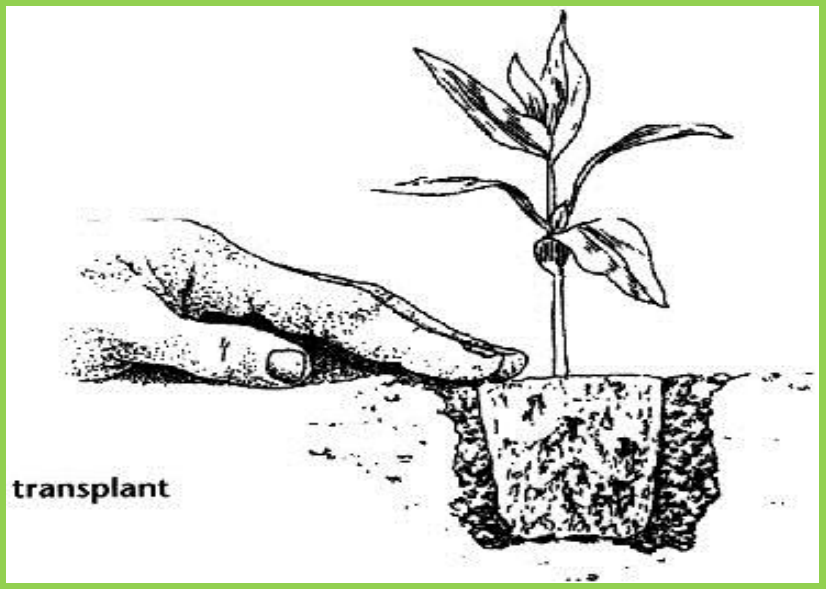
Transplanting

Why Transplant?

Transplants offer several advantages to the grower.

We use transplants to lengthen our growing season. In the Midwest this is especially important with plantings that require long growing seasons. By starting our seedlings in a greenhouse we gain valuable growing time; bringing produce to market earlier when profit margins are at their best. Of course not all plants respond well to transplanting (root systems have a big part to do with this) and even the ones that do need special care and attention for success.

Controlled environments, like greenhouses, give farmers the ability to start seedlings early and use transplants in the farming enterprise.



Greenhouse Advantages

1. Greater Climate Control

2. Intensive rather than extensive management of seedlings
   - Pest management
   - Disease management
   - Irrigation needs

3. Rapid crop successions

The root nature of a plant is a good indicator if it will be a successful transplant. The fibrous root system (spread root system) is typical of plants grown for transplanting (vs tap roots which are more typically directly seeded).

Transplants allow for greater control over specific density of crops. Spacing is more exact and controlled.

Seedling pre-treatment necessary for successful transplanting

The soil mix that seedlings are grown in should be fertile and have water retention capabilities. Pre-mixed starter soils with the OMRI label are acceptable alternatives to mixing your own. (see greenhouse module)

Moisture in flats should be 50%-75% of field capacity and in cells at field capacity.

Soil Moisture Chart

SOIL MOISTURE LEVEL (% OF FIELD CAPACITY)	COARSE (SAND)	LIGHT (LOAMY SAND, SANDY LOAM)	MEDIUM (FINE, SANDY LOAM, SILT LOAM)	HEAVY (CLAY LOAM, CLAY)
0–25% No available soil moisture. Plants wilt. Irrigation required. (1st range)	Dry, loose, single grained, flows through fingers. No stain or smear on fingers.	Dry, loose, clods easily crushed and will flow through fingers. No stain or smear on fingers.	Crumbly, dry, powdery, will barely maintain shape. Clods, breaks down easily. May leave slight smear or stain when worked with hands or fingers.	Hard, firm baked, cracked. Usually too stiff or tough to work or ribbon[1] by squeezing between thumb or forefinger. May leave slight smear or stain.
25–50% Moisture is available, but level is low. Irrigation needed. (2nd range)	Appears dry; will not retain shape when squeezed in hand.	Appears dry; may tend to make a cast[2] when squeezed in hand, but seldom will hold together.	May form a weak ball[2] under pressure but will still be crumbly. Color is pale with no obvious moisture.	Pliable, forms a ball; will ribbon but usually breaks or is crumbly. May leave slight stain or smear.
50–75% Moisture is available. Level is high. Irrigation not yet needed. (3rd range)	Color is darkened with obvious moisture. Soil may stick together in very weak cast or ball.	Color is darkened with obvious moisture. Soil forms weak ball or cast under pressure. Slight finger stain, but no ribbon when squeezed between thumb and forefinger.	Color is darkened from obvious moisture. Forms a ball. Works easily, clods are soft with mellow feel. Will stain finger and have slick feel when squeezed.	Color is darkened with obvious moisture. Forms good ball. Ribbons easily, has slick feel. Leaves stain on fingers.
75% to field capacity (100%) Soil moisture level following an irrigation. (4th range)	Appears and feels moist. Color is darkened. May form weak cast or ball. Will leave wet outline or slight smear on hand.	Appears and feels moist. Color is darkened. Forms cast or ball. Will not ribbon, but will show smear or stain and leave wet outline on hand.	Appears and feels moist. Color is darkened. Has a smooth, mellow feel. Forms ball and will ribbon when squeezed. Stains and smears. Leaves wet outline on hand.	Color is darkened. Appears moist; may feel sticky. Ribbons out easily, smears and stains hand, leaves wet outline. Forms good ball.

