Agricultural Journal 3 (6): 476-481, 2008
ISSN: 1816-9155

Investment Potentials of *Hibiscus sabdariffa* Linn (Var. sabdariffa): A Case Study of Zobo Drink in Southwestern Nigeria

O.G.E. Arowosoge
Department of Forestry, Wildlife and Fisheries Management,
University of Ado-Ekiti, Nigeria

Abstract: A non-alcoholic drink popularly known as zobo drink has been contributing to the livelihood of people. This study evaluated the investment potentials of zobo drink with the aim of encouraging its improved production. This evaluation was carried out through personal interview and administration of structured questionnaire on the marketers of roselle calyx, as well as the producers and consumers of zobo drink. The study revealed that the wholesalers of roselle calyx are northerners who purchase it from the northern part of Nigeria. The number of zobo drink producers has been on the increase, while students were the major buyers of the drink. It was however observed that the poor hygienic condition in which zobo drink was produced limited its demand. The cost and benefit analysis showed that zobo drink production was profitable with Benefit Cost Ratio (BCR) and average Rate of Return on Investment (RRI) of 1.75 and 70.31, respectively. Improved production of zobo drink under hygienic condition with the certification of National Agency for Food, Drugs Administration and Control (NAFDAC) would increase its demand and consequently increase its profit margin.

Key words: *Hibiscus sabdariffa*, zobo drink, investment potentials, cost benefit analysis

INTRODUCTION

Hibiscus sabdariffa commonly called roselle is a Non-Timber Forest Product (NTFP) of the African origin. It is extensively cultivated in tropical Africa, Asia, Australia and Central America (Schippers, 2000). The roselle is an annual herb, belonging to the family Malvaceae. The plant grows up to 2 m with pale green leaves of various lengths, ranging between 5 and 12 cm. The flowers are yellowish with dark red pigmentation at the center. The fruit is about 2.5 cm in length with fleshy calyces containing dark brown seed (Kalyane, 1986; Rice *et al*., 1990). Roselle has a wide spread in the Savannah region of Nigeria where it is cultivated.

The leaves of roselle are eaten as vegetables, while the seeds are used as feed meal for fish and domestic animals (Backeit *et al*., 1994; Mukhtar, 2007). The red calyces surrounding the fruits (Plate 1) are used to brew non-alcoholic drinks and as colouring reagent for jelly, jam, beverages and foods (Gibbon and Pain, 1995; Rao, 1996). In Nigeria, the use of roselle is most common in the production of non-alcoholic drink known as zobo. This drink is a hot water extract of roselle calyxes locally processed with sweeteners, spices and flavour such as ginger, vanilla, strawberry and pineapple. The word zobo is derived from Zoborodo, a Northern Nigeria (Hausa) name for roselle plant. Roselle plant, which is quite popular in the study area, enjoys high patronage from the stand point of nutritional and medicinal values as well as economic value. This is because it is cheaper, when compared with other available soft drinks. In terms of nutritional values, it has been found to be a good source of protein (Mohammed and Adris, 1991; Mukhtar, 2007). Its medicinal values include: prevention and cure of hypertension and inflammation of the bladder (Qi *et al*., 2005).

Plate 1: *Hibiscus sabdariffa* (roselle) calyces. Field survey, 2007

The various uses to which roselle has been put show that it has been contributing to the livelihood of people.

However, its production into zobo drink for, which it is used in the study area is at the cottage level with a very short-shelf life (Omemu *et al*., 2006).

The aim of this study, therefore is to carry out research on the investment potential of zobo drink production with a view to determining the possibility of investing on it in large scale. The study examined the basis for the development and promotion of roselle for zobo drink while determining its economic returns and market potentials in order to ascertain its profitability.

MATERIALS AND METHODS

The study area is South-western Nigeria which consists of Lagos, Oyo, Ogun, Osun, Ondo and Ekiti. It lies between longitude 2°31' and 6°00' East and latitude 6°21' and 8°37' N. It is also known as South west geopolitical zone of Nigeria. It has a total land area of 77,818 km^2 and a population of 27,581,982 (Geohive Infor, 2007).

