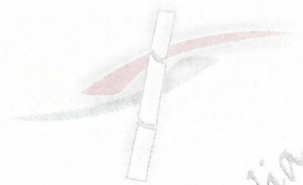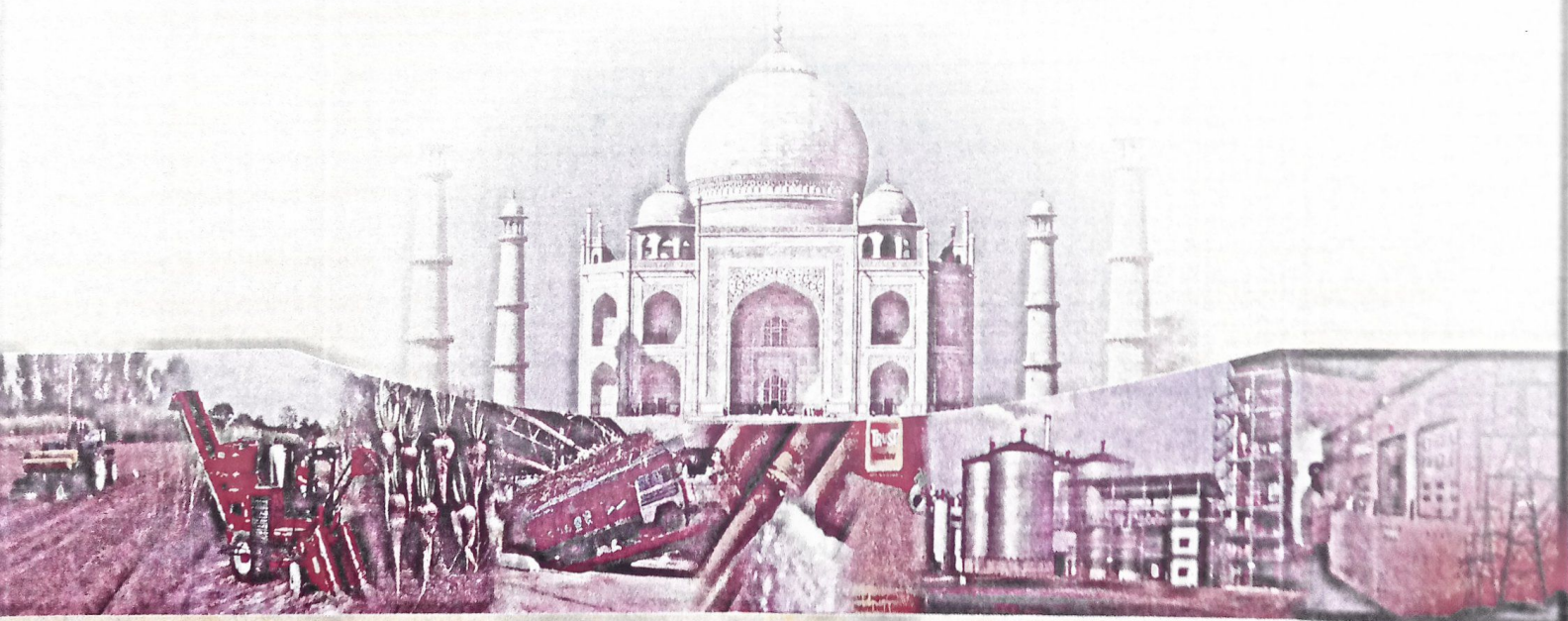# Balancing Sugar and Energy Production in Developing Countries: Sustainable Technologies and Marketing Strategies

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FINANCIAL FEASIBILITY STUDY OF BROWN SUGAR MINI-PROCESSING FIRMS IN NIGERIA

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Abstract

Nigeria's sugar industry dates back to the mid-sixties, but is still in its infancy. Attempts at large scale sugar production collapsed in the last 20th and early 21st centuries in the country. Novel technologies at the National Cereals Research Institute (NCRI), Badeggi gave birth to the cottage level brown sugar processing plant which has been established in several sugar cane growing communities in Nigeria and the present study was set up to study its financial feasibility in four states of Nigeria: Anambra, Jigawa, Kaduna and Niger as well as the Federal Capital Territory, (FCT), Abuja. One hundred and sixty-three (163) sugar cane farmers and seventy (70) sugar traders were selected using random sampling technique, while a purposive sampling technique was used in selecting the five Brown Sugar Mini Processing Firms or Processors. Primary and secondary data were also collected for the study. Analytical tools used were descriptive statistics, undiscounted cash flow measures, discounted cash flow measures and sensitivity analysis test models. The results established that; (i) The average simple rate of return of the brown sugar mini-processing firm was 64%, which was higher than the 25% interest rate prevailing in the capital market. (ii). The Pay-Back Period (PBP) for the investment was three years. (iii). the Benefit-Cost Ratio (BCR) of 3.2 was obtained at a suitable discount rate of 25%, which was quite greater than 1. (iv), the average Net Present Value (NPV) at interest rate of 25% was ₦54,005,492.58. (v); the Internal Rate of Return (IRR) was positive and even greater than 50%, which made the project worthwhile and financially viable and (xi) the sensitivity analysis test showed that both 10% and 20% either in increase in cost of processing or in decline in prices of output had no negative impact on the project. Every component of the financial analysis investigated in this study indicated that the project was feasible, profitable and viable.

