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TECHNO-ECONOMIC PACKAGING OF PALM WINE PRESERVATION AND BOTTLING TECHNOLOGY FOR ENTREPRENEURS

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ABSTRACT

The study was carried out to investigate the economic viability of setting up a small scale palm wine bottling factory with a view to providing investment data to guide entrepreneurs in making investment decisions. The economic evaluation was based on a factory capacity of 750,000 bottles (60cl) per annum with production commencing in year one at 75% capacity utilization. Production cost estimate varies between N37.85/bottle (60cl) in the first year and N35.37/bottle (60cl) in the fifth year. The annual net profits are N8, 460,430.00 and N12, 025,710.00 in years one and five respectively. Projected cash flow is positive in year one i.e. N5,329,960.00 while the projected balance sheet shows that the net worth of the project is N19,904,010.00 in year one and N41,887,370.00 in year five. Payback period, discounted payback period and profitability index are 1.4 years, 3.3 years and 1.5 respectively. The breakeven point in year one is 48.1% or a breakeven sales volume of N16, 236,312.35.00. The Return on Investment (ROI) and Return on Equity (ROE) in year one are 57.5% and 86.1% respectively. Capital Turnover Ratio (CTR) varies between 2.3 and 2.9 within the first five years. Internal Rate of Return (IRR) is above 45%. The Net Present Value (NPV) at 25% is estimated at N3, 143,100.00. The Debt Service Coverage Ratio (DSCR) increases gradually from 1.33 to 2.75 between the first and the fifth year.

KEYWORDS: Entrepreneur, Palm Wine Preservation, Palmwine Bottling Technology, Techno-Economic Packaging.

INTRODUCTION

The palm plants have been reported to be the fourth largest among the monocots after the grasses, lilies and orchids (Chinarasa, 1968). Some of the palm plants are used for ornamental purposes, while others are cultivated mainly for economic purposes. Most of these plants are slender, single-stemmed (though there are a few branching species) between 30 and 60 feet high and are found mainly in the tropical regions of the world including the forests zone of Southern Nigeria (Akinrele, 1968). Oil palm is cultivated abundantly in Nigeria. Published data by the Central Bank of Nigeria shows that about 209,200 tonnes of oil palm is produced in year 2006 in Nigeria. Akwa Ibom with total oil palm production of 102.12 metric tonnes was the highest producer of oil palm in Nigeria in year 1998 (Federal Office of Statistics, 2001). Palm wine (Emu) is the fermented sap of certain varieties of palm trees including raphia palm (*Raphia hookeri or R. Vinifera*) (Ali, 2008). It is an important alcoholic beverage in West Africa where it is consumed by more than ten million people (Howtopedia.org, 2008). It is a highly perishable liquid consisting mainly of water, sugar, vitamins and many aroma and flavour components in very small amounts

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(Okafor, 1977). Ukhum, *et al* (2005) reported comparative mineral profiles of fresh and bottled palm wine. Other studies on uses, composition and preservation of palm wine have been reported (Olasupo and Obayori, 2003; Enwefa *et al*, 2004; Levi and Oruche, 1957). This article reports the economic evaluation of a small scale palm wine preservation and bottling project with a view to providing investment guide to entrepreneurs who intend to invest in palm wine bottling business venture.

MATERIALS AND METHODS

MATERIALS

The main raw material for production of bottled palm wine is fresh palm wine. Other material inputs include preservative (e.g. potassium metabisulphite), 60cl glass bottles, labels and cartons.

METHODS

Process Technology

The process technology for palm wine bottling and preservation reported by Yussuf (2006) is described in the production flow chart in Fig. 1.

