No Dig Bed Materials

No-Dig Beds, Lasagna Beds, Compost Beds.... whatever you call it, this method is excellent for creating a quick, thick garden bed of humus-laden, water retaining, nutrient-rich, organic soil for your vegetables. Use this method to amend current beds (and destroy the weeds that are taking them over), fill new garden boxes, or experiment with inviting rainwater into your landscape. The steps are easy enough, and there is a plethora of resources, including this great 2 page article compiled by Bob Jones. Basically, rather than trying to amend the dirt you already have on your property and adjusting for all the deficiencies abundantly inherent in our high plains desert (which takes years), you are starting with a bed made up only of the good stuff. You make this "good stuff" soil by composting it right where you want your bed to be out of materials from the neighborhood. However, since you're eating out of this compost pile, you want to be selective about the materials you put in.

Example: Absolutely no Manure.... not fresh manure (whether it's cow, chicken, or horse... no!) or "aged" manure. It's fine to put manure in your well-managed, 2-year rotation hot compost pile, but not in your 4 weeks to planting pile. Instead, use finished compost! Finished dairy compost (even organic) and finished sheep compost are both locally available (find them on our gardener resource map) at local landscape supply yards. Also try finished YOUR OWN compost, or see if a neighbor wants to share! Finished compost actually has more available, not to mention environmentally friendlier, nitrogen than manure, meaning you don't need as much, so why risk the manure thing? And manure, but not necessarily compost, is high in salts. Boooo. Might as well plant directly in the ground.

Example: Try to reduce introducing weed seeds. Use weed-seed free straw, not hay. Use finished compost (manure also will have weed seeds that finished compost will not). Judge for yourself if your yard waste from last year should be hot composted to kill weed seeds and plant disease.

Example: Avoid pesticide and herbicide-laden plant material. Ask your tree company if whatever they are injecting could potentially remain in the leaves... cause there is likely an option that won't. Don't use herbicides. Period. (actually, corn gluten is kind of cool...) Listen to what your landscape is telling you. If you're growing weeds, there is something else going on.... but I digress. Compost piles can effectively and quickly break down many agri-pharm products, but not this compost pile. So don't add

'em.

Example: The cardboard layer IS the weedmat layer. It really works. Seriously. Beneficially. Don't put down weedmat too.

So as you can see, this no dig garden bed is a compost pile, but not just any compost pile. We reccommend you ALSO build a regular compost pile. Check out the following to find out what you can add to your No-Dig Bed....

Optional Materials for Your No-Dig Bed

BROWN (CARBON)	C:N RATIO	GREEN (NITROGEN)	C:N RATIO
Cardboard	500:1	Grass Clippings	15:1
Newspaper	55:1	Finished Compost	10:1
Telephone Books	775:1	Coffee Grounds	15:1
Office Paper	130:1	Vegetable Waste	10:1
Leaves (Dried)	45:1	Fresh Oak Leaves	25:1
Leaves (Fresh)	35:1	Hay	20:1
Pine Needles	75:1		
Straw	55:1		
Sawdust	440:1		
Wood chips	550:1		

The C:N Ratio, Kind Of Explained

The C:N Ratio is the amount of Carbon (brown) to Nitrogen (green) a material contains, based on dry weight. You may notice in the chart above that all materials contain more Carbon than Nitrogen. Welcome to Earth. Scientists agree that the ideal Carbon to Nitrogen ratio is around 30:1. More Carbon than this (say, 45:1) and all the Nitrogen is caught up breaking down your Carbon and isn't available to your plants. This is a brown material. Less Carbon than this (say, 15:1) and the pile becomes stinky with escaping Ammonia (NH_3) and anaerobic bacteria because it doesn't have enough Carbon and Oxygen to invite and support the happy, plant-friendly nitrifying bacteria that convert the stinky, water and air - polluting Ammonia(NH_3) into Nitrates(NO_3) that stay in place for plants

to eat up. This is a green material. This Nitrogen Cycle is super cool and you can read a good explanation of it here .

