

DRAFT Report on price sensitivity and consumer acceptability of consumers in Ghana

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Abstract

Rice (prototype, local and imported) was evaluated by 109 consumers in the unpacked form for acceptability and affordability. The most acceptable rice comprised the prototype, imported parboiled and imported US No 5 followed by the local white and lastly the locally sold parboiled rice. This suggests that there is potential for the prototype rice providing a suitable marketing strategy is employed and the benefits to producers and traders are real. Most consumers interviewed ate rice either every week or every day and purchased imported white rice (5kg) every month from local markets. The most common dish containing rice was jollof. The majority (70%) said they had received information (through TV and radio) promoting rice and that promotions were reported to emphasise taste, quality and nutritional benefits. However, only 45% were aware of the potential benefits. Most consumers (87%) mentioned they would like to receive more information and that the most popular medium mentioned was the TV (GBC and TV3 stations) followed by radio (Peace FM, ADOM FM and Joy FM stations). Compared to the other similar types of rice commonly sold in Accra, the mean price of the prototype estimated by the consumers was Cedi 7773 which was similar to imported US raw rice. As the score for acceptability of rice judged by consumers increased, the affordability decreased. More detailed inspection suggested that there were two groups of consumers; those who expressed low affordability with price and those who expressed high affordability with price. The least affordability group of consumers scored the lowest priced rice (local parboiled) as more acceptable while the high affordability group found the higher price rice samples (local white and US No 5) to be more acceptable suggesting real behavioural differences. Inspection of the two groups with respect to affordability suggested that the higher affordability group were younger, more likely to be working full time, have additional sources of income, more likely to own their accommodation (13% for low affordability, 24% for high affordability), live in detached accommodation as opposed to a compound or a flat, have achieved a higher level of education, own a vehicle, purchase rice at the supermarket or minishop, purchase larger quantities at a time and have received information promoting rice. This suggests that the prototype rice would probably sell at a lower price (between Cedi 5667 and Cedi 7250) in the markets if sold in the unpackaged form. The prototype rice would be anticipated to sell at a higher price (between Cedi 8833 and Cedi 10417) if targeted at the higher affordability group. However, this study does not indicate the proportion of consumers in Accra who belong to the low and high affordability groups or the additional packaging and marketing costs required to reach these groups.

1. Introduction

Consumer acceptability of rice has previously been investigated in Ghana (Tomlins et al 2004). This indicated that acceptability of rice differed and that this was mostly influenced by the brown colour of the cooked rice and paddy in the raw rice. Segmentation of the consumers showed that the majority preferred all the rice samples while smaller groups either did not like the brown colour or the reverse. As a result of these findings, an improved parboiled rice was developed using new technologies that improved the parboiling process, was easier to use by rural producers and consumed less fuel hence protecting the environment.

This study reports new work which confirmed that the improved parboiled rice is more acceptable to consumers and approaches that were applied to estimate the local marketing approach including a price that the improved product could be sold at. Psychometric tests of consumers were also used to predict purchasing behaviour of consumers.

2. Materials and Methods

2.1 Samples

Five samples of rice selected for the study and some characteristics are as follows:

- a) US (United States) imported raw rice (US No 5) - widely available in Ghana
- b) US imported parboiled rice (Tilda) - premium product limited to a few supermarkets
- c) Parboiled rice purchased in Accra, Ghana - average quality local product that has undergone limited sorting and clean-up
- d) Local raw rice purchased in Accra, Ghana - average quality local product that has undergone sorting and clean-up
- e) Improved parboiled rice produced in the Northern region –quality local product that has undergone sorting and clean-up

2.2 Cooking method for sensory testing

Rice samples (300 g) were washed in water (300 ml) of water and drained for five minutes. The samples were cooked in 450 ml boiling salted water (3 g salt in 1000 ml water) until the rice was soft in a rice cooker (Iris, details of make of rice cooker and cooking times). Cooked rice was kept in a heated box ($60^{\circ}\text{C} \pm 5^{\circ}\text{C}$) for up to one hour until served to the sensory panel.

