

**Sustainable Food:
Surveying UTK Students on Plant-Based Meat**

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Abstract

The purpose of this study is to answer the following question: If the University of Tennessee, Knoxville (UTK), had more plant-based meat alternatives (PBMA), would UTK students eat more plant-based meat? With the need to reduce meat consumption due to climate change (Stehfest et al., 2009); the rise of PBMA, such as Impossible Foods and Beyond Meat, across college campuses (Helmer, 2019); and the campus-wide initiative of UTK to provide “Sustainable Food” (“What is Green Thread?” n.d.)—UTK has 9 out of 40 Vol Dining locations that offer PBMA. Should there be more PBMA locations? In an online survey of 50 UTK students, I found that 54% of respondents would be “very likely” and 28% would be “likely” to eat more PBMA if more Vol Dining locations provided them. Thus, to meet the student demand in PBMA and reduce the campus’ environmental footprint, Vol Dining should consider incorporating more of these alternatives into the on-campus dining experience.

Keywords: Sustainable food, plant-based meat, UTK, students, survey

Sustainable Food:

Surveying UTK Students on Plant-Based Meat

The livestock sector is a major contributor to climate change. Globally, not only does animal agriculture exhaust many natural resources, but it emits 14.5% of the greenhouse gases (GHGs) created by human activity (Grossi et al., 2019). Moreover, 45% of these livestock emissions are from the beef cattle industry, which annually surpasses all other animal agricultural industries with an equivalent of 1.8 gigatons of carbon dioxide—further fueling global warming (Grossi et al., 2019). What this means is that current meat production is unsustainable. And to reduce meat production will require a reduction in meat consumption—a shift from meat-rich diets to plant-rich diets (Stehfest et al., 2009).

Consequently, companies like Impossible Foods and Beyond Meat apparently have risen to the challenge. Taking on the meat industry and targeting regular meat consumers, they sell plant-based meat alternatives (PBMAs), products that imitate meat but contain no actual meat, only plant-based ingredients (Reiley, 2019). Is the promotion of plant-based meat as a sustainable alternative to meat merely a marketing ploy, or is plant-based meat truly better for the environment? A Life Cycle Analysis (LCA) of Beyond Meat's pea-protein burger, "Beyond Burger," revealed that, compared to a US beef burger, it produces 90% fewer GHG emissions, while also needing "46% less energy, 99% less water, and 93% less land" (Hu et al., 2019, 1,547). This LCA suggests that "if a substantial number of consumers" substituted plant-based meat for animal meat more often, this dietary change could have "a major positive impact on the environment" (McClements, 2020). Clearly, the environmental benefits of PBMAs are very real, and they may play an important role in mitigating climate change.

College campuses across the United States are starting to take notice. For example, colleges like Vanderbilt University, Cornell University, Unity College, the University of Chicago, and Yale University have incorporated PBMAs into their dining options due to a significant

number of students who want meatless alternatives (Helmer, 2019). The University of Tennessee, Knoxville (UTK), is also among those colleges that offer PBMA, although the Vol Dining website does not advertise any (“Vegan & Vegetarian Options,” n.d.).

This lack of information on Vol Dining PBMA could be misleading. The Vol Dining website lists vegan and vegetarian items such as meatless salads and veggie sandwiches, but it does not inform students on whether they can substitute meat analogues for real meat (“Vegan & Vegetarian Options,” n.d.). Without promotion of such options, it could be more difficult for students to find PBMA, thus affecting their dietary choices on campus. If staple foods like beef burgers, for instance, are much easier to locate than faux-beef burgers, could this accessibility gap discourage students from opting for the more sustainable product? The Vol Dining web page assures students that it is dedicated to the “Sustainable Food” initiative, which values local and environmentally conscious production of food (“What is Green Thread?” n.d.). But UTK has yet to join other colleges in challenging meat consumption by promoting plant-based meat options (Helmer, 2019).

