Grower 101

Calculating Costs Part I: Media

Learn how to calculate the costs associated with preparing media or purchasing a commercially prepared mix.

By Thomas Boyle

Soil amendments such as fertilizer, limestone and wetting agents must be calculated into the cost of the media.

Growing media represents approximately 5-10 percent of the cost of producing most potted crops and bedding plants. Growers often ignore the actual costs of mixing or purchasing growing media because it is a relatively small expenditure relative to other costs such as energy and labor. Some growers, however, have come to realize that several of their managerial and labor concerns are directly related to mixing and handling growing media. Therefore, it is important for growers to calculate the costs associated with preparing their own media or purchasing a commercially prepared mix.

Custom Mixes

Many commercial greenhouse operations choose to mix their own media. It enables growers to have control and flexibility: control over the selection of ingredients and the quality of the final product and the flexibility to prepare growing media tailored to specific crops.

Typically, growers use ingredients such as sphagnum peat moss, perlite, vermiculite, composted bark and coir for preparing media. Alternatively, growers may add 10-20 percent field soil to a soilless mix to alter the physical and nutritional properties of the medium and increase consumer satisfaction after sales.

Costs that should be considered when mixing growing media are ingredients; equipment for mixing, treating and handling media; and labor.

Cost Of Ingredients

Growing media costs are affected by the costs of ingredients and the amount (volume) of each ingredient added to the mix. Larger greenhouse operations can buy ingredients in truckload quantities and save considerably on costs, whereas small- to medium-sized operations usually pay higher prices for ingredients because of an inability to purchase and/or handle truckload-size quantities. The cost of ingredients can be determined quickly with the aid of a calculator.

Example 1: You have decided to prepare a growing medium composed of five parts peat moss, one part perlite and one part coarse vermiculite (by volume). The peat moss will cost $1.60 per cu.ft., the perlite will cost $2.60 per cu.ft. and the coarse vermiculite will cost $2.70 per cu.ft. How much will this growing medium cost per cubic foot?

1. List all the variables to find out what is known and unknown:
   - Five parts peat, one part perlite and one part coarse vermiculite (by volume).
   - Peat at $1.60 per cu.ft.; perlite at $2.60 per cu.ft.; coarse vermiculite at $2.70 per cu.ft.
   - Cost of growing medium is unknown.
2. Perform calculations:
   - *Total number parts = 5 parts peat + 1 part perlite + 1 part soil = 7*
   - $\text{Cost} = \frac{(\#\text{ parts} \times \text{cost}) + (\#\text{ parts} \times \text{cost}) + (\#\text{ parts} \times \text{cost})}{\text{total number parts}}$
   - $\text{Cost} = \frac{(5 \times \$1.60\text{ per cu.ft.}) + (1 \times \$2.60\text{ per cu.ft.}) + (1 \times \$2.70\text{ per cu.ft.})}{7\text{ parts total}}$
   - *($8.00 + $2.60 + $2.70) ÷ 7 = $13.30 ÷ 7 = $1.90 per cu.ft. for this mix*

Fertilizers, limestone and/or wetting agents are usually added during the mixing operation, and these incur extra costs. These amendments can easily be calculated into the cost of mixing growing media.

Example 2: You plan on adding Aqua-Gro 2000 G (The Scotts Company) wetting agent to your growing medium. It costs $168 per 44-lb. drum and is applied at 0.5-1 lb. per cu.yd. How much will this amendment cost per cubic foot?

1. List all the variables to find out what is known and unknown:
   - Aqua-Gro 2000 G is $168 per 44-lb. drum.
   - Recommended rate: 0.5-1 lb. per cu.yd. (= 0.3-0.6 oz. per cu.ft.).

   Cost of Aqua-Gro 2000 G per cu.ft. is unknown.
2. Perform calculations:
   - *$168 ÷ 44 lb. = $3.82 per lb.*
   - *0.5 lb. per cu.yd. x $3.82 lb. = $1.91 per cu.yd.;*
   - *1 lb. per cu.yd. x $3.82 per lb. = $3.82 per cu.yd.*
   - *1 cu.yd. = 27 cu.ft.;*

     Therefore, $1.91 cu.yd. ÷ 27 cu.ft. per cu.yd. = $.07 per cu.ft.;

     $3.82 per cu.yd. ÷ 27 cu.ft. per cu.yd. = $.14 per cu.ft.
   - *$.07-.14 per cu.ft. for Aqua-Gro 2000 G*

