F. Commodity Recommendations

Pesticide Use Disclaimer

THE LABEL IS THE LAW
Before using a pesticide, check the label for up to date rates and restrictions.

Labels can be downloaded from: *http://www.cdms.net/, https://www.greenbook.net/* or *http://www.agrian.com/labelcenter/results.cfm*

For more information on Pesticide Safety and the Pesticide Label see chapter D.

Guide to the Recommended Pesticide Tables in the Following Crop Sections:

1. Pesticides are listed by **group or code number based on chemical structure and mechanism of action**, as classified by the Weed Science Society of America (WSSA) for herbicides, the Insecticide Resistance Action Committee (IRAC) for insecticides, and the Fungicide Resistance Action Committee (FRAC) for fungicides.
   If the number is in bold font, the product may have resistance concerns.

2. For **restricted use pesticides**, the restricted active ingredients are labeled with a *****. (See section D 3.2.1 "Restricted Use Classification Statement" for more information).

3. **In addition to the pesticides listed below, other formulations or brands with the same active ingredient(s) may be available. ALWAYS CHECK THE LABEL:**
   a) to ensure a pesticide is labeled for the same use,
   b) to ensure the pesticide is labeled for the desired crop, and
   c) for additional restrictions.

4. All pesticide recommendations are made for spraying a **broadcast area of 1 acre** (43,560 square feet). **Adjust the rate for banded applications** (for more information, see section E 1.3 Calibrating Granular Applicators).

5. Check the label for the maximum amount of pesticide per application and the maximum number of applications per year.

6. **Bee Toxicity Rating (Bee TR)**: N=nontoxic; L=minimum impact on bees; M=moderately toxic, can be used if dosage, timing and method of application are correct, but should NOT be applied directly to the crop if bees are present; H=highly toxic, severe losses expected, -- = data not available.

Specialty Vegetables

Niche Marketing

The term ‘specialty vegetables’ refers to a broad range of crops that are sold in niche markets. They are sometimes called ‘exotic’ as they represent a class of vegetables unlike standard tomatoes, peppers, beans, peas, sweet corn, etc.; ‘alternative’ because they represent new enterprises that traditional vegetable growers might try; or ‘designer veggies’ that allow the consumer to be creative with their presentation. Recently, the term 'ultra-niche crops' was created to describe very high value specialty crops that provide opportunities to help beginner/small farmers get established. Most fresh-market specialty vegetables and herbs fit this description.

Specialty vegetables can be described as **new or unusual manner in which they are grown** (aeroponic, hydroponic); by the **color, shape or flavor** of the varieties grown (red and oakleaf lettuces, pear tomatoes, heirloom varieties, or unusual greens like radicchio); by their **size** (baby, miniature, micro); or by their **diverse origins and demand** (Asian crucifers and cucurbits, Hispanic peppers, African greens and eggplants).

Specialty Vegetable Markets

Developing a marketing plan for specialty vegetables is essential. Important points to consider include:

- Before planting, know where you will be selling your crop;
- Understand all the quality, grading and packaging requirements, and costs for various market outlets (similar ethnic groups may want different varieties/types of the same crop, use the same/similar names for different types of crops, or different names for the same crop);
- Determine that consumers will want it when you can produce it;
- Assess the costs of production, especially the time and labor required. Maynard and Hochmuch (In: Knott's Handbook for Vegetable Growers, 5th ed., 2006, John Wiley and Sons, Inc., NY) describe conducting on-farm trials to help determine varieties and production systems. Small plantings can help work out problems that can be resolved easily. Accurate records of small plantings can be used to estimate costs and returns for full-scale plantings;
- Increase production as demand grows, but be aware of competitors entering the market (prospective buyers, state and federal crop reporting agencies, and local Extension workers can be good sources of information);
- Project the impact that various levels of competitive supply will have on price to determine if returns will pay for any required capital costs over a specified time period; and
- Understand that a specialty crop enterprise may not be limited to a single vegetable but may include a group of complimentary crops that fill a market niche. Several different crops may be a required in order to gain a foothold in the market.

A successful specialty produce business requires knowledge and experience. It is advisable to start small and build the business gradually. Understanding marketing for specialty crops is the first step toward making profitable production decisions. The following sections describe production practices for specialty vegetables grouped by the general market outlets for the specific crops directing the producer’s attention to that critical part of the decision process.

