Cornell University
Cornell Cooperative Extension
Eastern New York Commercial Horticulture

New Apple Grower - Overview

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So you want to start an apple orchard?
Starting an orchard is an exciting but extremely complex, challenging venture. There are many possible ways to go about it, and the 'correct' one will depend on your own specific goals, resources, and site. In any situation, establishing a *successful* orchard will require significant investment in time, labor, and financing. The best thing you can do to prepare is to educate yourself by reading, talking to specialists and owners of established orchards, and thoroughly evaluating your situation.

The information here is designed to provide you with a general overview of what will be involved and to help you assess your situation. Throughout, you will find numbered superscripts [1] indicating a resource that can help you. All resources are listed on the last page.

Where to begin: Home Orchard or Commercial Enterprise?
It is critical to answer this question at the beginning. These are two radically different undertakings, with equally distinct courses of direction, final goals, and definitions of 'success.'

Establishing a new orchard planting, say from a half dozen trees, on up to a 1/4 acre planting, may primarily be meant to serve as a direct resource for a family, friends, and neighbors. Such a small orchard is a very different undertaking than if one is setting out to establish an orchard clearly intended for the commercial marketplace. The difference between a 'home orchard' and a 'commercial enterprise' is more than a matter of scale. While a home orchard can satisfy idyllic, pastoral notions of a person looking for a fulfilling hobby, a commercial operation is much more demanding. It requires defined operational and business plans with quantifiable metrics for assessing the business. An orchard or farm operation is no different in this respect than any other business. The wise course is to prepare thoroughly and to proceed in a measured fashion; take the time to do it right.

For either home or commercial orchard, two excellent starting points for information on tree fruit production are the Cornell Tree Fruit Website[1] and the Cornell Home Fruit Production Guide[2].

If you aspire to plant a 'home orchard' you should contact your local county office[3] where there are master gardeners and local agents to assist you. If you are interested in a commercial operation, you should contact the regional commercial horticulture specialists on this regional team, the Eastern NY Commercial Horticulture Program (ENYCHP)[4].

Want to know more? Read on!

Evaluation & Planning

Self Evaluation

Before you begin, make sure you know what it's going to take to be a farmer.

Ask yourself if you have the skills and resources necessary for success[5] and familiarize yourself with the resources and programs available for a beginning farmer.[6,7]

Site Evaluation Selecting a suitable site is critical for success. Prior to even purchasing land (or at least before deciding to plant on your existing property), you should assess the potential site's natural characteristics such as soils, slope, and micro-climate. You should also evaluate the physical location of the site based on proximity to other farms and your desired markets/consumers. Some specific aspects to consider:

Soils. Optimal soils are loamy and well-draining; avoid clay soils which are heavy and have poor water drainage. Dig a soil pit to observe drainage, and take a soil sample to evaluate texture, nutrient status, and pH. Use the NRCS Web Soil Survey Tool[8] to view a soil map of your site.

Slope. A gentle slope is ideal for good air drainage, which will prevent collection of cold air leading to frost injury. Too much slope will make operating heavy equipment difficult.

Climate and Micro-climate. Regional climate and the site's micro-climate include the number of frost-free days, heat accumulation during the growing season, and minimum winter low temperatures. These will influence the varieties of apples that you can plant, based on winter hardiness and season length. Directional orientation, surrounding vegetation, and elevation can also have a profound impact on micro-climate. There are many free tools available online to help you determine if your site is suitable for fruit production[9-12].

Location. Proximity to other growers, markets, supply stores, etc. can have an impact on your operation. Other farmers may be a source of competition if you are selling the same commodities at the same times; they are also a potential asset, acting as a source of knowledge, experience, and shared/rentable equipment. Areas with an established farming community usually already have consumer and market recognition, more regulations and protections in place, and existing infrastructure like farm supply stores and consultant/extension support.

Cost of Establishment

Today, for commercial establishment, the cost of planting a dwarf orchard, considering all costs, is estimated to be from $6,000 to $13,000 per acre (or more, depending on density and planting system). Economic projections suggest that a tree density of 800 - 1000 trees per acre (or more) is required to recover all costs and return a profit over the life of a new wholesale commercial apple planting (20+ years). Positive cash flow typically does not occur in these orchards until after the seventh season. An economic profile will differ for direct retail and/or pick your own orchards. A strong business plan is the best way to plan for a successful orchard business. Business plan guidance can be found in the beginning farmer resources mentioned earlier.

Preparation and Establishment

Prepare your site and yourself. The optimal time for site preparation begins 1-3 years before your trees actually go into the ground. You should begin preparing your business and farming skills as soon as possible. Also major decisions should be made about the nature of production prior to establishment. Here are some steps to take.

Soil Preparation. Soil testing, tiling, and any fertilizer and liming are best done at least a year prior to planting. I do not make general fertilizer suggestions. Recommendations are developed from Cornell's nutrient analysis lab on the basis of soil tests (and also from leaf tissue analysis after trees are planted and growing for several seasons). Soil test kits can be purchased through Agro-One Soils Laboratory or through your county CCE Office. The Agro-One website provides directions for taking and submitting a soil samples[13].