2.3 Consumer methodology

The consumer interviews were carried out in four stages to elicit socio-economic information, acceptability of raw rice, the price of the improved parboiled rice and affordability of rice.

Stage 1

Socio-economic information

Consumers (105) were interviewed Accra, in Ghana using the method of central location testing. Consumers were selected according to income group, gender and ages from 18 to 70 years.

During testing, raw rice samples were presented to consumers. Consumers scored the acceptability of rice using a 9-point hedonic box scale (Meilgaard *et al.*, 1987) from 'dislike extremely' to 'like extremely'. The six cooked rice samples were coded with 3-figure random numbers and presented simultaneously, but in random order, to each consumer on white paper plates.

After scoring the acceptability of the rice, consumers were interviewed. This recorded information on gender, age, occupation, how often they consumed rice, where they eat rice, which rice they prefer to purchase (local or imported), their preferred staple and who purchases rice in their household. The interview lasted about 30 min.

2.4. Sensory methodology

The same rice samples prepared for the consumers were scored by a semi-trained sensory panel using a modified version of quantitative descriptive analysis (QDA) since standards were not provided (Meilgaard *et al.*, 1987; Bainbridge *et al.*, 1996). The sensory panel (10 panellists) was conducted at the Food Research Institute (FRI), Accra, Ghana under controlled temperature (air conditioned) and lighting. The panel was comprised of staff from the Food Research Institute who had been screened for perception of the basic tastes (sweet, sour, bitter and salty), familiarity with the product and ability to determine differences between rice samples. Sensory attributes for uncooked (visual and odour) and cooked (visual, odour, taste and texture) rice were generated during a preliminary focus group session guided by the panel leader. A total of 16 uncooked and 14 cooked sensory attributes were developed for which the group had a consensus. Sensory attributes generated for the uncooked product were uniform colour, black specks, white heads, yellow colour, brown colour, cream colour, brightness, translucence, clean appearance, chalky appearance, unshelled paddy (not completed hulled), whole grain shape (as opposed to broken), long shape, oval shape, size and slender. Sensory terms for the cooked rice were brown colour, yellow colour, whitish appearance, black specks, uniform appearance, typical rice odour, sweet taste, sour taste, creamy flavour, sticky texture, grainy texture and hard texture.

The six rice samples were tested in triplicate by the panel over a three day period and the order in which they were cooked was random. At each session, three rice samples (coded with 3-figure random numbers) were served in random order to each panellist (there were two sessions on each of the three days). Samples (40 g) were close to room temperature (25°C to 30°C) and panellists rinsed their mouth with mineral water before tasting each sample. Intensity was scored on a 100 mm unstructured scale, anchored with the terms 'not very' at the low end and 'very' at the high end.

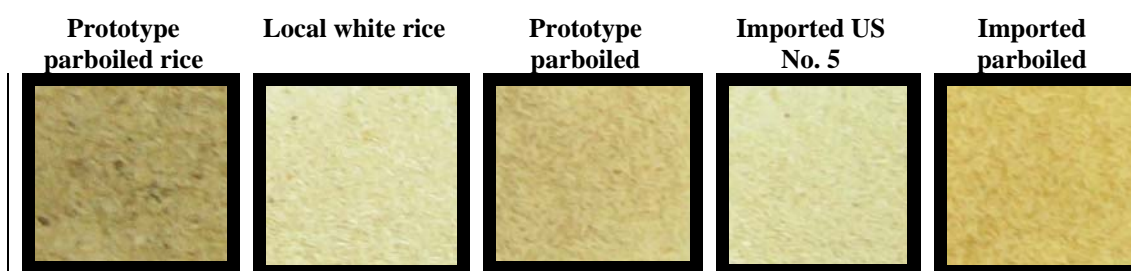
2.6. Data analysis

Analysis of variance (ANOVA) or Kruskal-Wallis as appropriate, correlation analysis, stepwise regression, principal component analysis (PCA; covariance), cluster analysis (agglomerative hierarchical clustering using Wards methods and k-means optimised using the within group variance) and internal preference mapping were computed using SPSS (version 11.5) and XLSTAT (version 6.1 v3.1).

