

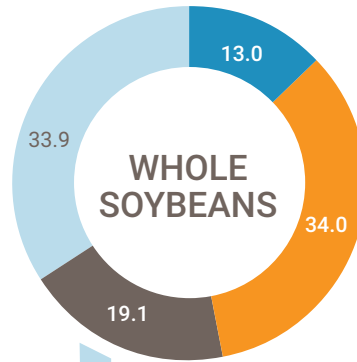
SOY PRODUCT FACT SHEET: FULL-FAT SOYBEANS

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.

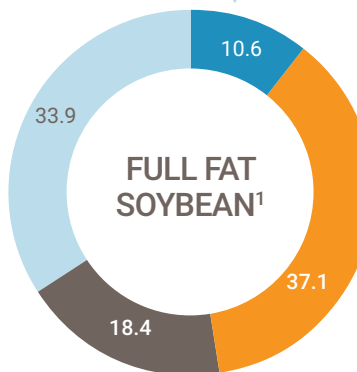
Form & Functional Properties

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 Profile¹

(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 Properties¹

 Gross Energy 5013 kcal/kg

 Oligosaccharides 14%

 Trypsin Inhibitors 1.0-14.0 mg/g

Species	Metabolizable Energy (kcal/kg) ²	Σ 5 Critical AAs (SID Values) ²	Maximum Recommended Inclusion Rate ¹	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.

¹Van 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.*

²The 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>.

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