Soil
FACTSHEET

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Soil Improvement Methods for the Home Garden

INTRODUCTION

Many home garden and lawn soils have undesirable structure and drainage that could be improved. Soils which have high clay, sand, or gravel have different problems associated with their management. Ideal garden soils would have a deep silty loam or sandy loam texture with high surface organic matter. Very often, this is not the case and many soils have become compacted during house and building construction. Soil amendments are often required.

ORGANIC MATTER

Adding organic matter to clay or sandy soils is beneficial for different reasons. Organic matter improves water penetration on clay soils and the ability to hold water and reduce the need for sprinkling on sandy soils.

Peat, manures, composts or even sawdust can be used. Manures, green vegetation and composted materials will provide nutrients, as well as organic material or bulk to the soil. Peat (sphagnum) and sawdust will decompose very slowly and must be compensated with fertilizer nutrients to avoid robbing nutrients from lawns or other plants. The best peat for mixing with soil or sand is a decomposed fibrous peat with a fine crumbly structure. Mixing with soil or sand should be done with a slightly moist peat material to avoid compaction of the peat. However, completely dry peat becomes hydrophobic and will not absorb water.

SAND

Sandy materials are often considered as an amendment for clay soils. It is thought that adding sand will improve the poor drainage of clays. It is difficult to mix sand into clay well enough to significantly alter the soil structure and drainage. Often the material sold as sandy loam has a high degree of very fine sand or silt, which will pack when walked on, or watered heavily, leading to ponding.

Coarse sandy materials should be either mixed with organic materials before being applied to either clay or sandy soils, or mixed on the soil surface before incorporating into the soil.

SOIL MODIFICATION PROCEDURES

1. Well Drained Sites

Rapidly drained soils need frequent watering and the water holding capacities of the soil need to be improved. The original soil should be graded to desired slope and shape before addition or incorporation of new soil materials. The new soil should have a high organic matter content and a loamy texture. If a good loam soil is not available, a mix of peat, sand and a small amount of clay (in a crumbly or finely broken down state) will do. Peat may be mixed at equal rates with the soil (50% soil to 50% peat) but clay should not exceed 10% on a volume basis.

At least 5 to 10 cm (2 to 4 inches) of material should be added and incorporated and graded, with another 10 to 15 cm (4 to 6 inches) added to the surface. This depth may create problems around buildings and the original soil may have to be graded to compensate for the depth of the new soil material.

Table 1 – CHARACTERISTICS OF FIVE COMMON TYPES OF PEAT AVAILABLE FOR TURFGRASS SOIL MODIFICATION

Type of Peat	State of Decomposition	pH	Water Absorbing Capacity, %	Volume Weight, lb/cu ft	Nitrogen, %	Desirability for Soil Modification
Peat humus	Advanced	5.0-7.5	150-500	20-40	2.0-3.5	Excellent
Reed-sedge peat, high pH	Intermediate	5.1-7.5	400-1200	10-18	2.0-3.5	Good
Reed-sedge peat, low pH	Intermediate	4.0-5.0	500-1200	10-15	1.5-3.0	Good
Hypnum moss peat	Least	5.0-7.0	1200-1800	5.0-1.0	2.0-3.5	Good
Sphagnum moss peat	Least	3.0-4.0	1500-3000	4.5-7.0	0.6-1.4	Poor

Source*: Turfgrass: Science and Culture by James B. Beard*

2. Poorly Drained Soils

Clay soils often have poor drainage and can be compacted more by walking or playing on it when wet. The key to improving the soil is to provide either surface or sub-surface drainage and avoid excessively wet periods.

Surface drainage can be achieved through gently grading the site or by shallow ditches.

Sub-surface drainage tiles can be laid on a grade and will provide excellent drainage. Drains may be laid 60 cm to 100 cm below the surface and backfilled with clean pea sized drainage gravel or wood shavings to within 30 cm of the surface. The spacing between tile trenches can be 5 meters (15 feet) or less.

Soils with high contents of very fine sand or silt may flow and clog drain tiles. New filtering sleeves on drain tile can stop the flow into the drain tile. Most soils, however, do not require filters.

Ponded areas can be drained through the use of stand pipes connected to a draintile system. Ultimately, the draintiles must be able to deliver their water to an outlet. An adequate, legal outlet must be established before installation can begin. A draintile system can be connected to a storm water system where it is available.

When there is no obvious outlet, then it may be possible to run draintiles into a “dry well” or as it is also known, a “soak pit”. A large hole should be dug 150 cm to 300 cm (5 to 10 feet) below ground level and either directly filled with coarse stone rubble, or a large steel drum (with a top) filled with rubble and pierced to allow water to drain out, can be placed in the hole. Drainage tiles are run to the pit and into, or alongside the drum. The hole is backfilled with loose soil material to within 45 cm (18 inches) and topped off with normal soil and seeded to grass or garden. Avoid placing tiles or soak pits near trees whose roots may interfere with drainage.

Once the drainage has been corrected, a 10 to 15 cm (4 to 6 inches) sand layer of 0.2 to 0.4 mm particle size should be applied over the original soil. This should be covered with a 5 cm (2 inch) layer of a 70% sand: 30% peat soil mix and seeded to grass for lawns. Higher amounts of peat can be added but will change the nature of water holding capacities. When peat is greater than 50%, the soil mix becomes very light weight and may be more suitable if incorporated into the original soil. Garden sites can be treated with peat or manures, or have soil mixes added as well.

Considerable amounts of amending materials are required to alter soil conditions. It is usually not effective to apply materials at a rate less than 25% of the soil volume to be amended. Clay soils or very sandy soils may require amending materials to be as high as 35-40% of the soil volume.

The amounts of materials required to amend soils are shown in **Table 2**.

Table 2 VOLUME OF AMENDMENTS (CUBIC YARDS PER 1000 SQUARE FEET) TO ADD TO INCORPORATE VARIOUS SOIL DEPTHS

% Amendment	Depth of Amended Soil (Soil and Amendments)			
	3 inch	4 inch	5 inch	6 inch
25	2.3	3.1	3.9	4.6
30	2.8	3.7	4.6	5.6
40	3.7	4.9	6.2	7.4
50	4.6	6.2	7.7	9.3

Source: *Western Fertilizer Handbook*

Table 3 provides a guide to estimate volumes of materials required to raise existing soil levels.

Table 3 VOLUME OF AMENDMENTS TO RAISE SOIL LEVELS

Depth of Material Above Original Soil Level	cubic yards/1000 sq. ft.	Volume of Amending Material cubic meters/100 m2
1 inch	3.0	2.5
2 inch	6.0	5.5
3 inch	9.25	8.0
4 inch	12.50	11.0
5 inch	15.50	14.0
6 inch	18.50	16.5

1 cubic yard = 0.765 cubic meters
1000 square feet = 92.9 square meters
1 cubic yard/1000 square feet = 0.8997 cubic meters/100 square meters

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