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The Benefits of Organic Spices, Herbs, and Teas

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Introduction

Spices and aromatic dried herbs impart ample flavor when added to foods, and brewed tea leaves offer a daily ritual that promotes mental stimulation or relaxation. Given the many uses for their distinct flavors and nutritional and medicinal benefits, consumption of spices, herbs, and teas is growing, so where do organic standards offer notable benefits?

This report presents science highlighting the benefits of spices and teas that are produced according to the United States Department of Agriculture (USDA) organic standards—from worker safety to the social equity and economic prosperity of those involved in their production, and ultimately, the consumer.

Spices and teas are unique because many are grown in other countries and imported to the United States for consumption. Extra steps must be taken abroad to uphold USDA's organic standards, from field to processing, before importation. Because of the global and historical roots of the tea and spice trade, the choices that consumers make have an impact on the prosperity of rural communities abroad where spices and teas are harvested.





Key Findings

This report provides a better understanding of how choosing organic spices, herbs, and teas from responsible producers can help mitigate consumer concerns about pesticide residues and other impurities, improve the health and safety of rural communities, and promote sustainability and environmental stewardship.

To provide the tools to make better choices and build greater awareness, this report spotlights case studies from organic companies that are working above and beyond to enhance environmental and socioeconomic outcomes along their supply chains.

The production of organic spices, herbs, and teas:

- ✓ Reduces the potential for consumption of harmful pesticide residues, which are amplified in dried products where residues can concentrate.
- ✓ Helps mitigate climate change impacts by reducing greenhouse gas emissions, increasing carbon capture, and limiting the uptake of heavy metals.
- ✓ Reduces occupational exposure to hazardous pesticides often used in conventional production.
- ✓ Can improve farmers' livelihoods by increasing income from organic premiums.
- ✓ Can increase the concentration of antioxidants.

Organic Standards: What does organic mean when it comes to spices, herbs, and teas?

Dried spices, herbs, and teas are subject to organic standards that apply to both farming and processing. This means that wherever these crops are grown, farm practices must maintain or improve the natural resources on and around the farm and growers are prohibited from using synthetic fertilizers and pesticides. These requirements improve biodiversity and soil health, and reduce human health risks, greenhouse gases, and energy consumption associated with the manufacturing of synthetic agrochemicals.

Many spices, herbs, and teas are grown and processed outside of the U.S. and imported. USDA organic standards and third-party certification apply to both domestic and imported organic products, and these standards are ensured either through USDA's National Organic Program certification or organic equivalency agreements with the country of export.

Like the U.S., many countries have their own organic standards and certification programs. [Organic equivalence](#) is a mutual recognition in the form of bilateral agreements that recognize countries' standards as comparable without compromising the integrity of organic designation in either market.



[Processed organic food](#) is not allowed to contain artificial flavors, colors, preservatives, or other synthetic chemicals. Minor non-organic ingredients used in organic food come from [a list of approved substances](#) that have been evaluated for their safety and impact on both human and environmental health and have no organic alternative available. By law, these ingredients are allowed to make up a maximum of five percent of the total ingredients (excluding water and salt) used to make the organic product, and they must be produced without the use of genetic engineering (GMOs), ionizing radiation, or sewage sludge.

Organic processors must take several steps to ensure additional requirements are met. These include thoroughly cleaning machinery, processing and storing organic ingredients and non-organic ingredients separately, and keeping accurate records that verify that organic standards have been met.



With spices, herbs, and teas, organic means:

✗ NO harmful synthetic pesticides or fertilizers

✗ NO artificial flavors, colors, or preservatives

✗ NO GMO ingredients

✗ NO sewage sludge or irradiation

Rigorous U.S. organic standards apply to all organic foods—both domestic and imported—for small, medium and large organic food makers and farmers.



Pesticide Use in Conventional Spices, Herbs, and Teas Highlights the Quality Benefits of Organic

Organic reduces exposure to residues

Consuming organic spices, herbs, and teas can help consumers avoid exposure to pesticide residues found in conventional products that are prohibited from organic production and processing. While traces of pesticides in small amounts in and on foods are deemed safe for human consumption (“tolerances”), pesticides found on conventional spices, herbs, and teas can sometimes exceed these limits.

