

NATURAL VERSUS ORGANIC SERIES



## Toxic Chemicals: Banned In Organics But Common in “Natural” Food Production

**Soy Protein and Chemical Solvents in Nutrition Bars and Meat Alternatives**

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# Acknowledgments

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The Cornucopia Institute’s “Natural Versus Organic series” aims to educate the public about the importance of choosing certified organic foods bearing the “USDA Organic” seal.

The Cornucopia Institute is dedicated to the fight for economic justice for the family-scale farming community. Through research, advocacy, and economic development, our goal is to empower farmers both politically and through marketplace initiatives.

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# Summary

CONVENTIONAL FOOD PRODUCTION depends heavily on the use of toxic chemicals and synthetic inputs in farming and food processing that pose potential threats to the environment, public health, and sustainability.

**Organic foods provide a government-regulated, third-party-certified refuge from foods produced and processed with toxins and potentially dangerous chemicals.**

Federal standards for organic foods are created and enforced by the United States Department of Agriculture, and prohibit the use of synthetic inputs that threaten the environment and/or human health.

The use of the term “natural” on food packages, on the other hand, is mostly unregulated. Companies freely use the “natural” label without any government oversight or verified commitment to ecological and safe production practices. In most cases, the company and its marketing department determine their own definition and meaning of the term “natural.”

There are many differences between USDA-certified organic foods and “natural” foods. One example is that federal law prohibits companies from processing organic foods with neurotoxic and polluting petrochemicals, including hexane. Foods labeled as “natural” and containing soy protein are almost universally processed with hexane.



# Hexane in the “natural” soyfoods industry

THE PROHIBITION OF HEXANE in the processing of organic foods, and its widespread use in non-organic veggie burgers, meat alternatives, nutrition bars and other “natural” foods is a perfect example of the importance of the organic label. A “natural” nutrition bar and a certified organic nutrition bar may look nearly identical, other than price, to a consumer, but a behind-the-scenes examination of how they were manufactured, focusing on the soy protein ingredients, reveals the importance of the organic label.

## WHAT IS HEXANE?

Hexane is a byproduct of gasoline refining. Soybean processors use it as a solvent—a cheap and efficient way of extracting oil from soybeans, a necessary step to making most conventional soy oil and protein ingredients.<sup>1</sup> Whole soybeans are literally bathed in hexane to separate the soybeans’ oil from protein.

Hexane is a neurotoxin, according to the Centers for Disease Control (CDC),<sup>2</sup> and a “hazardous air pollutant,” according to the Environmental Protection Agency (EPA).<sup>3</sup>

## HEXANE RESIDUES IN FOOD

The FDA does not set a maximum residue level in soy foods for hexane, and does not require that food manufacturers test for residues. The European Union, on the other hand, has adopted a directive setting maximum limits of solvent residues in foods, including hexane residues in soy ingredients. For defatted soy flour used as ingredients in consumer foods, the European Union prohibits levels of hexane residues greater than 10 ppm.<sup>4</sup> When The Cornucopia Institute tested samples of soy ingredients for hexane residues, levels as high as 21 ppm were found.

## A neurotoxin and threat to human health

Hexane poses a health danger to the employees working in food-processing plants because of its neurotoxicity. Workers who come in dermal (skin) contact with hexane experience immediate irritation, characterized by erythema and hyperemia, and they develop blisters after several hours. The Occupational Safety and Health Administration (OSHA) sets the permissible exposure level at 500 parts per million

(ppm) for workers with eight-hour exposures to hexane. If exposed through the air to 800 ppm of hexane for 15 minutes or longer, workers can develop eye and upper respiratory tract irritation and will show mild symptoms of narcosis (unconsciousness caused by a chemical substance) if exposed to 1,000 ppm. At high exposure levels, workers will develop vertigo, headache, and nausea (after 10 minutes of exposure to 5,000 ppm).<sup>5</sup>

Workers who are chronically exposed to hexane levels ranging from 400 to 600 ppm, with occasional exposures of up to 2,500 ppm, have developed polyneuropathy, a neurological disorder. In these cases, distal symmetrical muscle weakness is common, and nerve biopsies show nerve damage. A published peer-reviewed article in *Environmental Health Perspectives* hypothesizes that occupational exposure to hexane may contribute to the development of Leber hereditary optic neuropathy, a disease that causes loss of vision.<sup>6</sup> Chronic exposure may also lead to blurred vision, restricted visual field, and optic nerve atrophy.<sup>7</sup>

Soy food consumers may want to consider if they want these potential impacts to be part of the foods they eat.

