CSAs year-round. We decided not to offer winter CSAs because we have a winter market and restaurants that use what we have at that time of year, and we enjoy a slower pace for a few months.

Infrastructure

Water and vegetables both freeze at 32°F. While summer CSA boxes can be picked up under a shade tree or from a porch, in the cold part of the year boxes need more protection.

At our farm pick-up, we put a heater in our walk-in cooler to keep it from freezing, and at our town pickup, we use chest freezers on a friend's protected porch to store the boxes until customers arrived.

We sealed up and insulated our processing room so we can wash and pack out of the cold.



A Clay Bottom Farm late-fall CSA box - turnips, carrots, spinach, radishes, pepper, winter squash, salad mix, heirloom tomatoes, apples. Tomatoes and peppers are kept alive late into the year in a greenhouse heated to 32°F. Below, the greenhouse in March.



Creative planning

Below is a sampling of items we include in our off-season CSA boxes, in northern Indiana. We have four greenhouses (about 9,000 square feet of covered ground) that fill 40 CSA boxes and supply four restaurants, our farmers market, and a grocery store. Two of our greenhouses have

heaters set to 32°F; the other two are unheated, with crops protected by suspended row cover.

Greens. We grow arugula, Asian greens, and mesclun mix all winter. Seeds can be planted all year, but we've found the best winter harvests are from September-October plantings.

Spinach. The trick with spinach is to give it plenty of room—we give it twice as much space as salad mix—and to supply it with plenty of high-nitrogen compost. We've harvested healthy fall-planted patches more than 10 times. New plantings seeded in our heated greenhouse in late January are usually ready to harvest by late-March or April.

Radishes and turnips. Radishes planted in mid January are ready to harvest by mid March in our heated greenhouse. Turnips are ready a month later. Fall-planted radishes and turnips are great crops to follow summer hoophouse tomatoes.

Carrots. Carrot seeds are picky. To get them to germinate, you must keep your soil consistently moist for the entire germination period, which can be a long time. For May harvests, we seed in mid December. We plant, water well, then keep the soil covered with row cover to keep the moisture in. I start to see tiny carrot tops come up in February. For our winter markets and March CSA boxes, we harvest fall-grown overwintered carrots from our unheated hoophouses.

Kale. We set out our first kale transplants in a hoop-house in February and harvest from the same plants until the next January. By the end of the season, the plants are about as tall as we are and look like palm trees. Late summer-planted kale will give you kale in mid winter.

Mint. It is worth it to put a big box of mint in one of your greenhouses. (The box is important or else mint will take over.) A great item to add aroma to April and May CSA boxes.

Pussy willow. Though not edible, cuttings from a pussy willow tree add a touch of spring to April CSA boxes.

Rhubarb and asparagus. These are usually ready in quantity for mid April CSA deliveries.

Leeks. We harvest our field leeks until the grounds freezes them in for good, usually in January.

Storage crops. We store sweet potatoes, potatoes, winter squash, and cabbage for late season and early spring CSA boxes.

Other local items

We include some items from other local farms to supplement our own food. These are great items to help you fill out your CSA boxes, and it's a great way to support other local farms.

Honey. Can often be purchased from local beekeepers for discount in 5 gallon quantities.

Popcorn. We have partnered with a local Amish organic farmer to grow and shell Ladyfinder popcorn, a favorite in our area.

Maple syrup. Who is going to complain about a small jar of fresh maple syrup in their CSA box?

Spreading the workload

If you are going to spread your workload out, it's important to plan for breaks and for a more even harvest throughout the year.

In addition to taking two weeks off from CSA deliveries in mid summer (we still keep our booth open at the market), throughout the year we never do more than eight CSA deliveries in a row without a week off. So no matter how worn out we are, we always know that a break is just a few weeks or days away.

This schedule takes more planning than we were used to. For example, we want to make sure we are not bombarded with zucchini or tomatoes in mid July when we're off or with too many microgreens during a week off in spring or fall.

So next year, if you are tired and sore by year's end, consider extending your CSA and spreading out your tasks. At first it will take some experimentation and creativity, but it could also help turn your operation into one that is truly sustainable for the long haul.

Ben Hartman and Rachel Hershberger own Clay Bottom Farm near Goshen, Indiana. They have a CSA and sell at the Goshen Farmers Market.



Workshops are demanding, but fun

By Alison and Paul Wiediger

As market farmers, we are always looking for new income opportunities. We also love to share the many facets of our business with other farmers. As a way to do both, we decided to try holding a workshop at our farm about our winter growing using hoophouses. In all the preparation for and holding of said workshop, we learned some things we'd like to share with you.

