Note by Note Academic Report:

Creation of the *Endangered Sope*

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Contents

1. Introduction

Agrifood systems are increasingly threatened by climate change, endangering the livelihoods of over 866 million people globally (FAO, 2023). In response, governments have introduced climate action plans with a strong focus on "Loss and Damage" (FAO, 2023). However, these plans often overlook agriculture, despite its central role in food production, distribution, and consumption, as well as its status as the most vulnerable sector within the agrifood system (FAO, 2023). The risks facing agriculture are further intensified by dietary convergence—a phenomenon driven by the food industry through increased trade, availability, and promotion of specific ingredients across global markets (Baquedano, 2020). The widespread demand for the same products, coupled with agricultural policies that strain farmer economics, has created a system that prioritizes high-value or mass-consumption crops, such as wheat and cacao, along with specific strains or species within a given crop (Kalibata, 2021b). These practices not only threaten biodiversity—as seen in Mexico, where avocado farming has driven deforestation, even in protected areas (Mondragón and López, 2020)—but also put the very crops they prioritize at risk, as demonstrated by cacao's vulnerability due to limited genetic diversity (Bediako et al., 2024). The impact extends beyond luxury commodities; staple crops essential to food security, such as potatoes, are becoming increasingly susceptible to adverse climatic conditions (Wilson of Landward, 2022). The global over-reliance on a narrow range of foodstuffs presents both economic and nutritional risks, demanding urgent intervention to avert a potential social crisis. However, current solutions, such as genetic modification to enhance crop resilience (Adams, 2024), merely address the symptoms rather than the root cause, perpetuating an unsustainable attitude towards food. Moving forward, systemic change is essential, beginning with consumer re-education to promote the reintegration of local ingredients and traditional dietary diversity. Reestablishing seasonality in consumer expectations is equally crucial to transitioning away from the unsustainable demand for year-round access to all ingredients. Achieving this transformation requires a collective effort across the entire food value chain, with a particular emphasis on those who directly interact with consumers, as they have the greatest influence over purchasing behaviors and the power to drive meaningful change.

Introduced in 1994 by Hervé This (Kurti and This-Benckhard, 1994), Note by Note cooking is a culinary approach that involves creating dishes and food products using only pure compounds rather than whole ingredients. It was

originally conceived to foster creativity and deepen the understanding of the physicochemical phenomena behind food by requiring professionals to intentionally design all aspects of a dish—flavor, texture, color, shape, and consistency (This, 2013). Over time, the concept has been proposed as a potential future for the food industry, with proponents citing benefits such as reduced ingredient spoilage—since no fresh ingredients are used—and lower costs in the food value chain, as removing water from ingredients reduces cargo weight and transportation expenses (This and DeBevoise, 2014). However, large-scale adoption may be impractical due to environmental, social, and economic challenges that such optimistic projections may not fully consider. Nevertheless, the methodology's focus on understanding the interactions between food components provides a valuable tool for driving change in the food industry. By leveraging the techniques and insights of Note by Note cooking, sustainable alternatives to widely consumed food products can be developed using locally available ingredients, making it easier for consumers to adopt desired attitudes and behaviors toward food.

Building on this background, we propose a dish that prioritizes local ingredients, draws inspiration from diverse cultural traditions, and employs innovative techniques to help re-educate consumers—aligning with the theme of the *International Contest of Note by Note Cuisine Nº13*, "Food for the Future." Staying true to these principles, we chose to localize Sopes, a traditional Mexican dish made from nixtamalized corn, a staple deeply embedded in Mexican cultural identity and nutrition. Beyond honoring tradition, the dish encourages reflection on our food choices by demonstrating that foreign cuisines can be adapted to local ingredient availability while also raising awareness of the social and environmental crises linked to our behaviours towards food. The inclusion of "Guacamole" highlights the deforestation and droughts caused by avocado overexploitation in Mexico. Similarly, using potato starch to create the Sope serves as a reminder of the severe social consequences that disruptions to staple foods have had, as witnessed in Ireland. Ultimately, the dish, *Endangered Sope*, is a call for change.

2. Aim of the Assignment

The aim of this assignment is to develop a Note by Note cuisine dish that aligns with the theme "Future of Food" by prioritizing local ingredients and promoting consumer re-education while ensuring reproducibility through a precise, well-documented creation process.

