

Innovation of rabbit (*oryctolagus cuniculus*) meat recipes and sensory evaluation

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ABSTRACT

This study was conducted at Central Poblacion and Ambayec, Bokod, Benguet, and at Benguet National High School, Wangal, La Trinidad, Benguet, in November and December 2023. Sensory evaluation was carried out to determine the qualities of innovated rabbit (*Oryctolagus cuniculus*) meat recipes and the preferences of respondents toward different samples. Eight rabbit meat dishes were subjected to sensory evaluation by 70 consumer-type panelists to assess comparative acceptability and preferences. Rabbit meat stew was also submitted to the DOST-CAR Regional Standards and Testing Laboratory for microbial analysis. Results revealed that the total coliform count was <10 CFU/g, *Escherichia coli* count was <10 CFU/g, aerobic plate count was <250 CFU/g, and *Salmonella* detection was negative in a 25 g sample. The total coliform count was analyzed through Petrifilm™ E. Coliform Count Plate. The aerobic plate count was determined using the pour plate method following the Bacteriological Analytical Manual (2001). *Salmonella* detection was performed through the 3M™ Petrifilm™ SALX *Salmonella* Express System (AOAC, 21st ed., 2019, Method 2014.01). In terms of general preferences and overall liking, the rabbit meat samples were rated as “liked extremely” and “liked very much.” Findings indicate that the rabbit meat recipes were acceptable in terms of taste, aroma, texture, and overall preference. Overall, the most preferred by respondents was the one-year-old rabbit kinuday stew.

Keywords: rabbit meat, sensory evaluation, consumer preference, microbial analysis, kinuday stew, food innovation

Date Submitted: May 31, 2025
Date Accepted: June 2, 2025
Date Published: June 11, 2025

DOI: <http://doi.org/10.69651/PIJHSS0403411>

Recommended citation:

Alban, C. S. (2025). Innovation of rabbit (*oryctolagus cuniculus*) meat recipes and sensory evaluation. *Pantao (The International Journal of the Humanities and Social Sciences)* 4 (3), 4416-4427.
<http://doi.org/10.69651/PIJHSS0403411>

INTRODUCTION

The meat industry has gained increasing global importance in recent years due to growing consumer demand and heightened competition. Meat remains a primary source of dietary fat, particularly saturated fatty acids, which are associated with lifestyle-related diseases prevalent in developed countries. Consequently, consumers have become more concerned about the nutritional value and safety of meat products, leading to changes in dietary habits. Rabbit meat presents itself as a viable alternative, being extremely nutritious, low in fat, and rich in protein. It is recommended for the elderly and is a significant source of easily absorbed micronutrients, including vitamins and minerals. Furthermore, it is low in purines and free of uric acid (Para et al., 2015), making it a healthy substitute for conventional meats.

In support of Sustainable Development Goal No. 2 on zero hunger (United Nations, 2022), which promotes safe and nutritious food, sustainable food production, and resilient agricultural practices, rabbit raising is being promoted as a fast-growing livestock alternative (Paladan, 2022). Rabbit meat has been noted to meet nutritional needs (Wood et al., 2008) and to serve as a potential solution to global food shortages (El-Sabrou, 2020). It is also considered a sustainable protein source amidst climate change and shifting consumption patterns in developing countries (Mutsami & Karl, 2020). Rabbit production has low costs, while its meat offers high-quality nutrition, characterized by low fat, sodium, and cholesterol (Lukefahr, 2010). Historically, rabbits have long been integrated into food culture, as evidenced by Spain, referred to as the “Land of Rabbits,” where consumption has been common since 1,000 B.C. (Darlene, 2020; Matin et al., 2020). In Rome, “cuniculture” or rabbit farming developed as an agricultural technique for meat, fur, and wool production (Amelinckx, 2017). Culinary traditions involving rabbit, such as Italy’s *coniglio all’ischitana* from Ischia, further illustrate its longstanding role in regional cuisines (Baldwin, 2019).