First, make sure that you really want a group of people you probably don't know as guests for a day. If you are market farmers, you probably already spend a lot of time with people, but unless you have a retail outlet on your farm, you are usually relating to those folks somewhere other than your home, and it's very different.

Okay, you're sure that you want to host a group. The next step is to decide who constitutes your intended audience. Are you holding a workshop for customers to learn a little about gardening, for farmers to learn about some specific crop(s) you raise, for prospective farmers to get a feel for what market farming entails, extension/university personnel, or some other group

I've missed? Your audience will determine the content and date of your workshop.

Now, let's set a date. We wanted to hold a workshop about our unheated hoophouse growing. We set a date in September, reasoning that it gave interested farmers enough time after the workshop to allow them to erect a hoophouse and grow over the winter. Good idea, bad timing. We had only a handful of interested farmers. In September, most market farmers are still busy growing, harvesting and marketing and don't have time for a workshop. This year we set the date for October 20th, after frost for most farmers, and had enough response we set an overflow for November 10th. The date might not have been the only reason, but it is a very important consideration.

You also want to set a fee at this time - before any promotion. Think about food costs (whether refreshments or meals), printing costs for handouts, postage for letters, rental on a Porta John, advertising, etc. Then, add a reasonable profit for yourself. Remember that you will be doing a lot of tasks just for the workshop, and pay yourself. We also wanted to keep it reasonable enough for farmers to be able to afford it. And, set an upper limit



The authors' hoophouse in winter. They have taught extensively about hoophouse production, both on the farm and at conferences.

for the number in the group. We decided a group of 25 was the largest we could have and still do a good job of teaching. Your ideal size might be larger or smaller.

Getting the word out

Promotion will be your next step. We were fortunate enough to be invited to some speaking engagements where we were able to promote our workshop. We also added information about it to any articles written about us and by us. We made a page on our website that promoted it and had a registration form. Many farming publications have a free service of announcing conferences and we took advantage of those. If we had not had the speaking engagements, we would have placed ads in two or three farming publications that we read, starting about 5 months before target date.

We'd like to suggest that if you are running a day-long workshop, including one or more meals, that you require pre-registration and have a cut-off date about 2 weeks before the event. That allows you to be able to gauge the supplies you will need for your guests. You might also check your community's requirements when cooking and serving a meal for a group.

As registrations came in, we added the participants to a simple database and sent them a confirmation letter. This could be done on paper as well. The important thing is to keep a record of who's coming. It also allows you to tell 'at a glance' how full your workshop is. Towards the end, you'll probably get phone calls asking whether the workshop is still open, and this way, you'll know. We asked for name(s), address, phone and email address so we had a variety of ways to keep in touch.

About 90 days before the workshop, we started gathering the information we wanted to include in participants' packets. For us that included some resource information we put together, information from Ag Extension, a sample of *Growing for Market*, a seed catalog and other vendor information we thought might be helpful. Vendors are really helpful about sending you information - it's good publicity for them, so ask. At this time we also began the process of determining the 'curriculum' for the day, and made notes on 3x5 cards of the critical points. It's easy to forget important information in the excitement of presenting.

At the two-month mark, we decided on the meals we wanted to serve and started working on a shopping list. Here, don't forget cups, plates, bowls, eating utensils, and any serving pieces you might need for a group that you don't have for your family. These can be bought or borrowed, but you need to think about them. You might also want to price having the meal catered. It's a lot of work doing the cooking and conducting the workshop.

Eight weeks out is also about the time you need to think about the tasks that need to be done on the farm

and/or in the house to prepare for a group. Since we farm alone, and Alison has a public job, a lot of "clean-up" jobs get put off "until later". And since we grow year-round, "later" hadn't happened for too long, and it took some time to catch up. For us, the real bonus was getting the farmstead looking the way we wanted it to, because "company was coming".

About 3 weeks out, it starts to get a little crazy. There's no way you'll ever get all the things on your list done. Don't give up, just prioritize and figure some tasks will be left undone. Your participants will feel a lot less intimidated if it isn't perfect anyway, so don't sweat it. At this point, you also might send a reminder letter to everyone, include a map, lodging and area attraction information. Call to rent a porta-john now too, if your numbers are too high for your home's facilities.

The final countdown

The last week: You're in the homestretch (and wondering why you ever had this bright idea). We spent that week finalizing what we wanted to teach, and...cooking. Each night we had a list of what needed to be cooked ahead. On Friday, Alison spent the day cooking and Paul doing last minute "essential" chores. If at all possible, try to be finished by dinnertime Friday, so you can have a leisurely dinner and get to bed early.