## Highly explosive vapors

Hexane is a highly explosive substance, posing a serious danger to the people who work in the processing plants that make soy protein for “natural” foods. On August 29, 2003, two workers died when hexane gas in a Sioux City, Iowa, soybean processing plant ignited.<sup>8</sup> Explosions caused by hexane are not uncommon; explosions have also occurred in South Africa (two dead),<sup>9</sup> Italy (four dead),<sup>10</sup> and Mexico (200 dead, 600 injured).<sup>11</sup> None of this is too surprising given that hexane is a highly volatile byproduct of gasoline refinement.

Even the truck drivers who are hired to transport hexane are put in danger: In 2001, a tanker truck carrying 4,500 gallons of hexane exploded and burst into flames, not only setting fire to two homes, but also critically injuring the truck driver and the driver of another vehicle.<sup>12</sup>

## A hazardous air pollutant

Hexane is classified as a “hazardous air pollutant” by the Environmental Protection Agency because it contributes to the formation of ground-level ozone (O<sub>3</sub>), which is the primary constituent of smog. While ozone is essential in the upper atmosphere, excess ozone at ground level is a pollutant—hazardous to human health and the environment.<sup>13</sup>

Ground-level ozone forms when oxides of nitrogen, emitted

primarily by motor vehicles, react in the presence of sunlight with volatile organic compounds such as hexane. The EPA lists hexane as one of 187 hazardous air pollutants, defined as airborne compounds “that cause or may cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental and ecological effects.”<sup>14</sup>

Grain processors, including those that process soybeans into soy protein ingredients for “natural” nutrition bars and veggie burgers, were responsible for more than two-thirds of all hexane emissions in the United States in 2009, releasing 19 million pounds of this hazardous air pollutant.<sup>15</sup> Other major emitters include tire factories and petrochemical plants. Many consumers of natural and organic products would likely gasp if they knew that one of the “processing agents” used to manufacture their food was also used in tire manufacturing.

High levels of surface ozone harm human health by causing respiratory symptoms. According to the EPA,

“Breathing ozone can trigger a variety of health problems including chest pain, coughing, throat irritation, and congestion. It can worsen bronchitis, emphysema, and asthma. “Bad” ozone also can reduce lung function and inflame the linings of the lungs. Repeated exposure may permanently scar lung tissue.”<sup>16</sup>

Excess ozone damages plant health as well, which leads to stunted growth of sensitive crops, including soybeans. A 2009 study by NASA estimates that rising surface ozone concentrations are causing nearly \$2 billion in damages annually to U.S. soybean crops.<sup>17</sup> By using hexane, a cheap but polluting solvent, to process soybeans, the soy industry is, ironically, damaging the very crop that sustains it.

A single Archer Daniels Midland (ADM) plant in Decatur, Ill., released nearly a million pounds of hexane in the course of a year, making it the second-largest single-source emitter

of this toxic air pollutant in the country.<sup>18</sup> In the state of Illinois alone, food processors ADM, Cargill, Bunge, and others release almost 4 million pounds of hexane yearly.<sup>19</sup>

Solae, a major supplier of soy protein ingredients found in “natural” veggie burgers, emitted nearly 900,000 pounds of hexane, as a pollutant, from its factories in Ohio and Illinois in 2009. Its plant in Bellevue, Ohio, is the nation’s thirteenth-largest emitter of hexane.

These soy processing plants, owned by ADM, Solae and others, make soy protein isolate, which finds its way into “natural” products aimed at environmentally conscious consumers. To reduce air pollution and its harmful effects on people and the planet, companies should reduce their use of hexane.

Companies and brands that are truly committed to sustainability have already shunned the use of hexane in the foods they produce. Examples include Amy’s Kitchen and Turtle Island Foods (Tofurky), which produce veggie burgers and meat alternatives that do not contain hexane-extracted soy protein, and Nature’s Path and Nutiva, which produce nutrition bars free of hexane-extracted ingredients.

