International Journal on Food, Agriculture, and Natural Resources
Volume 06, Issue 03, Page 128-134
ISSN: 2722-4066
http://www.fanres.org

Original Paper

Participatory, demonstration and evaluation of different fish recipe to the local community from Tekeze Reservoir; Waghimra, Ethiopia

Alachew Adino[1], Wubet Beiset[2], and Melese Mamo[2]*

1) *Department of Aquatic Ecosystems and Environmental Management, Bahir Dar Fishery and Other Aquatic Life Research Center, P.O. Box 794, Bahir Dar, Ethiopia*
2) *Department of Livestock Research Directorate, Sekota Dryland Agricultural Research Center, P.O. Box 62, Sekota, Ethiopia*

*) *Corresponding Author: alachewadino26@gmail.com*

Received: 13 June 2025; Revised: 25 September 2025; Accepted: 29 September 2025
DOI: https://doi.org/10.46676/ij-fanres.v6i3.557

***Abstract*— Fish and fishery products are well known for their high nutritional value and quality; specifically, they are relatively low in fat, saturated fat, omega 3, and cholesterol, yet they are high in polyunsaturated fatty acids, protein, and minerals. The objective of the study is participatory sensory evaluation of fish products (meat) in different food items for the local community. The study was carried out in three selected districts (Abergele, Zequala, and Sehala) in the Waghimra zone of the Amhara region of northern Ethiopia. The fish recipes were fish stew (asa wote), fish duel (asa dulet), fish fry (asa tibs), fish goulash (asa gulesh), fish hamburger (asa hamburger), fish palpetii (asa palpetii), and dried fish (asa quanta). In the Sehala district, fish fry, fish goulash, fish palpatii, and dried fish scored the highest. In the Abergele fish duel, the fish stew score was the highest. The highest scores for fish recipe tenderness and texture were found in the Abergele district, where fish stew was the most popular. In conclusion, the participatory demonstration and evaluation of fish recipes in the Waghimra Zone showed promising results in terms of community engagement, overall acceptance, and the potential for developing local fishery resources. Future studies and continued monitoring are recommended to further explore and scale up dried fish, fish fry, fish goulash, and fish duelet.**

Keywords*— *Abergele, Fish recipe, Sehala, Waghimra and Zequala

I. INTRODUCTION

Ethiopia has an agrarian dominated-economy, with the agricultural sector accounting for 85% of the total employment, 98% of the total calorie supply, 70% of industrial raw material supplies, over 45% of GDP, and 90% of the foreign currency earnings [1]. The estimated fish production capacity of the capture fisheries in Ethiopia's primary aquatic ecosystems, which encompass lakes, rivers, reservoirs, and wetlands, is approximately 128,000 tons annually [2, 3].

Fish and fishery products are well known for their high nutritional value and quality [4, 5]. Specifically, they are relatively low in fat, saturated fat, omega 3, and cholesterol, yet they are high in polyunsaturated fatty acids, protein, and minerals such as calcium, phosphorus, sodium, potassium, and magnesium [6, 7]. In Ethiopia, fish comes exclusively from inland water bodies, including lakes, rivers, streams, reservoirs, and substantial wetlands that are of great socio-economic, ecological, and scientific importance. The existing role of fishery is insignificant in the country's overall economy because the fishery sector in the country is far below its potential [8]. The contributions of fisheries to food security and growth in the country are minimal. Artisanal freshwater fishery is one of the most important economic activities in Ethiopia; improvements in the fishery sector can potentially contribute to poverty alleviation and environmental sustainability in the country [1]. According to WHO, the minimum recommended protein is 70 grams per person per day, of which 49 gram should be animal-oriented. Proteins are made up of multiple amino acids linked together [9].

Protein for human consumption usually comes from plants and animals. Sources of protein include meats, milk and milk products, poultry, eggs, fish, and plants. Plant proteins are deficient in certain amino acids, notably methionine, tryptophan, and lysine, which are necessary for proper healthy growth. About 20% of the world's population derives at least one-fifth of its animal protein intake from fish, and some small island states depend almost exclusively on fish [9]. Fish is nutritious, contributes to food security. Fish provides not only high-value protein but also represents an important source of a wide range of essential micronutrients, minerals, and fatty acids. Amino acids are classified as essential and nonessential [9].

Malnutrition, which is mostly due to inadequate food supply, is a major public health problem in Ethiopia. Increasing protein intake to combat protein-energy malnutrition is crucial, and one way can be increasing consumption of fish. According to World Bank study in 2012, rapid urbanization, which is a remarkable characteristic of SSA, with 3.7% per year, and rising food prices have an impact on food security in many countries of the region [9].

