Uganda Journal of Agricultural Sciences, 2013, 14 (2): 1 - 11 ISSN 1026-0919
Printed in Uganda. All rights reserved © 2013, National Agricultural Research Organisation

Preferences of Ugandan consumers for rice varieties and brands on the local market

M. Masette[1], A. Candia[2], E. Khakasa[1], S. Okurut[2] and S.E. Tinyiro[1]

[1]Food Biosciences Research Centre (FBRC) P. O. Box. 7852 Kampala-Uganda
[2]Appropriate Engineering Agricultural Technology .P. O. Box 7065 Kampala-Uganda
Author for correspondence: mmasette@gmail.com

Abstract

The demand for rice *Oryza sativa* in Uganda has exceeded local supply resulting into importation of several other rice varieties and brands to meet the deficit. Lack of information on consumer preferences hinders decision-making to invest in the rice sub sector. This study seeks to provide information on consumer preferences of most rice brands and varieties on the local market. A consumer survey and sensory analysis were undertaken in the study. The rice consumers' survey was conducted among 475 households from 8 selected rice growing districts in Uganda using a structured questionnaire to establish culinary attributes of rice preferred. Sensory analysis was conducted by a 25-person controlled sensory panel that evaluated 17 boiled varieties and brands of rice using a hedonic scale of 1-7, to rank basic culinary attributes. Consumers' survey revealed that 27 % of households consumed rice among the starchy food types. The consumption of local and imported rice varieties and brands was 77.4 % and 22.6 % respectively. Preference for local rice varieties and/or brands was influenced by affordability (63.4 %) and good aroma and freshness (47 %). Imported rice was appreciated for being full grain (82 %) and stone-free (82.7%). The consumer survey further showed that preference for local rice varieties was in order of importance as "*Supa*" (77.8 %), *Kaiso* (10.7 %) and *NERICA* lines (6.5 %). Sensory evaluation to obtain the mean sensory score (parentheses), indicated that the most preferred local rice variety was NERICA 10 (5.56) while the least preferred variety was NERICA 1 (3.44). Overall, the Tilda and imported rice varieties and brands were more acceptable than the local varieties on account of cleanliness although *Supa* also scored highly due to its aroma.

Key words: Choice, market test, quality, rice varieties and brands

Introduction

Rice *(Oryza sativa)* is one of the most important cereal grains used as a staple food for a large part of the world's consumers stretching from South East Asia to the West Indies (FAO, 2000). Rice is the fourth most important cereal in sub-Sahara Africa in terms of production, behind sorghum, maize and millet (FAOSTAT, 2006). The world production of rice has risen steadily from about 200 million tonnes of paddy rice in 1960 to over 607.9 million tonnes in 2004, 634.5 million tonnes in 2005, and 685 million tonnes in 2008 (Global Grain Singapore Pte Ltd, 2012). Approximately 20 million farmers in sub-Saharan Africa grow rice while about 100 million people depend on it for their livelihood. The demand for rice in Africa is growing at about 6 percent per annum, faster than anywhere else in the world, with the latest available statistics suggesting that sub-Saharan Africa now

accounts for 20 percent of the total world rice imports (Balasubramanian *et al.*, 2007). Eighteen of sub-Saharan African countries consume more than 100, 000 tons of rice per year each, for a total of 19 million tons.

In Uganda, rice has become an indispensable menu item for most homes. The increased consumption of rice in non-traditional rice growing areas has created demand which in turn has rejuvenated production (Kijima *et al.*, 2006). The demand for rice in the country has been attributed to three factors: increase in human population currently estimated at 35 million; its promotion to staple status especially in the eastern part of the country and rapid urbanization as a result of rural migration into towns that has invariably created a niche market for rice. The current estimated demand for rice in Uganda is over 225,000 metric tons of which only 73 % is produced locally and the deficit met by imports (MAAIF, 2009). Despite the high demand, major stakeholders like consumers, policy makers and investors lack vital information from which they can make informed decisions. From field observation, there are typically three categories of rice consumers based on economic status which in turn influences choice of brand. They include high income earners and expatriates; growing middle-class and the poverty-stricken. The first two categories usually base their choice of rice brands for consumption on quality, taste, cooking time, flavour and other culinary properties as opposed to the third category whose choice is based on the price tag and affordability. Currently, 37 % of Ugandans live below the poverty line and certainly quality and other premium related factors are the least on their minds when making choice. The policy makers would require information to set enforceable standards, quotas for export and recommendations to guide investors. On the other hand, investors would like to know which rice variety would be ideal for which targeted group, market or societal segment. The main objective of this study was to generate information on the culinary characteristics of rice varieties and brands preferred by Ugandan consumers as a basis for decision-making with regard to investment in the rice sub sector.

