



## Consumer Awareness, Utilization, and Acceptance of Orange-Fleshed Sweet Potato (*Ipomoea Batatas* (L.) Lam) Value-Added Food Products in Elgeyo Marakwet County, Kenya

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### Abstract

Sweet potato is a crucial crop for food security. promoted in Kenya due to its reported health benefits and resilience to drought. The benefits and application of the sweet potato with orange flesh (OFSP) in Elgeyo Marakwet County have, however, not been established. The current research sought to establish knowledge, method of utilization, and acceptability of specialty products made from OFSP. Information on sweet potato knowledge and use was gathered from 201 smallholder farmers in Endo Ward, Elgeyo Marakwet County, using a multi-stage sampling technique. Promotion of recipes of OFSP value-added products was undertaken among 30 selected farmers through practical demonstration and a farmer participation approach. The evaluation was undertaken through semi-structured questionnaires and scoring sheets for the preferred products and reasons to support their preferences. The results indicated that 82.6% of farmers in Elgeyo Marakwet are aware compared to other crops, sweet potatoes are easier to grow and more suited to difficult climates (80.1 %). They were also aware of the advantages OFSP has for health (61.7%) and as a household food security crop (79.1%). However, 89.1% of the farmers have inadequate knowledge and skills in value addition. The majority of the farmers (70%) boil the sweet potatoes while 30% make snacks out of the OFSP. Consumer knowledge, utilization, and acceptability are influenced by demographic factors such as gender, education levels, size of land, and occupation. Products made with OFSP puree are the most



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preferred over wheat justifying its uses to produce acceptable and nutritious chapati, mandazi, and yogurt as part of diversification from the current practice of simply eating the boiled roots. These results suggest that increased efforts are required to educate farmers about the nutritional advantages of cultivating and consuming OFSP to boost agricultural value addition and the amount of vitamin A in households' diet.

## Introduction

Sweet potatoes are an essential crop for food security in Sub-Saharan Africa. The root has a three-month growth cycle and is regarded as a climate-smart crop. It grows on marginal terrain, including saline areas, and needs very little water. Orange-fleshed sweet potatoes (OFSPs) are a great source of energy and vitamins, particularly provitamin A carotenoid, which has been demonstrated to be an efficient and long-lasting source of vitamin A in humans<sup>1</sup>

Orange-fleshed sweet potato puree is a novel and distinctive ingredient with significant growth potential found in baking items. East African nations are among the major importers of wheat, with African millers spending millions on this purchase.<sup>1</sup> In baked and fried goods, pureed OFSP can take the place of part of the white, wheat flour. OFSP puree can take the place of up to 50% of the wheat flour in bread. which also reduces sugar by 90%, fat by 50%, and artificial coloring by 50%. (egg yellow). Wheat products have a better texture thanks to the OFSP puree, which makes them simpler to chew and digest. , and the baked bread preserves more than 50% of the  $\beta$ -carotene.

For a number of years, the International Potato Center (CIP) has been creating and marketing baked goods that substitute OFSP puree for 20–45% wheat flour. These products have been piloted in Ethiopia, Uganda, Ghana, Nigeria, Tanzania, The Gambia, South Africa, and Mozambique. They have also been successfully sold in Kenya, Malawi, Rwanda, and Burkina Faso. The OFSP puree value chain operations have increased the crop's value and opened up new markets for smallholder sweet potato producers, especially for women and young people. Increased farm-gate prices for roots may incentivize farmers to utilize more inputs, narrowing the current yield gap and boosting the availability of sweet potatoes in rural regions and nutrient-dense OFSP for urban consumers.<sup>3</sup>

In developing countries where a lack of vitamin A (VAD) , especially in young people and expectant mothers, is a serious issue, taking in OFSP is a beneficial choice.<sup>4</sup> In numerous developing nations, chronic malnutrition is a serious issue since there is a severe dearth of meal high in nutrients.<sup>1</sup>

There is a new demand for orange-fleshed sweet potato (OFSP) in Kenya with the emergence of commercially available baked goods using OFSP puree in place of wheat flour due to the extensive reporting on its nutritional content.<sup>1</sup> This is promoted under the SUSTAIN (Scaling Up Sweetpotato Through Agriculture and Nutrition) project, where baked goods with OFSP as a primary ingredient were tested and promoted for commercialization. Acceptability of these products depends on sensory properties (appearance, texture, taste, and aroma), functional aspects, and nutritional value.<sup>5</sup>

