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RESEARCH ARTICLE

Farmers' selection criteria for sweet potato varieties in Benin: An application of Best-Worst Scaling

Idrissou Ahoudou[1], Dêêdi E. O. Sogbohossou[1], Nicodeme V. Fassinou Hotegni[1], Charlotte O. A. Adjé[1], Françoise Assogba Komlan[3], Ismail Moumouni-Moussa[2] and Enoch G. Achigan-Dako[1]

[1]Genetics, Biotechnology and Seed Science Unit (GBioS), Laboratory of Crop Production, Physiology and Plant Breeding, Faculty of Agronomic Sciences, University of Abomey-Calavi, Tri Postal Cotonou 01 BP 526, Republic of Benin, [2]Laboratory of Research on Innovation for Agricultural Development (LRIDA), University of Parakou (UP), Republic of Benin and [3]Vegetable Research Program, National Institute of Agricultural Research of Benin (INRAB), Cotonou 01 BP 884, Republic of Benin
Corresponding author: Enoch G. Achigan-Dako; Email: e.adako@gmail.com

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Summary
Integrating farmers' preferences into the breeding and dissemination of new genotypes is a effective approach to enhance their successful adoption by farmers. In the case of sweet potato, a staple crop in many parts of West Africa, there is a need for more research on the selection criteria used by farmers when choosing which varieties to grow. This study aims to highlight farmers' selection criteria for sweet potato varieties in the main production areas in Benin. A total of 480 farmers from the top three sweet potato production areas were surveyed. The relative importance of various traits for sweet potato farmers was evaluated using best-worst scaling methods. Latent class analysis was applied to find groups of farmers with similar preferences. Best-Worst Scaling analysis revealed that high root yield, root size, marketability, and early maturing were the most important variety selection criteria. Latent class analysis revealed three farmers' groups referred to as 'Yield potential', 'Market value', and 'Plant resilience' classes. 'Yield potential' farmers were more likely to be from Atlantique and Alibori departments; they significantly committed more acreage to sweet potato production. The 'Market value' farmers highlighted the variety of root size and commercial value as the main selection criteria and consisted of farmers with primary education levels from the Ouémé department. 'Plant resilience' refers to a group of Alibori farmers who prioritize environmental issues and primarily grow sweet potatoes for self-consumption. Our findings shed light on farmers' preferences and suggested that heterogeneity in sweet potato selection criteria was highly influenced by various socio-economic factors and location.

Keywords: Best-Worst Scaling; improved cultivars; latent class analysis; sweet potato; technology adoption

Introduction
Over the past 20 years, food security has become a major concern for the world, particularly for developing countries in Africa. This situation is becoming increasingly critical due to the rapid growth of the world population and the escalating effects of climate change on global food production. (Chapman *et al.*, 2022; Lin *et al.*, 2022; Valin *et al.*, 2014). To face food security challenges, crop diversification represents an interesting and sustainable approach. Consuming a wider range of food sources is therefore critical to combat malnutrition and global food insecurity, which is projected to worsen (Khoury *et al.*, 2014). Among the crops promoted for food and nutrition security is the sweet potato (*Ipomoea batatas* L.), which unfortunately reveals a 71.9% decline in the relative abundance of global food supplies per capita from 1961 to 2019, with an

average yearly drop of 2.2% (Faostat, 2022). Sweet potato occupies an important place in the production systems of sub-Saharan countries, where it is the second most cultivated root and tuber crop after cassava (Faostat, 2022). The tuber, as well as the leaves, represents an important source of energy, essential minerals, vitamins, and dietary fiber (Bovell-Benjamin, 2010); this crop is less labor-intensive compared to most other staple crops, and can be produced over a long period without considerable yield loss (Low *et al.*, 2007). Despite its importance, sweet potato production is relatively low in West Africa compared to the East, with a total production in 2020 of around 5 662 183 tons and 19 243 428 tons, respectively (Faostat, 2022). In Benin, Nigeria, and Togo, the production has decreased in recent years despite changes in production area. In Benin, the production decreased from 59 400 tons in 2019 to 56 923 tons in 2020, while the production area increased. In Nigeria, production slightly decreased from 3 884 273 tons in 2019 to 3 867 871 tons in 2020, while the production area increased. In Togo, production decreased from 8672 tons in 2019 to 7408 tons in 2020 and the production area decreased as well (Faostat, 2022). This may be due, among other things, to the fact that in those countries, as in the majority of sub-Saharan countries, sweet potato production is mainly dominated by landraces, which generally produce lower yields under optimal conditions compared to improved cultivars (Xiahong *et al.*, 2011; Yong'an *et al.*, 2010). The maintenance of landraces for production despite the presence of improved varieties is mainly due to the fact that those landraces have interesting characteristics such as yield stability, dry matter content, market preference, or resistance to abiotic and biotic constraints (Tairo *et al.*, 2008; Zawedde *et al.*, 2014).

The landraces produced are generally dominated by white and yellow-fleshed varieties, having no or low levels of beta-carotene, respectively (Low *et al.*, 2017a; Sohindji *et al.*, 2022). These varieties, however, contribute little to combating vitamin A deficiency diseases. In contrast, the orange-fleshed sweet potato (OFSP) variety is a significant source of vitamin A (Low *et al.*, 2017a). OFSP consumption is now widely recognized as an excellent way of combating vitamin A deficiency-related diseases in Sub-Saharan Africa (SSA) (Low *et al.*, 2017b).

Despite its nutritional value, OFSP adoption in West Africa is still lower than in East Africa. The low adoption rate may however be due, among other factors, to the traits of the variety proposed. Indeed, when selecting new sweet potato varieties, farmers take into account a range of agronomic, culinary, and organoleptic attributes. These include factors such as yield, dry matter content, skin and flesh color, root size, taste, pest and drought resistance, time to maturity, vine development, and storage capacity (Jenkins *et al.*, 2018; Shumbusha *et al.*, 2020; Zawedde *et al.*, 2014). The specific criteria for selection can vary considerably depending on the country and the production locations and regions. For example, in drought-prone areas, farmers may prefer sweet potato varieties with high yield potential and short maturity periods (Ilukor *et al.*, 2014; Kaguongo *et al.*, 2012). In contrast, in regions where sweet potato is intercropped with other crops, farmers may choose varieties with longer maturity periods and lower yield potential like the white flesh sweet potato (Kapinga *et al.*, 2003). In Mozambique, the adoption of OFSP varieties was influenced by agronomic traits and access to planting material (Jogo *et al.*, 2021). In Ghana, unsweetened sweet potato varieties were preferred and OFSP varieties that are too sweet may not be successful (Baafi *et al.*, 2016). The latter situation has enabled the International potato center (CIP) and the national programs of Ghana and Nigeria to prioritize in their sweet potato breeding program less or unsweetened OFSP varieties development (Low *et al.*, 2017b). It is, therefore, very important to determine farmers' preferred traits in crop varieties. This would enhance the potential for adoption of the new varieties in the target population. Unfortunately, unlike some main crops such as cassava (Agre *et al.*, 2017) and rice (Loko *et al.*, 2021), there has been relatively little empirical study analyzing the key varietal selection criteria in African sweet potato farmers in general, and in West African farmers in particular. Thus, by filling this research gap, this study can provide valuable insights into the decision-making processes of smallholder farmers in Benin, contributing to farmers' decision-making theory and ultimately enhancing the potential for the adoption of new varieties in the target population.

Given that the varietal selection criteria are crucial to responding effectively to the farmer's needs and therefore ensuring better food security, this study questions: what are the main selection criteria that smallholder farmers use to select sweet potato varieties in Benin? Based on the selection criteria and preferences, what are the attributes that help categorize sweet potato growers? To answer those questions, we hypothesized that (*H1*) root yield and market value are the main selection criteria for sweet potato variety for Beninese farmers, and that (*H2*) heterogeneity in farmer responses to the sweet potato selection criteria is strongly influenced by farmers' sociodemographic attributes or locations.

This study aims to enhance the understanding of farmers' preferences for sweet potato variety selection criteria in Benin by utilizing a different analytical approach, the Best-Worst Scaling (BWS) method, to identify the key factors that influence the adoption and maintenance of sweet potato varieties in the country.

Materials and Methods

Survey approach

A survey of sweet potato farmers was conducted to investigate farmers' selection criteria for sweet potato varieties and factors that influence their prioritization. For this purpose, the BWS method was adopted. BWS is a survey approach for determining individuals' priorities (what they consider to be best and worst) among a set of items evaluated (Flynn *et al.*, 2007). Developed by Louviere and Woodworth (1990) and first published by Finn and Louviere (1992), this approach allows survey respondents to select the "best" and "worst" traits from a series of repeated choice sets. It belongs to the conjoint analysis methods family, which collectively serve to identify preferences and trade-offs that contribute to individuals' choices with respect to "goods" (Lancsar et Louviere 2008), and is based on Random Utility Theory, which assumes that an individual's relative preference for object A over object B is a function of the relative frequency with which object A is chosen as better than, or preferred to, object B (Louviere *et al.*, 2013).

Also known as the maximum difference scale, the BWS approach has proven to have higher discrimination than rating scales because it forces respondents to make trade-offs between items or benefits to choose only one most and one least preferred item in each choice set (Cohen, 2003; Jaeger *et al.*, 2008; Lee *et al.*, 2007). This solves the problem of having multiple items with comparable relevance weights (Cohen, 2009). In addition, because BWS is based on choices of the most preferred (best) and least liked (worst) method, it allows to avoid bias known in rating and scaling methods (Mueller Loose and Lockshin, 2013). According to Cohen (2009), the ranking approach is only applicable to a small number of items, but the rating method does not enable drawing conclusions about respondent preferences for the items when all items are rated as relevant to them. Lagerkvist (2013) showed that ranking is an appropriate approach for a wide range of items; however, the BWS method gave a better solution. Erdem and Rigby (2013) reported that this method is especially useful for ranking many components based on their importance or preference for individuals. Furthermore, it provides an easy technique to distinguish the traits studied without making the test more difficult for respondents (Cohen, 2009; Jaeger *et al.*, 2008). This method is widely used in a wide range of research fields, including agricultural, environment (Dumbrell *et al.*, 2016; Jones *et al.*, 2013; Loureiro and Dominguez Arcos, 2012), health (Tatar *et al.*, 2022), and marketing (Stanco *et al.*, 2020; Umberger *et al.*, 2010).