Materials and methods

A survey of potential rice consumers in the market place and sensory evaluation of most common brands and varieties in a controlled environment were the two methods used to determine consumer preferences of rice varieties.

Potential rice consumers survey

Rice consumers' survey was conducted in eight pre-selected districts of Butaleja and Jinja in the eastern region, Lira and Amuru in the northern region, Kampala, Nakaseke and Mityana in the central region and Hoima in the western region. These districts were selected on the basis of being major rice production areas and having high levels of rice consumption and rice trade. A multi-stage and purposively sampling method was used to select the study districts. Key informants, consumers and managers of rice milling companies were the respondents in the survey. Purposive sampling method was used to select the key informants while random sampling was used to select rice consumers and managers of rice milling companies. Majority of respondents were from the urban and peri-urban centres in big towns where most of the niche markets for rice is available and only a few were

from some rice growing rural areas. A total of 475 consumers (of which 60.5 % were women), 49 managers of rice milling companies and 50 key informants were interviewed during the study. A non-formal participatory research technique based on interactive discussions was used for obtaining relevant information. Descriptive statistics was used to analyse the survey data. SPSS version 16 statistical package was used to aid the data analysis.

Sensory evaluation

A total of 17 rice varieties and brands, both imported and local each weighing 5kg were used in the study. The imported brands were: Prime Harvest, Premium Quality, Pure Mweya Pishori, SWT Pakistan Basmati, King's Long Grain, Dawaat Long Grain, Pearl Kenya Pishori, Pakistan and Brown Rice. The local brands included Tilda Basmati, Tilda Aromatic, Tilda Crystal Long grain and Tilda Rice halves, while the local varieties were NERICA varieties 1, 4 and 10 (N1, N4 and N10), Kaiso and *Supa*. The imported rice samples were purchased from Uchumi Supermarket. To ensure variety purity, the NERICA varieties were collected from Cereal Programme of the National Crops Resources Research Institute (NaCCRI) - Namulonge and *Supa* was purchased from a farmer in Lira district which is one of the main areas that grow *Supa* rice variety. The other local varieties were bought from shops around Kampala.

Experimental design

Sensory evaluation was conducted in a controlled environment using a controlled sensory panel of 25 individuals. All panellists involved in the sensory evaluation were residing around Kampala. The culinary attributes of cooked rice varieties and brands assessed therefore represented the consumers' preference to rice of urban respondents interviewed. Admittedly, consumers rarely differentiate between the various descriptive culinary attributes but for purposes of this paper, the responses of each culinary attribute as it varied across the various rice brands and varieties was singularly evaluated. The attributes included appearance, taste, aroma, texture, stickiness, cleanliness and overall acceptability. Evaluation of appearance was made on colour, shape and size among other aesthetic parameters. Using a hedonic scale of 1-9, the 25 panellists assessed the 17 brands and varieties of rice collected. Each panellist scored all rice brands and varieties individually and the average score of each culinary attribute from the 25 panellists was collated to represent the culinary attributes of the respective 17 rice brands and varieties. The preferred choice of consumers was calculated from the average scores of all the culinary attributes of each rice brand. The variety or brand that had the highest average of all the culinary attributes was considered as the most preferred variety or brand and its culinary attributes generally represented consumer preference.