3. Materials and Methods

The dish was developed by creating three key components: the “Potato Sope” (a cooked and shaped dough made from potato starch and gluten), the “Mushroom Guacamole” (an oil-in-water emulsion flavored with 1-octen-3-ol), and the “Beetroot Chorizo” (a crispy crumble made from potato starch dough infused with beetroot powder). The ingredients, detailed preparation methods for each component, and the overall equipment used are outlined below.

3.1 Materials

The same equipment was used for the preparation of all three components. Table 1 provides a comprehensive list of the equipment, including relevant details such as name, brand and model.

Table 1. *Equipment used during the development and production of the Endangered Sope*

Name	Brand	Model	Picture
Electronic Scale	Amput	Amput 7k Scale	
Gas Stove	Electrolux	Modular Cooking Range Line 900XP 4-Burner Gas Range 10 kW on Gas Oven	

Immersion Blender	Robot Coupe	Mini MP 160 V.V	

Additionally, basic kitchen utensils such as bowls, cups, pans, pots, spatulas, and spoons were used for handling and manipulating ingredients during mixing and cooking. As these tools are generic and standard across kitchens, no further details are necessary.

3.2 Methods

3.2.1 Potato Sope

The Potato Sope recipe was based on the Note by Note dish *Do – Pot sticker* prepared by a team of chefs at the At-Sunrice Global Chef Academy (Burke et al., 2021). Specifically, the dough in the Potato Sope, replicates the starch to gluten ratios proposed by said recipe. Its preparation consisted of combining potato starch, gluten, water, neutral oil, and salt to form a pliable, elastic dough. This dough was then covered and rested for 20 minutes to allow the gluten network to relax, making it easier to work with. After resting, the dough was rolled out to a thickness of 0.5–1.0 cm and cut into the desired shape. The shaped disks were then cooked on a gas stove using a skillet over low heat for 10 minutes, ensuring they were thoroughly cooked throughout. The detailed ingredient list and process are displayed below.

Table 2. *Potato Sope ingredient list*

Ingredient	Quantity	Brand and prod. Name	Label Picture
Potato Starch	100g	Meade Farm: Irish Potato Starch	

Water (filtered)	92g	N/A	N/A
Gluten	10g	Biotiva: Weizengluten	
Sunflower oil (linoleic and oleic acid)	8g	Loughcrew: Sunflower Oil 100% Pure	
Salt	2g	N/A	N/A

Process

1. Scale and mix all dry ingredients
2. Add the oil and mix until fully incorporated
3. Gradually pour in the water while mixing until the dough is homogenous, soft, and manageable
5. Cover the dough an let it rest for 20 minutes
6. Strech the dough to a thickness of 0.5-1 cm and cut into circles
7. Pinch the rim of each dough disc to create a slight indent all around
8. Heat a dry skillet and cook each sope over low heat for 5 minutes on each side until fully cooked and lightly golden
9. Place the warm sopes in a clean kitchen towel

3.2.2 Beetroot Chorizo

The creation of the Beetroot Chorizo also leveraged the starch to gluten ratio proposed in the Note by Note dish *Do – Pot sticker* (Burke et al., 2021). Its preparation consisted of combining potato starch, gluten, beetroot extract, water, neutral oil, and salt to form a pliable, elastic dough. This dough was then covered and rested for 20 minutes. After resting, the dough was shredded into uneven crumbles using a fork and cooked on a gas stove using a pan over medium heat for 8 minutes, ensuring they were thoroughly

cooked and crispy. The detailed ingredient list and process are displayed below.

Table 3. *Beetroot Chorizo ingredient list*

Ingredient	Quantity	Brand and prod. Name	Label Picture
Potato Starch	100g	Meade Farm: Irish Potato Starch	
Water (filtered)	92g	N/A	N/A
Gluten	10g	Biotiva: Weizengluten	
Lyophilized Beetroot	8g	Sosa: Remolacha liofilizada en polvo	
Sunflower oil (linoleic and oleic acid)	8g	Loughcrew: Sunflower Oil 100% Pure	
Salt	2g	N/A	N/A

Process

1. Scale and mix all dry ingredients
2. Add the oil and mix until fully incorporated
3. Gradually pour in the water while mixing until the dough is homogenous, soft, and manageable
4. Cover the dough an let it rest for 20 minutes
5. Shread the dough with a fork creating small uneven crumbs
6. Heat a dry skillet and cook the crumble over medium heat for 8 minutes until fully cooked and crispy