Planting System. (i.e. spacing, tree size, support system). What size tree do you want to have? With old, full sized, spreading apple trees, you might have had 40 trees on an acre; today's commercial orchards will have upwards of 1000+ trees on that same acre. Soil, rootstock vigor, and variety differences (growth habit, vigor) influence tree spacing. As a general rule, yields, efficiency, profitability, and up-front investment costs increase with increasing tree density. High density trees will require an adequate support system, usually a 4 or 5 wire trellis.

Variety Selection. There are many cultivated varieties or "cultivars" to consider for the different fruit crops, each may have some variation of size, flavor, season, production characteristic, etc. One good overall source of variety information is the "All About Apples Website."[14] Be wary of long season apples, as they may not mature well in our Northeast NY region. Visit area orchards and learn what others are successfully being grown in your region. While you are there, ask about the rootstocks that orchard's apples are growing on. Where there is – or you have – uncertainty, plant a very limited number of a candidate apple, in order to determine its suitability over at least several years.

Tree Sources. Investigate nursery sources and the quality of their trees (a few suggestions at the end[15-17]). Good caliper, well-feathered trees are important for early production and return on your investment. Many nurseries require orders to be made 1-3 years in advance, especially on larger orders or specific trees.

Pest Management. Insects, diseases, weeds, and wildlife are all pests that will compromise the productivity and quality of your orchard. You will need to learn the skills to monitor and manage these pests, whether you are planning to employ conventional or organic controls or deterrents.

> **Pesticide Applicator License.** You will likely need to obtain a pesticide applicators license from the NYS DEC**.** This is especially true if you intend a commercial operation. To learn whether you will need one and how to obtain it, read the article, "Navigating the NYS DEC."[18] You will also likely need a sprayer. There are many articles and videos online about a range of equipment and calibration methods, from small backpack sprayers through large equipment[19].

Deer. You will likely need protective fencing for your orchard, as feeding on young buds will undue the training system and cropping density you are attempting to establish. Quite serious injury can occur and this result can often be worse in the smallest orchard by virtue of scale.

Weed control and irrigation are essential for the establishment of new trees. Typically, in preparing a site for planting, perennial weeds are treated with a systemic herbicide such as Roundup. Afterwards, nutrients are worked in according to soil test results, and a fall cover crop is sown. Establishing high-density orchards will almost certainly require supplemental water, particularly over several years of establishment. Do you have the water capacity for irrigation? And what is the water's quality? (i.e. not contaminated, proper pH, etc.)

Insects and Diseases. These two groups of pests typically require the most intensive management. Our humid climate especially facilitates their growth and damage. The good news is, extensive, ongoing research is being conducted to understand the lifecycles and best control measures for these pests. Take the time to learn about this by reading the NYS IPM Fact Sheets[20] and Apple IPM for Beginners[21]. For more advanced pest management information visit the NEWA website[22] and obtain a copy of the Cornell Tree Fruit Pest Management Guidelines[23].

Crop Management. Apples will require management of fruit set and crop load to foster good production levels and to avoid small fruit and/or biennial bearing (i.e. pronounced fruiting every other year rather than regular cropping each year). Good crop management also promotes winter acclimation, which in turn minimizes winter injury and associated stresses. Sound crop management is accomplished via proper pruning in late winter, through the application of chemical thinning materials and/or hormonal growth regulators at one or more points following the petal fall period, and potentially later hand thinning as needed. Detailed thinning rates and timing recommendations can be found in the Cornell Guidelines mentioned earlier.

Fall temperature shifts, light wave and level changes, and also night temperatures, influence fruit stem attachment to the tree in the fall; very often, there is a pronounced premature drop of sound fruit which can be economically unsustainable. So common is this occurrence, that hormonal growth regulators are also applied within the several weeks prior to normal harvest dates to greatly reduce this loss risk.

Harvest and post-harvest plans. Maturity charts can be used to roughly predict when each variety will be harvested in a given year. Direct market farms, where fruit are going to be sold and consumed immediately, may plan their harvest based on the rough parameters of fruit appearance and taste.

Additional maturity testing parameters are necessary for wholesale fruit, particularly when fruit are going to be put into any type of long-term storage to extend the marketing window. In this case, fruit samples should be collected nearing the anticipated harvest window to evaluate fruit firmness, % sugar, and the starch pattern index (SPI). More information can be found in the apple maturity bulletin[24]. Cornell Cooperative Extension releases maturity reports every fall to help New York growers determine when specific varieties are entering the proper harvest window.

Most orchards are currently harvested by hand. This requires an extensive labor force, and harvest labor is one of the largest expenses for an orchard operation. Many orchards hire a temporary workforce to help harvest their crop. Where enough local labor is not available, many farms rely on temporary migrant labor programs, such as the federal H2A program[25].