It has also been suggested that product diversification increases consumer preference. Although they might embrace value-added products, young people do not like boiled sweet potatoes.<sup>6</sup> Most African cultures prefer to eat fresh sweet potatoes cooked, steamed, roasted, or fried <sup>7</sup> Making OFSP roots into a puree expands how these roots can be consumed, increasing their accessibility in urban areas and lowering food loss and waste. However, the utilization of sweet potatoes among the households in Tot Division is limited to boiling. Despite the documented benefits and interests in growing and consuming OFSP, the smallholder farmers in Tot Division have not embraced it due to limited knowledge. Therefore, it is crucial to introduce simple value-adding technologies and upscale initiatives to educate farmers about the health advantages of cultivating and eating OFSP to boost agricultural value addition and boost the amount of vitamin A in households' diets.

## Materials and Methods

### Study Site

This research was done in one of Kenya's 47 counties, Tot Division, Elgeyo Marakwet County. Its capital and main town is Iten, and it is situated in the region that was once the Rift Valley Province.

It shares borders with the counties of Baringo County to the east, Uasin Gishu to the southwest, Trans Nzoia to the northwest, and West Pokot to the north (Figure 1). For most households, subsistence farming is the primary source of income with sweet potatoes being one of the resilient crops grown

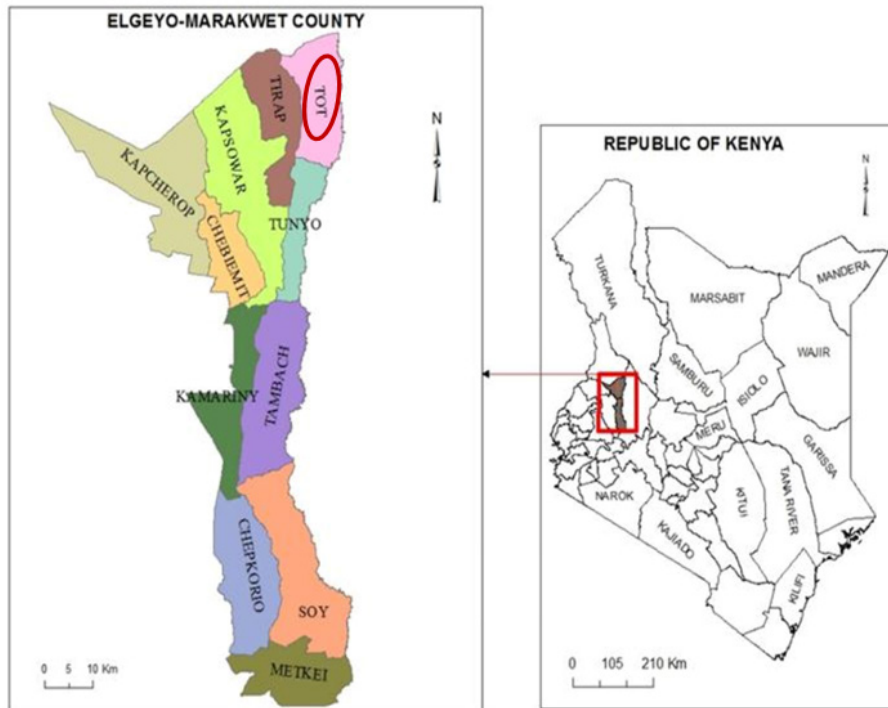


Fig. 1: A map of Tot Division in Elgeyo Marakwet County, the study area

### Sampling Procedure and Sample Size determination

The survey targeted smallholder farmers residing in the four locations (Murkutwo, Chechan, Ketut, and Endo) in Tot Division where the new varieties of Orange-fleshed sweet potatoes were promoted by the County government and mostly grown by the farmers. About 201 farmers were randomly selected from a list developed with the extension officers from four locations (Murkutwo, Chechan, Ketut, and Endo) in Endo Ward based on Krejcie and Morgan table.