Three sets of structured questionnaires and personal interview were used to generate data from the marketers of roselle calyx as well as the processors and the consumers of zobo drink. A multistage sampling procedure was adopted to obtain a representative sample of marketers of roselle calyx, producers and consumers of zobo drink in the study area. The first stage of selection was the purposive selection of Lagos, Ibadan and Osogbo from the 6 metropolitan areas that make up the study area. This selection was based on the popularity of zobo in the area and their fair representation of the zone. Lagos, Ibadan and Osogbo metropolis areas are made up of 16, 5 and 2 Local Government Areas (LGAs). The 2nd stage involved the selection of 5 marketers per market in major markets where roselle calyces are sold. This is because preliminary investigation revealed that the sales of roselle calyces are limited to some markets. Thus in Lagos 20 respondents were randomly selected in 4 markets, while questionnaire was administered on 10 respondents in two markets in Ibadan. In Osogbo, 5 respondents were interviewed in one market. This makes a total of 35 marketers. The third stage was the random selection of four producers of zobo drink per LGA in the 3 metropolitan areas studied. Thus, 64, 20 and 8 respondents were interviewed in Lagos, Ibadan and Osogbo, respectively. This makes a total of 92 producers of zobo drink. The fourth stage also involved the random selection of 10 consumers of zobo juice per LGA. This makes 160, 50 and 20 consumers in Lagos, Ibadan and Osogbo, respectively and a total of 230 consumers. The various sampled sizes are as shown in Table 1.

Table 1: Sampling layout

Sample Cities	Marketers of roselle calyx	Producers of zobo juice	Consumers of zobo juice	Total
Lagos	20	64	160	244
Ibadan	10	20	50	80
Osogbo	5	8	20	33
Total	35	92	230	357

Field survey, 2007

Data were analysed using descriptive statistics such as histogram and frequency distribution tables. Method used to prioritize consumers' reasons for taking zobo drink followed the format of International Centre for Research in Agroforestry (ICRAF) as used by Popoola *et al.* (1996). It is given as follows:

$$\text{Mention (\%) of a variable} = \frac{\text{Number of times a variable mentioned}}{\text{Number of interviews conducted}} \quad (1)$$

Two economic tools namely Benefit Cost Ratio (BCR) and Rate of Return on Investment (RRI) were used to measure economic returns on the production of zobo drink from roselle calyx. BCR is the ratio of discounted cost to discounted return. This ratio was obtained by dividing the present worth of return (discounted benefit) with the present worth of cost (discounted cost). For discounting, a discount rate of 18% was used for the analysis. This is because the lending rate of commercial bank as at the time of carrying out this study ranged between 16 and 19%. Mathematically it is expressed as:

$$BCR = \frac{\sum_{t=1}^{t=n} \frac{B_t}{1+r}}{\sum_{t=1}^{t=n} \frac{C_t}{(1+r)^1}} \quad (2)$$

Where,

B_t = Benefit/Return in each year.
C_t = Cost in each year.
r = Discount rate.
t = 1, 2,….., n.
n = Number of years.

The RRI measures the profitability of an investment at a point in time and shows how much could be realized on the money invested. According to Adeyokunnu (1973), it is expressed mathematically as:

$$\frac{TR - TC}{TC} \times \frac{100}{1} \quad (3)$$

TR = PQ
TC = TVC + TFC
TVC = $PX_1 + PX_2 + \ldots . PX_n$
TFC = K

Where,

TR = Total Revenue.
PQ = Product of Price per unit of output and Quantity produced.
PX = Price per unit of production input.
TC = Total Cost.
TVC = Total Variable Cost.
TFC = Total Fixed Cost.
K = Depreciation value of capital.

