# Fundamentals of Bareroot Seedling Nursery Management in Afghanistan

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## Purpose:

**Provide basic principles of seed processing and storage, seedling production, and handling for successful tree planting projects**

# Outline

1. Nursery Goals = Plantation Goals
2. Target Seedling Concept
3. Seed Sources/Collection
4. Seed Ripeness
5. Seed Processing
6. Seed Drying
7. Seed Storage
8. Labeling Seed
9. Repellents/Barriers
10. Seeding
11. Soil Management
12. Site Preparation and Field Cultivation
13. Seedbed Preparation
14. Seeding
15. Irrigation for Bareroot Seedlings
16. Seedling Harvest
17. Seedling Shipment
18. Seedling Planting
19. Post Planting Care

**Nursery Manager must know goals of Ministry officials:**

1. **Species**
2. **Quantity**
3. **Size/Age**
4. **Type (BR/CTR)**
5. **Planting site**
6. **Delivery date**

# "Target Seedling"

**(Grow the right sized tree for the right place for planting success)**

1. **Plant large saplings where is care can be given (urban).**
2. **Plant smaller seedlings where care is minimal (countryside).**
3. **Stem diameter and root development are more important than height for planting success.**
4. **"Shoot-root" best when top height = root length**

# Seed Sources/Collection

**(Mother trees will produce similar offspring)**

1. **Collect from several healthy (20) trees in an area**
2. **Maintain Seed Production Areas**
3. **Trees should be free of disease and insect damage**
4. **Nearly mature**
5. **Collect seed as soon as it is ripe**
6. **Collect from trees that will meet planting goals (fruit production, growth rate, drought-tolerance, form)**
7. **Collect fruits through all parts of tree (top, middle, bottom)**

**FIGURE 3.** Mature (top) and immature (bottom) interior spruce seeds

## Ripe Seed:

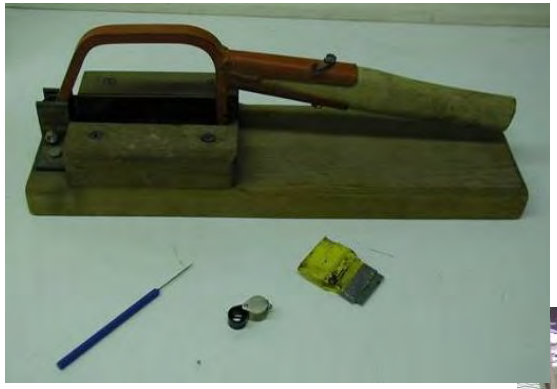
**Seed embryo fills the cavity**
**Seed storage tissue firm and white**
**Seed storage tissue like coconut meat**
**Seed coat firm, brown/black in color**
**Seed coat easy to separate**
**Seed coat brown in color**

## Unripe Seed:

**Undeveloped seed embryo**
**Seed storage tissue soft**
**Seed coat soft, light brown in color**
**Seed coat attached to embryo**

# Seed Processing: Dry Fruits (cones)

1. **Collect cones when seed is ripe, prior to cone opening**
2. **Make collection when cones are dry on the tree**
3. **Make sure cones are dry and cool during transport to nursery**
4. **If *Pinus halapensis* cones require heat to open, dip cones in hot water (55 C for 5 minutes)**
5. **Set out to dry in the sun on drying screens**



# Seed Processing:  Dry Fruits (cones)

**(Use only the best seed for production)**

1. **Once cones open, tumble to remove seed**
2. **Clean seeds by blowing or winnowing**
3. **Immerse seeds for short period of time in water**
4. **Throw out seeds that float**
5. **Drain water, re-dry seeds that sink on drying screens**
6. **Sun dry until dry, weigh and make ready for storage**