### Data Collection

#### Field Survey

The field survey was conducted in April 2023 in the four selected locations in Endo Ward (Mokoro, Chechan, Ketut, and Endo). Depending on whether

they engaged in sweet potato farming at least once a year, farmers were purposefully sampled. Interviews were conducted with 201 farmers in total, one for each of the four locations. Data were gathered using structured questionnaires and in-person interviews. Either English or Swahili was used to administer the questionnaire. The study used a variety of closed-ended questions in which respondents could respond "true," "false," or "don't know." The questionnaire collected socio-demographic data on gender, educational attainment, occupation, size of the land, and make-up of the family. Three elements made up the questionnaire: demographics, knowledge, and utilization of OFSP products. Ten people from the Chesongoch area participated in a pilot research. The main study did not include the pilot study participants.

### Training

Thirty trainers were randomly selected among the 201 sweet potato farmers and trained using the Training of Trainers (ToTs) model to promote value-added OFSP product recipes through practical demonstration and a farmer participation approach. The recipe manuals for the value-added products (mandazi, chapati, and yogurt) were developed and distributed to farmers for their daily use in the households. The evaluation was undertaken using a scoring sheet for the preferred products and reasons to support preferences.

### Preparation of OFSP Products

Orange fleshed sweet potato mature roots were procured. The roots were peeled, washed, and cut into approximately 3 cm cubes before boiling and mashing them into a puree for use in different products. For chapatti and Mandazi, a ratio of 1:3 OFSP to wheat flour was used, salt was added to taste and kneading proceeded as normal followed by shallow or deep frying. For yogurt processing, milk was heated just to the boil and then subdivided into four to make the varied four products. The yogurt was prepared with the addition of sugar, 6% of the sugar was added. The sweetened milk was allowed to cool to a temperature of warm on touch before adding a fermenting bacterial culture and OFSP puree followed by incubation for five hours. The control yogurt did not have added OFSP puree.

### Sensory Evaluation and Consumer Acceptability

Twenty panelists ( $n=20$ ) were randomly selected from a list of 30 training trainers (ToTs) to assess OFSP product samples based on seven sensory attributes; appearance, odor, taste, texture, mouth feel, product separation, and overall acceptability. Panelists were instructed to use a seven-point hedonic scale to record their observations on the sensory sheet (seven and one points showing they like it extremely and dislike it extremely, respectively). Before the samples were assessed, the research assistant gave the participants an explanation of each sensory attribute so they would understand what each of the seven attributes meant. All the panelists were familiar with the products prepared. Panelists were free to exit the study at any time, and participation was entirely voluntary. Before any data was collected, research assistants who were proficient in Marakwet and Kiswahili were hired and trained. Because the study participants

speak Kiswahili and Marakwet as their native tongues, these languages were chosen for the study. To protect participant anonymity, a participant number was provided.

### Data Analysis

The data from the sensory evaluation and survey questionnaires were imported into Kobo and transferred to Statistical Package for Social Sciences (SPSS) version 22 for descriptive, inferential, and exploratory factor analysis based on the F test at the 5% level of significance. The data on hedonic scale scores for sensory attributes was subjected to analysis of variance and mean separation was done based on LSD T-test.

## Results and Discussion

### The Respondents' Sociodemographic Characteristics

#### Gender and Level Of Education

The majority of respondents were female (83%) with diverse levels of education background. This agrees with the general observations that sweet potatoes are seen as a "woman's crop" in terms of the amount of time they require to produce relative to other crops.<sup>8</sup> This would suggest that women are actively engaged in farming in a region where men have traditionally and culturally been known to participate most. Most of the farmers went to secondary (36.3%) and primary schools (33.8%) with few attending tertiary (20.4%), and adult education levels (4.5%). However, (5.0%) has no formal education (Table 1). Knowledge of nutrition is positively correlated with education level, and those who have higher education levels are more likely to want highly nutritious and quality goods.<sup>9</sup>

#### Occupation, Land Size, and Household Size

The main occupation of most of the respondents was mixed farming with 44.3% growing crops and 24.9% keeping livestock. This can be a sign of a change in the county of Elgeyo Marakwet communities' economic and/or social priorities from pastoralism to crop farming. The average farm size was  $1.78 \pm 1.402$  ha with an average of  $0.30 \pm 0.441$  ha occupied by OFSP (Table 1). Farm size has a big impact on what farmers decide to do with crop diversification and new agronomic technologies. Large farms allow farmers to reduce the risk of loss due to resource scarcity and climate change, as well as to vary their livestock and crop options. According to the

survey findings, the majority of households in the Tot division were medium-sized with a range of 4-8

individuals and an average size of.<sup>7</sup> The average household size is greater than 3.9 which is the average household size as reported in the most recent national census of population and housing.<sup>8</sup> This demonstrates the high demand for food in the households.