With either too much Carbon or too much Nitrogen, other plant nutrients won't be available either, so starting off with a good 30:1 ratio is innumerably important. However, this is easier said than done. There are all kinds of reasons why an exact calculation of your no-dig bed's C:N ratio is realistically impossible. First off, the math (although logical) is pretty hard for most of us. If you're a stickler for numbers, I would stop reading this article and go to the Cornell website for a sweet equation. If you really don't feel like opening up to the world of numbers at all today, I recommend going to the Compost Calculators at either the Klickitat County Website or at Florida's Virtual Pile. In both cases I caution that any 1 material's C:N ratio is highly variable based on it's pre-death life, so it's a good idea to get used to accepting "guesstimates" in your equations. This isn't rocket science or agri-business. For math you can figure in your head as you build your bed, read on....

How to Calculate the Amount of Materials you Require

There are two ways I guesstimate to reach the amount of materials I require for building a bed. That way I can cross check myself and hopefully convince myself I am not completely messing up. The first method uses the C:N ratio. (Remember, the C:N ratio applies to the *dry weight*, not the mass or space the material takes up... yards or ft^3 are measurements of mass, not weight). All over the Internet you can find C:N ratios for any material you might be thinking of adding (except for your high school math teacher....). You have to start out with an agreed on weight, any weight you can lift, to be considered 1 "part". When you add together the C:N ratios of all the "parts" of the materials you are adding and divide by the total number of "parts" you are adding, you want that number to be as close to 30 as is possible without driving you crazy. For instance.....

[(X number of parts x C:N of material A) + (Y number of parts x C:N of material B)] 🕑 (X + Y) = 30

Example 1) You want to use dried leaves and coffee grounds to build your bed. You're comfortable lifting 10 pounds at a time (and biking it back from

the coffee shop). So 10 pounds equals 1 "part". Dried leaves have a C:N of 45:1 and coffee grounds have a C:N of 15:1.

- [(1 part x 15/1) + (1 part x 45/1)] 🕑 (1+1) = 30
- [(15) + (45)] 🕑 2 = 30
- 60 🕑 2 = 30
- 30 = 30

So 1 part dried leaves plus 1 part coffee grounds equals a C:N of 30:1
This means you need 10 pounds of coffee grounds to balance 10 pounds of dried leaves

Example 2) How does this equation work when you don't know how much you need? Lets say you have 10 pounds of finished compost (C:N of 10:1... check the table at the beginning of this article for more C:N's of note) from your neighbors. How many pounds of leaves do you need to rake up to finish you bed? 10 pounds will again equal 1 part. But if your neighbor only gave you 5 pounds, 5 pounds would equal 1 part.

- [(1 part of compost x 10) + (X parts of leaves x 45)] 🕑 (1 + X) = 30
- [(10) + (45X)] 🕑 ~~(1 + X)~~ x ~~(1 + X)~~ = 30 x (1 + X)
- - ~~10 + 10~~ + 45X = 30 + 30X - 10
- 45X - 30X = 20 + ~~30X~~ - ~~30X~~
- (15 X) 🕑 15 = 20 🕑 15
- X parts of leaves = 1.3 parts x 10 pounds per part = 13 pounds of leaves

So 10 pounds of of compost require 13 pounds of leaves to build your bed.

Example #3) What if you want to use more than 2 ingredients in you bed? You can add to this equation indefinitely. You may want to mix it up abit... say you already have 50 pounds of dry leaves (say around 5 trash bags of 'em) and 10 pounds of coffee grounds you can pick up. You want to figure out how much finished compost you have to buy to make a good bed. First determine your common weight that defines a "part". You have 50 pounds of 1 thing and 10 pounds of another. Since 10 divides easily in to 50, lets make 10 pounds our common weight. So you already have 5 parts of leaves (50 lbs 🕑 10 lbs = 5) and 1 part of Coffee (10 lbs 🕑 10 lbs = 1)
Leaves have a C:N of 45:1, Coffee has a C:N of 15:1, and finished compost has a C:N of 10:1

- [(5 parts x 45) + (1 part x 15) + (X parts x 10)] 🕑 (5 parts + 1 part+ X parts) = 30

- (225 + 15+10X) 🕑 (6 + X) = 30
- ~~(6 + X)~~ x [(240 + 10X) 🕑 ~~(6 + X)~~] = 30 x (6 + X)
- 240 + 10X = 30 x 6 + 30 x X
- 240 + 10X = 180 + 30X
- 240 + ~~10X~~ - ~~10X~~ = 180 + 30X - ~~10X~~
- 240 - ~~180~~ = ~~180~~ + 20X - ~~180~~
- (60) 🕑 ~~20~~ = (~~20~~X) 🕑 ~~20~~
- 3 parts = X parts

So you still need to add 30 pounds (3 parts x 10 pounds each part = 30 pounds) of compost to get your bed going.