Cost Of Equipment

All ingredients must be mixed sufficiently so that a uniform product is obtained. Thorough mixing becomes essential when small quantities of ➧

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Soil Mixing and Pasteurizing Equipment	
Item	**Cost**
Basic Equipment	
Batch soil mixer (2 cu.yd. capacity) with 3-phase motor	$11,000
15 ft. incline conveyor with bale fluffer (for converting baled or compacted ingredients into ready-to-use materials)	$7,700
Installation (electrical, miscellaneous, etc.)	$2,500
Basic equipment costs	**$21,200**
Optional Equipment	
Steam generator	$4,925
Steamer cart (2 cu.yd. capacity) with cover	$7,260
Steam aerator	$4,325
Hoses (steam generator to aerator; aerator to steamer cart)	$700
Optional equipment costs	**$17,210**
Total	**$38,410**

Figure 1. A mixing operation suitable for a 1-acre or larger greenhouse operation may include these types of equipment but often does not include all the pieces.

ingredients (such as a wetting agent or micronutrients) are added to several cubic yards of growing medium. Failure to mix thoroughly may result in uneven plant growth. It is equally important to avoid overmixing, which could lead to reduced aeration and increased water-retention due to particle breakdown.

A mixing operation suitable for a 1-acre or larger greenhouse operation may include several different pieces of equipment (see Figure 1, above). Basic equipment might include a 2 cu.yd. batch mixer and an incline conveyor with a bale fluffer. Assuming a depreciation period of 10 years, the annual cost for this equipment (plus installation) is $2,120. Typical annual usage for a 1- to 1½-acre operation would involve mixing about 70 batches of growing media (equivalent to 3,780 cu.ft.). Equipment costs (on a per cubic foot basis) would thus be $2,120 ÷ 3,780 cu.ft. or $.56 per cu.ft. Equipment costs per cubic foot would decrease if more than 70 batches of growing media were prepared annually. Other costs to consider that are not included here are interest costs if a loan is taken to purchase the equipment and the cost of parts and labor required to keep the equipment working properly.

If field soil or sand will be included in the growing medium, then these components should be steam pasteurized to eliminate disease-causing fungi, nematodes and weed seeds. A steam generator, steamer cart, steam aerator and hoses would be needed for aerated pasteurization (140-160° F) of ingredients, and these pieces of equipment would cost about $17,000 (see Figure 1, above). If steam is used for heating greenhouses, there would be no need to purchase a steam generator, and equipment costs would be less.

Fuel is required for generating steam for pasteurization. If steam boilers are available, fuel costs for pasteurization can be estimated at about $.11 per cu.ft. assuming a cost of $2.20 per gal. for No. 2 fuel oil. With a steam generator, about 4½ gal. of No. 2 fuel oil are required to pasteurize 1 cu.yd. (54 cu.ft.) of medium. The fuel cost would be about $.37 per cu.ft.

Equipment represents a major cost of preparing growing media. The costs listed in Figure 1, above, are for new equipment (freight costs included). Equipment costs could be reduced by purchasing used equipment or demonstration models. Another way to substantially reduce equipment costs would be to use ingredients that do not require pasteurization, e.g., sphagnum peat, composted bark, vermiculite and perlite. Avoiding media pasteurization would reduce equipment costs, eliminate fuel costs for pasteurization, and save time and labor in media preparation.

Cost Of Labor

Labor is another major cost of mixing growing media. Mechanized operations can mix 1 cu.yd. of growing medium more thoroughly and in considerably less time than unmechanized operations. Assuming the equipment listed above is available, the two main tasks in preparing the medium are adding the ingredients to the mixer in their proper proportions and monitoring the mixing, wetting and pasteurization procedures.

Example 3: Assume that an average wage of $8.50 per hour is paid to laborers for transporting, preparing and mixing the ingredients, and 54 cu.ft. of medium can be prepared in 45 minutes (or 0.75 hour) by two persons using a 2 cu.yd. batch mixer and an incline conveyor with a bale fluffer. What are the labor costs per cubic foot associated with preparing this growing medium? ➧