1/16/13

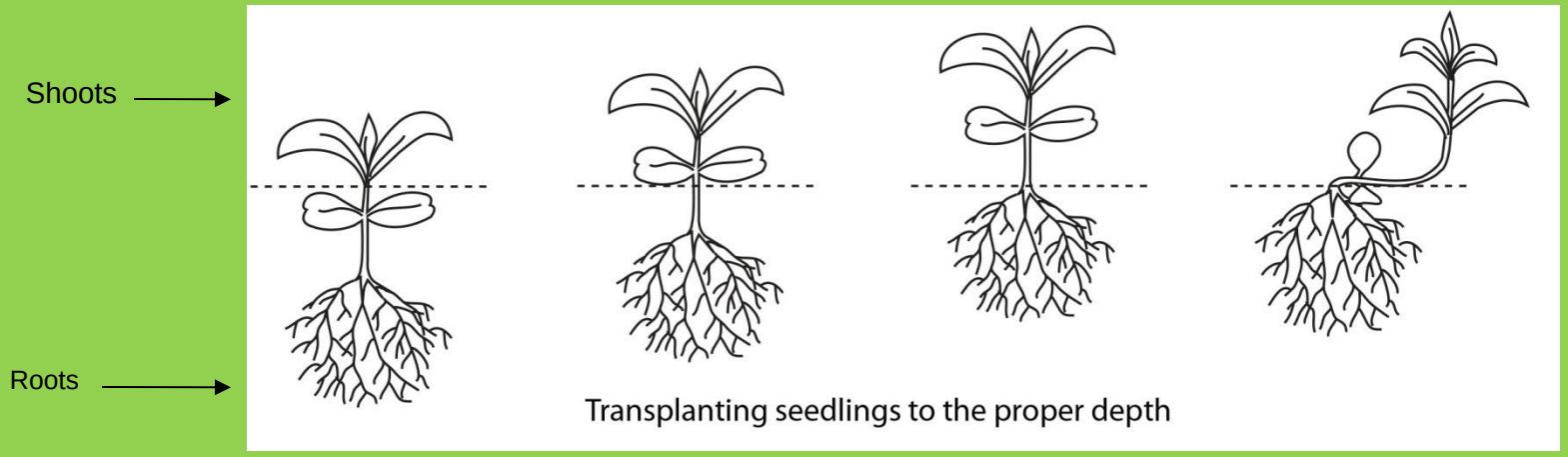
Assess Plant, Soil, and Environmental Conditions Prior to Transplanting

Assessing the Plant for Transplanting Readiness

Plants should show second set of true leaves (shoot development).

Root Knit should be present in cells or roots should fill allotted space in flats(blocks).

Soil Blocking Video



Transition from Greenhouse to Field

Hardening off period: Hardening off reduces amount of stress for start by gradually increasing amount of exposure to outside elements. Hardening off should start up to 21* days prior to acceptable field transplant date.

Move starts to cold frame 3-21* days before they are ready to enter the field, cover off in the day and cover on at night

Leave the starts exposed to the elements for a half hour to an hour longer each consecutive day

Finally, leave them exposed all day and all night the final days.

*Hardening-off period should increase in duration with increased differential between field and greenhouse conditions.