This context is important when exploring the possibility of introducing more PBMA on campus. After all, UTK may need to supplement this PBMA increase with an awareness initiative, ensuring students not only have more PBMA options but know where to find them. With this context in mind, then, would greater accessibility to PBMA lead to less meat consumption and, thus, a smaller environmental footprint? Does UTK have enough PBMA locations? Vol Dining must look to students for the answer. After all, their perceptions of plant-based meat will determine whether having more PBMA options would interest them. This study will help make clear whether UTK students want more plant-based meat as part of their Vol Dining experience.

Methods

To survey UTK students on plant-based meat, I designed a 10-question survey on SurveyMonkey, which, on average, took respondents about two minutes to complete. Because my study's research population comprises only UTK students, the survey began with a message instructing participants only to proceed if they are students at the University of Tennessee, Knoxville. It also clarified the terms "plant-based meat" and "eating on campus." This was to avoid possible confusion and misinterpretation of the survey questions. Furthermore, all but the first question used a 5-point Likert scale, and each question provided quantitative data that convert easily to percentage bar graphs.

In questions 1–3, I asked respondents whether they live on campus, how often they eat on campus, how often they consume meat, and how often they consume plant-based meat. By asking about students' eating habits, I can provide important context for their subsequent answers. In questions 4–10, I gauged students' perceptions of plant-based meat, especially in relation to real meat, and examined their willingness to eat more PBMA. The key question in the survey—and the purpose for this study—was the final question in which I asked students how likely they would eat more PBMA if more Vol Dining locations offered them. See Appendix A for the 10-question survey to which students responded (Table 1).

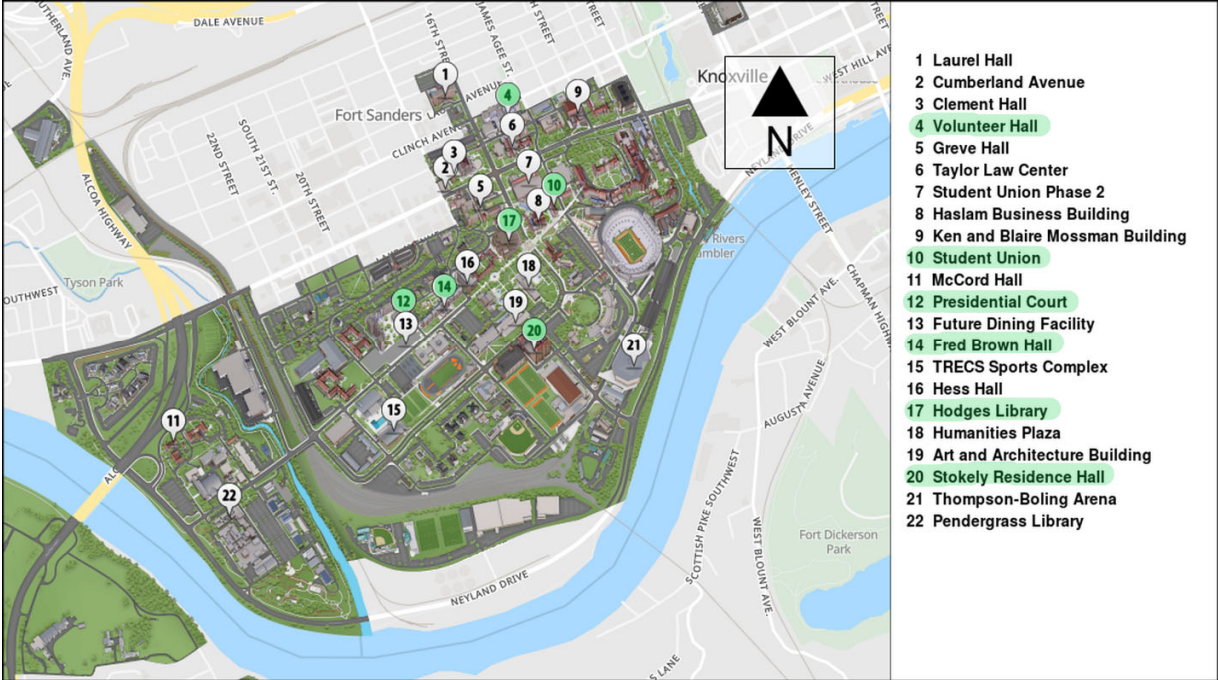
After creating this survey, I emailed the survey link to Cassie Austin, academic engagement specialist for the UTK Office of Sustainability, who then promoted it to UTK students through the Office's Instagram account (@UTSustainability) and October 2020 newsletter (*The Green Leaf*). I also emailed the survey link to two faculty members of UTK: Dr. Russel Hirst, lecturer and program director of technical communication, and Dr. Melissa Hinten, lecturer and program director of sustainability—both of whom shared the survey with their students. The online survey was active from September 23 to November 10, 2020.