Strict [organic standards](#) implement even lower tolerance limits of pesticide residues that can occur from inadvertent pesticide contamination like drift events.

Organic certifiers test organic products for any type of prohibited substance residue including pesticides, GMOs, antibiotics, heavy metals, and pathogenic organisms. Any detection of a prohibited substance is investigated. When residues of prohibited pesticides are detected above five percent of the EPA tolerance for the specific pesticide, the sampled crop may not be sold as organic and must be diverted to the conventional market.

Reducing pesticide use during production and processing is especially important for dried botanical products like spices, herbs, and teas, as the dehydration process can [concentrate](#) residues that exist on the fresh product.

According to a [2014 study](#), in cultures where green and black teas are consumed daily, the practice of [over-boiling tea leaves should be avoided](#) to help reduce the transfer of soluble and non-soluble contaminants, such as pesticide residues and other impurities in dried tea leaves.

A [14-year survey](#) of imported conventional dried spices and herbs at a Tokyo market detected residues from 37 pesticides from a list targeting organophosphate, organochlorine, pyrethroid, and carbamate pesticides. Most residue detections were in trace amounts, but some exceeded tolerances. In a [study](#) that looked at imports of conventional black pepper, nutmeg, basil, thyme, and oregano, ten percent of the oregano and 46 percent of the thyme samples contained pesticide residues from fungicides that exceeded regulatory tolerances. Border detections from the EU's Rapid Alert System for Food and Feed [illustrated](#) that paprika spice contained residues from 30 of the 51 total pesticides allowed for use in the production of the *Capsicum annum* pepper plant.

Organic dried botanical products reduce pesticide consumption

Dehydration can increase pesticide residues in tea [four-fold](#)



Water-soluble pesticides used to grow conventional teas can infuse into the consumers cup



Health Benefits of Organic

Organic has more antioxidants and fewer heavy metals

Beyond potential residue exposure, synthetic pesticide use can impact the nutritional quality of spice crops. [A 2018 trial](#) modeling commercial production of Hungarian paprika pepper plants found that a mixture of three synthetic insecticides (carbamate, organophosphate, and pyrethroid) and a fungicide (penzacole) applied during production is associated with a reduction in specific antioxidants: up to 16 percent for carotenoids and up to 13 percent for tocopherol (Vitamin E) in the plant's fruits after one to three applications. Residue levels of the pesticide chlorpyrifos were associated with a reduction in beta-carotene and other carotenoid antioxidants.

In a [meta-analysis](#) of 343 peer-reviewed publications on crops and processed crop-based foods that were produced following organic farming protocols, organic products contained higher antioxidant activity (19 percent phenolic acids, 50 percent flavonols, and 51 percent anthocyanins) and 48 percent lower levels of the heavy metal cadmium. Crops produced without synthetic pesticides contained more than a four-fold reduction in residues.





Store-bought samples of organic sage and mint in Poland contained more than 100 percent higher levels of [flavonoids](#). Another [study](#) found a similar result, with a 60 percent increase in polyphenol content in organic tea leaves in Malaysia. More studies are needed to demonstrate the relationship between farming practices and antioxidant levels in organic spices, herbs, and teas, but considering existing evidence and the high levels of antioxidants already known to be [present](#) in spices and herbs, it is safe to assume that organic farming protocols, which exclude synthetic agrochemical use, impact antioxidant levels.

Choosing responsible spice and tea producers is important as testing for pesticide residues of imported spices, herbs, and teas largely falls on the manufacturer prior to milling and bottling due to the high cost of residue screens. According to spice industry professionals, organic spices, herbs, and teas receive extra regulatory oversight at ports through process audits that require records to trace compliance with USDA organic standards.

Worker Health and Safety Benefits

Numerous individuals are involved in the production of spices, herbs, and teas, and the benefits of organics go beyond quality and safety for consumers. This is apparent in regions where there may be less enforcement of and safety training for the use of pesticides.

India, a major tea- and spice-producing country, is reported to be the largest producer of pesticides in Asia, and has ranked third in the world in pesticide use. History shows that occupational exposure to harmful pesticides is prevalent in the production of spices, herbs, and teas, and that organic production reduces this exposure.