Cooking practices such as stewing have also been linked to the historical preparation of rabbit meat. Stewing involves slow simmering of small, uniform cuts of meat in liquid, a technique dating back thousands of years (Gavin, 2020; Roland, 2020). Early records, including Herodotus and Taillevent, highlight the role of boiling and stewing in sustaining communities. In the Philippines, rabbit farming was introduced during World War II to help address food shortages, although rabbits have often been regarded more as pets than livestock. Nonetheless, rabbit farming has supported food security and livelihoods in many developing countries (Lopez, 2022). More recently, Agriculture Secretary William Dar encouraged rabbit raising as an alternative protein source to pork, especially during outbreaks of African Swine Fever. Rabbit meat, classified by the USDA as poultry, has been described as one of the most nutritious meats due to its digestibility, mineral richness, and low-fat content.

The potential of rabbit production is further strengthened by the species’ high reproductive capacity, with female rabbits able to give birth to up to 14 offspring in a single litter after only 28–31 days of pregnancy (Tabasa, 2021). In Pampanga, rising pork prices due to African Swine Fever outbreaks have encouraged consumers to turn to rabbit as a substitute (Nelz, 2021). Innovative rabbit-based food products, such as empanadas or “lapanada” (Espiritu et al., 2021), longganisa (Cabrera et al., 2022), siopao, burger patties, and spreads (La Consolacion College Bacolod, 2023), have been developed to promote consumer acceptance. Rabbit dishes have also been integrated into local restaurants and cafés, such as Café Tam Tam

in Baguio City, which serves a variety of rabbit-based specialties (Astudillo, 2021). These innovations reflect the emerging culinary potential of rabbit meat in the Philippines.

Despite these developments, rabbit meat remains relatively uncommon in Filipino cuisine, and there is limited research on consumer acceptance of rabbit-based dishes, particularly rabbit stew. Existing studies have generally focused on attitudes toward rabbit meat in general, addressing factors such as taste, nutritional value, cultural perceptions, and market potential. However, no significant studies have evaluated consumer acceptability, sensory qualities, or market viability of rabbit meat stew specifically. To address this gap, the present study was conducted to develop an innovative, nutritious rabbit stew, assess its sensory qualities in terms of taste, aroma, texture, and overall acceptability, and conduct microbial analysis to ensure food safety. By promoting rabbit farming and product innovation, this study contributes to improving the diet of Bokod residents, enhancing local food security, and supporting the rabbit industry as a sustainable alternative to conventional livestock.

Statement of the problem

This study was conducted to evaluate the sensory acceptability of rabbit meat prepared in different recipes and to determine the microbial quality of rabbit stew to ensure food safety. Despite the nutritional benefits and culinary versatility of rabbit meat, its consumption remains limited in the Philippines, and little is known about consumer acceptance of rabbit stew. Thus, this research seeks to examine the sensory qualities of rabbit meat dishes and the microbial safety of rabbit stew in order to promote rabbit farming as a sustainable and nutritious alternative to traditional meat sources.

1. What is the sensory acceptability of rabbit meat samples in terms of taste, aroma, texture, and overall preference?
2. What is the microbial quality of rabbit stew in terms of total coliform count, *Escherichia coli* count, aerobic plate count, and *Salmonella* detection?

METHODOLOGY

The study employed a descriptive-developmental quantitative survey research design to evaluate the sensory qualities and microbial safety of innovated rabbit meat recipes. This design was selected to capture the responses, preferences, and perceptions of consumers without manipulating variables, thereby providing a comprehensive account of their acceptability ratings. Data were collected through field surveys, face-to-face interviews, unstructured questionnaires, and personal observations. To evaluate consumer acceptance, the nine-point Hedonic Scale was utilized, ranging from “dislike extremely” to “like extremely.” Survey administration was carefully organized to maximize participation and ensure clarity, accessibility, and logical organization.

The primary material used in the study was the Local New Zealand rabbit breed, weighing approximately 4–5 kilograms live weight and dressed at 1.5–2 kilograms. Rabbits were sourced from Ambayec, Abatan, and Central Poblacion in Bokod, Benguet, and included both 5–6-month-old and one-year-old specimens. Various tools and cooking equipment were employed,

including a gas stove, pressure cooker, saucepans, knives, cutting boards, measuring implements, containers, and weighing scales. Sensory evaluation kits consisted of product samples, score sheets, pens, pencils, and cups of water for palate cleansing between tastings. Recipes prepared included plain boiled rabbit meat, rabbit stew, rabbit kinuday stew, and rabbit stew mixed with pork kinuday. Each treatment used both 6-month-old and one-year-old rabbit meat, prepared through standardized procedures involving parboiling, stock preparation, smoking with guava branches, leaves, and trunks, and flavoring with mirepoix, camote, rosemary, bay leaves, and peppercorns. The treatments were systematically coded as follows: T1, boiled rabbit (6 months); T2, boiled rabbit (1 year); T3, rabbit stew (6 months); T4, rabbit stew (1 year); T5, rabbit kinuday stew (6 months); T6, rabbit kinuday stew (1 year); T7, rabbit stew with pork kinuday (6 months); and T8, rabbit stew with pork kinuday (1 year).

