



Product Formulation and Calculating Organic Content

Determining your product's percentage of organic ingredients is a prerequisite to identifying which label claim it may bear, and this percentage is derived directly from the product's formulation. This article outlines the process of constructing a formulation suitable for certifier review: distinguishing agricultural ingredients from processing aids, identifying the organic content of each ingredient, and performing the calculation in accordance with regulatory requirements—excluding water and salt, excluding processing aids, and rounding the final organic percentage down.



What You'll Learn

- The difference between ingredients and processing aids in your formulation
- What a product formulation must contain
- How to evaluate the organic content of each ingredient
- How to calculate your product's organic percentage step by step
- The challenges and tools involved in calculating
- How a certifier will review your formulation

Product formulation is where organic certification meets your recipe. A formulation is the precise, ingredient-by-ingredient record of everything in a product, including processing aids, along with the amount of each. From that record, one figure emerges: your organic percentage. That percentage places your product into a composition category, and the category determines what you may claim on the label.^{1,2} Get the formulation and the underlying math right and the rest follows. This article builds on the composition categories described in [Product Composition - 100% Organic, Organic, and Made with Organic](#), and on the difference between an ingredient and a processing aid from [Allowed Ingredients and Processing Aids in Organic Products](#). It does not cover livestock feed, which follows different rules that are outlined in [Livestock Feed Composition and Product Formulation](#).



Get your product development team off to a good start with these actions:

- ☐ **Identify why you are developing organic products, and use that reason to set your intended organic percentage and labeling claim.** Knowing your target up front, and what is and is not allowed in that category, saves a lot of time and reformulating later.
- ☐ **Watch out for an ingredient-substitution mindset.** If you are converting a conventional product, swapping one input at a time for its organic version can lead you astray. Study organic formulations for similar products as part of your research instead. See [Product Composition - 100% Organic, Organic, and Made with Organic](#) for what each labeling claim allows.
- ☐ **Build relationships with current and potential suppliers early.** You will need ingredient documentation from them, and you will need to keep it current. A supplier who is not responsive may not be a good fit.
- ☐ **Develop collaborative habits with your certifier and learn their timing needs.** Ask about response times when you are certifier shopping, and keep communication flowing so your team is not the holdup on a tight timeline. When a review stalls, your certifier may be waiting on your supplier, another certifier, or you. For choosing and working with suppliers, see [Building and Maintaining a Supplier Approval Program](#), and for verifying materials, [Verifying Compliant Ingredients and Processing Aids](#).
- ☐ **Be ready for how much information your certifier will request.** This includes ingredient documentation, your full formulation, and proposed label, if available, so they can compare ingredients against your claim.
- ☐ **Start with realistic expectations.** First-time formulation and certification take time and effort, and there is a learning curve. Give your team room and do not try to rush the certification timeframe.

DEVELOPING YOUR FORMULATION

Your formulation needs to be a precise, repeatable recipe. Your certifier will ask you to write it on a product formulation form, and they will want a separate one, sometimes called a product profile, for each distinct product you certify. You will use it to calculate the organic percentage of each product, which helps determine the labeling category you qualify for, and it also links the specific formulation to any label and brand names.

You will also need to describe your process in enough detail that your certifier can follow it from formulation to finished product, including any processing aids that may be used along the way. A process flow chart or written description is requested as part of your Organic System Plan, and your certifier needs these details to understand and approve your formulation.³

INGREDIENTS, PROCESSING AIDS, AND OTHER TERMS

Whether a material is an ingredient or a processing aid is the single most important judgment for this calculation, because ingredients count toward your organic percentage and processing aids do not. You'll find the full definitions and an explanation of the nuances in [Allowed Ingredients and Processing Aids in Organic Products](#), but here they are in brief: An **ingredient** is a substance added during processing that remains in the final product, like the wheat in bread, and it appears on the retail ingredient list.⁴ A **processing aid** is a substance used during processing that does not remain in the final product, or remains only in trace amounts with no functional effect, like the release oil sprayed on a baking pan.⁵