Saturday morning, 5:30, up and at it. Our workshop started at 8:30 and we had folks as much as 45 minutes early. We had breakfast beverages and a light meal for them so they could help themselves. We also had a fire going in our chiminea, which made a focal point for the group to gather around. As people arrived, we checked them off our list, handed out packets and nametags, and pointed them to the food. By the time the workshop started, they were like a group of old friends.

We had family and friends to help with the logistics of feeding and cleaning up. You'll probably need at least a couple of people to help with that. We also underestimated the energy that we'd consume and were wiped out by the end of the day. But, it was so much fun, we think we gave folks a lot of good information, and we met a lot of really nice people we'd never have met otherwise. Will we do it again? We really haven't decided yet. Watch GFM for an announcement.

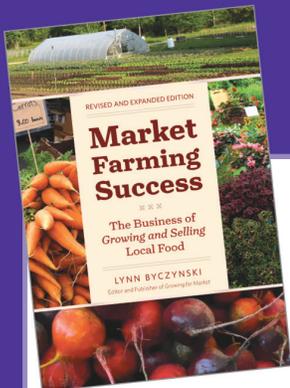
Alison and Paul Wiediger are the owners of Au Naturel Farm in Smiths Grove, Kentucky. They can be contacted at wiediger@windstream.net

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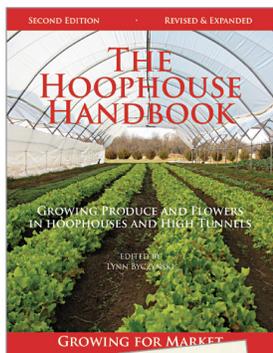
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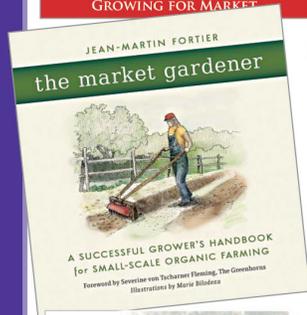
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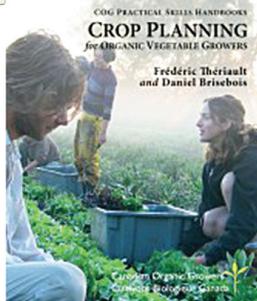
• **NEW! Market Farming Success: The Business of Growing and Selling Local Food** by GFM's editor, Lynn Byczynski. Written for people just getting started, this book covers a wide array of topics including startup costs, how much you can earn, essential equipment, the best places to sell, and much more. Expert advice that will help you advance quickly and confidently through the inevitable learning curve of starting a new business. \$30 **Member price: \$24**



• **NEW! The Hoophouse Handbook, second edition, revised and updated.** An overview of buying, building, and growing in hoophouses/high tunnels, with a focus on the most profitable uses for this valuable space. Detailed information on tomatoes, winter crops, and cut flowers. \$28 **Member price: \$22.40**



• **NEW! The Market Gardener** by Jean-Martin Fortier. Growing on just 1.5 acres, the author feeds more than 200 families through a thriving CSA and seasonal market stands. The secret of his success is the low-tech, high-yield production methods he has developed by focusing on growing better rather than growing bigger. Lots of details on crop yields, prices, and profits. \$25 **Member price: \$20**



• **Crop Planning for Organic Vegetable Growers** from Canadian Organic Growers Association. This book provides a field-tested 11-step planning process that will take some of the chaos out of farming and help you move toward profitability. \$27 **Member price: \$21.60**

• **The Flower Farmer** by Lynn Byczynski. Local flowers are the hottest trend in market farming, and this book will help you jump on board. Clear, concise information about what to grow, how to grow and harvest it, and where to sell it. Essential reading for anyone who wants to sell flowers either as a full-time business or a sideline to produce. \$35 **Member price: \$28**

