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Economic Evaluation of Soy- Chocolate Beverage Drink

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Abstract Soy- chocolate beverage drink is a nutritional health drink was obtained from soya bean and cocoa powder. The study was conducted to evaluate the economic analyses of soy- chocolate beverage drink production with a view to establishing the profitability of the investment. The method used in this study involved an investment decision model comprising Net present value (NPV), Benefit Cost Ratio (BCR) and Internal Rate of Return (IRR). The results indicates an NPV of ₦480, 535 discounted at 21%, BCR of 2.5 and IRR of 21.33% These positive values are indices to the fact that investment of soya chocolate beverage is a profitable venture and worthwhile.

Keywords Soy-Chocolate, Investment Decisions, Benefit Cost Ratio, Net Present Value

1. Introduction

The economic importance of cocoa to the economic development of the Nigerian economy has received much attention over the years as much work has been published in these areas (Olayemi, 1973; Folayan et al, 2006).Cocoa production and processing has made immense contribution to the foreign exchange earnings of which it has been reported that no single agricultural export commodity has earned more than cocoa, with respect to employment, both directly (farmers on cocoa production) and indirectly (cocoa manufacturing industries). Cocoa sub sector generates employment opportunity to quite a number of the Nigerian populace accounting to a reduction of unemployment. In addition, it is an important source of raw materials, as well as revenue to government of cocoa producing states in Nigeria.

Cocoa is known to be of immense importance nutritionally and medically particularly when processed into chocolate and cocoa powder. There has been increasing scientific interest in the potential health benefits associated with regular cocoa consumption. This interest stems from data gathered from both epidemiological investigations and human dietary intervention trials (Kwik-Uribe et al, 2008).When combined with other agricultural product like soybean which is known to be very rich in protein, it has been found to boost nutritional deficient a major deficient and expensive component in most Nigerian diet (Root et al, 1987).

Over seventy five percent (75%) of cocoa produced in Nigeria is been exported on yearly bases leaving about twenty five percent 25% for local processing and consumption. This implies that more cocoa can be made available for consumption thereby enhancing the health status of the vast populace and the economy of the country.

Chocolate a product of the cocoa industry is known to be very nutritious and a good source of folic acid, copper and magnesium and more importantly, it is rich in polyphenols and flavonoids which are good antioxidant for the body. Cocoa is believed to surpass both green tea and garlic as a protective antioxidant food; it is also known to contain theobomine, stimulating substances due to its structural similarities to caffeine (Guy, 1992). Generally, cocoa product is believed to have a restorative effect, energy producing, and tonics effect on the body.

Soya bean, an agricultural product rich in protein and amino acid especially lysine, tryptophan and threonine are considered to be a premier crop to solving the malnutrition problems in Nigeria if its nutritive potential are utilized (Omueti et al, 2000). It is known to reduce the risk of cancer and postmenopausal symptoms. Soya bean is also known to contain plant sterols similar in structure to cholesterol and have been found to reduce low density cholesterol.

In view of the complimentary nature of the nutritional value of these agricultural products cocoa and soya bean, it became imperative to develop an acceptable Soy-chocolate beverage drink that is highly nutritious so as to enhance the nutritive value of the people. This was successfully developed in Cocoa Research Institute of Nigeria. (Jayeola and Omueti, 2011). It is important to evaluate the economics involved in the production of soya chocolate drink in order to determine its profitability which will encourage investor in its production.

The utilization of the two products, besides improving the nutritional standard of the people, will help in improving on the domestic demand for cocoa and Soya bean in Nigeria as well as generating economic activities and employment and

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adding value to the crops.

In the economic evaluation of Soya chocolate drinks, the key questions which need to be addressed are what is the economic viability of Soya chocolate product? What is the economic net present value or benefit cost ratio as well as the internal rate of return on investment in the production of Soya chocolate beverage?

2. Methodology

Preparation of soy-chocolate beverage

Seed of soybeans (variety TGX –923-2e) were obtained from the store of the Institute of Agricultural Research and Training. Cocoa beans were obtained from the Cocoa Research Institute of Nigeria. Cocoa powder for this experiment was obtained from Cocoa Industries Limited Ikeja, Lagos. Cocoa beans were roasted at 120℃. The shell was removed to expose the nib; the cocoa nibs and cocoa powder were used for this experiment.

