



University of Kentucky
College of Agriculture,
Food and Environment
Cooperative Extension Service
Horticulture

High tunnels: they're not just for tomatoes

CROP ROTATION OPTIONS FOR HIGH TUNNEL GROWERS

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FEBRUARY 16, 2023

Background

Many KY high tunnel growers plant nothing but tomatoes

This can lead to high tunnels being unused or under-used in the fall after tomatoes come out

Fertilizer is applied in high tunnels during spring and summer with no leaching

- Could a lower maintenance crop could take up the extra fertilizer following tomato?

Pests and disease can get worse over time without rotation

- What other profitable crops can we plant instead of tomato?



Crop management

You can put anything in a high tunnel, but should you?

Consider your spacing

- Usually tighter than open field planting
- Seed heavy then thin out later
- Tighter spacing may lead to more disease/pest pressure
- What can you manage?
- What kind of room do you need to harvest?



Crop management

Planting windows

- Successional planting/seeding for continuous availability
- Staggered planting every 1 or 2 weeks
 - Think about labor and market

Transplanting vs. direct seeding

Consider crops that allow for multiple harvests

- Tomato vs. cabbage

Make use of the whole tunnel when possible

- Grow up when possible
- Find the balance with your labor and time



Crop rotation

Crop rotation is the sequence of crops grown in a specific location

- Cash crops, cover crops, green manures, anything

Crop rotation options are possible in high tunnels, but require planning

Changing of crops over both space/location and time

Why bother with rotation?

- Improvement of soil quality
- Improvement of soil fertility
- Management of pests and diseases



Rotation strategies

Rotate based on:

- Plant family
- Nutrient requirements
- Host suitability to certain pests and diseases
- Rooting depth and type
- Needed cover crops or green manures



Limitations

Number of tunnels the grower has

- 1, 2, 3...
- The rotations can be longer with more tunnels

Market

Motivation/interest

Time

Labor



Rotational options

Within beds in one high tunnel

- Similar crops every year, but in different locations within the tunnel
- Potentially higher maintenance

