Whitepaper

Arepa and Tortillas

Trends, Challenges and Opportunities in Pre-Cooked Maize Flour

Innovations for a **better world.**

BÜHLER

Arepas and Tortillas
Trends, Challenges and Opportunities in Pre-Cooked Maize Flour

Pre-cooked maize flour has transformed from a household staple in Latin America to a global ingredient in modern food production. As demand grows, the industry faces rising pressure to balance convenience and sustainability.

Pre-cooked maize flours such as arepa flour and masa flour, anchor a market worth billions of dollars. Yet this success also brings new technical, environmental, and economic challenges, driving innovation in how the world's most versatile grain is processed.

Maize (or corn) has been a staple food in Latin America for more than 3,000 years. Today, average per capita consumption of maize is around 50 kg in Central and South America, and the crop has become a primary source of calories across much of Africa. Maize-based snacks and food products are widely consumed across North America, and are growing in popularity in Europe and parts of Asia. Global maize production has more than doubled since the start of the 21st century, reaching approximately 1.1 billion tons—of which about 150 million tons are used for food—making it around 50 percent higher than rice or wheat production.[1]

Maize is an exceptionally versatile ingredient, used to produce a diverse range of dishes including baked goods, porridges, drinks, and snacks. In Latin American markets, however, consumption is dominated by tortillas and arepas, typically made using pre-cooked maize flour.

Pre-cooking maize before grinding enhances flavor, texture, and handling, while improving the bioavailability of nutrients. Historically, this pre-cooking and grinding were carried out in households, a labor-intensive and time-consuming process. Since the 1950s, however, domestic processing has largely been replaced by industrially produced flours, which offer longer shelf life and far greater convenience.

Pre-cooked maize flour provides the base of foods such as Arepas, Tortillas, Empanadas and more.

Demand growth

Today, the global market for pre-cooked flours is valued at around USD 21 billion, with maize flours dominating. This market is forecast to expand rapidly, at more than 10 percent per year.[2] Growth is being driven by rapid urbanization in regions where maize remains a staple, and by increasing demand in new markets where maize-based foods are gaining popularity.

Pre-cooked maize flours are produced in a wide range of styles, tailored to different cuisines and consumer preferences. The nixtamalization process, for instance, involves soaking and cooking maize in an alkaline solution (usually lime water), this leads to starch gelatinization, improving water absorption and flavor. Nixtamalized flours are used extensively in Mexican cuisine for staples such as tortillas and tamales.

In contrast, consumers in Colombia and Venezuela prefer non-alkali-treated flours used to make arepas, grilled, fried, or baked unleavened flatbreads eaten either plain or stuffed with meats, vegetables, or cheese.

Arepas vary by region: Venezuelan arepas are typically thicker and stuffed, while Colombian varieties are thinner and sometimes sweetened or topped.

Grilled arepas with meat and cheese stuffings.

Soft tortillas and tortilla chips produced from pre-cooked maize flour.

From local to global

Consumption of pre-cooked maize flours is expanding beyond traditional regions. Some of this growth stems from the global popularity of Latin American cuisine, but maize's flavor, functionality, and nutritional qualities are also driving its use in packaged and convenience foods.

Both nixtamalized and non-nixtamalized flours are now used in chips, extruded snacks, and coatings for fried or baked foods. Maize flours offer an appealing alternative to potato or wheat-based formulations, meeting consumer preferences for products that are gluten-free, lower in fat, and made with simpler ingredient lists.

Globally, the market for corn-based snack products is estimated at around USD 9.5 billion, growing at roughly 4 percent annually. North America remains the largest consumer, but growth is expected to accelerate in the Asia-Pacific region, driven by changing lifestyles and dietary preferences.[3]

Challenges for processors

Producers of pre-cooked maize flours face growing technical and economic pressures. Input costs have risen due to higher energy prices and volatile maize harvests.