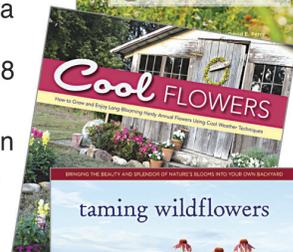
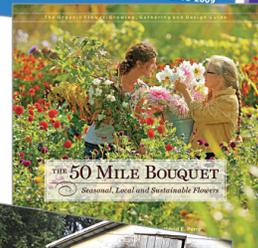
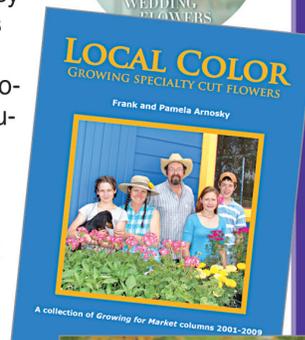
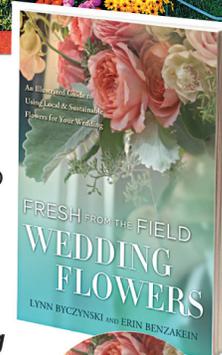
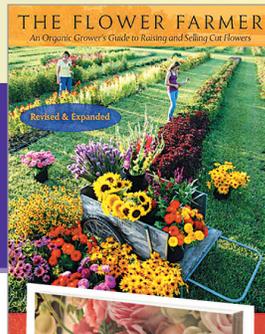
• **NEW! Fresh from the Field Wedding Flowers** by Lynn Byczynski and Erin Benzakein. The real money in flowers is in doing weddings, but most growers don't have the technical skills. They're easy to learn, though, with the help of this guidebook to wedding flowers. Through photo essays and video tutorials, you can learn how to make bouquets, boutonnieres and corsages, centerpieces, and other wedding florals. \$40 **Member price: \$32**

• **Local Color** by Pamela and Frank Arnosky of Texas Specialty Cut Flowers. The Arnoskys wrote about flowers in GFM for many years, and this is a collection of their articles. Packed with detailed, accurate advice about dozens of varieties, but also fun to read for its glimpses into life on their farm. \$25 **Member price: \$20**

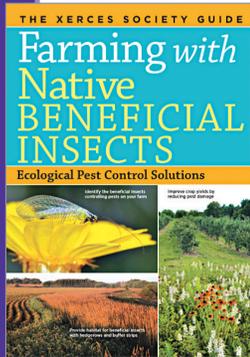
• **NEW! Fifty Mile Bouquet.** Debra Prinzing profiles people with successful local flower businesses. \$18 **Member price: \$14.40**

• **NEW! Cool Flowers.** Lisa Mason Ziegler shares detailed information on the easiest cut flowers to grow, the hardy annuals. \$18 **Member price: \$14.40**

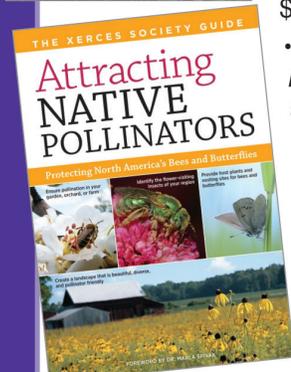
• **NEW! Taming Wildflowers.** Miriam Goldberger has written the ultimate DIY book on growing and selling wildflowers. \$19 **Member price: \$15.20**



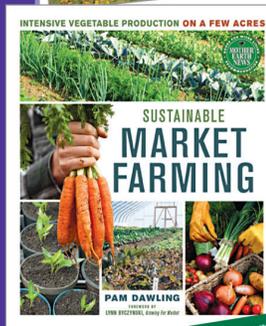
The Best Books about Market Farming



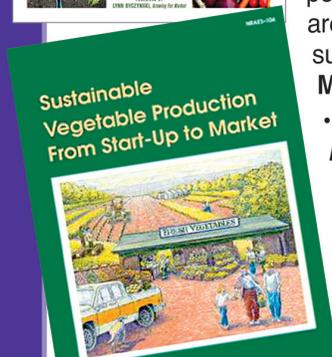
• **NEW! Farming with Native Beneficial Insects.** This beautiful and inspiring book by the Xerces Society shows how to create a farm or garden habitat that will attract native beneficials to protect your crops from damage without pesticides. Great photos and detailed directions for attracting and conserving these important allies on a sustainable farm. \$25 **Member price: \$20**



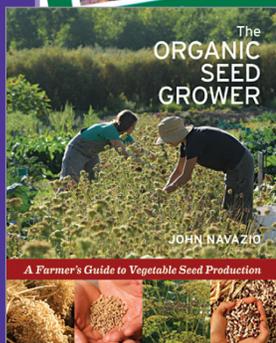
• **NEW! Attracting Native Pollinators.** The Xerces Society shows you how to provide flowering habitat and nesting sites for pollinators. With native pollinators responsible for pollinating 70% of all flowering plants, including many vegetables and fruits, ensuring their survival is critical to market farmers. \$30 **Member price: \$24**