From this example we can derive that 50 pounds of leaves, 10 pounds of coffee grounds, and 30 pounds of compost would make a balanced bed. But how big of a bed can I make from those ingredients? That is dependant on your materials. 1 yard of materials is equal to 3' long x 3' wide x 3' deep (27 ft^3) of material... or 9' long x 3' wide by 1' deep (also 27 ft^3) of material, or my favorite... 4.5' long x 3' long x 2' deep (also 27 ft^3, or 1 yard of material)

But how many pounds of dried leaves can you cram into a yard? Apparently the variable poundage of 100 - 300 pounds. Also, although the C:N of a material is indicative of the available nitrogen, it is not really exact due to the amount of oxygen the material is able to access. So don't get caught up in the numbers..... Thus, enter my second method of guesstimation...

The second method uses the highly unscientific ratio of 3-5 masses of brown (depending on how compacted) to 1 mass of green. By mass, I mean the visual bulk of the material. Like 3-5 yards of leaves (light and fluffy) to 1 yard of composted dairy manure (pretty dense). Since the C:N ratio is based on *dry weight* (the weight of the material if you spun it really fast and warmed it until all the water was gone) you either have to sample each material you use for moisture content and then subtract that moisture content percentage from the weight of the material you can jam into a 3' x 3' x 3' box (which you measured on the truck scale you keep handy) to figure out exactly how much of the material's weight per yard is applicable to the C:N ratio which is then messed up because it rains next Thursday, ... or you can wing it using the first rough calculation and this rough visual method. Since most greens have more moisture in them ('cause they were more recently alive, or in the case of compost, are still alive) they will be heavier and more compacted than long-gone browns. And for the materials

we use in no-dig beds, we have found that visually this looks like 5 masses brown to 1 mass green.

In our "Example #3" above, we found out an example of a balanced bed has 50 pounds of dried leaves, 10 pounds of coffee grounds, and 30 pounds of compost. This sounds like alot of compost until you see it visually. Remember we said 50 pounds of leaves looked like 5 big trash bags (or 1 trash bag can be about 10 pounds). Well, 10 pounds of coffee grounds looks like a bucket that is maybe 1/4 the size of 1 of those bags of leaves. (All of these maybes and abouts are due to that moisture content thing... wetter ingredients weigh more. So try to compare ingredients that have equal moisture levels... your coffee grounds may have to sit out for a day to feel as wet as the leaves you bagged last fall.... or just wing it) 10 pounds of compost may also look like 1/4 of 1 of those trash bags. Thus, 10 pounds of coffee grounds and 30 pounds of finished compost (our greens) look like 1/5 of the amount of 50 pounds of leaves.

10 lbs leaves	+	10 lbs leaves	+	10 lbs leaves	+	10 lbs leaves	+	10 lbs leaves	+	10 lbs coffee grounds + 30 lbs compost

If you can't estimate it, guesstimate it! For some scientific verification, check out the Cornell On-Farm Composting Handbook where some of their guesstimated weights per yard are on display. 1 yard (27 ft^3) of dried leaves (C:N of approx. 45:1) weighs anywhere from 100 to 300 pounds per yard. 1 yard of "compacted" grass clippings (left sitting in the bag from last year???) (C:N of 17:1) weighs anywhere from 500 - 800 pounds per yard. thus, it is feasible that 5 yards (or bags, or whatever) of dried leaves need 1-ish yards (or bags, or buckets) of compacted grass clippings to balance out the bed. Furthermore, if you had 100 pounds (1 part and in this case only, 1 yard) of dry leaves with a C:N of 45:1, you would need approximately 100 pounds (1 part and in this case 1/5 of a yard) of compacted grass clippings to balance your bed.