This study assessed 13 criteria related to sweet potato varieties, as shown in Table 1. The criteria were identified through a two-phase process. Firstly, previous studies on sweet potato production, consumption, and marketing in Benin and other countries were reviewed to determine the most relevant and important selection criteria for farmers (Doussoh *et al.*, 2017; Kapinga *et al.*, 2003; Low *et al.*, 2017a). Secondly, additional criteria were obtained from a baseline study on sweet potato production systems in the country's largest production area, which helped to validate and

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Table 1. Sweet potato attributes and descriptions used in the analysis

No.	Criteria	Description of criteria
1	High root yield	Refers to sweet potato varieties with high fresh roots yield performance (number of storage roots per plant)
2	Root firmness	Describes the level of dry matter content of the sweet potato during consumption
3	Root size	Describes the potential of sweet potato varieties to produce large root size
4	Root shape	Describes the potential of sweet potato varieties to develop beautifully shaped roots
5	Root shelf life	Describes the number of days after harvest that sweet potato roots can be stored without rotting
6	Sweetness	Refers to the desired taste of sweet potato varieties (sweet taste)
7	Fiber content	Refers to the filaments (cellulose) that can be seen in the roots of certain varieties of sweet potatoes
8	High vine yield	Refers to sweet potato varieties with good vegetative production that can be used for human and animal feeding
9	Early maturing	Describes the number of days after sowing to harvest. Accounts for how early sweet potato roots bulking and ready to be harvested
10	Insect tolerance	Refers to sweet potato varieties that exhibit low damage despite the prevalence of pest
11	Disease tolerance	Refers to sweet potato varieties that exhibit low damage despite the prevalence of disease (viral or fungal diseases)
12	Waterlogging tolerance	Describes the ability of sweet potato varieties to cope with unexpected flooding during production
13	Marketability	Describes the level of market demand for sweet potato varieties

refine the list of attributes or selection criteria. Farmers were surveyed and asked to rank the criteria for choosing sweet potatoes based on importance and provide the rationales for such choices. The 13 most frequently mentioned criteria were selected for this study. Supplementary Material Table S1 provides a detailed justification from farmers for each of the 13 criteria used to guide the selection of sweet potato varieties.

To design the BWS scenarios, the balanced incomplete block design (BIBD) design was used. The BIBD for v attributes is denoted as b, r, k, λ where b is the number of choice sets (blocks), r is the repetition per level, k is the number of items in each choice set (block size), and λ is the pair frequency. For this study, the design was 13,4,4,1 for the 13 attributes (selection criteria) and has 13 choice sets, each attribute appears four times across all choice sets, each choice set contains four attributes, and each attribute appears once with each other. Table 2 depicts the full BIBD experimental design for the 13 choice sets used to ask the farmers to choose simultaneously the most important (best) and least important (worst) attributes, respectively, from the four criteria in each set.

Data collection

The surveys were carried out from August to December 2021 in three major sweet potato-producing departments of Benin (Fig. 1). Data were collected from a structured questionnaire administered to sweet potato farmers. The multistage sampling technique was applied to randomly select communes and villages from each production area, a total of 10 municipalities were selected with an average of five villages per municipality. In each village, community leaders were asked to provide lists of sweet potato producers. Farmers were proportionately and randomly selected from this list. Overall, a total of 480 farmers from equal subsamples of 48 farmers from each commune were interviewed. The spatial location of the survey (village/point) is shown in Fig. 1. The questionnaire administered through face-to-face interviews was organized into two categories. The first category includes questions on the characteristics of the farmers in the sample (gender, education, age, and experience) and farm structure (location, farm size), and the second category includes the different choice sets for the BWS experiment. Our fluency in the main

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Table 2. Attributes set design for Best-Worst Scaling (BWS), where all criteria in the design had equal and independent occurrences (1 or 0), allowing farmers to evaluate all potential pairings of items within the exhibited BWS set and select the pair that showed their difference in preference. One and 0 mean occurrence or absence of a criteria in a choice set

		Choice Sets												
Code	Criteria	1	2	3	4	5	6	7	8	9	10	11	12	13
C1	High root yield	0	0	0	0	0	0	1	0	1	1	1	0	0
C2	Root firmness	1	0	0	1	0	0	0	0	0	0	1	0	1
C3	Root size	0	1	0	1	0	1	1	0	0	0	0	0	0
C4	Root shape	0	1	1	0	0	0	0	1	0	0	1	0	0
C5	Root shelf life	0	0	0	1	1	0	0	1	0	1	0	0	0
C6	Sweetness	0	0	1	1	0	0	0	0	1	0	0	1	0
C7	Fiber content	0	1	0	0	1	0	0	0	1	0	0	0	1
C8	High vine yield	1	0	1	0	1	0	1	0	0	0	0	0	0
C9	Early maturing	0	0	0	0	0	0	1	1	0	0	0	1	1
C10	Insect tolerance	1	0	0	0	0	1	0	1	1	0	0	0	0
C11	Disease tolerance	0	0	0	0	1	1	0	0	0	0	1	1	0
C12	Waterlogging tolerance	0	0	1	0	0	1	0	0	0	1	0	0	1
C13	Marketability	1	1	0	0	0	0	0	0	0	1	0	1	0
Number of attributes in each choice set		4	4	4	4	4	4	4	4	4	4	4	4	4

spoken dialects (Dendi, Fon) by the target population facilitated access to farmers. However, translators were recruited where the local language was Bariba, Fulfulde, or Bô.

The average age of the farmers interviewed was approximately 43.17 years old and 57.5 % were between 30–49 years old (Supplementary Material Table S2). About 89.0% of the farmers were men; the majority of respondents (51.9%) were uneducated. The average household size was 8.61 persons per farmer, and the average farming experience was 21.63 years. Respondents allocated last year an average area of 0.39 ha for the sweet potato production, and the average income from the past production was \$214.10; 29.0% of respondents did not produce for sale, and 41.0% earned more than \$150 from sweet potato selling. The average number of varieties produced was 1.24 per farmer.

Data analysis

Best–worst scaling (BWS)

Individual respondents' BW scores were calculated by summing the number of times each respondent (i, where $i = 1$–480) stated an attribute (j, where $j = 1$–13) was most important as 'best' (B_i) and was least important as 'worst' (W_i). The importance of each of these attributes for each respondent (BW_i) was determined by subtracting W_i from B_i. Aggregate scores ($gg\ BW_i$) for each attribute were obtained by subtracting the sum of aggregate 'worst' from the sum of aggregate 'best' of each attribute across the sample of all the respondents. The best-worst outcomes are converted into a Standard Score average (std. BW_i) for each attribute by dividing BWS scores for each attribute (BW_i) by the product of the number of respondents surveyed (N) and the number of appearances (r) of each attribute in the design:

$$\text{std. } BW_i = \frac{Agg\ BW_i}{Nr}$$

To easily interpret the relative importance between attributes, the BW score has been standardized to a probabilistic ratio scale as suggested by Mueller and Rungie (2009). This ratio scale can be derived by transforming the square root of the frequency of best (B_i) divided by the frequency of worst (W_i) to a 0 to 100 scale (Mueller and Rungie, 2009). The square root is presented as follows:

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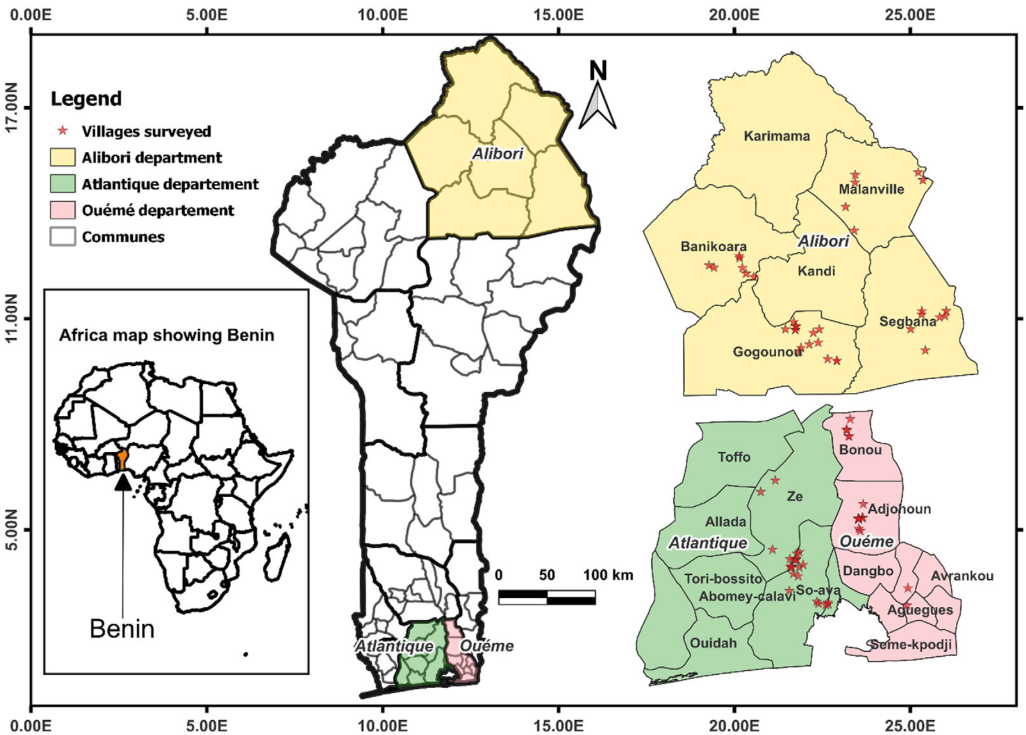

Figure 1. Maps of Benin indicating the departments and villages (stars) where data collection occurred.

$$\text{sqrt. BW}_i = \sqrt{B_i / W_i}$$

The most important attribute with the highest sqrt. BW_{i} becomes 100, and all other attributes are scaled relative to this attribute (Mueller and Rungie, 2009; Mueller Loose and Lockshin, 2013; Umberger *et al.*, 2010).