**Table 1: Sociodemographic characteristics of the surveyed participants (n=201)**

Parameter	Frequency n(%)*
<b>Gender</b>	
Female	167(83.1)
Male	34 (16.9)
<b>Education Level</b>	
Lack formal education	10 (5.0)
Education for adults	9 (4.5)
Primary education	68(33.8)
Secondary education	73(36.3)
Tertiary education	41(20.4)
<b>Main occupation</b>	
cultivation of food crops farming of livestock	89 (44.3)
Trader/Service	50 (24.9)
Formal wage earner	46 (22.9)
<b>Average land size</b>	16 (8.0)
<b>Average household size</b>	1.78±1.402 7 ± 3

\* Percentage of sample calculated using total sample (n = 201).

**Knowledge of Sweet Potato Production and Nutritional Content**

The farmers were aware that Sweet potatoes are easier to grow than other crops (80.1%) and are well suited to tough climates (82.6 percent). This is consistent with reported information by.<sup>1</sup> The farmers are also aware of the advantages OFSP has for health due to the high levels of beta-carotene (61.7%) and how it helps prevent deficiencies in young people, expectant mothers, and the aged (54.2%). This is in agreement with a report that, in developing countries where lack of vitamin A, especially in young people, is a serious issue, consuming OFSP is a beneficial choice<sup>10</sup> .The farmers also acknowledge the relevance of sweet potato production to household food security (79.1%) as reported by,<sup>1</sup> supplementing animal feed (86.1%), employment (52.7%), and enhancing soil fertility since it is a cover crop (84.1%) Table 2.

**Table 2: Percentage of participants' responses to knowledge on sweet potato production and nutritional content**

	True (%)	False (%)	Don't know (%)
Sweet potatoes are climatically suited to hard environments.	82.6	4.5	12.9
Sweet potatoes are simpler to raise comparison to other crops	80.1	8.5	11.4
Sweet potatoes are essential for ensuring the food security of a household.	79.1	4	16.9
potatoes are essential ingredients for supplementing animal diet.	86.1	1.5	12.4
For HH members, the production of sweet potatoes offers employment prospects.	52.7	22.9	24.4
Sweet potato cultivation improves soil fertility	84.1	1.5	14.4
Sweet potatoes overcooking destroys most of the essential nutrients	43.8	16.4	39.8
Sweet potatoes contain essential vitamins for human healthy	61.7	2.5	35.8
Sweet potatoes' high vitamin content helps prevent vitamin deficits in young people, expectant mothers, and the elderly	54.2	10	35.8

**Methods of Utilization of Sweet Potatoes**

The most common mode of utilization of sweet potatoes by households in Tot Division is through

boiling (70%) while a few people make snacks (30%) (Figure 2). Most studies highlight that OFSP is turned into flour, which is then used to make

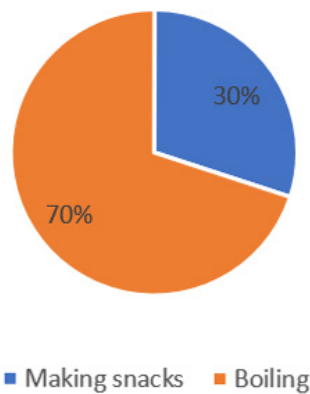
unique food items including chips, cereal, biscuits, bread, porridge and drinks. like chapati.<sup>11</sup> However, this is contrary to the study findings and this may be attributed to inadequate knowledge and skills in value addition techniques. Through provision of effective and efficient extension training on the utilization of modern processing techniques to increase agricultural value addition, OFSP farmers should feel more empowered. Therefore, the promotion of recipes of diverse value-added products like mandazi, chapati, and yogurt enriched with OFSP may raise the amount of vitamin A that

is consumed in food in the households as suggested by.<sup>12</sup>

**Sensory Evaluation and Consumer Acceptability**

Typically, consumers were asked to rate how much they enjoyed a product to determine the level of customer acceptability.<sup>13</sup> Even if a product has been shown to provide health benefits, consumers may not accept it if it is not appealing to them or if their expectations are not met by its sensory qualities.<sup>14</sup> A seven (7) point hedonic scale scores were used in the evaluation and data was presented based on attribute scores ranging from 1 to 7.

