Nursery Operations

Part 2

Principles of Effective Reforestation

2009
27b

What is effective reforestation
Examples of effective reforestation in Afghanistan
Steps for effective reforestation
Incentives for reforestation in Afghanistan

Much of this material was prepared by Clark D. Fleege, Nursery Manager, Lucky Peak Nursery USDA Forest Service, Boise, Idaho 2007, 2008 and 2009
Definition of “Effective Reforestation”

1. Sustainable (healthy, long-term viability)
2. Meets desired goals and objectives

Components of “Effective Reforestation”

First part: Planning (one-third)
Second part: Execution (one-third)
Third part: Monitoring (one-third)

Examples of Effective Reforestation in Afghanistan

“Planting the Right Trees in the Right Places”

1. Kabul Greenbelt plantings (Tapi-Marjan)
2. Cottonwood plantings in Logar
3. Pistashio plantings in Samangan
Steps For Effective Reforestation in Afghanistan

1. Clearly Stated Objective (Goal) of Planting

Why It’s Important:
   a. This becomes the “what”
   b. “Desired Future Condition” is identified
   c. “If you don't know where you are going, any road will get you there.”
   d. Must be attainable.
   e. Must be “ecologically compatible” (Douglas-fir for Kabul Greenbelt is very poor choice)

Examples:
   a. *Populus* pole production for houses
   b. Re-establish natural woodlands for fruit production
   c. Re-establish natural woodlands for wood production

Steps For Effective Reforestation in Afghanistan

2. Consultation/Community Involvement

Why It’s Important:
   a. This becomes the “who”
   b. Understanding of need of the project
   c. Increased participation (historical record, reduced destruction)
   d. Potential for improved project through collaboration
   e. Greater chance for longevity of project after project life

Examples:
   a. Meet with community leaders on project acceptance
   b. Meet with local farmers on local practices
   c. Identify local expert or “champion”
Steps For Effective Reforestation in Afghanistan

3. Establish Standards and Guidelines

Why It’s Important:
   a. This becomes the “how”
   b. These become the “roadmap”
   c. These become the details; must be specific
   d. The more complete the details, greater chance of success
   e. Identifies weakness to strengthen

Examples:
   a. What tree species to plant?
   b. Where is the source?
   c. Identifying the “target seedling” for the specific sites.
   d. What is the site preparation prior to plantings? How? Who?
   e. What is the post-planting care? How? Who?
   f. Where will the funding come from? For how many years?
   g. Provide training workshops to employees.
   h. Seek out and retain skilled advisors.

Examples of Standards and Guidelines (Tools)

Seed Storage for Future Projects

Seed Orchard for Seedling Production
Examples of Standards and Guidelines (Tools)

Technical Seed and Nursery Workshops

Example of Standard and Guidelines: Target Seedling Concept
“Planting the Right Size Trees in the Right Places”

Rural Planting Sites

Urban Planting Sites
Steps For Effective Reforestation in Afghanistan

4. Monitor the Process and Results

Why It’s Important?
   a. Did we reach our destination?
   b. Did we begin to accomplish our stated objective?
   c. Did we follow the established standard and guidelines?
   d. Does the community still support our joint project?
   e. Could we improve our results with a change standards/guidelines?
   f. Is this objective simply unobtainable; should it change?
   g. Monitoring should occur all long the process, not just at the end.
   h. It can cause the standards and guidelines to change during the process.

Examples:
   a. Seedling survival surveys every first, third, fifth years.
   b. Changes in technology from planning stage to implementation stage.
   c. Are there standards/guidelines that could be changed to get same or improved result?

Sapling Handling at the Nursery

1. Limiting factor in tree growth and development is moisture;
2. Limit root exposure to sun/winds to 30 seconds;
3. Remove trees from nursery soils when soils are moist;
4. Use moist soil for packing roots for temporary storage;
5. Minimum root length should be 25 cm;
6. Keep roots out of direct sunlight (prevents drying);
7. Once trees are harvested from nursery, move quickly to temporary storage;
8. Trees should be dormant (not actively active) when harvested.
9. Trees must have adequate root mass when harvested.
Transporting Saplings to Planting Site

1. Protect trees’ roots from drying (sun, wind) by covering;
2. Avoid damage to trees by rough handling;
3. Avoid contact of trees with petroleum;
4. Transport trees quickly to planting site;
5. Provide protection for seedlings at planting site.