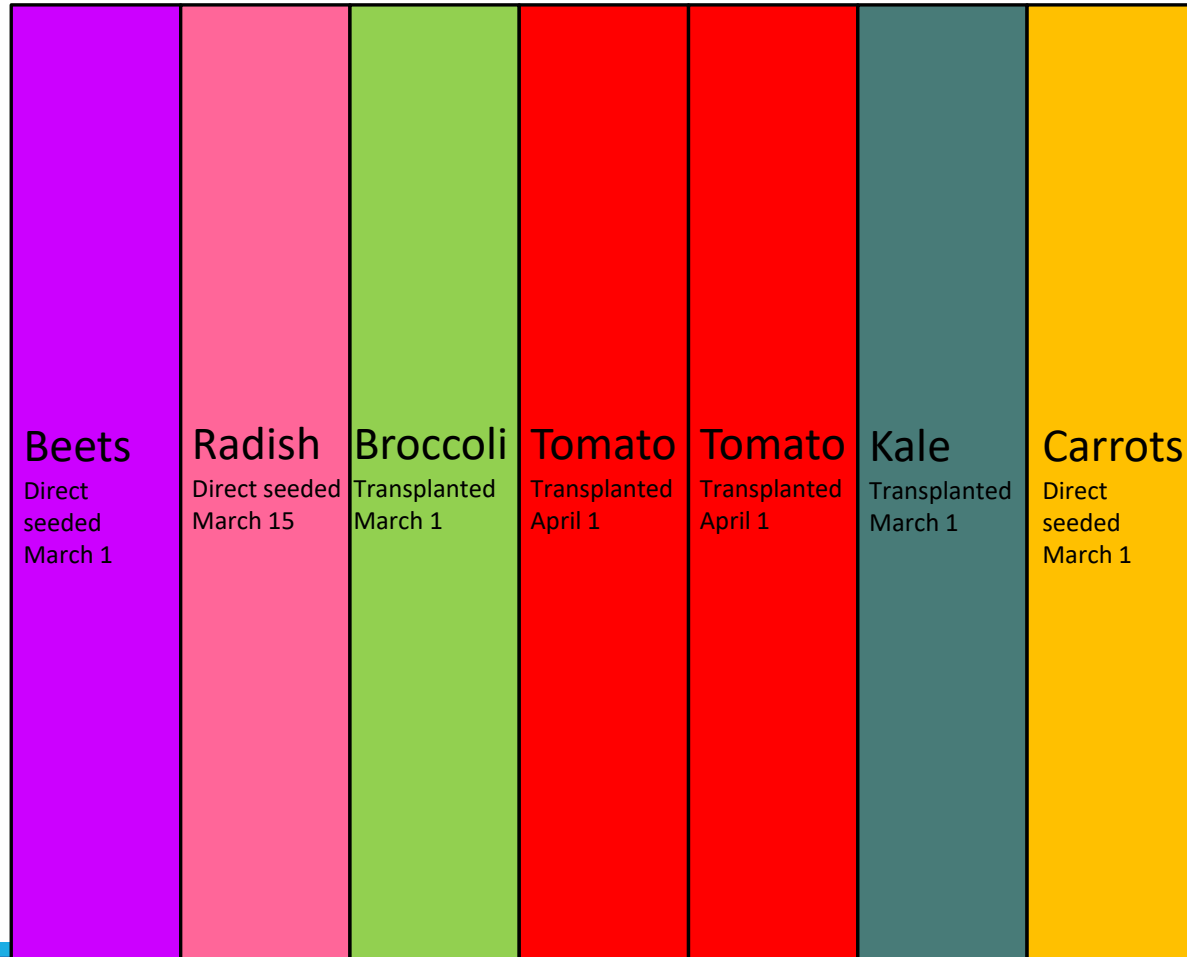
Inter-seasonal

- Rotate between seasons within the same calendar year
- May help with soil fertility management
- May help break some of the pest and disease cycle
- Can be done with one high tunnel

Multi-year

- Need at least two high tunnels in order to maintain tomato crop every year
- Lots of options for rotations
- Able to break the pest and disease cycle
- More cover cropping options