The Waghimra area is mainly dependent on the livestock-rearing livelihood strategy, especially for small ruminants and apiculture. Dealing with food security in Waghimra area is really the right place; the ample fish resource in the Tekeze

reservoir is a critical commodity for achieving food security plans. Therefore, this study particularly focuses on conducting a participatory demonstration on fish food preparation with the intention of providing the participants practical skills in preparing nutritional food like fish for the local community on fish products located at the surrounding Tekeze reservoir. However, there was no previous study on participatory demonstration and evaluation of different fish recipes in our study areas. This study aimed to evaluate the participatory, demonstration and evaluation of different fish recipes.

II. Material And Methods

A. Study Area Description

The study was carried out in three selected districts (Abergele, Zequala, and Sehala). Abergele district is one of the woredas in the Amhara Region of Ethiopia. The capital and main town of the woreda is Nirak. Part of the Waghimra Zone, Abergele is bordered on the south by Zekuala and on the southwest by Sehala. Ziquala district is found in Waghimra zone of the Amhara region, and is agro-ecologically characterized as hot, warm sub-moist lowland located at an average altitude of 1450 masl. Sehala districts is one of the districts in the Amhara Region of Ethiopia. Part of the Waghimra zone, Sehala is bordered on the west by the Semien (North) Gondar Zone, on the northwest by Abergele, and on the east and southeast by the Tekezé Reservoir, which separates it from Zikuala. Sehala was separated from the Zekuala district [10].

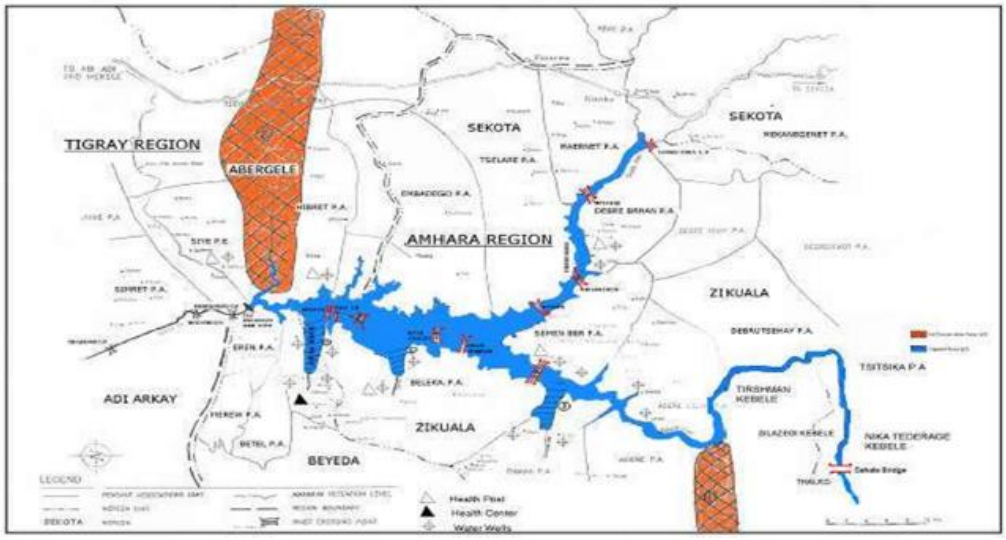

Fig. 1. Map of study area in Tekeze reservoir fisheries (adopted from Ayalew Assefa, Fufa Abunna [11])

B. Research Design and Data Collection

Purposive sampling techniques were employed to select study districts and participants and had access to fish products from the Tekeze reservoir. For the fish recipe, we selected the local community from three districts based on the purpose of having access to fish products. In each district (Abergele, Zequala, and Sehala), 10 household heads with their spouses participated in the FREG group. A couple of FREG members were selected based on their interest in and representativeness of the population under study.

Before the enactment, the participants received basic training on food items and utilization in particular and the participatory extension approach in general. Majorly harvested fish species were selected for food preparation: Tilapia (Oreochromis niloticus), Catfish (Clarias garipinus), and Bagrus docmack. Chosen the variety of fish recipes, considering ease of preparation, dietary restriction, cultural diversity, and seasonal availability of ingredients. The cooking methods were grilling, frying, poaching, and steaming. The fish recipes were fish stew (asa wote), fish duel (asa dulet), fish fry (asa tibs), fish goulash (asa gulesh), fish hamburger (asa hamburger), fish palpetii (asa palpetii), and dried fish (asa quanta). Then, through sensory evaluation, the participants were graded on their preferences based on their preference parameters, like odour, taste, and tactile appearance, by using the human senses of sight, smell, and taste. In order to get good flavor from one fish recipe to the next, we used lemon to remove the flavour from the previous fish recipe.