Let's look at some examples of processing aids:

- **Enzymes** are proteins that speed up a reaction during processing, such as breaking down starches in brewing or distilling. When they finish their work and have no functional effect in the finished product, they are treated as processing aids and are generally not listed on the label.
- **Filtration aids** are materials used to clarify or filter a liquid and are then removed, so they do not remain in the finished product. Diatomaceous earth, perlite, and activated charcoal are common examples, all on the National List for filtration use.⁶
- **Defoaming agents (or defoamers)** are substances added to prevent or reduce foam during processing. They have no functional effect in the finished product and leave minimal residue. Silicon dioxide is a common example on the National List.⁶
- **Carbon dioxide** can be either a processing aid or an ingredient depending on how it is used. A packaging flush is an aid while carbonation is an ingredient, one of the grey areas covered in [Allowed Ingredients and Processing Aids in Organic Products](#).

The grey area matters. You may need to explain to your certifier how you use a material, how it contributes to the finished product, and why you consider it a processing aid rather than an ingredient. Only ingredients count toward your organic percentage, and processing aids are shown as zero percent. One practical wrinkle worth knowing is that certifiers vary in how they treat a processing aid that remains in the finished product, and many still ask you to list processing aids on the product profile even though they do not count toward the percentage. Follow your certifier's form and ask when a material could go either way.

DOCUMENTING THE CALCULATIONS

The quantities and organic content of every ingredient go on the product formulation form, which can also be called a product profile or a similarly named document your certifier provides, and you use that to calculate your product's organic percentage. It is best to use your certifier's own form, which is usually a self-calculating spreadsheet, because it does the math the way they want it done. A paper form works too if you prefer.

Your certifier may also ask you to list processing aids on the product profile, since they affect which labeling claim you qualify for and still have to be reviewed and approved. They will not enter the organic percentage calculation, but they should also appear in your process flow chart and on any master list of ingredients and processing aids your certifier keeps.

THE RULES OF THE CALCULATION

A handful of rules govern the math, and they come straight from the USDA organic regulations:¹

- Every ingredient is included in the formulation, each with its own organic content.
- Weight or fluid volume can be used. If both solid and liquid ingredients are included, calculate using weight.
- The calculation uses the amounts at formulation, in your recipe, not the amounts in the finished product. If you dehydrate cranberries, you use the fresh weight and any other ingredients like sugar as measured at formulation. You do not account for the water loss during drying.
- Water and salt added at formulation are excluded from the calculation. They are nonagricultural and cannot be organic. Salt still has to be verified free of prohibited additives.
- Processing aids are excluded from the calculation.
- The final organic percentage is always rounded down to the nearest whole number.

DETERMINE THE ORGANIC CONTENT OF EACH INGREDIENT

The heart of the calculation is that each ingredient has its own organic content, and you have to use the right figure for each one. Each ingredient contributes a percentage, and you find that percentage from its organic certificate and any supporting documentation.

Reading Organic Content from a Certificate

The certification scope shapes what you can assume.

- Crop and livestock scopes cover raw agricultural commodities from farms. Certificates for these scopes may not list a labeling category like “100% Organic” or “Organic,” and the raw agricultural products on them are generally treated as having 100 percent organic content.
- Handling and processing certificates should list labeling claims. An ingredient listed as “100% Organic” is treated as having 100 percent organic content. An ingredient listed as “Organic” is generally treated as 95 percent organic content, its minimum, unless you obtain documentation supporting a higher figure. An ingredient listed as “Made with Organic” is treated as 70 percent.
- A nonorganic ingredient counts as 0 percent, whether it is a nonorganic agricultural product or a nonagricultural material on the National List.^{6,7}

Certifiers do vary here, so confirm how yours treats a given ingredient. Any documentation supporting a figure above the assumed organic percentage would generally come from that ingredient’s own certifier.

