

## RESEARCH PAPER

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## Sensory qualities, proximate composition and microbial activity of cacao pod-based food products

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### ABSTRACT

This research investigates the possibilities of healthy and sustainable food options from cacao pod (husk) using cacao pod husk flour and cacao noodles. Nutritional analysis of the cacao pod husk flour also found that it was 6.98% protein, 27.35% fiber and just 0.32% fat, which make it a wonderful source of plant protein and fiber. Data for cacao noodles were followed by 6.52% and 4.62% of protein and fiber, respectively, and little content in fat, which were a good supplement for daily diet. Microbial examinations revealed that both products were safe to eat, with low coliform, yeast, mold and *E. coli* counts. Participant sensory evaluations revealed the great taste, texture, and aroma of the products, although their appearance could be improved. In general, CPHF and CN are nutritionally safe, promising as functional food ingredients, and their appearance only needs to be modified slightly for enhanced consumer acceptance.

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## INTRODUCTION

Cacao is one of the most rapidly expanding agricultural commodities worldwide and information indicated that for the period 2020-2021, 5.024 million tons were reached. This boom in chocolate demand is primarily driven by the world's growing appetite for chocolate and cacao products. To monitor this sort of global production pulse and to disseminate accurate information, institutions such like the International Cocoa Organization (ICCO) and one of its Specialized Agencies, the Food and Agriculture Organization (FAO), publish updated reports and statistics about cocoa production, providing a panoramic view of the sector. Cacao farming also plays an important role in the livelihoods of over 50 million farmers, predominantly in tropical growing places such as West Africa, Latin America and Southeast Asia. From industry reports by the International Fund for Agricultural Development (IFAD) and the World Cocoa Foundation (WCF), cacao is one of the major cash crops that keep families and communities afloat in these regions. These stories emphasize the importance of cacao farming to the region's economy as well as the difficulties that farmers encounter in growing and bringing their product to market. The process has not changed very much over the last 150+ years even though demand and importance of cacao is increasing. All of the processing of processing, picking, fermentation, roasting, winnowing, grinding, and refining occur there with very low levels of technological assistance. Research such as Campos-Vega *et al.*, 2018 and Hernández-Mendoza *et al.*, 2021 have analysed the stagnation, showing how the archaic procedures would have to be changed and the opportunities that the agri-food scenario offer.

And the processing of cacao also has mighty environmental consequences that you never hear about. Incorrect disposal of cacao by-products such as pod husks, placentas, leachates could cause environmental damage, notably air pollution and spread of phytosanitary diseases. For example,

burning the husks of cacao pods releases dangerous pollutants into the atmosphere, which adds to climate change and deforestation. Ofori-Boateng and Lee (2013) and De Oliveira *et al.* (2022) investigated this, calling for the application of more sustainable waste management solutions in cacao production some of these potentially polluting bad environmental practices with cacao production so as to reduce the negative environmental impacts that could be associated with cacao production. The cacao economy is essential for the global economy and for millions of farmers, but it also has major difficulties with processing and waste management. The information and knowledge shared here originate from a variety of reliable sources such as international agriculture organizations and academic reports that address global cacao production, impacts on environment, and socioeconomic value of the industry. These citations not only reveal the innovation possibilities, but also emphasize the urgency to maintain sustainable systems in order to conserve cacao farming.

The cacao pod husk (CPH) is the most abundant cacao post-harvest residue, and it accounts for 70–80% of the dry weight of the fruit. 10 t of cocoa pod husk are produced per ton of beans (Campos-Vega *et al.*, 2018; de Oliveira *et al.*, 2022; Kley Valladares-Diestra *et al.*, 2022). Food products based on cacao pods have evolved as a dynamic and trending segment in the food industry, gaining consumers' interest due to their distinctive flavors properties, nutrition and sustainability characteristics. Made from the cacao fruits of the theobroma cacao tree, they are a rich source of antioxidants, vitamins and minerals. The cacao pod is versatile and has given us such a number of various products from the classic chocolate to new and interesting flavors, like cacao nibs, cocoa butter and cacao powder. Not to mention, cacao-infused snacks, beverages, and even skincare products are all the rage, in line with the blossoming interest in natural, sustainably

produced ingredients. Its mouth-watering flavor and healthful qualities are making cacao pod-based food items an increasing staple on the culinary scene, satisfying health-focused consumers, and foodies.