Latent class analysis

We applied latent class analysis (LCA) on individual scores for each of the BWS attributes to derive the different farmer's segments (classes) beside heterogeneity observed for the responses and the explanatory variables behind this segmentation. Several agricultural studies have used this approach (Barnes *et al.*, 2013; Jin *et al.*, 2020; Sakolwitayanon *et al.*, 2018;; Yeh *et al.*, 2020). Latent class analysis is a clustering technique that assumes individuals belong to one of the k latent classes wherein the size and number are unknown a priori to the researcher (Haughton *et al.*, 2009; Umberger *et al.*, 2010). Respondent segmentation in LCA is based on the condition that respondents of the same class have identical preference scores and are thus believed to come from the same probability distribution, indicating that unobserved preference is heterogeneous between classes but homogeneous within a class (Umberger *et al.*, 2010). This method is useful for evaluating differences in preference choices that we cannot directly detect among respondents since, unlike other clustering methods, it is based on the probability of belonging to a class using model parameters and observable individual measurements (Meghani *et al.*, 2009; Umberger *et al.*, 2010). Members' classification can be improved by including covariates, and they help to easily explain heterogeneity between classes (Haughton *et al.*, 2009).

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Following Linzer and Lewis (2011), the LCA can be expressed as follows. Let Π_{jrk} represent the 'class-conditional probability' so that an individual in class $r = 1, \ldots, R$ generates the k_{th} outcome in the j_{th} variable. The sum of all outcomes for each manifest variable within each r is equal to 1. p_r captures the unconditional probability for an individual to belong to each class before taking into account the responses Y_{ijk} provided on the observed variables, so-called 'the prior probabilities of class membership'. Assuming conditional independence of the outcome Y gave class membership, the probability that an individual i in class r produces a particular set of J outcomes on the manifest variables is, therefore, the product of the following formula:

$$f(Y_i; \Pi_r) = \prod_{j=1}^{j} \prod_{k=1}^{k_j} (\Pi_{jrk}) Y_{ijk}$$

Accordingly, the probability density function across all classes is the weighted sum:

$$P(Y_i \Pi, p) = \sum_{r=1}^{R} Pr \prod_{j=1}^{j} \prod_{k=1}^{k_j} (\Pi_{jrk}) Y_{ijk}$$

The parameters estimated by the latent class model are P_r and Π_{jrk}. Based on the parameters estimates $\hat{P}_r$ and Π_{jrk} of P_r and Π_{jrk}, the posterior probability that each individual belongs to each class, conditional on the observed values of the manifest variables, can be calculated using Bayes' formula:

$$\hat{P}(r_i Y_i) = \frac{\hat{P}_r f(Y_i; \hat{\Pi}_q)}{\sum_q^R = 1 \hat{P}_r f(Y_i; \hat{\Pi}_q)}$$

where $r_i \varepsilon \{1, \ldots, R\}$.

Disaggregated B-W scores for all 480 respondents across the 13 criteria were used as dependent variables in the Latent class analysis for this study to investigate farmers' heterogeneity in their most preferred sweet potato selection criterion. Several factors were used to explain differences in farmers' B-W selection criteria scores. The descriptive data for each of the variables used in the LCA are presented in (Supplementary Material Table S2). The latent classes analysis and covariates were estimated in one step using the poLCA package (Linzer and Lewis, 2011) in the R software v4.1.3 (R core team, 2022).

Several models were examined using the Bayesian information criteria (BIC), the Akaike information criteria (AIC), the Likelihood ratio (LR), and Log-likelihood to determine the ideal number of latent classes and appropriate class separation. The appropriate number of classes was determined by minimizing the values of these various parameters, particularly the BIC (Nylund *et al.*, 2007). BIC is recommended for fitting the latent class in case of larger sample sizes (Forster, 2000). Entropy has been also estimated; its values range from 0 to 1. The higher the entropy value, the better is the classification (Williams and Kibowski, 2016).

Results

Farmers' selection criteria for sweet potato variety

The Best-Worst Scaling approach allowed ranking sweet potato varieties selection criteria for farmers in different regions of Benin. According to the BWS analysis results (Table 3), yield performance, roots size, marketability, and early maturing represented the top four essential characteristics for sweet potato variety selection, followed by root shelf life, root shape, fiber content, sweetness, and insect tolerance. Waterlogging tolerance, high vine yield, root firmness, and disease tolerance were the least important criteria for the farmers surveyed.

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Table 3. Best-Worst Scaling (BWS) analysis results. Bi: number of times a criterion **i** is mentioned as best and Wi: number of times a criterion **i** is mentioned as worst

Criteria	Bi	Wi	Agg.BWi	Ranking	Mean.BWi	Stdev	Stdev/Mean.BWi	std.Bwi	sqrt.Bwi	Relative Importance	Relative Ranking
High vine yield	233	855	−622	13	−1.30	1.92	−1.48	−0.32	0.52	21.5	11
High root yield	981	166	815	3	1.70	1.63	0.96	0.42	2.43	100	1
Early maturing	859	273	586	4	1.22	1.78	1.46	0.31	1.77	72.9	4
Insect tolerance	180	559	−379	10	−0.79	1.43	−1.81	−0.20	0.57	23.3	9
Disease tolerance	97	448	−351	9	−0.73	1.28	−1.75	−0.18	0.47	19.1	13
Roots shelf life	381	400	−19	5	−0.04	1.43	−36.21	−0.01	0.98	40.1	5
Roots firmness	90	344	−254	6	−0.53	1.19	−2.25	−0.13	0.51	21.0	12
Waterlogging tolerance	177	568	−391	12	−0.81	1.67	−2.05	−0.20	0.56	22.9	10
Sweetness	267	575	−308	7	−0.64	1.65	−2.57	−0.16	0.68	28.0	8
Fiber content	313	652	−339	8	−0.71	1.72	−2.44	−0.18	0.69	28.5	7
Marketability	1123	297	826	1	1.72	2.16	1.26	0.43	1.94	79.9	3
Roots size	1109	288	821	2	1.71	1.72	1.01	0.43	1.96	80.7	2
Roots shape	430	815	−385	11	−0.80	2.02	−2.52	−0.20	0.73	29.9	6

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After evaluating the different selection criteria, it was found that 'high root yield' was the most important factor for sweet potato farmers in Benin, with a relative importance of 100. 'Root size' and 'marketability' were respectively 0.81 and 0.80 times as important as 'high root yield,' while 'early maturing' was nearly 0.73 times as important as 'high root yield.' However, other criteria such as 'root shelf life,' 'root shape,' 'fiber content,' 'sweetness,' 'insect tolerance,' 'waterlogging tolerance,' 'high vine production,' and 'root firmness' were not considered important by the farmers. Among these, 'disease tolerance' was found to be the least important for selecting sweet potato varieties.

The standard deviation (Stdev) of all respondents' individual BWS scores revealed the heterogeneity of the selection criterion. The results revealed the extent to which the importance criterion differed throughout the sample, which is a useful indicator of whether respondents' selections were consistent or showed heterogeneity (Mueller and Rungie, 2009). According to the authors, a standard deviation value greater than one indicates the existence of heterogeneity.

The standard deviations for all 13 criteria in Table 3 were greater than one, indicating that the answers varied. The Chi-square test revealed that the differences in the choices of the surveyed farmers were statistically significant ($p < 0.000$) among Bi, Wi, and Agg.BWi (Supplementary Material Table S4). This confirms the heterogeneity of farmers' responses to the different attributes. The degree of variability was calculated by dividing the standard deviation by the individual mean of BWS (Stdev/Mean.BWi). The underlying hypothesis was that a high absolute ratio of Stdev/Mean.BWi indicates greater heterogeneity, whereas values close to zero imply high levels of agreement about the relevance of the selection criteria. Sweet potato selection criteria such as 'high root yield', 'root size', 'marketability', 'early maturing.' and 'high vine yield' had scores below 1.5, indicating some degree of agreement among survey respondents regarding the importance of the criteria studied. The remaining criteria, 'root shelf life,' 'sweetness,' 'root shape,' 'root firmness,' and 'waterlogging tolerance,' each gave Stdev/Mean.BWi values higher than 1.5.

Selection criteria heterogeneity and characteristics of farmers

The conditional item probabilities of three-class solution are shown in Fig. 2. The first class had an estimated population size of 55.2%; it was distinguished by a moderate to high probability preference for yield performance, root size, early maturity, a slightly to moderately increased probability for marketability and root shape, and a low probability for the remaining criteria.

The second-largest class (31.0%) exhibited the highest probability, particularly for high root yield, early maturity, root size, and marketability; interest in the other criteria in this class was often quite low. The third class had a relative size of 13.8 % and was characterized by a moderate to high probability of preferred criteria such as high root yield, early maturing, insect tolerance, disease tolerance, root shelf life, waterlogging tolerance, marketability, and a slightly to moderately increased probability of root size preference. Based on these trends, we classified the classes as 'Yield potential', 'Market value', and 'Plant resilience'. in descending order of class size.

A comparison of socioeconomic features and other parameters across the three classes was presented in (Supplementary material Table S5). A strong separation was noted between classes for producing area, with the first class 'Yield potential' consisting of farmers from the Atlantique (54.8%) and Alibori (38.5%) departments. This class, however, was dominated by Atlantique farmers. Farmers in this category were typically between the ages of 30–49, had more than 20 years of farming experience, and had a household size of 5 to 9 people. They typically grew only one variety on an area of 0.25–0.5 ha. The majority of this class earned more than $150 from sweet potato commercialization.

