Developing Bockie; The Evolution of Vegan Bockwurst for the Indonesian Market

Ivan Joe[1], Amaka Okafor[2], Shiftra Marie[3], Marta Bartels[4], *Aditya Nova Putra[5], Siti Nutrifiana[6], Niken Taufiqurrahmi Listyorini[7]

[1]International University Liaison Indonesia, Associate Tower 7th, Intermark, BSD, 15310
e-mail: *Aditya.putra@iuli.ac.id

ABSTRACT. The emergence of plant-based foods has sparked a global shift towards sustainable and healthier dietary choices. This paper explores the development and introduction of a novel vegan sausage into the Indonesian market. Utilizing locally sourced tofu as the primary ingredient, this sausage aims to cater to the growing demand for plant-based alternatives while addressing sustainability concerns within the food industry. Incorporating a taste enhancer from the Korean company, Cheil Jedang Food & Nutrition Technology (CJ FNT), which initiated this endeavor as a competitive challenge, enhances the flavor profile of the sausage, making it appealing to a wide range of consumers. Through a combination of market analysis, nutritional evaluation, and sensory testing, this paper examines the feasibility and potential impact of introducing such a product in Indonesia. By highlighting the benefits of plant-based diets for both personal health and environmental sustainability, this study contributes to the promotion of sustainable food practices in emerging markets

Keywords: plant based food, sausage, sustainability, food industry

1. INTRODUCTION

The global food landscape is undergoing a remarkable transformation, driven by increasing awareness of the environmental and health implications of traditional dietary habits. As such, there is a growing demand for sustainable and plant-based alternatives to conventional animal-derived products.

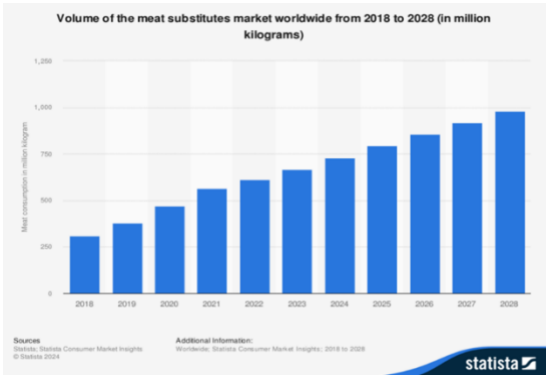


Figure 1.1
Volume of the Meat Substitutes market from 2018 to 2028

This graph shows how the consumption of meat substitutes rose over the past years and predicts how it should continue to rise over the next few years.

Recognizing this trend, we decided to create a vegan sausage and bring it to the Indonesian market. Indonesia, with its rich culinary heritage and diverse population, presents a unique opportunity for the introduction of plant-based products. However, the concept of veganism and plant-based diets is still relatively novel in the country, making it crucial to provide accessible and appealing options to consumers. By developing a vegan sausage that incorporates familiar ingredients like tofu, we aim to bridge the gap between traditional Indonesian cuisine and contemporary dietary preferences. Our sausage, made out of tofu which is a type of food made from soybeans. Tofu is already popular in Indonesia and is a good source of protein, which is important for a healthy diet. The goal is to offer a food option that is not only delicious but also good for the environment. Adopting a plant-based diet offers numerous benefits, benefiting both individuals and the planet. Plant-based foods naturally contain lower levels of saturated fats and cholesterol, promoting heart health and overall well-being. Furthermore, shifting away from reliance on animal agriculture associated with traditional diets can alleviate environmental concerns such as deforestation, water pollution, and greenhouse gas emissions. Crucially, transitioning to plant-based diets plays a pivotal role in reducing food-related emissions, particularly stemming from livestock

farming. Cattle, in particular, are significant contributors to greenhouse gas emissions, mainly through methane and nitrous oxide production. By embracing plant-based alternatives, we have the opportunity to effectively mitigate these emissions, thereby contributing to global efforts to combat climate change.

Importantly, the Korean company, Cheil Jedang Food & Nutrition Technology (CJ FNT), started this project as a competitive challenge, driving innovation and fostering a spirit of healthy competition in the development of plant-based products.