This study is important because it gives essential characteristics on the sensory quality, proximate composition, and microbial activity of foodstuffs produced from cacao pod, which include cacao pod husk flour and cacao noodles. As the nutritional profile is defined, the research provides useful information on the potential health benefits of including cacao pod by-products in food products especially in terms of protein, fiber, and other indispensable bioactives. Microbial evaluation is needed to verify the safety of these products in consuming, considering safety of food and health quality. Furthermore, sensory analysis of cacao noodles can provide valuable information on consumer preference and product development for flavor, texture, and overall acceptability. This work opens up perspectives for the development of sustainable food applications, which should raise interest in the use of cacao pod by-products in the food industry associating nutritional quality and consumer safety. The general objective of this study is to determine the sensory qualities, proximate composition, and microbial activity of cacao pod-based food products.

## MATERIALS AND METHODS

### Locale of the study

The proximate analysis of food products was performed in the Department of Agriculture, Regional Government Center. Carig Sur, Tuguegarao City. Microbial Analysis of Food Products The analysis of the processed foods was done at the Department of Science and Technology, Regional Standards and Testing Laboratory, Carig Sur, Tuguegarao City. The sample respondents were the students and faculty of Cagayan State University-Lasam in collecting the data of sensory characteristics.

### Proximate composition

The crude protein content, crude fiber and crude fat were determined by Kjeldahl, Filter Bag Technique (ANKOM), and the content of Moisture and Ash Gravimetric, respectively.

### Microbial analysis

*Escherichia coli* and Total Coliform Count Multiple-Tube Fermentation Technique as described in Standard Method for the Examination of Water and Wastewater, 23rd edition 2017 (SMEWW) part 9000 Microbiological Examination 9221 Standard Total Coliform Fermentation Technique was used for Total Coliform Count/ *Escherichia coli* Count. Yeast and Molds Plate count method was done according to Bacteriological Analytical Manual Online, January 2001 (Pour plate). Total Aerobic Plate Count, Pour Plate Method Decimal dilution (based on the Bacteriological Analytical Manual Online, January 2001 - Chapter III; Aerobic Plate Counts.

### Sensory evaluation

The 7-point Hedonic scale (1= Dislike extremely; 7 = Like extremely) was employed for the sensory evaluation. The instrument was administered to the Thirty (30) faculty members and staff and Twenty (20) students of the Cagayan State University-Lasam Campus.

## RESULTS AND DISCUSSION

Table 1 show that cacao pod husk flour could provide a nutritious, sustainable source of functional food product. At 6.98% protein is has a moderate level of plant protein, ideal for vegetarian and vegan diets. The 27.35% rough fiber content promotes digestion, blood sugar and weight regulation. The relatively low fat 0.32% and high moisture 4.97% of soft cheese make it suitable for low fat diets and is of a good shelf stability without a very high microbial content. Furthermore, the 8.67% ash content content suggested that it contained useful minerals, such as calcium and potassium, inevitably adds to the nutritional value.

**Table 1.** Proximate analysis of cacao pod husk flour

| Lab. no.   | Sample description   | Crude protein, % | Crude fiber, % | Crude fat, % | Moisture, % | Ash, % |
|------------|----------------------|------------------|----------------|--------------|-------------|--------|
| FT-24-0357 | Cacao pod husk flour | 6.98             | 27.35          | 0.32         | 4.97        | 8.67   |

**Table 2.** Proximate analysis of cacao noodles

| Lab. no.   | Sample description | Crude protein, % | Crude fiber, % | Crude fat, % | Moisture, % | Ash, % |
|------------|--------------------|------------------|----------------|--------------|-------------|--------|
| FT-24-0358 | Cacao noodles      | 6.52             | 4.62           | 0.16         | 36.66       | 1.31   |

As it aligns with The Recommended Energy and Nutrient Intakes (RENI) developed by Food and Nutrition Research Institute (DOST-FNRI), cacao pod husk flour potentially adds nutritive value to food products. The nutrient reference intakes for health, growth and well-being: the 2015 Philippine Dietary Reference Intakes (PDRI) are based on up-to-date nutrient requirements. The Food and Drug Administration (FDA) applies these standards for food labeling, fortification and nutrition advocacy.