3.2.3 Mushroom Guacamole

The Mushroom Guacamole was based of the recipe by Burke and Danaher *Mayonnaise Without Mustard,* developed for the Emulsions and Foams module in the TFCS9025: Advanced Molecular Gastronomy course offered at TU Dublin Grangegorman (Burke and Danaher, 2025a). Specifically, the recipe was used to identify the correct oil to water ratio. The preparation of the Mushroom Guacamole involved creating an oil-in-water emulsion. First, skimmed milk powder and lecithin were dissolved in water, followed by the addition of vinegar. Neutral oil was then gradually added to the aqueous phase while mixing with an immersion blender. Once the desired texture was achieved, green food coloring and mushroom flavoring were incorporated. To ensure food safety, the quantity of green food coloring was kept below 0.265 g/kg, in accordance with the producer's guidelines. The mushroom flavoring used—1-octen-3-ol—has no established usage limits, as current research shows no evidence of genotoxicity (Api et al., 2019). A detailed ingredient list and step-by-step process are provided below.

Table 4. *Mushroom Guacamole ingredient list*

Ingredient	Quantity	Brand and prod. Name	Label Picture
Sunflower oil (linoleic and oleic acid)	100g	Loughcrew: Sunflower Oil 100% Pure	
Water (filtered)	20g	N/A	N/A
White rice vinegar	5g	Narcissus: White Rice Vinegar	
Skimmed milk powder	5g	Millac Value: Skimmed milk powder	

Soy Lecithin	2g	PCB Creation: 08 EMUL S Soy Lecithin	
Mushroom Flavouring (1-octen-3-ol)	0.5g	The Kitchen Laboratory: N°9 Mushroom	
Green Food Colouring (Tartrazine, Patent blue, Allura Red)	0.02g (q.s.)	Mallard Ferrière: Apple Green	

Process

1. Add the skimmed milk powder to the water and mix the milk until fully dissolved
2. Dissolve the soy lecithin in the water
3. Add the vinegar and mix
4. Slowly pour the oil into the aqueous phase while mixing with an immersion blender until the desired texture is achieved
5. Add the green food colouring and mushroom flavouring and fully incorporate

3.2.4 Endangered Sope

The preparation of the final dish was achieved through the assembly of the three components. The step-by-step process and final result are displayed below.

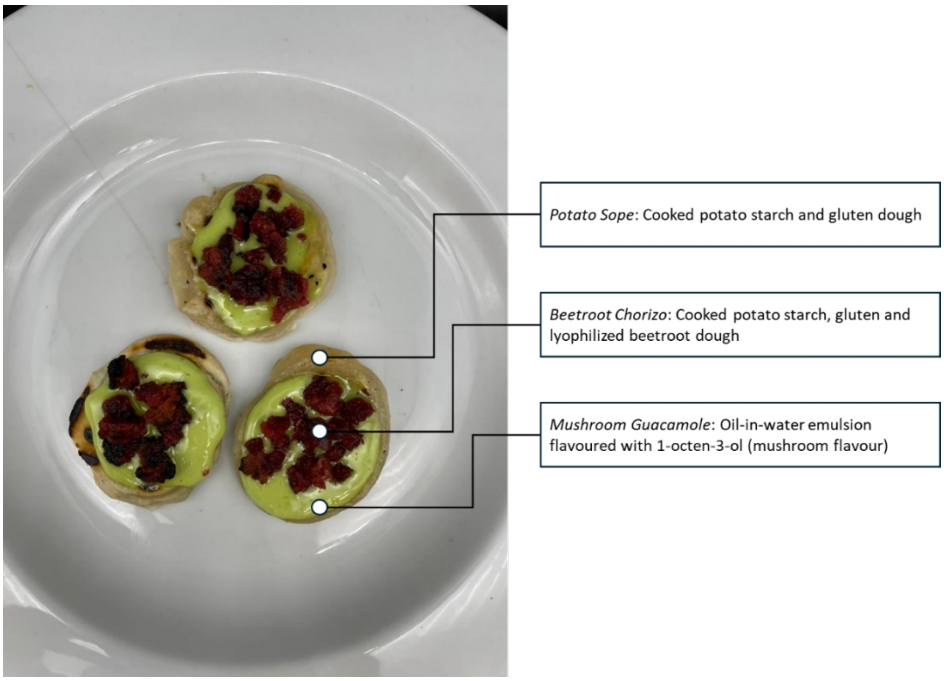


Figure 1. *Endangered Sope prepared at TU Dublin Grangegorman on April 7, 2025*

Process

1. Spread 2g of the Mushroom Guacamole in the surface of three warm Potato Sopes, ensuring that the sope is completely coated except for the indentation.
2. Sprinkle 3g of Beetroot Chorizo over each sope
3. Plate the three Endangered Sopes