Other prominent companies, such as Lightlife, Yves Veggie Cuisine, and Clif Bar, continue to use hexane-extracted soy ingredients in their products. Consumers should demand that they adopt cleaner practices and switch to greener sources of soy protein.

It has been suggested that it is hypocritical of some of these companies, which are leaders in their market segment, to tout investments in green energy and other environmentally sensitive messaging to their consumers, while simultaneously underwriting the use of a petrochemical solvent that damages the environment.



# How to avoid hexane-processed foods

Avoiding hexane-extracted soy protein ingredients in foods is relatively simple for consumers who keep in mind these two facts:

**1 The use of hexane and other synthetic solvents is prohibited in ORGANIC FOOD processing, but only when the food carries the “USDA Organic” seal.**

- Always look for the “USDA Organic” seal, or the word “ORGANIC” on food packages.
- The claims “Natural” and “Made with Organic Ingredients” do not guarantee hexane-free soy ingredients.

The term organic is regulated by the government, which has established a three-tiered system of organic labeling. Only products that are designated as organic may carry the “USDA Organic” seal. The use of hexane and other solvents is strictly prohibited in foods carrying this seal.

Products that state “made with organic ingredients” must contain at least 70% organic ingredients to make this claim. These products may not display the “USDA Organic” seal. Although not common, companies are not prohibited from using hexane to process the soy ingredients that make up the

remaining 30% of (non-organic) ingredients. Clif Bar is an example of a major national brand that uses the 70% organic claim and uses hexane-extracted ingredients in the remaining 30%.

**2 Non-organic soy protein ingredients are almost universally processed with hexane, so consumers wishing to avoid hexane-extracted foods should AVOID THE FOLLOWING LISTED INGREDIENTS unless the package specifically makes an organic or non-hexane claim (it should be noted that just a few natural companies have gone out of their way to source non-hexane-extracted soy ingredients):**

- Soy protein
- Soy protein isolate
- Soy protein concentrate
- Textured vegetable protein

**The USDA Organic seal on the package is your best guarantee that the product’s soy protein was not bathed in hexane.**

The National Organic Program, of the United States Department of Agriculture, has made it easy for consumers to recognize foods that were produced in an environmentally beneficial and safe way. Foods that were grown on certified organic farms and processed using approved organic methods carry the USDA Organic seal. USDA Organic foods never contain soy protein that was processed with the use of hexane.



## NATURAL MARKETING SPIN (DISINFORMATION): AGRIBUSINESS RESPONSE TO CONSUMER CONCERN ABOUT FOOD TOXINS

Consumers who email companies to inquire about their use of hexane-extracted soy ingredients should be aware that they will not always receive a forthright answer. Beware the following misleading answers, which have been sent to inquiring customers:

“Our soy ingredients are not hexane-derived.”

As a solvent, hexane is a processing aid and not an ingredient or raw product. No ingredient is “derived” from hexane—rather, ingredients are processed with hexane. Customer service representatives have responded to customer inquiries by stating their ingredients are not hexane-derived, thereby avoiding answering the real question of whether their products are hexane-extracted.

“[Our company] does not use hexane to process soybeans.”

Many food manufacturers buy soy protein ingredients from large corporate suppliers like Archer Daniels Midland (ADM) and Solae, which is a joint venture between agribusiness gi-

ants Bunge and DuPont. The company that makes and markets the veggie burger or nutrition bar indeed does not use hexane to process soybeans in its own food processing plants; rather, it buys soy protein ingredients from companies that use hexane to transform whole soybeans into processed soy ingredients.

## GUIDE TO AVOIDING HEXANE-EXTRACTED SOY—THE CORNUCOPIA GUIDE

To assist consumers, and wholesale buyers, in making informed purchasing decisions and supporting the companies that have committed to hexane-free soy ingredients, The Cornucopia Institute developed two guides: the “Guide to Choosing Non-Hexane Meat Alternatives” and the “Guide to Choosing Non-Hexane Nutrition Bars” [www.cornucopia.org].