The method of data collection was using participant observation; the focus group discussion approach [12]; preparing and consuming food; and how they reacted to the new recipe. Prepare the recipe, invite the participant, and collect feedback on the sensory evaluation parameters. For sensory evaluation, the data were collected using the Likert scale method [13]: the scoring criteria were 1 = strongly dislike, 2 = dislike, 3 = neutral, 4 = like, and 5 = strongly

C. Data Analysis

The collected data were stored in a Microsoft Office Excel 2016 spreadsheet. Descriptive statistics such as frequency, mean, percentage, and standard deviations were used for the analysis of the data. In addition, the t-test and chi-square test (to test the significance of continuous and discrete variables, respectively) were also used to summarize and compare the information between fishers and regions.

III. Results and Discussion

Fish recipes come in a wide range of flavors and styles, from tilapia (Oreochromis niloticus), catfish (Clarias gariepinus), and Bagrus docmack [14]. The fish recipes were fish stew (asa wote), fish duel (asa dulet), fish fry (asa tibs), fish goulash (asa gulesh), fish hamburger (asa hamburger), fish palpetii (asa palpetii), and dried fish (asa quanta). Both theoretical and practical demonstrations on fish recipe preparation were done, and 30 participants (fishers, fishmongers, restaurant owners, zonal experts, and Woreda experts) participated in the participatory demonstration from each district.

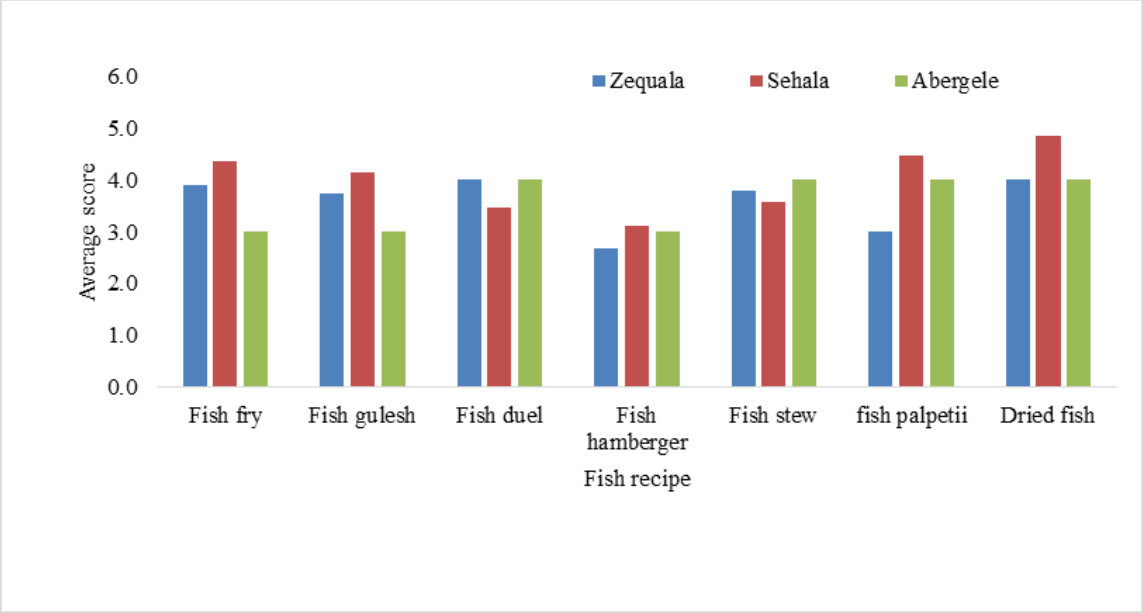

Fig. 2. The fish recipe color

Fish recipe Color is a visual perception that results from the interaction of light with the photoreceptor cells in the retina of the eye [15]. Based on figure 2, in Sehala district, fish fry (4.4) and fish goulash (4.4) were the highest scores based on the Likert scale result; it was agree. Abergele district, the fish duel (4) and the fish stew (4) score was the highest (the score result was four and above). In addition, in Zequala district, the fish fry (3.9) and dried fish (4) scores were the highest. The fish recipes were dominant in the three districts because most of the results shows that they like them and strongly like them.