RESULTS AND DISCUSSION

Descriptive statistics of marketers of roselle calyx: Most of the marketers (80%) of roselle calyx in the study area were retailers, while 20% were wholesalers (Table 2). The wholesalers purchased roselle calyx from the Northern part of Nigeria mostly Kano and Katsina states where the crop is grown. All the wholesalers interviewed are northerner, while the retailers are from different tribes of Nigeria. The reason may be due to language barriers as most farmers and traders in the northern part of the country do not speak English due to lack of formal education. These wholesalers sell in large quantities from one bag and above. A standard bag weighs about 12 kg, while the retailers sell in small quantities with kongo, the Nigeria standard bowl of measuring grains in the market (Plate 2).

Descriptive statistics of producers of zobo drink: At the inception of producing zobo drink, the highest percentage (38.05%) of zobo drink producers started production with investment capital that ranged between ₦201 ($1.65) and ₦400 ($3.28) followed by 34.78%, who started with capital of at least ₦800 ($6.56). Furthermore, 14.13% of the zobo drink producers started production with capital that ranged between ₦401 ($3.28) and ₦800 ($6.56), while ₦13.04% started with capital of ₦200 ($1.64) and below (Table 3). This relatively low capital needed suggests why zobo drink production has been at the cottage level with inadequate precautionary measures and without the certification of National Agency for Food, Drugs Administration and Control (NAFDAC). Generally, used bottles are re-used in bottling zobo drink without sealing the cover. Plate 3 shows some of the various bottles being displayed on a thermocool cooler used in refrigerating the drink as one of the students sips from the bottle.

Table 2: Marketing channels of roselle calyxes

Marketing channel	Frequency	(%)
Wholesalers	7	20
Retailers	28	80
Total	35	100

Field survey, 2007

Table 3: Zobo juice production capital at inception

Capital (₦)	Frequency	(%)
≤200	12	13.04
201-400	35	38.05
401-800	13	14.13
≥800	32	34.78
Total	92	100.00

Field survey, 2007; US$1 = N122 as at June, 2007

The number of zobo juice producers has been on the increase. As shown in Fig. 1, before 1990 only 6% of the respondents were producing zobo drink, from year 2000 and above, the number of producers has increased to 44%. Reasons that could be adduced for such a geometrical increase include the relatively low capital needed for production, the profit level and increase in demand which may be due to prices of other soft drink that have been skyrocketing, increase in population and increase in the awareness of its nutritional and medicinal values, among others.

Plate 2: A retailer measuring roselle calyces for sale with kongo (Nigeria measurement bowl). Source: Field survey, 2007

Plate 3: Various sizes of bottles of zobo drink displayed on a thermocool cooler Field survey, 2007

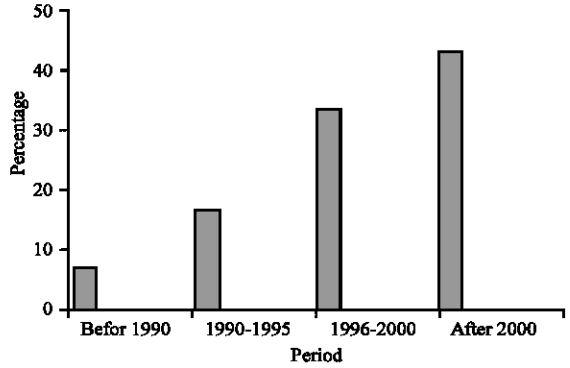

Fig. 1: Period over which zobo juice producers started production

Descriptive statistics of consumers of zobo drink: Zobo drink consumers are fairly distributed across all ages. However, the age range of 20-30 years forming 20.43% constituted the highest consumers followed by age range of 31-40 with 17.39%. Next to these were age above 60 years with 16.52% and age range of 51- 60, 41-50 and below 20 years with 13.92, 13.48 and 13.26%, respectively. (Table 4). Prioritization of consumers' reasons for taking zobo drink showed that taste ranked 1st with 85.22%. This was closely followed by cheapness with 83.48%, while nutritional value, medicinal value and colour ranked 3rd, 4 and 5th as consumers' reasons for taking zobo drink with 75.65, 66.52 and 57.39%, respectively (Table 5). 63.91% of consumers used to buy zobo in the open market due to the fact that it is readily available, while 36.09% claimed to prepare the drink by themselves (Table 4). Reasons given by most of the consumers who prepared it by themselves are hygiene and avoidance of sugar.

