BLENDING MICHIGAN BEANS WITH LOCAL MEAT FOR INSTITUTIONAL MARKETS

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Introduction

Many large institutions like hospitals and universities are seeking to reduce their environmental impact and embrace their role in supporting local economies as well as consumer, employee, and community health. Food service is an area of operations where modest interventions can have a significant impact and help institutions achieve their social and environmental goals.

Shifting dietary patterns and procurement practices are two primary strategies that institutions can employ in these efforts. For example, many institutions have sought to reduce the serving size and consumption of beef products due to the large environmental impact of cattle production and health concerns related to red meat consumption.[1,2] While these efforts are often perceived as a direct threat by the broader meat industry, meat reduction programs may in fact create new opportunities for small and mid-sized producers and processors who might otherwise be locked out of these lucrative markets.

Rethinking how protein is served on institutional menus allows institutions to adopt different procurement criteria for animal products. These criteria may include reduced antibiotic use, higher animal welfare, pasture-based production methods, and geographic source verification. Proteins often make up the largest percentage of plate cost in institutional food

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service, creating a potential benefit for local food economies if purchase dollars can be shifted to supporting regional producers and processors.[3]

For example, serving each of the 1.5 million students in the Michigan K-12 school system a 2.5 ounce hamburger on one single day in the school year would require nearly 120 tons of beef.[4] This represents a potential gross sales value of $645,600 to beef producers for this single meal, assuming the current price for USDA commodity ground beef ($2.69/lb).[5] If local processing was used to produce these hamburgers, this single meal could potentially bring a quarter million dollars to the state processing sector (based on $0.97/lb processing cost for similar products made out of state).

This work explores how blended meat products can be deployed as a strategy to help small and mid-sized regional producers and their processing partners increase sales to local institutional markets.

1 de Boer, J., Schösler, H., & Aiking, H. (2014). "Meatless days" or "less but better"? Exploring strategies to adapt Western meat consumption to health and sustainability challenges. *Appetite*, 76, 120-128. Retrieved from: https://www.sciencedirect.com/science/article/pii/S0195666314000907

2 Godfray, H.C. J. et al. (2018). *Meat consumption, health, and the environment*. Science, 361(6399). Retrieved from: https://science.sciencemag.org/content/361/6399/eaam5324

3 The Cost of School Lunch (n.d.) *School Food 101*. C.S. Mott Group and Michigan State University Center for Regional Food Systems. Retrieved from: https://www.canr.msu.edu/foodsystems/uploads/files/cost-of-school-lunch.pdf

4 Michigan Department of Education. (2017) *Fast Facts*. Retrieved from: https://www.michigan.gov/documents/mde/MDE_Fast_Fact_379573_7.pdf

5 Michigan Department of Education. (2019) USDA *Average Price File*. Retrieved from: https://www.michigan.gov/documents/mde/SY_19-20_Ave_Price_File_-_Website_658879_7.pdf

Rise of the blended burger

The concept of blended burgers has been widely adopted by large institutions as an effective strategy for reducing meat consumption while maintaining serving size. The most ubiquitous version of the blended burger is made with beef, chopped mushrooms, and seasonings, and has even appeared on the menu of a national fast-food chain.[6]

The current mainstream acceptance of blended burgers can be attributed to campaigns like the James Beard Foundation Blended Burger Project™ and the Culinary Institute of America's Menus of Change® "Protein Flip" program,[7] which promote "plant-forward" menus through recipe development, promotional materials, and cooking competition sponsorships. Health Care Without Harm's "Less Meat, Better Meat" campaign[8] specifically targets the healthcare industry and encourages blended burgers as part of a broader program to incrementally reduce meat consumption.

In fact, blended meat products are nothing new and have been commonplace in both school and hospital cafeterias for several decades. Many of the most popular food service protein items such as beef patties, chicken nuggets, and pork breakfast sausage contain 10–30% textured soy protein (TSP). The practice of using TSP as a binder and filler is widespread throughout the meat processing industry and creates nutritionally equivalent products that are palatable and cost competitive.[9]

The innovation of blended mushroom and beef burgers has increased public acceptance and culinary appeal of blended meat products, but may not achieve the cost savings and nutritional equivalency necessary to allow regional livestock producers to compete in the broader institutional market, including public K-12 schools.

New strategies for blended meat products: Beef and black bean patties

Beginning in 2016, specialists at Michigan State University's Center for Regional Food Systems (MSU CRFS) started developing innovative strategies to market local proteins to institutions using novel approaches to blended meat products. Working with the MSU Meat Lab and MSU Department of Food Science and Human Nutrition, CRFS specialists pioneered processes and formulations for blending local, sustainably raised meat with several varieties of Michigan-grown edible beans. The first product that was developed was a market-ready beef and black bean burger patty (See Table 1).