3. Results and discussion

The visual appearance of the rice samples is shown in figure 1. These samples were scored for sensory attributes by the sensory panel and for acceptability by consumers. Acceptability of the prototype rice was compared with other rice sold in local markets, supermarkets and minishops (for example shops situated at petrol/gasoline/filling stations). The rice samples were compared in the unpackaged form because rice is most commonly sold in open containers (margarine tin, American tin and sacks) in local markets in Accra. Increasingly, however, rice is sold in a packaged form in supermarkets and minishops but this form was not evaluated.

Figure 1: Visual appearance of rice samples used in the sensory and consumer testing



Socio-economic profile of consumers interviewed

A total of 109 consumers were interviewed at two locations in Accra (market and at the Food Research Institute, Accra; figure 2). The mean responses from the consumers are given in table 1. The weighting of the consumers was towards the female gender (69 %) because the majority of people purchasing rice at markets in Accra were female.

Figure 2: Consumers being interviewed in Accra

Consumer interviews in a market in Accra	Consumer interviews at the Food Research Institute
	



The consumers varied in age group (91% between 25 and 64 yrs), employment, ethnic group (71% Akan and Ewe) and income status (the majority rented their accommodation, lived in compound accommodation with more than five people, did not own a vehicle and had received elementary education).

The majority ate rice either every week or every day and purchased imported white rice (5kg) every month from local markets. The most common dish containing rice was jollof.

Considering how consumers obtained information about rice, the majority (70%) said they had received information (through TV and radio) promoting rice. Promotions were reported to emphasise taste, quality and nutritional benefits. However, only 45% were aware of the potential benefits.

Considering promotion strategies for the improved rice, most (87%) mentioned they would like to receive more information and that the most popular medium mentioned was the TV (GBC and TV3 stations) followed by radio (Peace FM, ADOM FM and Joy FM stations). The most popular radio station mentioned was one that broadcast in the local language.

Table 1: Profile of consumers interviewed for this study

Question / observation	Consumer response (%)					
	Male	Female				
Gender	30	69				
Age	15 - 24	25 - 34	35 - 44	45 - 54	55 - 64	65+
	4	39	29	23	3	0
Working status	Working full-time	Studying	Working part-time	Retired	Other	
	78	7	4	1	10	
What is your main employment?	Government	Self-employed	Non-government	Other		
	51	29	11	7		

Additional sources of income?	Yes	No							
	71	16							
Is your accommodation?	Rented	Owned	Other						
	68	18	14						
What type Is your accommodation?	Compound	Flat	Detached	Other					
	61	18	12	8					
How many people live in your house?	1	2	3	4	5+				
	5	3	9	18	61				
Are you the head of the household?	Yes	No							
	33	63							
Marital status. Are you?	Married	Single	Separated	Divorced	Widowed				
	69	27	3	1	1				
Are you the main grocery shopper in your household?	Main purchaser	Joint purchaser	No						
	53	18	27						
What is your ethnic group?	Akan	Ewe	Ga	Frafra	Dagonba	Gonja	Dagarti	Other	
	41	30	14	3	1	1	1	8	
What is your religious faith?	Traditional	Christian	Islam	Other					
	95	2	1	0					
What is your achieved level of education?	None	Elementary / JSS	Secondary / SSS	Vocational	University	Other			
	11	38	14	8	17	10			
Do you own any of the following (tick all that apply)	TV	Radio	Fridge	Vehicle	Bicycle	Motorbike			
	78	72	69	11	10	3			
How often do you eat rice?	Every day	Every week	Every month	Rarely					
	43	51	1	4					
What type of rice do you eat? (tick all that apply)	Imported white	Local white	Local parboiled	Imported parboiled	Other				
	84	23	18	6	1				
Where do you purchase rice (tick all that apply)	Market	Supermarket	Minishop	Other					
	80	26	18	5					
How often do you purchase rice?	Every day	Every week	Every month	Rarely					
	9	34	50	6					