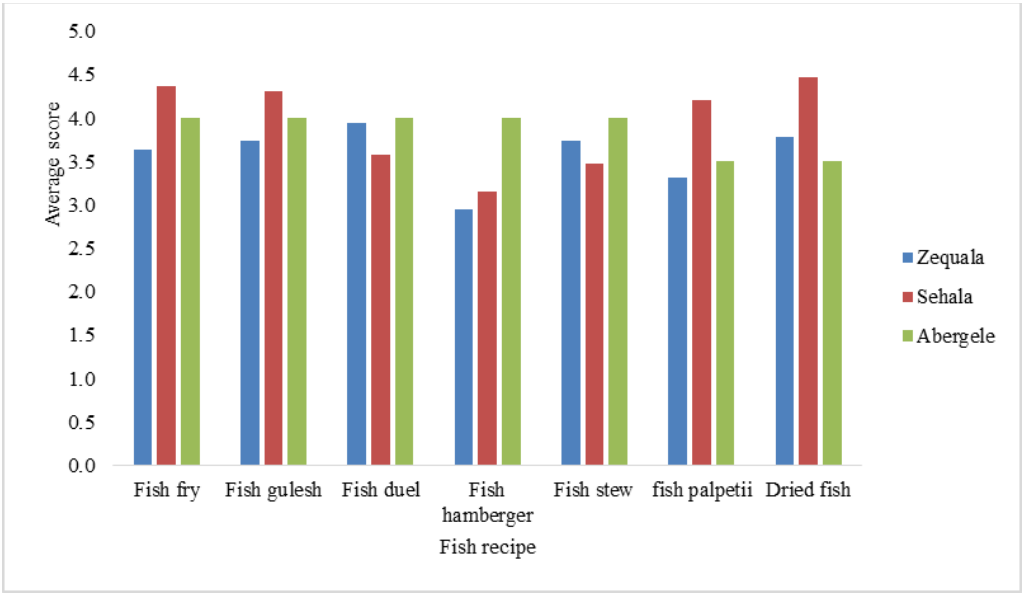

Fig. 3. The fish recipe flavor

A flavoring, also known as flavor or flavoring, is a food additive used to improve the taste or smell of food. It changes the perceptual impression of food as determined primarily by the chemoreceptors of the gustatory and olfactory systems [16]. According to Figure 3, the highest score was recorded in the Sehala district, and the fish recipes were fish fry (3.9) and dried

fish (3.8). In Zequala, fish duelet (3.9) and fish stew (3.7) were recorded high. In addition, in Abergele, fish fry and dried fish results were high.