# Seed Processing:  Dry Fruits (Pods)

**(Use only the best seed for production; make sure seed remains during processing)**

1. **Make collection when pods are dry on the tree.**
2. **Make sure pods will remain dry during transport to nursery.**
3. **Allow pods to dry on trays in the sun.**
4. **When fully dry, place pods inside burlap sack.**
5. **Fill bag to ¼ full**
6. **Tie bag off at the top.**
7. **Lay bag over flat, clean concrete surface.**
8. **Breaking pods by beating sack, or walking over it**
9. **Run broken pods, seed over screen to separate seed from pod.**
10. **Separate fine trash from seed by winnowing.**
11. **Sun dry until dry, weigh and make ready for storage**

# Seed Processing:  Dry Fruits (Fraxinus)

**(Use only the best seed for production; make sure seed remains dry to prevent molding)**

1. **Make collection when seed is dry on the tree**
2. **Make sure seed will be dry and cool during transport**
3. **Set out to dry in the sun on drying screens**
4. **Sun dry until dry, weigh and make ready for storage**

# Seed Processing:  Fleshy Fruits (apricots)

**(Use only the best seed for production)**

1. **Begin cleaning soon to prevent fruit from fermenting (heat)**
2. **Immerse in water until fruit becomes soft (1-2 days)**
3. **Carefully scrape, crush, rub seeds with separate seed from fruit**
4. **Remove all floating seeds and fruit**
5. **Drain off water**
6. **Re-wash seeds that sink**
7. **Air-dry until seed is dry (1-2 days)**
8. **Re-clean seed by winnowing**

# Seed Drying

**(Seed not properly dried will germinate/deteriorate in storage)**

1. **Spread seed out in thin layer on screen**
2. **Stir and turn seed often during drying for uniform drying**
3. **Dry in shade during the heat of day.**
4. **Protect seed from rodents, birds during drying process**
5. **Drying may take 1-3 days depending upon how wet they are.**

# Seed Storage

**(Open storage will reduce viability by half within 8 months; viability remains high when seed moisture and temperatures are kept low)**

1. **Store only new, mature, healthy and well-dried seed**
2. **Keep them in dry and cool place to extend viability**
3. **Store in clean, air-tight containers (tin cans, glass, plastic)**
4. **Put moisture-absorbing material in container (dry charcoal, small pieces of newspaper)**
5. **Do “cut test” before storing**
6. **Protect seed from insects and fungi (mix with dry ash)**
7. **Protect seed from rodents during storage**
8. **Open seed container only when necessary**
9. **If seed is processed properly, there is no need to use fungicides**

# Labeling of Seed

1. **Label inside seed container**
2. **Label outside seed container**
3. **Written inventory maintained in Seed/Nursery Office**

## Seed Inventory
## Guzargah Nursery

| Identification Number | Afghan Name | Latin Name | Yr Collected | Source | Seeds / KG | Germ |
|---|---|---|---|---|---|---|
| 07001 | Najo | Pinus halepensis | 2007 | Kabul Uni | 25,000 | 80 |

| Date | Addition (KG) | Subtraction (KG) | Balance (KG) | Use |
|---|---|---|---|---|
| 13/9/2007 | 100 | | 100 | Cone Collection |
| 20/9/2007 | | 20 | 80 | Sow at Guzargah |
| 21/9/2007 | 5 | | 85 | Rtn from Guzargah |
| 1/10/2007 | | 25 | 60 | Sow at Paghman |

# Repellants/Barriers

**(Make seed unattractive or inaccessible to predators)**

1. **Determine extent of damage through estimation (randomly sample of sowing area).**
2. **Identify predator.**
3. **Erect physical barriers to separate predator from seed source**
4. **If not possible, treat seed w/ repellant specific to predator**
5. **Pepper repellant recipe:**
    - **4 liters water**
    - **30-60 milliliters finely ground hot pepper**
    - **30-60 milliliters liquid hot pepper sauce**
    - **30-60 milliliters school glue (glue that can be washed off with water)**