**Method of utilization**



**Fig. 2** Methods of sweet potato utilization by most households in the Tot division

**Chapati**

There was a significant variation ( $P < 0.05$ ) in color, texture, and oiliness between chapati made with OFSP puree and wheat (Table 3). Chapati made from OFSP puree was mostly preferred ( $6.38 \pm 0.97$ ) than that made with wheat ( $5.38 \pm 1.88$ ). Chapatis are mostly made from wheat products that rely on imports to prepare. In this preparation, wheat had been replaced by OFSP up to 30%, and yet the products were more acceptable. OFSP was locally grown and is more nutritious since it has vitamin A which is lacking in wheat, and it also has additional antioxidants that are beneficial to human health.<sup>15</sup> Besides, OFSP are climate-smart crops that should be promoted for both local and international markets.<sup>1</sup>

**Table 3: Hedonic scale scores for sensory attributes of chapati made with OFSP puree compared to wheat (n=20)**

Product	Color	Flavor	Texture	Oiliness	Overall acceptability
OFSP puree	$6.2 \pm 1.18^a$	$5.38 \pm 1.69^a$	$5.76 \pm 1.67^a$	$6.14 \pm 1.35^a$	$6.38 \pm 0.97^a$
Wheat	$5.8 \pm 1.0^b$	$5.19 \pm 1.21^b$	$4.86 \pm 1.42^b$	$4.71 \pm 1.85^b$	$5.38 \pm 1.88^b$
P value	0.04	0.04	0.03	0.02	0.03

Scores on the hedonic scale that are followed in a column by a different letter (a or b) show a significant difference ( $p < 0.05$ ).

**Mandazi**

Mandazi made with OFSP puree were the most preferred ( $6.3 \pm 1.41$ ) compared to the regular wheat Mandazi ( $5.7 \pm 0.66$ ) as reflected in the overall acceptability scores (Table 4). There were significant differences ( $P < 0.01$ ) in color, flavor, and texture with

Mandazi made with OFSP puree ranking highest at  $6 \pm 0.97$ ,  $5.5 \pm 1.2$ , and  $5.9 \pm 0.85$  for the parameters respectively. In terms of oiliness, there was no significant difference ( $P > 0.05$ ) between wheat Mandazi and those prepared with OFSP.

**Table 4: Hedonic scale scores for sensory attributes of Mandazi made with OFSP puree compared to wheat (n=20)**

Product	Color	Flavor	Texture	Oiliness	Overall acceptability
Wheat	4.3±1.53 <sup>a</sup>	4.35±1.14 <sup>a</sup>	4.7±1.42 <sup>a</sup>	4.9±1.73 <sup>a</sup>	5.7±0.66 <sup>a</sup>
OFSP puree	6.0±0.97 <sup>b</sup>	5.5±1.23 <sup>b</sup>	5.9±0.85 <sup>b</sup>	4.95±1.40 <sup>b</sup>	6.3±1.41 <sup>b</sup>
P Value	0.002	0.006	0.002	0.841	0.022

Scores on the hedonic scale that are followed in a column by a different letter (a or b) show a significant difference ( $p < 0.05$ )

**Table 5: Hedonic scale scores for sensory attributes of yogurt made with OFSP puree compared to natural (n=20)**

Product	Color	Flavor	Mouthfeel	Separation	Lumpiness	Overall acceptability
OFSP puree Without sugar	4.7±1.34 <sup>a</sup>	4.5±1.27 <sup>a</sup>	3.9±1.73 <sup>a</sup>	4.67±1.23 <sup>a</sup>	4.4±1.35 <sup>a</sup>	5.4±1.35 <sup>b</sup>
OFSP puree with sugar	4.9±0.99 <sup>ab</sup>	4.5±0.97 <sup>a</sup>	4.6±0.69 <sup>ab</sup>	4.67±1.41 <sup>a</sup>	4.2±1.14 <sup>a</sup>	5.5±0.97 <sup>b</sup>
Natural	5.2±1.68 <sup>ab</sup>	5±1.16 <sup>a</sup>	5.7±1.25 <sup>bc</sup>	4.56±1.33 <sup>a</sup>	5.7±0.82 <sup>b</sup>	5.1±1.79 <sup>a</sup>
OFSP puree with Sugar and strawberry	6.3±0.67 <sup>c</sup>	5.8±1.23 <sup>a</sup>	6.3±0.82 <sup>c</sup>	5.56±1.33 <sup>a</sup>	6.3±0.82 <sup>b</sup>	6.5±0.71 <sup>c</sup>
P value	0.029	0.064	0.000	0.360	0.000	0.006