Members of 'Market value' were largely farmers from the department of Ouémé (89.3%), with a primary education and 1 to 10 years of agricultural experience. As first-class members, their household size varied between 5 and 9 people. However, unlike those in the first class, they devoted less than 0.25 ha to sweet potato production. They mostly grew a single variety of sweet

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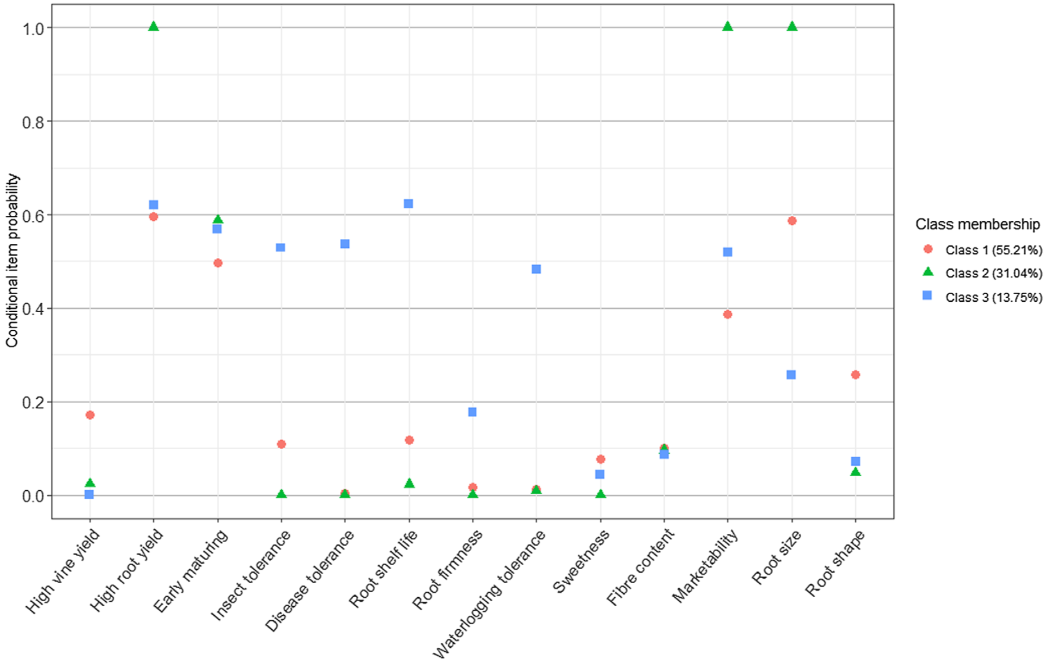

Figure 2. Conditional item probabilities of selection criteria for a three-class latent model.

potatoes, with profits from sales ranging from \$51 to \$150. 'Plant resilience' is the smallest of the three and is made up of the majority of Alibori farmers (98.5%). Farmers in this class, like those in the first, were illiterate, had more than 20 years of agricultural experience, and generally had more than ten people in charge. Members of this last class grew sweet potato on less than 0.25 ha, as did members of the second class, but unlike the previous two classes, they grew more than two varieties and the output was primarily for self-consumption.

The results of the covariate one-step estimation are shown in Table 4. These compare descriptive variables to 'Yield potential' membership. The findings are provided in order to calculate the odds ratios, which reflect the likelihood of belonging to an outcome category in comparison to the likelihood of belonging to the base outcome category. If the odds ratio within a class is smaller than one, that variable suggests membership in the baseline class; the 'Yield potential' class was used as a baseline outcome.

Effect of production area was a strong determinant of class identity. In comparison to 'Yield potential', 'Market value' farmers are more likely to be from the Ouémé department, and they had no chance of being classed as 'Plant resilience' members. Farmers in the Atlantique department were less likely to be in the 'Market value' or 'Plant resilience' classes than those in the 'Yield potential' class. Farmers with no education had an increased likelihood of belonging to the 'Plant resilience' class, whereas farmers with primary education had an increased chance of belonging to the 'Market value' class. Farmers with more than 10 years of farming experience were less likely to belong to 'Market value' or 'Plant resilience'. In terms of sweet potato production area, farmers who dedicated less than 0.25 ha for sweet potato production were more likely to be classified as 'Market value' or 'Plant resilience'. Regarding the number of varieties produced, farmers who produced more than two varieties had no chance of being 'Market value' but had a high chance of being in the 'Plant resilience' class. As for sweet potato income, only one significant result was found: farmers who earned more than \$150 from sweet potato sales were less likely to be classified as 'Plant resilience' members.

Table 4. Latent class analysis (LCA) multinomial regression results, referenced against the yield potential class, coefficients, odds ratios, and significance

	Market value			Plant resilience		
Characteristic	β	OR	p-value	β	OR	p-value
Department (ref: Alibori)						
Atlantique	−1.82	0.16	*	−4.18	0.02	***
Ouémé	3.48	32.4	***	−19.11	0.00	***
Gender (ref: women)						
Men	−0.48	0.62	ns	−0.05	0.95	ns
Age (ref: 18–29)						
30–49	−1	0.37	ns	−1.14	0.32	ns
≥50	1.4	4.05	ns	0.27	1.31	ns
Education (ref: Alphabetized)						
None	3.14	23.1	*	3.48	32.5	***
Primary	3.74	42.2	*	1.58	4.85	ns
Secondary	2.75	15.6	ns	2.19	8.91	*
Farming Experience (ref: 1–10)						
11–20	−1.03	0.36	ns	−1.48	0.23	ns
>20	−3.41	0.03	***	−2.3	0.10	*
Household size (ref: 0–4)						
5–9	1.22	3.38	ns	3.05	21.2	**
>10	1.95	7.06	*	3.8	44.9	***
Past area dedicated to sweet potato production (ref: 0.25–0.5)						
<0.25	1.77	5.89	**	1.27	3.57	*
>0.5	0.42	1.52	ns	−0.07	0.93	ns
Number of sweet potato varieties produced (ref: 1)						
2	1.77	5.87	**	3.35	28.4	***
>2	−12.13	0.00	ns	2.96	19.3	**
Past income from sweet potato (ref: $0–50)						
$51–150	−0.02	0.98	ns	−1.07	0.34	ns
>$150	−0.16	0.85	ns	−2.22	0.11	***

ns: no significant, *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$, OR: Odds ratios.

Discussion

In this study, we combined a discrete choice approach and latent class analysis to test the hypothesis that (*H1*) roots' consumption attributes are the principal selection criteria of sweet potato variety for Beninese farmers, and that (*H2*) Heterogeneity in farmer responses to the sweet potato selection criteria preference are strongly influenced by farmers' locality.

First, we examined sweet potato variety selection criteria among Benin farmers using a methodology called BWS. According to the results, farmers used various selection criteria for sweet potato varieties. Farmer' preferences for sweet potato varieties were not only influenced by the yield performance but also the variety's commercial value, notably root size, as well as market demand for the variety (Adeola *et al.*, 2019; Mwanga *et al.*, 2021b; Shumbusha *et al.*, 2020;). The findings confirmed that yield was not the only factor in farmers' sweet potato variety selection (Doussoh *et al.*, 2017; Low *et al.*, 2017a; Placide *et al.*, 2015; Sanoussi *et al.*, 2016).

The rating for early maturity likely reflected farmers' concern not just with the commercial value of the sweet potato but also with its food value throughout the lean season. Indeed, a variety's capacity to mature early (approximately three months after planting) was found as a crucial selection criterion for farmers whose primary goal is commercial sweet potato production. However, according to most farmers' explanations, an early maturing variety allowed those for whom this crop is not primarily intended for marketing to make some money to meet certain urgent financial needs. Additionally, this criterion is very important to meet the food needs of the family in the event of an extended dry spell or a delayed harvest of the main crops. Several studies have also reported the importance of early maturity in sweet potato production and in variety selection (Adekambi *et al.*, 2020; Okello *et al.*, 2022; Yanfu *et al.*, 1989).

The importance given to sweet potato yield performance over other attributes suggests that farmers certainly preferred high-yielding varieties as reported by Sanoussi *et al.* (2016) and Adekambi *et al.*, 2020). However, various factors influence this criterion. For instance, over the last ten years, the average national sweet potato harvested in Benin, Niger, and Nigeria has been 65 487.55, 110 518.64, and 374 9984.46 tons, respectively, equating to an average annual evolution rate of −3.0%, 17.0%, and 1.1% (Faostat, 2022). The yield dropping in Benin can be explained first by the fact that the production technique of this crop is still traditional, the lack of knowledge of farmers on the best agronomic practices for this crop is, therefore, a factor affecting the yielding. Adopting good agricultural practices such as appropriate production site selection, planting technique, spacing, fertilization, disease and pest management, and water management can significantly improve sweet potato yields (Rahmawati *et al.,* 2021; Sarkodie-addo, 2017; Sebastiani *et al.*, 2006).

Second, sweet potato production in Benin is mainly dominated by local landraces, which typically provide lower yields than expected. As a result, farmers may reject a variety if its yield performance is lower than the average produced; note that the average yield of these local varieties varied from 4.2 tons to 6.85 tons.ha^{-1} in Benin (MAEP, 2021), with a cycle ranging from 2.5 to 6 months for those in southern and central Benin (Ezin *et al.*, 2018; Sanoussi *et al.*, 2016). Sweet potato breeding for yield would allow genetic gains of about 20% compared to healthy local varieties (Gruneberg *et al.*, 2004). For example, orange varieties "King-J" and "Mother's Delight" developed in Nigeria have yields estimated at 35 tons.ha^{-1} and 31.4 tons.ha^{-1}, respectively (CIP, 2022).

Third, poor access to 'clean' planting material is an important constraint to improved production. Indeed, the vines used for production are obtained either by self-production or purchased at the local market or from another producer. This 'farmer to farmer' method of obtaining plant material facilitates the spread of certain pests and viral diseases, which negatively affect yield. For example, sweet potato yield reductions of up to 98% can be caused solely by virus diseases (Mukasa *et al.*, 2003). However, the use of healthy planting materials can improve the yield performance of sweet potatoes by 30–60% (Clark and Hoy, 2006). The designing of training modules for farmers on best agricultural practices for sweet potato production, a suitable seed system to ensure the supply of healthy seeds to farmers, and the development of varieties with higher yields may be viable options for increasing the level of adoption and production of sweet potato in Benin, as well as a strategy to leverage the value chains.

Based on our findings, disease tolerance appears to be one of the least essential traits for farmers, which contradicts the findings of Sanoussi *et al.* (2016) in Benin and Adekambi *et al.*, 2020) in Ghana. This disparity in results can be explained by the fact that most sweet potato growers were unaware of sweet potato infections and the symptoms associated with them. In reality, sweet potato was rarely a major crop for many growers. In Benin and even in the main production areas, sweet potato is one of the neglected and underutilized crops despite its nutritional importance (Dansi *et al.*, 2012). In consequence, the importance attributed to sweet potato could influence the priority given to the knowledge and awareness about diseases (Greig, 2009). This implies that if sweet potato is not considered as a main crop by farmers, they might not have prioritized understanding and managing the crop's diseases. A study carried out in Uganda also found that if sweet potatoes were not one of the main crops grown by farmers, they might not have invested much time and resources into understanding and managing sweet potato diseases (Zawedde *et al.*, 2014). In addition, the fact that sweet potato production was largely dominated by landraces could explain why farmers showed less interest in diseases affecting sweet potatoes. According to Zawedde *et al.* (2014), landraces, over time, had the capacity to adapt to their local environment, including native pests and diseases.