Once I collected the results of my survey, I emailed a nutritional counselor at UTK about which Vol Dining locations have PBMA and what kinds of PBMA they offer. In response, she created a complete list and sent it to me. From this list, I then made a table with each PBMA location, its building, and its PBMA options (Appendix B), and I generated a map of the locations using UTK’s “Campus Map” (n.d.) to help visualize accessibility of plant-based meat (Figure 1).

Results

After contacting a nutritional counselor at UTK, I discovered that 9 out of 40 Vol Dining locations have at least one PBMA. Depending on the dining location, options range from black bean burgers to Beyond Sausage to vegan chicken to tacos with Impossible Meat (Appendix B). Thus, with regards to the options themselves, one can argue that there is a fair amount of variety on campus. As for accessibility, the map below shows how PBMA locations are distributed across campus:

Figure 1
Map of UTK Buildings with Plant-Based Meat



Note. I generated this map using UTK’s online “Campus Map” (n.d.), pinning the 22 buildings designated as Vol Dining locations and highlighting in green the 6 with PBMA.

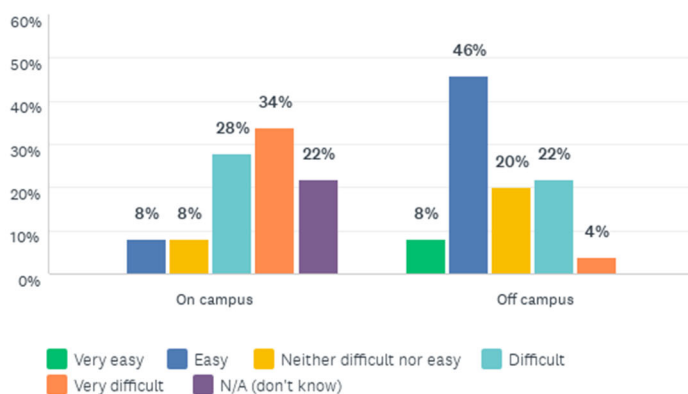
Although UTK has 9 dining locations with PBMA, there are just 6 buildings with PBMA: Volunteer Hall (Dunkin’ Donuts), Student Union (Starbucks, Qdoba, and Subway), Presidential Court (PCB Café), Fred Brown Hall (Subway), Hodges Library (Starbucks), and Stokely Hall (Starbucks and Fresh Food Company) (Appendix B). As the map above illustrates, these 6 buildings mostly occupy the northeast side of the main campus area. Additionally, 16 buildings designated as Vol Dining locations do not have PBMA (Figure 1). Having more PBMA on campus, then, might mean not only having more PBMA locations in buildings that already have them but introducing PBMA to more buildings, which would enhance accessibility.

How accessible are PBMA on campus? The figure below highlights the results of one my survey questions that attempts to address this issue:

Figure 2

Difficulty of Finding On-Campus PBMA Vs. Off-Campus PBMA

Q5 How difficult is it for you to find plant-based-meat options?