Asses Field or Garden Soil Conditions Before Transplanting

- **Moisture**
- **Cultivation**
- **Environmental Conditions**

Moisture

Soil Moisture for optimum conditions when transplanting should be 50-75% of field capacity

Cultivation

Extensive secondary cultivation is needed for transplants with small, weak or insufficient root systems (i.e. beets or carrots) much like direct seeding.

Course secondary tillage for large, vigorous, and resilient transplants (e.g. tomatoes and peppers) is fine.

2nd method video

Setting up your garden

Consider using no –till methods for establishing gardens/plots.

No-till bed preparation

Environmental Conditions Favorable for Successful Transplanting

Optimal conditions in the field will add to the success of your transplants by reducing shock and helping the seedlings to take root quickly.

The best field conditions for Transplanting seedlings include:

- Low light levels
- Low Temperatures
- Little or no wind
- High humidity

The best time to transplant any start is in the cool of the evening. This allows the plant a nice buffer to become acquainted with its new surroundings before dealing with a hot sun.

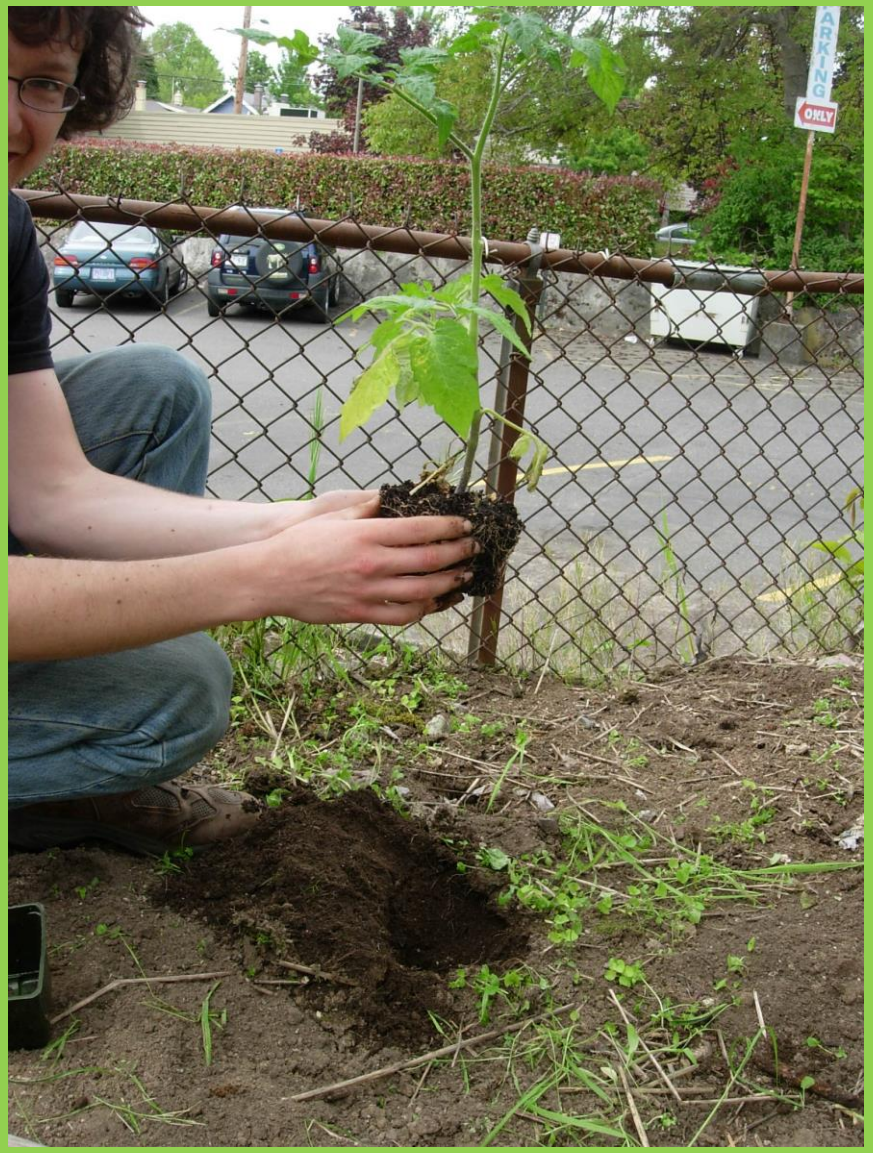
Transplanting Starts

Gather your tools;