The study was conducted in Central Poblacion and Sitio Ambayec, Bokod, and at Benguet National High School in Wangal, La Trinidad, Benguet. Respondents were chosen using purposive sampling due to their knowledge and understanding of the sensory evaluation checklist. A total of seventy participants were recruited, representing various groups: thirty-seven students, five teachers, five business owners, five farmers and rabbit raisers, two Department of Agriculture employees, five police officers, one barangay health worker, one social worker, one midwife, one barangay kagawad, one fire officer, one administrative assistant, two participants from the Government Internship Program, one architect, one accountant, and one non-uniformed police staff. Of these respondents, forty-two were female (60%) and twenty-eight were male (40%). The largest age group was 15–19 years old, comprising 46% of respondents, followed by those aged 20–29 (20%), 40–49 (14%), 30–39 (11%), and 50 years and above (9%).

Survey data also revealed the distribution of rabbit raisers in Bokod as of March 2023. Barangay Poblacion reported the highest number, with 22 raisers and 199 heads, followed by Karao with 10 raisers and 111 heads, and Daclan with 6 raisers and 101 heads. In other barangays, the numbers ranged from 2 raisers with 5 heads in Pito to 20 raisers with 51 heads in Bila. Within Barangay Poblacion, Sitio Ambayec reported the highest concentration of rabbit production with 10 raisers and 86 heads, while other sitios such as Abatan, Bagong Purok, and Bagong Barrio reported between 15 and 41 heads. These figures highlighted the suitability of the locale for conducting the study, given the availability of rabbit raisers and accessibility to respondents.

The sensory evaluation checklist, adapted from Adique et al. (2020), served as the primary instrument for measuring acceptability in terms of taste, texture, aroma, and overall preference. An unstructured interview was also conducted to gather insights into consumer perceptions of rabbit meat as an alternative protein source. The nine-point Hedonic Scale guided evaluation, with descriptors ranging from “dislike extremely” (1.0–1.89) to “like extremely” (8.13–9.00). Statistical interpretation of sensory data followed these established ranges, while further descriptors were applied for taste, texture, and aroma correlations with demographic variables. For instance, taste descriptors ranged from “very strong flavor of rabbit” (3.5–4.0) to “absence of rabbit flavor” (0.1–1.49). Texture was classified from “very soft” (4.21–5.00) to “extremely hard” (1.00–1.80), while aroma ranged from “stimulating fragrance” (4.21–5.00) to “no aroma” (1.00–1.80).

The data collection procedure began with formal requests for approval from the school principal, barangay officials, and guardians of minor respondents. Once permissions were granted, the researchers conducted experiments and distributed finished products to respondents, who were informed in advance about the sensory evaluation. Participants were oriented on the evaluation process, which included tasting eight coded samples and rating them using the score sheets. Palate cleansing with water was required between tastings to ensure unbiased judgment. Responses were collected, tallied, summarized, and analyzed, while comments and suggestions were considered for product refinement. Ethical provisions were observed by securing voluntary participation and parental consent for minors.

For statistical treatment, pairwise comparisons were used to assess differences among treatments, while chi-square tests determined consumer preferences and associations between categorical variables such as demographic profile and sensory ratings. This approach allowed the study to identify varietal sensory qualities across treatments and measure the acceptability of rabbit meat stew in comparison with other recipes.

The most preferred rabbit stew sample, identified from the sensory evaluation, was submitted for microbial analysis at the DOST-CAR Regional Standards and Testing Laboratory. The analyses included total coliform count, *Escherichia coli* count, aerobic plate count, and *Salmonella* detection. Results were obtained using Petrifilm™ E. Coliform Count Plate, the pour plate method as outlined in the Bacteriological Analytical Manual (2001), and the 3M™ Petrifilm™ SALX *Salmonella* Express System (AOAC, 21st ed., 2019, Method 2014.01). These procedures ensured that the rabbit stew met microbiological safety standards.