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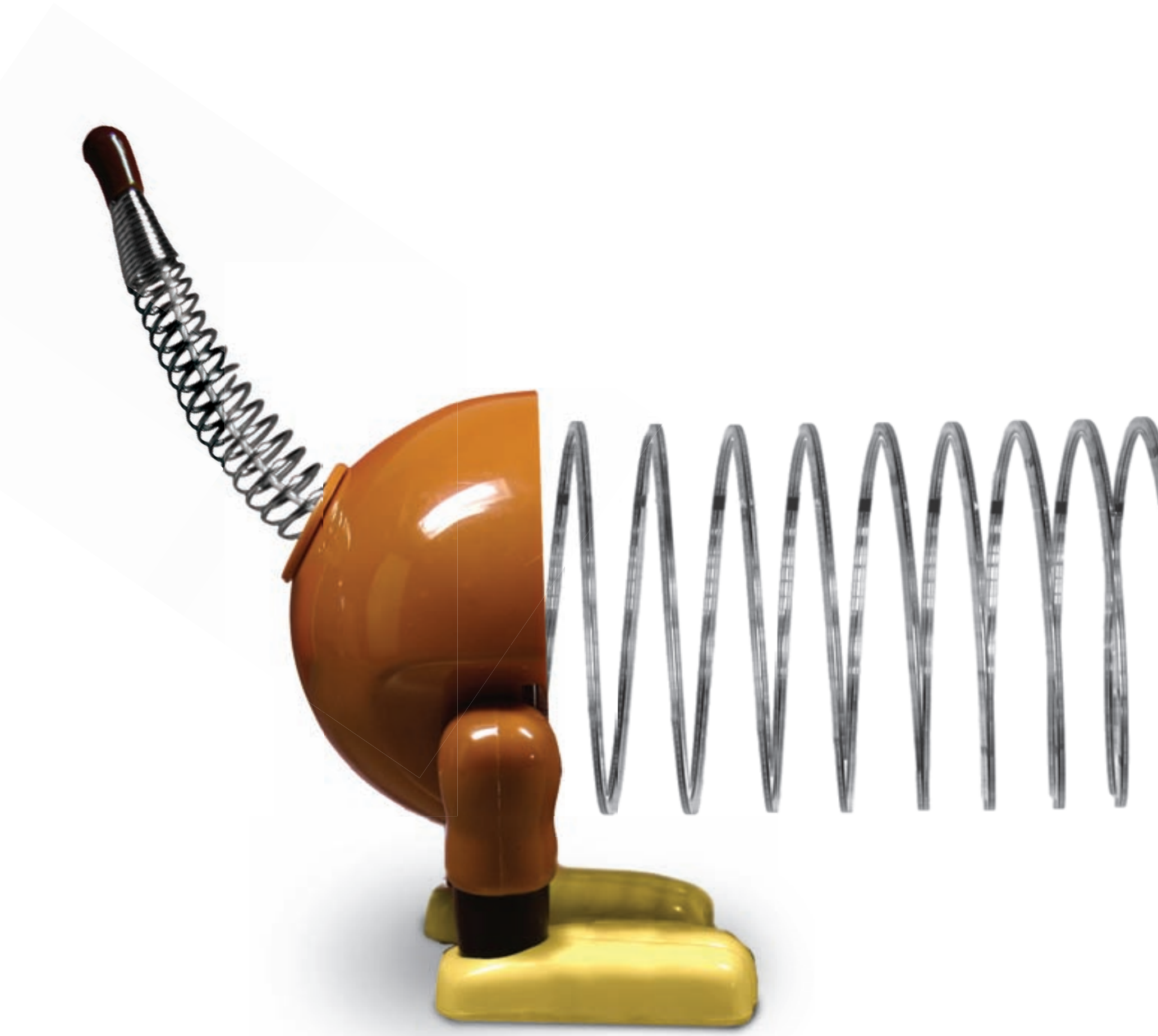