What quantity of rice do you purchase at a time?	American tin	25kg bag	Margarine tin	50 kg bag	Other					
	31	30	17	15	5					
Which meals do you eat that contain rice (tick all that apply)	Jollof	Plain	Waakye	Emotuo	Fried	Rice water	Other			
	88	82	70	62	57	54	6			
Which is your favourite meal that contains rice?	jollof	plain rice	Emotuo	waakye	fried rice	rice water	red	red	rice & stew	
	41	26	11	10	7	3	1	1		
Are you aware of the benefits of eating rice?	Yes	No								
	54	45								
Have you received information promoting rice before?	Yes	No								
	70	26								
If yes, when and how?	Radio	TV	Newspapers	Magazines	Other					
	50	50	13	1	2					
What were they promoting about rice? (tick all that apply)	Taste	Quality	Nutritional benefit	Price	Recipe	Convenience	Other			
	50	45	43	16	6	4	4			
Would you like to know more about rice?	Yes	No								
	87	4								
Do you read any of the following newspapers? (tick all that apply)	Daily Graphic	Ghanaian Times	Chronicle	Daily Guide	Statesman	Daily Dispatch	Freepress	Other		
	57	23	16	11	7	5	4	10		
Do you watch any of the following TV stations? (tick all that apply)	GBC	TV3	Other							
	76	76	45							
Do you listen to any of the following radio stations (tick all that apply)	Peace FM	ADOM FM	Joy FM	Radio Gold	Choice FM	Happy FM	Vive FM	Obonu FM	Other	
	83	56	47	34	30	18	12	12	10	
If you were to receive more information about rice, which would be best for you?	TV	Radio	Newspapers	Magazines	Other					
	66	53	11	2	1					

Consumer acceptability

Consumers were invited to evaluate the acceptability of the rice samples in the raw form. This method was selected because this is how the majority of consumers were observed to evaluate rice sold in markets in Accra.

Of the rice samples evaluated analysis of variance showed that the consumer acceptability significantly differed ($P < 0.05$) and the least significant different test indicated three groups of acceptability (Table 2). The most acceptable rice comprised the prototype, imported parboiled and imported US No 5. The second group consisted of the local white and the last group being the locally sold parboiled rice. Since the prototype rice was in the most preferred group, there is potential providing a suitable marketing strategy is employed and the benefits to producers and traders are real.

Table 2: Mean values for consumer acceptability

<u>Rice type</u>	<u>Mean</u>	<u>Std. Deviation</u>
Prototype	7.68ab	1.522
Imported parboiled	7.44abc	1.845
Imported US No 5	7.05bc	1.862
Local white	6.32d	1.837
Local parboiled	4.31e	2.455

Price of improved rice suggested by consumers

Consumers judged the price of prototype rice by comparing it with prices of rice currently sold in markets in Accra (figure 3). The mean price of the local parboiled rice, local white rice, imported US No. 5 imported parboiled rice is given in Table 3.

Figure 3: Interviewer with consumer who is judging the price of the prototype rice



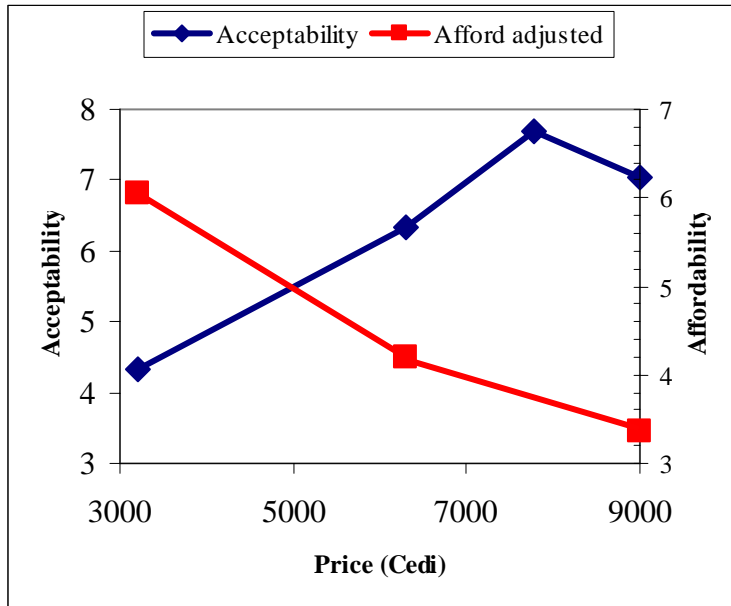
Table 3: Price (Cedi/kg) for rice locally purchased in Accra