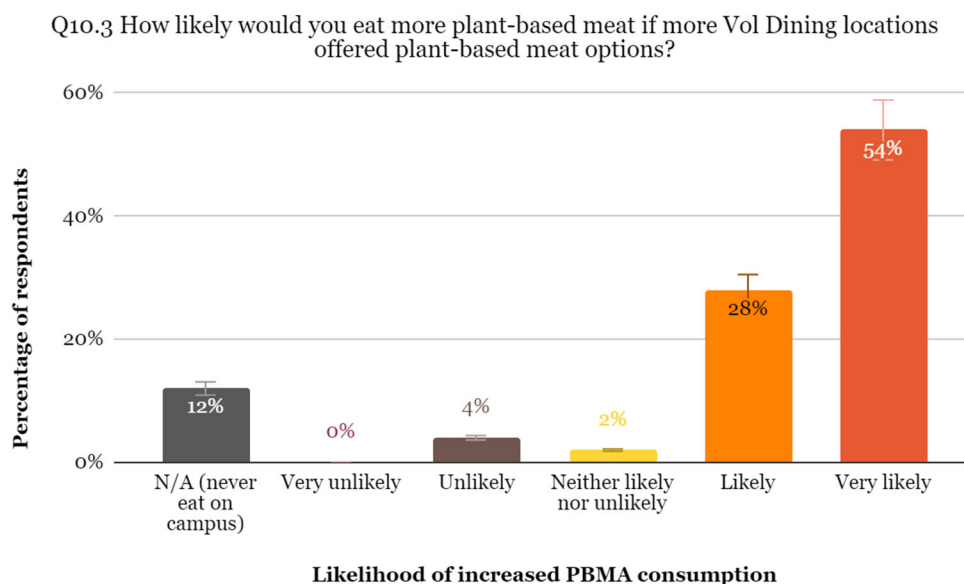
According to Figure 2, respondents have a harder time finding PBMA on campus than they do off campus. In summary, the weighted average for difficulty is 4.13/5 on campus,

whereas it is only 2.68/5 off campus (Appendix A, Q5). Moreover, 22% do not know where to find PBMA on campus, but 0% said they do not know where to find them off campus (Figure 2). This disparity could be partly due to most respondents (76%) living off campus and, on average, eating on campus only a few times per month, the weighted average for frequency being 3.52/5 (Appendix A, Q1–2). However, it is possible that the higher off-campus living and dining are a temporary result of the COVID-19 pandemic. Another potential factor, as I discussed earlier, is the lack of PBMA marketing. Nevertheless, since respondents feel PBMA accessibility on campus is worse, this perception could impact their desire to see more PBMA on campus. In other words, the difficulty of finding PBMA locations may mean that they are more likely to want more PBMA locations.

With this context established, how likely would UTK students eat more PBMA if more Vol Dining locations offered them? This was the final question of my survey and is the purpose of this study. Below is a graph summarizing the results of my research question:

Figure 3

Likelihood of Increased PBMA Consumption with Increased PBMA Accessibility on Campus



As Figure 3 indicates, if more Vol Dining locations offered PBMA, 54% of respondents would be “very likely” and 28% would be “likely” to increase their PBMA consumption. In other words, 82% said they would be willing to eat more plant-based meat in this scenario. These results suggest that 9 PBMA locations currently are not enough to meet student demand and, thus, that Vol Dining should increase accessibility to PBMA by providing more dining locations with plant-based meat.

Do these results reflect the beliefs of most UTK students? The first consideration is the sample size. In Fall 2020, UTK had 30,559 students (“Quick Facts,” n.d.), and in the 49 days my survey was active, I surveyed 50 students, only about 0.2% of the research population. With an 80% confidence level, then, the margin of error for my survey results is 9% (“Margin of error calculator,” n.d.). Therefore, if one only accounts for sample size, 45–63% of UTK students would be “very likely” and 19–37% would be “likely” to eat more PBMA given the option of more PBMA locations. That would amount to at least 64%, or 19,557 students, who are willing to increase their PBMA consumption.

However, the second consideration casts some doubt on these statistics. Not only is the sample size relatively small, but it is also a convenience sample. The survey relied on responses from UTK students with an interest in sustainability. For example, distribution of the survey by the Office of Sustainability inevitably favored students who are more receptive to plant-based meat; after all, students following the Office’s Instagram account and newsletter likely are more concerned about the environment.

Indeed, my survey found that 62% of respondents are “extremely concerned” about the environmental impacts of meat consumption/production (Appendix A, Q4). This statistic is higher than one might expect. Additionally, another result that might raise questions about the survey’s accuracy is that, according to the weighted average, respondents eat plant-based meat nearly as often as meat—2.64/5 and 2.7/5 respectively (Appendix A, Q3). Interestingly, despite their relatively low meat consumption and relatively high PBMA consumption, most

respondents (56%) “strongly agree” that they want to decrease their own meat consumption (Appendix A, Q9). Nonetheless, what these results indicate is that the survey tapped into a demographic that has a higher awareness of environmental issues and that leans toward sustainable action.