- Mature seedlings
- Hand trowel
- Watering wand
- Dibble
- String and stakes

Optional transplanting tools;

- Hatfield transplanter (Johnny's seeds) http://www.johnnyseeds.com/MediaPlayer.aspx?VideoID=21&source=JSSVideos
- Pull behind mechanisms http://youtu.be/gMSpN0E8_H8



Starts should be thoroughly watered before transplanting. This greatly reduces shock. Using a weak fish emulsion solution just prior to transplanting helps reduce shock.

1 sand

LIQUID FERTILITY

Using watering can, per gallon of water:

1/4 cup liquid fish emusion

1/2 tsp. Kelp powder

Using foliar sprayer:

Also add 1/4 tsp. sticker-spreader (surfactant), added last into the tank to avoid excess foaming (see Resources section)

Mix ingredients in a little water in a bucket, then pour into a 3-gallon backpack sprayer and fill to the line with more water. For basal applications, remove spray nozzle.

Fertigation is best done in the early morning or in the evening.

Plant spacing considerations;

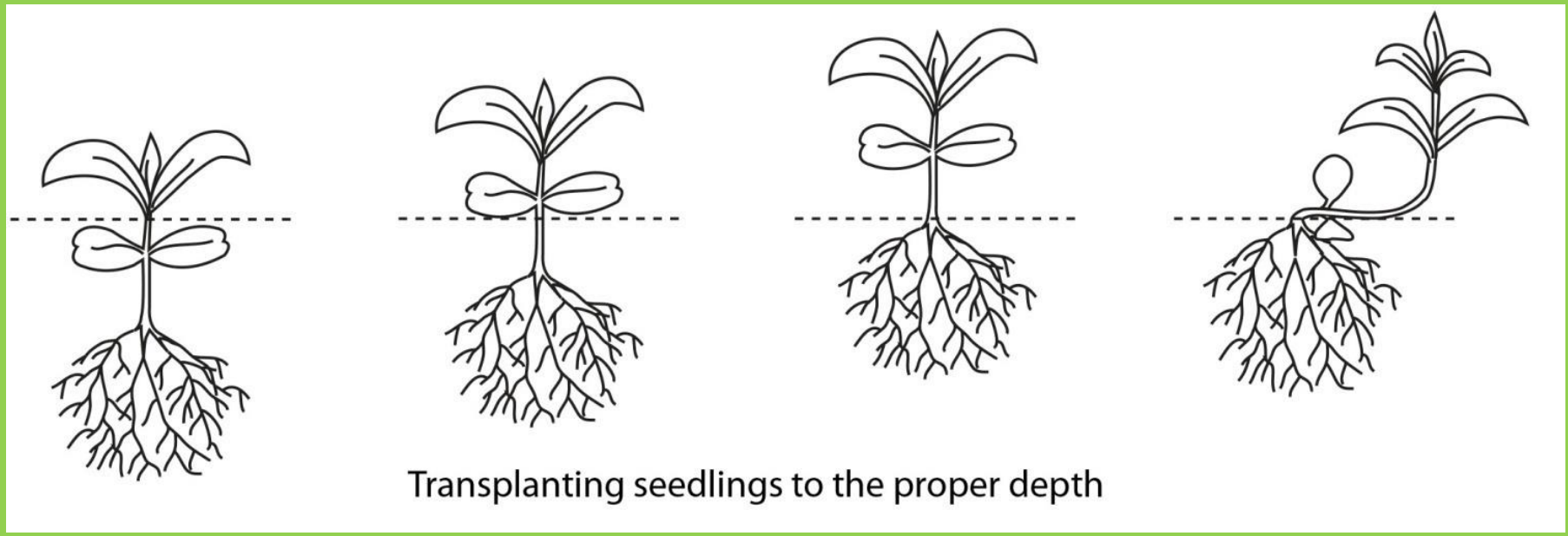
- Row planting should be wide enough to accommodate drip irrigation ribbon and cultivation tool.
- Fertile soils can accommodate denser plantings where as infertile or degraded soil plant density should be low.
- How large will the root system and plant shoots be at maturity.
- Is the crop susceptible to disease; Increasing the spacing to assure better air circulation can cut down on fungal pathogens(early and late blights).
- By increasing crop density in certain cut flowers, the bloom shaft length may be increased. Increasing spacing often results in greater numbers of shorter bloom shafts.
- Use available references and seed packaging to help determine best spacing.