Pesticides use in the field

Organophosphates are not the only pesticides used in tea and spice production, but they are [used widely](#) in agriculture and are [most reported](#) for causing acute pesticide poisoning (APP). As a result of their widespread use, many people are exposed to organophosphates during their lifetime and complain of chronic illness following exposure.



In the southern Indian state of Kerala, where spices have been produced for centuries, [a survey](#) identified that all 300 pesticide applicators reported at least one symptom of APP from 30 cardamom plantations in the Idukki district. This was the first survey to report 100 percent prevalence of APP in India or elsewhere. Pesticide use in cardamom plantations is some of the [highest](#) for the region, making APP a major occupational hazard.



A meta-analysis of 14 epidemiological studies and data from more than 1,600 participant studies identified a significant association between chronic low-level exposure to organophosphates and neurobehavioral impairments, such as motor speed and working memory.

In the tea gardens of Darjeeling, India, mixtures of organophosphate, pyrethroid, carbamate, and organochlorine pesticides are applied to tea bushes by men while the tea leaves are harvested by women. Driven by public health concerns, [a study](#) examined the enzymes acetylcholinesterase and butyrylcholinesterase in the blood of tea garden workers to assess their levels of exposure from carbamate and organophosphate pesticide mixtures. The study found that overall enzyme levels were reduced for both sexes, and that proper safety measures and use of PPE were lacking for the West Bengal region.





High levels of acute and low levels of chronic exposure to organophosphates in spice, herb, and tea production increase the risk for chronic illness and impairments to those who work closely with these insecticides and other pesticides. Overall, organic production protects the safety and health of workers and communities as it promotes alternative measures for pest control and allows for the use of less-toxic pesticides, reducing the potential risk for harm to those who must apply them or handle crops with residues.

Synthetic chemical use in non-organic processing

Once whole spices, herbs, and teas are harvested, conventional processing includes pasteurization treatments to reduce the food-safety risks of Salmonella and other harmful bacteria. In processing, the fumigant ethylene oxide and the less-common practice of irradiation are allowed for pasteurization in dried spices and herbs.

The practice of sterilizing food before transport with ethylene oxide has been linked to negative health outcomes. Long-term chronic health effects from inhalation exposure increase lymphoma and breast cancer risk and are a safety concern for workers who handle and work near ethylene oxide gas.

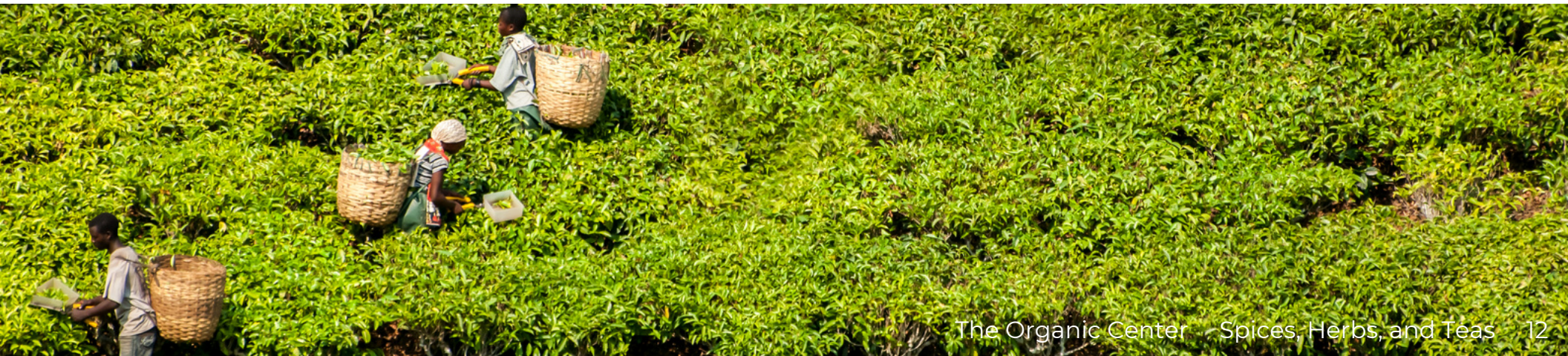
While the Food and Drug Administration deems irradiation safe and non-compromising to the nutritional quality of sterilized foods, including spices and seasonings, there is some research that demonstrates it can [reduce](#) the levels of antioxidants in dried spices and herbs.