The method of Omueti et al. (2000) was employed with little modification. The soybean seeds were soaked overnight in a ratio of 1:5 beans to water. The first method involved soaking of the beans overnight and blanching for 30 min. It was then drained and cocoa nib were added and milled in a locally fabricated attrition mill. The different percentage of the mixtures ranging between 5, 10, 15 and 20% roasted cocoa nib addition and labeled A, B, C and D. The second method involved mixing the cocoa powder with blanched and ground soybean paste (70% total solids of paste), following the same ratio and labelled E, F, G and H. The mixtures diluted with three parts of water and sieved with fine muslin cloth. The filtrate was allowed to boil for 10 min after it has reached its boiling point, and then sweetened with 10% sugar and cooled. The soy -choco beverage can be served as refreshment or food compliments.

Proximate analysis

Proximate composition was determined as described in AOAC (1990), WPACDS740 standard pH meter with a glass electrode was used for measuring the pH of the soychoco beverage. 10 ml of the beverages was used for the pH measurement. Moisture content was determined by drying 10 g of the beverage at 105℃ in a force draught oven to constant weight. The total nitrogen content of the beverage was determined by standard Kjeldahl procedure and the protein content was obtained by multiplying the total nitrogen by the factor 6.25. The fat content was determined by using Tecators Soxhlet HT2, 1045 extraction unit. Minerals such as calcium, sodium, iron, phosphorus, magnesium and potassium were determined using absorption spectrophotometer (Perkin Elmer, model 306). Vitamins like vitamin A, B, C and D content were determined using the methods of Pearson (1976).

Economic Analyses

In carrying out the study on the economic evaluation of Soy- chocolate beverage drink, data on variable and fixed cost as well as expected revenues were collected as shown in table 1. From this cost items, a stream of discounted cost and benefit were calculated base on the opportunities cost of capital or discount rate of 21% and 32%.

The results were subjected to investment decision model such as net present value (NPV) Benefit cost Ratio (BCR) and internal rate of returns (IRR) on investment.

The Investment Decision Model.

Net present value (NPV)

The net present value is an important tool in making decision by an investor investing in Soy- chocolate beverage. In arriving at the NPV, the stream of discounted cost and benefit were used to obtain the net income from each year.

Following Gotsch and Burger (2001) model, if we define NI as the net income (or benefit) from one year of production of Soy- chocolate as expected in year t, then the net present value of the expected net income from production of circle will amount to:

$$NPV_{I,t.} = \sum_{i=1}^{I} \frac{INC_{i,t}}{(1+r)^i}$$

$INC_{i,t\_}$ is the expected net income of production in year t given as:

$$INCt = \sum_{i=I}^{I} (REVi,t - TCi,t)$$

Where REVi,t is the expected revenue from the Soy-chocolate production in year t

TC is the total cost of production in year t

R is the discount rate or the opportunity cost of capital and t is the time period.

In arriving at a conclusion, the criterion selection is to accept the investment of Soy- chocolate production as technically and economically visible if the net present value is positive. However if NPV is negative it implies that the stream of discounted income or benefit (REVi,t) is less than the discounted cost ($TC_{i,t}$) . The implication of this is that the revenues are insufficient to allow for the recovery of the investment.

Benefit Cost Ratio (BCR)

The investment Decision model also utilizes the Benefit cost Return (BCR). It is given as the ratio of the sum of discounted benefit to the sun of discounted cost. Thus for a cycle of I year duration, the benefit cost ratio can be represented by the formula:

$$BCR_{i,t} = \frac{\sum_{I=0}^{I} DREV_{i,t}}{DTC_{i,t}}$$

Where $DREV_{i,t}$ is discounted revenue from soy- chocolate production in year t

$DTC_{i,t}$ is the discounted total cost of soy- chocolate production in year t.

According to Gittinger, 1989, the decision rule is that for an investment to be economically viable, the ratio must be greater than unity. In arriving at the investment analysis, the following basic assumptions were made:

Fixed cost remains constant for 5years, variable cost in-

creases by 15% yearly, output increases by 5% yearly, selling prices also increase by 5% on yearly basis, opportunity cost of capital is 21%

Contingency is taken to be 5%, 500 bottles is produced per cycle and 12 cycle per year hence 6,000 bottles per year @ #50 per bottle.