Key words: Profitable project, financial viability, discounted cash flow, undiscounted cash flow, Brown sugar processing mini firms, Nigeria.

INTRODUCTION

More than 100 countries produce sugar, 78% of which is made from sugar cane grown primarily in the tropical and sub-tropical zones of the southern hemisphere, and the balance of 22% from sugar beet which is grown mainly in the temperate zones of the northern hemisphere. Generally, the costs of producing sugar from sugar cane are lower than those of processing sugar beets. In the Year 2008, statistics show that 69% of the world's sugar was consumed in the countries of origin, while the 31% was traded in world markets (ISO 2008).

The first sugar production in Nigeria was in 1964/1965, with the commissioning of the the Nigerian Sugar Company, (NISUCO), at Bacita, in 1962 (Oguntoyinbo 1987). This was followed by the establishment of the Savannah Sugar Company (SSC) at Numan in1977 (NSDC 2003). The two sugar plants had a combined installed capacity of 105,000 tonnes/annum or about 10% of the country's annual requirement. Production however, oscillated around 50,000 tonnes / annum, between 1978 and 1998, making Nigerian sugar production slightly less than 5 % of its annual requirement. From the year 1999 to 2006, the production of sugar has been on the decline, reaching an all time low value of less than 2% (FOS, 1990-2005). Thus the wide gap between sugar requirement and production is usually filled through massive importation with huge amount of foreign exchange (NSDC 2007).

Development of sugar processing technology at intermediate or rural levels with indigenous technology had reached a tertiary stage in several other third-worlds countries like India, Cuba, Brazil and Puerto-Rico (Raphael, 2004). In these countries, enormous socio-economic benefits have been reaped, such as generating employment, increasing incomes of the citizenry and raising the living standard of the rural dwellers, thus justifying their existence and improvement (Baron 1975; Garg 2007). The dismal performance of the large sugar plants in Bacita and Numan made the country to go into research on indigenous brown sugar Mini- processing machinery with the aim of decreasing sugar importations into Nigeria (NCRI 1998). The broad objective of this work is to study financial feasibility of five brown Sugar Mini- processing firms in Nigeria.

MATERIAL AND METHODS

Study Areas

The study was carried out in five villages in five states of Nigeria – Abuja-Federal Capital Territory (FCT)
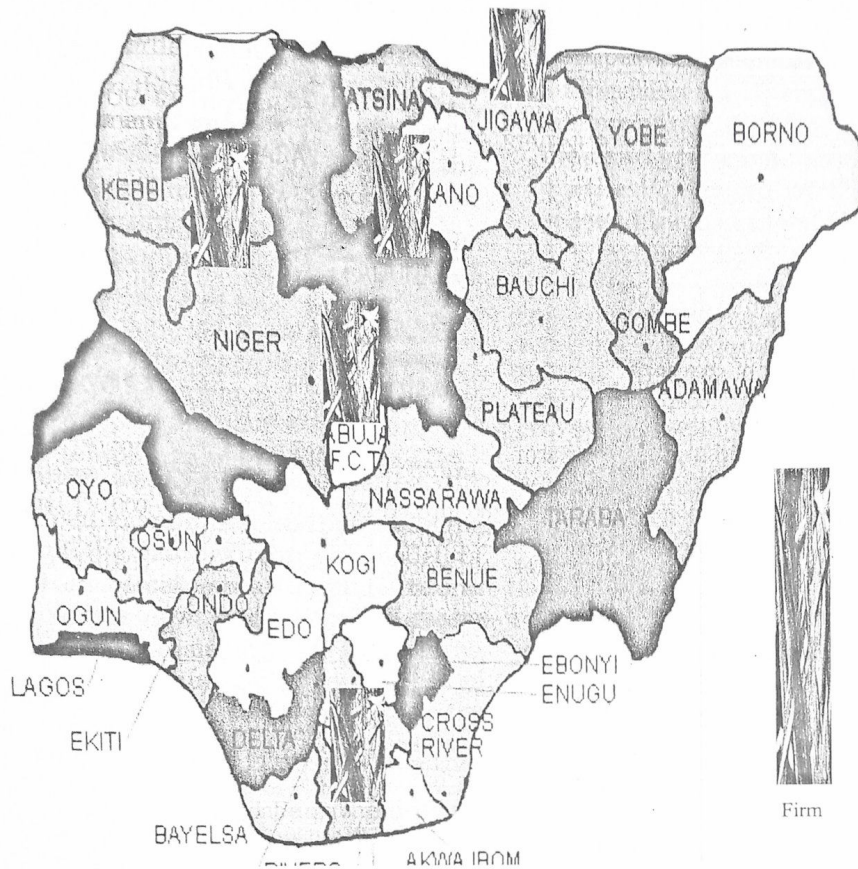
Fig. 1. Map of Nigeria Showing the States where Brown Sugar Firms were Located