Tree Planting

1. Harvest from nursery only enough trees for that day’s planting;
2. Have an adequate sized crew;
3. Have the tools and supervision available;
4. Crew should receiving training in tree handling and planting prior to planting;
5. There must be adequate soil moisture before planting;
6. Select planting sites well before planting day; match tree species and sizes to the sites.
Site Preparation

1. Dig holes immediately prior to planting;
2. Must have adequate soil moisture at planting;
3. Avoid digging holes days prior to planting;
4. Pre-dug holes could be dry (too dry);
5. Pre-dug holes could be full of water (too wet);
6. Dig hole just large enough for root system;
7. If necessary remove weeds from planting hole prior to planting.

Planting Depth

1. Trees must be planted at the “root collar“ (the same depth they grew in the nursery);
2. No roots must be exposed to sun and drying winds before planting;
3. Planting depth = that point where above-ground and below-ground meet;
4. Firmly pack loose soil around seedlings' roots (no air pockets);
5. Create shallow “bowl“ (2 cm depth) for water collection.
**Pruning After Planting**

1. Prune no more than 50% height of planted tree (2m height = 1m pruned);
2. Leaves produce food for tree;
3. Limited leaves = reduced food production for tree = greater chance of mortality.

**Example of poor pruning**

**Poor Root Systems Are Tree Killers**

1. Poorly developed root systems will restrict moisture uptake;
2. Fibrous roots are critical for moisture uptake;
3. Larger roots are critical for support;
4. Long roots absorb sub-surface soil moisture during dry periods;
5. Minimum root length for conifers 25 cm;
6. The larger the top of the conifer, the larger the root system needed;
7. Ideal conifer shoot/root ratio is 1/1.

**Tree Mortality Caused by Poor Root Development; Trees Planted with Too Small Root Ball**
Post-Planting Care: Irrigation

1. Helps eliminate air pockets after planting;
2. Keeps root zone moist;
3. Must be thorough watering;
4. Must be done every 2 weeks during first growing season.

Post-Planting Care: Protection

1. Protect saplings from human traffic;
2. Protect saplings from grazing;
3. Protect saplings from housing developments;
4. Protect tree with: fencing, guards, laws with penalties.
Establish Minimum Standards
Have planting plan before starting (“right tree in right place”)
Hole digging prior to planting (adequate soil moisture)
Limit root exposure time (dry roots are dead roots; 30 sec)
Proper planting depth (equal to “root collar”)  
Irrigation (moisture limiting factor in tree growth; every 14 days)
Pruning (leaves produce plant’s food; ½ height of tree)
Root length (anchor and “feeder”; minimum 25 cm)
Shoot height (right-sized tree to location)
Site selection (match kind of tree to location)

Provide Training Prior to Practice
You demonstrate and explain
They demonstrate and you explain
They demonstrate and explain

Have the Right Tools
Covered transport, shovels, tarps

Enforce the Standards

### Sapling Planting Summary: Quality Control

#### Soils

- **Common Bosoke**: Suitable for most conditions.
- **Common Donk**: Suitable for moist soils.
- **Common Shelf**: Suitable for dry soils.

#### Drought and Inundation

- **Drought Tolerant**: Good
- **Inundation Tolerant**: Good
- **Dry-Bottomed**: Not good
- **Wet-Bottomed**: Not good

#### Root and Minimum Soil Requirements

- **Critical Roots**: Minimum 5 cm
- **Stem Diameter**: Minimum 5 cm

#### Basic Conditions

- **Human Made**: Best
- **Lack of Irrigation**: Poor
- **Soil Phosphorus**: Medium
- **Manganese Intake**: Medium

#### Environmental Conditions

- **Evapotranspiration Band (°C)**: 30-40

### Plant Suitability Index for Afghanistan

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**Notes:**
- **P** Poor potential for tree growth and development
- **Y** Potential for tree growth and development

### Root Length

- **Anchor Root**: Minimum 25 cm
- **Feeder Root**: Minimum 25 cm

### Site Selection

- **Match Kind of Tree to Location**
Increasing Need for Wood Products

Remember: Afghanistan's Forests = Water
Why Plant? And Why Maintain?