Diversified cropping—spring example

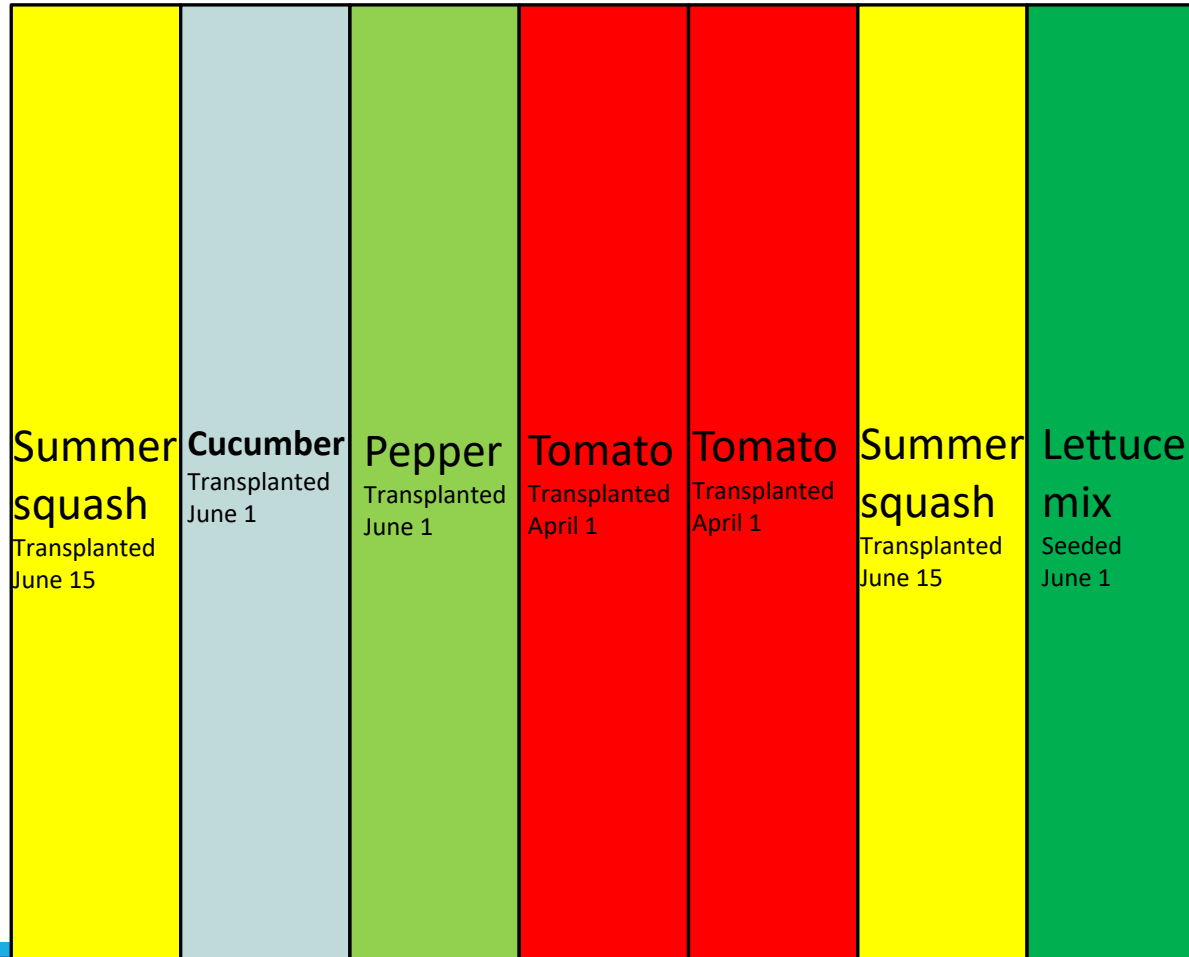


Each rectangle represents a bed in the high tunnel

Early spring is a good season for cooler season crops with less days to maturity

Or early-planted warmer season crops with more days to maturity; row cover may be required depending on the temperature

Diversified cropping—summer example



For summer, it is important to choose crops that can withstand high air temperatures

Make sure there is plenty of access to water for consistent irrigation

There are several warm season crops that can only be grown at this time of year (without supplemental heating)