Multi-Ingredient Ingredients

A multi-ingredient ingredient, like a spice blend, enters the calculation as a single line at the organic content shown on its certificate. You do not calculate its sub-ingredients separately. You will still submit a spec sheet or ingredient statement for it, which your certifier uses to check your finished product label ingredient listing.

Imported and International Certificates

International certificates do not use the USDA product composition categories. The European Union, for example, recognizes neither “100% Organic” nor “Made with Organic” labeling categories and sets a 95 percent organic minimum,^{8,9} so your certifier will generally assume 95 percent organic content for an EU organic ingredient, and EU certifiers may be puzzled if asked for a more specific figure.

“Made with Organic” Ingredients

“Made with Organic” products can be made with ingredients and processing aids that are not allowed in “Organic” products. A “Made with Organic” ingredient used in a product aiming for an “Organic” labeling claim has to be checked for nonorganic agricultural materials that are not on the National List.^{6,7} Your certifier reviews documentation for all ingredients, which is described in more detail in [Verifying Compliant Ingredients and Processing Aids](#).



HANDLER TIP

When 95 Percent Is Not Enough

Because an ingredient that is certified as “Organic” is assumed to be 95 percent organic, a product built from those ingredients plus even a small amount of a nonorganic ingredient can calculate below 95 percent and lose the organic claim. Say you make baked goods from organic flour that is certified to the organic category, which your certifier assumes is 95 percent organic, plus a couple of nonorganic materials like sodium bicarbonate and tocopherols. Your final calculation can land under 95 percent, so the product cannot qualify for the “Organic” claim. If you can get documentation from the flour’s certifier showing it is actually higher than 95 percent, that can lift your result back over the line. Maple syrup, which may be made with a tiny amount of defoamer, and malted grains for brewing are other cases where the true organic content is often higher than 95 percent when they are certified to the “Organic” category.

RUNNING THE CALCULATION, STEP BY STEP

Step 1. Separate Ingredients from Processing Aids

Go through your formulation and mark each material as an ingredient or a processing aid. If your certifier asks you to list processing aids on the product profile, enter them at 0 percent content. When a material could be either, consult your certifier before you decide.

Step 2. List Each Ingredient With Its Organic Content

Write down every ingredient and its organic content, taken from its certificate and any supporting documentation, using the assumptions above. Remember that a multi-ingredient ingredient is entered as one line at its certified organic content, not broken into its sub-ingredients.

Step 3. Choose Weight or Volume

Decide whether you are measuring by weight or by fluid volume, and standardize so every entry uses the same kind of unit.¹ Use weight for solids, such as a trail mix. Use fluid volume for liquids, such as lemonade. Use weight when a product mixes solids and liquids, such as granola with oats, nuts, honey, and maple syrup. If a liquid ingredient is identified on the label as reconstituted from concentrate, base the calculation on single-strength concentrations of all ingredients.¹

Step 4. Measure Everything at Formulation

Measure the amount of each ingredient at formulation, in your recipe, using your standardized units, not the amount in the finished product.¹ Water and salt added at formulation still need to be measured, because you will subtract their amounts as you do the math.

Step 5. Subtract Water and Salt

Set aside the water and salt. Your certifier's form usually has a place to record how much of each is in the formulation, and they are removed from the organic percentage calculation.

Step 6. Do the Math

There are a couple of different ways to approach doing the calculation. Your certifier likely has a self-calculating spreadsheet that will walk you through the math, or you can do it on paper if you prefer. Here we will reference calculating with weight, but you could substitute volume if appropriate.

Let's walk through a sample calculation starting with the weight of each ingredient.