Sample preparation and presentation

About one litre of water was poured in three (3) pre-coded saucepans and allowed to boil. Half a kilogram of each of the rice brands/varieties was put in boiling water with a corresponding code, covered and allowed to boil while monitoring amount of water imbibed by rice and cooking time. The boiling operation was repeated for each of the 17 branded rice types.To eliminate external flavor enhancement and bias among panelists, salt was not added to any

of the rice brands tasted. The three boiled samples were put on a partitioned plate that had been coded with numbers corresponding to the rice brands/varieties. The plates were placed in partitioned cubicles to ensure that panelists did not share responses. Each cubicle had a glass of water to act as neutralizing agent. The panelists were instructed to rinse the mouth thoroughly between tasting different samples. Using a pencil, the panelist scored responses on a structured sheet which had a brief definition of the sensory parameters. The evaluation exercise was conducted between 10-11a.m. for five days to ensure that the panelist were not very hungry or too satisfied as both factors would affect the taste buds.

Statistical analysis

The Statistical Analysis System software package (Version 8.1. 2000; SAS Institute Inc., Cary, NC, USA) was used for data analysis. One-way ANOVA was used to compare data sets with Duncan's multiple range test giving significant difference ($P<0.05$) among means.

Results

Potential rice consumers survey

Rice consumption at household level

Most Ugandans consumed a variety of food stuffs at household level (Fig. 1). Since most of the consumers interviewed were from urban and peri-urban dwellings (especially Jinja and Kampala), the households consumed more than one type of food per meal as opposed to one type of food served at a meal in rural settings. On average, the 475 households interviewed spent UGX 7,480 +/- 8,222 on food per day although the range was UGX 1,000 and 50,000 depending on economic status.

Preferred rice varieties and brands

All the respondents interviewed had consumed rice in the past one week. About

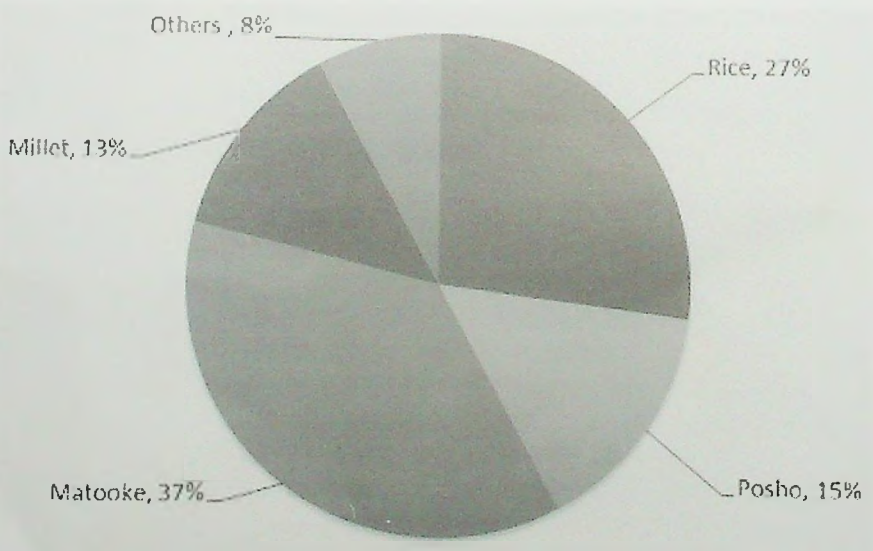


Figure 1. Starchy food types consumed at household level by respondents in study area during 2010.

77.4 % consumed local varieties while 22.6 % consumed imported brands although they quite often supplemented it with local rice varieties. "*Supa*" (77.8 %) was the most preferred local rice variety while *NERICA* lines (6.5 %) were the least. However, there was an overlap of factors influencing choice of rice brand and/or variety (Table 1). Whereas imported rice assumed prominence among most consumers because of its desired quality properties, some consumers preferred eating local varieties and/or brands for their affordability (63.4%) and good aroma and freshness (47%).

Under ideal conditions most consumers interviewed would prefer milled rice brand with the attributes summarised in Table 2.