Keep starts in shaded area until they enter the ground

When pulling apart individual soil blocks or removing starts from trays, carefully separate the intertwined root growth, causing as little trauma as possible, while still remaining efficient.

Do not expose tender root systems to direct sunlight (as little as 15 seconds of exposure can kill roots)

Depth Of Planting



Transplanting seedlings to the proper depth

Most crops should be planted to the cotyledons (immature leaf set). However, the Solanaceae family (tomatoes, peppers,eggplants) and Brassicaceae family (broccoli,cabbage,cauliflower, brussel sprouts, etc) are adventitious rooters and can be buried to the first true leaves (or deeper).

Take special care to insure the top of the soil block or cell being planted is covered with native field soil; this greatly reduces the natural drying out process during the beginning of the plants field life. After transplanting in dry soil water in the plants.

Transplanting Broccoli Video

Some farmers will apply a furrowed in line of organic fertilizer along or around new transplants ,referred to as side dressing. This should be done only if the quality of the soil requires that boost.

Always water in a new start.
This is the highest
preventative measure you
can take against shock

Bring the root zone of the crop to field capacity using drip irrigation.

Mulching

Mulching is an excellent alternative to weeding and it conserves water by requiring 1/10 of the regular use. Consider mulching your transplants with available organic materials (wood chips, grass clippings, clean straw, news paper) or compost. Organic mulching weed suppresses, conserves water and feeds important micro organisms in the soil. It does require large amounts of organic material and the initial application is time consuming.

Black plastic is a mulching alternative as well and is installed after the ground is prepared and before transplanting. Holes are punctured or burnt into the plastic and then transplants are planted. Black plastic mulch is used in larger farm operations and usually requires a partner irrigation system (usually drip). Black plastic mulch is a petroleum product and is not reusable after one season.

Documenting

Using the crop marker from the flat of seedlings add the transplant date (or transpose the information to a larger marker)and use as a end row/garden marker. Also record transplant dates in record log books.

Crop	Date and Amount Sown	Seed Co. & Seed Lot/Year	Comments on Germination & Seedling Growth	Prickout Date (if applicable)	Transplant Date (to Field)	1st and Last Harvest Dates	Yield Information	Other

Video on Record Keeping

Follow Up after Planting

- Set up irrigation system
- Return unused seedlings to propagation area. Refill the flats with starter mix and water thoroughly.
- Over the following week, monitor soil moisture in the root zone of transplants. Irrigate whenever the root zone reaches 50% of field capacity.
- Periodic, light overhead irrigation will raise the humidity around the seedlings, reduce the rate of evaporation and help minimize transplant shock.
- Observe transplant growth for changes in color, and damage due to predation.
- Replace lost seedlings with those stored from original planting.

Common Favorable Crops for Transplanting in the Mid-West

Cold Crops
Cabbages
Cauliflower
Brussel Sprouts
Broccoli
Onion

Warm Crops
Tomatoes
Peppers
Eggplant
Squash

Herbs
Basil
Rosemary
Thyme
Oregano
Parsley
Sage

Greens
Head Lettuce
Kales
Chards

Self-Evaluation Questions

1) List 3 environmental conditions favorable for successful transplanting of flat-grown seedlings?
2) What is the optimal range of soil moisture for transplanting seedlings?
3) Describe how the size, root nature, and vigor of transplants influence cultivation needs?
4) List 2 characteristics of seedlings at transplanting maturity?
5) List 2 necessary steps in preparing seedlings for transplanting?
6) What pieces of information are commonly documented in the propagation process?
7) What is the hardening off process?
8) List 2 characteristics of cell-tray grown seedlings at maturity?
9) List 2 necessary steps for preparing seedlings before transplanting them to the field or garden.
10) List the environmental conditions most favorable for successful bare root transplanting?
12) What should be considered when determining transplant spacing?
13) How deep should seedlings be transplanted?
14) What is the role of mulching in the transplanting process.
15) Describe the follow-up care for transplanted crops?

Resources

- *SARE*
- *New Organic Grower* by Elliot Coleman