

SOY FLOUR PRODUCTION GUIDE

A PRACTICAL GUIDE TO THE PROCESSING AND OPPORTUNITIES OF A HIGH-VALUE FOOD INGREDIENT







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U.S. SOYBEAN EXPORT COUNCIL

WHAT IS SOY FLOUR?

A familiar food ingredient with new possibilities

Soybean flour is a human food ingredient that can be used to improve the protein content and nutritional quality of regional food staples such as bread, tortillas and arepas.

It can be incorporated as a direct weight-for-weight substitute for wheat flour in a range of inclusion rates. Even small to moderate inclusions can significantly increase the protein content of the finished product while maintaining consumer acceptance. In some cases, products made with soy flour had better flavor and color compared with the original product.

That makes soy flour particularly interesting for manufacturers looking for ways to add nutritional value to foods consumers already know and eat.

ALREADY PROCESSING SOYBEANS? SOY FLOUR MAY OFFER AN OPPORTUNITY TO ADD FOOD-INGREDIENT CAPACITY.

From soybean to food ingredient

The best soy flour starts with consistent high-quality soybean meal made from dry, field-matured soybeans. Soybean flour millers worldwide can source U.S. soybeans that mature naturally in the field, meet USDA Grade #1 specifications and benefit from sophisticated grading, storage and logistics systems that connect soybean production to food manufacturing.

Different types for different uses

Soy flour is not one product. Different processing methods produce flours with different characteristics and applications.

DE-FATTED SOY FLOUR

Milled from hexane-extracted soybean meal when a manufacturer wants the nutritional and functional benefits of soy protein without significant added fat.
Typical fat/oil: Less than 1%

LOW-FAT SOY FLOUR

Milled from pressure-extracted soybean meal, it provides a balance of soy protein and fat and can be suited to applications where some of the soybean's natural oil is desirable.
Typical fat/oil: Approximately 6%

FULL-FAT SOY FLOUR

Milled from whole soybeans, it retains the soybean's natural oil and can provide a richer nutritional and flavor profile.
Typical fat/oil: Approximately 18–20%

LECITHINATED SOY FLOUR

Soy lecithin is returned to the flour to improve water dispersal and retention. Roasting soybeans before crushing can also create the bolder, nutty flavor associated with Japanese kinako.

ENZYME-ACTIVE SOY FLOUR

A small amount of enzyme-active soy flour (0.75–1.0%) that has not been heat-treated can be added to wheat flour recipes to whiten bread crumb, improve gluten structure and improve gas retention (rising).



WHY USE SOY FLOUR?

Put more nutrition in what people already eat

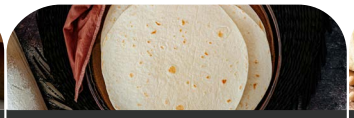
One of soy flour's biggest opportunities is its ability to increase the nutrient density of familiar staple foods. It can be used as a direct substitute by weight for wheat flour without requiring consumers to change what they eat.

Add more nutrition as you add soy flour

Research and recipes developed through Northern Crops Institute show how soy flour can be incorporated at varying levels in familiar staple foods, building nutritional benefits as inclusion increases up to 30%.

Nutritional Improvement in Familiar Foods Incorporating 10-30% Soy Flour

Serving Size (100 g)


Nutrient	Bread Soy Four Substitution Rate (%)			Tortilla Soy Four Substitution Rate (%)			Arepa Soy Four Substitution Rate (%)		
	0%	10%	30%	0%	10%	30%	0%	10%	30%
Protein (g)	6	9	14	6	8	13	3	4	7
Carbohydrates (g)	47	44	39	43	41	35	25	24	20
Calories	250	250	250	280	280	270	120	120	110
Fiber (g)	0	<1	2	0	<1	2	2	2	2
Calcium (g)	30	40	60	60	70	90	50	50	60
Iron (mg)	0	1	2	0	1	2	3	3	3
Potassium (mg)	100	220	470	60	180	430	90	160	300

More than nutrition

Soy flour can contribute a range of functional and nutritional advantages.

- **PROTEIN DENSITY** Soy flour can substantially increase the protein content of familiar staple foods without the texture and aftertaste concerns sometimes associated with other high-protein ingredients.
- **SATIETY** Increasing protein density can help improve satiety compared with wheat flour alone.
- **FUNCTIONALITY** Soy flour can improve water retention, dough behavior and crumb structure.
- **COLOR AND FLAVOR** At appropriate inclusion rates, soy flour can contribute a favorable flavor profile and caramelized color in fried products such as tortillas and arepas.
- **GLUTEN REDUCTION** Replacing a portion of wheat flour with soy flour reduces the gluten content of the finished product.
- **NUTRITIONAL QUALITY** Soy provides a balanced amino acid profile, helping increase the nutritional value of familiar staple foods.

