

RECIPE SCALING FROM STOVE TOP TO KETTLE

By Brian Norder

Most food entrepreneurs start their food businesses with recipes developed or refined in their home kitchens. Often these recipes are formatted in units such as teaspoons, tablespoons, cups, pinches or dashes. While traditional, these units do not lend themselves for effective recipe scaling and must be converted into commercial format by the producer.

The standard of measurement for food formulas is weight. For the home cook, the idea of pounds of water (or kilograms of water if using metric) may sound foreign but several steps in starting of expanding a food business require formulas or recipes written by weight. Ingredient statements on labels need to list the ingredients in descending order by weight, food scientists performing a process review analyze the formulas in terms of percentage by weight and FDA and state filings for scheduled process require this unit of measurement also.

The most important piece of equipment for re-scaling a recipe is a quality digital scale, which can be used at shared-use kitchens or pilot plants available for public use. Alternatively, one can be purchased for between \$100 and \$200 for light to medium duty units. The scale should have a minimum capacity of four pounds, work in either English or metric units and have a readability in a maximum of one gram increments.

We need to address the issue of using English measurement versus metric. Only a very rudimentary understanding of metrics is needed to work in that format and as you proceed, the benefits become obvious. Lets assume that you use small amounts of several spices in your home recipe, say half-teaspoons. A half-teaspoon of pepper will likely be too light to move a scale from 0 to 1 ounce while it could register a few grams in metric format. Accuracy as the recipe is expanded will be greater using the smaller metric units. The math involved in multiplying the recipe will be easier also with metric.

The first step in scaling-up your recipe is to prepare it in the size and method you currently do with the added step of weighing and documenting all ingredients. If your recipe calls for a half-cup of water, you will weigh the empty half-cup measure, reset the scale to zero and weigh it again with the water in it. Repeat this for all ingredients, prepare the batch and make sure it tastes the way you want it to.

This is the stage where possible product variations should be explored to maximize efficiency when making large batches. Can dehydrated garlic or onions replace fresh without compromising taste to a noticeable degree? How well will Individually Quick Frozen (IQF) fruits work in the old family jam recipe as opposed to fresh picked? Is a hot pepper mash or puree preferable to stemming and chopping fresh peppers for the salsa recipe? Allow friends and family to be the judge in blind taste tests so that they can give an objective opinion.

After determining the final form of raw ingredients to be used, re-write the recipe with ingredients listed in descending order by weight. Add the total weights to obtain a batch weight then divide the weight of each ingredient by the total to calculate the percentage of

each individual item. The following example from “Small Scale Food Entrepreneurship: A Technical Guide for Food Ventures,” page 45 illustrates the process.

PRODUCT
Measured pH = 3.60

DATE

COMPANY NAME
John Doe
Main St.
Anywhere, NY 10000
Phone/ Fax

Critical Factors¹
 (Must keep records)
Maximum pH = 4.0
Fill Temp = 190°F
Vacuum = visual check

INGREDIENTS²	WEIGHT³ (lbs.)	% BY WEIGHT⁴
Ketchup	9.00	53.99%
Lime Juice	2.13	12.78%
Vinegar (5% Acidity) ⁵	2.09	12.54%
Peanuts, ground	2.00	12.00%
Dark Brown Sugar	0.59	3.54%
Scallion, fresh	0.33	1.98%
Garlic, fresh, sliced	0.25	1.50%
Chili Powder	0.19	1.14%
Parsley, dried	0.09	0.54%
TOTALS	16.67	100.00%

PROCEDURE: ⁶

- Blend ingredients.
- Cook sauce to desired consistency.
- Check pH to be sure it is 4.0 or below.
- Fill into clean, 16oz. glass containers at 190°F or higher, seal and invert.
- Label: "**Refrigerate After Opening.**"
- Check pH after equilibration or before shipping to be sure it is 4.0 or below.

The next step in the process is the production of a test batch to determine how well the recipe responds to being multiplied. The size of the scaled-up test batch can be driven by a number of variables including the size of “normal” production and equipment capacity. While this number may be 30, 50, 90 gallons or more, it is advisable to start with a much smaller test batch of perhaps 10 gallons. This could translate out to a weight of 80 to 100 pounds depending on the weight of the ingredients

Batching is accomplished by using the “percentage by weight” calculation from the example above. If the intended batch size is 85 pounds, then for calculation purposes, multiply the percentage of the total of each ingredient by 85 pounds. For example:

- Ketchup $85\# \times 53.99\% = 45.8\#$
- Lime juice $85\# \times 12.78\% = 11.03\#$
- Vinegar (5% acidity) $85\# \times 12.54\% = 10.66\#$
- And so forth.

A batch of this size allows you to test your scaling with enough volume to provide a valid sample while not placing an entire kettle of product at risk. It also can highlight potential problems with equipment or processes that were not apparent on the stovetop. Some ingredients such as spices, hot peppers, ginger, garlic and other savory components may not behave in a linear fashion when multiplied.

You should start with less than the full amount of these type foods; say 50-75% of that called for in the scaling math to see if that amount provides the desired flavor. If not, you can always continue to add until you obtain the right flavor. (Once they are in there, you can't take them out!)

Carefully document all changes and revise the weights and percentages accordingly. Once you are satisfied that this scale-up is the product you want, the product is ready to be sent to a process authority for testing and formula review. The process authority will test the product for appropriate control factors - pH, water activity, moisture, and then make scheduled process recommendations. If the product is determined to be a low-acid or acidified food, then that scheduled process needs to be filed with the US Food and Drug Administration (FDA.) Other products may have specific filing requirements as determined by state or local jurisdictions, (see chapter 7, Food Processing Laws.)

Under most circumstances the recipe is now ready to be fully scaled-up to the final commercial batch size needed. Even then, there may be some unexpected results. The time it takes to fill a larger batch may result in excessive evaporation and may need compensation by adding liquid, spicing may need further adjusting or the longer cook time needed for larger batches may affect the behavior of certain ingredients such as pectin for preserves.

In all likelihood, you will make several changes to your initial procedures as you continue to grow and areas of improvement become apparent. Any changes to the approved formula for low acid and acidified foods must be, by law, approved by the process authority and review of deviations for all food formulas is recommended.