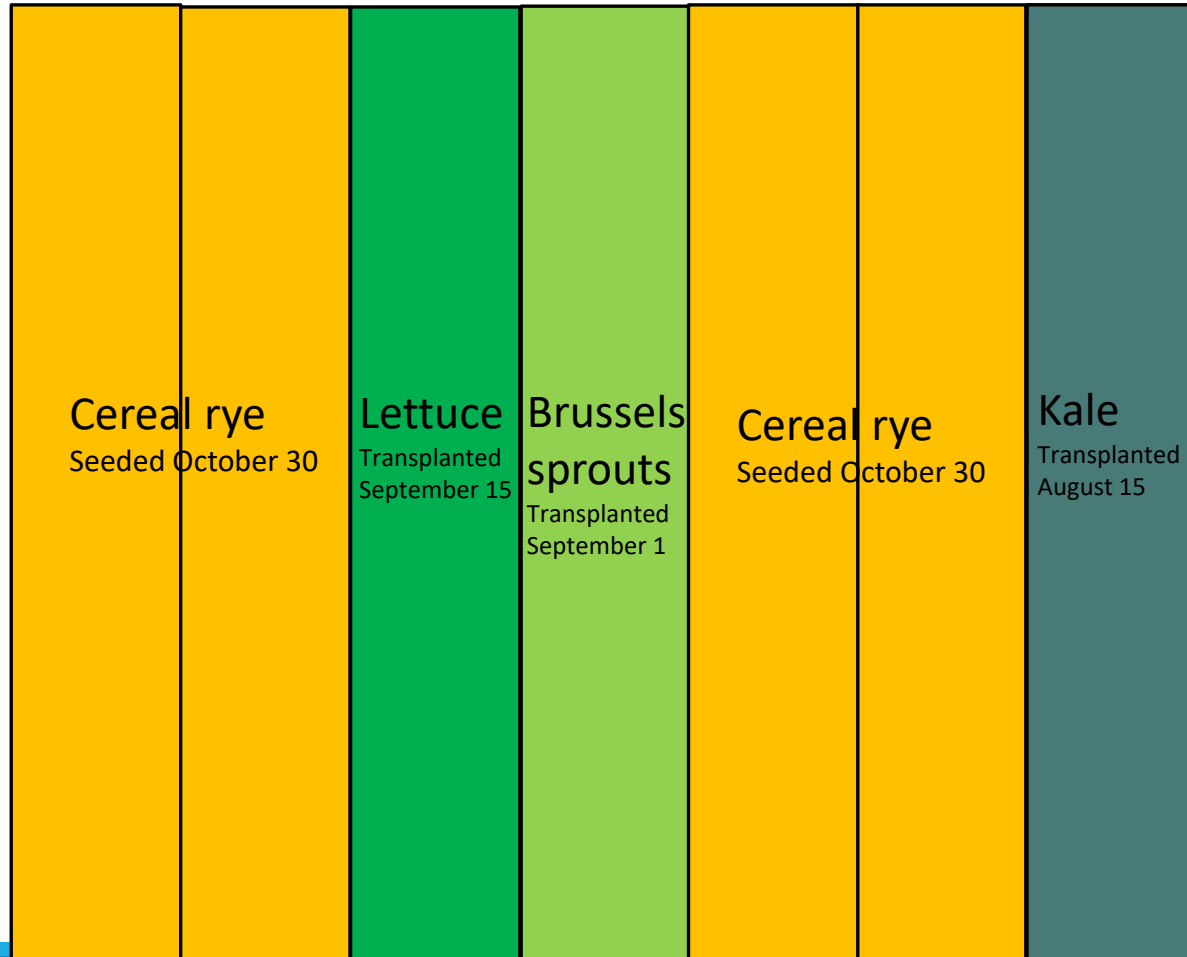
Diversified cropping—fall example

Carrots Direct seeded August 15	Spinach Direct seeded September 1	Lettuce Transplanted September 15	Brussels sprouts Transplanted September 1	Cauliflower Transplanted August 15	Beets Direct seeded August 15	Kale Transplanted August 15
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Fall is a good time to grow cole crops, such as broccoli and cauliflower

Also a good time to grow cooler season crops that require fewer days to mature

Diversified cropping—winter example



Winter may be a good time to either take a break from growing and get your high tunnel ready for spring

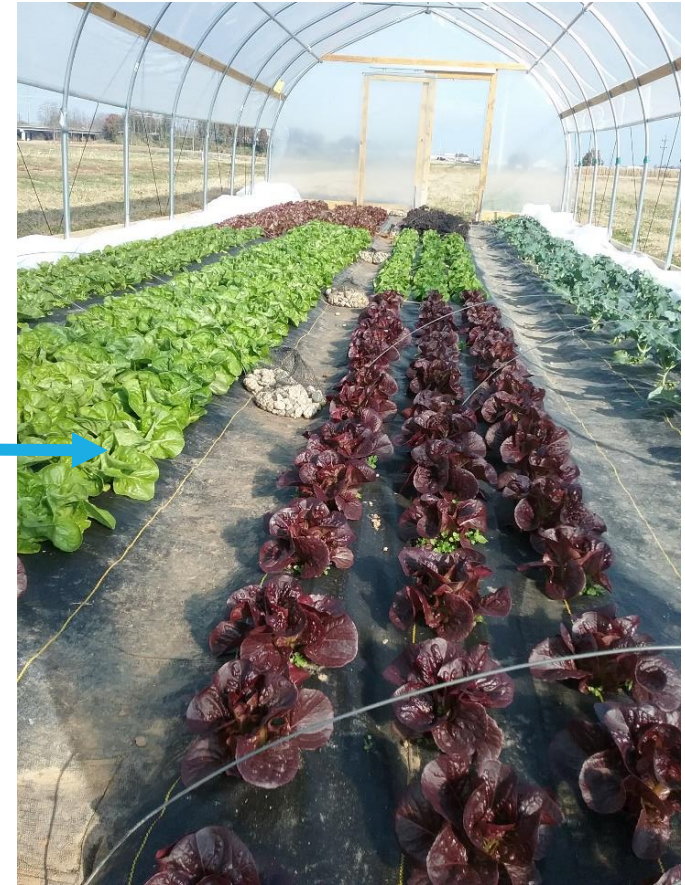
Winter may also be a good time to have cover crops to build organic matter