Scores on the hedonic scale that are followed in a column by a different letter (a or b) show a significant difference ( $p < 0.05$ )

### Yogurt

There was no significant variation ( $P > 0.05$ ) in separation (syneresis) for the four products with yogurt made with sugar and strawberry having the highest rating (5.56±1.333) and the natural yogurt with the lowest rating (4.56±1.33; Table 5). Yogurt that had sugar and strawberry, ranked highest in all other parameters; color (6.3±0.675), flavor (5.8±1.229), mouthfeel (6.3±0.823), smoothness/lumpiness (6.3±0.823) and overall acceptability (6.5±0.707). There was a distinct difference ( $P < 0.05$ ) in color and mouthfeel for the four products. The use of OFSP in yogurt serves four main purposes: first, it thickens the product and hence prevents the use of expensive or artificial thickeners, secondly, it gives a desired flavor and prevents the use of artificial and non-nutritive flavorings, thirdly, it imparts sweetening and reduces the need for the addition of sugars and lastly, OFSP adds to the yogurt drink pro-vitamin A

carotenoid (beta carotene). Adoption and use of the OFSP, therefore, gives a great advantage to yogurt consumers and hence the need to promote its use by fronting the health benefits of the OFSP yogurt.

### Conclusion

The farmers in Elgeyo Marakwet are aware that compared to other crops, sweet potatoes are easier to grow and more suited to difficult climates. They are also aware of the advantages OFSP has for health and are ready to adopt the crop. Orange fleshed sweet potato puree can be used to produce acceptable and nutritious Chapati, Mandazi, and yogurt as part of diversification from the current practice of boiling the roots. The county government of Elgeyo Marakwet should take the lead in upscaling initiatives to educate farmers about the health advantages of cultivating and eating OFSP through effective and efficient extension training.

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### Conflicts of Interest

The authors declare no conflict of interest

### Author Contributions

Conceptualization, J.C., H.G., T.N. and M.K.; methodology, J.C., G.A; H.G. and T.N.; software, J.C and G.A.; validation, J.C; G.A; H.G., T.N. and M.K. formal analysis, J.C and G.A.; investigation, J.C.; resources, J.C.; data curation, J.C. and H.G.;

writing—original draft preparation, J.C., G.A; H.G., T.N. and M.K.; writing—review and editing, J.C; G.A; H.G. and T.N.; visualization, J.C. and H.G.; supervision, J.C. project administration, J.C.; funding acquisition, J.C. All authors have read and agreed to the published version of the manuscript.

### Data Availability Statement

The manuscript incorporates all datasets collected in this study. The corresponding author can provide any extra data from this study upon request.

### Ethics Statement

The KNH-UoN Ethics and Research Committee granted ethical approval (P717/09/2022) <https://erc.uonbi.ac.ke/index.php/>, accessed on 29 November 2022 while the National Council of Science, Technology and Innovations (NACOSTI-Kenya), a regulatory agency, provided the study permit (NACOSTI/P/23/22730).

### Informed Consent Statement

Each research participant provided their free and informed consent before beginning the study. Throughout the study, the values of secrecy and respect were upheld. Community standards related to data collection were adhered to when collecting data. Only relevant information was collected from the community members and the participants were given information on the objective of the research and access to the findings.