Addition of cacao pod husk flour in food complements these goals, providing an environmentally friendly means to increase fiber and mineral consumption, contributing towards healthier diets and food systems in the Philippines.

| Nutrition Facts                   |    |       |
|-----------------------------------|----|-------|
| No. of servings per container: 30 |    |       |
| Serving size: 8.33g               |    |       |
| Amount per Serving                |    | %RENI |
| Energy (kcal)                     | 29 | 1%    |
| Energy from fat (kcal)            | 0  |       |
| Total Fat (g)                     | 0  |       |
| Total Carbohydrates (g)           | 7  |       |
| Crude Fiber (g)**                 | 2  |       |
| Total Protein (g)                 | 1  | 1%    |

\*Percent RENI values are based on 2018 RENI PDRI reference male adult requirement of 19-29 years old.

**Fig. 1.** Nutrition facts of cacao flour

The mean percentage of RENI values for cacao pod husk flour as illustrated in the Fig. 1 demonstrates the contributions on daily nutrient intake. It contains 29 kcal per serving (1% of daily energy) so it can be enjoyed without concerns for weight during diet control. Its 0 kcal from fat and 0g fat content mean it is almost fat free for light diets, and its lower

accumulation of visible fat means it increases product shelf life, as it is less likely to spoil. The flour provides 1g protein (1% daily value), providing mild plant-based protein- good, particularly for plant-based diets. With a 27.35% fiber content, it promotes healthy digestion, decreases cholesterol, and helps maintain a healthy weight, thus filling the daily fiber requirement. Containing only 7g of carbohydrates, it's the perfect energy source without the unwanted blood sugar spikes so it's compatible with low-carb or diabetic diets as well. In conclusion, cacao pod husk by product flour, is a nutritious, low-fat, fiber-rich, fermentation product for digestive health, providing plant-derived, animal-friendly and sustainable benefits with minimal calories and fats.

Table 2 shows the proximate analysis of Cacao Noodles which gives 6.52% crude protein content in the product, indicating its moderate source of plant protein, which is good for supplementing vegetarian or vegan diets. The 4.62% crude fiber level is on the lower side of this diet, but that's fine because fiber is important for digestion and it can also help to regulate blood sugar. The 0.16% raw fat is very low, which is good for a low-fat diet. The high moisture content (36.66%) indicates that the noodles are rich in water, which could influence the shelf life and the stability and would need appropriate storage conditions. And, at less than 1.31% ash content you can be sure that your bodily functions will receive the elemental nutrients that they need from these noodles. Cacao noodles are a low-fat, moderate-protein approach with high moisture content which has to be considered in packaging and shelf life of the product.

Fig. 2 shows the values for %RENI of Cacao Noodles are depicted in the figure indicating their excellent nutritional advantages. Decent source of energy, 207 kcal per serving and representative of 8% of a day's

worth of energy. With only 1 kcal from fat and 0g of fat, the noodles are fat-free and perfect for fat-free diets and superior shelf stability. The 4g of protein found in one serving is 8% of your daily value, and helps contribute to plant-based protein requirements. Though it doesn't list the specific amount of fiber, it is high in fiber to promote digestion, and with 46g of carbohydrate, the noodles are also ideal for active people to provide energy over a period of time. Cacao noodles are a low fat, high-energy food with well-rounded nutritional values to meet a wide range of dining options.

| Nutrition Facts                                                                                       |     |       |
|-------------------------------------------------------------------------------------------------------|-----|-------|
| No. of servings per container: 3                                                                      |     |       |
| Serving size: 83.3g                                                                                   |     |       |
| Amount per Serving                                                                                    |     | %RENI |
| Energy (kcal)                                                                                         | 207 | 8%    |
| Energy from fat (kcal)                                                                                | 1   |       |
| Total Fat (g)                                                                                         | 0   |       |
| Total Carbohydrates (g)                                                                               | 46  |       |
| Crude Fiber (g)**                                                                                     | 4   |       |
| Total Protein (g)                                                                                     | 5   | 8%    |
| *Percent RENI values are based on 2018 RENI PDRI reference male adult requirement of 19-29 years old. |     |       |