• **Sustainable Market Farming: Intensive Vegetable Production on a Few Acres.** GFM Contributing Editor Pam Dawling provides the kind of details you need to successfully grow vegetables on a few acres: varieties, scheduling, cultivation, harvest, and postharvest for every vegetable are covered, plus chapters on sustainable practices. \$35 **Member price: \$28**

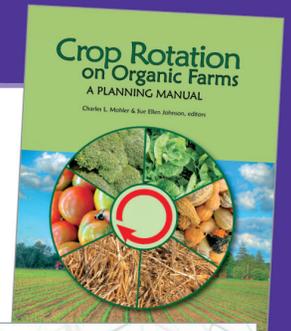


• **Sustainable Vegetable Production from Start-Up to Market** by Vern Grubinger. A great introduction to market farming on the livelihood scale — excellent for small growers interested in scaling up. \$38 **Member price: \$30.40**

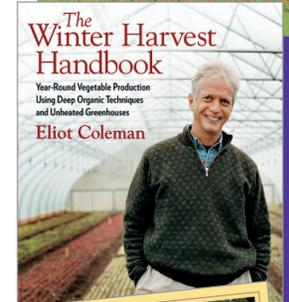


• **The Organic Seed Grower.** Dr. John Navazio has written a clear, comprehensive guide for growers who want to grow seed as a business or for their own use. He advises on each type of vegetable, including selecting the best plants for your conditions. \$50 **Member price: \$40**

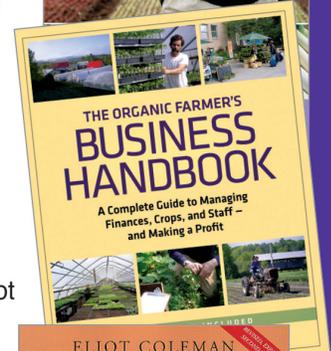
• **Crop Rotation on Organic Farms.** Provides an in-depth review of crop rotation and its many applications, such as improving soil quality and health, and managing pests, weeds, and diseases. \$24 **Member price: \$19.20**



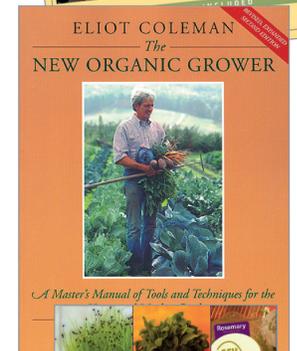
• **Winter Harvest Handbook.** Coleman's work for the past decade has focused on extending the season with unheated hoophouses. In this book, he shares everything he has learned about growing and harvesting in fall, winter, and early spring. Essential reading for new hoophouse owners. \$30 **Member price: \$24**



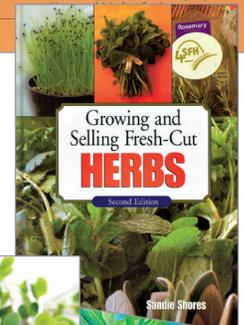
• **The Organic Farmer's Business Handbook** by Richard Wiswall. An experienced, lifelong farmer shows how to identify profitable crops, increase efficiency, and make more money on your market farm. Includes CD with self-calculating spreadsheets for creating crop budgets. \$35 **Member price: \$28**



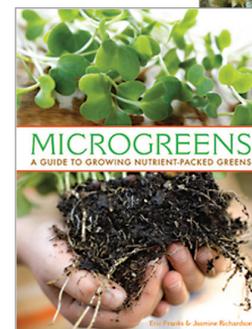
• **The New Organic Grower** by Eliot Coleman. *A Master's Manual of Tools and Techniques for the Home and Market Gardener.* Everyone reads this book when starting out in market gardening! \$25 **Member price: \$20**



• **Growing and Selling Fresh Cut Herbs** by Sandie Shores. The best how-to book for commercial production of culinary herbs. \$35 **Member price: \$28**



• **Growing Great Garlic** by Ron Engeland. The first garlic book written for organic gardeners and small-scale farmers. \$17 **Member price: \$13.60**



• **Microgreens** by Eric Franks and Jasmine Richardson of Microcosm. Provides detailed advice on producing microgreens for market or personal use. Illustrated with beautiful photographs and includes numerous recipes. \$20 **Member price: \$16**



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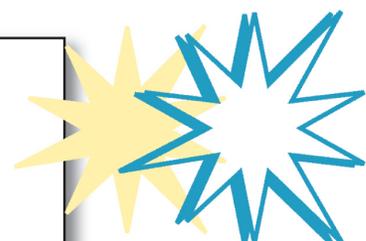
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