Sensory evaluation

The average sensory assessment for all the 17 rice brands and varieties obtained in markets is shown in Table 3. For each sensory attribute, the most and least preferred rice brands/varieties, respectively, were: appearance - NERICA 10 (5.72) and Brown Rice (2.64), taste – Pearl Kenya Pishori (5.34) and Tilda rice halves (3.57), aroma –

Table 1. Factors influencing consumption trends among rice consumers in Uganda

Rice types	Factor	Number of consumers (%)
Imported rice	Clean without stones	82.7
	Full grain	82.0
	Good aroma	61.7
	Easy to cook and non-sticky	10.7
Local varieties	Affordable price	63.4
	Good aroma and fresh	47
	Easy to cook	39
	Good whiteness degree	26
	Non sticky and full grain	2

Table 2. Quality attributes of rice varieties/brands preferred by respondents

Rice attribute	*Consumer preference (%)
Good aroma and freshness	44.6
Rice without stones	33
Affordable price	30
Easy to cook	28
Full grain	40.3
Non sticky	15
Degree of whiteness	14

*The percentages exceed 100 because of multiple responses on desired characteristics that cause overlap

Table 3. Sensory assessment of rice brands/varieties available on the market in Uganda

Rice brand	Average score and sd (*parenthesis*)of quality attributes (N=40)						
	Appearance	Taste	Aroma	Texture	Stickiness	Cleanliness	Overall Acceptability
NERICA 1	2.94(1.39)	4.0(1.60)	4.48(1.70)	3.66(1.68)	4.26(1.67)	6.12(0.69)	3.58(1.43)
NERICA 4	4.62(0.94)	5.18(1.04)	4.52(1.31)	4.56(1.16)	5.0(1.55)	6.04(0.81)	5.12 (1.27)
NERICA 10	5.72(0.78)	4.88(1.02)	4.6 (1.03)	5.06(1.18)	4.90 (1.43)	6.82 (0.74)	5.62(0.90)
Kaiso	4.33(1.19)	4.17(1.20)	4.15(1.25)	4.02(1.24)	4.35 (1.32)	6.83 (0.71)	4.22(1.22)
Supa	3.93(1.27)	4.5(1.60)	4.72(1.44)	3.89(1.45)	4.43 (1.41)	6.89 (0.43)	4.39(1.40)
Pakistan	4.54(1.10)	3.87(1.11)	3.91(1.10)	4.41(1.39)	4.15 (1.07)	6.98 (0.15)	4.59(1.24)
Tilda Classic Aromatic	5.37(0.92)	5.0(1.22)	4.92(1.29)	4.65(1.46)	4.47(1.65)	6.82(0.59)	5.0(1.11)
Tilda Crystal Long	5.55(1.15)	5.08(1.37)	4.52(1.28)	5.1(1.30)	4.8 (1.57)	6.9(0.38)	5.27(1.13)
Tilda Rice Halves	2.82(1.24)	3.57(1.45)	3.27(1.57)	3.17(1.55)	3.52(1.62)	5.32(1.62)	3.42(1.36)
SWT Pakistan Basmati	5.1(1.16)	4.8(1.34)	4.42(1.42)	5.07(1.19)	4.25(1.54)	6.7(0.53)	5.25 (1.19)
Tilda Basmati	4.18(1.35)	4.42(1.33)	4.05(1.61)	4.7(1.45)	4.72(1.30)	6.45(0.50)	4.83(1.37)
Dawaat Long Grain	5.4(1.14)	5.25(1.27)	5.18(1.25)	4.6(1.28)	4.8 (1.33)	6.57(0.56)	5.43(1.10)
Pearl Kenya Pishori	5.71(1.04)	5.34(1.07)	5.03(1.22)	5.08(1.05)	4.55 (1.33)	6.76(0.54)	5.45(1.13)
Pure Mweya Pishori	4.95(1.11)	4.34(1.28)	4.55(1.27)	4.13(1.32)	4.13(1.32)	6.68(0.57)	4.66(1.38)
Prime Harvest Premium Quality	4.08(1.10)	4.24(1.12)	3.84(0.94)	4.79(1.36)	4.63(1.34)	6.66(0.63)	4.34(1.32)
Brown Rice	2.64(1.60)	4.14(1.62)	4.34(1.46)	4.5(1.50)	4.07(1.37)	6.59(0.54)	3.95(1.46)
King's Long Grain	5.52(0.98)	4.89(1.22)	4.5 (1.11)	4.61(1.31)	4.86(0.85)	6.48(0.59)	5.32(1.05)

Means with different letter denotes significant difference among means within a column ($P<0.05$)

Dawaat Long Grain (5.18) and Tilda rice halves (3.27), texture – Tilda Crystal Long (5.1) and Tilda rice halves (3.17), stickiness – NERICA 4 (5.0) and Tilda Rice Halves (3.52), cleanliness - Pakistan (6.98) and NERICA 4 (6.04). Generally variability was less in rice cleanliness than in other quality attributes summarised in Table 3.