They wanted to see who could come up with the best plant-based product. This challenge pushed us to be creative and think of new ideas. By working with CJ FNT, we have optimized the flavor profile of our vegan sausage to ensure consumer satisfaction. This collaboration underscores our commitment to innovation and quality, further enhancing the market appeal of our product.

In this paper, we aim to elucidate the rationale behind the development of our vegan sausage, emphasizing the triple objectives of promoting healthier dietary choices, advancing sustainability in the food industry, and mitigating food-related emissions. By fostering dialogue and collaboration among stakeholders, we aspire to catalyze positive change and contribute to the burgeoning plant-based movement in Indonesia and beyond. (Mosedale, J., & Voll, F. (2018). Nachhaltigkeit und Tourismus (Vol. 14). Mannheim: MetaGIS-Systems; Grunwald, A., & Kopfmüller, J. (2012). Nachhaltigkeit. Frankfurt: Campus.; Sloan, P., Legrand, W., & Chen, J. (2013). Sustainability in the hospitality industry: principles of sustainable operations (2 ed.). London: Routledge.) By offering a tasty and healthy vegan sausage, we can encourage more people to try plant-based foods. This can lead to better health outcomes and help protect our environment. Our project also shows how important it is to work with others. By collaborating with companies like CJ FNT, we can create better products and make a bigger impact. Additionally, we want to highlight the importance of local ingredients. By using tofu made from locally grown soybeans, we support local farmers and businesses. This not only helps the local economy but also reduces the environmental impact of transporting food over long distances. Overall, our vegan sausage project is about more than just creating a new food product. It's about promoting healthier eating habits, protecting the environment, and working together to make positive changes.

2. LITERATURE REVIEW

2.1. Environmental Impact

The introduction of our vegan sausage, Bockie: Vegan Bockwurst, into the Indonesian market signifies a notable step towards reducing the environmental footprint associated with food production. By utilizing locally sourced tofu as the primary ingredient, we are not only supporting local farmers but also significantly reducing the carbon emissions typically associated with transportation. Additionally, our strategic collaboration with CJ FNT enables us to incorporate taste enhancers without resorting to artificial additives, thereby minimizing the environmental impact of the production process.

Furthermore, the shift towards plant-based diets inherently promotes environmental sustainability by mitigating the adverse effects of traditional livestock farming. Plant-based foods require significantly fewer natural resources, such as water and land, compared to animal agriculture. By reducing reliance on animal-derived ingredients, our product contributes to the conservation of ecosystems, minimizes deforestation, and helps combat biodiversity loss.

2.2. Strategies for Enhanced Sustainability

a. Environmental Sustainability

Emphasizing the use of locally sourced ingredients is a core aspect of our sustainability strategy. By minimizing transportation distances, we reduce greenhouse gas emissions associated with food distribution. Additionally, our commitment to reducing food waste by optimizing recipe formulations and production processes further enhances our environmental sustainability efforts.

b. Social Sustainability

Our initiative prioritizes social sustainability by fostering partnerships with local communities and supporting small-scale tofu producers. By sourcing ingredients locally, we empower local farmers and contribute to the economic development of rural areas. Moreover, we prioritize fair labor practices throughout our supply chain, ensuring that all stakeholders are treated ethically and equitably.

c. Economic Sustainability

Incorporating sustainable practices into our production processes not only benefits the environment and society but also contributes to long-term economic viability. By reducing energy consumption, minimizing waste generation, and optimizing resource utilization, we enhance operational efficiency and reduce production costs. Moreover, by catering to the growing demand for plant-based alternatives, we capitalize on emerging market trends, thereby ensuring the financial sustainability of our venture.

In summary, our commitment to environmental, social, and economic sustainability underscores our dedication to creating a positive impact on both local communities and the global food system. Through continuous innovation, collaboration, and responsible business practices, we aim to pave the way for a more sustainable and resilient future in the food industry.