Many cold hardy crops can be grown, but row cover may be required

Inter-seasonal rotations



Spring/summer tomato



Fall/winter greens

Inter-seasonal rotations



Spring/summer tomatoes



Fall flowers

Inter-seasonal rotations



Late winter/early spring greens



Spring/summer tomatoes



Fall/winter Cole crops

Inter-seasonal rotations



Spring/summer tomatoes



Late summer/fall/winter cover crop

Multi-year rotations

Many more rotational options with more than one tunnel

More success with soil fertility, pest and disease management will come from longer rotations

Planning required to ensure best rotation and most rotational time possible



Option 1—two tunnels

Tunnel 1

- Year 1: Greens → tomatoes → Cole crops
- Year 2: Root crops → cucurbits → greens
- Year 3: Cole crops → tomatoes → root crops



Tunnel 2

- Year 1: Root crops → cucurbits → greens
- Year 2: Cole crops → tomatoes → root crops
- Year 3: Greens → cucurbits → Cole crops



Option 2—three+ tunnels

Tunnel 1

- Year 1: Greens → tomatoes → root crops
- Year 2: Cole crops → beans → greens (or flowers)
- Year 3: Root crops → cucurbits → cole crops

Tunnel 2

- Year 1: Cole crops → cucurbits → greens (or flowers)
- Year 2: Root crops → tomatoes → cole crops
- Year 3: Greens → beans → root crops

Tunnel 3

- Year 1: Root crops → beans → cole crops
- Year 2: Greens → cucurbits → root crops
- Year 3: Cole crops → tomatoes → greens (or flowers)



Flowers



strawflower

amaranth

zinnias

cosmos

strawflower

zinnias

sunflowers

amaranth



'Queen Lime w/ Blush' zinnia



'Coral Fountain' amaranth



'Double Click' cosmo



'Queen Red Lime' zinnia



'Red Spike' amaranth



'Cupcake Blush' cosmo



'Procut White Nite' sunflower



'Procut Red' sunflower



'Procut Bicolor' sunflower



'Apricot Peach' strawflower



'Silvery Rose' strawflower



'Ivory Princess' calendula



'Orange Button' calendula

High vs. moderate input –flowers

Two high tunnels (15 x 44 ft each)

Input	High	Low
At-planting fertigation (20% of total N)	1 lb calcium nitrate	½ lb calcium nitrate
10-inch tall fertigation (30% of total N)	1.5 lb calcium nitrate	¾ lb calcium nitrate
4-6 weeks before final harvest fertigation (rest of total N, 50%)	2.41 lb calcium nitrate	1.2 lb calcium nitrate
Pesticides—insecticides, fungicides	11 applications	4 applications

High input
2 lb of N/1,000 sq. ft

Low input
1.5 lb of N/1,000 sq. ft

High vs. low input—flowers

Flower	Marketable Stem Count		Unmarketable Stem Count	
	High	Low	High	Low
Sunflower (stagger planted)	115	86	6	7
Zinnia	101	76	6	19
Cosmo	320	202	61	28
Amaranth	102	73	9	16
Calendula (2022)	157	278	45	39
2022 total	896	715	127	109
Strawflower (2021)	92	87	0	4

Marketable stems

- No shorter than 12''
- Pencil width except for sunflowers and amaranth
- Straight

Reason for unmarketability

Flea beetle damage
 Incomplete flower development
 Army worm damage
 Stem too short
 Stem too thin
 Stem too thick
 Damaged petals/bloom
 Broken stem

Other options

Think of unrelated crops that can be added to the rotation that would also be “worth” putting in the high tunnel

High value crops that will add and improve to the rotation

- Alliums—onions, garlic
- Herbs
- Strawberries? Share many diseases with solanaceous crops

Anything can be grown in a high tunnel, but should it? Consider:

- Space
- Management
- Days to maturity
- Multiple or single harvest

Considerations

Diseases or pests that are already a problem

- Soilborne disease
- Plant-parasitic nematodes

Sanitation will still be very important

Soil fertility and soil sampling will be crucial

- Soil sample at least once per year
- What do the results mean?

Timing!