Materials for No - Dig Beds and Workshops

So for No-Dig workshops, Home Grown Food is committed to making sure you have access to all the materials you need. Check out our HGF Garden Resource Map for a listing of local landscape supply businesses and low - no cost garden building supply locations, as well as our HGF Gardener Map for a listing of gardeners near you (who may either be interested in sharing supplies and/or attending your workshop!) Also consider utilizing some of the great community-mobilized Internet programs for gleaning no-dig bed materials. You can post for free for materials requests such as sawdust or spent straw on Craig's List , post for leaves on the Leaf Exchange graciously set up by the city, or ask questions and trade plants on the Plant Exchange Yahoo Group (thanks Totalbeard!) or the Garden Traders Yahoo Group , and of course the Home Grown Food Google Group .
If you need some help with obtaining materials, please let us know! Your facilitator will be able to make sure you have the materials you need! The sooner we know, the sooner we can figure it out.

Here are some basic recipes for a 200 ft^3 bed. Only have half that space? Halve all ingredients? Want to build it 3' deep instead of 2' deep? Make it shorter or increase you ingredients by half! Not sure? Ask your facilitator! We stay up late on Saturday nights thinking about this stuff.

Example Recipe # 1

Bed size: 10' long by 10' wide by 2' deep
= 200 ft^3/27 ft^3 = 7.4 yds of material

Material	Material Sub-Category	Special Instructions	C:N	Yards of Material	Potential dimensions/ weight
Cardboard	corrugated	tape removed	400:1	2/5 or .4 yds	10' x 10' x 2"
Leaves	Dry	Dry and Fluffy	45:1	5.25 yds	525 lbs
Dairy or Sheep Compost	Finished	Not Manure! Should look	10:1	1.75 yds	??

		and smell like dirt.			
Worm Compost (Click on the link and look for the worm icon to find where to get it!)		Just 1 gallon or so... to seed your bed with worms and beneficials	N/A		
Water		Lots of it to start. It is neccessary to adhesive the layers together in unified break-down potential	N/A		LOTS (your hose will be running for 1/2 the workshop)

Example recipe #2

Bed size: 10' long by 10' wide by 2' deep
= 200 ft^3/27 ft^3 = 7.4 yds of material

Material	Material Sub-Category	Special Instructions	C:N	Yards of Material	Potential dimensions/ weight
Newspaper		No shiny portions	55:1	1.4 yds	10' x 10' x 5" / 200 lbs per yd
Leaves	Dry	Loose	35:1	3.25 yds	325 lbs

Straw		Weed seed free does not mean seed free...	55:1	1 yd	3 - ish bales
Home Compost	i.e. coffee grounds, veggie scraps	doesn't have to be finished, as long as there is no meat or dairy	15:1	1.75 yds	??? 1 yd = 3' x 3' x 3'
Worm Compost		Just 1 gallon or so... to seed your bed with worms and beneficials	N/A		
Water		The Magic Ingredient... to start. The bed is very water-retention friendly once it gets going			Lots

Not sure it will work? Check it out of the Compost Calculator!
If you get a number between 20:1 to 35:1 you're probably okay. This calculator was developed where moisture is plentiful, so their "Available" Carbon and Nitrogen calculations are bound to be different from ours... It's better to err on the side of Nitrogen Deficiency (so a number above 30:1 rather than below is preferred). It is easier to add more nitrogen to kickstart a failing no-dig bed (in the form of worm compost tea, blood meal, or kelp fertilizer) than to re-mix in leaves and straw for additional carbon.

Bed Maintenance

Expect to continue to add to this bed every year. Some stuff will break down, plants will eat up the nutrients (horaay), and treated city water will slowly raise the pH and add salts to your bed. New stuff can be added to keep the 30:1 ratio goal alive (as well as the beneficials) and keep the bed oxygen rich. Some weeding will be necessary. But you will be amazed at how easy it is to pull 'em.

-composed by Lauren Dittmann of Northern Colorado Gardenscapes.
First weekend of spring, 2009

Let us know what you think of this article. Additions? 3 pages of subtractions? We appreciate your input! Contact us at contact@homegrownfoodcolorado.org

Spaces still available to host or participate in an upcoming workshop!