Overall preference of rice varieties and brands on local markets

The overall consumer preference of all rice types on the local market were similarly assessed as culinary attributes (Fig. 2). Of all the 17 different varieties and brands of rice, overall sensory acceptability showed that NERICA 10 (5.62) was the most preferred rice variety while Tilda Rice Halves (3.42) was the least preferred and the difference between the two was significant ($P<0.05$).

Discussion

Rice consumers survey

From the survey, all respondents interviewed had consumed rice in the past one week which ascertains the assertion that rice had assumed the second position on the menu of most Ugandan consumers (Candia *et al.*, 2007). About 77.4 % of the consumers ate mainly local varieties and brands while 22.6 % ate mainly imported brands which correlated closely with the notion that 20 % of local rice demand was bridged by imports. It was also observed that some households who consumed imported varieties were not entirely dependent on them but quite often supplemented it with local rice varieties. Indeed "*Supa*" was the most preferred local rice variety followed by *Kaiso* and *NERICA* lines. The long history of *Supa* on the Ugandan market enhanced by its

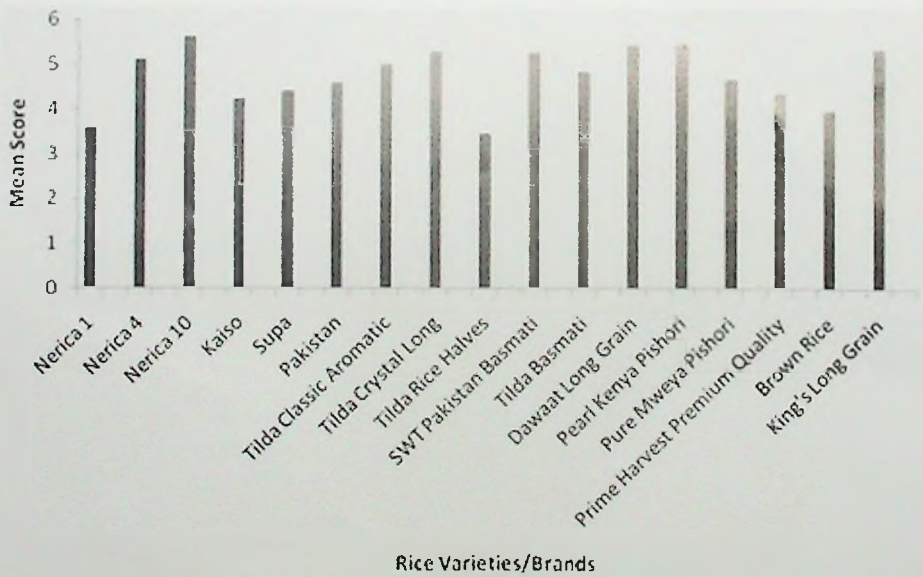


Figure 2. General consumer preference of rice types based on mean score of all culinary attributes.

flavour contributed highly to its elevated level of preference among consumers. On the other hand, the *NERICA* varieties were lowly rated among the urban and peri-urban consumers probably due to poor branding and muted promotion. On the contrary, the locally grown and processed Tilda brands were hardly reported by the respondents and yet they are on the shelves of all major super markets but hardly in the back streets of Kampala. Obviously, Tilda marketers targeted a niche among the affluent which was inaccessible to low income earners who formed the bulk of respondents. Understandably, the respondents were not aware of the Tilda brands and probably there was a sampling error.