Anambra, Jigawa, Kaduna and Niger States. Fig. 1 shows the states where the brown sugar mini-processing firms were located, with their capitals indicated by dots.

Sampling Techniques

A reconnaissance survey, which is useful to obtain a more detailed picture of the project areas, was undertaken. During the survey, technical and non-technical data were collected from the State Ministries of Agriculture/ ADPS of the four States and FCT, and also from the farmers and the brown sugar processors. A total of five Hundred and forty-five (545) sugar cane farmers were identified (95 from Baizare in Kaduna State, 144 from Sara in Jigawa State, 120 from Konar-Mada in FCT Abuja, 130 from Gbajigi in Niger State and 56 from Omor in Anambra State) and five (5) brown sugar Mini-Processing firms located at; Baizare village – Zaria in Kaduna State, Sara in Jigawa State, Konar-Mada in FCT Abuja, Gbajigi in Niger and Omor village in Anambra state were identified as population size or sample frame. For this study, Thirty percent (30%) of the identified sample frame was used as sample size. **Simple random sampling method** was applied in selecting the 163 sugar cane farmers across the locations (28 from Bazaire, 43 from Sara, 36 from Konar-Mada, 39 from Gbajigi and 17 from Omor).

A purposive sampling technique was used for the 5 brown sugar mini-processing firms selected. Here, the investigator exercised his judgement in the choice and includes those items in the sample which were thought to be the most typical of the universe with regard to the characteristics under study.

Methods of Data Collection

The study relied on both primary and secondary data collected in order to have enough information to achieve the objectives. Primary data were collected using a set of survey questionnaires administered on 163 sugar cane farmers across the locations on:-

- the availability of sugar cane cultivable land and farm sizes under sugar cane cultivation

- yield of sugarcane per hectare and,

- on total farm size put into sugar cane production within the brown sugar cottage firm sited areas.

Similarly sets of questionnaires were administered on brown sugar processors on:-

- the general cost of the plant

- building and installment/test running

- quantity of raw materials (other inputs) and their cost
- Prices of the expected product and,
- Staff requirement.

Secondary data were obtained from The Ministry of Agriculture and Rural Development / Agricultural Development Projects (ADPs) in the five states/FCT, research reports, libraries, National Sugar Development Council (NSDC) Abuja, National Bureau of Statistics Office-Abuja, Bacita Sugar Company, Savannah Sugar Company, Numan, journals, Federal Ministry of Agriculture, internets and other documents that were relevant to the study

Analytical Techniques Used

The analytical techniques used in this study include; (1) descriptive statistics, (2) Undiscounted, (3) discounted cash flow Measures and (4) Sensitivity analysis test.

Descriptive statistics

Descriptive statistics used include means, percentage, variance and standard deviation.

Undiscounted Cash flow measures.

Simple Rate of Return

$$SRR = \frac{P}{C} \times 100 \qquad (1)$$

Where : SRR : Simple rate of return on total investment; P: The net profit in a normal year after making provisions for depreciation, interest charges and taxes; C: The total investment cost, comprising equity and loans

Pay- Back-Period (PBP)

$$Pay - Back - Period \ (PBP) = \frac{The \ Costs \ of \ Project \ / \ initial \ Investment}{Annual \ Cash \ Inflows} \quad 2$$

It is also easily applied in spreadsheets.