USDA organic standards prohibit the use of irradiation and ethylene oxide for pasteurization and organic processors must use other effective and allowed practices, such as steam sterilization, to manage applicable food-safety risks. This eliminates occupational exposure to radiation and ethylene oxide gas for those who process spices, herbs, and teas.

Socioeconomic Benefits of Organic Spices, Herbs, and Teas

With deep colonial roots, oppressive systems still exist in many historical spice and tea production regions. Business models from the colonial British era are still present in Indian tea estates. Private entities often [own the land and facilities](#) where tea farmers and workers live and oversee their choices for housing, food, healthcare, and subsidies for children's education. While organic certification standards do not directly dismantle these systems, this section of the report highlights studies showing that producing spices and teas for the organic supply chain offers many social and economic benefits that help combat these oppressive systems.

Organic production of spices, herbs, and teas improves the livelihoods and social benefits for resource-poor, small-scale farmers. These benefits include more options for paid, local work that disproportionately benefits women of reproductive ages. The organic premium increases household income, which is boosted even further when combined with fair-trade premiums. Many organic companies are making extreme efforts to improve equity within their supply chains.



Responsible tea importers are trying to break the colonialism model by creating an ownership stake in the processing facilities where tea is made and shifting the value of tea into the hands of farmers. According to one of these importers, Young Mountain Tea, the organic premium can increase livelihoods of tea farmers by 15 to 20 percent in Nepal and India. This is supported by a recently published case study of small-scale tea farmers in Assam, India, that shows that organic certification increases revenue by 10 percent per hectare as long as organic growers attain average yields.

In some cases, the benefits of organic certification can outweigh those of fair trade certification. For example, a [survey](#) of 300 smallholder black-pepper farms in Kerala, India, revealed that organic certification substantially increased farmer income more than fair-trade certification, which helps farmers increase assets rather than income.

Organic + Fair Trade

The benefits of organic certification can be **enhanced when combined** with fair trade certification, leading to increased household incomes and the ability to accumulate more assets.



[Surveys](#) of smallholder tea farmers from China and Sri Lanka with both organic and fair-trade certification showed that organic production reduced input costs and increased farmer labor inputs that were supported and compensated from organic premiums and the acquisition of [assets](#) from fair-trade premiums. Women of reproductive age typically [benefit most](#) from these certification combinations, but larger-scale operations showed a greater impact on providing for household livelihoods.

Environmental Benefits of Organic Spices, Herbs, and Teas

The beneficial impacts that organic farming has on the environment are supported by a vast and growing body of evidence that translates to spice, herb, and tea production systems. A major driver of the advantages seen in organic cropping systems comes from the elimination of synthetic fertilizers and pesticides. The bulk of available studies taken from tea production illustrate the benefits of organic in these systems on the reduction of heavy metals and the increase of biodiversity, soil health, and climate-change mitigation.





Organic improves soil health and reduces environmental heavy metals

There is a large body of scientific literature that shows organic farming builds soil health and reduces heavy metal contamination of crops. Organic regulations require farmers to maintain or improve the natural resources of an operation, including soil and water quality ([7 CFR 205.200](#)). Furthermore, they are required to implement tillage and cultivation practices that maintain or improve soil quality and minimize soil erosion ([205.203a](#)).

As a result of the organic standards ...

Organic soil has **13% higher total soil organic matter than conventional soil**

Organic soil has **44% more stable sequestered carbon than conventional soil**

Organic soil has up to **60% higher soil stability than conventional**



Organic roots have **40% more beneficial mycorrhizae fungus**

Organic **reduces crop uptake of the heavy metal cadmium by more than 70%**

The benefits of organic spice, herb, and tea production follow suit with the benefits of organic overall. Long-term use of synthetic nitrogen fertilizers meant to amplify yields is known to acidify soils and free up heavy metal ions bound in soils.

According to [research](#) in tea orchards of the major tea province in Fujian, China, orchards under organic fertilizer management significantly reduced soil acidification and the presence of mobile heavy metals (Cu, Pb, Cd, As) in tea leaves and in soils, and increased beneficial soil microbes.

Another [study](#) with a similar result attributes declines in beneficial microbes in soils to the nitrates from synthetic nitrogen fertilizers. In samples taken from tea orchards under long-term management with organic fertilizers, the diversity of beneficial microbes increased by 29 percent, 110 percent, 41 percent, and 557 percent.