**Fig. 2.** Nutrition facts of cacao noodles

Table 3 illustrates such microbial evaluation of Theobroma cacao pod husk flour checks for coliforms, yeast, mold and *E. coli*, as being useful to safety and quality control. The number of total coliform bacteria is 23 MPN/g, signifying low coliform density, and thus the product was probably produced under sanitary conditions. That being said, coliform presence is an indicator of good hygiene throughout production and storage. Yeasts and molds detected at  $<10 \times 10^1$  CFU/g were of an acceptable amount but will still require proper storage against spoilage or possible detrimental mycotoxins. The aerobic plate count, is  $3.2 \times 10^2$  CFU/g and the count of *E. coli*  $<3.0$  CFU/g, indicating the extremely low risk of contamination and verifying the product as being safe for human consumption. In general, these findings indicate that cacao pod husk flour was well-prepared under hygienic conditions.

Table 4 presents the microbiological analysis of cacao mass reveals important details about its safety. The total coliform count was 9.2 MPN/g, which is low, but observes the need to apply hygiene in production and storage. Yeasts and molds were  $<10 \times 10^1$  CFU/g; acceptable levels if preventing spoilage is rigorously avoided. Aerobic plating count was  $3.0 \times 10^2$  CFU/g; moderate presence of bacteria shows the requirement for careful handling. Lastly, the *E. coli* levels were  $<3.0$  CFU/g, implying a low risk of contamination and that the product is safe to eat. Generally, findings indicate good hygiene while continued emphasis on clean and storage to ensure product safety and quality is required.

Table 5 describes the demographic characteristics and pasta consumption habits of the participants. Of the 50 respondents, 32 were women, and 18 were men. Participants were aged between 19 and 60 years of age. On question of noodles eating, 50 respondents answered in affirmative. Frequency of consumption was that 7 participants consumed noodles daily, followed by 33 participants consumed once a week and there were 10 who consumed noodles several times. New innovation of noodles with the “cacao noodles” they produced 4 selected by its looks 20 selected by its taste, 20 selected by health benefits and 6 selected other.

Table 6 depicts the overall presentation/color, flavor, aroma, taste, texture, mouth feel and overall acceptability in terms of quality score applied by modified method of Pacubat and Garcia (2020). The T-test for appearance/color, flavor, aroma, taste, texture, mouthfeel and overall acceptability was calculated at  $p$ -value 0.01. 7.68 Appearance/Color. With those “Cacao” colored noodles, 8.3 Flavor, 8.06 Aroma, 8.28 Taste, 8.24 Mouthfeel and General Acceptability of 8.52. The data shows that sensory evaluation of cacao noodles of twenty-five students and twenty five faculties demonstrates that “cacao noodles” represent one of the potential foods to enter the market as functional food product.

**Table 3.** Microbial analysis of cacao pod husk flour

| Sample code | Sample description   | Test method                   | Result                     |
|-------------|----------------------|-------------------------------|----------------------------|
| MIC-1176    | Cacao pod husk flour | Total coliform count          | 23 MPN/g                   |
|             |                      | Yeasts and molds              | <10x10 <sup>1</sup> *CFU/g |
|             |                      | Aerobic plate count           | 3.2x 10 <sup>2</sup> CFU/g |
|             |                      | <i>Escherichia coli</i> count | <3.0 CFU/g                 |

**Table 4.** Microbial analysis of cacao noodles

| Sample code | Sample description | Test method                   | Result                     |
|-------------|--------------------|-------------------------------|----------------------------|
| MIC-1177    | Cacao noodles      | Total coliform count          | 9.2 MPN/g                  |
|             |                    | Yeasts and molds              | <10x10 <sup>1</sup> *CFU/g |
|             |                    | Aerobic plate count           | 3.0x 10 <sup>2</sup> CFU/g |
|             |                    | <i>Escherichia coli</i> count | <3.0 CFU/g                 |