Discounted Cash flows measures

Discounted cash flow measures are however, the most accepted criteria of investment analysis (Gittinger 1994). These include; (i) Benefit-Cost Ratio BCR), (ii) the Net Present Value (NPV) and (iii) the Internal Rate of Return (IRR).

Benefit - Cost Ratio

$$BCR = \frac{\sum_{t=1}^{t=n} \frac{B_t}{(1+i)^t}}{\sum_{t=1}^{t=n} \frac{C_t}{(1+i)^t}} \qquad \text{Equation} \quad (3)$$

Where, B_t: Benefit each year; Ct: Cost in each year; T:Time period in years; I: Interest rate or the discount rate which is assured to remain constant over the relevant Period under reviewed.

The Net Present Value (NPV)

$$NPV = B_0 - C_0 + \frac{B_1 - C_1}{(1+r)} + \frac{B_2 - C_2}{(1+r)^2} + ... + \frac{B_t - C_t}{(1+r)^t} + ... + \frac{B_n - C_n}{(1+r)^n}$$

$$= \sum_{t=0}^{n} \frac{B_t - C_t}{(1+r)^t} \qquad \text{Equation (4)}$$

Where: B_t: The benefits in year t; C_t = The costs in year t; r: The discount rate, and n = is the horizon year.

$\frac{1}{(1+r)^t}$ is called the discount factor in Year t.

Note that if Present Value of Benefits (PVB) is the sum of the discounted benefit stream, $\sum_{t=0}^{n} \frac{B_t}{(1+r)^t}$, and Present Value of Costs (PVC) is the sum of the discounted cost stream, $\sum_{t=0}^{n} \frac{C_t}{(1+r)^t}$,

then NPV = PVB – PVC.

$$NPV = \sum_{t=1}^{n} \frac{B_t}{(1+r)^t} - \sum_{t=1}^{n} \frac{C_t}{(1+r)^t} = \sum_{t=1}^{n} \frac{(B_t - C_t)}{(1+r)^t}$$

Where: B_t: Cash inflow in period t; C_t : Cash outflow in period t; r: Discount factor corresponding to the cost of capital'.

The NPV can be calculated using spreadsheet software such as Microsoft Excel, most of which conveniently have an NPV function built-in.

The Internal Rate Return (IRR)

$$IRR = B_0 - C_0 + \frac{B_1 - C_1}{(1+IRR)} + \frac{B_2 - C_2}{(1+IRR)^2} + ... + \frac{B_t - C_t}{(1+IRR)^t} + ... + \frac{B_n - C_n}{(1+IRR)^n}$$

$$OR \ IRR = 0 \ \sum_{t=0}^{n} \frac{B_t - C_t}{(1+r)^t} = 0 \ or \ IRR = NPV = 0 \qquad (5)$$

Where: B_t : Net return of period 't'; C_t: Total estimated cost of capital items and operation costs; n: Number of years; t: Time periods in years (where t = 1, 2, n).

This is the terminal end of the life span of the investment

Criteria for acceptability: NPV > 0 or IRR > the discount rate, r

This can be solved by a search procedure, which is available in most spreadsheet packages such as Microsoft Excel