3.2.5 Consumer Evaluation

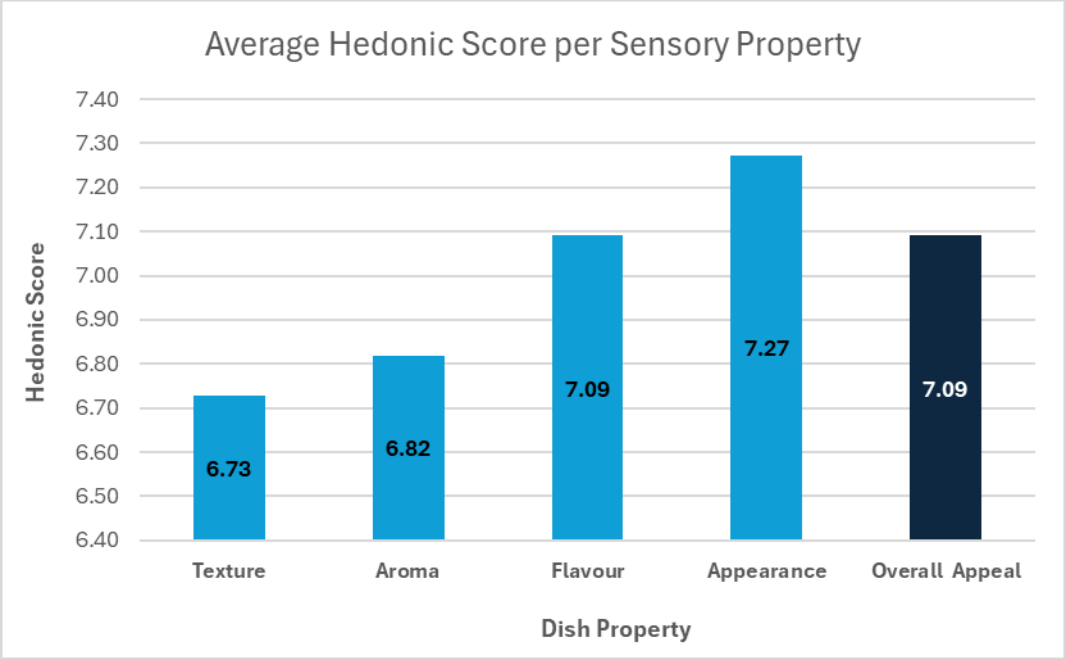
The Endangered Sope dish was presented to 12 consumers to conduct an informal sensory trial. The participants were requested to evaluate the dish's most relevant properties (appearance, flavour, aroma and texture) by completing a digital questionnaire. For this purpose, a 9-point hedonic scale assigning the verbal anchors "Extremely Dislike" and "Extremely like" to the values 1 and 9 respectively was used. In addition, the consumers were asked to rate the product's overall resemblance to a Mexican dish using a 9-point scale to determine the dish's level of success in localizing a foreign dish. The data collected was then processed and analyzed using Microsoft Excel from which the findings are presented in the following section.

4. Results & Discussion

During and after the preparation of each component of the Endangered Sope, it was confirmed that the developed recipes were accurate and effective in delivering the expected functional and sensory properties. For both the Potato Sope and the Beetroot Chorizo, the inclusion of gluten successfully imparted viscoelastic characteristics to the dough, resulting in a cohesive and pliable matrix (Hui et al., 2006) that could be shaped without difficulty. Allowing the doughs to rest prior to shaping proved beneficial, as it enabled the gluten network to relax, making it easier to stretch the dough to the desired thickness without tearing. Upon cooking, both components achieved the intended golden-brown coloration and caramelized flavor, largely due to the presence of oil in the formulation, which provided the fats necessary for glycation reactions with the starch sugars. In the Beetroot Chorizo, the use of freeze-dried beetroot powder not only contributed to the flavor but also imparted a vibrant natural color, eliminating the need for artificial food coloring. Regarding the Mushroom Guacamole, the combination of soy lecithin and casein from powdered milk effectively stabilized the oil-in-water emulsion (Burke et al., 2021), resulting in a mayo-like texture that closely mimicked the creaminess of avocado. Most importantly, the final components complemented each other to create a dish that emulates traditional sopes in both appearance and overall sensory experience.