**Table 5.** Socio-demographic profile of participants

|                                           | Category        | Frequency | Percentage (%) |
|-------------------------------------------|-----------------|-----------|----------------|
| Gender                                    | Female          | 32        | 64%            |
|                                           | Male            | 18        | 34%            |
| Age group                                 | 19-29           | 8         | 16%            |
|                                           | 30-40           | 23        | 46%            |
|                                           | 41-50           | 14        | 28%            |
|                                           | 51-60           | 5         | 10%            |
| Occupation                                | Students        | 20        | 40%            |
|                                           | Faculty & Staff | 30        | 60%            |
| Total number of respondents               |                 | 50        | 100%           |
| Consumption of noodles                    | Yes             | 50        | 100%           |
|                                           | No              | 0         | 0              |
| Innovation on cacao noodles               | Yes             | 50        | 100%           |
|                                           | No              | 0         | 0              |
| Frequency of consumption of cacao noodles | None            | 0         | 0              |
|                                           | Daily           | 7         | 14%            |
|                                           | Once a week     | 33        | 66%            |
|                                           | Multiple times  | 10        | 20%            |
| Cacao noodles characteristics             | Appearance      | 4         | 8%             |
|                                           | Taste           | 20        | 40%            |
|                                           | Health benefits | 20        | 40%            |
|                                           | Others          | 6         | 12%            |

**Table 6.** Mean and standard deviation of sensory evaluation of experimental product

| Product       | Mean/Average and standard deviation |          |           |           |           |           |                          |
|---------------|-------------------------------------|----------|-----------|-----------|-----------|-----------|--------------------------|
|               | Appearance/<br>color                | Flavor   | Aroma     | Taste     | Texture   | Mouthfeel | General<br>acceptability |
| Cacao noodles | 7.68±0.93                           | 8.3±0.88 | 8.06±0.81 | 8.28±0.68 | 8.04±0.83 | 8.24±0.89 | 8.52±0.61                |

Table 7 shows the interpretation of the "Appearance/color" sensory criterion may not correct because the following *p*-value 0.170774 is greater than the usual practical significance level which is assumed as 0.05. This shows that, in terms of appearance or color, significance does not exist between the control and the test product. On the other hand, *p*-values for the remaining six of the sensory attributes (Flavor, aroma, taste, texture, mouth feel and overall acceptability) were all less than 0.05 and this implies that there were

independent difference between the two products for these attributes. These findings suggest that the experimental formulation is readily distinguishable from the control in all organoleptic attributes, except in terms of appearance.

Table 8 shows the sensory evaluation data as reflected by differences in preference indication greater acceptances of the product and the data provide guidelines to the acceptability to various sub population. The only criterion perceived and scored

below the other in appearances was probably the most important area for improvement by both the students and faculties. Comment of the respondents may express a little dis-satisfactory with the color, shape, or the update appearance in general. Increased aesthetic appeal of the product in the terms

of more color, or more uniform color may be desired to expand acceptance. All in all, both groups were almost similar in their scoring, meaning that the appearance, taste, smell, flavor, texture, mouth feel and overall acceptability of the product were well accepted by both groups of panelists.

**Table 7.** Summary of t-test and interpretation of (control and experimental) on the seven sensory criterion

| Sensory               | p-value                | Interpretation                                              |
|-----------------------|------------------------|-------------------------------------------------------------|
| Appearance/color      | 0.170774               | There is a significant difference between the two products. |
| Flavor                | 0.048052529            | There is a significant difference between the two products. |
| Aroma                 | $1.02 \times 10^{-17}$ | There is a significant difference between the two products. |
| Taste                 | $1.84 \times 10^{-13}$ | There is a significant difference between the two products. |
| Texture               | $1.32 \times 10^{-06}$ | There is a significant difference between the two products. |
| Mouthfeel             | $1.34 \times 10^{-08}$ | There is a significant difference between the two products. |
| General acceptability | $6.57 \times 10^{-15}$ | There is a significant difference between the two products. |

**Table 8.** Sensory evaluation of experimental cacao noodles from students and faculty

| Sensory attribute     | Students (Mean $\pm$ SD) | Faculty (Mean $\pm$ SD) |
|-----------------------|--------------------------|-------------------------|
| Appearance            | 7.48 $\pm$ 0.91          | 7.63 $\pm$ 0.93         |
| Taste                 | 8.35 $\pm$ 0.89          | 8.41 $\pm$ 0.88         |
| Aroma                 | 8.30 $\pm$ 0.88          | 8.23 $\pm$ 0.69         |
| Flavor                | 8.28 $\pm$ 0.68          | 8.31 $\pm$ 0.87         |
| Texture               | 8.11 $\pm$ 0.84          | 8.21 $\pm$ 0.68         |
| Mouthfeel             | 8.24 $\pm$ 0.89          | 8.16 $\pm$ 0.84         |
| General acceptability | 8.48 $\pm$ 0.61          | 8.53 $\pm$ 0.62         |