With regards to hygiene, some fungi namely *Aspergillus niger*, *Aspergillus flavus*, *Rhizopus oligosporus*, *Penicillium citrinum*, *Mucor* sp., *Saccharomyces cerevisiae* and *Candida krusei*; as well as bacteria, namely *Bacillus subtilis*, *Pseudomonas* sp., *Staphylococcus aureus*, *Streptococcus faecalis*, *Escherichia coli*, *Proteus mirabilis*, *Serratia* sp., *Lactobacillus brevis* and *Lactobacillus fermentum* had been identified in commercially sold zobo (retail) juice in some parts of Southwestern Nigeria. These microorganisms were linked with the presence of feacal contamination most probably from the water used for the production of the juice and inadequate precautionary measures during processing, production and packaging (Edema *et al*., 2001; Omemu *et al*., 2006). Furthermore, the use of the fruits of *Thaumatococcus danielli* (miraculous berry) which have medicinal values and have been found to be used locally as sweeteners (Arowosoge and Popoola, 2006) could be used as substitute to sugar and thus be an added advantage for consumers who would not want sugar.

Table 4: Descriptive statistics of consumers of zobo drink

Variables	Categories	Frequency	(%)
(a) Age (Years)			
	Below 20	42	13.26
	20-30	47	20.43
	31- 40	40	17.39
	41- 50	31	13.48
	51- 60	32	13.92
	Above 60	38	16.52
	Total	230	100
(b) Source of zobo juice			
	Market	147	63.91
	Self preparation	83	36.09
	Total	230	100
(c) Occupation of Zobo juice buyer from the market.	Students	102	69.39
	Workers	45	30.61
	Total	147	100

Field survey, 2007

Table 5: Prioritization of consumers' reasons for taking zobo drink

Reasons	No of time mentioned	Mention (%)	Rank
Taste	196 (230)	85.22	1st
Cheapness	192 (230)	83.48	2nd
Nutritional value	174 (230)	75.65	3rd
Medicinal value	153 (230)	66.52	4th
Colour	132 (230)	57.39	5th

Figures in brackets are the numbers of interviews conducted; Field survey, 2007

Table 6: Cost of production (₦)

	Year			
Item	2004	2005	2006	2007
Roselle calyx	1162161.60	1783821.65	2701268.46	3935105.70
Energy	1068468.00	1282732.36	1971043.21	2838425.47
Labour	3905404.00	4879027.00	7247592.00	11864407.00
Container	581080.80	597715.23	744217.12	805398.30
Water	494271.05	605284.87	912857.45	1272243.35
Market stall	389108.75	504691.47	621547.68	747926.08
Ice block	449214.23	621043.29	1184613.06	1520765.30
Sweetener	326118.24	503745.74	674374.91	982565.76
Flavour/Spices	292514.48	481379.03	685791.59	819548.62
Transportation	347520.40	582014.50	1247264.60	2262453.00
Total	9015861.55	11841455.14	17990570.08	27048838.58

US$1 = ₦122 as at June, 2007

Table 7: Price range and average price of roselle calyx in naira per kg

Year	Price range (₦)	Average price (₦)
2004	420-570	480
2005	630-720	660
2006	780-840	820
2007	960-1080	970

Field survey, 2007; US$1 = ₦122 as at June, 2007

Table 8: Estimation of revenue

	Year			
Item	2004	2005	2006	2007
Roselle calyx (kg)	2421.17	2702.76	3294.23	4056.81
Roselle calyx drink (Litre)	581080.8	648662.4	790615.2	973634.4
Average selling price per litre(₦)	25	30	40	50
Revenue (₦)	14527020	19459872	31624608	48681720