Rice type	Price (Cedi/ kg)		
	Mean	Minimum	Minimum
Local parboiled	3183	3000	3367
Imported US No 5 raw	9000	9000	9000
Local white raw	6300	5600	7000
Imported parboiled	38350	38350	38350

Consumers rated the price of the prototype rice relative to the given prices for the local parboiled, local white rice and the imported US No. 5. The imported parboiled rice was excluded because this was a niche rice that sells at a price well above the others. Considering all of the consumers interviewed, the mean price for prototype was Cedi 7773 which varied between Cedi 2500 and Cedi 12000.

Consumers were also asked to score the affordability of the local parboiled, imported US No 5 and local white raw rice samples. The affordability of the rice samples significantly differed (ANOVA; $P < 0.001$) and the affordability along with the consumer acceptability scores is illustrated in figure 4. This shows that as the price increases, the affordability decreases while the acceptability increased. Interestingly, while the acceptability of the prototype was the highest it was rated as more affordable than the US No 5.

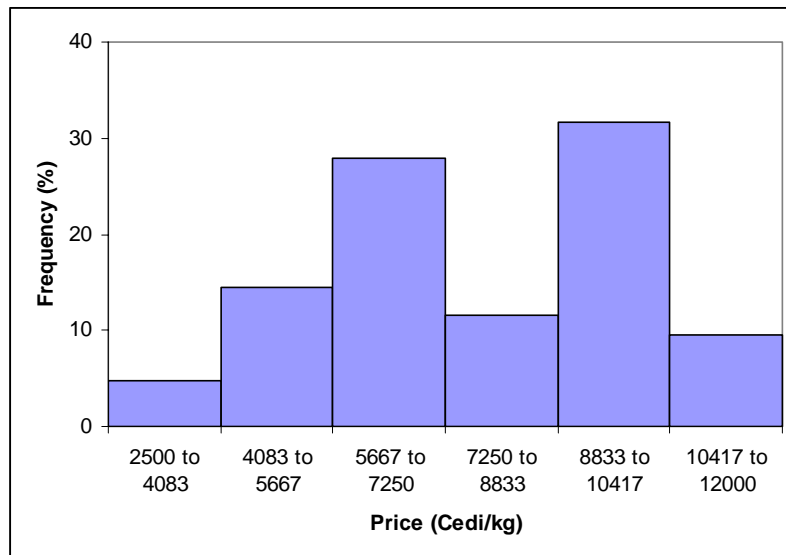
Figure 4: Changes in consumer acceptability and affordability with market price of rice in Accra, Ghana



Variations in price sensitivity among consumers

A histogram of the frequencies of consumers rating affordability with increasing market price of rice indicated two maxima (figure 5). The lower affordability group was in the range cedi 2500 and 8042 and the higher in the range of Cedi 8042 and 12000.

Figure 5: Histogram showing frequency of consumers rating affordability with increasing market price for rice.

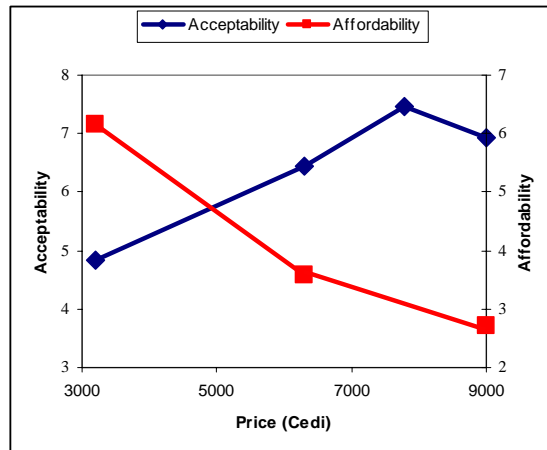


The two groups of consumers (low and high affordability) were compared with respect to how they scored the acceptability of the rice samples evaluated (figure 6). In general, the low affordability group of consumers scored the lowest priced rice (local parboiled) as more acceptable (ANOVA; P=0.012)

