Good Food Institute

ACTION PAPER

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Plant-based meat manufacturing capacity and pathways for expansion

A summary of recommended industry stakeholder actions

A report by the Good Food Institute and Bright Green Partners quantifies existing global plant-based meat capacity and evaluates the potential for and trade-offs of retrofitting existing facilities to build additional capacity. This summary uplifts key insights from the study and outlines considerations and recommended actions for industry participants.

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Overview

The global plant-based meat market has experienced considerable growth over much of the past decade. As product availability and variety grow, the industry's supply chains must keep pace to avoid shortages and improve access and affordability. Scale-up and continued product innovation are critical for appealing to meat-eating consumers and ensuring long-term category growth.

The report, authored by the Good Food Institute and Bright Green Partners, aims to quantify existing global plant-based meat manufacturing capacity and evaluate the benefits and challenges of retrofitting facilities to build additional capacity.

The analysis focuses on the production of structured plant protein (SPP) via high or low moisture extrusion as well as the creation of end products from SPP, a step known as post-processing. Facilities suitable for retrofitting for extrusion include those that produce pet food, pasta, breakfast cereals, and dry snacks, while animal meat processing facilities are well-suited for retrofitting to plant-based meat post-processing.

The analysis demonstrates the significant potential benefits of retrofitting existing suitable facilities, requiring a third of the lead time and a fifth of the Capex, on average, compared to greenfield facility development.

The report concludes that retrofitting provides an efficient and effective solution to quickly scale capacity while achieving considerable capital expenditure (Capex) savings. This is a relevant route to consider as industry participants are not likely to perfectly align planned capacity with market growth.

Greenfield facility development is riskier, requiring significant up-front Capex investment and up to three years' lead time. However, in the long run, greenfield development allows manufacturers to optimize their operating efficiency and potentially lower production costs.

Full report: Plant-based meat manufacturing capacity and pathways for expansion

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Key findings

Current global plant-based meat manufacturing capacity is estimated to be ~2.2 million metric tons per year, far less than what is required to meet growing demand.

Extrusion capacity is well-utilized. Post-processing capacity utilization is at roughly 45 percent, but additional capacity is needed if demand rises above 2.2 million metric tons (MMT) annually. The report estimates that the majority of this post-processing capacity is in North America (34%) and Europe (41%) based on a survey of existing facilities.

Even moderate market growth may outstrip the industry's ability to serve demand within the next few years. This may lead to a capacity shortage if expansion is not adequately planned.

Retrofitting facilities from suitable industries presents significant potential benefits.

Reusing equipment and buildings allows manufacturers to retrofit a suitable extrusion or post-processing facility in days or months with up to 85 percent lower associated Capex than a greenfield facility. Retrofitting is a feasible and capital-efficient solution for scaling capacity quickly, especially when access to capital or facility financing is limited.

Greenfield facilities require more up-front Capex investment and longer lead times but provide attractive optimization opportunities.

Capital expenditures for greenfield facilities average $0.9–2.9 million per thousand metric tons (MM/TMT) of capacity versus only $0.1–0.6 MM/TMT for retrofitted facilities. Similarly, lead times for greenfield facilities can range from 18 months to three years, while retrofitting lead times may be as short as a few days when additional equipment is not needed. Despite higher up-front costs and longer lead times, greenfield facilities can optimize operational efficiency for specific production processes and the latest technologies, leading to long-term savings.

Current extrusion and post-processing manufacturers in suitable industries can diversify production via the contract manufacturing of plant-based products.

Companies from extrusion industries such as pet food, pasta, breakfast cereals, and dry snacks could diversify their production lines to function as contract manufacturers for the plant-based industry. This step would make those companies more flexible to market shifts, adding capacity to the plant-based industry during high demand and switching to other products during periods of low demand. Additionally, this would allow plant-based meat companies to grow supply with little to no capital expenditure.

Current capacity is well-utilized, but even moderate market growth may soon outstrip the industry's ability to serve demand.

Industry recommendations

Industries with potential retrofitting opportunities

Utilize contract manufacturing opportunities for portfolio diversification.