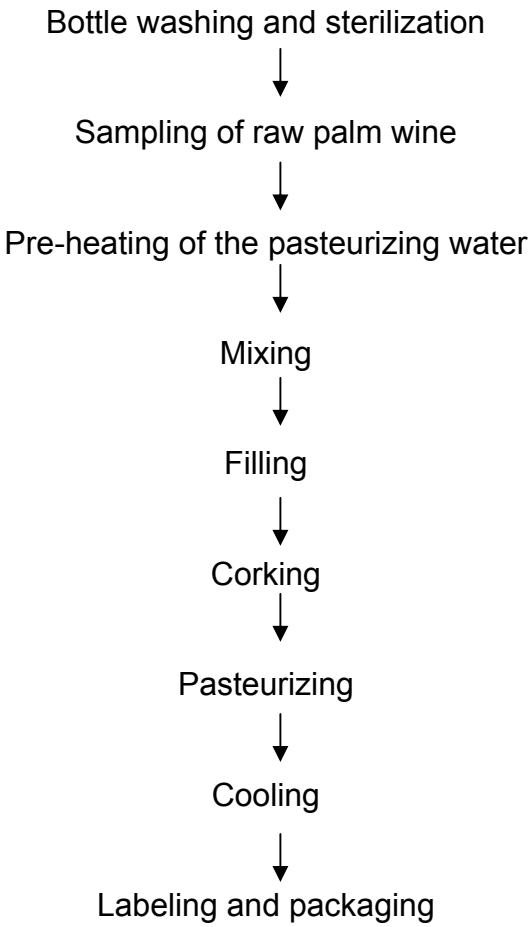

Fig 1: Production flow chart for palm wine preservation and bottling.

Production data were obtained from FIIRO palm wine bottling pilot plant and Oranseniwo & Co Nigeria Limited palm wine bottling plant installed by FIIRO at Obada- Oko near Abeokuta in Ogun State, Nigeria. Basic production equipment are: Pasteurizer, homogenizer, liquid filling machine, corking machine and other accessories like weighing scale, holding tank, refractometer and P^H meter.

Economic Analysis.

The project's economic viability was investigated using the following economic performance indicators: Net Present Value (NPV), Internal Rate of Return (IRR), Return on Investment (ROI), Return on Equity (ROE), Profitability Index (PI), Payback period, Breakeven Analysis, Net Profit to Sales Ratio and Discounted Payback Period. NPV was determined by the method described by Marcouse (1999) while IRR was determined using DeGarmo's model (1979). Payback period, internal rate of return, return on investment, return on equity, breakeven point and net profit to sales ratio were also determined by the methods described by Marcouse (1999). Discounted payback period was taken as the ratio of initial investment to average present value. Profitability index was expressed as the ratio of the total present value of cash flow to initial investment while debt service coverage ratio was taken as the ratio of the summation of profit after tax, depreciation and interest on loan to summation of loan repayment and interest on loan (Oyeku, 2002).

RESULTS AND DISCUSSION

The economic analysis was based on the factory production capacity of 2,500 bottles (60cl bottles) per day or annual production capacity of 750,000 bottles at 100% capacity utilization. Proposed capacity utilization in year one is 75% while production capacity in subsequent years increases gradually to 95% in the fifth year of production. The extent of market and equipment reliability informed the high capacity utilizations.