1. Project Establishment Costs across the Five Sites of The Brown Sugar – Mini Processing Firms

Activities	Omor-Anambra State (N)	Konar-Mada FCT-Abuja (N)	Zaria, Kaduna State (N)	Sara, Jigawa State (N)	Gbajigi-Bida, Niger State (N)	Pooled Data Cost (N)
A. Land, building and External works	2,150,000	1,650,000	1,650,000	1,650,000	1,650,000	1,750,000
Machinery and Equipments	3,614,000	3,614,000	3,614,000	3,614,000	3,614,000	3,614,000
Pick-up Van	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000
Stand-by-Generator	4,500,000	4,500,000	4,500,000	4,500,000	4,500,000	4,500,000
Installation, Commissioning/ Training	250,000	120,000	120,000	120,000	120,000	120,000
Pre-investment	150,000	100,000	100,000	100,000	100,000	100,000
Contingency (5%)	608,200	574,200	574,200	574,200	574,200	579,200
Sub-Total	12,772,200	12,058,200	12,058,200	12,058,200	12,058,200	12,163,200
B. Personnel Wages and Allowances						
Total staff strength	13	13	13	13	13	13
1No. Factory manager/supervisor (20,000 X 12) =	300,000	240,000	240,000	240,000	240,000	252,000
1No. Accounts/Sales clerk (7,000X12) =	180,000	84,000	84,000	84,000	84,000	103,200
2 Nos. Mechanical/ Electrical Operators (6,000 x2x12)	240,000	144,000	144,000	144,000	144,000	163,200
2Nos. Security guards (5,000X2X12 months	168,000	120,000	120,000	120,000	120,000	129,600
1No. Messenger/Cleaner (5,000x12 months)	84,000	60,000	60,000	60,000	60,000	64,800
6 Nos. casual Workers (lump sum for 5 months (6 X5,400X5)	210,000	162,000	162,000	162,000	162,000	171,600
Sub-total	1,182,000	810,000	810,000	810,000	810,000	884,400
C. Utilities and Maintenance						
Electricity -	108,000	90,000	90,000	90,000	90,000	93,600
Water -	108,000	36,000	36,000	36,000	36,000	50,400
Fuel -	504,000	504,000	504,000	504,000	504,000	504,000
Sub-total	720,000	630,000	630,000	630,000	630,000	648,000
D. Raw and Packaging materials						
Sugarcane (10 tonnes X 150days x N3,000/tonne	6,000,000.00	4,500,000	4,500,000	4,500,000	4,500,000	4,800,000
polythene packages and plastic drums –lump sum	200,000	200,000	200,000	200,000	200,000	200,000
Labelling (logo printing in packages- lump sum	150,000	150,000	150,000	150,000	150,000	150,000
Firewood, okra, etc	100,000	100,000	100,000	100,000	100,000	100,000
Sub-total	6,450,000	4,950,000	4,950,000	4,950,000	4,950,000	5,250,000
E. Miscellaneous Expenses	100,000	100,000	100,000	100,000	100,000	100,000
F. Total Annual working capital (summary)						
personnel wages and allowances	1,182,000	810,000	810,000	810,000	810,000	884,400
Utilities and Maintenance	720,000	630,000	630,000	630,000	630,000	648,000
raw materials and other inputs	6,450,000	4,950,000	4,950,000	4,950,000	4,950,000	5,230,000
Miscellaneous Expenses	100,000	100,000	100,000	100,000	100,000	100,000
Sub-total (summary)	8,452,000	6,490,000	6,490,000	6,490,000	6,490,000	6,862,400
G. Grand Total Investment Cost = Project Establishment + Total Annual Working Capital	21,124,620	18,548,200	18,548,200	18,548,200	18,548,200	19,063,484

RESULTS AND DISCUSSION

Simple Rate of Return

Simple rate of return method is a capital budgeting technique that was used to achieve the objectives; the parameters or factors used in calculating simple rate of return and the subsequent models include:

i. Total number of firm/factory working days per annum (i.e crushing season) for income and expenditure is 150 days (5 months from November to March)

ii. Plant capacity is 10 tcd, therefore factory/firm were to process 10 x 150 tonnes (i.e 1500 tonnes) each in one season.

iii. Sugar cane supplied was for 150 days i.e 1500 tonnes at the rate of N3,000 per tonne in Sara, Jigawa State, Zaria in Kaduna State, Gbajigi in Niger State and Konar- mada in FCT- Abuja, while it was at N4,000 per tonne in Omor-Anambra State

iv. Processing costs and prices of each product are very conservative and based on current market price (Brown sugar @ N164 per Kilogram (Kg) and at N120/ kg).

v. Provision was made for all minor inputs – Okra, firewood, packaging materials and water, Electricity and fuel for transportation - in the estimation of Annual expenditure.

vi. The total strength of staff was 13; this consisted of eight (8) permanent staff and 5 part- time Staff on

Table 2. Sources / Revenue Generated for one Year full Operation across the Sites

S/No.	Brown Sugar Minn– Processing Firms Location	Revenue Source (s)	Tonnes/ Year	N/Tonne	Value per Year (N)	Total Revenue / Year (N)
1	Omor -Anambra State	Brown Sugar (crystal)	73	164,000	11,972,000	
2	Konar-Mada, FCT-Abuja	Liquid Sugar (mollasses)	89.3	120,000	10,720,000	22,692,0000
3	Bazaire-Zaria, Kaduna State	Brown Sugar (crystal)	68	164,000	11,152,000	
4	Sara, Jigawa State	Liquid Sugar (mollasses)	70	120,000	8,400,000	19,552,000
		Brown Sugar (crystal)	75	164,000	12,300,000	
5	Gbajigi-Bida, Niger State	Liquid Sugar (mollasses)	82	120,000	9,840,000	22,140,000
		Brown Sugar (crystal)	82	164,000	13,448,000	
6	Pooled Data	Liquid Sugar (mollasses)	82.3	120,000	9,876,000	23,324,000
		Brown Sugar (crystal)	72	164,000	11,808,000	
		Liquid Sugar (mollasses)	87	120,000	10,440,000	22,248,000
		Brown Sugar (crystal)	74	164,000	12,136,000	
		Liquid Sugar (mollasses)	82.12	120,000	9,854,400	21,990,400

