Table A-4. Temperature and Planting Recommendations for Transplant Production

Crop	Optimum Day Temperature (F)	Minimum Night Temperature (F)	Weeks to Grow	Square Inch per Plant	Number of Plants per Square Foot	1020 tray size cells
Broccoli	65-70	60	4-7	2-3	48	72
Cabbage	65	60	6-7	2-3	48	72
Cauliflower	65-70	60	6-8	2-3	48	72
Celery	65-70	60	9-12	2-3	48	72
Cucumber[1]	70-75	65	2-4	4	36	50 or 72
Eggplant	70-85	65	6-9	4	36	50 or 72
Endive, Escarole	70-75	70	5-7	2	72	72 or 96
Lettuce	60-65	40	4-6	1	144	96 or 128
Melon[1]	70-75	65	2-4	4	36	50 or 72
Onion	65-70	60	9-12	0.5-0.65	220-288	288 or 312
Pepper	70-75	60	7-9	2-3	48	72
Summer squash[1]	70-75	65	2-4	4	36	50 or 72
Tomato	65-75	60	5-6	2-3	48	72
Watermelon (seeded)[1]	70-75	65	3-4	4	36	50 or 72

[1]Seed directly in container; do not transplant prior to setting in the field.

Table A-5. Planting and Harvesting Schedule for Freestanding High Tunnel Vegetable Crop Production

Crop	Method[1]	Average High Tunnel Planting Dates	Average High Tunnel Harvest Dates
Beet	TRP or DS	February-April; August-October 15	October-May
Bean (Snap)	TRP or DS	April-September 1	June-October
Bok Choi	TRP or DS	February-November	Year-round
Broccoli	TRP or DS	March-April; August	May-June; October- November
Cabbage (Chinese)	TRP or DS	February 15-April 15; August 1-September 30	April-June; October-December 10
Cabbage (Green)	TRP or DS	March 15-May 15; August-September	May-December
Cantaloupe	TRP or DS	March 21-May	June-August
Carrot	DS	February 1-April 15; August-October	March-June; November-April
Cauliflower	TRP or DS	March 15-April 15; August	May-June; October-December 10
Chard	TRP or DS	Year-round	Year-round
Cucumber	TRP or DS	April-September 1	May-October
Eggplant	TRP	April 15-August 15	July-October
Garlic	DS	October-November	June-August
Kale	TRP or DS	January-April 15; August-November 1	February-June; September-January
Kohlrabi	TRP or DS	March-April; August-September	May-June; October-December
Leek	TRP or DS	February 15-November 15	April-May; November-April
Lettuce	TRP or DS	Year-round	Year-round
Onion (Bulb)	TRP	February-March; October-November	May-July
Onion (Bunching Green)	TRP or DS	September-December; February-June	March-December
Pea	TRP or DS	February-April	May-June
Pepper (Bell)	TRP	April-July 20	June-November
Potato (Irish)	DS	February 14-March 15; August	May-June; October-December
Radish	DS	February-April; September-December	February-May; November-January
Spinach	DS	January 1-May 1; August-December	January-May; October-December
Summer Squash	TRP or DS	April-May	May-June
Tomato	TRP	March 15-July 15	June 1-December 5
Turnip	DS	February-April; September-December	February-May; November-January

[1]TRP=Transplanting, DS=Direct Seeding.

Table B-1. Target Soil pH Values for Vegetable Crops

Crop	Target pH	Apply lime when pH falls below	Crop	Target pH	Apply lime when pH falls below
Asparagus	6.8	6.2	Okra	6.5	6.0
Beans - lima, snap	6.2	6.0	Onions - green, bulb, scallions	6.5	6.0
Beets	6.5	6.2	Parsley	6.5	6.0
Broccoli	6.5	6.2	Parsnips	6.5	6.0
Brussels sprouts	6.5	6.2	Peas	6.5	6.0
Cabbage	6.5	6.2	Peppers	6.5	6.0
Carrot	6.0	5.5	Potatoes, sweet	6.2	5.5
Cauliflower	6.5	6.2	Potatoes - white, scab susceptible	5.2	5.0
Collards	6.5	6.2	Potatoes - white, scab resistant	6.2	5.5
Cantaloupes	6.5	6.0	Pumpkins	6.5	6.0
Celery	6.5	6.0	Radish	6.5	6.2
Cucumber	6.5	6.0	Rhubarb	6.5	5.5
Eggplant	6.5	6.0	Rutabaga	6.5	6.2
Endive - escarole	6.5	6.0	Spinach	6.5	6.0
Horseradish	6.5	5.5	Squash - winter, summer	6.5	6.0
Kale	6.5	6.2	Sweet corn	6.5	6.0
Kohlrabi	6.5	6.2	Strawberries	6.2	5.8
Leeks	6.5	6.0	Tomatoes	6.5	6.0
Lettuce - leaf, iceberg	6.5	6.0	Turnips	6.5	6.0
Mixed vegetables	6.5	6.0	Watermelon	6.2	5.5
Muskmelons	6.5	6.0			