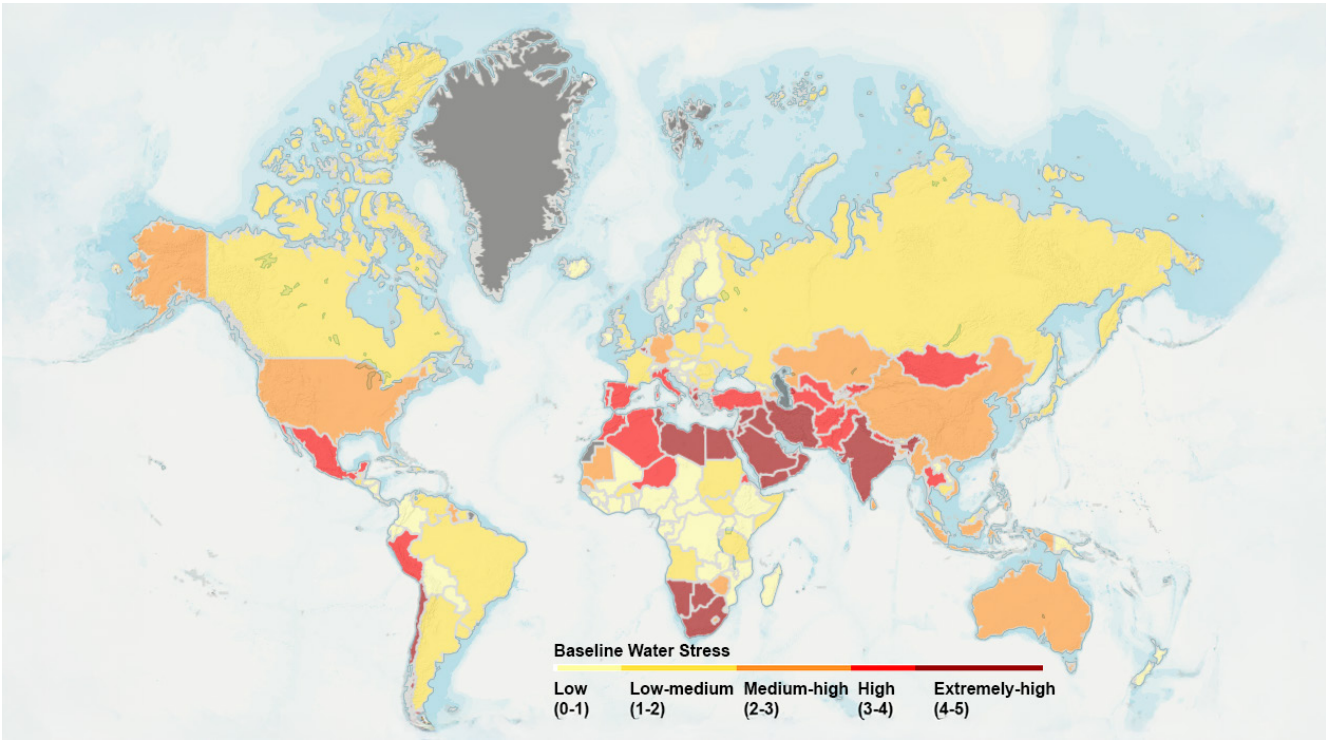
Meanwhile, industrial customers, especially snack and packaged food manufacturers, demand consistent quality and tight process control.

Industrial-scale demand is creating production bottlenecks too. Most producers in Columbia, Mexico and Venezuela manufacture in relatively small volumes for regional markets. Only a handful of organizations have invested in high-capacity mills capable of delivering flour in the quantities required for large-scale industrial snack production.

Environmental scrutiny is also intensifying. Pre-cooked flour production is energy- and water-intensive: producing one ton of nixtamalized flour can require more than three tons of water and around 5.8 GJ of energy.[4]

Waste streams are another concern. Wastewater from cooking, soaking, and cleaning contains large amounts of suspended and dissolved organic material, and nejayote, the liquid waste from nixtamalization — is highly alkaline.[5] That waste has a direct downside for consumers too, since lost organic material is a significant fraction of the nutritional content of the maize.

