



A Cost-Effective Process for Creating Sustainable, Alternative Protein Foods

Editor's Note: Sustainable Bioproducts changed its name to Nature's Fynd in early 2020. The company recently raised \$80 million in Series B funding and began production of its protein product in a new 35,000-ft² manufacturing facility.

The Food and Agricultural Organization of the United Nations (FAO) estimates that, by 2050, agricultural production will need to grow by almost 50% to meet the world's increasing demand for food. A growing population needs access to vital protein, and current animal farming and meat alternatives are either capacity-constrained or resource-inefficient.

Consuming more meat without a step-change in efficiency is not only logistically untenable, it could also take a toll on the environment. For example, to produce one hamburger requires approximately 660 gal of water based on lifecycle estimates from the U.S. Dept. of Agriculture (USDA). Significant improvements in resource efficiency and alternative technologies (e.g., sustainable microbial production of proteins) are required at a global level to meet the increased protein demand and minimize environmental harm.

Sustainable Bioproducts (SBP), a Chicago-based food biotech company funded by the National Science Foundation and others, has developed a breakthrough technology to produce



▲ A growing population needs access to vital protein. Current animal farming and meat alternatives are either capacity-constrained or resource-inefficient.

cost-effective and sustainable proteins for use as high-quality foods.

The technology is based on an efficient solid-state fermentation process that uses an acidophilic microorganism known as MK7. The natural MK7 strain has strong enzymatic capabilities and can directly convert a wide range of feedstocks, such as sugars, cellulose, and lignin, to nutritional biomass. The resulting biomass contains 50% high-quality protein (with all essential amino acids, similar to egg albumin) and desirable amounts of unsaturated fats, vitamins, and fiber. The complete protein is also highly digestible — comparing favorably to beef — and is currently being developed into a variety of food products.

SBP's innovation is a one-step, proprietary process of surface fermentation in trays as opposed to large, energy-intensive stirred-tank reactors. Conversion times, in many cases, are less than 4 days, and deployment is simple, scalable, and straightforward in off-the-shelf growth chambers and trays. The process can be deployed in a wide range of climate-controlled conditions.

SBP's process leverages unique characteristics of MK7; for example, the microbe's tolerance of very low pH enables aggressive sterilization of the system with no deleterious effects. SBP's fermentation process is less expensive, more efficient and sustainable, and easier to deploy than current technologies for food protein production. For example, after surface fermentation, the product does not require extensive processing or purification steps; it can be subjected to a simple heat-kill procedure and then used as-is for downstream products.

SBP is currently focused on two

initial markets for its novel protein technology: meat alternatives (primary) and dairy alternatives (secondary). Both markets are growing rapidly; 2022 forecasts are projected to hit values of \$6 billion and \$14 billion, respectively. The company is poised to gain significant traction because its protein product has a desirable texture, is healthier than traditional meat, and has competitive unit economics. Through partnerships with strategic investors — Archer Daniels Midland and Danone Manifesto Ventures — the company has demonstrated its protein's versatility across many uses, including solid, liquid, and powder formats.

To commercialize the technology, SBP plans to first enter the market as a business-to-consumer (B2C) company, launching a limited number of retail products. By entering the market as a B2C company, SBP believes it can better ensure new product adoption, while simultaneously building corporate brand equity. SBP will pursue a build, own, operate (BOO) asset model for the production of the MK7 ingredient and will contract manufacture the conversion of the ingredient into finished foods for retail distribution.

Once brand equity from the B2C side of the business is established, SBP intends to extend its offerings into business-to-business (B2B) ingredient sales. SBP will also pursue a BOO asset model for B2B products. Based on the number of corporations already expressing interest, SBP plans to explore opportunities for joint ventures and co-marketing/distribution in some applications.



This technology was funded through the NSF Small Business Innovation Research Program.

This article was prepared by the National Science Foundation in partnership with CEP.