# Soil Management

**(Needed for plant growth and development)**

1. **Fertile (suitable for agricultural crop production)**
2. **Well-drained (no standing water, salt accumulations)**
3. **Relatively level fields**
4. **Close to a clean, available water source**
5. **Site not susceptible to early or late season frosts**
6. **Rest fields every year or two**

# Site Preparation and Field Cultivation

**(Soils must be well-cultivated for proper seed placement during sowing, for proper drainage, root development and weed control)**

**Primary (Prior to sowing to loosen soil and eliminate residue):**

1. **Break, loosen the soil to a depth > 30 cm**
2. **Remove vegetation**
3. **Done when soil is dry**

**Secondary (Prior to sowing to prepare seedbeds):**

1. **Break large soil blocks**
2. **Smooth, level soil surface for ease of sowing**
3. **Done when soil is dry**

**Tertiary (Cultivation during season):**

1. **Loose cultivation to a working depth of 3-5 cm**
2. **Aids in weed control**
3. **Breaks up soil surface to aid in irrigation infiltration**
4. **Breaks up soil surface to aid in root development**
5. **Soil can be moist**

# Seedbed Preparation

**(Experience will determine best seedbed preparation for the site)**

1. **Flood Irrigation**

- **Field to be cultivated to depth of >30 cm**
- **Field to be level**
- **Field to be smooth, free of vegetation, large blocks of soil**

2. **"Joya and Pushta" (Ditch and Mound)**

- **Field to be cultivated to depth > 30 cm**
- **Field to be level**
- **Field to be free of vegetation, large blocks of soil**

# Seeding

**(Seed requires combination of moisture and cool temperatures for germination)**

1. **Sow seed in the fall (November)**
2. **Stratify seed for spring sowing (Refer to Afghan Seed Maturation Table)**
   **-watersoak seed for 24 hours in clean water**
   **-drain water**
   **-place plastic bag and place in refrigerator (2-5 C)**
   **-keep cool for required period of time (30 days +)**
3. **Sowing depth 2 times diameter of seed**

# Irrigation for Bareroot Seedlings

**(For best seedling development)**

1. **Flood irrigation with clear, clean water**
2. **Measure moisture level at root zone before irrigating**
3. **Use “Feel and Appearance” test to determine need to irrigate**
4. **Avoid saturating soil (poor root development, salt build-up)**
5. **Roots need room to breath and grow**

# Seedling Harvest

**(Careful handling will increase planting success)**

1. **Harvest seedlings/saplings when dormant (early spring)**
2. **Minimum root length 30 cm**
3. **Soil should be moist before and during harvest**
4. **Protect roots from drying at all times**
5. **Cover roots with moist soil until wrapped**
6. **Wrap roots to protect from drying**
7. **Plants trees as soon as possible after harvest**

# Seedling Shipment

**(Careful handling will increase planting success)**

1. **Ship seedlings soon after harvest.**
2. **Keep plants protected from wind and sun during transport**
3. **Avoid storing petroleum products with seedlings**
4. **Keep roots moist during transport**
5. **If possible, avoid transporting during heat of the day**

# Seedling Planting

**(Careful handling will increase planting success)**

1. **Keep roots moist and protected at all times during planting.**
2. **Soils should be moist at planting time.**
3. **Dig hole immediately prior to planting, large enough (deep and wide) to fit the tree's roots.**
4. **Terraces may be necessary on steep slopes.**
5. **Make sure to remove the polybag completely**
6. **If the tree's roots are circling from the polybag, make 3-4 vertical cuts (1 cm deep) on the outside of the root mass.**
7. **Make sure tree's roots are vertical in planting hole.**
8. **Plant sapling at proper depth (root collar at soil surface)**
9. **Fill planting holes with moist soil.**
10. **Make sure there are not air pockets in planting hole.**
11. **Leave shallow depression in planting hole to hold water.**

# Post-Planting Care

**(Healthy trees will increase planting success**

1. **Provide thorough soakings of water during dry periods (monthly)**
2. **Restrict grazing in planted areas**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