In a study that compared natural forests to organic and nonorganic tea orchards, organic tea orchards had no evidence of soil acidification and pH levels were similar to that of natural forests (a pH of around 5) while nonorganic tea orchards saw a decline in pH (a pH of close to 4).

Organic improves biodiversity

According to the [National Organic Program](#), farmers must use practices that support biodiversity and avoid any activities that would harm it. There is a vast body of literature that shows that organic practices not only support, but often improve, biodiversity on farms, much to the benefit of the organic farmers and their crop yields.

Organic farming increases the amount and diversity (by 1.5 times) of beneficial soil fungi (AMF) in soils beneath [a range of crops](#), including pomegranates, grapes, mangoes, lemons, and limes, and even tropical organic crops like [cacao](#). Populations of beneficial insects that offer services to improve crop yield—such as [pollinators](#), [natural enemies to pests](#), and even [decomposers](#)—are all increased by organic production. Organic farms support these organisms when natural habitat is limited in the landscape.



Organic farming
generally [increases](#)
[biodiversity](#) by
30%

While there are fewer biodiversity studies that specifically target spice, herb, or tea cropping systems, the strong evidence that shows organic generally supports biodiversity suggests that the same is true for these crops. One recent [study](#) quantified impacts on the diversity of soil organisms in tea orchards under different management regimes, and found that orchards managed using organic practices were the most sustainable for tea cultivation, promoted the greatest biodiversity, nutrient, and soil health conditions, and exhibited less interference in the overall soil fauna food web.

Organic mitigates climate change

Reducing greenhouse gas emissions and increasing carbon sequestration in both plants and soil are critical for combatting climate change. Organic farms [sequester more carbon](#) in the soil, [use less energy, reduce greenhouse gas emissions](#), and have [less nitrogen pollution](#) than their conventional counterparts, largely because synthetic nitrogen fertilizer is prohibited in organic farming. When synthetic fertilizer is swapped for soil-building organic soil amendments, nitrogen is recycled instead of newly manufactured ([an energy-intensive process](#)). Further, more [carbon is locked](#) away in healthy soil, which helps to mitigate global climate change.





Organic tea production, like organic production [in general](#), is climate-smart. [Studies](#) find that when organic practices are used, soil and roots in organic tea orchards sequester more carbon. This was an especially strong outcome of long-term organic management [of more than 10 years](#), where gaps in yield also decreased. This outcome is supported by an ever-growing body of literature that shows organic can produce comparable yields to conventional, especially [in the long term](#).

Improving the storage of soil organic carbon not only helps mitigate climate change, it also helps local farmers [better cope](#) with the impacts of extreme weather. Long-term research at the Rodale Institute shows that organic farming offers climate resilience, where yields have been found to be [40 percent higher](#) than conventional in years of drought and extreme weather.

Many Organic Companies Go Beyond Certification to Support Community Development and Environmental Stewardship

TEECCINO

[Teeccino](#) pioneered a new trade of wild-harvested ramón seeds collected in nine villages in Guatemala's Maya Biosphere Reserve. By giving economic value to ramón trees and supporting local workshops to teach women how to prepare food made with ramón seeds for their families, Teeccino helps relieve poverty and provide critical nutrition for these rural communities while preserving the forest canopy.

DRACO HERBS

As a worldwide leader in the manufacture and supply of natural botanical ingredients, [Draco Natural Products](#) believes in the importance of preservation, conservation, and maintaining the integrity of the natural environments where plants are harvested. The company is partners in an initiative to protect and conserve panda habitats by maintaining bamboo forests for the continued sustainability of the plant and animal species that live there.

KALUSTYAN

[Kalustyan Corporation's](#) pledge to future generations combines science, technology, and sustainability practices. The company's commitment starts with healthy soils. Kalustyan advocates for a brighter future by taking forward-thinking actions to protect and restore degraded soil, which can only be remediated now with biological and micro-nutrient inputs. The company is committed to investing in origins, significantly leveraging its unified spice network to offer sustainable practices to the planet and support farming communities that need healthy soils to grow crops.