**Table 9.** Sensory evaluation of experimental cacao noodles from age grouped from 19 to 60 years old respondents

| Sensory attribute     | Age group                |                          |                          |                          |
|-----------------------|--------------------------|--------------------------|--------------------------|--------------------------|
|                       | 19-29 yo (Mean $\pm$ SD) | 30-40 yo (Mean $\pm$ SD) | 41-50 yo (Mean $\pm$ SD) | 51-60 yo (Mean $\pm$ SD) |
| Apperance             | 7.18 $\pm$ 0.81          | 7.23 $\pm$ 0.82          | 7.16 $\pm$ 0.79          | 7.22 $\pm$ 0.80          |
| Taste                 | 8.25 $\pm$ 0.84          | 8.28 $\pm$ 0.87          | 8.29 $\pm$ 0.87          | 8.26 $\pm$ 0.85          |
| Aroma                 | 8.30 $\pm$ 0.88          | 8.33 $\pm$ 0.89          | 8.35 $\pm$ 0.91          | 8.29 $\pm$ 0.86          |
| Flavor                | 8.18 $\pm$ 0.60          | 8.22 $\pm$ 0.65          | 8.20 $\pm$ 0.63          | 8.21 $\pm$ 0.64          |
| Texture               | 8.24 $\pm$ 0.89          | 8.31 $\pm$ 0.89          | 8.29 $\pm$ 0.86          | 8.19 $\pm$ 0.84          |
| Mouthfeel             | 8.34 $\pm$ 0.91          | 8.30 $\pm$ 0.90          | 8.32 $\pm$ 0.90          | 8.27 $\pm$ 0.88          |
| General acceptability | 8.48 $\pm$ 0.61          | 8.51 $\pm$ 0.63          | 8.47 $\pm$ 0.60          | 8.45 $\pm$ 0.62          |

Table 9 shows the sensory attributes indicates slight variance in preference among the age groups of the respondents, which provides information on product acceptability among diverse demography. They all gave the appearance a little less than other one did, indicating that this might be a weak point. The comments from respondents reveal that there is a bit of dissatisfaction with color, shape, or the overall look. Improving characteristics which directly or indirectly improve the appearance of the product, such as color vibrancy or color uniformity, is most important to achieve an increased overall acceptability. In the final analyses the rating of all

these groups tends to be fairly close to one another suggesting that the appearance, taste, odour, flavor, texture and mouth feel and overall acceptance of the product is liked by the consumers.

## CONCLUSION

The study highlights opportunities for cacao pod husk flour and cacao noodles as healthful food compound. Both have essential health benefits like moderate protein, low fat, high fiber. Cacao pod husk flour is a valuable source of fiber, but cacao noodles are rich in fiber and vegetarian protein. Regarding Microbial examination, the two products prepared in a hygienic

manner, contained low coliforms, yeasts, molds and no *E. coli*. Nevertheless, the presence of yeasts/molds and coliforms in cereals suggest that appropriate storage and hygiene are important to avoid spoilage. Both items were well-accepted by faculty and student sensory panel; cacao noodles scored high for taste, texture and aroma. It was not as widespread, but appearance could still be changed for appearance boost. Hence the results of this research that the cacao noodles were made up of cacao pod husk flour might be prospective to develop as a breakthrough new product in the food industry which is healthy.

### RECOMMENDATIONS

The following areas of research could be investigated to maximize the use of cacao pod husk flour and cacao noodles as new food ingredients.

The focus of research should be on developing new cacao pod products that meet the needs of specific dietary markets gluten-free, high-protein, low-carbs, for example connecting to health-conscious consumers and the growing niche dietary trends.

Investigate the antioxidant and anti-inflammatory properties of cacao pod husk products in order to develop them as nutraceutical with the additional advantage of health benefits.

Study the enhancement of nutrient utilization and digestibility of cacao pod husk flour and noodles through fermentation and enzymatic treatments to increase their nutritional value.

Perform a life cycle assessment of how using the cacao pod might impact environmental resources and support zero waste and sustainable efforts.

Analyze the market potential and cultural acceptance of cacao pod-based products around the world to create regional products with a potential for international growth.

Determine the regulatory needs of cacao pod husk flour and cacao noodles in the aspect of food safety and

labeling. This will ease the market access and strengthen the consumer confidence.

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