The investment cost is ₦14,717,230.00. This is summarized in table 1 and it comprises of ₦11,843,000.00 fixed capital (Land and factory building – ₦6,700,000.00, Machinery and equipment – ₦3,168,000.00, Generator – ₦275,000.00, Borehole – ₦350,000.00, Office furniture and equipment – ₦150,000.00 and project truck - ₦1,200,000.00), ₦1,820,990.00 working capital (Table 2), ₦450,640.00 preproduction expenses and ₦602,600.00 contingencies. The projected sales revenue based on selling price of ₦60.00/bottle is ₦33,750,000.00 in year one while same is ₦42,750,000.00 in year five. Production cost per 60cl bottled palm wine decreases from ₦37.85 in year one to ₦35.37 in year five. Within the same period, the total annual production cost varies between ₦21,292,190.00 and ₦25,198,930.00 (Table 3) while the unit production cost varies between ₦37.85 and ₦35.37. The annual net profit increases from ₦8, 460,430.00 in year one to ₦12, 025,710.00 in year five (Table 4). The projected cash flow (Table 5) is liquid from the first year (that is, ₦5, 329,960.00). This is an indication that the project will be able to meet all its financial obligations right from the first year of operation. The Return on Investment in year one and five are 57.5% and 81.7% respectively. Commercial banks in Nigeria accept projects with return on investment above 15% in year one (Oyeku *et al*, 2006). The Return on Equity ranges between 86.1% and 122.4% within the first five years. Net profit to sales are 25.1% and 28.1% in years one and five respectively. The project payback period is estimated at 1.4 years with a discounted payback period of 3.3 years. The profitability index is 1.5. The rule is to accept a project with profitability index greater than 1 (Oyeku, *et al*, 2007). The net present value (NPV) at 30% is estimated at N5, 080,770.00. Since the project NPV> 1, the project is acceptable (DeGarmo, *et al*, 1979). The internal rate of return is above 45%. This is considered good because it is higher than 25% interest rate on loan. The low break-even point of 48.1% (or break-even volume of N16, 236,312.35) in year one makes the project attractive. The debt services coverage ratio increases from 4.8 to 10.7 within the first five years indicating the increasing capacity of the project to pay back. The capital turnover ratio in year one is 2.3 and 2.9 in year five. The net worth of the project as shown in the projected balance sheet (Table 6) is ₦19, 904,010.00 in the first year and ₦41, 887,370.00 in the fifth year.

CONCLUSION

Based on our observation and the positive indications of all the economic performance indicators, the project has been found to be technically feasible and economically viable. Entrepreneurs should take advantage of the abundant raw material, especially in the identified areas in Nigeria as well as the large and vibrant potential market for the product to set up palm wine bottling factories. It is however, recommended that investors should carry out detailed techno-economic feasibility study on the project before embarking on its commercial production. FIIRO renders technical assistance and management consultancy services (including preparation of feasibility report) on palm wine preservation and bottling to interested investors or entrepreneurs.

Table 1: Total Investment Cost Estimate ₦"000

Item	Cost Estimate
Land & Factory Building	6,700.00
Machinery & Equipment	3,168.00
Generator	275.00
Borehole	350.00
Office Furniture & Equipment	150.00
Project Truck	1,200.00
Working Capital	1,820.99
Preproduction Expenses	450.64
Contingencies	602.60
TOTAL	**14,717.23**

Table 2: Working Capital Estimate ₦'000

Item	Coverage period	Year 1	Year 2	Year 3	Year 4	Year 5
A. CURRENT ASSET		**2,909.67**	**3,081.29**	**3,313.25**	**3,488.59**	**3,666.79**
I. ACCOUNTS RECEIVABLE	1 Month	1,569.80	1,663.72	1,784.71	1,880.10	1,976.88
II. INVENTORY						
- Raw materials	1 Day	33.97	36.23	38.50	40.76	43.03
- Supplies	3 Months	465.02	495.98	526.94	557.97	588.93
- Finished Product Stock	1 Week	359.75	381.45	409.59	432.48	455.71
III. CASH-IN-HAND	1 Month	481.13	503.90	553.51	577.28	602.24
B. CURRENT LIABILITIES		**1,088.68**	**1,159.83**	**1,231.20**	**1,302.82**	**1,374.64**
ACCOUNTS PAYABLE	1 Month	1,088.68	1,159.83	1,231.20	1,302.82	1,374.64
C. WORKING CAPITAL (A-B)		**1,820.99**	**1,921.46**	**2,082.05**	**2,185.77**	**2,292.15**
D. DECREASE OR INCREASE IN WORKING CAPITAL		1,820.99	100.47	160.59	103.72	106.38

Table 3: Annual Production Cost Estimate ₦'000

YEAR	1	2	3	4	5
Capacity Utilization (%)	**75**	**80**	**85**	**90**	**95**
Raw materials	10,190.63	10,870.02	11,549.39	12,228.78	12,908.115
Supplies	1,860.08	1,983.90	2,107.74	2,231.89	2,355.73
Utilities	1,013.40	1,064.07	1,117.27	1,173.13	1,231.79
Labor	3,480.00	3,654.00	3,836.70	4,028.54	4,229.97
Factory Overhead	308.40	308.40	616.80	647.54	680.02
FACTORY COST	**16,852.51**	**17,880.39**	**19,227.90**	**20,309.98**	**21,405.66**
Admin Overhead	1,135.12	1,191.88	1,251.47	1,314.04	1,379.74
Marketing Overhead	850.00	892.50	937.13	937.13	937.13
OPERATING COST	**18,837.63**	**19,964.77**	**21,416.50**	**22,561.15**	**23,722.53**
Depreciation	866.80	866.80	866.80	866.80	866.80