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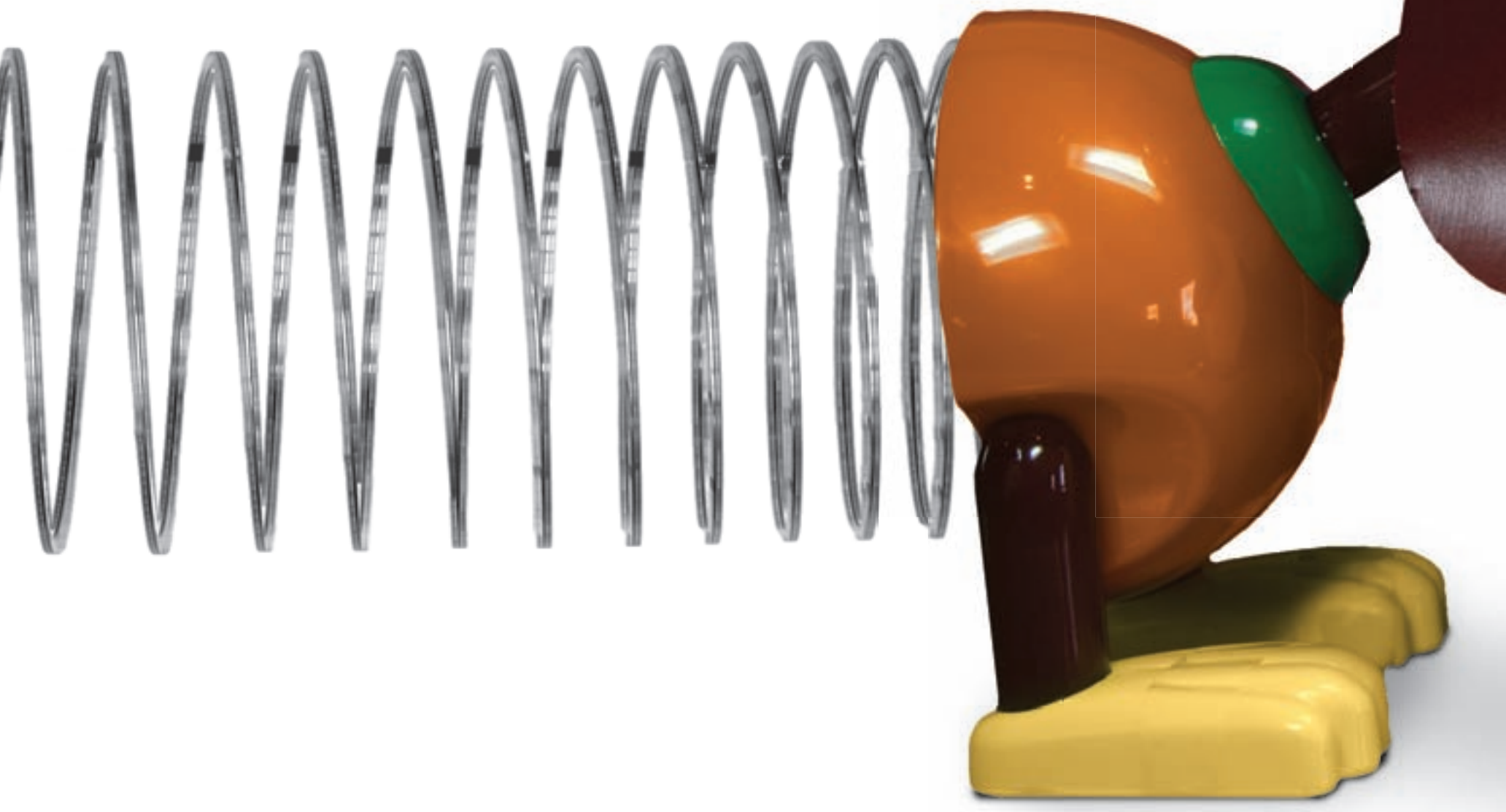

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Labor costs = $\frac{\text{(number persons x hourly wage x number hours)}}{\text{number cubic feet mixed}}$
Labor costs = (2 persons x $8.50 per hour x 0.75 hour) ÷ 54 cu.ft.
Labor costs = $12.75 ÷ 54 cu.ft. = 0.236
Labor costs = $.24 per cu.ft. of medium

Example 4: Assume laborers receive an average wage of $8.50 per hour for preparing ingredients and mixing growing media and 40 cu.ft. of media can be prepared in 1½ hours by two persons using a 0.5 cu.yd. batch mixer. What is the labor cost associated with preparing this growing medium?

Labor costs = $\frac{\text{(number persons x hourly wage x number hours)}}{\text{number cubic feet mixed}}$
Labor costs = (2 persons x $8.50 per hour x 1½ hours) ÷ 40 cu.ft.
Labor costs = $25.50 ÷ 40 cu.ft. = 0.638
Labor costs = $.64 per cu.ft. of medium

If the grower is also the manager, then a cost for supervising the mixing operation should also be included.

Custom Mix Summary

A reliable cost estimate of a growing medium can be calculated once the costs of ingredients, equipment, fuel and labor have been determined. Assume that a grower prepared a soilless mix with a per-cubic-foot cost of $2.10 for ingredients, $.60 for equipment, and $.50 for labor and supervision, then the total cost of this medium would be $3.20 per cu.ft. Thus, it would cost about $.31 to fill a 288 square plug tray with this growing medium (see Figure 2, below). Note that this figure does not include several other costs such as electricity, equipment repair and testing the medium for pH, soluble salts and wettability. These costs should be included to obtain a more accurate cost estimate.