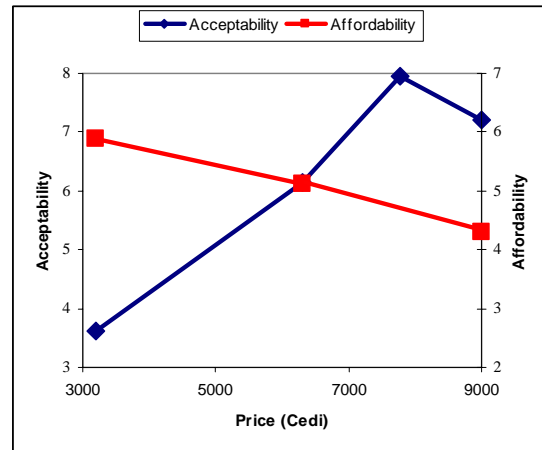
while the high affordability group found the higher price rice samples (local white and US No 5) to be more acceptable.

Figure 6: Comparison of acceptability and affordability with price of low and high affordability groups of consumers

a) Low affordability group of consumers



b) High affordability group of consumers



Inspection of the two groups with respect to affordability suggested that the higher affordability group were younger, more likely to be working full time, have additional sources of income, more likely to own their accommodation (13% for low affordability, 24% for high affordability), live in detached accommodation as opposed to a compound or a flat, have achieved a higher level of education, own a vehicle, purchase rice at the supermarket or minishop, purchase larger quantities at a time and have received information promoting rice (table 4).

Table 4: Comparison of social profiles of low and high affordability groups of consumers

	Consumers (%)	
	Low affordability	High affordability
Gender		
Male	32	29
Female	67	71
Age**		
15 – 24	2	7
25 – 34	33	47
35 – 44	32	24
45 – 54	28	16
55 – 64	3	2
65+	0	0
Working status*		
Working full-time	72	87
Studying	7	0
Working part-time	5	9

Retired	2	0
Other	15	2
What is your main employment?		
Government	47	58
Self-employed	12	11
Non-government	32	24
Other	7	7
Additional sources of income?		
Yes	63	82
No	25	4
Is your accommodation?		
Rented	73	60
Owned	13	24
Other	13	16
What type is your accommodation?		
Compound	67	53
Flat	22	13
Detached	5	22
Other	7	9
How many people live in your house?		
1	7	2
2	3	2
3	5	13
4	23	11
5+	55	69
Are you the head of the household?		
Yes	38	27
No	58	69
Marital status. Are you?		
Married	70	67
Single	23	31
Widowed	2	0
Separated	3	2
Divorced	2	0
Are you the main grocery shopper in your household?		
Main purchaser	55	51
Joint purchaser	17	20
No	25	29
What is your ethnic group?		
Akan	43	38
Ewe	33	27
Ga	10	20
Frafra	2	0
Dagonba	0	2
Gonja	3	2

Dagarti	2	0
Other	7	9

What is your religious faith?

Traditional	0	0
Christian	97	93
Islam	0	4
Other	2	0

What is your achieved level of education?

None	10	13
Elementary/JSS	47	27
Secondary/SSS	12	18
Vocational	12	2
University	8	29
Other	7	11

Do you own any of the following (tick all that apply)

Radio	97	93
TV	77	80
Fridge	70	67
Bicycle	18	0
Vehicle	8	16
Motorbike	3	2

How often do you eat rice?

Every day	37	51
Every week	58	42
Every month	2	0
Rarely	3	4

What type of rice do you eat? (tick all that apply)

Imported white	22	13
Local white	25	20
Local parboiled	82	87
Imported parboiled	7	4
Other	0	2

Where do you purchase rice (tick all that apply)

Market	80	80
Supermarket	22	31
Minishop	13	24
Other	3	7

How often do you purchase rice?