Table B-2. Pounds of Calcium Carbonate Equivalent (CCE) Recommended per Acre

For Crops with a Target Soil pH of 6.5

	Soil Texture and Fertility				
Initial Soil pH	**Loamy Sand**	**Sandy Loam**	**Loam**	**Silt Loam**	**Clay Loam**
4.1-4.4	4,500	5,400	9,800	11,600	23,300
4.5-4.8	3,600	4,500	8,100	9,800	18,800
4.9-5.2	2,700	3,600	6,300	8,100	15,200
5.3-5.6	1,800	2,700	4,500	6,300	12,500
5.7-6.0	900	1,800	3,600	4,500	8,100
6.1-6.4	500	900	1,800	3,600	5,400
Above 6.5	0	0	0	0	0

For Crops with a Target Soil pH of 6.2

	Soil Texture and Fertility				
Initial Soil pH	**Loamy Sandy**	**Sandy Loam**	**Loam**	**Silt Loam**	**Clay Loam**
4.1-4.4	4,000	4,500	8,000	8,900	20,600
4.5-4.8	3,100	3,600	6,300	7,100	16,100
4.9-5.2	2,200	2,700	4,500	5,400	12,500
5.3-5.6	1,300	1,800	2,700	3,600	9,800
5.7-6.0	500	900	1,200	1,800	5,400
Above 6.5	0	0	0	0	0

For Potato Varieties with a Target Soil pH of 5.2

	Soil Texture and Fertility			
Initial Soil pH	**Loamy Sandy**	**Sandy Loam**	**Loam**	**Silt Loam**
4.5	630	990	1,350	1,790
4.6	540	810	1,160	1,520
4.7	450	630	940	1,250
4.8	360	540	760	990
4.9	270	450	540	760
5.0	180	270	400	490
5.1	90	100	180	270
5.2	0	0	0	0

Table B-3. Conversion of Recommended Calcium Carbonate Equivalent to Recommended Limestone. Find your soil test limestone recommendation in the left-hand column, then read across the table on the line until you come to the column headed by the percent CCE nearest to that of your liming material. Application rates may be rounded off to the nearest 500 lb/A practical for spreading equipment.

CCE (lb/A) Recommended by Soil Test	Percent Calcium Carbonate Equivalent (% CCE) of Liming Material							
	70	75	80	85	90	95	100	105
	Actual Limestone Recommendation (lb/A)[1,2]							
1,000	1,400	1,300	1,200	1,200	1,100	1,100	1,000	1,000
2,000	2,900	2,700	2,500	2,400	2,200	2,100	2,000	1,900
3,000	4,300	4,000	3,700	3,500	3,300	3,200	3,000	2,900
4,000	5,700	5,300	5,000	4,700	4,400	4,200	4,000	3,800
5,000	7,100	6,700	6,200	5,900	5,600	5,300	5,000	4,800
6,000	8,600	8,000	7,500	7,100	6,700	6,300	6,000	5,700
7,000	10,000	9,300	8,700	8,200	7,800	7,400	7,000	6,700
8,000	11,400	10,700	10,000	9,400	8,900	8,400	8,000	7,600
9,000	12,000	12,000	11,200	10,600	10,000	9,500	9,000	8,600
10,000	14,300	13,300	12,500	11,800	11,100	10,500	10,000	9,500
11,000	15,700	14,700	13,700	12,900	12,200	11,600	11,000	10,500
12,000	17,100	16,000	15,000	14,100	13,300	12,600	12,000	11,400
13,000	18,600	17,300	16,200	15,300	14,400	13,200	13,000	12,400
14,000	20,000	18,700	17,500	16,500	15,600	14,700	14,000	13,300

[1]The amounts of CCE recommended in the table are for increasing the pH of an **8-inch soil layer** to the desired pH value. Multiply the numbers in the table by 1.25 to adjust a 10-inch plow layer to the desired pH. [2]**It is not advisable to apply more than the following lb/A of CCE as a topdressing:** loamy sand 2,000, sandy loam 3,000, loam 4,000, and silt loam 5,000. If fields are to be plowed and the CCE recommendation exceeds 3,000 lb/A, plow under half the needed amount and apply the other half after plowing and then disk in as deeply as possible.