US$1 = ₦122 as at June, 2007

Table 9: Cost benefit analysis

Year	Discount rate	Cost (₦)	Revenue (₦)	Benefit (₦)	Discounted revenue	Discounted cost	RRI (%)
2004	0.847	9015861.55	14527020	5511158.45	17151145.22	10644464.64	61.13
2005	0.718	11841455.14	19459872	7618416.86	27102885.79	16492277.35	64.34
2006	0.609	17990570.08	31624608	13634037.92	51928748.77	29541165.98	75.78
2007	0.516	27048838.58	48681720	21632881.42	94344418.60	52420229.81	79.98
					190527198.40	109098137.80	281.23
					BCR	1.75	70.31

Further analysis of zobo drink buyers revealed that 69.39% of the buyers were students while 30.61% were workers (Table 4). Reason for the high percentage obtained for students may be due to the fact that zobo drink was cheaper when compared to other bottled soft drinks. This further confirms the findings of the preliminary survey and that of Popoola *et al*. (2005) that sales of zobo drink were more in schools and campuses than in the open market.

Cost and revenue estimation: The cost components as indicated in Table 6 include: Roselle calyx, energy used for cooking, labour, transportation, containers, water, market stall, ice block, sweetener, flavour/spices and transportation. The quantities of roselle calyx and zobo drink were standardized into kg and litre, respectively for pricing purposes. As revealed during the course of carrying out this study, 1 kg of roselle calyx gives an average of 240 L of zobo drink.

Prices of roselle calyx as presented in Table 7 shows a wide range of prices per annum This wide range according to the marketers of roselle calyx is because price is generally low during harvesting when it is abundant and after harvesting as the roselle calyx becomes scarce price increases. The mean annual price per kg ranged between ₦480 ($3.93) and ₦970 ($7.95) in increasing order from year 2004-2007 (Table 7). In the same vein the mean selling price of zobo drink per litre ranged between ₦25 ($0.20) and ₦50 ($0.41) (Table 8) in increase for the 4 years of study (Tables 8). This increment could be due to yearly inflation rates which had direct effects on the cost of production and increase in demand.

Profitability analysis: The result of the BCR and the RRI used to evaluate the profit generated on zobo drink is as presented in Table 9. The table shows that at the actual cost of production of 18% discount rate, the BCR was 1.75. This is greater than 1 and thus adjudged profitable (Adegeye and Dittoh, 1985). The RRI ranged from 61.13% to 79.98% in increasing order from year 2004 to 2007. The mean RRI was 70.31%. This suggests that the venture is profitable since it is greater than the bank interest rate of 18%.

CONCLUSION

Investment on zobo drink production is profitable based on the magnitude of the BCR and the RRI. Moreso, that the RRI has been on the increase from 2004-2007 in this study. The findings of the study revealed that the demand for zobo drink would increase if the level of hygiene in its preparation is vouched for. This suggests the need for production and packaging with appropriate preservation under the approval of NAFDAC. Hence, the need to increase the capital base of zobo drink production above its present cottage level. Increasing the capital base will further bring about improved technology in its production, packaging and preservation under a more hygienic condition. This venture could be financed by the Small and Medium Enterprises Equity Investment Scheme (SMEEIS) under the umbrella of Small and Medium Enterprises Development Agency of Nigeria (SMEDAN). Furthermore, increasing the awareness of the nutritional and medicinal value of zobo drink will add to its market value.

REFERENCES

Adegeye, A.J. and J.S. Dittoh, 1985. Essentials of Agricultural Economics. 1t Edn. Impact publishers Nig. Ltd. Ibadan, pp: 164-182. ISBN: 978-2386-00-6.

Adeyokunnu, T.O., 1973. Marketing margin for rice in Egba division, Western State of Nigeria. Bull. Rural Econ. Sociol., 8 (2): 2-4.

Arowosoge, O.G.E. and L. Popoola, 2006. Economic analysis of *Thaumatococcus danielli* (miraculous berry) in Ekiti State, Nigeria. J. Food, Agric. Environ., 4 (1): 264-269. ISSN: 1459-0255. http://www.isfae.org/scientficjournal/2006/issue1/contents.pdf.