As water scarcity intensifies, these challenges will become more acute. Global freshwater demand is outpacing supply, and in Latin America, water demand is expected to rise by more than 40 percent by 2025 — double the global rate. Droughts have already caused severe crop losses in the region. By 2080, the UNDP expects 46 percent of Latin American countries to experience water stress, with 16 percent facing high or extreme levels. Mexico experienced its driest year on record in 2023, with drought conditions impacting 55% of the country.[6]



A map addressing the baseline water stress (measures the ratio of total water demand to available renewable water supplies) across the world.[7]

Resource-efficient production

The maize processing industry is acutely aware of these sustainability challenges and is actively developing approaches to reduce waste by finding alternative uses for production side streams. Research is also under way into technologies that energy and water use while maintaining product quality. Approaches under development include microwave, ultrasound, and pulsed-electric-field systems for thermal processing and mechanical extrusion, which promotes starch gelatinization with lower energy input.

Another promising innovation replaces conventional immersion cooking with steam-based processing. This approach, pioneered by Bühler, can significantly reduce water consumption during the cooking phase. The same technologies are opening new opportunities across the pre-cooked flour sector. Bühler's Prime Masa process, for instance, uses lime addition during steam processing to produce nixtamalized flours. Already operating at three sites, with two more in construction, it has demonstrated reductions of 84 percent in water use, 52 percent in energy use and 96 percent in wastewater generation compared to conventional methods, while improving the nutritional profile of the product.

Steam cooking also eliminates liquid waste streams, improves process control during cooking, and can significantly reduce water absorption during the cooking phase. Moisture control plays a key role in energy efficiency improvement, since the drying step is the most energy-intensive phase of pre-cooked flour production.

Nutritionally, steam processing offers additional benefits. In traditional cooking, fiber and micronutrients are lost in the cooking liquid. Steam processing retains more of these valuable components. In analysis conducted by the Technological Institute of Monterrey, Mexico, unenriched Prime Masa flour was found to have equivalent or higher concentrations of vitamins and minerals to commercial nutritionally enriched brands of nixtamalized maize flour. The ability to produce a favorable nutritional profile without the cost and complexity of product fortification represents a further economic benefit for producers.

A major European processor of Maize for the agri-food industry, Quality Corn, has recently invested in the first hybrid arepa and Prime Masa nixtamal plant built by Bühler. This state-of-the-art facility represents a unique integration of two processes, enabling the production of pre-cooked maize flour for arepas as well as nixtamalized maize flour for tortillas. Spain is home to approximately 4.2 million immigrants from South America, Central America, and the Caribbean, where maize flour is central to many traditional cuisines. The growing presence of these communities, combined with the rising popularity of Latin American foods among the broader Spanish population, has created a strong market demand for both arepa flour and nixtamalized maize flour.

With an annual production target of 30,000 tonnes, Quality Corn's new plant is set to meet this growing demand and strengthen its position as a leading supplier of high-quality maize flour products in Europe.

The hygienically designed cooking tower is an essential part of the pre-cooked maize flour production.

Beyond maize

Steam processing also shows promise for non-maize applications, with trials underway for a range of grains such as quinoa, millet and sorghum. The nutritional profile of these alternatives to maize makes them a potentially appealing option for food and snack products aimed at health conscious consumers. And the energy and resource-efficient processing of these crops into versatile, palatable ingredients could lead to significant economic and nutritional opportunities around the world, given their drought-resistance and tolerance of poor soils and challenging growing conditions.

Conclusion

Pre-cooked flour has evolved from a regional staple into a globally significant food ingredient. As demand rises, producers are rethinking how to make this ancient product fit for a resource-constrained future. Innovations in steam and mechanical processing point toward a more sustainable model — one that preserves tradition while reducing environmental impact. For the humble arepa and beyond, the next chapter of pre-cooked flour production be as much about technology, efficiency and nutrition as it is about flavor and culture.

References

1 https://link.springer.com/article/10.1007/s12571-022-01288-7

2 https://straitsresearch.com/report/precooked-flours-market

3 https://www.infiniumglobalresearch.com/reports/global-corn-snacks-market

4 https://www.sciencedirect.com/science/article/abs/pii/S0959652619338065

5 https://www.sciencedirect.com/science/article/abs/pii/S0048969723073023

6 https://www.undp.org/latin-america/blog/running-dry-addressing-water-stress-lac

7 https://www.wri.org/applications/aqueduct/country-rankings/?indicator=bws

Bühler AG

CH-9240 Uzwil,
Switzerland

T +41 71 955 11 11

milling@buhlergroup.com
www.buhlergroup.com