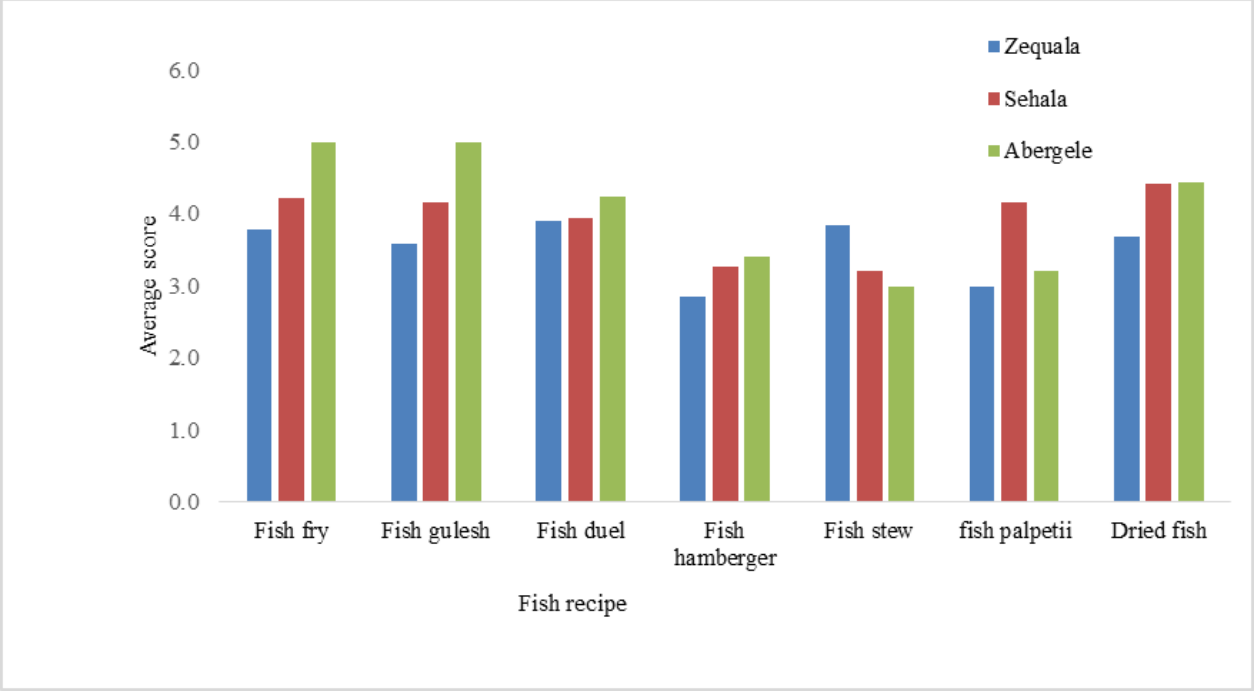

Fig. 4. The fish recipe taste

Taste is the perception stimulated when a substance in the mouth reacts chemically with taste receptor cells located on taste buds in the oral cavity, mostly on the tongue [17]. Sense of Taste. Springer Fachmedien Wiesbaden. Based on Figure 4, the highest score was observed in the Sehala district, where the recipe consisted of fish fry, fish goulash, fish duel, fish palpatii, and dried fish. In Zequala, fish duelet and fish stew attained the highest scores, while in Abergele, fish fry and fish goulash were the leading fish recipes.

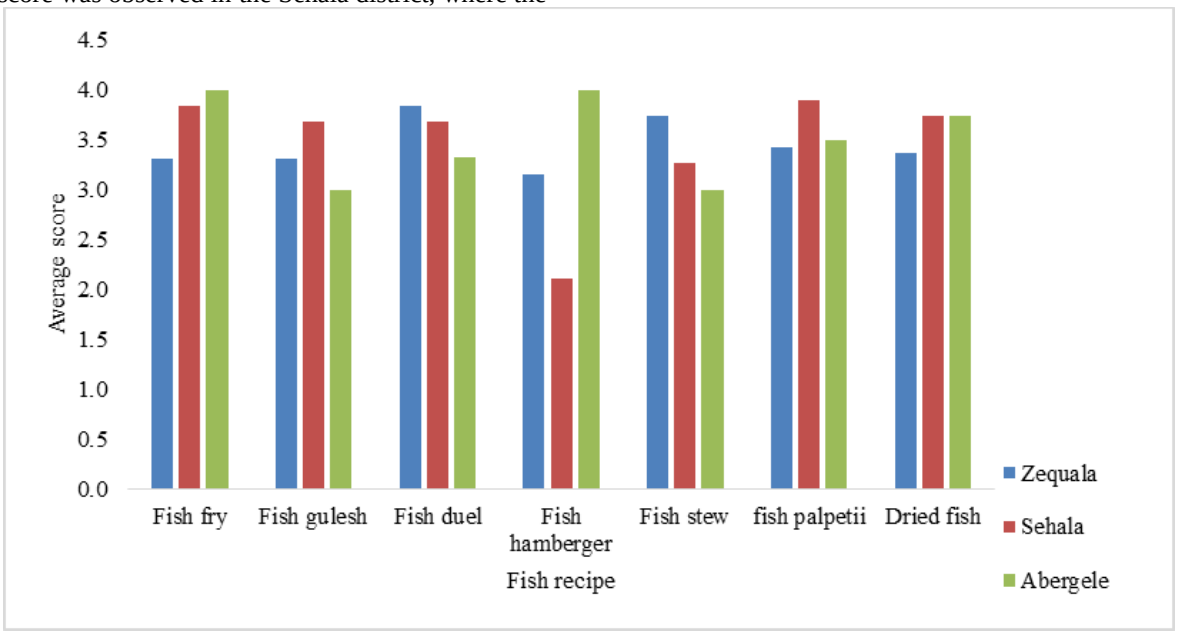

Fig. 5. The fish recipe tenderness

Tenderness is a feeling of affection, gentleness, and sensitivity. It can be expressed through physical touch [18]. Based on Figure 5. The highest score was highest in the Abergele district, and the fish recipe was fish fry and

hamburger. In Sehala fish fry, fish goulash, fish duel, fish palpatii, and dried fish had the highest score. In addition, in the Zequala district, fish duelet and fish stew had the highest score in the fish recipe.

