Matching Trees to Planting Sites

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Objectives of Course

- Participants will understand the important concept of matching tree species to local planting sites.
- Participants will be able to use a soil reaction (pH) test to match trees to pH requirements.
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PH

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PH

Matching Trees to Planting Sites

It is very important to plant the right kind of trees on your local planting site. In order for the trees to be healthy and to grow well, they must have the proper kind of soil, slope, elevation, and soil moisture for which they are suited.

Matching Trees to Planting Sites

If you plant a tree on a kind of site where it would not grow naturally, then that tree might not survive. If it does survive, then it may not be healthy.

Matching Trees to Planting Sites

It is best to choose trees that are native not only to Afghanistan but are also native to your province and your planting site.

A tree that grows in the nursery from a seed collected in your province is the best kind of tree for you to plant. That means it will be suitable for your local growing conditions.

Matching Trees to Planting Sites

Some kinds of trees are considered by people to be native to Afghanistan but really are not. They have been used for a long time in the country, but they actually came from other countries. You should look about the area to see what trees are growing naturally there. These are the trees that will do well on your planting site.

Matching Trees to Planting Sites

The different kinds of trees tolerate different extremes of cold in the winter.

Matching Trees to Planting Sites

The trees that grow high in the mountains are able to tolerate lower temperatures for longer lengths of time than those that only grow in the low river valleys. For example, Ailanthus needs at least 150 frost-free days to grow well with minimum temperatures of -13 degrees F and Pinus nigra only needs 100 frost-free days and can live in temperatures down to -38 degrees F.

Matching Trees to Planting Sites

The different kinds of trees also tolerate different extremes soil moisture. Species like Pinus have a medium drought tolerance, and pistachio has a high drought tolerance.

Matching Trees to Planting Sites

The characteristics of the soil are also very important when choosing tree species to plant. One of the most important soil characteristics to look at when choosing a tree to plant is the pH of the soil.

Soil pH

Soils have different amounts of acid in them depending on the rock material from which the soil was formed, the amount of rainfall the soil is exposed to, depth of the soil, and the kind of vegetation that grows on the soil. The degree of the acidity or alkalinity of the soil is called soil reaction or pH (potential hydrogen ion, H+). Basically, the pH is a reflection of the natural fertility of a soil.

Soil pH

Soil pH is expressed on a scale from 0.0 to 14.0. A soil with a pH lower than 7.0 is considered to be an acid soil, and one higher than 7.0 is alkaline. A pH of 7.0 is neutral. A neutral pH is that of pure, clean water. The pH scale is a logarithmic scale where a soil with a pH of 6.0 has ten times as many hydrogen ions (H+) as a soil pH of 7.0, and a soil with a pH of 7.0 is 100 times more alkaline than a pH of 5.0 or 1000 times more alkaline than a pH of 4.0.

Soil pH

Descriptive terms commonly associated with pH are:

- **<4.5 = extremely acid**
- **4-5 to 5.0 = very strongly acid**
- **5.6 to 6.0 = moderately acid**
- **6.1 to 6.5 = slightly acid**
- **6.6 to 7.3 = neutral**
- **7.4 to 7.8 = slightly alkaline**
- **7.9 to 8.4 = moderately alkaline**
- **8.5 to 9.0 = strongly alkaline**

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Soil pH

Generally, soils which developed in dry climates like in Afghanistan are alkaline due to lack of soil moisture that would, over time, leach out available basic nutrients.

Soil pH

The pH of a soil influences the solubility of minerals or nutrients that trees must have to grow and be healthy. Before the tree can use a nutrient from the soil, the nutrient must be dissolved in the soil solution and available for uptake into the roots. Most minerals and nutrients are more soluble or available in acid soils than in neutral or slightly alkaline soils.

Soil pH

Common nutrient deficiencies associated with soil pH are:

- **Acid soils with a pH of <6.0 – calcium, magnesium, phosphorous, potassium, and molybdenum**
- **Acid soils with a pH of <4.0 – aluminum, manganese**
- **Alkaline soils with a pH of >7.0 – iron, manganese, zinc, copper, boron**

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Soil pH

The soil pH can also influence plant growth by its effect on activity of beneficial microorganisms. Bacteria, fungi, and soil microbes that decompose soil organic matter are hindered in strong acid soils. This prevents organic matter from breaking down, resulting in an accumulation of organic matter and the tie-up of nutrients, particularly nitrogen, that are held in the organic matter.