The sweetness in sweet potato was also ranked as one of the least significant criteria. This implies that in Benin, sweet potato genotypes with a high sugar content (very sweet taste) were less favored. The same trend was observed in Ghana, where sweet potato genotypes with orange flesh and high sugar content were less preferred than non-sweet genotypes (bland taste) (Adekambi *et al.*, 2020; Baafi *et al.*, 2015, 2016). This led to the development of genotypes with significantly reduced sugar levels (Adekambi *et al.*, 2020; Baafi *et al.*, 2016; Hannah *et al.*, 2022). Akoroda (2009) further supported this observation, noting that in West Africa, the sweetness (high sugar content) of sweet potatoes turned them less preferred compared to bland starchy staple root crops such as yam, cassava, and cocoyam.

Latent class analysis was performed to understand the variability in farmers' selection criteria using respondents' individual BW scores and socio-economic factors as covariates. As shown in Table S4, a 3-class model seemed to be the optimal choice for the analysis, owing to its lower BIC value compared to the other models. However, a 4-class model also exhibited a good fit, evidenced by lower AIC and LR indices, along with a higher LL value. Nylund-Gibson and Choi (2018) pointed out that it was common for various fit indicators to propose different models in LCA analysis. This is why researchers often rely on the BIC to evaluate model fit. Several studies, including those by Nylund *et al.* (2007) and Vermunt (2002), recommend using BIC for better model selection, especially when the sample size is larger than 300 (Nylund *et al.*, 2007). Since the BIC is considered the most reliable fit statistic in LCA, 3-class model was maintained for our analysis.

Each class obtained was characterized by specific selection criteria. We integrated these findings to shed light on what differentiated the various classes of Beninese sweet potato farmers, evaluated the relative higher or lower specific varietal selection criteria, and explored the significant distinctions that exist between the resulting classes.

When selecting sweet potato varieties, farmers focused their attention on factors such as high fresh root yield, early maturity, and market values. Surprisingly, the sensory properties of the roots, particularly sweetness, hardness, and fiber content, were rated relatively low, contrary to what was reported in the literature (Mwanga *et al.*, 2021b; Sanoussi *et al.*, 2016; Zawedde *et al.*, 2014). However, considerable heterogeneity in preferences for several traits was identified within farmer classes.

The class 'Yield potential' comprised farmers with a clear preference for criteria such as high yield and related attributes including root size, marketability, and early maturity. This group predominantly included farmers surveyed in the Atlantique and Alibori departments, suggesting a shared set of selection criteria among these regions. The area devoted by farmers in this class to sweet potato cultivation, typically ranging from 0.25 to 0.5 hectares, hinted at the underutilization of sweet potato production. Interestingly, these findings diverge from the conclusions of Sanoussi *et al.* (2016) in southern and central Benin.

However, it is essential to acknowledge that factors influencing 'yield potential' can be multifaceted and intricate, potentially hindering the widespread adoption of new varieties. Biotic factors, such as sweet potato virus disease (SPVD), emerge as significant obstacles to the adoption of OFSP varieties across SSA. Similarly, abiotic factors, specifically drought, have a pronounced impact (Jenkins *et al.*, 2018; Low *et al.*, 2020; Mwanga *et al.*, 2021a; Ngailo *et al.*, 2016). It is crucial to underscore that SPVD, in particular, leads to substantial yield losses, ranging from 50% to over 90% in susceptible genotypes (Clark *et al.*, 2012; Karyeija *et al.*, 1998). Importantly, the effectiveness of resistant genotypes might be influenced by various viral strains specific to different environments. Instances in Uganda where introduced genotypes succumbed to the country's own sweet potato feathery mottle potyvirus underscore this challenge (Karyeija *et al.*, 1998). Furthermore, even within the same region, resistant cultivars succumbed to SPVD (Tairo *et al.*, 2005). These complexities imply that addressing farmers' requirements for "yield potential" must account for the diverse obstacles that can impact this criterion. The adaptation of varietal selection in line with the specific constraints of each environment becomes paramount.

The preferences of the 'Market value' class were quite distinct from those of the other classes; this class appeared to have a very high preference for commercial value in addition to potential yield. In addition, this class mainly included farmers from the Ouémé department. This could mean that farmers in this area mainly produced sweet potatoes for sale. Consistent with other studies, southern farmers produced sweet potato for economic reasons (Sanoussi *et al.*, 2016). The choice and maintenance of a variety of sweet potatoes in the production system in the Ouémé area would largely depend on the commercial value that this variety can induce. Moreover, this class also exhibits a very strong interest in the size of the roots; this criterion is likely linked to the consumer preferences of this production zone because we noted that the importance given to the size of the sweet potato roots by the farmers of this class was proportional to the importance given to the commercial value (Fig. 2); so it is likely that the farmers of this class showed a particular interest in the size of the roots because this criterion is more in demand on the market of this area. Kaguongo *et al.* (2012) reported similar results in his study highlighting that the origin of the farmer as well as the level of commercialization of a variety influences its adoption. For Doussoh *et al.* (2017), high commercial value was one of the important selection criteria for sweet potato varieties intended for production in Benin.

In spite of its promising commercial value, the selected variety remains vulnerable to a range of market influences. Obstacles such as market scarcity, market volatility, declining prices, and post-harvest losses pose significant challenges for both farmers and traders (Jenkins *et al.*, 2018; Ngailo *et al.*, 2016), especially when the broader sweet potato value chain is inadequately developed within the country. As observed by Low *et al.* (2007), farmers exhibited hesitancy in expanding their OFSP cultivation due to uncertainties in the market. Consequently, a robust business strategy is essential when introducing a new variety, such as OFSP. This strategy would ensure sustainable income for producers, improve market accessibility, and increase adoption rates of the new variety. Market influence was particularly pronounced in regions characterized by high agroecological potential and/or proximity to major transportation roads (Low *et al.*, 2007). Furthermore, recognizing the value of derivative products from the new variety could serve as a catalyst for fostering growth within the processing industry.

The 'Plant resilience' class, which represents the opinions of 66 farmers (13.8% of the total sample surveyed), highlights the importance of environmental constraints and resistance traits such as pest tolerance, disease tolerance, flood tolerance, and good shelf life for some farmers. This is because sweet potato production in Benin is mainly rain-fed and commonly subject to various biotic and abiotic constraints. However, this low proportion indicates that Benin farmers in general attach less importance to sweet potato production biotic and abiotic constraints and, therefore, express less desire for resistant varieties to these constraints for now.

Regarding abiotic constraints, farmers in this class mentioned flood tolerance as a selection criterion for sweet potato, which differs from the current trend of several studies, including Sanoussi *et al.* (2016) and Jogo *et al.* (2021), who highlighted farmers' preference for drought-resistant varieties as important selection criteria. This disparity could be explained by the fact that farmers of this class probably cultivate sweet potato in flood-prone areas, exposing them to more flooding during the rainy season, as also reported by Ezin *et al.* (2018).

This class is made up of 95.5% of Alibori farmers, which could mean that farmers in this area were probably more aware of the existence of these various constraints mentioned above. There were also farmers who produced sweet potato mainly for self-consumption, which could explain their interest in varieties with a long shelf life.

The criteria highlighted by this class underscore the significance of considering various biotic and abiotic factors that can potentially impact the performance of new varieties. This would enable the selection and dissemination of varieties that are adapted to the specific conditions of the target regions. One effective approach for achieving this is through multi-environment evaluation, which can be complemented by involving producers through methods such as participatory plant breeding (PPB) and participatory variety selection (PVS). As elucidated by Dawson *et al.* (2008), PPB and PVS stand out as the most appropriate means to cultivate varieties suited for challenging, stress-prone environments, particularly those with limited resources. Notably, the involvement of farmers in the crop improvement process has yielded successful outcomes in various countries as Uganda (Gibson *et al.*, 2011; Mwanga *et al.*, 2011), Rwanda (Shumbusha *et al.*, 2015), Côte d'Ivoire (Brice Dibi *et al.*, 2017), and Ethiopia (Gobena *et al.*, 2022).

The establishment of a system for promoting sweet potato, particularly for biofortified varieties (orange/purple), remains an option to be taken into consideration in the context of the fight against food insecurity. The first important step to be considered in this system is the promotion of biofortified varieties through a breeding program or varietal introduction to meet the needs of farmers. Based on the above results, the development and diffusion of sweet potato varieties with big roots could significantly increase yield from the current average of 5.5 tons.ha^{-1} to about 40 tons.ha^{-1} (Otoboni *et al.*, 2020; Sohindji *et al.*, 2022). These varieties would mature in three months, compared to the 3.5 to 4 months required for local varieties (Low *et al.*, 2009), and would be tolerant to both biotic and abiotic constraints (Mwanga *et al.*, 2017). The commercial potential of these varieties could be realized through the production of high-value agri-food derivatives like infant and pastry flour, and chips, rich in beta-carotene/anthocyanin (Low *et al.*, 2017b). This approach could upgrade the sweet potato status from an underutilized crop to a key economic resource in Benin.

An overall view of the results reveals the presence of a complex system formed by the interplay of a number of different components. These factors necessitate, among other things, the inclusion of several disciplines of research for complementarity in understanding farmers' decisions about variety selection or adoption. The key actors in our case study come from the domains of agriculture, sociology, economics, and psychology. In line with Below *et al.*, (2012), different fields (sociology, social psychology, and cultural research) identified the factors that affect the farmer's behavior and decision-making from economic, agricultural science, and social perspectives. According to Edwards-Jones (2006), the psychological makeup of the farmer, socio-demographics, household characteristics, business structure, social environment, and the characteristics of the innovation to be adopted are among the factors that affect the farmer's decision-making process.