The guides are based primarily on information acquired through research, surveys and investigations with industry participants. Cornucopia staff members contacted companies that produce and market meat alternatives, including veggie burgers, and nutrition bars, to better understand their production practices. Every company listed was given the opportunity to share the details of their production processes with Cornucopia researchers. Products are listed as “highly likely to use hexane” only when three criteria are met:

- **The product is not certified organic. Beware that products with the claim “made with organic ingredients” are not always certified organic with the “USDA Organic” seal, and these may contain hexane-extracted ingredients.**
- **The product contains soy protein ingredients that are nearly universally processed with hexane, such as soy protein isolate and soy protein concentrate.**
- **The product’s manufacturer or marketer did not respond to our inquiries regarding the use of solvents in their processing and make no public statements on their website or product packaging alluding to being “hexane-free.”**

In many cases, Cornucopia researchers were able to confirm that many products in the “highly likely hexane-extracted” section do indeed use hexane.

Companies that, subsequent to our research, decide to change their production and sourcing practices to move away from using hexane are encouraged to contact The Cornucopia Institute, and our guide will be quickly updated to reflect these changes.

Certified organic products are listed as processed without hexane, given that this is a legal requirement for products carrying the “USDA Organic” seal.

Both guides aim to be comprehensive by listing as many as possible of the brands that generally interest organic consumers. However, not all brands are listed. Especially in the nutrition bar category, listing all natural/conventional products would be nearly impossible given the vast number of new bars on market shelves. Therefore, our guide focuses on brands that appeal to organic and environmentally conscientious consumers, especially companies that market their brands as “natural” or “all-natural.”

## MAKING INFORMED MARKETPLACE DECISIONS—BRANDS DOING IT RIGHT AND BRANDS TO AVOID

CONSUMERS SHOULD BE AWARE of products containing hexane-extracted soy that market themselves under a “green” image and appeal to environmentally and health-conscious shoppers. Such brands include Yves Veggie Cuisine, Lightlife and Clif Bars.

Prominent companies that have committed to using “clean” soy ingredients include Wildwood, Turtle Island Foods and Amy’s Kitchen.

Choose these products containing non-hexane-extracted sources of protein.

### DOING IT RIGHT

**AMY’S KITCHEN** changed the recipe for its veggie burgers to avoid hexane-extracted soy protein ingredients after it learned of the ubiquitous use of hexane through previous Cornucopia research. It should be noted that because hexane is a “processing agent,” rather than an ingredient, it is not listed on food labels,



and some manufacturers have not been aware that their raw materials were exposed to the solvent.

The company **TURTLE ISLAND FOODS**, makers of **TOFURKY**, has always focused on traditional soy ingredients and shunned the use of hexane-extracted soy.

**WILDWOOD** produces certified organic veggie burgers—organic standards prohibit the use of hexane in organic food processing.

## QUICK GUIDE FOR NUTRITION BARS

NO HEXANE-EXTRACTED SOY INGREDIENTS USED

Alpsnack  
 Amazing Grass  
 Bumble Bar  
 Garden of Life  
 Hammer Bars  
 LaraBar  
 Nectar Bar  
 NuGo Organic Bar  
 Nutiva  
 Optimum Bar  
 Raw Revolution  
 Potent Foods  
 Pure Bar  
 SoyJoy



LIKELY HEXANE-EXTRACTED SOY INGREDIENTS USED

365 Super Greens Bar  
 Balance Bar  
 Builders Bar  
 Clif Bar  
 Genisoy  
 Greens Plus  
 Honey Stinger  
 Kind Plus  
 Odwalla Bar  
 Luna Bar  
 Mojo Bar  
 NuGo Bar  
 PowerBar  
 Pure Protein Bar  
 Think Bar  
 Zone Perfect Bar



## QUICK GUIDE FOR VEGGIE BURGERS/MEAT ALTERNATIVES

NO HEXANE-EXTRACTED SOY INGREDIENTS USED

Amy's  
 Asherah's Gourmet  
 Field Roast  
 Helen's Kitchen  
 Primm Springs Foods  
 Soy Deli  
 Sunshine Burgers  
 Tofu Shop  
 Tofurky  
 Turtle Island Foods  
 Wildwood



LIKELY HEXANE-EXTRACTED SOY INGREDIENTS USED

Boca  
 Dr. Praegers  
 Franklin Farms  
 Fantastic World Foods  
 Gardein  
 Gardenburger  
 Lightlife  
 Morningstar  
 SoyBoy  
 Spice of Life  
 StarLite Cuisine  
 Trader Joe's  
 Yves Veggie Cuisine



Products in the red column use non-organic soy protein. Our research suggests that these soy protein ingredients were extracted with the use of hexane, a neurotoxic chemical solvent that is prohibited in organic food processing. We strongly urge the companies that manufacture these products to switch to non-hexane extracted soy products.