Organic and Hydroponic Production

Organic and hydroponic production which, in and of themselves, create niche-market specialty crops are not the focus of this guide, but most, if not all of the crops described, can be grown using ‘organic’ practices, *i.e.*, those approved under the USDA National Organic Program. Where appropriate, organic practices and pest control options are provided under each crop throughout this guide (see also section A 4 Organic Production in the General Production Recommendations chapter). Using ‘hydroponic’ techniques to grow crops in a nutrient solution, usually within a controlled environment such as a greenhouse, is also suitable for many vegetable crops where there is sufficient market demand to justify the capital investment. Both production systems require selling to specific niche markets where demand provides the greatest return. 'Hydroponic' specialties should be marketed on their own unique qualities. If producing crops organically check with the certifying organization for requirements.

Fresh-Cut Processing

The rapid growth in demand for convenience foods has encompassed fresh vegetables with the advent of fresh-cut processing, *i.e.*, pre-packaged, ready-to-eat salads and washed, trimmed, pre-cut and ready-to-cook vegetables. The

major ingredients used by the fresh-cut salad industry are mainstay vegetables like iceberg and romaine lettuces, cabbage, carrots and spinach, complimented by a variety of additional crops that can provide color, texture and taste in both salad and stir-fry mixes. Salad and stir-fry mixes are commonly made up of chopped or shredded mature crops grown by standard practices but are usually sold alongside mesclun which is a blend of baby greens (see Mesclun section below).

Advances in packaging and post-harvest technologies has allowed the fresh-cut processing industry to develop into its own specialty niche. The shelf-life of fresh vegetables, once cut, is inherently very short, especially leafy vegetables such as lettuces. Oxidative browning and decay follow rapidly. Development of breathable plastic films which create a miniature controlled atmosphere within the package reduces the levels of oxygen and ethylene while increasing the carbon dioxide levels. These conditions slow respiration, the chemical browning process, and reduce the growth of decay organisms. Sanitizing the produce before and during the processing/packaging greatly reduces the number of decay organisms entering the package (see Section A13 Food Safety Concerns). The combination of handling practices and packaging materials has increased the shelf-life of fresh-cut products, in some cases, from a few days to several weeks.

Ethnic Vegetables

New immigrant populations throughout the Mid-Atlantic and Northeast have created opportunities for specialty produce farmers to cater to these ethnically diverse consumers. Major retailers are responding to these population shifts creating sales opportunities for both retail and wholesale growers.

It is critical to understand the ethnic community for which you will be growing in order to make the correct crop and variety selections, harvest at the correct stage, and package in appropriate containers. The worldcrops.org website is designed to help growers exploring ethnic crop markets understand the nuances of marketing to such diverse groups. For example, Hispanic cultures consume many types of peppers/chiles, but assuming every ethnic group wants one type of pepper would be a mistake.

Similarly, eggplant is very popular among Asian Indian people, but they prefer a small, egg size, pink 'brinjal' eggplant, while Chinese consumers look for long, slender fruit, and people in various Africans countries consume a white or pale green, medium size eggplant (a little smaller than the traditional Italian eggplant) that most call 'Bitter Ball'. West Africans also use a pea-sized, red eggplant for medicinal purposes, known as the 'Ghanan pea' in most countries. That unusual eggplant is called 'Kiteley' in Liberia, while 'Kitley' describes 'Bitter Ball' in Ghana.

Table 1. Common Ethnic Vegetable Crops for Mid-Atlantic Growers[1]

Vegetable Types	Ethnic Community	Ethnic Crop Name
Solanaceous		
Eggplant	Brazil	Gilo
	West Africa	Bitter Ball, Kiteley, Ghanan Pea
	India	Brinjal
	France	Aubergine
Pepper	Mexico	Habanero
	Dominican Republic	Aji Dulce
Husk Tomato	Mexico	Tomatillo
Cruciferous	China, Southeast Asia	Napa/Chinese Cabbages, Pak Choys, Mustards, Flowering Broccoli
Other Greens	West Africa	Jute
	India	Fenugreek (Methi)
	Mexico	Purslane (Verdolaga)
	Universal	Amaranth, Roselle, Malabar Spinach

[1]see *https://worldcrops.org/* for more information

"Designer Veggies"