3. METHODOLOGY

In this study, we aimed to develop a delicious and satisfying vegan sausage named Bockie: Vegan Bockwurst. Our research is focused on creating a plant-based sausage that closely mimicked the texture and appearance of traditional bockwurst while incorporating vegan ingredients. The methodology is using based on

experiment method. Through a series of experiments (6 trials and errors) and recipe iterations, we explored the optimal combination of ingredients and cooking techniques to achieve a sausage-like texture. This section outlines our research method, including the process, materials, and formula utilized in the development of the Bockie: Vegan Bockwurst.

1st trial	2nd trial	3rd trial	4th trial
400gr tofu	300gr silken tofu	300gr silken tofu	300gr silken tofu
3 tbsp cold water	3tbsp ketchup	3 tbsp ketchup	3 tbsp ketchup
½ onion	1tbsp soy sauce	1 tbsp soy sauce	1 tbsp soy sauce
1 ½ tbsp salt	2 tbsp vegetable oil	2 tbsp olive oil	2 tbsp olive oil
3 pinches of cardamom powder	1 tsp chili powder	1 tsp chili powder	1gr garlic powder
2 pinches of nutmeg powder	1 ½ tsp paprika powder	1 ½ tsp paprika powder	1 tsp chili powder
½ tsp cinnamon	1 tsp ground blackpepper	1.2 tsp five spices powder	1 ½ tsp paprika powder
2 tsp mustard	220 gr vital wheat gluten	2 garlic cloves	1 tsp ground white pepper
40 gr cornstarch	Texturized soy protein	1 tsp ground white pepper	1.2 tsp five spices powder
30 gr tempe flour	Nucleotide IMP & VMeat Tastenrich RCK	220 gr vital wheat gluten	200 gr vital wheat gluten
Coconut oil		Nucleotide IMP & VMeat Tastenrich RCK	20 gr cornstarch
Nucleotide IMP & VMeat Tastenrich RCK			Nucleotide IMP & VMeat Tastenrich RCK

5th trial	6th trial	7th trial	Final Formulation
150gr silken tofu	300g silken tofu	300g silken tofu	300g silken tofu
7.5 ml ketchup	15 ml ketchup	45 ml beetroot puree	60 ml beetroot puree
7.5 ml vegan mayonnaise	15 ml vegan mayonnaise	15 ml water	30 ml olive oil
7 gr beetroot	15 gr beetroot	30 ml olive oil	15 gr salt
7.5 ml soy sauce	15 ml soy sauce	15 gr salt	7.5 gr garlic powder
3 gr salt	30 ml olive oil	7.5 gr garlic powder	3 gr chili powder
15ml olive oil	2gr garlic powder	3 gr chili powder	4.5 gr paprika powder
1gr garlic powder	3 gr chili powder	4.5 gr paprika powder	1.5 gr ground white pepper
1.5gr chili powder	4.5 gr paprika powder	1.5 gr ground white pepper	1.2 gr cumin powder

2gr paprika powder	4 gr ground white pepper	1.2 gr cumin powder	1.2 gr five spice powder
1.5 gr ground white pepper	4.5 gr cumin powder	1.2 gr five spice powder	180 gr vital wheat gluten
2 gr cumin powder	180 gr vital wheat gluten	180 gr vital wheat gluten	10 gr corn starch
100 gr vital wheat gluten	20 gr corn starch	10 gr corn starch	10 gr all purpose flour
10 gr corn starch	Nucleotide IMP & VMeat Tastenrich RCK	10 gr all purpose flour	0.3 gr Nucleotide I&G
Nucleotide IMP & VMeat Tastenrich RCK		Nucleotide IMP & VMeat Tastenrich RCK	2.5 gr Vmeat tasterich B5

Step of Cooking Method;

1) Steam tofu for ~10 minutes

2) Put tofu, beetroot puree, water, olive oil, salt, garlic powder, chili powder, paprika powder, ground white pepper, five spice powder, and cumin powder into a food processor, blitz it until smooth and homogenous,

3) Combine vital wheat gluten, all-purpose flour, and cornstarch, add into the food processor and blitz only until all the flour is incorporated,

4) Divide the dough into portions and roll it using parchment paper followed with aluminum foil into a sausage shape, and cook it in boiling water for 1 hour,

5) Sausage is done

4. RESULT

The finalization of the recipe for Bockie: Vegan Bockwurst took around 2 months through several trials and errors.