Where the opportunity gets bigger

Increasing nutrient density can be particularly relevant in markets and programs focused on nutritious, affordable foods. Potential applications include school meals, staple foods, high-protein baked goods and bars, foods for populations with limited dietary diversity and foods formulated for metabolic health concerns.





SOY FLOUR IN BAKING

Adjust the recipe, not the product

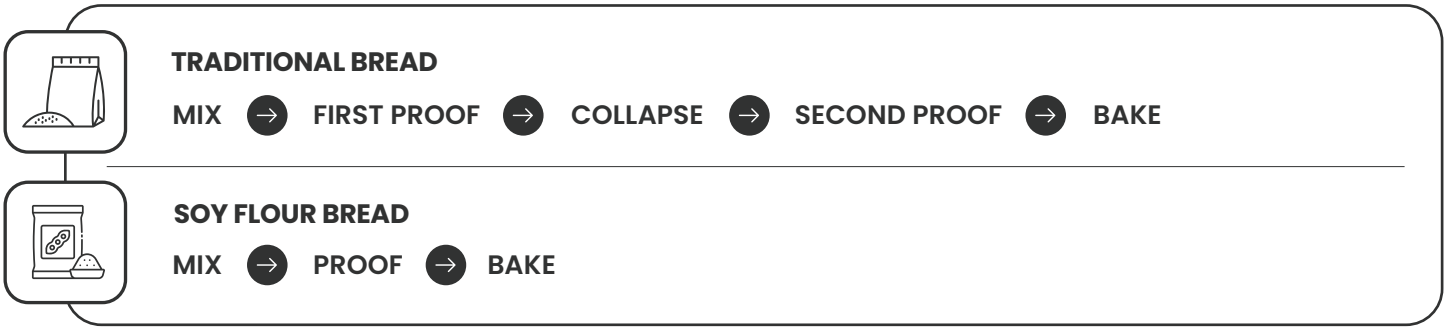
Soy flour can be incorporated into familiar wheat-based products while maintaining a familiar eating experience. In baking, soy flour is commonly used as a direct replacement for a portion of wheat flour, with inclusion rates of up to 30% by weight.

Bread

At higher inclusion rates, soy flour can:

- Increase protein substantially
- Increase water retention
- Reduce gluten content
- Support a high, light crumb
- Reduce the number of proofing steps
- Contribute favorable flavor and color

Traditional bread recipes often use two proofing steps. A 30% soy flour formulation can eliminate the final proof step, potentially shortening mixing and production time by 30–60 minutes.