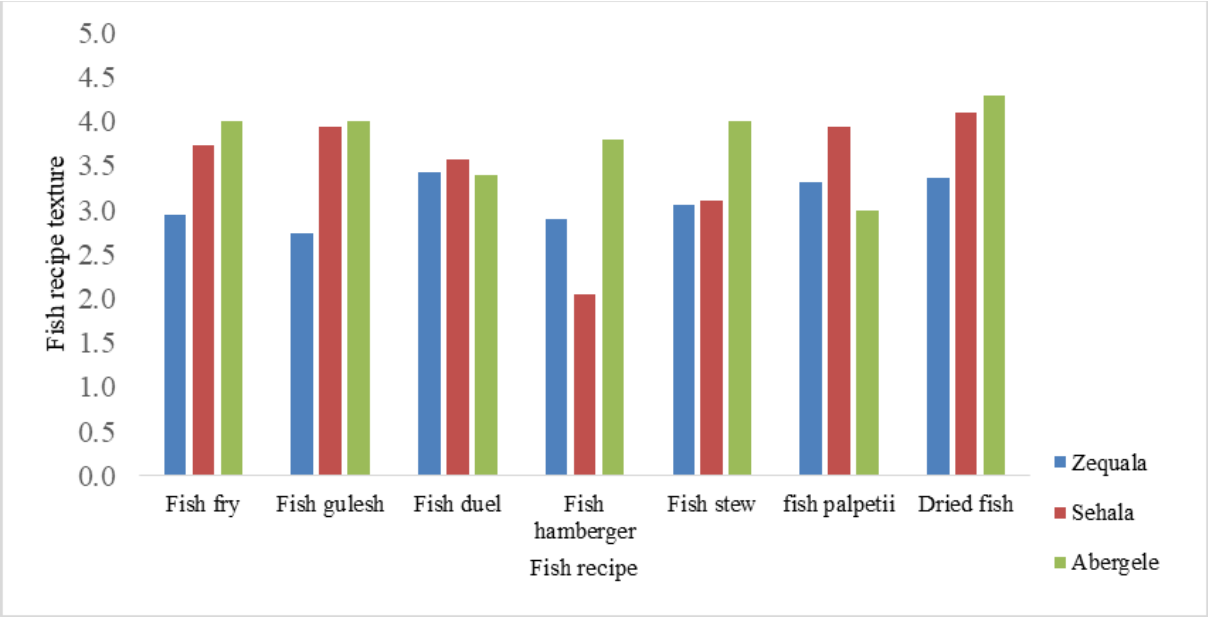

Fig. 6. The fish recipe texture

In a general sense, the word "texture" refers to the surface characteristics and appearance of an object given by the size, shape, density, arrangement, and proportion of its elementary parts. A texture is usually described as smooth or rough, soft or hard, coarse or fine, matt or glossy, etc [19]. Based on the above figure, Abergele district fish stew and fish fry had the highest scores. In Zequala district, fish duelet and dried fish had the highest score, whereas in Sehala district, fish palpate, fish goulash and dried fish had the highest.