Throughout the study, sanitation and hygiene were strictly observed. In accordance with FDA (2012) guidelines, all personnel maintained personal cleanliness, wore gloves and appropriate clothing, washed hands thoroughly before and after food handling, and ensured that tools and equipment were sanitized. Jewelry was prohibited during food preparation to minimize contamination risks, and all necessary precautions were taken to safeguard the integrity of the meat samples and the finished products. These measures guaranteed that the research upheld both scientific rigor and food safety standards.

RESULTS AND DISCUSSION

A total of seventy respondents participated in the evaluation of eight rabbit meat recipes prepared using both six-month-old and one-year-old rabbits. These respondents represented different community sectors including students, teachers, business owners, farmers, rabbit raisers, government employees, and health workers. They were purposively selected and evaluated the products using the nine-point Hedonic Scale. The recipes included plain boiled rabbit meat, rabbit stew, rabbit kinuday stew, and rabbit stew with pork kinuday, prepared with standardized procedures as described in the methodology. Following sensory evaluation, the most acceptable rabbit stew sample was subjected to microbial analysis at the DOST-CAR Regional Standards and Testing Laboratory, where tests included total coliform count, *Escherichia coli* count, aerobic plate count, and *Salmonella* detection.

Innovation of rabbit meat recipes

The results revealed that all recipes were highly acceptable, with most ratings falling under “liked extremely.” Among the recipes, the one-year-old rabbit kinuday stew achieved the highest overall liking, with a mean of 8.65, equivalent to “liked extremely.” In terms of taste, the most preferred was the six-month-old rabbit stew with pork kinuday, which had a mean score of 8.52, also “liked extremely,” followed closely by the one-year-old rabbit stew with pork kinuday with a mean of 8.50. In terms of aroma, the highest rating was given to the one-year-old rabbit kinuday stew with a mean of 8.57, while the one-year-old rabbit stew with pork kinuday also performed well with a mean of 8.55. For texture, the most highly rated was the one-year-old rabbit stew with pork kinuday, with a mean of 8.56, followed closely by the six-month-old rabbit stew with pork kinuday and the six-month-old rabbit kinuday stew, each rated at 8.55. These findings show that kinuday preparations, particularly those combined with pork, improved the overall sensory qualities of the dishes.

Sensory evaluation preferences

In terms of taste, all samples were liked extremely by the respondents. The six-month-old rabbit stew with pork kinuday had the highest mean of 8.52, followed by the one-year-old rabbit stew with pork kinuday at 8.50, while kinuday stews for both ages also achieved means above 8.44. Control samples, plain boiled rabbit meat, were rated slightly lower, with the six-month-old control at 8.07 and the one-year-old control at 8.18, interpreted as “liked very much” to “liked extremely.” Respondents commented that rabbit meat tasted similar to chicken, with a chewy and tasty character complemented by the herbs, spices, pork kinuday, and sweet potato. One respondent remarked, “Egmandangsi iya rabbit meat. First time kon mengan ni rabbit meat. Mayat gayam numan senga manok e nanam to. Nay bagay e daok ja Kinuday,” which translates to “The rabbit meat doesn’t smell fishy. It is my first time tasting rabbit meat. It tastes good and it tastes like chicken. The added kinuday blended well in the stew.”

In terms of aroma, the one-year-old rabbit kinuday stew was rated highest with a mean of 8.57, followed by the one-year-old rabbit stew with pork kinuday at 8.55 and the six-month-old rabbit stew with pork kinuday at 8.54. These were all described as “liked extremely.” Respondents highlighted the stimulating fragrance imparted by the guava wood smoking method. One respondent commented, “Manseng-ow numan e bayabas, mayat talgan mausal para kinuday niya rabbit aliwen bengat para shi pork,” meaning that guava material for smoking was suitable for rabbit kinuday and not only for pork. These findings align with El-Halim (2014) who reported that guava smoke produces unique aroma and flavor, and Guava Wood Farms Hawaii (2011), which described guava wood as imparting a sweet and subtle fragrance.