Manufacturers in suitable industries should explore the potential benefits of product flexibility. Manufacturers in the pet food, pasta, breakfast cereals, and dry snacks industries should consider acting as contract manufacturers for the plant-based meat industry. If the incumbent industries are flat or growing slowly in certain regions that also feature strong plant-based meat markets, manufacturers should look to diversify—especially if doing so is relatively low cost. Diversifying production lines would allow manufacturers to respond quickly to changing market conditions and maximize margins accordingly. The ability to build a flexible and dynamic supply chain for alternative protein products is increasingly important in the United States, as outlined in Executive Order 14081, Advancing Biotechnology and Biomanufacturing Innovation for a Sustainable, Safe, and Secure Bioeconomy, which highlights the need for modular biomanufacturing capacity.

Explore the benefits of retrofitting existing facilities for plant-based meat production.

Manufacturers in the extrusion and animal processing industries should consider retrofitting for full-time plant-based meat production. In industries whose sales and margins are under pressure due to market decline or fierce competition, retrofitting for plant-based meat production may provide an avenue for margin improvement in regions experiencing plant-based meat market growth. Similarly, existing plant-based meat producers should seek opportunities to purchase or lease facilities in industries facing such situations as cost-effective methods to scale capacity.

Alternative protein industry

Engage in strategic planning to ensure an adequate supply of plant-based products.

To meet future market demand, plant-based companies need to explore all potential avenues for growing capacity. Those options include expanding existing facilities, building new manufacturing facilities, retrofitting facilities from suitable industries, and partnering with a contract manufacturer. Retrofitted facilities and contract manufacturing agreements require the shortest lead times and lowest capital expenditures and hold the most potential to prevent shortages and improve the short-term accessibility and affordability of plant-based products.

If considering a greenfield project, emphasize efficiency and optimization.

Greenfield projects can carry more risk due to Capex and lead time requirements but hold long-term cost benefits. Companies that have the necessary scale, long-term business objectives, and project finance capabilities should investigate a greenfield configuration with a high level of automation. In greenfield facilities, companies can maximize operational and supply chain efficiency, optimize product quality by targeting production equipment and processes to achieve the desirable characteristics, and achieve better cost structures.

Use every available tool to work toward price parity.

Price remains a key barrier to consumer interest in plant-based meat, and producers should focus on reducing prices without sacrificing quality. Companies can improve the efficiency and scalability of plant-based meat production through an increased willingness to explore retrofitting opportunities and more efficient greenfield production. They should also pursue contract manufacturing opportunities with suitable facilities in the extrusion and post-processing industries. Doing so will allow manufacturers to produce plant-based meat at lower costs and offer products at competitive prices.

Engage in the open exchange of information.

To capitalize on potential contract manufacturing opportunities, plant-based meat companies or those involved in other suitable industries should more actively share capacity information.[1] A more active distribution of production and capacity information would allow industry participants to identify contract manufacturing opportunities. The information would also help participants understand where infrastructure bottlenecks exist and how best to address them.

[1] https://gfi.org/resource/contract-manufacturing-database/#contract-pilot-scale-facilities

About the author

Daniel's role at GFI focuses on alternative protein market research, industry landscape analysis, and identifying gaps and opportunities in the alternative protein market. Daniel earned both a Master of Science and a Bachelor of Science in agricultural economics from the University of Nebraska-Lincoln, where he performed research on livestock health economics, distillers' grains markets, and production topics related to Covid-19. Prior to joining GFI, Daniel worked at a dairy market intelligence and consulting firm with a portfolio of projects in economic and data analysis, price forecasts, and individual consulting projects.

Daniel Gertner
Business Analyst, The Good Food Institute
danielg@gfi.org Daniel Gertner

About GFI

The Good Food Institute is a 501(c)(3) nonprofit working internationally to make alternative proteins like plant-based and cultivated meat delicious, affordable, and accessible. GFI advances open-access research, mobilizes resources and talent, and empowers partners across the food system to create a sustainable, secure, and just protein supply.

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