Commercial Mixes

Many greenhouse operations choose to purchase bags or bales of commercial growing mixes. There are several reasons why growers choose to purchase a commercial mix rather than prepare their own growing medium: 1) commercial mixes meet growers' expectations with regard to product quality, uniformity, bulk density (weight per unit volume) and price; 2) more time for management and labor to focus on production issues; and 3) less capital invested in equipment required for media preparation and handling. These are important considerations for many greenhouse operations and especially for smaller ones.

The cost of using a commercial mix is easy to calculate with a hand calculator. For example, 48 2.8-cu.ft. loose-fill bags of Grow Mix 3-B (Fafard) can be purchased from a greenhouse supply company for $10 per bag or $3.57 per cu.ft. Thus, it would cost about $.08 to fill a 4½-inch azalea pot with this medium (see Figure 2, below).

Calculating Volume

How many cubic feet of medium are required to produce a crop? Growers need to answer this question to ensure that sufficient media is available for transplanting. Calculations of this type require conversion tables that provide information on the number of containers that can be filled with 1 cu.ft. of

Cost of Growing Medium to Fill One Container

Cost of growing medium (per cubic foot)	2½-inch square pot	4½-inch azalea pot	288 square plug tray	806 cell packs in a 1020 tray
$2.60	$.012	$.059	$.236	$.433
$2.80	$.013	$.064	$.255	$.467
$3.00	$.013	$.068	$.273	$.500
$3.20	$.014	$.073	$.291	$.533
$3.40	$.015	$.077	$.309	$.567
$3.60	$.016	$.082	$.327	$.600
$3.80	$.017	$.086	$.345	$.633
$4.00	$.018	$.091	$.364	$.667
$4.20	$.019	$.095	$.382	$.700
$4.40	$.020	$.100	$.400	$.733

Figure 2. This table is used to convert growing medium costs on a per-cubic-foot basis to an individual container basis.

growing medium. Conversion tables can be obtained from media or greenhouse supply companies. Two examples of volume calculations are provided below:

Example 5: The crop is 3,000 4-inch and 2,000 6-inch geraniums. The growing medium will be two parts peat moss, one part perlite and one part field soil (by volume). How much peat moss, perlite and field soil (in cubic feet) will be needed for this geranium crop?

1. List all the variables to find out what is known and unknown:
   - 3,000 4-inch and 2,000 6-inch pots.
   - The growing medium is 2 peat moss; 1 perlite; 1 field soil.
   - Total # parts = 2 parts peat + 1 part perlite + 1 part soil = 4.
   - The growing medium is 0.50 peat moss; 0.25 perlite; 0.25 field soil.
2. A conversion table supplies the following information:
   - 1 cu.ft. of growing medium will fill 56 4-inch pots.
   - 1 cu.ft. of growing medium will fill 16 6-inch pots.
3. Perform calculations:
   - *3,000 pots ÷ 56 pots per cu.ft. = 53.6 cu.ft. of medium*
   - *2,000 pots ÷ 16 pots per cu.ft. = 125 cu.ft. of medium*
   - *53.6 + 125 = 178.6 = 179 cu.ft. of medium for the entire crop*
   - *179 cu.ft x 0.5 peat moss = 89.5 = 90 cu.ft. of peat moss*
   - *179 cu.ft. x 0.25 perlite = 44.8 = 45 cu.ft. of perlite*
   - *179 cu.ft. x 0.25 field soil = 44.8 = 45 cu.ft. of field soil*

Example 6: A 24x96-ft. greenhouse will accommodate 1,060 1020 trays with 806 inserts if the trays are placed solid on the floor. The medium is a commercial mix that is sold in 3.8 cu.ft. compressed bales; each bale yields 7.5 cu.ft. of medium when fluffed up. How many bales will be needed for this crop?

1. List all the variables to find out what is known and unknown:
   - 1,060 bedding plant (1020) trays with 806 inserts.
   - Each bale yields 7.5 cu.ft. of medium.
2. A conversion table provides the following information:
   - 1 cu.ft. of growing medium will fill six 1020 trays with 806 inserts.
3. Perform calculations:
   - *1,060 flats ÷ 6 trays per cu.ft. = 176.6 = 177 cu.ft. of medium*
   - *177 cu.ft. ÷ 7.5 cu.ft. per bale = 23.6 = 24 bales* GPN

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