The Main Package of Onion Production: Seeding to Harvesting

1. Introduction to Onion Cultivation

Onions are a globally significant crop, with cultivation dating back over 4,000 years. The production process, from seeding to harvesting, requires careful management of environmental and cultural factors. Onions are classified based on their response to day length, which dictates the appropriate growing region:

- **Short-day varieties:** Bulb with 10–13 hours of daylight (suitable for Southern regions).
- **Intermediate-day varieties:** Bulb with 13–14 hours of daylight (mid-temperate regions).
- **Long-day varieties:** Bulb with over 14 hours of daylight (Northern regions).

The entire production cycle, from planting to harvest, typically spans **5 to 7 months**.

2. Seeding and Transplanting

Onions can be grown from direct seeding or from transplants, with transplants being the more common method for certain high-value varieties like Vidalia onions.

Transplant Production

1. **Seed Sowing:** Begins in late summer (e.g., September). Seeds are sown in a prepared plant bed at a high density (60-70 seeds per linear foot) and a depth of $\frac{1}{4}$ to $\frac{1}{2}$ inch.
2. **Transplant Harvest:** Plants are ready in about **8 to 10 weeks** when they reach the diameter of a pencil.

3. **Field Setting:** Transplants are hand-set in the field, typically in November to January, on slightly raised beds.

Direct Seeding

- **Timing:** Sown later than transplant production (e.g., October 15) to prevent premature flowering (bolting).
- **Seedbed:** Must be free of clods and plant residue, with a smooth surface and proper moisture.
- **Spacing:** Sown at 4–6 inches in-row, with four rows on a raised bed spaced 12–14 inches apart.

3. Soil and Nutrient Management

Onions thrive in fertile, well-drained soils, ideally sandy loam or loamy sand, with a high organic matter content.

Factor	Recommendation	Rationale
Soil pH	**6.2 to 6.5**	Low pH can cause nutrient deficiencies (Calcium, Phosphorus) and reduce yield. Dolomitic lime is preferred to supply Calcium and Magnesium.
Nitrogen (N)	125–150 lb/acre (split applications)	Essential for growth, but excess N late in the season can delay maturity and cause double centers. Final application should be at least 4 weeks before harvest.
Phosphorus (P) & Potassium (K)	Based on soil test (e.g., 90-120 lb/acre for medium soil)	K is critical for water relations and cold tolerance. Both are applied in split applications due to leaching risk.
Sulfur (S)	40–60 lb/acre (split applications)	Critical for quality, but high S levels can increase pungency. Should not be applied after late January for sweet onions.
Micronutrients	Boron (1 lb/acre) and Zinc (5 lb/acre) if low	Apply only if soil test indicates deficiency, as excessive amounts can be toxic.

4. Cultural Practices and Irrigation

Bed Preparation and Spacing

- **Beds:** Slightly raised beds, approximately 4 ft wide, with 6 ft center-to-center spacing.
- **Plant Spacing:** 4.5 to 6 inches within the row.

Irrigation

Irrigation is essential for high yields and quality, especially for sweet onions, as it increases bulb size and reduces pungency.

Stage	Water Demand	Application
Establishment	Low	½ inch immediately after transplanting to settle roots.
Vegetative Growth	Low to Moderate	½ inch per application, applied when the top 6 inches of soil become dry.
Bulb Enlargement	**Peak** (up to 1.5–2.0 in./week)	0.6 to 1.0 inch per application, 2-3 times per week during dry, warm weather.

Monitoring: Soil moisture sensors (tensiometers) are recommended, with readings between 5 and 20 centibars being ideal.

Physiological Disorders

- **Splits/Doubles:** Caused by over-fertilization, uneven watering, and temperature fluctuations (below 20 °F).
- **Bolting (Seedstem Formation):** Occurs when cool temperatures in late season cause the plant to flower.
- **Freeze Injury:** Hard freezes can damage the bulb, leading to translucent scales or abnormal growth. Cultivating the field can help insulate the soil.

5. Pest and Disease Management

A comprehensive management system is required, involving rotation, sanitation, and chemical applications.

- **Rotation:** Critical to avoid a buildup of soil-borne diseases and pests. A 3-year rotation away from *Alliums* is recommended.
- **Fungal Diseases:** Common issues include **Pink Root** (*Phoma terrestris*), which causes pink-colored roots, and various leaf blights.
- **Insects:** Thrips are a major pest, causing silvery streaks on leaves.
- **Weeds:** Weed control is vital as onions are poor competitors. Pre-emergent and post-emergent herbicides are used, often applied with boom or air-assisted sprayers.

6. Harvesting, Curing, and Storage

Harvesting is the final critical stage that determines the quality and storage life of the bulb.

1. **Maturity:** Onions are ready for harvest when the tops begin to **"go down"** (break over at the neck). This typically occurs when 50% of the tops have fallen.
2. **Harvesting:** The bulbs are lifted from the soil, often mechanically, but care must be taken to minimize bruising.
3. **Curing:** This is a crucial process to dry the neck and outer scales, which seals the bulb and prevents the entry of decay organisms.
    - **Field Curing:** Bulbs are left in the field for **2 to 3 days** after lifting, or until the neck is dry and the outer scales rustle. They must be protected from sunscald and rain.
    - **Artificial Curing:** In humid conditions, onions are cured in specialized sheds with forced heated air (90–95°F) for 48 to 72 hours.
4. **Topping:** After curing, the tops are cut off, leaving a 1-inch neck.
5. **Storage:** Onions are stored in a cool, dry, and well-ventilated environment. Controlled Atmosphere (CA) storage (low oxygen, high CO_2) is used to extend the shelf life for months.

This document is a summary of best practices for onion production, compiled from agricultural extension resources.