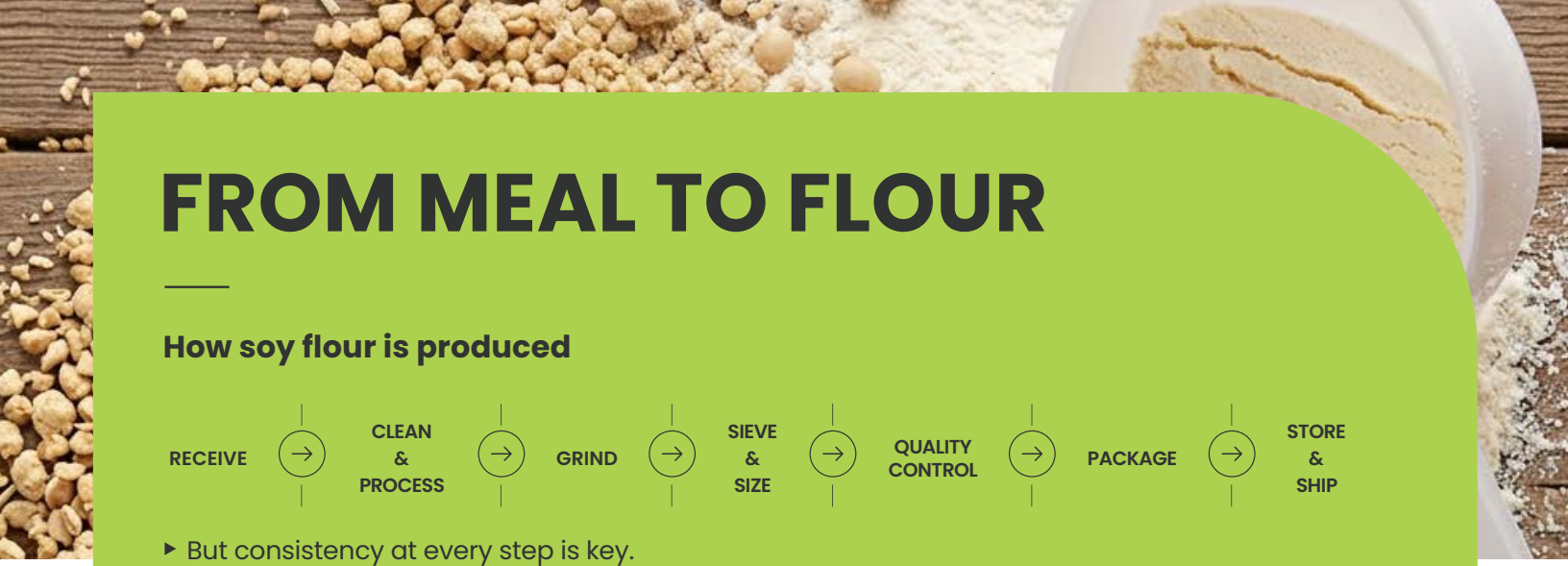
Tortillas and arepas

Soy flour can also be incorporated into regional staple foods such as tortillas and arepas. At higher inclusion rates, formulations developed through Northern Crops Institute work demonstrated substantial increases in protein per serving.

Soy flour also produces uniform caramelization during frying, with a taste and texture similar to traditional versions and a natural, favorable flavor profile. Tortilla formulations require particular attention to dough handling because reduced gluten can make tortillas more fragile than conventional wheat tortillas.

More protein into familiar favorites

What makes soy flour most unique as a food ingredient is its ability to help manufacturers add protein to foods consumers already know and use without requiring an entirely new food category.



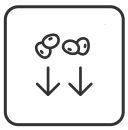
FROM MEAL TO FLOUR

How soy flour is produced

RECEIVE → CLEAN & PROCESS → GRIND → SIEVE & SIZE → QUALITY CONTROL → PACKAGE → STORE & SHIP

- But consistency at every step is key.

STEP 1



RECEIVE
Soybean meal enters the facility and is inspected for quality before processing. The consistency of the incoming meal is one of the most important factors in producing consistent flour.

STEP 2



CLEAN & PROCESS
The meal is cleaned and processed according to the characteristics required for the finished flour.

STEP 3



GRIND
The meal is ground into a coarse flour.

STEP 4



SIEVE & SIZE
The ground material passes through sieves to achieve a consistent particle size.

STEP 5



QUALITY CONTROL
Random samples are analyzed before packaging to confirm that the finished flour meets required specifications.

STEP 6



PACKAGE
Packaging is selected according to the intended market and customer requirements.

STEP 7



STORE & SHIP
Finished flour must be protected from moisture, insects, rodents and birds. Environmental controls help maintain product quality through storage and transportation.



BUILDING THE CAPABILITY

What does a soy flour operation require?

Adding soy flour production is more than installing a mill. A successful food-ingredient operation requires the right combination of **equipment, facility design, quality systems, people, raw materials and logistics.**



FACILITY The grinding and sizing building should provide sufficient vertical space for gravity flow through sieve equipment. The source material recommends at least 10 meters of trestle height.



MATERIAL HANDLING Tube conveyors and pneumatic conveyors/lifters can efficiently move and elevate product through the facility.



GRINDING Roller mills can be used to grind meal into flour. The source material indicates roller mills can use up to 85% less energy than standard hammer mills.



SIZING Sieve equipment produces the uniform particle size needed for predictable functionality. Standard soybean flour requires 97% of the flour to pass through a 100-mesh sieve (150 microns). Uniform particle size helps make functionality more predictable and can reduce batch-to-batch variation. Material that remains above the largest commercial sieve can be returned for additional grinding.



HEAT TREATMENT Where required, extrusion can provide the heat and pressure needed to deactivate trypsin inhibitors, an anti-nutritional factor.



PACKAGING Packaging should reflect the target market need. Potential formats range from smaller 0.5 kg retail packages to commercial 30 kg sacks and 1,000 kg supersacks. Whatever the format, packaging should ensure accurate weighing within specifications and secure seals, with effective controls for dust and air quality.



QUALITY CONTROL Food production requires quality-control infrastructure capable of monitoring product specifications and food-safety requirements in the region. Product checks may include sieve requirements, color and odor, functionality, other customer specifications, and, where required, effective biological kill-step verification.



FOOD QUALITY STANDARDS

Food-grade means food-grade

A food-grade soy flour facility must address the following needs to create a quality product for food manufacturing.

Food Safety
Hazard prevention & safe handling

Foreign Material Control
Monitor and remove foreign objects

Environmental Control
Manage temperature and humidity

Pest Management
Protection throughout processing and storage

Employee Training
Food and workplace safety

Equipment Maintenance
Maintain equipment and prevent contamination

Documentation
Record procedures and corrective actions.