## AVOID

### MEAT ALTERNATIVES

**YVES VEGGIE CUISINE™** (Hain Celestial Group) states:

"We have always strived to achieve ultimate customer satisfaction, producing high-quality products in an **environmentally responsible manner**. Our success has been founded on these principles and they will continue to guide us as Yves grows and continues to prosper."<sup>20</sup>

Producing foods "in an environmentally responsible manner" would imply that Yves avoids hexane in its manufacturing process—which is not the case, according to our research. By not telling its customers of its hexane use, Yves has avoided problems with customer satisfaction, but how happy will its customers be when they find out? If principles of environmental responsibility truly guide Yves Veggie Cuisine, switching to non-hexane-extracted soy protein should be a given.

**LIGHTLIFE™** (ConAgra) products come with the following catchy line on its packages: "**Veggie Goodness for You and the Planet.**"

Lightlife states:

"Choosing to eat a more veggie-based diet is one small but significant step, as veggie-based foods take less from the land than meat-based products."

Lightlife does not mention that its products are made with hexane-extracted soy protein isolate. Lightlife products, as a result, may take "less from the land," but put more in the air than if they were using non-hexane-extracted soy. We would encourage Lightlife to take the "small but significant step" of helping the environment by using soy protein isolate that was not hexane-extracted.

**GARDEIN** states:

"Tastes Good... Good for You... **Good for the Planet.**"

When you eat Gardein, you're eating soy protein processed with an air pollutant that is not exactly "good for the planet."

**GARDENBURGER™** (Kellogg's) states:

"We aspire to make the best-tasting vegetarian foods, always with real good ingredients. And we promise to



always treat our vegetables and whole grains with dignity and respect."

Many consumers would not consider hexane-extracted soy protein to be "real good ingredients." Gardenburger should eliminate all hexane-extracted soy protein isolate from its veggie burgers.

### NUTRITION BARS

**CLIF BAR™** states:

"And food, made right, **can make the world a better place**. That's why we use organic ingredients in all our products."

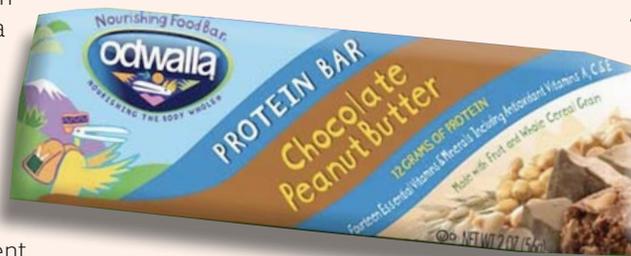
What they do not tell consumers is that Clif Bars contain only 70% organic ingredients, and contain hexane-extracted soy protein isolate.

Clif Bar™ also states:

"Food grown organically—without the use of toxic pesticides or synthetic chemicals—is better for the planet, the body and the soul... **We recognize that food matters to our families, our communities, our planet**—as our food choices affect the physical, social, and environmental fabric of our lives."

This language seems to be quite duplicitous. Including soy protein ingredients that were produced in hexane-emitting facilities does not qualify as being "better for the planet." Clif's Clif Bars, Luna Bars and Builder Bars all contain hexane-extracted soy protein isolate.

**ODWALLA™** (Coca-Cola) states:



"Our mission is to nourish people everywhere and adhere to our guiding principle of respect: respect for our consumers who rely on us for great-tasting and nourishing beverages and bars and **respect for the earth** on which we rely for holistic nourishment. Odwalla simply wouldn't be Odwalla

without **taking care of Mother Earth.**"

In its SuperProtein bars, Odwalla should consider respecting its customers and Mother Earth by using hexane-free soy protein ingredients.