Discussion

From my study, I found that most respondents want more PBMA options on campus. Supporting this overwhelmingly pro-PBMA response are other key findings that (1) most respondents find it difficult to access PBMA on campus, (2) most are extremely concerned about the environmental impacts of meat, and (3) most want to eat less meat. These results suggest that Vol Dining should consider boosting the presence of plant-based meat on campus, as part of its Sustainable Food initiative.

As my methods and results suggest, the major limitation of my study was the difficulty in acquiring a representative sample size. That the survey respondents lean toward sustainability, however, does not indicate intentional bias in the data collection process, but rather a convenience bias that resulted from a lack of online distribution resources and a pandemic that severely limited my accessibility to survey respondents. Had it not been for COVID-19, I would have interviewed students in person. However, under the circumstances during this study, I understood that many students would have refused (or been hesitant to accept) such an arrangement. The solution to this limitation is for Vol Dining to take up my study’s research question—whether to incorporate PBMA into more dining locations—by using its greater resources to survey a wider range of UTK students.

In pursuing my research question further, Vol Dining should also investigate how best to market plant-based meat. After all, in my study, I did not research which marketing mediums and ways of framing plant-based meat to students could increase PBMA awareness and improve PBMA perceptions. It is important to fill this gap in my survey data since it is unclear why my

survey respondents find it much more difficult to get PBMA's on campus than off campus. Could it be that campus has fewer PBMA's? Or could it be UTK's lack of information about PBMA locations and options? If my respondents are, in fact, sustainability-leaning, then one would expect them to be the most informed students regarding PBMA access on campus, so students who are not as sustainability-leaning might be even less informed. By researching this aspect of PBMA perceptions, Vol Dining could find out whether better promotion of PBMA's might obviate the need for more PBMA locations.

Therefore, I recommend that Vol Dining research student demand for PBMA's, as well as research effective marketing strategies, to increase PBMA consumption. The reason for considering this initiative is that better accessibility and/or better awareness could increase PBMA consumption and decrease meat consumption, which would reduce UTK's environmental footprint. As a campus that prioritizes sustainable food, UTK must ensure it is maximizing those options that are best for the local community and the planet. This study, then, lays the groundwork for further studies to explore how plant-based meat could make the UTK campus a better model for environmental stewardship and sustainability.

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Appendix A Survey Results

Table 1

UTK Survey on Plant-Based Meat

Q1. Do you live on campus?												
Answer Choices		Responses										
Yes		24%	12									
No		76%	38									
		Answered	50									
		Skipped	0									
Q2. About how often do you eat on campus?												
Answer Choices		Responses										
Very often (every day)		4%	2									
Often (a few times a week)		20%	10									
Occasionally (a few times a month)		28%	14									
Infrequently (less than a few times a month)		16%	8									
Never		32%	16									
		Answered	50	Weighted average: 3.52								
		Skipped	0									
Q3. About how often do you eat the following?												
	Never		Infrequently (less than a few times a month)		Occasionally (a few times a month)		Often (a few times a week)		Very often (every day)		Total	Weighted Average
Meat	38%	19	8%	4	16%	8	22%	11	16%	8	50	2.7
Plant-based meat	22%	11	26%	13	28%	14	14%	7	10%	5	50	2.64
											Answered	50
											Skipped	0
Q4. How concerning to you are the impacts of meat consumption / production on....												
	Not at all concerning	Not so concerning	Somewhat concerning	Very concerning	Extremely concerning	Total	Weighted Average					

