

Carbohydrate Supply and Use 2011



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Throughout human history carbohydrates have played an important role in aiding and sustaining life, as well as providing alternative materials for construction and fuel. Wheat, rice, and other grains, which have existed for millennia, provide excellent sources of carbohydrates for human use. Throughout human history we have developed and utilized alternative food sources, particularly different sources of carbohydrates. Not only have our supply sources changed, we have devised methods to process, modify, and alter their use as foods, constituents within foods, and in nonfood products, including alternative fuels.

Carbohydrate Sources

Today, there are five globally utilized carbohydrate sources: maize, wheat, cassava, rice, and potato. Although many other sources are used in significant volumes, they are typically restricted to a country or region. Maize, wheat, cassava, rice, and potato are not only utilized globally, they are also grown, processed, and sold around the world.

For example, maize is produced and processed in North America, South America, China, and Europe and is an important source of carbohydrates. Maize is likely to become a critical source of carbohydrates in the future, and genetically modified (GM) varieties will most likely play a dominant role in production. The top five wheat-producing countries are China, India, the United States, Russia, and France. Cassava, also known by some as tapioca, is a principal carbohydrate source in Indonesia, Vietnam, Africa, and Mexico. Africa has

not exported cassava for many years due to the demand for the product in Africa. Presently, non-GM cassava remains prevalent; however, as with other raw materials, there are differences in cassava properties. The cassava produced in Asia and Africa differs in its physical properties compared with cassava produced in South America. Rice, typically used as a direct food source, is now grown in Southeast Asia, Japan, and North America, with other regions contributing to the global supply but in lesser amounts. Potato production has experienced one of the greatest shifts in use and supply over the past 20 years. Previously, potatoes were grown and consumed predominantly in Europe, North America, and the former Soviet Union. Today, China and India produce approximately one-third of the world's supply of potatoes. The Russian Federation and the United States are still significant suppliers and consumers, but the global supply has changed significantly.

Today, these five sources of carbohydrates (maize, wheat, cassava, rice, and potato) are commercially available as flours. In many cases carbohydrates are found in native or modified starches. Almost all of these sources have been either crossbred or treated with genetically modified organisms (GMOs) to produce unique base materials. Several newly developed products are now commercially available. For example,

Maize: Common, waxy, high amylose

Cassava (tapioca): Native, high amylose

Wheat: Native, waxy

Rice: Native, waxy

Potato: Native, high amylose

Major Carbohydrate Suppliers

Who are the major players who supply carbohydrates as raw materials and processed products? As many in the food industry are aware, numerous starch

producers have merged over the past couple of decades. Just as major retail food manufacturers around the world have merged, we have seen the same trend in the global ingredient supply arena. In addition to monitoring changes in suppliers, food manufacturers must be aware of other products that influence the availability of carbohydrates for use in the production of goods. For example the sweetener industry is critical to carbohydrate utilization, and processors must continually study the markets related to this product category. Major sweetener categories include

- Sucrose (sugar)
- Liquid conventional sweeteners
- Dry conventional sweeteners
- High-intensity sweeteners (sugar substitutes)
- Maltodextrins
- Specialty sweeteners

In North and South America, Australia, and China, maize remains a principal source of starches and carbohydrates used in the production of sweeteners. However, although maize production has risen in Europe, wheat and potato are still the primary sources for starch in this region.

As sugar production has shifted globally from the use of cane to the use of beets, producers of fructose and other syrups have begun looking for alternative sources of carbohydrates for their production.

Asia, for example, utilizes cassava (tapioca), sorghum, and rice, as well as maize, for specialty sweetener products.

Not only have carbohydrate sources changed—the manufacturers and drivers for economic growth have significantly changed from 25, 15, and even 10 years ago. Today, we look to consumer and business indicators such as

- Health and wellness
- Ease of preparation
- Costs

- Flavor
- Caloric content
- Younger generation preferences
- Older generation preferences
- Ethanol
- Food (animal/human) versus nonfood products
- Government regulations (global restrictions)

Obesity, diabetes, heart health, and cancer remain the principal areas of interest within the category of health and wellness, and the food industry continues to struggle with not only finished food products that meet consumer expectations, but the ingredients utilized in their preparation. Consumer demographics and rising costs for not only commercial foods but all phases of life will greatly impact the funds available for food consumption—both meals prepared at home and purchased meals. Even with these constraints, however, trends indicate that consumers will continue to ensure their pets are fed and cared for. In some instances, they will even place the well-being of their pets above their own. Finally, there is the continuing impact of global fuel requirements, not only for automobiles, but also for heating, cooling, and, just as importantly, production of food and nonfood products.

Conclusions

As we can see, the global positioning for carbohydrate production, marketing, and utilization has become a significant driver. This has created the need to ensure the global availability of carbohydrate sources, as well as the need to produce globally as many of these sources as possible. One question yet to be answered is what area of the world, if any, will become the center of GM crop production? Or, will GMOs be used globally in crop production?

A paid ad appeared here in the printed version of the journal.



Thomas E. Luallen has been working within the food industry for more than 45 years—primarily as a technical resource to the food industry for the development and utilization of specialty food ingredients derived from carbohydrates. He has corporate work experience with several major suppliers within the food ingredient industry, including Tate & Lyle, MGPI, National Starch, ConAgra, and Cargill. Tom is an active member of AACC International and the Institute of Food Technologists and lectures for both the starch and gum short courses provided by the Center for Professional Advancement. He has authored several articles published both in *Cereal Foods World* and *Food Technology* during his career. He also has authored several chapters for reference books.

Presently, he is president of his consulting company, Starquest F.O.O.D. Consulting LLC, and is vice president of a new business venture, Eliza's Quest Foods, LLC, where he is involved in the production of Postum, an instant beverage. Tom can be reached at tom_luallen@starquestfood.com.