Coined to describe unusual produce used by creative chefs to decorate gourmet plates with more than a traditional garnish, "designer veggies" can be any crop grown for its size, shape, color, texture, or flavor. Types of "designer veggies" may include, but are not limited to, any/all the crops described in the following sections. They are usually 'trendy' crops that help celebrity chefs stand out from the crowd, so one year's hot item may be a slow mover a year or two later, especially if several growers add more plantings. Radicchio can be considered one of the original "designer veggies". When it appeared in produce aisles in the mid-1980s there was nothing like its bright red leaves with contrasting white veins and strong bitter flavor. Today, while radicchio leaves are common ingredients in many

salad mixes, recent studies show that it qualifies as a nutrient-dense 'super food'. Coupling nutritional qualities with its ability to stand up to cooking in a variety of ways and increasing attention by food marketers, radicchio may once again be propelled into "designer veggie" status.

Success in the "designer veggie" business requires working closely with chefs and gourmand customers, paying close attention to food and trade publications and TV, attending produce and gourmet food shows, and being able to grow and deliver small quantities of labor-intensive produce.

Baby, Miniature and Micro Vegetables

Variety Selection

Though the publicity is perhaps not as great as during the late 1980's when they were faddish, demand continues for smaller vegetables among gourmet and specialty food outlets. Today, **micro-greens** may be the most popular type in highest demand. **Micro-greens** are seedling plants consumed at a stage (stem and cotyledon as 1 or 2 true leaves appear - smaller than transplant seedlings) between **sprouts** (roots and unopened cotyledons) and **baby** sizes (immature root vegetables or the first few true leaves of many greens). **Micro-greens** are cut above the soil line, so no roots or seed coats typically found in sprouted crops are included. Many types of vegetables can be harvested at these immature stages and sold as **baby** or **micro-vegetables**. There are other cultivars of vegetables which mature smaller than standard types of the same vegetable. These are referred to as **miniatures** and are grown to full maturity. Most seed companies offering specialty vegetables also recommend certain varieties for immature harvest in addition to listing miniature varieties.

Table 2. Baby and Miniature Vegetable Varieties and Harvest Stage

Vegetable Type	Harvest Stage[1]	Varieties for Baby Harvest	Miniature Varieties
Beans	IF	Aiguillon Cristal, Fine de Bagnols, Blue Lake	
Beets	IR	Burpee Golden, Boldet, Dwergina	Baby Beet Spinel, Crosby's Egyptian, Little Ball
Carrots	IR	Minicor, Round Paris Market, A&C Brand Nantes, Nantes, Scarlet Nantes S. T., Chantenay Red Core #5, Amsterdam A. B. K., Caramba	Carrot Sucrum, Baby Long Carrot, AMCA, Planet, Little Finger, Amstel
Corn	IF	Any sweet corn variety harvested within 3 days of silk emergence - supersweet varieties with tendencies to produce multiple ears/plant will increase yields	Golden Midget, Baby Asian Corn
Greens	G	Most greens, including mustards, cabbages (European and Oriental), chicories, etc. can be harvested at the 4-6" stage. A mixture of baby greens and lettuces can be sold as "Mesclun" salad mix.	
Lettuce	G	Green Oak Leaf, Red Oak Leaf, Merveille de Quatra Saisons, Sucrine, Lollo Rosso, Lollo Biondo, Red Grenobloise, Diana, Kagraner Sommer, Craquante D'Avignon, Red Salad Bowl	Tom Thumb, Baby Oak, Perella Red, Perella Green, Rougette de Midi, Morgana,Summer Baby Bibb, Little Gem Mini Romaine, Rubens Dwarf Romaine
Peppers, Tomatoes, Eggplant	IF	Fingerling eggplant	Miniature Baby Bell peppers, Cherry and Mini-Pear tomatoes
Radish	IR	Flamboyant, Flambo, Sezanne, Italian Oliva, French Breakfast	
Squash	IF	zucchini and yellow curved or straightneck, white and golden scallop, Jersey Golden Acorn, and Sweet Dumpling all can be harvested just before or after blossom drop.	
Turnips	IR	Milan Early Red Top, De Milan, Tokyo Cross, White Lady	Market Express

[1]IF=immature fruit, IR=immature roots (usually ½ to 1-inch diameter), G=greens (usually 4-6 inches and before head formation).