Table 1 shows, there was an overlap of factors influencing choice of a given rice brand. Whereas imported rice had assumed prominence among most middle-class and expatriate consumers because of its superior attributes, preference for local varieties was pegged on unit cost and culinary properties among other factors. Considering that about 25 % of Ugandan's live below the poverty line (IFAD, 2008), affordability is a crucial factor low-income consumers. Presence of foreign matter and especially stones was the major factor that made local rice brands unpopular among the Ugandan consumers. This is because; these local brands were processed by cottage rice mills without de-stoners (Candia *et al.*, 2008). Given that 77.4 % of the consumers liked eating local rice brands, improving the quality particularly cleanliness and maintaining whole grain would significantly contribute to improving the competitiveness of the local brands in niche local markets. This is evidenced by the good prices offered by the consumers for the Tilda brands found in supermarkets. High cost and low taste were the factors that made some of the imported brands unpopular among consumers. Under ideal conditions most consumers interviewed preferred milled rice brands with the attributes summarised in Table 2 but at affordable prices.

Sensory evaluation

Of the 17 rice brands and varieties on the market that were sensorially evaluated, only five local rice brands and varieties were rated highly. They included in descending order, NERICA 10, Tilda crystal Long, NERICA 4, Tilda classic aromatic and Tilda Basmati. Most of these brands and varieties are sold in supermarkets infrequently visited by low income earners that form the bulk of Ugandan rice consumers.

Tilda Rice Halves, Brown rice and NERICA 1 were rated least (Table 3) because of their purportedly inferior appearance. Their appearance was significantly different from the other rice types ($p<0.05$). The light brown color of brown rice is caused by the presence of bran layer, which is rich in minerals and vitamins. Although brown rice offers superior nutritive value than white rice (Juliana, 1993). Awareness has not been created among most Ugandan consumers who base their preference on appearance. Contrasting results were obtained for other brands like Pakistan whose grains remained whole and therefore scored better than *Supa* and Kaiso which had some broken grains.

Unlike in Sierra Leone where broken rice is more preferred than whole grain (Candia, (unpublished data), the reverse occurs in Uganda. This underscores the complexity of consumer preferences and the subjectivity of the sensory method. Of the local rice brands, based on taste, Tilda Basmati was preferred with significant

difference to Tilda Rice Halves despite Tilda Basmati brands being more expensive than Tilda rice halves by 20% at about US$ 3.6 per kg on the local market. Imported varieties/brands like Pearl Kenya Pishori and Dawaat were comparatively tastier than local rice varieties/brands however the difference was not significant ($P<0.05$). The major drawback of the local varieties was the presence of extraneous material and especially stones.

According to Champagne (2004), there is a correlation between taste and amylose content of the grains. Sweet taste is perceived in grains containing higher amounts of amylose and the opposite is true for sour and astringent tastes. Aroma scores of the different rice brands/varieties are shown in Table 3. The perceived aroma of the different varieties/brands can be attributed to different content of one or more volatile compounds contributing to rice aroma.

The compound 2-acetyl-1-pyrroline has been predominantly associated with popcorn-like aroma in rice (Schieberle, 1991). Brown rice has a nut-like flavour which was scored satisfactorily. It is also important to note that the genotype as well as specific pre and post-harvest treatments variably influence the perceived aroma (Champagne, 2008). In most Ugandan homes, texture of cooked rice is very important. It should be dry, firm and grainy as opposed to marshy and sticky like *posho* (maize meal) and thus low texture scores were obtained for Tilda Rice Halves, NERICA 1 and *Supa*.

Cooked brown rice had slightly chewy texture however it had a fair score, probably due to its other culinary attributes like taste and aroma. Rice texture is dependent on amylose and to a lesser extent protein content. Dry and firm rice grains after cooking is an indication of high amylose with moist and sticky grains representing low amylose and thus high amylopectin (Webb, 1985). Stickiness for the rice varieties/brands (Table 3) like 2-acetyl-1 pyroline. Stickiness of rice is linked to the amylose-amylopectin ratio making up the starch component. Rice varieties with high amylase content remain intact after cooking while those high in amylopectin are comparatively sticky after the same treatment. In addition, long-grain rice is reported to contain more amylose while medium/short-grain rice types are high in amylopectin (Champagne, 2008).