Soil pH

Tree species are adapted to thrive in different pH ranges of soils and are affected in different ways by soil pH. For example, Pinus nigra grows best in soils with a pH range of 5.5 to 7.5. Generally, Afghan conifers grow best in acid soils and hardwoods in alkaline soils.

Soil pH

Tree Species	Soil pH
Acer negundo	5.2-7.0
Ailanthus altissima	4.9-7.5
Cedrus deodora	6.0-7.5
Cercis griffithii	5.1-6.5
Cupressus arizonica	7.0-8.5
Pinus nigra	5.5-7.5
Populus nigra	5.1-7.0
Robinia pseudoacacia	4.8-7.5
Thuja orientalis	4.7-6.8
Ulmus pumila	5.5-8.0

Soil Salinity

If the soil pH is 8.6 or higher, then the soil has a high amount of salinity. Only trees that are tolerant of salinity should be planted on those soils.

Tree Species	Salinity Tolerance
Acer Negundo	Medium
Ailanthus Altissima	None
Cupressus arizonica	None
Pinus nigra	High
Populus nigra	Medium
Ulmus pumila	None

Soil pH test kit

How to Use the Soil pH Test Kit

1. Place a small amount of soil in the cavity of the test plate. The cavity should be about ¼ full.
2. Add 1 or 2 drops of the bottled solution to the soil. The soil should be wet but not a liquid.
3. Mix the solution and the soil thoroughly with the stick provided with the kit.

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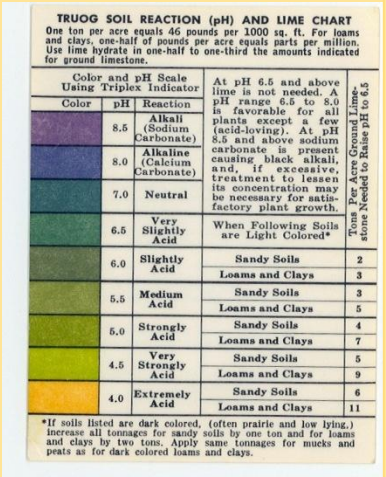
How to Use the Soil pH Test Kit

4. Move the soil to one side of the cavity to make a slope.
5. Cover the wet soil surface with a film of the powder from the kit. You can do this by holding the container about 2 inches above the soil and tapping the bottom of it with your fingers. Add just enough powder to cover the soil surface evenly and completely so that the color of the soil is hidden.

How to Use the Soil pH Test Kit

6. Wait 2 minutes and then compare the color of the powder with the standard color chart from the kit. Do this by sliding the color edge of the chart over the colored powder.
7. After making the closest match possible, read off the corresponding pH number to the right of the color blocks.



TRUOG SOIL REACTION (pH) AND LIME CHART

One ton per acre equals 46 pounds per 1000 sq. ft. For loams and clays, one-half of pounds per acre equals parts per million. Use lime hydrate in one-half to one-third the amounts indicated for ground limestone.

Color and pH Scale Using Triplex Indicator			At pH 6.5 and above lime is not needed. A pH range 6.5 to 8.0 is favorable for all plants except a few (acid-loving). At pH 8.5 and above sodium carbonate is present causing black alkali, and, if excessive, treatment to lessen its concentration may be necessary for satisfactory plant growth.	Tons Per Acre Ground Limestone Needed to Raise pH to 6.5
Color	pH	Reaction		
	8.5	Alkali (Sodium Carbonate)		
	8.0	Alkaline (Calcium Carbonate)		
	7.0	Neutral		
	6.5	Very Slightly Acid	When Following Soils are Light Colored*	
	6.0	Slightly Acid	Sandy Soils	2
			Loams and Clays	3
	5.5	Medium Acid	Sandy Soils	3
			Loams and Clays	5
	5.0	Strongly Acid	Sandy Soils	4
			Loams and Clays	7
	4.5	Very Strongly Acid	Sandy Soils	5
			Loams and Clays	9
	4.0	Extremely Acid	Sandy Soils	6
			Loams and Clays	11

*If soils listed are dark colored, (often prairie and low lying,) increase all tonnages for sandy soils by one ton and for loams and clays by two tons. Apply same tonnages for mucks and peats as for dark colored loams and clays.

Group Exercise

- Identify the kind of area from which you got the soil that you brought from your province:
  1. Slope and general elevation
  2. Soil Moisture
  3. Trees growing naturally there
- Use the soil test kit to determine the pH of the soil.

Group Exercise

- Compare answers among your group members.
- Select a spokesman to tell the entire audience about the differences found in the soils from your group.
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