## References

1. Wanjuu C, Bocher T, Abong' G, Low J, Mbogo D, Heck S, Muzhingi T. Consumer Knowledge and Attitude Towards Orange-Fleshed Sweetpotato (OFSP) Puree Bread in Kenya. *Open Agric.* 2019;4(1):616-622. doi:10.1515/opag-2019-0061
2. Wanjuu C, Abong G, Mbogo D, Heck S, Low J, Muzhingi T. The physiochemical properties and shelf-life of orange-fleshed sweet potato puree composite bread. *Food Sci Nutr.* 2018;6(6):1555-1563. doi:10.1002/fsn3.710
3. Moyo M, Truong VD, Simunovic J, Pankuku J, Abong G, Amagloh F, Fuchs R, Magnaghi A, Rajendran S, Grant F, Muzhingi T. Orange-Fleshed Sweetpotato Puree: A Breakthrough Product for the Bakery Sector in Africa. In: Root, Tuber and Banana Food System Innovations. *Springer International Publishing*; 2022:145-172. doi:10.1007/978-3-030-92022-7\_5
4. Low JW, Van Jaarsveld PJ. The Potential Contribution of Bread Buns Fortified with  $\beta$ -Carotene-Rich Sweet Potato in Central Mozambique. *Food Nutr Bull.* 2008;29(2):98-107. doi:10.1177/156482650802900203
5. Adeyonu AG, Ajala AO, Adigun GT, Ajiboye BO, Gbotosho OO. Determinants of sweet potato value addition among smallholder farming households in Kwara state, Nigeria. *Agro-Science.* 2017;15(1):17. doi:10.4314/



- as.v15i1.4
6. Orinda M, Lagat J, Mshenga P. Analysis of the Determinants of Sweet Potato Value Addition by Smallholder Farmers in Kenya. *J Econ Sustain Dev* www.iiste.org ISSN. 2017;8(8). www.iiste.org
  7. Mwangi ROM, Mayanja S, Swanckaert J, Nakitto M, Felde T, Grüneberg W, Mudege N, Moyo M, Banda L, Tinyiro S, Kisakye S, Bamwirire D, Anena B, Bouniol A, Magala DB, Yada B, Carey E, Andrade M, Johanningsmeier S, Forsythe L, Fliedel G, Muzhingi T. Development of a food product profile for boiled and steamed sweetpotato in Uganda for effective breeding. *Int J Food Sci Technol*. 2021;56(3):1385-1398. doi:10.1111/ijfs.14792
  8. Owuor AA, Otieno DJ, Okello JJ, Oluoch-Kosura W, Dufour D. Assessment of consumers' preference for orange-fleshed sweet potato puree <scp> chapati </scp> : a case of rural and urban consumers in Kenya. *J Sci Food Agric*. Published online June 29, 2023. doi:10.1002/jsfa.12734
  9. Worsley A, Wang WC, Yeatman H, Byrne S, Wijayarathne P. Does school health and home economics education influence adults' food knowledge? *Health Promot Int*. Published online August 19, 2015:dav078. doi:10.1093/heapro/dav078
  10. Low JW, Arimond M, Osman N, Cunguara B, Zano F, Tschirley D. A Food-Based Approach Introducing Orange-Fleshed Sweet Potatoes Increased Vitamin A Intake and Serum Retinol Concentrations in Young Children in Rural Mozambique .3. *J Nutr*. 2007;137(5):1320-1327. doi:10.1093/jn/137.5.1320
  11. Mohammed AA. Awareness, Attitude and Utilization of Orange-Fleshed Sweet Potato (OFSP): Critical Literature Review. *Eur Sci Journal, ESJ*. 2023;19(18):36. doi:10.19044/esj.2023.v19n18p36
  12. Richard AA, Nyarkoa D, Francis KA. Orange-Fleshed Sweet Potato (Ipomoea batatas L (Lam)) Composite Spaghetti has Good Consumer Acceptability and a Significant Source of Dietary Vitamin A. *Food Process Nutr Sci*. 2020;1(1):25-30. doi:10.46619/Fpns.2020.1-1003
  13. Menon L, Majumdar SD, Ravi U. Development and analysis of composite flour bread. *J Food Sci Technol*. 2015;52(7):4156-4165. doi:10.1007/s13197-014-1466-8
  14. Menrad K. Market and marketing of functional food in Europe. *J Food Eng*. 2003;56(2-3):181-188. doi:10.1016/S0260-8774(02)00247-9
  15. Hellmann H, Goyer A, Navarre DA. Antioxidants in Potatoes: A Functional View on One of the Major Food Crops Worldwide. *Molecules*. 2021;26(9):2446. doi:10.3390/molecules26092446