Trial No.	Taste	Smell	Color	Texture	Average
1	1	1	1	1	1
2	4	5	5	7	5,25
3	3	4	5	4	4
4	5	6	5	9	6,25
5	6	7	8	6	6.75
6	5	7	9	7	7
7	8	8	9	7	8
8	8	8	10	9	8,75

Note: The scores here were based upon agreements that our group collectively made.

4.1. Findings

The first trial was a complete disaster as the recipe did not have any ingredients that would give the end product structure; hence the texture was very mushy. Additionally, the use of too many products containing soy gave the end product a very strong soy smell and taste, which we all agreed to be unpleasant.

The second trial paved the way for the rest of our trials as we were pretty pleased with the end result in terms of texture, so we decided to make it our base recipe and to do minor adjustments for future trials. We also tried different methods in terms of mixing the dough. We found that overmixing the dough would result in a chewier end result.

Third trial, we tried different methods in handling and storing the dough before the cooking process. We found that kneading the dough would result in a chewier and a rubberier end result. Additionally, we found that resting and storing the dough in a refrigerated environment would develop a stronger ketchup flavor with notes of sourness, and a sausage that would expand to nearly triple of its original size when cooked.

On fourth trial, we tried taking out a portion of the vital wheat gluten, which is the main ingredient that gives our sausage its structure, and substituting it with corn starch. We found that the addition of corn starch makes the dough less gummy. Additionally, substituting whole garlic cloves with garlic powder resulted in a more even garlic flavor distribution without any visible garlic chunks.

On fifth trial, we assumed that the ketchup is mainly there to give it a hint of tang

and color, but based on our third trial we did not like the overpowering ketchup flavor. We decided to substitute a portion of the ketchup with a vegetable known and famous as a food coloring agent, beetroot, and vegan mayonnaise that we made too. We found that the addition of beetroot gives our end sausage a more vibrant meat-like color.

On sixth trial, we adjusted some of the spices and reduced the amount of vital wheat gluten, and found that it made the texture a little bit better.

On our seventh trial, we decided to use pureed beetroot for better control, salt instead of soy sauce to reduce the soy after-taste, substituting a portion of the vital wheat gluten with all-purpose flour, and use the I&G Nucleotide and VMeat Tastenrich B5 instead of our usual IMP & RCK. We found that the presence of all-purpose flour helped to make the sausage less gummy.

On final formula, we decided to use more all-purpose flour and combine both VMeat Tastenrich B5 & RCK, and found that the addition of all-purpose flour gives it that mouth-feel similar to that of a meat-based sausages.

4.2. The Use of Nucleotides & VMeat TasteNRich. Throughout the course of this project, we tried out several Nucleotides & VMeat TasteNRich products from CJ FNT and found that:

- VMeat Tastenrich RCK has the deepest color and the most pungent smell among the other VMeat Tastenrich products that some people may find unpleasant. However, we also found that VMeat Tastenrich RCK gives the strongest flavor boost, a flavor profile similar to that of a chicken-based flavor enhancer.

- VMeat Tastenrich B5 has a rather mild taste, and does not really give any additional meaty-flavor profile when used on its own, rather it enhances the umami-ness of the product.

- VMeat Tastenrich UF-01 does not give off a rather strong smell and taste, but somehow gives a rather corny-flavor profile.

- When combined together, we found that a blend of equal amounts of both VMeat Tastenrich RCK and B5 creates the perfect balance of chicken flavor that brings out its umami rather than a very synthetic taste of chicken.

- All nucleotides IMP, GMP, and I&G when used alone do not really have any flavor-profile, but when used with other spices they seem to intensify the overall flavor-profile.

- Compared to the commonly-sold MSG brands, all nucleotides IMP, GMP, and I&G seem to leave a longer mouth-feel that lingers.

- The use of Nucleotide IMP seems to bring out a stronger tang and sourness within a recipe.