Culture

Micro-greens can be grown in protected culture for year-round, continuous harvesting. Typically, microgreens are planted in the containers in which they will be shipped and/or sold, leaving the 'harvesting' to the end user (chef or consumer). For wholesale customers, plastic transplant trays are lined with rock-wool/coir mats or a thin layer of soilless mix upon which the seeds are spread. Similarly, consumer packages such as clamshells or lidded trays can be used. Germination and 1 or 2 days of growth without light will cause the seedlings to stretch taller for easier harvest. This is followed by 2-3 days in full light which will allow the plant to produce chlorophyll and a dark green color. Un-cut micro-greens can then be delivered directly to chefs/consumers within a week to 10 days.

Baby and miniature vegetables are planted and grown much the same as standard varieties. Plant spacing is one major exception because miniatures are physically smaller and baby leaf and root crops are often harvested at the stage a standard variety would be thinned. Higher plant densities are desirable to maximize production. Baby leaf and some root crops can be grown in a solid bed by broadcast seeding since they will be harvested before crowding becomes a factor, or they may be drilled in rows 4-6 inches apart and as many across a bed as will fit. Spacing of miniature varieties will depend on the final size of the dwarfed plant. On the other hand, vegetables grown for their fruit (seeds or pods) such as beans, corn and squash should be grown at standard plant spacing to maximize output per plant. Crowding can affect the production of fruit reducing yields even if those fruit are to be harvested at an immature stage.

Field fertility may be modified depending on the crop and harvest stage. Immature, baby vegetables are harvested before they begin drawing significant amounts of nutrients from the soil. Most will perform with little additional fertilizer beyond the reserves left from previous crops. Baby and miniature vegetables production can be scheduled to provide continual year-round harvests by using high tunnels or greenhouses.

Harvesting baby and miniature fruiting vegetables is laborious and time-consuming as many are hand harvested specially for small producers. Conversely, specialty equipment manufacturers, especially in Europe, have developed efficient mechanical harvesters for baby greens. These tools may need to be used in conjunction with matched bed shapers and other implements, so careful analysis of the market and size of production is required to justify the added expense. Smaller scale manual and semi-mechanical harvest tools have been developed for smaller operations.

Postharvest Handling

Baby vegetables are immature crops at harvest-time and as such, both fruit and leafy crops tend to have higher respiration rates and are more tender than when they reach maturity. Proper postharvest handling procedures are critical to maximize shelf-life. Gentle handling and special packaging from harvest on are required to reduce bruising and dehydration. Rapid postharvest cooling removes field heat and extends shelf-life. This may be combined with triple washing to remove soil and field debris followed by spin-drying as a method of adding value.

Plastic-lined cardboard boxes, clear plastic food-service containers and inflated, resealable, plastic bags are some of the innovative packages tried in early tests. The industry has settled on 3-pound plastic-lined, or wax treated, cardboard boxes for the wholesale trade. Larger bulk boxes may be suitable to send these products to fresh-cut processors who eventually repackage their finished products in the consumer-oriented plastic bags or clamshell boxes. This packing system allows modified atmosphere treatment to reduce decay while providing support throughout the bulk package to reduce bruising/injury caused by the weight of the product itself. Micro-greens that are harvested at the farm are offered the most protection by use of clamshell boxes. Determine the appropriate package for the intended market.

Mesclun (French)/Misticanza (Italian)

Mesclun usually refers to mixed young/baby salad greens and herbs. Ingredients in mesclun blends vary, consisting of many varieties of the crops listed in Table 3. Seed companies sometimes sell pre-mixed selections for mesclun production, but since different species emerge and grow at different rates, it is recommended to grow each separately and mix after harvest. This allows the grower to create unique blends, as well as timing production to allow harvest of similar stages of growth of each species.

Table 3. Potherbs and Salad Greens Leafy greens can be described simply as any plant grown for consumption of its fleshy leaves, petioles and/or stems, either raw (salad greens) or cooked (potherbs) (see also Greens section).