Source: 2009/2010 Survey data, Financial Feasibility study on Five Brown Sugar Mini-Processing Firms in Nigeria

commensurate salaries which have been negotiated by the processors based on the prevailing economic realities.

vii. Depreciation is calculated on the fixed costs (Land, building, plant and Machinery) using a straight line method.

viii. The projected life span of the project is 10 years

ix. The enterprise was said to enjoy a tax free holiday for the first five years arising from its Pioneer *status*.

x. The processors obtained bank loan at an interest rate of 25%.

Tables 1 and 2 present the total establishment cost and the revenue generated for a full year (five Months) operation respectively of the studied brown sugar mini - processing firms. This is to aid in the calculation of the simple rate of return (SRR) and the subsequent analytical models.

The results which are conveyed in Table 3 shows that the pooled data have 64% simple rate of return, while 45%, 49%,63%, 69% and 63% for Omor-Anambra State, Konar-Mada, FCT-Abuja, Zaria- Kaduna State, Sara - Jigawa State and Gbajigi-Bida Niger State respectively.

Table 3. Simple Rate of Return of the project across the sites

(a) S/No	(b) Brown sugar Mini-processing Firms Locations (	(c) Total Investment cost (N)	(d) Annual Net profit (N)	(e) Simple Rate of Return _R (d) / (c) X100
1	Omor-Anambra State	21,224,200	10,974,738	52%
2	Konar-Mada FCT-Abuja	18,611,200	10,233,680	55%
3	Zaria, Kaduna State	18,596,200	13, 001,680	70%
4	Sara, Jigawa State	18,617,200	14,005,680	75%
5	Gbajigi-Bida, Niger State	18,512,200	12,929,680	70%
6	Pooled Data	19,103,300	12,229,092	64%

Source: 2009/2010 Survey data, Financial Feasibility study on Five Brown Sugar Mini-Processing Firms in Nigeria

Note: Net Profit in a normal year = Total revenue – { operation costs + interest charged (25%) + Depreciation- a straight line depreciation method is used for *the fixed cost}.* Pay- Back-Period (PBP)

Table 4. Pay - Back- Period (PBP) across the Sites /Pooled Data

S/No	Brown Sugar Mini – processing firms' locations	(a) Total Fixed Cost (N)	(b) Total Variable Cost (N)	(c) Total Investment Cost {(a) + (b)} (N)	(d) Annual or yearly Revenue (N)	(e) Annual or yearly Net Profit (N)	(F) Pay-Back-Period (PBP) Years {(c) / (e)}
1	Omor-Anambra State	12,772,620	8,352,000	21, 124,620	22,692,000	10,974,738	1.92 + 1yr.of zero prod
2	Konar-Mada FCT-Abuja	12,127,200	6,490,000	18,617,200	19,552,000	10,233,680	1.82 + 1yr.of zero prod
3	Zaria, Kaduna State	12,142,200	6,490,000	18,632,200	22,140,000	13,001,680	1.43 + 1yr.of zero prod
4	Sara, Jigawa State	12,163,200	6,490,000	18,653,200	23,324,000	14,005,680	1.32 + 1yr.of zero prod.
5	Gbajigi-Bida, Niger State	12,058,200	6,490,000	18,548,200	22,248,000	12,929,680	1.43 + 1yr.of zero prod.
6	Pooled Data	12,240,900	6,862,400	19,103,300	21,990,400	12,229,092	1.56 + 1yr.of zero prod

Source: 2009/2010 Survey data, Financial Feasibility study on Five Brown Sugar Mini-Processing Firms in Nigeria

Note: - net profit in a normal year = Total revenue - { operation costs + interest charged (25%) + Depreciation}

Table 5. Computation of NPV, IRR and BCR for Brown sugar Mini- Cottage processing firm in Nigeria – Using pooled data...