Table 1: *Beef and Black Patty Bean Formulation (Yield 1–3 oz serving)*

Ingredient	25% bean to beef ratio
Michigan beef	62.37 g
Black beans (cooked, drained)	21.26 g
Salt	0.25 g
Pepper	0.19 g
Onion powder	0.37 g

The primary goal was to create a new, cost-competitive institutional food service product that would form a market access point for Michigan's small and mid-sized livestock producers and meat processors. Capturing even a small portion of the current institutional food market in Michigan could result in improved farm viability, and more stable livelihoods for Michigan's meat and livestock businesses.

In the current era of plant-based and lab-cultured meat substitutes, we recognize that blended

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6 Charles, D. (2018). *Here's Why Environmentalists Are Cheering The Latest Burger At Sonic Drive-In*. NPR. Retrieved from: https://www.npr.org/sections/the-salt/2018/03/02/590253046/heres-why-environmentalists-are-cheering-the-latest-burger-at-sonic-drive-in

7 Menus of Change (n.d.) *Menus of Change Downloadable Resources*. Retrieved from: http://www.menusofchange.org/principles-resources/resources/white-papers/

8 Health Care Without Harm (n.d.) *Blended Burger Poster*. Retrieved from: https://noharm-uscanada.org/blended-burger-poster

9 Asgar, M.A., Fazilah, A. Huda, N., Bhat, R., & Karim, A. (2010). *Nonmeat Protein Alternatives as Meat Extenders and Meat Analogs*. Comprehensive Reviews in Food Science and Food Safety. 9. 513 - 529. Retrieved from: https://doi.org/10.1111/j.1541-4337.2010.00124.x.

meat products may be perceived as a threat to livestock producers and meat processors because a reduction in meat consumption directly impacts their source of livelihood. However, we maintain that the production of blended meat products is an essential strategy that allows small and mid-size producers and processors to effectively compete on cost with the conventional meat industry. Quite simply, selling a product that contains 75% meat is better than not selling a product that is 100% meat.

Advantages of beans in blended meat products

Our work has revealed several advantages to using beans over other fillers, such as mushrooms, for application in blended meat products. For example, black beans are inexpensive, high in protein, taste good, and are widely available in Michigan.

Table 2:
Cost Comparison

	Mushrooms	Beans	Ground Beef: 85/15
Price/lb (Ave. retail [10, 11])	$3.55/lb (whole, fresh)	$1.40/lb (dried)	$3.82[12]
Price/lb (USDA processor material prices[13]	$0.79/lb (diced, individually quick frozen (IQF))	$0.37/lb (dried) $0.35/lb (canned)	$2.22/lb (coarse ground, frozen)

Cost

Dry beans are a very inexpensive source of protein, with a price ranging from $0.37/lb to $1.40/lb retail (See Table 2). One cup of dry beans becomes 3 cups when soaked and cooked,[14] effectively reducing the price of cooked beans to as low as $0.12/lb. The substantial price difference between beans and beef creates a strong price advantage when beans and beef are blended together. A burger made with 25% beans and locally sourced beef costs roughly the same as conventional blended products made with USDA commodity beef and TSP.

Table 3:
Nutrition Comparison per 100g [15]

	Mushrooms (white button, raw)	Black beans (cooked, boiled)	Ground Beef (85/15, broiled patty)
Protein	3.09 g	8.86 g	25.93 g
Dietary fiber	1.0 g	8.7 g	0 g
Energy	22 kcal (3.26 g carbohydrates)	132 kcal (23.71 g carbohydrates)	250 kcal (0 g carbohydrates)
Fat	0.34 g	0.54 g	15.41 g
Saturated fat	0 g	0 g	5.9 g
Child Nutrition Program Meal Contribution[16]	2 oz raw, sliced = 1 vegetable credit	2 oz drained beans = 1 M/MA credit	1 oz cooked lean meat = 1 M/MA credit

10 United States Department of Agriculture (2018). *Fruit and Vegetable Prices*. Economic Research Service. Retrieved from: https://www.ers.usda.gov/data-products/fruit-and-vegetable-prices.aspx

11 United States Department of Labor (n.d). *Databases, Tables & Calculators by Subject*. Bureau of Labor and Statistics. Retrieved from: https://www.bls.gov/data/#prices