Study Limitation

Data collection and statistical methods used in this study (BWS and LCA) had inherent assumptions. BWS required respondents to make multiple comparisons within a set of items, which could have been cognitively demanding. It also assumed that choices were made independently and that the best and worst choices made by an individual reflected mirror image value. Deviations from these assumptions could subtly influence the interpretation of the results. LCA assigned individuals to classes based on probability. The true class membership was unknown for each individual and these classes could not be directly measured other than through the patterns of responses on the indicator variables. If these assumptions did not hold or if there were practical limitations related to survey administration such as non-response bias or inaccuracies in self-reported data, it could have impacted the reliability of the findings. These limitations did not undermine the value of the research but rather provided areas for further exploration and refinement in future studies. These limitations should be carefully considered when interpreting the results and implications of our study for practice and breeding programs. While our findings provide valuable insights into farmers' preferences and practices, it is important to remind readers that preferences are influenced by a complex interplay of factors and can vary across different contexts and over time.

Conclusion

Given the growing concern for food security in Benin, the adoption of improved sweet potato varieties is important to contribute both to increasing food diversity and minimizing the downside effect of food insecurity. This study used a BWS and LCA approach to investigate the varietal selection criteria of sweet potato growers, which could contribute to the breeding of sweet potatoes and new varieties of OFSP introduction in the future. Results show that farmers had strong preferences for varieties with high root yield, good root size, marketability, and early maturing as the most important selection criteria. This provides a solid foundation for improving the sweet potato value chain.

We also found variations in farmers' selection criteria for sweet potato varieties, which allowed us to identify three types of farmers: 'Yield potential', 'Market value', and 'Plant resilience'. Each class was connected with diverse socio-economic characteristics, demonstrating farmers' preferences for different sweet potato cultivars that satisfy their expectations for a wide variety of crop features.

The findings have substantial policy implications for breeding priority setting and the encouragement of enhanced variety adoption in Benin. Emphasis on yield as well as yield features can contribute to production expansion.

By determining the preferred traits of sweet potato varieties among farmers in Benin, we have contributed to the understanding of farmers' decision-making criteria. This represents a promising research perspective for scientists interested in understanding how farmers make decisions about their crops.

Supplementary material. The supplementary material for this article can be found at https://doi.org/10.1017/S0014479723000224

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Competing interests. The authors declare that they have no conflict of interest.

Ethics approval. The study objectives were clearly explained to local authorities and respondents. Authorities' and respondents' individual consent to participate in the study was requested prior to the administration of the questionnaire. Only people who gave their agreement to participate in the study were considered. We ensured the informants' confidentiality by anonymizing their identities in databases.

Consent to participate. Verbal informed consent was obtained before the interview.

References

Adekambi S., Okello J., Rajendran S., Acheremu K., Carey E., Low J. and Abidin P. (2020). Effect of varietal attributes on the adoption of an orange-fleshed sweetpotato variety in Upper East and Northern Ghana. *Outlook on Agriculture* **49**, 311–320. https://doi.org/10.1177/0030727020950324

Adeola R.G., Ogunleye K.Y. and Adewole W.A. (2019). Adoption intensity determinants for improved sweet potato varieties among farmers in Nigeria. *International Journal of Agricultural Management and Development (Ijamad)* **9**, 203–211.

Agre A.P., Bhattacharjee R., Dansi A., Becerra Lopez-Lavalle L.A., Dansi M. and Sanni A. (2017). 'Assessment of cassava (Manihot esculenta Crantz) diversity, loss of landraces and farmers preference criteria in southern Benin using farmers' participatory approach. *Genetic Resources and Crop Evolution* **64**, 307–320. https://doi.org/10.1007/s10722-015-0352-1

Akoroda M. (2009).Sweetpotato in West Africa. *The Sweetpotato* 441–468. https://doi.org/10.1007/978-1-4020-9475-0_19/COVER

Baafi E., Blay E.T., Ofori K., Gracen V.E., Manu-Aduening J. and Carey E.E. (2016). Breeding superior orange-fleshed sweetpotato cultivars for West Africa. *Journal of Crop Improvement* **30**, 293–310. https://doi.org/10.1080/15427528.2016.1154492

Baafi E., Manu-Aduening J., Carey E.E., Ofori K., Blay E.T. and Gracen V.E. (2015). Constraints and breeding priorities for increased sweetpotato utilization in Ghana. *Sustainable Agriculture Research* **4**, 1. https://doi.org/10.5539/sar.v4n4p1

Barnes A.P., Islam M.M. and Toma L. (2013). Heterogeneity in climate change risk perception amongst dairy farmers: a latent class clustering analysis. *Applied Geography* **41**, 105–115. https://doi.org/10.1016/j.apgeog.2013.03.011

Below T.B., Mutabazi K.D., Kirschke D., Franke C., Sieber S., Siebert R. and Tscherning K. (2012). 'Can farmers' adaptation to climate change be explained by socio-economic household-level variables? *Global Environmental Change* **22**, 223–235. https://doi.org/10.1016/j.gloenvcha.2011.11.012

Bovell-Benjamin A.C. (2010). Sweet potato utilization in human health, industry and animal feed systems, in R.C. Ray and K.I. Tomlins (eds), *Sweet Potato: Post Harvest Aspects in Food, Feed and Industry*. New York: Nova Science, pp. 193–224.

Brice Dibi K.E., Essis B.S., N'zué B., Kouakou A.M., Zohouri G.P., Assouan A.B. and Van Mourik T. (2017). Participatory selection of orange-fleshed sweetpotato varieties in north and north-east Côte d'Ivoire. *Open Agriculture* **2**, 83–90. https://doi.org/10.1515/opag-2017-0009

Chapman J., Power A., Netzel M.E., Sultanbawa Y., Smyth H.E., Truong V.K. and Cozzolino D. (2022). Challenges and opportunities of the fourth revolution: a brief insight into the future of food. *Critical Reviews in Food Science and Nutrition* **62**, 2845–2853. https://doi.org/10.1080/10408398.2020.1863328

CIP (2022). *2019 Sweetpotato Catalogue for Sub-Saharan Africa (SSA).* https://research.cip.cgiar.org/sweetpotato-catalog/cip_sp_catalogue/ (accessed 19 July 2022).

Clark C.A., Davis J.A., Abad J.A., Cuellar W.J., Fuentes S., Kreuze J.F., Gibson R.W., Mukasa S.B., Tugume A.K., Tairo F.D. and Valkonen J.P.T. (2012). Sweetpotato viruses: 15 years of progress on understanding and managing complex diseases. *Plant Disease* **96**, 168–185. https://doi.org/10.1094/PDIS-07-11-0550

Clark C.A. and Hoy M.W. (2006). Effects of common viruses on yield and quality of beauregard sweetpotato in Louisiana. *Plant Disease* **90**, 83–88. https://doi.org/10.1094/PD-90-0083

Cohen E. (2009). Applying best-worst scaling to wine marketing. *International Journal of Wine Business Research*. Edited by E. Cohen, **21**(1), 8–23. https://doi.org/10.1108/17511060910948008

Cohen S.H. (2003). Maximum difference scaling: and preference for segmentation. *Sawtooth Software Research Paper Series* **98382**, 1–17.

Dansi A., Vodouhè R., Azokpota P., Yedomonhan H., Assogba P., Adjatin A., Loko Y.L., Dossou-Aminon I. and Akpagana K. (2012). Diversity of the neglected and underutilized crop species of importance in Benin. *The Scientific World Journal* **2012**, 1–19. https://doi.org/10.1100/2012/932947

Dawson J.C., Murphy K.M. and Jones S.S. (2008). Decentralized selection and participatory approaches in plant breeding for low-input systems. *Euphytica* **160**, 143–154. https://doi.org/10.1007/s10681-007-9533-0

Doussoh A.M., Dangou J.S., Houedjissin S.S., Assogba A.K. and Ahanhanzo C. (2017). Analyse des connaissances endogènes et des déterminants de la production de la patate douce [*Ipomoea batatas* (L.)], une culture à haute valeur socioculturelle et économique au Bénin. *International Journal of Biological and Chemical Sciences* **10**, 2596. https://doi.org/10.4314/ijbcs.v10i6.16

Dumbrell N.P., Kragt M.E. and Gibson F.L. (2016). What carbon farming activities are farmers likely to adopt? A best–worst scaling survey. *Land Use Policy* **54**, 29–37. https://doi.org/10.1016/j.landusepol.2016.02.002

Edwards-Jones G. (2006). Modelling farmer decision-making: concepts, progress and challenges. *Animal Science* **82**, 783–790. https://doi.org/10.1017/ASC2006112

Erdem S. and Rigby D. (2013). Investigating heterogeneity in the characterization of risks using best worst scaling. *Risk Analysis* **33**, 1728–1748. https://doi.org/10.1111/risa.12012

Ezin V., Quenum F., Bodjrenou R.H., Kpanougo C.M.I., Kochoni E.M.G., Chabi B.I. and Ahanchede A. (2018). Assessment of production and marketing constraints and value chain of sweet potato in the municipalities of Dangbo and Bonou. *Agriculture & Food Security* **7**, 15. https://doi.org/10.1186/s40066-018-0164-6

Faostat (2022). FAOSTAT. Available at https://www.fao.org/faostat/en/#compare (accessed 7 June 2022).