Backeit, M.H., E.A. El Zubeir and S.K. Jubarah, 1994. The nutritional value of Roselle seed meal in laying hen diets. J. Sci. Food Agric., 65: 199-200. http://www.grande.nal.usda.gov/ibids/index.php?mode2=detail&origin=ibids_references&therow=440249.

Edema, M.O., A.M. Omemu and O.M. Fapetu, 2001. Microbiology and physico-chemical analysis of different sources of drinking water in Abeokuta, Nigeria. Nig. J. Microbiol., 15 (1): 57-61.

Geohive Infor, 2007. General information on Nigeria population and area. National Bureau of Statistics, Nigeria. http://www.geohive.com/cntry/nigeria.aspx.

Gibbon, D. and A. Pain, 1995. Crops of the drier regions of the tropics. J. Food Sci., 2: 61-63. http://www.amazon.ca/Crops-Drier-Regions-Tropics-Gibbon/dp/058277506X.

Kalyane, V.L., 1986. Nutritional quality of Hibiscus seed protein. Int. J. Trop. Agric., 4 (3): 280-282.

Mohammed, T.A. and A.A. Idris, 1991. Nutritive value of roselle seed (*Hibiscus sabdariffa*) meal for broiler chicks. Wor. Rev. Anim. Prod., (26): 59-62. http://www.grande.nal.usda.gov/ibids/index.php?mode2=detail&origin=ibids_references&therow=67454.

Mukhtar, A.M., 2007. The Effect of Feeding Roselle (*Hibiscus sabdariffa*) Seed on Broiler Chick's Performance. J. Anim. Vet. Sci., 2: 21-23. http://www.insinet.net/rjavs/2007/21-23.pdf.

Omemu, A.M., M.O. Edema, A.O. Atayese and A.O. Obadina, 2006. A survey of the microflora of *Hibiscus sabdariffa* (Roselle) and the resulting Zobo juice. Afr. J. Biotech., 5 (3): 254-259. http://www.academicjournals.org/AJB/PDF/pdf2006/2Feb/Omemu%20et%20al.pdf.

Popoola, L., A.O. Adeola, I.O.O. Aiyelaagbe and D.O. Ladipo, 1996. Farmers' priority multipupose tree and shrub species for Agro-forestry in the humid lowlands of Nigeria. J. Trop. For. Res., 12: 16-31.

Popoola, L., O.O. Faboye and O.I. Ajewole, 2005. Marketing and Utilization of *Hibiscus sabdariffa* in Ibadan, Nigeria. Proceeding of the 30th Annual Conference of Forestry Association of Nigeria, Held at Kaduna, Nigeria Between 7 and 11th November, pp: 256-263.

Qi, Y., K.L. Chin, F. Malekian, M. Berhane and J. Gager, 2005. Biological characteristics, Nutritional and Medicinal value of *Hibiscus sabdariffa*. Circular paper on Urban Forestry, Natural Resources and Environment. No. 604. http://www.suagcenter.com/documents/Extension%20Circular%20-%20hibiscus.pdf.

Rao, P.U., 1996. Nutrient composition and biological evaluation of mesta (*Hibiscus sabdariffa*) seeds. Plant Foods Hum. Nurt., 49 (1): 27-34. www.ncbi.nlm.nih.gov/pubmed/9139301.

Rice, R.P., I.W. Rice and H.D. Tindall, 1990. Fruits and Vegetables Production in Warm Climates. First Edition. Macmillan Press Limited, London, U.K., pp: 40-65. ISBN: 0-333-46850-3. www4.fao.org/.../faobib/mona&lang=eng&format_name=EFMON.

Schippers, R.R., 2000. African indigenous vegetables. An overview of the cultivated species. Natural Resources Institute. Publisher, Chatham, U.K. ISBN: 0-85954-515-6. http://www.infoagrar.ch/.../ba427baf0037beecc12569e00039300b/ebdeb6c72d6e692ac1256a4e002c7de7?OpenDocument.