Every day	7	11
Every week	42	24
Every month	45	58
Rarely	5	7

What quantity of rice do you purchase at a time?

1kg (Margarine tin)	22	11
2kg (American tin)	35	27
25kg bag	23	31

50 kg bag	10	22
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Which meals do you eat that contain rice (tick all that apply)

Jolloff	87	89
Plain	72	69
Waakye	60	64
Emotuo	78	87
Fried	57	58
Rice water	55	53
Other	8	2

Are you aware of the benefits of eating rice?

Yes	56	57
No	44	43

Have you received information promoting rice before?

Yes	55	63
No	45	37

If yes, when and how?

Radio	47	56
TV	48	53
Newspapers	12	16
Magazines	0	2
Other	2	2

What were they promoting about rice? (tick all that apply)

Taste	35	53
Quality	5	7
Nutritional benefit	5	16
Price	40	64
Recipe	37	56
Convenience	15	18
Other	2	7

Would you like to know more about rice?

Yes	83	91
No	7	0

Do you read any of the following newspapers? (tick all that apply)

Daily Graphic	52	64
Ghanaian Times	23	22
Chronicle	8	27
Daily Guide	5	9
Statesman	5	4
Daily Dispatch	12	11
Freepress	2	7
Other	5	16

Do you watch any of the following TV stations? (tick all that apply)

GBC	70	84
TV3	77	76
Other	43	47

Do you listen to any of the following radio stations (tick all that apply)

Peace FM	80	87
ADOM FM	32	27
Joy FM	53	60
Radio Gold	22	13
Choice FM	40	27
Happy FM	45	49
Vive FM	13	11
Obonu FM	15	9
Other	8	13

If you were to receive more information about rice, which would be best for you?

TV	63	69
Radio	57	49
Newspapers	13	9
Magazines	3	0
Other	2	0

Where * = significant at $P < 0.010$, ** = significant at $P < 0.050$

Conclusions

Rice (prototype, local and imported) was evaluated by 109 consumers in the unpacked form for acceptability and affordability. The most acceptable rice comprised the prototype, imported parboiled and imported US No 5 followed by the local white and lastly the locally sold parboiled rice. This suggests that there is potential for the prototype rice providing a suitable marketing strategy is employed and the benefits to producers and traders are real.

The majority of consumers interviewed ate rice either every week or every day and purchased imported white rice (5kg) every month from local markets. The most common dish containing rice was jollof. Considering how consumers obtained information about rice, the majority (70%) said they had received information (through TV and radio) promoting rice. Promotions were reported to emphasise taste, quality and nutritional benefits. However, only 45% were aware of the potential benefits. Considering promotion strategies for the improved rice, most (87%) mentioned they would like to receive more information and that the most popular medium mentioned was the TV (GBC and TV3 stations) followed by radio (Peace FM, ADOM FM and Joy FM stations).

Compared to the other similar types of rice commonly sold in Accra, the mean price of the prototype estimated by the consumers was Cedi 7773 and this varied between Cedi 2500 and Cedi 12000.

Compared to acceptability, as the score for acceptability of rice judged by consumers increased, the affordability decreased.

Inspection of a frequency histogram of affordability and price suggested that there were two groups of consumers; those who expressed low affordability with price and those who expressed high affordability with price. The least affordability group of consumers scored the lowest priced rice (local parboiled) as more acceptable while the high affordability group found the higher price rice samples

(local white and US No 5) to be more acceptable suggesting real behavioural differences. Inspection of the two groups with respect to affordability suggested that the higher affordability group were younger, more likely to be working full time, have additional sources of income, more likely to own their accommodation (13% for low affordability, 24% for high affordability), live in detached accommodation as opposed to a compound or a flat, have achieved a higher level of education, own a vehicle, purchase rice at the supermarket or minishop, purchase larger quantities at a time and have received information promoting rice.

This suggests that the prototype rice would probably sell at a lower price in the markets if sold in the unpackaged form. The prototype rice would be anticipated to sell at a higher price if targeted at the higher affordability group. However, this study does not indicate the proportion of consumers in Accra who belong to the low and high affordability groups or the additional packaging and marketing costs required to reach these groups.