PROJECT YEAR	GROSS COST N	GROSS REVENUE N	NET REVENUE N	DF@25%	NPV OF NET REVENUE@25% N	NPV OF GROSS REVENUE@25% N	NPV OF GROSS COST @25% N	DF @50%	NPV OF NET REVENUE AT 50% N	IRR (25%)	IRR	BCR @25%
0	12,240,900	0	-12,240,900	0	0	0	0	0	0			
1	6,862,400	21,990,400	15,128,000	0.80	12102400	17592320	5489920	0.667	10090376			
2	6,862,400	21,990,400	15,128,000	0.64	9681920	14073856	4391936	0.444	6716832			
3	6,862,400	21,990,400	15,128,000	0.512	7745536	11259084.8	3513548.8	0.296	4477888			
4	6,862,400	21,990,400	15,128,000	0.409	6187352	8994073.6	2806721.6	0.198	2995344			
5	6,862,400	21,990,400	15,128,000	0.32768	4957143.04	7205814.272	2248671.232	0.132	1996896			
6	6,862,400	21,990,400	15,128,000	0.262144	3965714.43	5764651.418	1798936.986	0.088	1331264			
7	6,862,400	21,990,400	15,128,000	0.209715	3172568.52	4611716.736	1439148.216	0.059	892552			
8	6,862,400	21,990,400	15,128,000	0.167772	2538054.82	3689373.389	1151318.573	0.039	589992			
9	6,862,400	21,990,400	15,128,000	0.134218	2030449.9	2951507.507	921057.6032	0.026	393328			
10	6,862,400	21,990,400	15,128,000	0.107374	1624353.87	2361197.21	736843.3376	0.017	257176			
Total	80,864,900		139,039,100		54005492.6	78503594.93	24498102.35		29741648	124%	124%	3.20

BCR = 3.2: NPV @ 25% = N54,005,492.58; IRR is positive and greater than 50%

NOTE: DF = Discount factor; NPV = Net Present Value; IRR = Internal Rate of Return and BCR = Benefit – Cost Ratio

Table 6. Computation of NPV, IRR and BCR for Brown sugar Mini- Processing firm with 20% increase in processing cost - Using pooled data across the five sites

PROJECT YEAR	GROSS COST N	GROSS REVENUE N	NET REVENUE N	DF@25%	NPV OF NET REVENUE@25% N	NPV OF GROSS REVENUE@25% N	NPV OF GROSS COST @25% N	DF @50%	NPV OF NET REVENUE AT 50% N	IRR (25%)	IRR (50%)	BCR @25%
0	14,689,080	0	-14,689,080	0	0	0	0	0	0			
1	8,234,880	21,990,400	13,755,520	0.80	11004416	17592320	6587904	0.667	9174931.8			
2	8,234,880	21,990,400	13,755,520	0.64	8803532.8	14073856	5270323.2	0.444	6107450.9			
3	8,234,880	21,990,400	13,755,520	0.512	7042826.2	11259084.8	4216258.6	0.296	4071633.9			
4	8,234,880	21,990,400	13,755,520	0.409	5626007.7	8994073.6	3368065.9	0.198	2723593			
5	8,234,880	21,990,400	13,755,520	0.3277	4507408.8	7205814.27	2698405.5	0.132	1815728.6			
6	8,234,880	21,990,400	13,755,520	0.2621	3605927	5764651.42	2158724.4	0.088	1210485.8			
7	8,234,880	21,990,400	13,755,520	0.2097	2884738.9	4611716.74	1726977.9	0.059	811575.68			
8	8,234,880	21,990,400	13,755,520	0.1678	2307791.1	3689373.39	1381582.3	0.039	536465.28			
9	8,234,880	21,990,400	13,755,520	0.1342	1846238.4	2951507.51	1105269.1	0.026	357643.52			
10	8,234,880	21,990,400	13,755,520	0.1074	1476985.2	2361197.21	884212.01	0.017	233843.84			
Total	97,037,880	219,904,000	122,866,120		49105872	78503594.9	29397723		27043352	94%	94%	2.6704

BCR = 2.67 NPV @ 25% = N49105672.11; IRR is positive and greater than 50%

Table 7. Computation of NPV, IRR and BCR for Brown sugar Mini- Processing Industry in Nigeria with 20% decline in revenue Using pooled data across locations