- The use of I&G brings out a really nice balance of flavor when used within a recipe.

4.3. Nutritional Content

Without the proper resource for the nutritional content calculation, we decided to just input all our ingredients into VeryWell (www.verywellfit.com/) to analyze the nutritional value of our Bockie: Vegan Bockwurst.

Nutrition Facts

Servings: 10

Amount per serving

Calories	**126**
	% Daily Value*
Total Fat 4g	**5%**
Saturated Fat 0.5g	**3%**
Cholesterol 0mg	**0%**
Sodium 600mg	**26%**
Total Carbohydrate 7.6g	**3%**
Dietary Fiber 0.3g	**1%**
Total Sugars 0.6g	
Protein 15.4g	
Vitamin D 0mcg	0%
Calcium 13mg	1%
Iron 0mg	3%
Potassium 74mg	2%

**The % Daily Value (DV) tells you how much a nutrient in a food serving contributes to a daily diet. 2,000 calorie a day is used for general nutrition advice.*

Recipe analyzed by verywell

4.4. Cost Calculation

Dish:	Bockie: Vegan Bockwurst			Amount:	10			
Ingredient	**Amount (sold)**		**Recipe Quantity**		**Base Price (IDR)**		**Total (IDR)**	
Silken tofu	300	g	300,0	grams	Rp	11.000	Rp	11.000
Beetroot	1000	g	60,0	grams	Rp	25.000	Rp	1.500
Olive Oil	1000	ml	30,0	ml	Rp	54.000	Rp	1.620
Salt	1000	g	15,0	grams	Rp	8.000	Rp	120
Garlic powder	1000	g	7,5	grams	Rp	33.000	Rp	248
Chili powder	100	g	3,0	grams	Rp	10.900	Rp	327
Paprika powder	100	g	4,5	grams	Rp	11.000	Rp	495
Ground pepper	250	g	1,5	grams	Rp	8.000	Rp	48
Cumin powder	1000	g	1,2	grams	Rp	90.500	Rp	109
Five-spice powder	40	g	4,5	grams	Rp	4.850	Rp	546
Nucleotide I+G	1000	g	0,3	grams	Rp	210.000	Rp	63
VMeat Tastenrich B5	1000	g	2,5	grams	Rp	250.000	Rp	625
VMeat Tastenrich RCK	1000	g	2,5	grams	Rp	540.000	Rp	1.350
Vital wheat gluten	1000	g	170,0	grams	Rp	46.500	Rp	7.905
All-purpose flour	1000	g	20,0	grams	Rp	9.000	Rp	180
Corn starch	1000	g	10,0	grams	Rp	14.500	Rp	145
Parchment paper + foil	1	roll	0,2	roll	Rp	22.880	Rp	4.576
Total cost							**Rp**	**30.856**
Cost per pack (6 sausages)							**Rp**	**18.513**

Assuming the cost for packaging and labeling per package of 6 sausages is Rp3.000,00, then the total **variable cost** per pack is Rp21.513,44.

As the fixed cost for production is unknown, we assume that it will account for 20% of the variable cost, hence the **fixed cost** per pack is Rp4.302,69.

As for the **profit margin**, as this is a new product launching in the market, we aim for an estimated profit margin of 30%, hence the selling price should be around Rp33.560,96, and for the purpose of easier calculation, we round it up to Rp35.000,00.

Production Capability

As we are still running a small-scale production, we assume in one day we can make 20 packages of sausages. Adjusting to the number of workdays in Indonesia, we set it to 20 working days per month for easier calculation, hence the total production per month is presumably 400 packages.

Referencing the fixed cost per pack that we calculated earlier, we get the monthly fixed cost of Rp1.721.074,80.