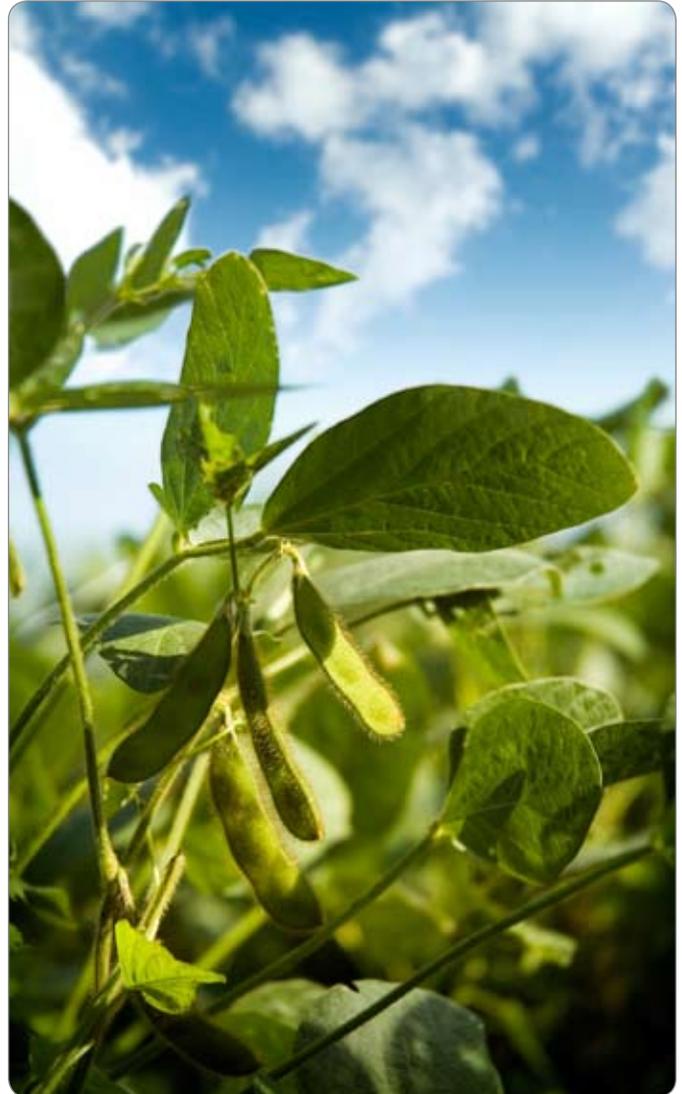
**Note: A high percentage of pioneering natural food brands are now owned by major corporate agribusinesses.**

## Conclusion

THE USE OF HEXANE in the “natural” soyfoods industry is widespread. The Cornucopia Institute urges companies that offer soy-based meat alternatives and nutrition bars to use soy protein ingredients that were processed without hexane, preferably organic.

Hexane is a neurotoxin, a hazardous air pollutant, and a highly explosive danger to worker health and safety. Its use in producing nutrition bars, veggie burgers and meat alternatives aimed at environmentally aware and health-conscious consumers is misleading and disingenuous.

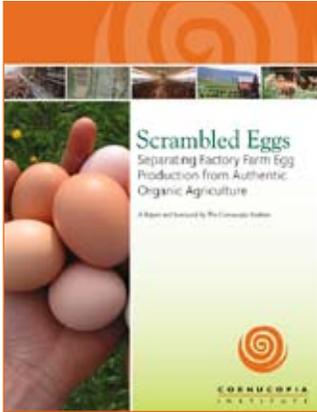
Consumers wishing to avoid hexane-extracted soy protein should always choose foods with the “USDA Organic” seal—their only guarantee that their food was not immersed in a toxic and polluting chemical solvent.



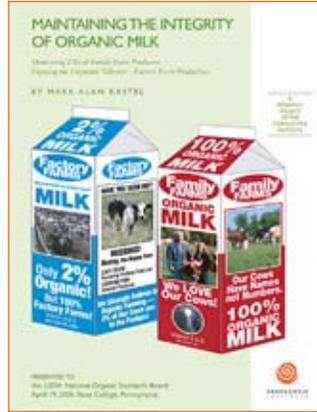
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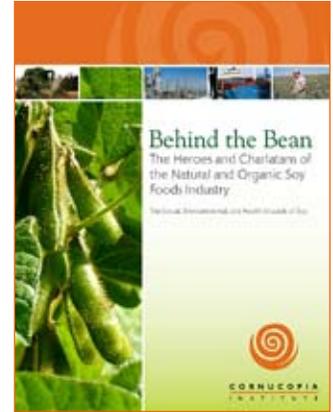
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