3. Results and Discussion

Table 1 showed the results of the proximate analyses of the cocoa fortified soy-chocolate beverage. From the result, there is an indication that pH ranges from 6.4 to 6.6. These ranges of pH are allowed for such a beverage drink. The percentage moisture content of soy beverage fortified with cocoa beans is lower than those fortified with cocoa powder this could be as a result of the presence of higher percentage of fat in cocoa beans than that of cocoa powder and also the cocoa powder has lower moisture content when compared with the whole beans. The protein content of the beverage has greatly increased from 2.31% of soy milk to 10.36% for 20% cocoa nib inclusion. A cocoa beverage produced using 20% cocoa nib has the highest percentage of fat with 8.52% while 5, 10 and 15% cocoa powder inclusion are 7.21, 7.52 and 8.11% respectively.

Table 2 shows the mineral element composition of soy-choco. It can be observed the product has mineral elements which are required by the human body. For example, Ca which is a required element for bone formation especially in children is readily available in this product which is as a result of the fortification.

Table 3 shows the investment profile of the production of soya chocolate beverage using cocoa powder and soya bean. From the table, the production cost was calculated to be ₦ 108,234 with fixed cost of ₦17, 000 held constant for 5 years, variable cost of ₦103, 080 and contingency #5,154 in the first year. A total of 6,000 bottles of soya chocolate beverages were produced in a year from 12 cycles of 500 bottles per cycle. The production process involved one skilled and three unskilled laborers. The results also shows that a bottle (350 ml) of soya chocolate beverage would sell for N50 to give a revenue of ₦191,766 in the first year and 5% yearly increase in the subsequent four years. The BCR calculated was found to be 2.5 while NPV discounted at 21% and 32% were ₦480, 535 and ₦ 1,134774 respectively. The internal rate of returns was found to be 21.33%. The Three investment parameters used via- a- vis NPV, BCR and IRR are all positive. Hence, it can be concluded that the soya chocolate production is economically viable and a worthwhile investment.

Table 1. Proximate analyses of soy- chocolate beverage

Samples	pH	Moisture content (%)	Protein (%)	Fat (%)	Carbohydrate (%)	Ash (%)	TS (%)
A	6.50	89.01	9.01	7.21	10.31	1.03	13.12
B	6.40	87.12	9.21	7.52	10.62	1.10	13.62
C	6.35	86.54	9.92	8.11	11.41	1.12	14.24
D	6.42	86.20	10.36	8.52	11.63	1.20	14.36
E	6.53	90.36	9.66	4.21	10.48	1.11	14.32
F	6.40	90.11	9.86	4.63	10.72	1.29	14.63
G	6.62	89.65	10.34	5.03	10.91	1.16	14.72
H	6.51	88.23	10.02	5.62	11.52	1.20	15.01
I	6.84	90.04	2.31	0.63	6.31	0.04	12.23
J	6.83	4.52	16.94	11.67	16.27	6.23	18.46

Table 2. Mineral Elements of soy-chocolate beverage

Element (mg/100g)	A	B	C	D	E	F	G	H	I	J
Ca	2.81	2.93	3.11	3.23	2.95	3.26	3.26	3.81	4.90	0.15
Na	0.89	0.83	0.84	0.90	0.90	0.86	1.02	1.14	1.29	0.01
Fe	0.23	0.26	1.03	1.03	0.36	0.42	1.02	1.01	1.03	2.50
P	9.02	9.34	10.04	11.42	9.42	10.32	11.21	12.01	12.91	0.70
K	89.36	90.35	90.11	92.26	90.17	90.62	91.33	92.30	93.10	2.01
Mg	24.42	24.31	22.36	20.02	20.21	18.22	16.33	14.81	0.23	80.0

Table 3. Investment profile of Soy- chocolate beverage

Year	Cost	Benefit	I/ Benefit	DF(21%)	DF (32%)	DC	DB	NPV (21%)	NPV (32%)
0	17,000		(17,000)	0.826	0.758	(14042)		(14,042)	(12,886)
1	108,234	300,000	191,766	0.683	0.574	73,923	204,900	130,976	110,073
2	129,881	330,750	200,869	0.564	0.435	73,252	186,543	113290	873,780
3	155,857	364,651	208,794	0.467	0.329	72,785	170,292	97,507	68,693
4	187,029	402,034	215,005	0.386	0.250	72,193	155,185	82,991	53,751
5	224,434.8	443,287	218,857	0.319	0.189	71,512	141,409	69,813	413,634
					Total	**349,623**	**858,329**	**480,535**	**1,134,774**

BCR = 2.5
IRR = 21.33%
NPV 480,535

4. Conclusions

The study on the economic viability of the production of soy- chocolate revealed that it is a profitable investment and worth embarking upon by would- be investor.

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