Cleanliness of the rice varieties/brands was also evaluated (Table 3). Cleanliness can be described as the absence of chaff, flakes of bran residue as well as stones and other extraneous matter which reflects the degree of post-harvest handling. In the current era where most housewives are multi-tasking, sorting and cleaning rice prior to cooking is a time consuming chore. Consequently, most of them prefer already cleaned brands regardless of the price tag. That explains the preference of imported brands over local types although there was a delicate balance between the two brands since for most, the differences were not significant. However, local brands like NERICA 10, *Supa* and Kaiso were highly rated in cleanliness and yet they could have been rated low since they are normally processed by using inefficient Engleberg and Mill-Top rice mills.

Their high score may be attributed to thorough sorting and cleaning prior to cooking. Usually the imported rice brands undergo meticulous post-harvest handling systems to meet market quality requirements than local types, hence the glaring differences between the two categories where differences were

significant with regard to level of cleanliness.

Overall preference of rice brands on local market

The most and least preferred rice varieties/ brands on the Ugandan market (Fig. 2) were determined by a combination of culinary attributes listed in Table 3. The differences among the most preferred rice types were not significant. However, between the most and least preferred, the difference was significant ($p<0.05$). Although most consumers in Uganda always talk of *Supa* variety as being their preferred rice type because of its aroma, this study rated it below the less aromatic NERICA 4 and 10 which are rarely mentioned in daily talk. The middle level rating of *Supa* may be attributed to its fairly dull colour and stickiness. When *NERICA 10* is well milled and cooked according to instructions, it exhibits culinary attributes acceptable to most consumers such as: white appearance, moderate stickiness and good taste.

Conclusion

Imported varieties and brands were more acceptable than local ones because most of them were sand-free and devoid of extraneous matter. There were two categories of factors that influenced consumer preferences of rice brands and varieties on the Ugandan market. These are intrinsic culinary attributes and external factors. Intrinsic culinary attributes include stickiness, aroma, and taste and colour while external factors comprised of grain wholeness, price and cleanliness.

Consumer survey results correlated well with sensory analysis that was conducted by a panel of controlled individuals. Essentially, Ugandan rice consumers prefer rice brands or varieties that have good aroma and taste, stone-free, white in colour, middle level of stickiness and whole grain but at affordable price. To attain the characteristics of rice brands preferred by most Ugandan consumers requires concerted and collaborative effort from breeders, agronomists and processors. Thus, the shortcoming of local varieties/ br ands especially the issue of cleanliness can be adequately addressed as a pre-requisite for increased competitiveness.

Acknowledgement

The research team acknowledges the contributions of Millennium Science Initiative of Uganda National Council for Science and Technology for funding the study, National Agricultural Research Organization for provision of staff and laboratory equipment used for the work.

References

Balasubramanian, V., Sie, M., Hijmans, R. J. and Otsuka, K. 2007. Increasing rice production in Sub-Saharan Africa: Challenges and opportunities. *Advances in Agronomy* 94:55-133.

Candia, A., Saasa, A.R., Okurut, S. and Oker, T. 2008. Survey report on the Status of Rice milling Industry in Uganda. Funded by JICA.

Champagne, E.T. 2008. Rice aroma and flavour: A literature review. *Cereal Chemistry Journal* 85(4):445-454.

FAO, 2000. Report: Bridging the rice yield gap in Asia and the Pacific. Minas, K., Papademetriou, F., Dent, J. and Herath, E.M.

FAOSTAT. 2006. http://faostat.fao.org.

Global Grain Singapore Pte Ltd, 2012. http://www.globalgrainsvn.com/GGSVN/Rice.html

IFAD. 2008. Rural poverty in Uganda.

Juliana, B.O. 1993. Rice in human nutrition (FAO Food and Nutrition Series No. 26) ISBN 92-5-103149-5. pp. 38.

Kijima, Y., Sserunkuuma, D. and Otsuka, K. 2006. How revolutionary is the "Nerica revolution"? Evidence from Uganda. *The Developing Economies* 44(2):252-267.

MAAIF. 2009. Uganda National Rice Development Strategy. Government of the Republic of Uganda.

Webb, B. D. 1985. Criteria of rice quality in the United States of America. FAO Tech Report.