Incentives needed to pay for the following:

1. The planting stock
2. The land to be planted
3. The labor to install the plants
4. The maintenance required to keep the plants alive
5. The protection of the reforestation

Without all 5 being addressed, a reforestation effort may fail
Type of incentives depend on the type or purpose of the planting

A 2008 and 2009 “Forestry Partners” meeting was held in Kabul. Discussion included this issue.

“The issue of what is an appropriate incentive relates to:

- Purpose of planting
- Location of reforestation effort
- Soil and water issues
- Source of planting stock and materials
- Legal protections
- Technical capabilities
- Funding capabilities
- Governmental capabilities
Many reasons for planting
The reasons behind planting are often linked to the incentives used to compensate people for the work

- Fruit
- Timber
- Firewood
- Soil Erosion
- Windbreak
- Riparian
- Beautification
- Biodiversity
- Picnic areas
- Wildlife
- Landslides and avalanche
- Education
- Non timber – medicines
- And more!

Reforestation in many different areas

- Home compounds
- Public Green Areas
- Marginal Lands
Many different types of incentives

- Direct Payments
- Food for work
- The job that they have
- Gifts of planting stock
- Half price planting stock
- Tools
- Intercropping plants
- Training and expertise
- Protection of their land
- Improvements to their environment
- Civic pride
- etc

Many variants of two themes

1. The payment is **immediate**

2. The payoff is **deferred**. It can be larger than 1 but it is over time

In general, the workgroup noted:

- Deferred incentives produce a better reforestation effort.
- Compensation over time results in the local population caring more for the plants.
- **BUT**, deferred incentives require creativity and can be difficult to effectively implement.
- Immediate compensation is easier to implement but requires continued funds to support maintenance and protection efforts.
All of these incentives can work well in some situations and poorly in other situations. Many specific lessons that have been learned in various reforestation efforts were discussed by the group.

- Direct Payments
- Food for work
- The job that they have
- Gifts of planting stock
- Half price planting stock
- Tools
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- etc

**Example:** Planting stock that is given away is not valued by the recipient and not maintained. Recipient should pay something (labor, trade, money) for planting stock so that they will maintain and protect the plantings.

**Example:** It is critical to be very selective in choosing the recipient of reforestation assistance where the incentive is over time. They need to be able to appreciate long deferred benefits for immediate work.

**Example:** Plantings that take a while to produce a benefit for the local population can be augmented with intercropping that produces a more immediate payoff for the people’s maintenance and protection efforts.

The key issue in selecting any incentive or incentive combination: Does the person doing the work to install and maintain the planting see a benefit over time?

If the people can not expect to be able to enjoyed deferred benefits, the incentive needs to be immediate.
The key is ownership

- Private Land or Private Control
  - Local people can benefit and control use of plantings
- Public Land
  - Unofficial benefit?
  - No legally recognized benefit for the local people

The 2008 and 2009 forestry workgroups had extensive discussion about how incentives and ownership of the resource are related

The question of who owns and controls the land affects many important aspects of reforestation

- Who pays for the plants
- Compensation for installation
- Maintenance
- Protection
- Village based management
Without addressing the immediate needs of the local people, there will be little that encourages them to take care of the plantings.

The incentives for installation, maintenance and protection need to be financial and legal.

When the locals have a stake in the planting effort, there are many more options for compensating for installation, maintenance and protection.

Combinations of free or reduced price planting stock, education, intercropping, harvesting materials have proven successful.

This sense of ownership stake can be legal title or an appreciation of their environment.
Examples of incentives that are useful when the land is privately owned or controlled

- Incentives for purchase of planting stock
- Incentives for maintenance
- Incentives for protection

Representative from Roots of Peace discussed using half price orchard stock, intercropping, tools, and donated wood lot stock as an incentive.

Examples of incentives that are useful when the land is publicly owned

- Incentives for purchase of planting stock
- Incentives for maintenance
- Incentives for protection

Representative from ACC discussed using cash payments as an incentive.
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(USRD)