Amortization	365.06	365.06	365.06	365.06	365.06
Financial Cost	1,222.70	978.16	733.62	489.08	244.54
TOTAL PRODUCTION COST	**21,292.19**	**22,174.79**	**23,381.98**	**24,282.09**	**25,198.93**
PRODUCTION COST/BOTTLE	**37.85**	**36.96**	**36.68**	**35.97**	**35.37**

Table 4: Net Income Statement ₦'000

Year	**1**	**2**	**3**	**4**	**5**
Capacity Utilization %	75	80	85	90	95
Sales Revenue	33,750.00	36,000.00	38,250.00	40,500.00	42,750.00
Less: Production Cost	21,292.19	22,174.79	23,381.98	24,282.09	25,198.93
Profit Before Tax	**12,457.81**	**13,825.21**	**14,868.02**	**16,217.91**	**17,551.07**
Tax (Adjusted)	3,997.38	4,407.60	4,720.45	5,125.41	5,525.36
NET PROFIT	**8,460.43**	**9,417.61**	**10,147.57**	**11,092.50**	**12,025.71**
Dividend (40%)	3,384.17	3,767.04	4,059.03	4,437.00	4,810.28
Retained Profit	5,076.26	5,650.57	6,088.54	6,655.50	7,215.43
Cumulative Profit	5,076.26	10,726.83	16,815.37	23,470.87	30,686.30

Table 5: Projected Cash flow Statement ₦'000

Year	0	1	2	3	4	5
A. CASH-IN-FLOW	0	33,750.00	36,000.00	38,250.00	40,500.00	42,750.00
Sales	0	33,750.00	36,000.00	38,250.00	40,500.00	42,750.00
B. CASH-OUT-FLOW	9,826.44	28,420.04	30,095.73	31,907.76	33,590.80	35,280.87
Asset Purchase	9,375.80	-	-	-	-	-
Operating Cost		18,837.63	19,964.77	21,416.50	22,561.15	23,722.53
Loan Repayment						
Interest		978.16	978.16	978.16	978.16	978.16
Tax		1,222.70	978.16	733.62	489.08	244.54
Dividend		3,997.38	4,407.60	4,720.45	5,125.41	5,525.36
Pre-production		3,384.17	3,767.04	4,059.03	4,437.00	4,810.28
Expenses	450.64	-	-	-	-	-
C. Net Cash Flow	(9,826.44)	5,329.96	5,904.27	6,342.24	6,909.20	7,469.13

Table 6: Projected Balance Sheet Statement ₦"000

YEAR	**O**	**1**	**2**	**3**	**4**	**5**
TOTAL ASSET	**14,717.23**	**19,904.01**	**26,647.57**	**29,829.32**	**35,578.28**	**41,887.37**
Fixed Asset	12,896.24	11,664.38	10,432.52	9,200.66	7,968.80	6,736.94
Current Asset	1,820.99	2,909.67	3,081.29	3,313.25	3,488.59	3,666.79
Cash Balance	-	5,329.96	11,133.76	17,315.41	24,120.89	31,483.64
TOTAL LIABILITIES	**14,717.23**	**19,904.01**	**24,647.57**	**29,829.32**	**35,578.28**	**41,887.37**
Current Liabilities	-	1,088.68	1,159.83	1,231.20	1,302.82	26,088.09
Loan						
Equity	4,890.79	3,912.63	2,934.47	1,956.31	978.15	-
Retained Profit	9,826.44	9,826.44	9,826.44	9,826.44	9,826.44	9,826.44
	-	5,076.26	10,726.83	16,815.37	23,470.87	30,686.30

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