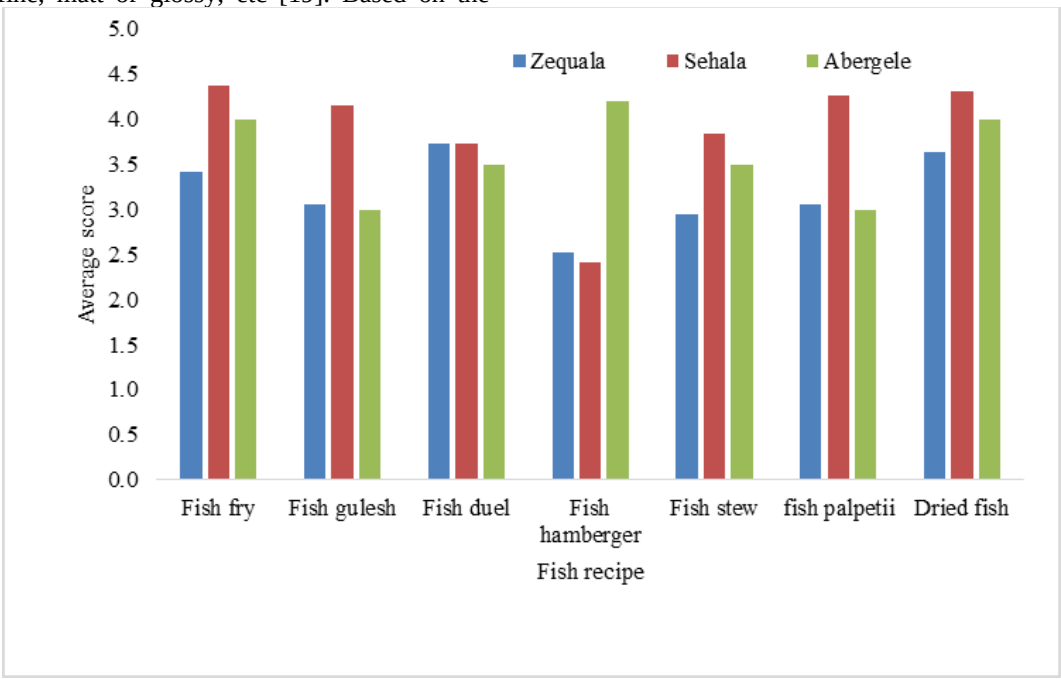

Fig. 7. The fish recipe mouth full ness

The amount of food or drink that fills your mouth or that you put into your mouth at one time [20]. Based on the above figure, in the Abergele district, fish stew and fish hambuger were the highest, and in Sehala, fish fry, fish goulash, fish palpatii, and dried fish were the highest. In addition, Zequala district fish duelet and dried fish were the highest.

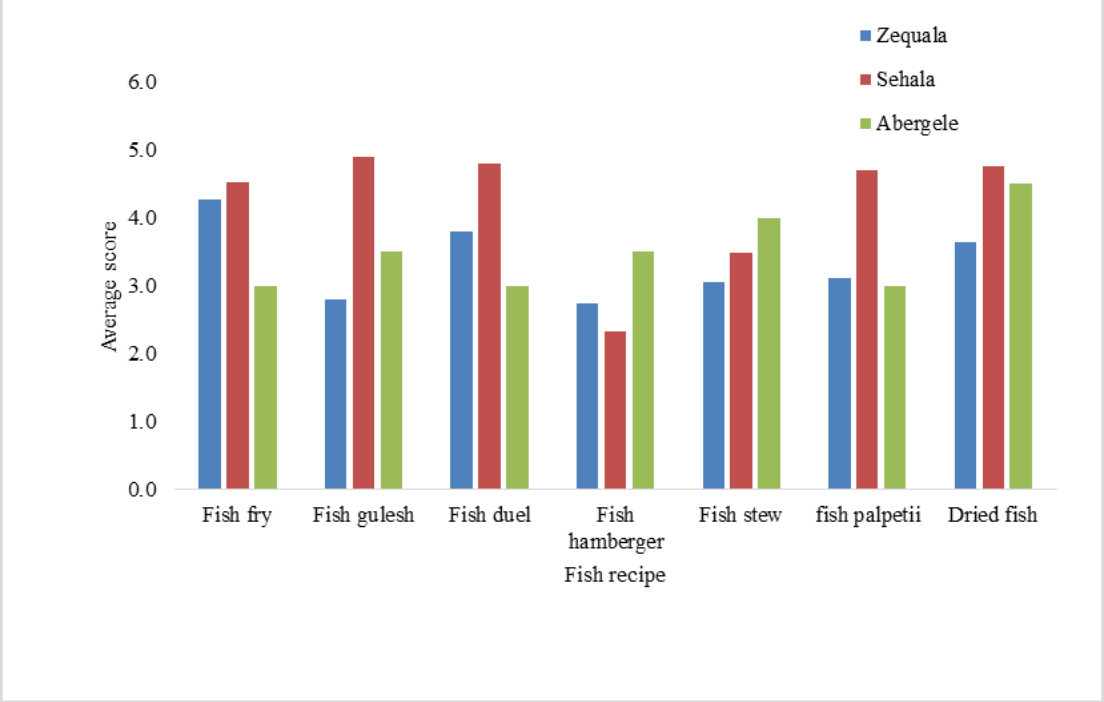

Fig. 8. The fish recipe overall acceptancec

Overall acceptance refers to the general agreement or approval of something or someone. It implies a positive reception and acknowledgment [21]. According to Figure 8 in sehala district, the overall acceptance of the recipe was high compared to others, or it shows consistently high acceptance across almost all categories. And those fish recipes were fish duel, fish goulash, fish palpetii, dried fish, and fish fry. In Abergele, fish gulash, fish hamburger, dried fish, and fish stew were the dominant fish recipes. In addition, in Zequala, fish duelet, fish fry, and dried fish got high scores from the respondents.