Resources

<https://www.youtube.com/channel/UC6JyU2Fdo3Yvml4y7LF0M4A>

- Three flower videos—flower pinching, flower harvesting, bouquet creation
- Cover cropping videos

Vegcrops.ca.uky.edu

ID-36 Commercial Vegetable Growers Handbook

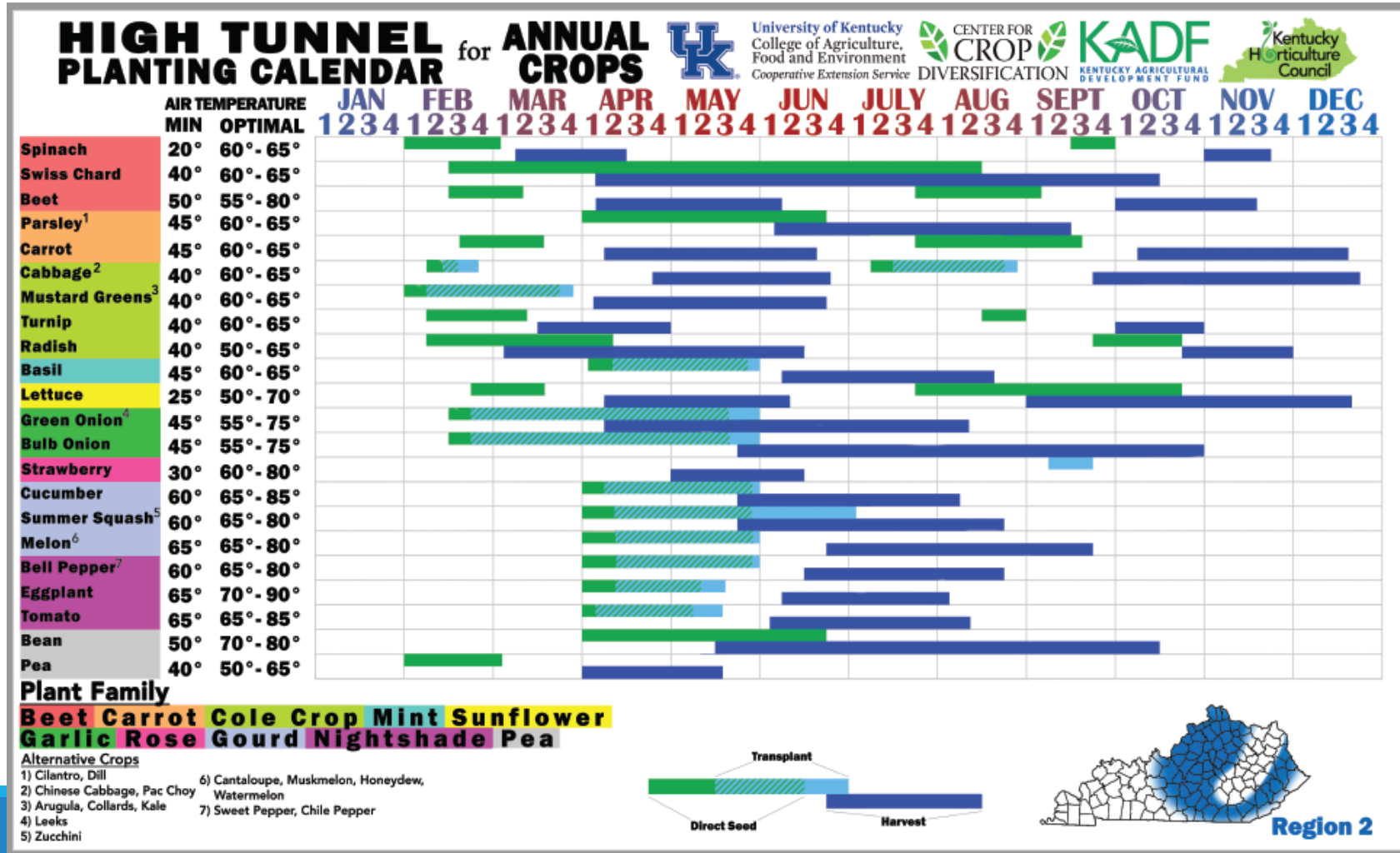
ID-235 Scouting guide for high tunnels

UK Center for Crop Diversification (CCD)

- For current prices, crop profiles



What and when to grow





Start the survey here.

Are you a
high tunnel grower?

Please complete this survey.

Thank you for sharing with us!