Following the basic formula for BEP (Break Even Point):

BEP (Unit) = Fixed cost/ Selling price - Variable cost

BEP (Unit) = Rp 1.721.074,80/(35.000,00 - Rp 21.513,44)

BEP (Unit) = 128 packs

BEP (Rp) = Fixed cost/ 1 -(Variable cost/Selling price)

BEP (Rp) = Rp 1.721.074,80/1- (Rp 21.513,44/Rp 35,000,00)

BEP (Rp) = **Rp 4.466.490,76**

4.5. Survey Analysis

To find out what the people who had tried out our Bockie: Vegan Bockwurst think about our product, we asked them to fill out a survey consisting of 10 questions:

1) On a scale of 1 to 5, how satisfied were you with the taste of our Bockie: Vegan Bockwurst?

2) On a scale of 1 to 5, how satisfied were you with the smell of our Bockie: Vegan Bockwurst?

3) On a scale of 1 to 5, how satisfied were you with the appearance of our Bockie: Vegan Bockwurst?

4) On a scale of 1 to 5, how satisfied were you with the texture of our Bockie: Vegan Bockwurst?

5) How does the taste of our Bockie: Vegan Bockwurst compare to other meat-based sausages you've tried?

6) How does the smell of our Bockie: Vegan Bockwurst compare to other meat-based sausages you've tried?

7) How does the appearance of our Bockie: Vegan Bockwurst compare to other meat-based sausages you've tried?

8) How does the texture of our Bockie: Vegan Bockwurst compare to other meat-based sausages you've tried?

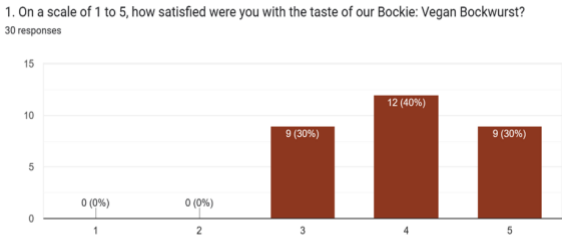
9) Would you purchase our tofu-based Bockwurst in the future?

10) Do you think Rp40.000,00 is a good price for a pack of Bockie: Vegan 6Bockwurst containing 6 sausages?

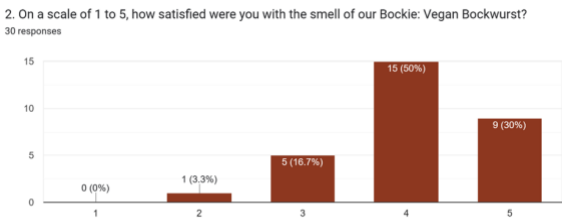
4.6 Survey Results

From the 30 responses that we got, the followings can be concluded:

1) 40% of respondents rated the taste at 4 and some above, indicating a high level of satisfaction with the taste.

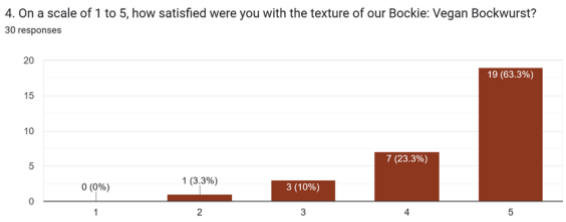


2) 50% of respondents rated the smell at 4 and some above which still shows a strong approval for the aroma of Bockie.

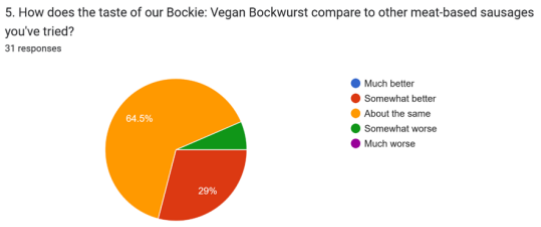


3) 90% rated the appearance at 4 or above, with 66.7% giving the highest rating, indicating that the appearance of Bockie is highly appealing.

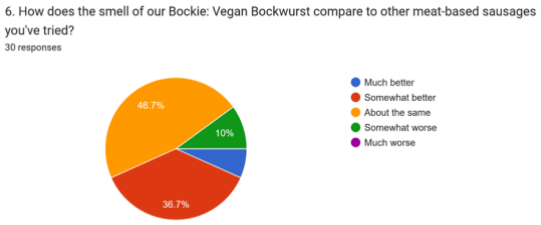
4) 86.6% rated the texture at 4 or above, with 63.3% at the highest rating, suggesting that the texture closely meets expectations.