the environment (climate change, pollution, habitat loss, water use, etc.)?	0%	0	2%	1	8%	4	28%	14	62%	31	50	4.5		
the animals themselves (ethical / moral / religious concerns)?	2%	1	8%	4	30%	15	22%	11	38%	19	50	3.86		
human health (cholesterol, obesity, diabetes, heart disease, etc.)?	0%	0	16%	8	24%	12	26%	13	34%	17	50	3.78		
											Answered	50		
											Skipped	0		
Q5. How difficult is it for you to find plant-based-meat options?														
	Very easy		Easy		Neither difficult nor easy		Difficult		Very difficult		N/A (don't know)		Total	Weighted Average
On campus	0%	0	8%	4	8%	4	28%	14	34%	17	22%	11	50	4.13
Off campus	8%	4	46%	23	20%	10	22%	11	4%	2	0%	0	50	2.68
												Answered	50	
												Skipped	0	
Q6. How does plant-based meat taste to you?														
	Very bad		Bad		Neither good nor bad		Good		Very good		N/A (don't know)		Total	Weighted Average
On campus	2%	1	2%	1	12%	6	12%	6	10%	5	62%	31	50	3.68
Off campus	0%	0	0%	0	16%	8	44%	22	28%	14	12%	6	50	4.14
												Answered	50	
												Skipped	0	
Q7. How expensive to you are plant-based-meat options?														
	Very inexpensive		Inexpensive		Neither expensive nor inexpensive		Expensive		Very expensive		N/A (don't know)		Total	Weighted Average
On campus	0%	0	6%	3	14%	7	16%	8	4%	2	60%	30	50	3.45
Off campus	4%	2	8%	4	12%	6	56%	28	12%	6	8%	4	50	3.7
												Answered	50	
												Skipped	0	

Q8. How positive overall is your experience with plant-based meat?														
	Very negative		Negative		Neutral		Positive		Very positive		N/A (never eaten it there)		Total	Weighted Average
On campus	2%	1	6%	3	14%	7	10%	5	8%	4	60%	30	50	3.4
Off campus	0%	0	2%	1	8%	4	40%	20	40%	20	10%	5	50	4.31
													Answered	50
													Skipped	0
Q9. How strongly do you agree with the following statements?														
	Strongly disagree		Disagree		Neither agree nor disagree		Agree		Strongly agree		N/A (don't know)		Total	Weighted Average
Plant-based meat is better for the environment than real meat.	4%	2	2%	1	6%	3	26%	13	62%	31	0%	0	50	4.4
You would feel better about eating plant-based meat than you would about eating real meat.	4%	2	0%	0	20%	10	14%	7	62%	31	0%	0	50	4.3
Eating plant-based meat is healthier than eating real meat.	6%	3	4%	2	28%	14	26%	13	34%	17	2%	1	50	3.8
You would like to eat less real meat.	4%	2	4%	2	8%	4	18%	9	56%	28	10%	5	50	4.31
You would like to eat more plant-based meat.	4%	2	6%	3	16%	8	26%	13	44%	22	4%	2	50	4.04
													Answered	50
													Skipped	0
Q10. How likely would you eat more plant-based meat if campus had the following?														
	Very unlikely		Unlikely		Neither likely nor unlikely		Likely		Very likely		N/A (never eat on campus or never eaten real meat)		Total	Weighted Average
Plant-based-meat options that taste as good as real-meat options	0%	0	2%	1	8%	4	24%	12	52%	26	14%	7	50	4.47
Plant-based-meat options that cost the	2%	1	6%	3	4%	2	16%	8	64%	32	8%	4	50	4.46

same as real-meal options															
More Vol Dining locations that offer plant-based-meat options	0%	0	4%	2	2%	1	28%	14	54%	27	12%	6	50	4.5	
													Answered	50	
													Skipped	0	

Appendix B PBMA Locations at UTK

Table 2

Vol Dining Locations with Plant-Based Meat

Dining location	Buildings	PBMAs
PCB Café	Presidential Court	Black bean burgers, vegan chicken, & vegan beef options
Fresh Food Company	Stokely Hall	Black bean burgers, vegan chicken, & vegan beef options
Starbucks	Student Union, Hodges Library, & Stokely Hall	Beyond Meat
Dunkin' Donuts	Volunteer Hall	Beyond Sausage
Qdoba	Student Union	Impossible Meat (for tacos, burritos, nachos, salads, rice bowls, etc.)
Subway	Student Union & Fred Brown Hall	Vegetarian Patties