- For each ingredient, multiply its weight by its organic content percentage to get its organic weight. A 95 percent organic ingredient weighing 250 grams contributes 237.5 grams of organic weight. ($0.95 \times 250 = 237.5$)
- Add up the organic weights of all ingredients, and separately add up the total weight of all ingredients, leaving out water and salt.
- Divide the total organic weight by the total ingredient weight, multiply by 100, and round the result down to the nearest whole number.

If you use your certifier's self-calculating spreadsheet, it does this for you once you enter each ingredient's weight or the percentage of that ingredient in the formulation and percent of organic content. Do not overwrite the built-in formulas.



DEFINITION

A **concentrate** is an ingredient from which water has been removed, like a juice concentrate, and single-strength is the strength it would have at normal dilution. The FDA defines single-strength for juices by the fruit's natural soluble solids content, measured in degrees Brix, and the specific requirements vary by product.¹⁰

TOTAL **ORGANIC** WEIGHT OR VOLUME OF INGREDIENTS*

TOTAL WEIGHT OR VOLUME OF **ALL** INGREDIENTS*

**excluding water and salt*

Let's look at a sample calculation using a production formulation form from the Organic Integrity Learning Center.¹¹ In this calculation, an organic spice blend contains a multi-ingredient ingredient that has a nonorganic sub-ingredient. When the autocalculating spreadsheet renders the total percent organic content as 99.95%, the value must be rounded down to the nearest whole number, bringing it to 99% organic. This places the spice blend in the "Organic" product composition category, which requires at least 95% organic ingredients. It falls short of "100% Organic" by less than 1%.

Ingredients (excluding water and salt)	(A) Weight of Ingredient at Formulation (in grams)	(B) Percent Organic Content in Ingredient	(A ÷ C) Percent of Ingredient in Formulation (excluding water and salt)	(A x B) ÷ (C) Actual Organic Percent of Ingredient in Product
Organic Cumin	20g	100.00%	20.41%	20.41%
Organic Paprika	10g	100.00%	10.20%	10.20%
Organic Tennessee Harvester Peppers	30g	100.00%	30.61%	30.61%
Organic Spooky Peppers	30g	100.00%	30.61%	30.61%
Organic Fire Spice Blend (organic blazing peppers, tricalcium phosphate)	5g	99.00%	5.10%	5.05%
Organic Chili	3g	100.00%	3.06%	3.06%
(C) Total Weight of Ingredients (excluding water and salt)	98g		Total % Organic Content in Product at Formulation (excluding water and salt)	99.95%

! WATCH OUT

The rounding is always **down**. Once you have compiled the formulation and done the math, a product that calculates to 94.9% is 94% organic, not 95%, so it misses the "Organic" claim and cannot bear the USDA seal. If you land just under, you may want to reformulate or consider the "Made with Organic" claim instead.

PRECISION IN THE FORMULATION

Many handlers work with ingredients that have seasonal variation, and following the exact same recipe every time is not always possible. Some processors use ingredient ranges instead of fixed amounts because it gives them flexibility. Talk it through with your certifier. Whether they will accept a range depends on the product and whether the variation would change your labeling category or the order of ingredients on your label.

Two Examples of Ingredient Variation

Example one: You make pickled peppers from farm produce. You do not use the same pepper varieties each time, and you adjust the amounts of herbs and seasonings slightly from batch to batch. The organic percentage stays comfortably above your claim and the ingredient order does not change.

Example two: You produce fruit salad bowls and the amounts of different fruits can vary seasonally. Every component is organic so the variation doesn't change your labeling category and the changes don't impact your label's ingredient list.

Organically Grown Company does just this. As Mike Dill, Director of Advocacy and Sustainability, noted, "We actually put a range of the percentage for every ingredient.... Depending on the season, it could be 10 to 40 percent.... At the end of the day, what really matters is that the batch records actually show what you used."

In cases like these, where the change does not affect your final organic percentage enough to alter your claim, the ingredients listed on your label, or the order of predominance, your certifier may accept ranges for some ingredients. Your processing records would still have to show the exact amounts used in each batch. But if the changes are large enough to produce a significantly different product, shift your labeling category, change your ingredient listing or reorder your ingredients, your certifier will require separate product formulation forms for each variation.