Food-grade safety protocols

As a food ingredient, food safety protocols are recommended, and appropriate safety protocols are required.

Soy flour facilities undergo a Hazard Analysis and Critical Control Point (HACCP) process to identify potential product-safety risks.

A robust quality-management system aligned with Global Food Safety Initiative standards – such as SQF, BRC or ISO 22000 – can help ensure hazards are identified, monitored and controlled.

Quality is the whole process

The goal is not simply to produce flour. The goal is to produce a consistent, safe food ingredient that customers can rely on.



SUPPLY, INVESTMENT AND ECONOMICS

Turning processing capacity into food-ingredient capacity

For companies considering soy flour production, the opportunity needs to make sense operationally and financially. Several foundational questions should be answered before moving forward.

Is there a reliable raw-material supply?

A stable supply of high-quality soybean meal is essential. High-quality soy flour can be produced from GMO, non-GMO or USDA Organic soybeans. Whatever the specification, insufficient supply or inconsistent meal quality can interrupt production.

Do you have the right people?

A successful facility needs both skilled personnel and an entry-level labor force capable of operating and maintaining the plant. Training should cover job responsibilities, food and workplace safety, personal protective equipment, equipment operation and reporting and corrective actions.

Is there sufficient capital?

A 2023 feasibility study conducted by the University of Illinois College of Business, with support from the Illinois Soybean Association, estimated the following.

Based on a facility producing 150 tons of soy flour per day

CAPITAL

US $8–10 Million
Potential construction capital for a food-grade soybean flour mill.

CREDIT

US $18–22 Million
Potential operating line of credit.

PROJECTIONS

4 Years
Positive return on invested capital

7 Years
Break-even point

7%
Base case internal rate of return (IRR)

US $2–3 Million
Seven-year net present value (NPV)

- Lower-volume facilities would have different capital and credit requirements and would also expect different rate-of-return projections.



WHY U.S. SOY?

The flour is only as good as the soybean behind it

For a food ingredient, raw-material quality matters. Taste, aroma, nutritional quality, functionality and consistency all begin with the soybean. U.S. soybean production offers an established system designed to move high-quality soybeans from farm to processing facility and ultimately to food markets.



FIELD-MATURED SOYBEANS
U.S. soybeans are allowed to mature in the field before harvest to reach proper moisture content, unlike in some parts of the world. Superior handling, grading, storage and transportation also help minimize factors such as mold, heat damage, broken grain and field debris that can affect food-grade quality.



SOPHISTICATED GRADING AND STORAGE
U.S. soybeans move through established systems for grading, handling and storage before becoming soybean meal.



CONSISTENT MEAL SUPPLY
Increasing U.S. soybean crush capacity supports a consistent supply of high-quality soybean meal, the essential raw material for many types of soy flour.



RELIABLE LOGISTICS
Established inland transportation and export infrastructure helps move soybean meal efficiently toward international markets. Container shipping and larger options are available.



PREDICTABLE COMMODITY MARKETS
Whole soybeans and soybean meal are hedgeable commodities with established futures markets and price discovery, giving manufacturers and processors tools to manage commodity-price exposure as part of their broader procurement strategy.



FOOD-INGREDIENT MINDSET
Soy flour is a food ingredient, not a feed ingredient. That means manufacturers need raw materials and processing systems that support food-grade expectations for consistency, quality and safety.

Determine how soy flour could work for your operation.

Soy flour can create an opportunity at the intersection of **soy processing, food manufacturing and nutrition.**

For companies with soybean capacity and the capital to invest, the next questions are practical:

- **What market should we serve?**
- **What type of soy flour should we produce?**
- **What equipment and facility configuration do we need?**
- **What products can we make?**
- **What volume can we sell?**
- **What would the investment look like?**

Answers will differ for every operation. That is why hands-on training, product development and technical consultation are important next steps.



Continue the conversation

Take the next step with the Northern Crops Institute. NCI research and training provide a foundation for exploring soy flour production, functionality and applications – from soy flour fundamentals to hands-on development of high-protein breads, tortillas and arepas.

Further reading

"Substituting Refined Flour with Soy Flour Improves Postprandial Glycemic Responses in Staple Foods Without Reducing Consumer Acceptability." Okoye, Stephanie I., et al. Nutrients. 2026; 18:1173.

This study is cited in the developed content in support of glycemic response and consumer acceptability.

Reference: **https://www.mdpi.com/2072-6643/18/8/1173/pdf**

For more information about U.S. soybeans, soybean meal, food ingredients and opportunities to work with U.S. soy suppliers, contact the U.S. Soybean Export Council.

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