YOUNG MOUNTAIN TEA

[Young Mountain Tea](#) is an Oregon-based importer and retailer of specialty loose-leaf tea. They directly source from small-scale organic farms on the Indian subcontinent. This mission-based brand works with Indian and Nepali communities to raise the quality of their tea, so they can earn more and raise the quality of their lives, creating a sustainable future for Himalayan farmers and their families. One percent of all sales from Young Mountain Tea supports a farmer-owned, FSMA-compliant tea factory that the company is launching in north India. It is scheduled to produce its first batch of certified-organic teas in spring 2023.

MCCABE SUN-DRIED HERBS AND TEAS

[McCabe](#) sun-dried herbs and teas are grown and harvested organically without using any chemicals or pesticides that may harm the natural habitat or environment. They also provide well-paying jobs in local communities by using hand sun-drying techniques, developed and led by community members, rather than drying machines that take jobs away from those who need them most.

ORGANIC INDIA

[Organic India](#) participates in initiatives that raise the bar on what it means to be a socially and environmentally conscious business. The company sources herbs and spices for its teas and supplements from small organic farms that work to improve soil fertility, strengthen crop resilience, enhance water conservation, increase carbon sequestration, and eliminate the use of toxic pesticides. Organic India purchases 100 percent of the crop yield from farmer-partners at premium market prices while providing health insurance and ongoing organic agricultural training to the region's farmers.

A photograph of a tea plantation with rows of green tea bushes. In the background, a person is visible, and the hills are covered in dense greenery under a bright sky.

FUCHS

[Fuchs North America](#), an industry leader in custom organic seasoning and spice solutions, relies on intact economic, ecological, and social systems in its supply chain to promote sustainable and ethical practices. The company reduces its carbon footprint by limiting energy consumption, CO2 emissions, and water consumption, and invest in improving the living and working conditions of the people along their supply chain.

FRONTIER CO-OP®

[Frontier Co-op](#) is a leader in organic and natural herbs, spices, and botanical products. The company's Well Earth® sustainable impact sourcing program benefits farmers, the environment, and businesses across the supply chain. They invest in infrastructure and business training to help their global suppliers adopt more sustainable practices.

DAVIDSON'S ORGANICS

[Davidson's Organics](#) supports 5,000 small tea-producing families living within the company's organic and fair-trade Darjeeling region. The company provides better working conditions for its growers by ensuring access to clean drinking water and medical care, supporting households with electricity, cooking stoves, and pressure cookers, providing soft loans for income diversification, developing a buy-back program for seed replantation, and focusing on women empowerment through the appointment of tea garden managers and welfare officers.

MOUNTAIN ROSE HERBS

[Mountain Rose Herbs](#) takes their dedication to environmental activism seriously. They adopted a zero-waste policy almost 15 years ago and collect and sort every piece of discarded material that would normally end up in the landfill. This environmental dedication is also apparent in how they manage their facilities. They are a chemical-free facility with a list of banned materials, including toxic chemical cleaning products, bleaches, synthetic and chemical-based soaps, ammonia, chlorine, and commercial pest repellents, fumigants, or other synthetic agents. Their landscape is designed to slow water runoff and filter it within their on-site bioswale, retention pond, and rain garden, which are teeming with native plants.

RIEGA FOODS

[Riega Foods](#) believes that real food begins at the source. Growing close working relationships with their farmers and suppliers is integral to providing consistent, clean, and high-quality spices. Most importantly, it's how they foster greater farmer and supplier equity from seed to shelf.

Colonization has had a lasting impact within supply chains. The exploitation of farmers and their goods led to major livelihood and economic disparities between small agrarian communities and their spice traders. With a supply chain that is personal, Riega is able to source from the farmers directly to ensure that opportunities are not only equitable, but are attained to strengthen local economies and livelihoods.



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About The Organic Center

The Organic Center is your trusted source on the science of organic food and farming. We serve up unbiased research so you can make choices based on scientific findings.

The Organic Center is a 501(c)(3) non-profit research and education organization.

Thank you to the brands that contributed their time and expertise in the development of this report.

Catspring Yaupon Tea
Davidson's Teas
Draco Herbs
Fuchs Group North America
Guayaki
Kalustyan
McCabe Sun-Dried Herbs and Teas
Frontier Co-op

Organic India
Teecino Herbal Teas and Roasted Coffees
Mountain Rose Herbs
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