How Ranges Are Handled

Where ranges are allowed, a few practices are typical. You list the range in your formulation rather than a single amount. Your certifier calculates your organic percentage using the low end of each organic ingredient's range, the conservative case, and confirms the range cannot push you below your claim or reorder your ingredient list. And your batch records must show the exact amounts you actually used.



HANDLER TIP

When you set your formulation, keep your intended claim and your label in mind. Your ingredient statement must list ingredients in descending order of predominance,¹² so a range wide enough to reorder that list can be a problem even when it does not change your organic percentage.

Tools for Calculating

Your main tool is your certifier's form, usually a self-calculating spreadsheet where you enter each ingredient's weight (or fluid volume) or the percentage of that ingredient in the formulation and percent of organic content and it returns the organic percentage that ingredient contributes to the overall formulation. It is far easier than working by hand, and again, do not erase the built-in formulas. The National Organic Program hosts some [sample forms on their website](#), including a Handler Product Formulation Form if you want to look at a form that isn't certifier specific.¹³



CERTIFIER REVIEW OF FORMULATIONS

Your certifier looks very closely at every item on your product formulation. Their job is to make sure it is accurate and easily auditable, that all ingredients and processing aids are compliant, and that your labeling claim is justified by what you submitted. They will match each ingredient to its documentation and, among other things:

- Check that the ingredient name matches its documentation and is consistent across every product profile that uses it.
 - Confirm whether an ingredient has sub-ingredients and that they are clearly documented.
 - Compare the organic content you listed against the certificates you provided, and confirm it is supported.
 - Confirm every nonorganic ingredient and processing aid is on the National List and allowed for your composition category, with enough documentation to approve them.
 - Recheck your math, and ask follow-up questions about how you decided what is an ingredient versus a processing aid.
 - Review the product and brand names as they will appear on the certificate, and analyze the formulation against any proposed label, especially the ingredient list.
 - Ask you to fill in anything left blank and to supply any missing documentation.
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TIPS FOR GETTING THROUGH THE CALCULATION

- Complete every field on the product formulation form, including label and brand names, so your certifier does not have to send it back.
 - Make sure you understand which nonorganic ingredients and processing aids are allowed for your intended claim. Handlers new to organic often assume more is allowed than is, and are surprised when a product does not qualify for the “Organic” claim.
 - Ask your certifier how to list ingredients that have sub-ingredients.
 - Use consistent ingredient names that match your documentation.
 - Record all weights or volumes in consistent units so the math comes out right.
 - If you use a self-calculating spreadsheet, do not erase the underlying formulas.
 - Check your certificates so you use the correct organic content, and gather documentation early if you need to claim above 95 percent for an ingredient certified as “Organic.”
 - Get every formulation and label, including any changes, approved by your certifier before you print labels, sell, or represent anything as organic. Printing ahead of approval can be an expensive mistake, and representing something as organic before it is certified can put your certification at risk.¹⁴
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CONCLUSION

Determining your product’s organic percentage and the claims it can qualify for is essential to weighing the organic opportunity for your business, and product formulation is where the rubber meets the road. With the categories and the math in hand, you are ready to formulate, or reformulate, toward the claim that fits your product. You are the expert in your recipe and your process, and your certifier is the expert in the organic requirements. Working through the formulation together to get it approved is how a product earns its label.

ACTION ITEMS

- Write each product's formulation on your certifier's form.
- Mark each material as an ingredient or a processing aid, listing aids at 0 percent.
- Determine and enter each ingredient's organic content from its certificate.
- Measure at formulation in consistent units, and set aside water and salt.
- Calculate the weighted percentage, round down, and check it against your claim.
- Submit the formulation and label for approval before printing labels or selling as organic.

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United States Department of Agriculture
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