Types of Greens	**Lettuces**	Iceberg, Romaine, Crisphead/Batavia, Leaf, Bibb, Boston
	Other Composites	Endive and Frisee, Escarole, Radicchio, Dandelion
	Mustards	Arugula, Cress, Mustard, Turnip tops, Watercress
	Cabbages	Red, Green and Savoy, Chinese Napa
	Spinach	Usually Flat leaf varieties
	Oriental Mustards	Mibuna, Misuna, Mizuna, Pak Choy; Flowering Broccoli
	Other Oriental Greens	Tricolor Amaranth, Shungiku Chrysanthemum
	Miscellaneous	Beet tops and Chard, Belgian Endive, Mache/Corn Salad, Orach, Claytonia/Miner's Lettuce, Sorrel, Purslane, Pea tips, Nasturtium leaves
	Herbs	Parsley, Basils, Borage, Chervil, Chives, Fennel, Salad Burnet
	Edible Flowers	Nasturtium, Viola, Violets, Pansy

Pest Control

Under Protected Culture

Specialty vegetable production can be extended in the field using floating row covers or grown nearly year-round using high-tunnels in most of the mid-Atlantic states. Pests likely to be encountered in high density plantings growing in high humidity are slugs, white flies, and botrytis. Slugs can be trapped and there are parasites for controlling white flies. Maintaining constant air circulation and adequate ventilation to reduce humidity within the plant canopy will reduce the incidence of botrytis. If making multiple harvests, carefully remove all dropped cut leaves as botrytis and bacterial soft rot get started on injured tissue.

Weed Control

Weed control may be the most difficult aspect of baby leafy green and herb production. Selecting fields with low levels of weed seedbanks and free of perennial species is important. Preventing weeds from producing seeds will help with control in subsequent seasons. Herbicides must be labeled for the specific greens and herbs grown; consult the weed control sections in this publication for herbicide recommendations for specific crops. Consult the herbicide label to determine if the time between herbicide use and harvest is equal to or exceeds the required preharvest interval (PHI).

Use cultural weed control methods such as stale seedbeds or plastic mulch when applicable. Mechanical weed control must be done in a planned, timely fashion. Most crops relying on mechanical weed control will require multiple cultivations, which will be more difficult in high density plantings. Resort to hoeing and hand weeding when necessary.

Insect Control

Careful crop monitoring is required to produce insect-free greens. Timing production and using physical insect barriers such as floating row covers can effectively control insects on many of the shortest season crops. Longer season crops usually require insecticides of some type to protect them from an array of root maggots, lepidopteran larvae, aphids, thrips, flea beetles, and more. Additionally, crop rotation and prompt destruction of crop residue help prevent buildup of flea beetles and other localized insect pests. Effective IPM scouting can identify pest population changes and alert the grower when a pest control application may be required. Given the diversity of crops within this group, there may be unexpected pests occurring on small plots of crop plants, making control even more difficult. Read pesticide labels carefully to ensure that a product is registered for use on a specific specialty crop. Many specialty vegetables fall under Crop Grouping labels. Consult the crop specific guidelines in this book for pest control recommendations.

Disease Control

Scout plantings on a regular basis and adopt IPM practices that will help produce a disease-free crop. Use genetic resistance to help limit potential losses due to disease. Many specialty vegetables fall under Crop Grouping labels, therefore consult the fungicide label and crop guidelines in this book for disease control recommendations.

Many specialty vegetables, especially heirloom/ethnic types of eggplants and tomatoes, are not resistant to common diseases that most modern hybrids have been bred to resist. Therefore, sanitation is critical to avoid building up populations of these pests. Solanaceous crops are especially susceptible to soil borne root diseases such as Verticillium and Fusarium, rarely seen in today's hybrid crops, but quickly re-emerging as serious pests in heirloom/ethnic crops. In addition to sanitation, **grafting** may be an alternative that allows a susceptible plant to be attached to a resistant rootstock allowing the desirable, but susceptible plant to be grown in infested soils. More information on grafting can be found in "Grafting Vegetables" in section A 5. Transplant Production.

For Immediate Medical Attention

Call 911

For a Pesticide Exposure Poisoning

Emergency Call

For All States

This number will automatically connect you to the poison center nearest to you.
Anyone with a poisoning emergency can call the toll-free telephone number for help. Personnel at the Center will give you first-aid information and direct you to local treatment centers if necessary.

For Pesticide Spills

Small Spills: See the product label for cleanup advice.
Large spills: Call the National Response Center at 1-800-424-8802 or CHEMTREC at 800-424-9300 (24 hours) - Industry assistance with emergency response cleanup procedures for large, dangerous spills.
Be aware of your responsibility to report spills to the proper state agency.