Texture evaluation revealed that the one-year-old rabbit stew with pork kinuday was the most preferred, with a mean of 8.56, followed closely by the six-month-old rabbit stew with pork kinuday and the six-month-old rabbit kinuday stew, both at 8.55. All samples were consistently rated as “liked extremely,” indicating tenderness and well-blended flavors. Respondents commented that the meat was soft, tender, and complemented by the smoke of pork kinuday. One Ibaloi respondent explained, “Endofet e karne ni rabbit pati kinuday mayat ema flavor sha,” which translates to “The rabbit meat has tender meat including smoked pork meat, and the

flavors are well blended.” These results are consistent with Koziol et al., who noted that boiling and stewing rabbit meat break down connective tissues, resulting in a very soft texture.

Overall preference scores confirmed the high acceptability of rabbit meat dishes. The one-year-old rabbit kinuday stew achieved the highest overall liking with a mean of 8.65, followed by the six-month-old rabbit kinuday stew at 8.62 and the six-month-old rabbit stew at 8.54. Even the least rated sample, the one-year-old rabbit control, received a mean of 8.09, still falling under “liked extremely.” These results suggest that kinuday-based recipes, especially when combined with pork, significantly enhance consumer acceptance of rabbit meat dishes.

Correlation of sensory attributes with gender, age, and occupation

The correlation between gender and taste showed that female respondents preferred stronger flavors, as indicated by the six-month control sample rated 2.5 and the one-year-old control sample rated 2.1 on the strength scale, interpreted as moderately strong flavors. Male respondents, on the other hand, showed no significant association with taste preferences. For aroma, male respondents rated the six-month control sample at 4.3, described as “stimulating fragrance,” while females rated it 3.8 or “slightly aromatic.” No significant relationship was found between gender and texture, as both male and female respondents consistently rated the texture of all samples as very soft.

Age was also found to affect taste and aroma. Respondents aged 20–29 years gave the highest preference to the one-year-old control sample, rating it a very strong flavor at 4.0, compared to the six-month control sample rated at 3.4 or moderately strong. For aroma, respondents aged 15–19 rated the six-month control sample at 4.4, “stimulating fragrance,” compared to the six-month kinuday stew rated 4.2, “slightly aromatic.” The chi-square test confirmed significant differences between age groups and their sensory preferences. However, texture was consistently rated as very soft across all age groups, with no significant differences observed.

Occupation also influenced preferences. Students rated the six-month control sample as moderately strong flavor with a mean of 3.0, while both the six-month and one-year kinuday stews were rated milder at 2.4. Business owners rated the control samples as slightly aromatic with a mean of 3.6, while students rated the six-month control more strongly aromatic at 4.4. However, occupation had no significant correlation with texture, as tenderness was consistently appreciated across groups.

Microbial qualities of rabbit meat samples

Microbial analysis of the most preferred rabbit stew confirmed its safety for consumption. The total coliform count was less than 10 CFU/g, far below the allowable limit of <100 CFU/g. This indicates that the stew was safe and unlikely to harbor harmful pathogens. Similarly, the *Escherichia coli* count was also less than 10 CFU/g, within acceptable limits and reflective of good hygienic handling during preparation. The aerobic plate count was less than 250 CFU/g, well within the safe range of 25–250 CFU/g for food products, confirming high

microbiological quality. Finally, *Salmonella* detection was negative in a 25-gram sample, which demonstrates compliance with food safety standards and eliminates the risk of salmonellosis.

Implications

The results clearly indicate that rabbit meat recipes, particularly kinuday-based preparations and those mixed with pork kinuday, were extremely well accepted in terms of taste, aroma, texture, and overall preference. Sensory evaluations demonstrated that consumers not only accepted but greatly enjoyed the dishes, while microbial analyses confirmed their safety. These findings highlight the potential of rabbit meat as a sustainable and nutritious alternative protein source that can be integrated into Filipino culinary traditions. The positive reception also underscores opportunities for local rabbit raisers and entrepreneurs to innovate rabbit-based products, contribute to food security, and expand livelihood options in communities such as Bokod, Benguet.

CONCLUSION

This study was conducted to develop and evaluate rabbit meat recipes using various treatments and to determine their sensory qualities and microbial safety. Rabbit stew, a slow-cooked dish prepared with rabbit meat, sweet potato, carrots, celery, onions, and herbs, served as the central product of innovation. Seventy evaluators participated in the sensory evaluation, comprising 42 females and 28 males ranging in age from 19 to 48 years old. The evaluation was based on the nine-point Hedonic Scale, which measured acceptability in terms of taste, texture, aroma, and overall liking. Among the recipes developed were plain boiled rabbit meat, rabbit stew, rabbit kinuday stew, and rabbit stew mixed with pork kinuday, prepared from both six-month-old and one-year-old rabbits. The most acceptable rabbit stew sample was also subjected to microbial analysis at the DOST-CAR Regional Standards and Testing Laboratory, where its total coliform count, *Escherichia coli* count, aerobic plate count, and *Salmonella* detection were examined.