Table B-8. Recommendations for Correction of Vegetable Crop Nutrient Deficiencies

Nutrient	Fertilizer	Method	Application Rate (Nutrient) lb/A
Nitrogen (N)	Urea-ammonium nitrate solutions	T,S,D[1]	30 to 40
	Calcium nitrate	T,S,D	30 to 40
Phosphorus (P_2O_5)	Ammonium phosphates	T,S,D	20
	Triple superphosphate	T,S	20
	Phosphoric acid	S,D	20
Potassium (K_2O)	Potassium chloride	T,S,D	30
	Potassium nitrate	T,S,D	30
Calcium (Ca)	Calcium nitrate	T,S,D	30
	Calcium chloride	D	30
Magnesium (Mg)	Magnesium sulfate	T,S,D	20
	Potassium magnesium sulfate	T,S	20
Sulfur (S)	Ammonium Sulfate	T,S,D	20
	Gypsum	T,S,D	20
Boron (B)	Borax, Solubor[2]	D,F[1]	0.1 to 0.2
Copper (Cu)	Copper sulfate	D,F	0.1 to 0.2
Iron (Fe)	Ferrous sulfate, chelated iron	D,F	0.2 to 0.5
Manganese (Mn)	Manganous sulfate, chelated manganese	D,F	0.5 to 1.0
Molybdenum (Mo)	Sodium molybdate	D,F	0.01 to 0.05
Zinc (Zn)	Zinc sulfate, chelated zinc	D,F	0.1 to 0.2

[1]T=topdress, S=sidedress, D=drip irrigation, F=foliar. [2]Mention of a trade name does not imply a recommendation over similar materials.

Table B-9. Sufficiency Ranges for Fresh Petiole Sap Concentrations in Vegetable Crops

Crop	Stage of Growth	Concentration (ppm)		Crop	Stage of Growth	Concentration (ppm)	
		K	NO_3-N			K	NO_3-N
Cucumber	First blossom	N/A	800-1000	**Potato**	Plants 8 in. tall	4500-5000	1200-1400
	Fruit (3 in.)	N/A	600-800		First open flowers	4500-5000	1000-1400
	First harvest	N/A	400-600		50% flowers open	4000-4500	1000-1200
Broccoli	Six-leaf stage	N/A	800-1000		100% flowers open	3500-4000	900-1200
	Just prior to harvest	N/A	500-800		Tops falling over	2500-3000	600-900
	At first harvest	N/A	300-500	**Squash**	First blossom	N/A	900-1000
Eggplant	First fruit (2 in)	4500-5000	1200-1600		First harvest	N/A	800-900
	First harvest	4000-5000	1000-1200	**Tomato (Field)**	First buds	3500-4000	1000-1200
	Mid harvest	3500-4000	600-800		First open flowers	3500-4000	600-800
Muskmelon (Cantaloupe)	First blossom	4000-5000	1000-1200		Fruit (1 in. diameter)	3000-3500	400-600
	Fruit (2 in.)	3500-4000	800-1000		Fruit (2 in. diameter)	3000-3500	400-600
	First harvest	3000-3500	700-800		First harvest	2500-3000	300-400
Pepper	First flower buds	3200-3500	1400-1600		Second harvest	2000-2500	200-400
	First open flowers	3000-3200	1400-1600	**Watermelon**	Vines (6 in. long)	4000-5000	1200-1500
	Fruit half-grown	3000-3200	1200-1400		Fruit (2 in. long)	4000-5000	1000-1200
	First harvest	2400-3000	800-1000		Fruit (half mature)	3500-4000	800-1000
	Second harvest	2000-2400	500-800		At first harvest	3000-3500	600-800

Table C-1. Most Critical Periods of Water Needs by Crops

Crop	Most Critical Period	Crop	Most Critical Period
Asparagus	Brush (period following fern mowing)	Onions: dry	Bulb enlargement
Beans: lima	Pollination and pod development	Peas	Seed enlargement and flowering
Beans: snap	Pod enlargement	Peppers	Flowering and fruit development
Broccoli	Head development	Potatoes: white	Tuber set and tuber enlargement
Cabbage	Head development	Potatoes: sweet	Root enlargement
Carrots	Root enlargement	Radishes	Root enlargement
Cauliflower	Head development	Strawberries	Establishment, runner development, fruit enlargement
Corn	Silking and tasseling, ear development		
Cucumbers	Flowering and fruit development	Squash: summer	Bud development and flowering
Eggplants	Flowering and fruit development	Tomatoes	Early flowering, fruit set, and enlargement
Lettuce	Head development	Turnips	Root enlargement
Melons	Flowering and fruit development		