IV. Conclusion And Recommendation

The implementation of participatory demonstrations and evaluations of fish recipes presents a valuable opportunity to diversify the food recipes within the local community surrounding the Tekeze Reservoir. By actively engaging community members, fostering culinary innovation, and promoting the nutritional value of fish, this initiative has the potential to enhance livelihoods, improve dietary diversity, and contribute to the overall well-being of the community. The highest fish recipe colors were found in the Sehala district and the Abergele district. Sehala district had the highest fish flavor score, with fish fry, dried fish, and fish palpatii being the top fish recipes. Zequala and Abergele districts also had high scores, with fish duel and fish fry being the leading fish recipes. Active participation of the local community to get hands-on practical practices. Demonstrate with active participation of the local community to get hands-on practical practices, not to have a workshop. The recommendation should suggest to upscale certain food recipes that have wider acceptance by the local community and also recommend creating a link between the fishermen and the local supplier so that the local community has access to those ingredients for the selected recipes.

Acknowledgment

We would like to express our sincere gratitude to the Sekota Dryland Agricultural Research Center, Amhara Agricultural Research Institute (ARARI), for providing research materials and covering the whole research cost.

References

[1] Esayas Hailu, et al., Socioeconomic and institutional factors determining the utilization of fish resource in Lake Ziway. Journal of Fisheries and Aquaculture Development, 2017.

[2] FAMP, Fisheries and Aquaculture Master Plan (2024-2033). Ministry of Agriculture, Ethiopia. 2024.

[3] Aschalew Lakew, Habtamu Tadesse, and Buzayehu Gutema, Diversity and Abundance of Small Indigenous Fish (SIF) in Human Stressed Major Tributaries of the Awash River. Ethiopian Journal of Agricultural Sciences, 2024. 34(2): p. 90-103.

[4] Mohamad, R., et al., Consumer preference towards fresh water fish product developed by MARDI. Econ. Technol. Manag. Rev, 2010. 5: p. 71-77.

[5] Adebayo-Tayo, et al., Microbial quality of frozen fish sold in Uyo Metropolis. Nature and science, 2012. 10(3): p. 71-77.

[6] Lovell, R., Nutrition and feeding of fish. 1989, Van Nostrand Reinhold.

[7] Watanabe, T., V. Kiron, and S. Satoh, Trace minerals in fish nutrition. Aquaculture, 1997. 151(1-4): p. 185-207

[8] Tegegn Fantahun, Assessment of the fishery, challenges and opportunities of Denbi reservoir in Bench Maji Zone, South Western part of Ethiopia. International Journal of Fisheries and Aquaculture, 2019. 11(1): p. 7-12.

[9] Sintayehu Bedada and Seblewengel Lemma, Fish consumption pattern and determinants at household level in Asella town: South Central Ethiopia. EC Nutrition, 2017. 6: p. 159-170.

[10] Ayalew Assefa and Adane Bahiru, Ethnoveterinary botanical survey of medicinal plants in Abergelle, Sekota and Lalibela districts of Amhara

region, Northern Ethiopia. Journal of Ethnopharmacology, 2018. 213: p. 340-349.

[11] Ayalew Assefa, et al., Assessment of post-harvest fish losses in two selected lakes of Amhara Region, Northern Ethiopia. Heliyon, 2018. 4(11).

[12] Nyumba, T., et al., The use of focus group discussion methodology: Insights from two decades of application in conservation. Methods in Ecology and evolution, 2018. 9(1): p. 20-32.

[13] Hojer, R., 'Is there fish in fish cakes?': An interdisciplinary inquiry into the influence of a sensory-based experiential cooking course on fish on children's food literacy and fish-eating behavior. 20 21.

[14] Nattabi, J.K., Aspects of the digestive physiology of larvae of the North African catfish, Clarias gariepinus (Burchell 1822), during early development. 2018.

[15] Dawson, T.L., Colour and colour vision of creatures great and small. Coloration technology, 2006. 122(2): p. 61-73.

[16] Keast, R.S., Food quality perception. Processing effects on safety and quality of foods, 2009: p. 67.

[17] Schling, P., Sense of Taste. 2021: Springer.

[18] Park, L. and E. Park, The Smoked-foods Cookbook: How to Flavor, Cure, and Prepare Savory Meats, Game, Fish, Nuts, and Cheese. 1992: Stackpole Books.

[19] Prabhu, L., Texture and sensory properties of modified fish products for dysphagia patients. 2018, University of Stavanger, Norway.

[20] Hyldig, G. and D. Nielsen, A review of sensory and instrumental methods used to evaluate the texture of fish muscle. Journal of texture studies, 2001. 32(3): p. 219-242.

[21] Paci, F., et al., Consumer acceptance and willingness to pay for a fresh fish-burger: A choice experiment. Journal of cleaner production, 2018. 172: p. 3128-3137.