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To Impossible & Beyond!

A revolution is underway in food science. Plant-based meat substitutes that taste like meat are now on the market. The food craze has set-off a stock craze. Beyond Meat has appreciated by 40% since its initial public offering in April, and Impossible Foods is preparing to raise equity.

- >> **The ingredients of these new foods provide some opportunities and some challenges.**
- >> **Health benefits are dubious, but environmental benefits are clear-cut.**
- >> **Production capacity additions are likely to chip-away at premium prices.**

Recipes for Success

On the opportunity side of the ingredient ledger, both companies have formulated products using new grains and grain combinations. Veggie burgers are not a new invention, as bean-based meat substitutes have been available for years. Instead of commonly used black beans, Impossible Foods uses a soy-based grain supplemented with potato protein. Soy has the advantage of having a readily available supply. Beyond Meats uses protein paste extracted from dry, yellow peas. Most of us know variants of these plants as chickpeas and fava beans. Peas have the advantage of being relatively high in fiber.

On the challenges front, additives to both grains have some health issues. One of the selling points of the new plant-based meat formulations is that they have a red color, similar to meats, and that they have a meaty taste. Beyond Meat uses beet juice extract to provide their color. While that additive is not too controversial, the additive that Impossible Foods uses does draw attention. Leghemoglobin is a soy product created using a lab-based, wheat fermentation process. The resulting substance yields an iron-like taste similar to blood found in most meat products. "Heme," as it is called for short, has been assigned health risks akin to those encountered with eating actual meat. Additionally, something about the contents of the Impossible Burger over-indexes Vitamins B1 and B2. Thiamine levels in these products are more than 2,000% of the recommended daily level.



Nutrition Negatives

Health characteristics deserve a bit more attention. The pea protein used in the Beyond Meat solution is high calorie, 270 calories per serving. Ground beef is 215 per similar serving. While Beyond Meat is high calorie, the Impossible Foods recipe has almost no fiber in the end product. Common elements in both plant-based meats include canola and coconut oil. As a result, both products are high fat. In fact, Beyond Meat's fat content is only 2 grams per serving lower than that of lean ground beef. Second, both products have high sodium content, higher than lean ground beef, near 20% of the recommended daily allowance. Making a case for these products based on health benefits looks challenging, however, consumers do seem to appreciate their environmental benefits.

Planet Positives

Plant-based meat companies make some assertive environmental claims. Beyond Meat markets that its product uses 46% less energy than meat products, and it has 93% less land use. Environmentalists point out that the production process of plant-based burgers results in an 89% decline in greenhouse gas emissions compared to that of meats. In terms of the crops themselves, field peas do seem to have some advantages over soy in terms of higher nutritional value and lower water needs, but a widening of their application looks to be limited by greater weather sensitivity.

Opulent Pricing Unlikely to Persist

Inspired by recipe innovations and environmental benefits and undaunted by health reservations, consumer appetite for plant-based meats is growing quickly. Impossible Foods now serves more than 7,000 restaurants including high profile Burger King, and Beyond Meat grew revenue 158% last year. Food enthusiasts and early adopters are driving growth, but some signs suggest that the growth will have limits. First, the price per pound of plant-based meat is currently near \$12. In comparison, ground beef is selling at a national average near \$3.50 per pound. Plant-based meat is priced as a luxury item, and some social premium for the product is likely warranted. However, comparing this plant-based meat premium to the premium for almond milk over cow's milk, a 66% mark-up looks to be an acceptable mass market up-charge longer term. If such a parallel holds, the price of plant-based meat-substitutes would have to cut in half to attract a broad audience.

A lack of production capacity appears to be the factor in keeping the price of plant-based meat at luxury good levels. Impossible Foods is the leading manufacturer by far with six million tons of capacity. That capacity looks to be fully utilized, and there are challenges with quickly expanding a biological-based production process. Pea protein makers are in the midst of a nearly 200% expansion in domestic production capacity. PURIS LLC is doubling capacity (200K tons to 400K tons) after a cash infusion from Conagra, and Ingredion is underway on a 160K ton greenfield plant. This capacity does not appear to be expensive at about \$1,000 per incremental ton. Food equipment manufacturers, makers of drying, grinding, and slurry equipment, are likely to see some incremental business from these plant expansions. On the agriculture side, the domestic production of yellow peas exceeds 16 million tons, which looks sufficient near term.

The new formulations of plant-based meats have some momentum that will likely lead them to improve upon their current 0.2% share of the meat/meat-substitute market. If meat mirrors the plant-based milk trend, these products could ultimately achieve 10% share of the \$200 billion meat market. The current market valuation of Beyond Meat already anticipates that the firm captures over a quarter of this market opportunity. Food giant Tyson Foods sees potential in this space, and a plant-based meat offering is expected from that firm this year. At least two additional start-ups offer competitive products as well. The growing market looks increasingly competitive.

Conclusion

At JAG, we see environmental benefits and health questions among the new plant-based meats. Exciting recipe innovations are attracting competition and the barriers to entry are not high. Our crystal ball sees growing volume and declining price in plant-based meat, with winners emerging in the food equipment side of the market. Our "Show Me" approach to ESG investing sees environmental promise in the new food innovation, but we await more evidence that the benefits of the plant-based meat investment will accrue to shareholders.



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