The findings revealed that the one-year-old rabbit kinuday stew received the highest overall preference rating, with a weighted mean of 8.65, corresponding to “liked extremely” on the Hedonic Scale. In terms of taste, the six-month-old rabbit stew with pork kinuday was the most preferred, with a mean rating of 8.52, also described as “liked extremely.” Respondents particularly appreciated the balance created by sweet potato, pork kinuday smoked in guava branches, trunks, and leaves, and seasonings such as rosemary, peppercorn, bay leaves, and onion leeks. These ingredients, along with mirepoix composed of onion, carrot, celery, and garlic, complemented the rabbit meat and enhanced its overall flavor. Aroma preferences were highest for the one-year-old rabbit kinuday stew, which achieved a mean of 8.57 and was described as having a stimulating fragrance produced by the guava-smoked kinuday preparation. Texture was most highly rated in the one-year-old rabbit stew with pork kinuday, which had a mean of 8.56, reflecting the tenderness of lean meat stewed for 20–30 minutes and blended with pork kinuday smoked for three days.

All recipes were generally rated as “liked extremely,” though the six-month-old plain boiled rabbit control sample was rated slightly lower at “liked very much.” Overall acceptability

was highest for kinuday preparations, particularly the one-year-old rabbit kinuday stew, which combined proper seasoning, smoking techniques, and cooking time. The microbial analysis confirmed that the rabbit stew samples were safe for consumption. The total coliform count and *E. coli* count were both less than 10 CFU/g, the aerobic plate count was less than 250 CFU/g, and *Salmonella* detection was negative at 25 g, all of which fall within safe limits as defined by food safety standards.

The correlations between demographic factors and sensory attributes provided further insights. Female respondents showed stronger preferences for the flavor of plain boiled rabbit meat, while male respondents rated the aroma of the six-month-old control sample more highly, describing it as having a stimulating fragrance. Age also influenced sensory perceptions: respondents aged 20–29 years preferred the very strong flavor of one-year-old boiled rabbit, while those aged 15–19 years favored the aroma of six-month-old rabbit control samples. Occupation was another factor that affected evaluations. Students rated the six-month-old control sample highest in taste, describing it as moderately strong in flavor, while business owners and students provided varying descriptions of aroma, with business owners describing some samples as slightly aromatic and students identifying stronger fragrances. However, neither gender, age, nor occupation showed significant correlations with texture, as all groups consistently described the rabbit meat as very soft.

The findings of this study lead to several important conclusions. First, innovated rabbit meat recipes such as rabbit stew, rabbit kinuday stew, and rabbit stew with pork kinuday are highly acceptable to consumers, with kinuday preparations consistently achieving the highest scores across taste, aroma, texture, and overall preference. Second, the incorporation of herbs, spices, and smoking techniques such as the use of guava wood significantly enhanced the sensory qualities of rabbit meat, aligning with cultural practices while also appealing to new consumers. Third, while demographic variables influenced certain sensory preferences, tenderness and overall acceptability of the recipes were consistently rated highly across groups. Finally, microbial analysis confirmed that rabbit stew prepared under proper hygienic conditions is safe for consumption, making it a viable and nutritious alternative protein source.

Based on these conclusions, several recommendations may be offered. The innovated recipes, particularly kinuday-based stews, should be promoted further, as they highlight the culinary versatility and acceptability of rabbit meat. Preparation techniques such as fasting rabbits before dispatch, carefully balancing herbs and spices to avoid overpowering natural flavors, and employing guava wood for smoking are recommended for optimal results. Future studies could explore additional recipe innovations and the incorporation of other local ingredients to expand consumer acceptance. Sensory evaluations should continue to involve diverse groups to assess broader market potential, while microbial testing should remain a standard part of product development to ensure food safety. Rabbit stew and related recipes are thus not only culturally adaptable and nutritionally beneficial but also hold potential for enhancing food security and creating livelihood opportunities in rabbit-raising communities.

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