12 United States Department of Agriculture (2019). *Meat Price Spreads. Economic Research Service*. Retrieved from: https://www.ers.usda.gov/data-products/meat-price-spreads/

13 United States Department of Agriculture (n.d.) *Processor Material Prices. Food and Nutrition Service*.Retrieved from: https://www.fns.usda.gov/fdd/processor-material-prices

14 The Bean Institute (n.d.) *Bean Counting: The Bean Yield Chart*. Retrieved from: http://beaninstitute.com/bean-counting-the-bean-yield-chart/

15 United States Department of Agriculture (2018). *National Nutrient Database for Standard Reference 1*. Agriculture Research Service. Retrieved from: https://fdc.nal.usda.gov/

16 United States Department of Agriculture (n.d.) *Food Buying Guide for Child Nutrition Programs Interactive Web-Based Tool*. Retrieved from: https://foodbuyingguide.fns.usda.gov

Nutrition

Beans contain around 9 grams of protein per cooked serving and are creditable as a meat alternate (M/MA) under current federal school nutrition guidelines. [17] Beef and bean blended products have the same amount of protein as 100% beef and reduce the amount of meat per serving. This is critically important for K-12 school food service, where each meal must credit properly to receive federal reimbursement. The patty formulation is also low in sodium and complies with the National School Lunch sodium reduction mandate.[18] As additional benefits, the blended beef and bean burger contains no soy allergens and is a "clean label" product, meaning it contains no preservatives, additives, or other artificial or synthetic ingredients.[19]

Taste and functionality

This work has shown that beans are a good binder and extender when blended with beef. Formulations with a low percentage (less than 25%) of beans create a blended patty that is moist, palatable, and not immediately distinguishable from 100% beef burgers in taste or appearance.

Taste panels conducted by the MSU Department of Food Science and Human Nutrition used a 9-point hedonic scale (1 = extremely dislike, 5 = neither like nor dislike, 9 = extremely like) to rate overall liking and sensory attribute liking (appearance, flavor, texture). Panels found that research participants

Table 4: *Taste Panel Results* (n = 6)

Ratings	Ratio 2 (25%)
Overall liking	6.7 $\pm$ 1.0
Appearance	6.0 $\pm$ 1.9
Flavor	**7.2 $\pm$ 0.8**
Texture	**7.2 $\pm$ 1.1**

Michigan is ranked first in the nation for black bean production, allowing the beef and bean burgers to be 99% Michigan sourced.

generally liked (6.7) the beef and bean patties, and used words like "meaty" to describe the flavor (See Table 3). When sampled alongside conventional food service beef patties containing TSP, research participants strongly preferred the beef and bean burgers. Field pilots with students in schools and university housing found similar results. The overall acceptance was high.

Additional observation from field tests revealed that the blended beef and bean burgers were easy for food service staff to handle and prepare and retained moisture and flavor when held at serving temperature for extended periods.[20]

Economic impact

Michigan is ranked first in the nation for black bean production, allowing the beef and bean burgers to be 99% Michigan sourced. Additionally, these blended meat products are specifically designed to be made in nearly any small, USDA-inspected meat plant without the need to invest in expensive, specialized processing equipment. This allows the beef and bean blended products to be marketed and made locally in both urban and rural communities across Michigan and ensures that institutional procurement dollars are kept local.

17 United States Department of Agriculture (n.d.) *Food Buying Guide for Child Nutrition Programs Interactive Web-Based Tool.* Retrieved from: https://foodbuyingguide.fns.usda.gov

18 United States Department of Agriculture (n.d.). *Tools for Schools: Reducing Sodium.* Retrieved from: https://www.fns.usda.gov/school-meals/tools-schools-sodium

19 The term "clean label" is driven by consumer advocates and is not defined by the US Food and Drug Administration.

20 Observation from Battle Creek Schools, March 2016.

Opportunities for future development

At time of this report, the beef and black bean patty products have been piloted by a regional hospital system and a university student housing unit. Producers, processors, and institutional food service professionals that are interested in this project should reach out to CRFS for additional information on opportunities to make and source these products. Future opportunities include measuring and tracking the direct and indirect economic impact of these blended products across Michigan and the Midwest.

Conclusion

This work has demonstrated that blended meat and bean products are a potentially viable solution for small and mid-scale livestock producers and their meat processing partners looking to tap into a stable, high volume institutional market. In particular, the low cost and high protein content of meat and bean blended products could allow regional producers to successfully supply K-12 schools and meet Child Nutrition requirements. Meat and bean blended products are an opportunity for institutions to improve protein sourcing and generate local economic impact while reducing overall meat consumption in line with institutions' health and environmental goals.

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