Storing fruit. Unless you plan to sell your fruit directly from the tree to your consumers, you will need to store your fruit for a period of time before they are sold. Many tree fruit continue to ripen once picked, so fruit should be kept in cold-storage to slow their metabolism and reduce further ripening. Most commercial orchards have walk-in cold storage rooms that can adequately accommodate a significant portion of their crop. Some farms also use controlled atmosphere (CA) storage rooms to further slow fruit maturity, further extending the marketing window of their crop.[26]

Packing. Many orchards now grade and pack their own fruit. When fruit are to be sold, they are put through a packing line to be sorted, cleaned, graded, sized, labeled, and packaged. Fruit are often packed into trays or bags, loaded into boxes, and stacked onto pallets for shipping.

Marketing and selling your crop. You should have pre-investigated the market disposition of any crop you intend to grow before planting a single tree. Tree fruit can be sold through a variety of channels[27]. Fruit can be sold direct to the consumer, or through wholesale channels. Fruit can be sold fresh, or to processing operations where they will be made into sauces, pie fillings, etc.

Wrap-up. Proper preparation is a must for any serious entrepreneurial endeavor, and a commercial orchard enterprise should be well thought out before any trees are purchased.

FAQ:

There is no set publication listing apple variety choices. Such decisions are influenced by your sales and marketing intent and what you may intend for "on-" or "off-" farm sales, pick-your-own, and other retail or wholesale purposes.

There is no general apple production manual. There are many apple pest management guides but no production manuals per se. Two useful publications are the Mid-Atlantic Orchard Pest Management Guide and the Cornell Pest Management Guidelines for Tree Fruit. Both are referenced via links on the Fruit Trees site of the main Cornell Fruit site mentioned above.

Periodically, specialized workshops are held to review and offer guidance on various aspects of orchard management. The ENYCHP also organizes an annual winter tree fruit school, which has educational speakers, vendor representatives (nurseries and orchard suppliers), and individual growers have the opportunity of meeting one another and talking shop.

Resources

General Fruit production

[1]Cornell Tree Fruit website https://blogs.cornell.edu/treefruit/
[2]Home fruit production guide https://ecommons.cornell.edu/bitstream/handle/1813/67/Cornell_Guide_to_Growing_Fruit.pdf?sequence=2&isAllowed=y

Cornell Cooperative Extension

[3]CCE County Associations. Find your local office here http://cce.cornell.edu/localoffices
[4]Eastern NY Commercial Horticulture Program (ENYCHP) http://enych.cce.cornell.edu/

Self Evaluation & Beginning Farmer

[5]Beginning Farmer Skills Checklist https://cpb-us-e1.wpmucdn.com/blogs.cornell.edu/dist/4/7493/files/2017/04/BF-Skills-Checklist.revised-obg8zc-16je0dc.pdf
[6]Cornell Small Farms Program https://smallfarms.cornell.edu/
[7]USDA New Farmers Website https://newfarmers.usda.gov/

Site Evaluation

[8]NRCS Web Soil Survey http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm
[9]Growing Degree Day Calculator http://climatesmartfarming.org/tools/csf-growing-degree-day-calculator/
[10]Growing Season Length Lookup https://davesgarden.com/guides/freeze-frost-dates/
[11]Annual Precipitation https://www.usclimatedata.com/
[12]Elevation Finder https://www.freemaptools.com/elevation-finder.htm
[13]Agro-One Soil Testing http://dairyone.com/analytical-services/agronomy-services/soil-testing/

Trees: Nurseries and Variety Selection

[14]All About Apples http://usapple.org/all-about-apples/
[15]Adams County https://www.acnursery.com/
[16]Stark Bros http://www.starkbros.com/
[17]Wafler Nursery http://www.waflernursery.com/

Pest Management

[18]"Navigating the NYS DEC." (Article in the ENYCHP Grape Newsletter, May 2015) https://enych.cce.cornell.edu/submission.php?id=680&crumb=crops|crops|grapes|crop*45
[19]Dr. Landers's Pesticide Application Technology site http://web.entomology.cornell.edu/landers/pestapp/
[20]NYS IPM Fact Sheets for Tree Fruit http://www.nysipm.cornell.edu/factsheets/treefruit/
[21]Apple IPM for Beginners https://blogs.cornell.edu/treefruit/ipm/apple-ipm-for-beginners/
[22]Network for Environment and Weather Applications (NEWA) http://newa.cornell.edu/
[23]Cornell Tree Fruit Pest Management Guidelines https://cropandpestguides.cce.cornell.edu/

Harvest and Post-harvest Plans

[24] Predicting Harvest Date Windows for Apples
https://ecommons.cornell.edu/bitstream/handle/1813/3299/Predicting%20Harvest%20Date%20Window%20for%20Apples.pdf?sequence=2&isAllowed=y
[25]H2A Visa Program https://www.farmers.gov/manage/h2a

Storing fruit
[26]The Commercial Storage of Fruits, Vegetables, and Florist and Nursery Stocks
https://www.ars.usda.gov/ARSUserFiles/oc/np/CommercialStorage/CommercialStorage.pdf

Marketing and selling your crop
[27] Agricultural Marketing Resource Center: Apples. https://www.agmrc.org/commodities-products/fruits/apples