Finn A. and Louviere J.J. (1992). Determining the appropriate response to evidence of public concern: the case of food safety. *Journal of Public Policy & Marketing* **11**, 12–25. https://doi.org/10.1177/074391569201100202

Flynn T.N., Louviere J.J., Peters T.J. and Coast J. (2007). Best–worst scaling: what it can do for health care research and how to do it. *Journal of Health Economics* **26**, 171–189. https://doi.org/10.1016/j.jhealeco.2006.04.002

Forster, M.R. (2000). Key Concepts in Model Selection: Performance and Generalizability. *Journal of Mathematical Psychology*, **44**(1), 205–231. https://doi.org/10.1006/jmps.1999.1284

Gibson R.W., Mpembe I. and Mwanga R.O.M. (2011). Benefits of participatory plant breeding (PPB) as exemplified by the first-ever officially released PPB-bred sweet potato cultivar. *The Journal of Agricultural Science* **149**, 625–632. https://doi.org/10.1017/S0021859611000190

Gobena T.L., Asemie M.M. and Firisa T.B. (2022). Evaluation of released sweet potato [Ipomoea batatas (L.) Lam] varieties for yield and yield-related attributes in Semen-Bench district of Bench-Sheko-Zone, South-Western Ethiopia. *Heliyon* **8**, e10950. https://doi.org/10.1016/j.heliyon.2022.e10950

Greig L. (2009). An analysis of the key factors influencing farmer's choice of crop, Kibamba Ward, Tanzania. *Journal of Agricultural Economics* **60**, 699–715. https://doi.org/10.1111/j.1477-9552.2009.00215.x

Gruneberg W.J., Abidin E., Ndolo P., Pereira C.A. and Hermann M. (2004). Variance component estimations and allocation of resources for breeding sweetpotato under East African conditions. *Plant Breeding* **123**, 311–315. https://doi.org/10.1111/j.1439-0523.2004.01000.x

Hannah C., Davies J., Green R., Zimmer A., Anderson P., Battersby J., Baylis K., Joshi N. and Evans T.P. (2022). Persistence of open-air markets in the food systems of Africa's secondary cities. *Cities* **124**, 103608. https://doi.org/10.1016/j.cities.2022.103608

Haughton D., Legrand P. and Woolford S. (2009). Review of three latent class cluster analysis packages: latent gold, poLCA, and MCLUST. *The American Statistician* **63**, 81–91. https://doi.org/10.1198/tast.2009.0016

Ilukor J., Bagamba F. and Bashaasha B. (2014). Application of the TOA-MD model to assess adoption potential of improved sweet potato technologies by rural poor farm households under climate change: the case of Kabale district in Uganda. *Food Security* **6**, 359–368. https://doi.org/10.1007/s12571-014-0350-8

Jaeger S.R., Jørgensen A.S., Aaslyng M.D. and Bredie W.L.P. (2008). Best–worst scaling: an introduction and initial comparison with monadic rating for preference elicitation with food products. *Food Quality and Preference* **19**, 579–588. https://doi.org/10.1016/j.foodqual.2008.03.002

Jenkins M., Shanks C.B., Brouwer R. and Houghtaling B. (2018). Factors affecting farmers' willingness and ability to adopt and retain vitamin A-rich varieties of orange-fleshed sweet potato in Mozambique. *Food Security* [Preprint]. https://doi.org/10.1007/s12571-018-0845-9

Jin S., Mansaray B., Jin X. and Li H. (2020). Farmers' preferences for attributes of rice varieties in Sierra Leone. *Food Security* **12**, 1185–1197. https://doi.org/10.1007/s12571-020-01019-w

Jogo W., Bocher T. and Grant F. (2021). Factors influencing farmers' dis-adoption and retention decisions for biofortified crops: the case of orange-fleshed sweetpotato in Mozambique. *Agrekon* **60**, 445–459. https://doi.org/10.1080/03031853.2021.1956555

Jones A.K., Jones D.L., Edwards-Jones G. and Cross P. (2013). Informing decision making in agricultural greenhouse gas mitigation policy: a Best–Worst Scaling survey of expert and farmer opinion in the sheep industry. *Environmental Science & Policy* **29**, 46–56. https://doi.org/10.1016/j.envsci.2013.02.003

Kaguongo, W., Ortmann, G., Wale, E., Darroch, M. and Low, J. (2012) 'Factors influencing adoption and intensity of adoption of orange flesh sweet potato varieties: Evidence from an extension intervention in Nyanza and Western provinces, Kenya', *African journal of agricultural reseearch*, **7**(3). https://doi.org/10.5897/AJAR11.062

Kapinga, R., Jeremiah, S., Rwiza, E.J. and Rees, D. (2003). Farmer criteria for selection of sweetpotato varieties. In D. Rees, Q. van Oirschot, and R. Kapinga (eds), Sweetpotato post-harvest assessment: experiences from East Africa. Chatham, UK: Natural Resources Institute, pp. 9–21.

Karyeija R.F., Gibson R.W. and Valkonen J.P.T. (1998). The significance of sweet potato feathery mottle virus in subsistence sweet potato production in Africa. *Plant Disease* **82**, 4–15. https://doi.org/10.1094/PDIS.1998.82.1.4

Khoury C.K., Bjorkman A.D., Dempewolf H., Ramirez-Villegas J., Guarino L., Jarvis A., Rieseberg L.H. and Struik P.C. (2014). Increasing homogeneity in global food supplies and the implications for food security. *Proceedings of the National Academy of Sciences* **111**(11), 4001–4006. https://doi.org/10.1073/pnas.1313490111

Lagerkvist C.J. (2013). Consumer preferences for food labelling attributes: comparing direct ranking and best–worst scaling for measurement of attribute importance, preference intensity and attribute dominance. *Food Quality and Preference* **29**, 77–88. https://doi.org/10.1016/j.foodqual.2013.02.005

Lancsar E. and Louviere J. (2008). Conducting discrete choice experiments to inform healthcare decision making. *PharmacoEconomics* **26**, 661–677. https://doi.org/10.2165/00019053-200826080-00004

Lee J.A., Soutar G.N. and Louviere J. (2007). Measuring values using best-worst scaling: the LOV example. *Psychology and Marketing* **24**, 1043–1058. https://doi.org/10.1002/mar.20197

Lin H.-I., Yu Y.-Y., Wen F.-I. and Liu P.-T. (2022). Status of food security in East and Southeast Asia and challenges of climate change. *Climate* **10**, 40. https://doi.org/10.3390/cli10030040

Linzer D.A. and Lewis J.B. (2011). poLCA: an R package for polytomous variable latent class analysis. *Journal of Statistical Software* **42**(10), 1–29. https://doi.org/10.18637/jss.v042.i10

Loko Y.L.E., Ewedje E.-E., Orobiyi A., Djedatin G., Toffa J., Gbemavo C.D.S.J., Tchakpa C., Gavoedo D., Sedah P. and Sabot F. (2021). On-Farm management of rice diversity, varietal preference criteria, and farmers' perceptions of the African (Oryza glaberrima Steud.) versus Asian rice (Oryza sativa L.) in the Republic of Benin (West Africa): implications for breeding and conservation. *Economic Botany* **75**, 1–29. https://doi.org/10.1007/s12231-021-09515-6

Loureiro M.L. and Dominguez Arcos F. (2012). Applying Best–Worst Scaling in a stated preference analysis of forest management programs. *Journal of Forest Economics* **18**, 381–394. https://doi.org/10.1016/j.jfe.2012.06.006

Louviere J., Lings I., Islam T., Gudergan S. and Flynn T. (2013). An introduction to the application of (case 1) best–worst scaling in marketing research. *International Journal of Research in Marketing* **30**, 292–303. https://doi.org/10.1016/j.ijresmar.2012.10.002

Louviere, J.J. and Woodworth, G.G. (1990) Best–Worst Scaling: A Model for Largest Difference Judgments [working paper]. Edmonton, *Canada*, University of Alberta, Faculty of Business.

Low J., Ball A., Magezi S., Njoku J., Mwanga R., Andrade M., Tomlins K., Dove R. and van Mourik T. (2017a). Sweet potato development and delivery in sub-Saharan Africa. *African Journal of Food, Agriculture, Nutrition and Development* **17**, 11955–11972. https://doi.org/10.18697/ajfand.HarvestPlus07

Low J., Lynam J., Lemaga B., Crissman C., Barker I., Thiele G., Namanda S., Wheatley C. and Andrade M. (2009). Sweetpotato in Sub-Saharan Africa. In *The Sweetpotato*. Dordrecht: Springer Netherlands, pp. 359–390. https://doi.org/10.1007/978-1-4020-9475-0_16

Low J.W., Arimond M., Osman N., Cunguara B., Zano F. and Tschirley D. (2007). Ensuring the supply of and creating demand for a biofortified crop with a visible trait: lessons learned from the introduction of orange-fleshed sweet potato in drought-prone areas of Mozambique. *Food and Nutrition Bulletin* **28**, S258–S270. https://doi.org/10.1177/15648265070282S205

Low J.W., Mwanga R.O.M., Andrade M., Carey E. and Ball A.-M. (2017b). Tackling vitamin A deficiency with biofortified sweetpotato in sub-Saharan Africa. *Global Food Security* **14**, 23–30. https://doi.org/10.1016/j.gfs.2017.01.004

Low J.W., Ortiz R., Vandamme E., Andrade M., Biazin B. and Grüneberg W.J. (2020). Nutrient-dense orange-fleshed sweetpotato: advances in drought-tolerance breeding and understanding of management practices for sustainable next-generation cropping systems in Sub-Saharan Africa. *Frontiers in Sustainable Food Systems* **4**. https://doi.org/10.3389/fsufs.2020.00050

MAEP (2021) Evolution de la production de la patate douce. *Ministère de l'Agriculture, de l'Elevage et de la Pêche (MAEP), Direction de la statistique agricole*. Cotonou, Bénin.