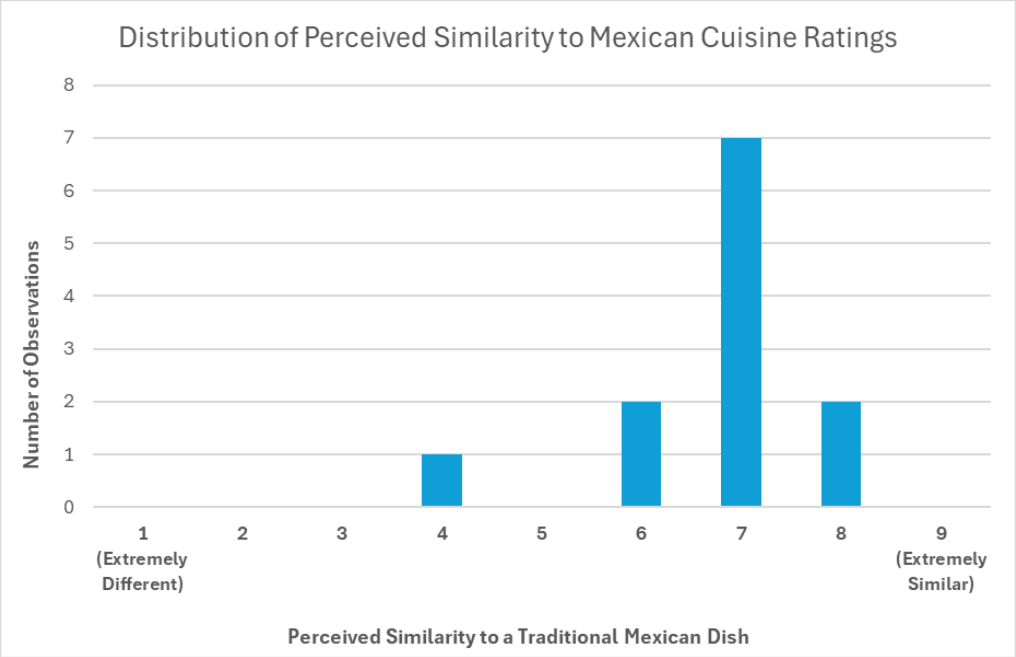
The success of localizing a traditional Mexican dish using flavors and textures which would be available from local ingredients was validated through sensory trials conducted with 12 untrained consumers.

Figure 2. *Average Hedonic Score per Sensory Property*



As shown in Figure 2, the Endangered Sope received a strong overall acceptability score, with an average hedonic rating of 7.02 on a 9-point scale. This positive reception was largely driven by the dish's appearance and flavor, which achieved high individual average hedonic scores of 7.27 and 7.09, respectively. Aroma (6.82) and texture (6.73) were also well received, though these slightly lower ratings suggest opportunities for further refinement by enhancing aromatic complexity and mouthfeel. Beyond its sensory performance, the dish also succeeded in evoking a strong cultural identity.

Figure 3. *Distribution of Perceived Similarity to Mexican Cuisine Ratings*



As illustrated in Figure 3, most participants rated the dish as closely resembling traditional Mexican cuisine, with an average similarity score of 6.92 on a scale where 9 indicates "Extremely Similar." These findings support the viability of adapting foreign dishes to local contexts without compromising sensory appeal or cultural recognition.

5. Conclusion

The Endangered Sope illustrates how the application of Molecular Gastronomy can help drive systemic change in the food industry. This project successfully met its aim of developing a reproducible dish that aligns with the theme 'Future of Food' by encouraging consumer re-education on seasonality, local sourcing, and the consequences of food system exploitation. The positive outcomes observed during sensory evaluation confirm that it is possible to recreate the essence of traditional foods—such as Mexican sopes—without relying on increasingly unsustainable or inaccessible ingredients. Instead, by leveraging regionally available components and scientific techniques, the Endangered Sope delivers comparable sensory appeal and cultural authenticity. Ultimately, this project highlights the transformative potential of combining science, tradition, and sustainability to drive change in the future of food.

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