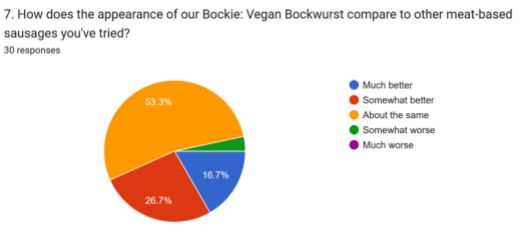
5) A significant 93.5% of respondents find the taste of Bockie comparable to or better than meat-based sausages.



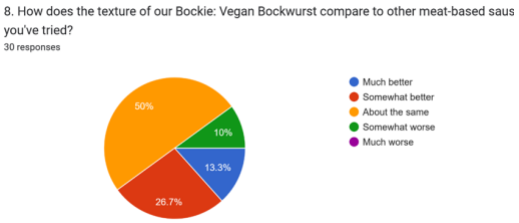
6) 86.1% rate the smell as comparable or better than meat-based sausages, with a substantial portion finding it somewhat better.



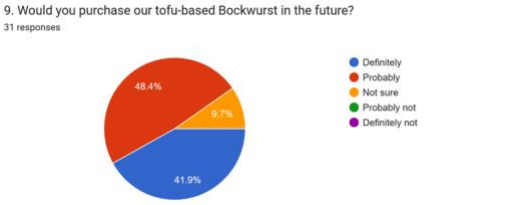
7) 96.7% see the appearance as comparable or better, with 53.3% saying it's about the same.



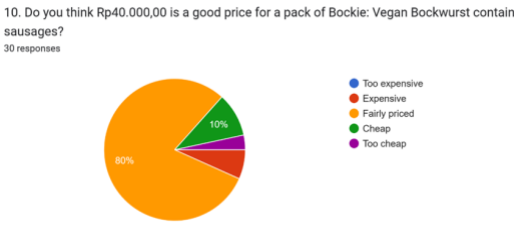
8) 90% find the texture to be comparable or better, indicating successful replication of the traditional sausage texture.



9) 90.3% of respondents are likely or certain to purchase Bockie, demonstrating strong market potential.



10) 93.3% find the price to be fair or cheap, indicating good value perception.



5. CONCLUSION

In conclusion, the development and launch of Buckie: Vegan Bockwurst marks a significant stride in promoting sustainable and healthy food choices in Indonesia. Our team meticulously crafted a delicious vegan sausage that meets customer expectations while addressing food-related emissions and supporting sustainability. Utilizing CJ FNT's flavor enhancers and locally sourced tofu as primary ingredients, we responded to the increasing demand for sustainable food options and environmental concerns in food production. Through extensive research, we formulated Buckie to achieve a balanced profile of flavors and textures similar to that of traditional sausages, all while strictly adhering to plant-based standards. Enriched with silken tofu, beetroot, vital wheat gluten, and carefully selected spices, Buckie appeals broadly to consumers seeking both flavor and sustainability in their diet. Buckie went through extensive sensory studies to create a delicious eating experience that corresponds to that of meat-based alternatives. Buckie not only has a rich flavor, but it also achieves high standards in texture and appeal, through enhancing ingredient proportions and testing input.

References

(n.d.). Verywell Fit - Know More. Be Healthier. Retrieved July 8, 2024, from https://www.verywellfit.com/

Wunsch, N. (n.d.). *Global: meat substitutes volume 2019-2029*. Statista. Retrieved July 8, 2024, from https://www.statista.com/statistics/1276467/worldwide-meat-substitute-consumption/

Grunwald, A., & Kopfmüller, J. (2012). Nachhaltigkeit. Frankfurt: Campus.

Mosedale, J., & Voll, F. (2018). Nachhaltigkeit und Tourismus (Vol. 14). Mannheim: MetaGIS--Systems;

Sloan, P., Legrand, W., & Chen, J. (2013). Sustainability in the hospitality industry: principles of sustainable operations (2 ed.). London: Routledge.)