PROJECT YEAR	GROSS COST	GROSS REVENUE	NET REVENUE	DF @ 25%	NPV OF NET REVENUE @ 25%	NPV OF GROSS REVENUE @ 25%	NPV OF GROSS COST @ 25%	DF 50%	NPV OF NET REVENUE AT 50%	IRR (25%)	IRR (50%)	BCR @ 25%
	N	N	N									N
0	12,240,900	12,240,900	0	0	0	0	0	0	0	87%	87%	2.56
1	6,862,400	17592320	10,729,920	0.80	8583936	14073856	5489920	0.667	7156856.6			
2	6,862,400	17592320	10,729,920	0.64	6867148.8	11259084.8	4391936	0.444	4764084.5			
3	6,862,400	17592320	10,729,920	0.512	5493719	9007267.84	3513548.8	0.296	3176056.3			
4	6,862,400	17592320	10,729,920	0.409	4388537.3	7195258.88	2806721.6	0.198	2124524.2			
5	6,862,400	17592320	10,729,920	0.3277	3515980.2	5764651.42	2248671.2	0.132	1416349.4			
6	6,862,400	17592320	10,729,920	0.2621	2812784.1	4611721.13	1798937	0.088	944232.96			
7	6,862,400	17592320	10,729,920	0.2097	2250225.2	3689373.39	1439148.2	0.059	633065.28			
8	6,862,400	17592320	10,729,920	0.1678	1800180.1	2951498.71	1151318.6	0.039	418466.88			
9	6,862,400	17592320	10,729,920	0.1342	1440148.4	2361206.01	921057.6	0.026	278977.92			
10	6,862,400	17592320	10,729,920	0.1074	1152114.4	1888957.77	736843.34	0.017	182408.64			
Total	80,864,900	175,923,200	95,058,300		38304774	62802875.9	24498102		21095023	87%	87%	2.56
BCR = 2.56; NPV @ 25% = N38,304,773.6; IRR is positive and greater than 50%												

Source: 2009/2010 Survey data, Financial Feasibility study on Five Brown Sugar Mini-Processing Firms in Nigeria

All the results of the simple rate of return across the sites were higher than the interest rating prevailing (25%) in the capital market (2009), which should be accepted as per the criteria for acceptance of projects.

The Payback Period represents the amount of time that it takes for a capital budgeting project to recover its initial cost. Table 4 shows that the pay back period which is three years was common for all sites studied. However, as indicated earlier, PBP has its disadvantages- i). **PBP** ignores any benefits that occur after the Payback Period. It does not measure total incomes, ii). **PBP** ignores the time value of money. Thus, it can not be used independently in determining the project viability/ practicability.

Straight line depreciation method is used for the fixed cost; See Table 4.4 for fixed costs and variable costs; See Table 4 for Sources of Annual or yearly Revenue

Benefit – Cost Ratio (BCR), Net Present Value (NPV) and Internal Rate Of Return (IRR).

To provide information on the profitability or otherwise of brown sugar mini - processing firms of the study, discounted cash flow analysis was carried out through which the Benefit-Cost Ratio (BCR), Net Present Value (NPV) and Internal Rate of return (IRR) were calculated.

Benefit – Cost Ratio (BCR)

The results of the analysis presented in Table 4. shows that the Benefit – Cost Ratio (BCR) on the pooled data across the locations was 3.2. Given BCR at all locations greater than 1, indicates that the present value of the costs at the discount rate do not exceed the present value of benefits. Therefore, the enterprises at all locations studied have recovered their initials expenditure plus the return on investment from the projects. Thus, the project has shown a great sign for viability.

Net Present Value (NPV)

The results of the analysis presented in the same Table 4. also shows that the NPV across locations @ 25% = N54,005,492.58. Given the positive NPV at all sites of processing, shows that brown sugar processing using the mini-processing plants were profitable at all locations studied. It implies that brown sugar mini - processing firms earned more than the discount rate, contributing positively to incremental national income.

Internal Rate of Return (IRR)

Found also on Table 5, is the Internal Rate of Return results. The IRR for pooled data across locations is positive and greater than 50%. The general principle is to consider a project worthwhile, if the IRR from the investments exceeds some suitable rates of investment such as Bank borrowing rates (25%) or the return earned in alternative investments. With IRR greater than 50% recorded across locations, it assured that the project was profitable/ worthwhile in the sense that the investment raised per-capital income relatively greater to what it otherwise would have been.

Table 6, shows that 20% increase in cost of processing would lead BCR declined from 3.20 to 2.23 for the pooled data. The NPV @ 25% also declined from N54,005,492.58 to N44,800,855 for the pooled data. A decline in IRR was also recorded in all sites but still maintained IRR greater than 50 % and 20% dcline in price of the outputs would lead to decline in BCR from 3.20 to 2.5 for the pooled data. The NPV@ 25% also declined from N54,005,492.58 to N38,304,774 for the pooled data. The IRR was also observed to have declined but still greater than 50% at all the processing sites studied (Table 7).

CONCLUSIONS

This study undertaken to examine the financial feasibility of five brown sugar mini-processing firms in Nigeria has been able to establish that every component of the financial analysis investigated indicated that the project was feasible, profitable and viable. This project if financed even by Bank loan can be fully paid back in the third year of full operation as it is a financially sound project for investment.

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