Meghani S.H., Lee C.S., Hanlon A.L. and Bruner D.W. (2009). Latent class cluster analysis to understand heterogeneity in prostate cancer treatment utilities. *BMC Medical Informatics and Decision Making* **9**, 47. https://doi.org/10.1186/1472-6947-9-47

Mueller S. and Rungie C. (2009). Is there more information in best-worst choice data? *International Journal of Wine Business Research*. Edited by E. Cohen, **21**(1), 24–40. https://doi.org/10.1108/17511060910948017

Mueller Loose S. and Lockshin L. (2013). Testing the robustness of best worst scaling for cross-national segmentation with different numbers of choice sets. *Food Quality and Preference* **27**, 230–242. https://doi.org/10.1016/j.foodqual.2012.02.002

Mukasa S.B., Rubaihayo P.R. and Valkonen J.P.T. (2003). Incidence of viruses and virus like diseases of sweetpotato in Uganda. *Plant Disease* **87**, 329–335. https://doi.org/10.1094/PDIS.2003.87.4.329

Mwanga R.O.M., Andrade M.I., Carey E.E., Low J.W., Yencho G.C. and Grüneberg W.J. (2017). Sweetpotato (Ipomoea batatas L.). In *Genetic Improvement of Tropical Crops*. Cham: Springer International Publishing, pp. 181–218. https://doi.org/10.1007/978-3-319-59819-2_6

Mwanga R.O.M., Mayanja S., Swanckaert J., Nakitto M., zum Felde T., Grüneberg W., Mudege N., Moyo M., Banda L., Tinyiro S.E., Kisakye S., Bamwirire D., Anena B., Bouniol A., Magala D.B., Yada B., Carey E., Andrade M., Johanningsmeier S.D., Forsythe L., Fliedel G. and Muzhingi T. (2021b). Development of a food product profile for boiled and steamed sweetpotato in Uganda for effective breeding. *International Journal of Food Science & Technology* **56**(3), 1385–1398. https://doi.org/10.1111/ijfs.14792

Mwanga R.O.M., Niringiye C., Alajo A., Kigozi B., Namukula J., Mpembe I., Tumwegamire S., Gibson R.W. and Craig Yencho G. (2011). "NASPOT 11", a sweetpotato cultivar bred by a participatory plant-breeding approach in Uganda. *HortScience* **46**, 317–321. https://doi.org/10.21273/HORTSCI.46.2.317

Mwanga R.O.M., Swanckaert J., da Silva Pereira G., Andrade M.I., Makunde G., Grüneberg W.J., Kreuze J., David M., De Boeck B., Carey E., Ssali R.T., Utoblo O., Gemenet D., Anyanga M.O., Yada B., Chelangat D.M., Oloka B., Mtunda K., Chiona M., Koussao S., Laurie S., Campos H., Yencho G.C. and Low J.W. (2021a). Breeding progress for vitamin A, iron and zinc biofortification, drought tolerance, and sweetpotato virus disease resistance in Sweetpotato. *Frontiers in Sustainable Food Systems* **5**. https://doi.org/10.3389/fsufs.2021.616674

Ngailo S., Shimelis H.A., Sibiya J. and Mtunda K. (2016). Assessment of sweetpotato farming systems, production constraints and breeding priorities in eastern Tanzania. *South African Journal of Plant and Soil* **33**, 105–112. https://doi.org/10.1080/02571862.2015.1079933

Nylund K.L., Asparouhov T. and Muthén B.O. (2007). Deciding on the number of classes in latent class analysis and growth mixture modeling: a Monte Carlo simulation study. *Structural Equation Modeling: A Multidisciplinary Journal* **14**, 535–569. https://doi.org/10.1080/10705510701575396

Nylund-Gibson K. and Choi A.Y. (2018). Ten frequently asked questions about latent class analysis. *Translational Issues in Psychological Science* **4**, 440–461. https://doi.org/10.1037/tps0000176

Okello J.J., Swanckaert J., Martin-Collado D., Santos B., Yada B., Mwanga R.O.M., Schurink A., Quinn M., Thiele G., Heck S., Byrne T.J., Hareau G.G. and Campos H. (2022). Market intelligence and incentive-based trait ranking for plant breeding: a sweetpotato pilot in Uganda. *Frontiers in Plant Science* **13**. https://doi.org/10.3389/fpls.2022.808597

Otoboni M.E.F., Oliveira D.J.L.S.F. de, Vargas P.F., Pavan B.E. and Andrade M.I. (2020). Genetic parameters and gain from selection in sweet potato genotypes with high beta-carotene content. *Crop Breeding and Applied Biotechnology* **20**(3). https://doi.org/10.1590/1984-70332020v20n3a42

Placide R., Shimelis H., Laing M. and Gahakwa D. (2015). Farmers' perceptions, production and productivity constraints, preferences, and breeding priorities of sweetpotato in Rwanda. *HortScience* **50**, 36–43. https://doi.org/10.21273/HORTSCI.50.1.36

Rahmawati N., Sipayung R. and Widya R. (2021). Analysis of yields quantity and quality of several sweet potatoes genotypes at different harvest ages. *IOP Conference Series: Earth and Environmental Science* **782**, 042047. https://doi.org/10.1088/1755-1315/782/4/042047

R core team (2022). *R: A Language and Environment for Statistical Computing*. Vienna, Austria: R Foundation for Statistical Computing. https://www.r-project.org/.

Sakolwitayanon H., Soni P. and Damien J. (2018). Attributes determining consumer preference for organic rice in Bangkok, Thailand. *British Food Journal* **120**, 2017–2032. https://doi.org/10.1108/BFJ-12-2017-0667

Sanoussi A.F., Dansi A., Orobiyi A., Gbaguidi A., Agre A.P., Dossou-Aminon I. and Sanni A. (2016). Ethnobotany, landraces diversity and potential vitamin A rich cultivars of sweet potato (Ipomoea batatas (L.] Lam.) in southern and central Benin. *Genetic Resources and Crop Evolution* **64**, 1431–1449. https://doi.org/10.1007/S10722-016-0447-3

Sarkodie-addo J. (2017). Effect of vine cutting length and potassium fertilizer rates on sweet potato growth and yield components effect of vine cutting length and potassium fertilizer rates on sweet potato growth and yield components. *International Journal of Agriculture and Forestry* **7**(September), 88–94. https://doi.org/10.5923/j.ijaf.20170704.02

Sebastiani S.K., Mgonja A., Urio F. and Ndondi T. (2006). Response of sweetpotato (Ipomoea batatas) to application of nitrogen and phosphorus fertilizers in the northern highlands of Tanzania. *Acta Horticulturae* **703**, 219–224. https://doi.org/10.17660/ActaHortic.2006.703.27

Shumbusha D., Ndirigwe J., Kankundiye L., Musabyemungu A. and Mwanga R.O.M. (2015). Development of dual-purpose sweetpotato varieties through participatory breeding in Rwanda. In *Potato and Sweetpotato in Africa: Transforming the Value Chains for Food and Nutrition Security*. UK: CABI, pp. 79–87. https://doi.org/10.1079/9781780644202.0079

Shumbusha D., Shimelis H., Laing M. and Rukundo P. (2020). Assessment of the roles and farmer-preferred traits of sweetpotato in a crop-livestock farming system in Rwanda: implications for breeding dual-purpose varieties. *Open Agriculture* **5**, 834–843. https://doi.org/10.1515/opag-2020-0082

Sohindji F.S., Adje O.A.C., Fassinou Hotegni V.N., Fanou Fogny N., Akponikpe T., Quenum F. and Achigan-Dako E.G. (2022). Orange-fleshed sweetpotato production: progress and perspectives for value chain development in West Africa. *JSFA Reports* **2**(5), 198–207. https://doi.org/10.1002/jsf2.42

Stanco M., Lerro M. and Marotta G. (2020). Consumers' preferences for wine attributes: a best-worst scaling analysis. *Sustainability* **12**, 2819. https://doi.org/10.3390/su12072819

Tairo F., Mneney E. and Kullaya A. (2008). Morphological and agronomical characterization of sweet potato [Ipomoea batatas (L.) Lam.] germplasm collection from Tanzania. *African Journal of Plant Science* **2**, 077–085. https://doi.org/10.5897/AJPS.9000173

Tairo F., Mukasa S.B., Jones R.A.C., Kullaya A., Rubaihayo A.R. and Valkonen J.P.T. (2005). Unravelling the genetic diversity of the three main viruses involved in Sweet Potato Virus Disease (SPVD), and its practical implications. *Molecular Plant Pathology* **6**, 199–211. https://doi.org/10.1111/j.1364-3703.2005.00267.x

Tatar O., Haward B., Zhu P., Griffin-Mathieu G., Perez S., Zimet G. and Rosberger Z. (2022). Using Best-Worst Scaling to investigate younger adult Canadians' preferences for COVID-19 vaccination and public health measures: an observational study. *Preventive Medicine Reports* **26**, 101755. https://doi.org/10.1016/j.pmedr.2022.101755

Umberger W.J., Stringer R. and Mueller S.C. (2010). Using best-worst scaling to determine market channel choice by small farmers in Indonesia. In *Proceedings of the Agricultural and Applied Economics Association Annual Meeting, July 25-27, 2010, Denver, Colorado, USA*, p. 27. https://doi.org/10.22004/ag.econ.90853.

Valin H., Sands R.D., van der Mensbrugghe D., Nelson G.C., Ahammad H., Blanc E., Bodirsky B., Fujimori S., Hasegawa T., Havlik P., Heyhoe E., Kyle P., Mason-D'Croz D., Paltsev S., Rolinski S., Tabeau A., van Meijl H., von Lampe M. and Willenbockel D. (2014). The future of food demand: understanding differences in global economic models. *Agricultural Economics* **45**, 51–67. https://doi.org/10.1111/agec.12089

Vermunt J.K. (2002). Latent class analysis of complex sample survey data: application to dietary data. *Journal of the American Statistical Association* **97**, 736–737.

Williams G.A. and Kibowski F. (2016). Latent class analysis and latent profile analysis. In *Handbook of Methodological Approaches to Community-Based Research*, pp. 143–152. https://doi.org/10.1093/med:psych/9780190243654.003.0015

Xiahong H., Yan S., Dong G., Fugang W., Lei P., Cunwu G., Ruzhi M., Yong X., Chengyun L. and Youyong Z. (2011). *Comparison of Agronomic Traits between Rice Landraces and Modern Varieties at Different Altitudes in the Paddy Fields of Yuanyang Terrace, Yunnan Province*, **2**, pp. 46–50. https://doi.org/10.3969/J.ISSN.1674-764X.2011.01.007

Yanfu Y., Jialan T., Yunchu Z. and Ruilian Q. (1989). Breeding for early-maturing sweet potato varieties. In Mackay K.T., Palomar M.K. and Sanico R.T. (eds), *Sweet Potato Research and Development for Small Farmers*. Laguna, The Philippines: SEAMEO-SEARCA, pp. 67–82.

Yeh C.-H., Hartmann M. and Langen N. (2020). The role of trust in explaining food choice: combining choice experiment and attribute best–worst scaling. *Foods* **9**, 45. https://doi.org/10.3390/foods9010045

Yong'an L., Quanwen D., Zhiguo C. and Deyong Z. (2010). Effect of drought on water use efficiency, agronomic traits and yield of spring wheat landraces and modern varieties in Northwest China. *African Journal of Agricultural Research* **5**, 1598–1608. https://doi.org/10.5897/AJAR.9000205

Zawedde B.M., Harris C., Alajo A., Hancock J. and Grumet R. (2014). Factors influencing diversity of farmers' varieties of sweet potato in Uganda: implications for conservation. *Economic Botany* **68**, 337–349. https://doi.org/10.1007/s12231-014-9278-3

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