



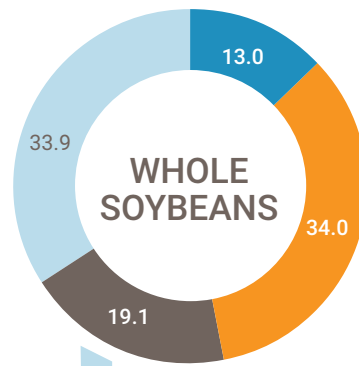
# SOY PRODUCT FACT SHEET: FULL-FAT SOYBEANS

## Overview

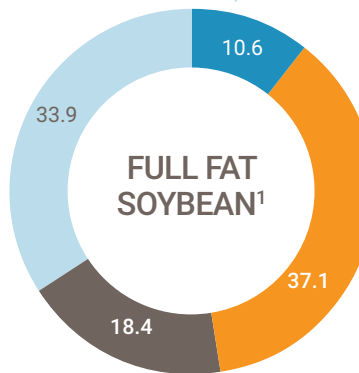
Full-fat soybeans (FFSB) are produced via extrusion, which uses friction heat and/or steam for heat processing. Whole soybeans (WSB) can also be dry-roasted, oil-roasted or soaked in water and steamed or boiled to produce FFSB, with the latter two roasting methods primarily used for human consumption. The thermal processing used in FFSB production deactivates the anti-nutritional factors present in raw WSB and improves protein and oil digestibility. The distinctive trait of FFSB is that the entire oil component remains in the product, enhancing its energy content and dry matter in the diet, as well as improving ingredient stability and shelf-life.

## Form & Functional Properties

Extrusion produces a meal product, while roasted WSB can be ground into a meal product, pelleted, flaked or converted into a powdered feed ingredient. The co-processing of WSB with other ingredients via extrusion is also a common use of FFSB in livestock and aquaculture feed.



**PROCESSING**  
Extrusion or Roasting  
of Whole Soybeans



Moisture (%) Crude Protein (%) Oil (%) Carbs and Ash (%)

## Amino Acid Profile<sup>1</sup> (Total Values, As-fed Basis)




2.66%	Arginine
0.53%	Cysteine*
1.58%	Glycine
1.68%	Isoleucine
2.26%	Lysine*
0.52%	Methionine*
1.86%	Serine
1.44%	Threonine*
0.49%	Tryptophan*
1.75%	Valine




\*Critical Amino Acid

## Nutritional Attributes

While the composition of FFSB mirrors that of the WSB used as inputs, adequate thermal treatment applied during processing results in a decrease in the anti-nutritional factors present and enhances the digestibility of the soybean protein and oil. Total protein and essential amino acids increase as total moisture decreases. FFSB is also a good source of digestible amino acids and vitamin E. Proper temperature and duration of heat treatment are imperative, as too little may not fully inactivate anti-nutritional factors and may reduce the shelf-life, while overprocessing may impair amino acid digestibility. Varying equipment and environmental conditions impact the degree of heat treatment. Therefore, care should be taken when sourcing FFSB to ensure quality standards are maintained during processing.

### Full-Fat Soybeans Nutritional Properties<sup>1</sup>

 Gross Energy 5013 kcal/kg	 Oligosaccharides 14%	 Trypsin Inhibitors 1.0-14.0 mg/g
---	--	--

Species	Metabolizable Energy (kcal/kg) <sup>2</sup>	Σ5 Critical AAs (SID Values) <sup>2</sup>	Maximum Recommended Inclusion Rate <sup>1</sup>	Feeding Advantage
 Poultry	3715	5.01	30%	Protein content and digestibility; improved layer performance Protein content and digestibility Effective method of increasing energy of extruded fish pellets
 Swine	4745	5.01	15%	
 Aquaculture	4213	5.01	5%	

## Product Market

The production capacity and capital requirements for soybean roasters and extrusion processors are much lower relative to solvent extractors, with most extruders processing no more than 50 metric tons per day. These factors make FFSB production inherently small scale, with commercial FFSB producers typically selling commoditized or unbranded products in localized areas. However, these same factors also mean FFSB can be used anywhere WSB are available, making on-farm production of FFSB common.

<sup>1</sup>Van Eys, J. E. and Ruiz, Nelson. 2021. *Quality Manual and Analysis for Soybean Products in the Feed Industry. Third Edition, U.S. Soybean Export Council, Chesterfield, Missouri, pages 23, 26-27.*

<sup>2</sup>The International Aquaculture Feed Formulation Database, Feed Ingredient Composition Database (FICD), has composition information for both toasted and extruded FFSB. While there were only slight differences in composition between these two FFSBs, the average composition of these two ingredients is reported. The database containing these composition data can be accessed at <https://www.iaffd.com/home.html?v=4.1.2>.

To learn more about how U.S. Soy can enable your business, please contact your U.S. Soybean Export Council (USSEC) region or country representative; or submit your contact details via <https://ussec.org/contact/>.

### ABOUT THE U.S. SOYBEAN EXPORT COUNCIL (USSEC)

Soybeans are the United States' number one food and agricultural export. The U.S. Soybean Export Council (USSEC) is devoted to building preference, improving the value, and enabling market access for the use of U.S. Soy for human consumption, aquaculture, and livestock feed in 82 countries across the world. USSEC is a dynamic partnership of U.S. soybean producers, processors, commodity shippers, merchandisers, allied agribusinesses, and agricultural organizations; and connects food and agriculture industry leaders through a robust membership program. USSEC is farmer-funded by checkoff funds invested by the United Soybean Board, various state soybean councils, the food and agriculture industry, and the American Soybean Association's investment of cost-share funding provided by U.S. Department of Agriculture's (USDA) Foreign Agricultural Service (FAS). To learn more, visit [www.ussoy.org](http://www.ussoy.org) and [www.ussec.org](http://www.ussec.org), and engage with us on [LinkedIn](#), [Twitter](#), [Facebook](#), [Instagram](#) and [YouTube](#).