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Employment creation and opportunities in the manufacturing sub-sector. The case for the production of corn flakes.

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EMPLOYMENT CREATION AND OPPORTUNITIES IN THE MANUFACTURING SUB-SECTOR: THE CASE FOR THE PRODUCTION OF CORN FLAKES

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BY
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INTRODUCTION

A number of investment opportunities exist in the manufacturing sector of the Nigerian economy. This is as a result of the vast array of both agricultural and mineral resources that are available in Nigeria. Consequently, the level and degree of development of the resources will play a central role in employment opportunities and industrial development of this nation.

Agricultural production engages the largest portion of the Nigerian population. This is because the Nigerian climate is suitable for cultivation of a wide variety of crops, most of which have high industrial potentials. Therefore, in terms of comparative advantage, the agricultural sector holds the key to the development of the real sector because of its potentials to provide inputs for downstream industrial activities. An articulated agricultural revolution and increased value addition activities in the downstream agro-processing sub-sector (for example cornflakes production, the subject of this paper) presents a potential platform for effective employment generation and consequently, sustainable poverty eradication in Nigeria.

Cornflakes production occupies a critical position in the hub of downstream agro-processing activities. This is so adjudged because cornflakes production utilizes a crop, which is grown in most parts of Nigeria and is consumed as a staple food in various forms by all Nigerians without discrimination. Moreso, cornflakes production used 100% locally sourced material, maize, and most of the processing equipment can be fabricated locally. Cornflakes therefore, has a large domestic market and its production has the potential to generate a number of productive economic activities related to the sourcing of the raw materials to marketing of the final product. These various activities inevitably involves the use of human resources and therefore engenders employment creation.

2.0 CORNFLAKES PRODUCTION

Cornflakes are food products from sweet corn (Maize) by rolling and toasting cooked corn mixed with sugar and vitamins. They feature prominently in our breakfast menu as a breakfast cereal, served with milk. The history of cornflakes production dates back to the 19th century in United States when a group of Seventh-day Adventists made attempt to develop food aimed at meeting strict vegetarian diet standard.

The Kellogg brothers (Dr. John Kellogg and Will Keith Kellogg) were the first to start commercial production of cornflakes in 1906. Currently, Kellogg Cornflakes is the most popular among corn flakes brands globally.

It worthy of note that the imports of grains maize (corn) in 2001 for rolled or flaked grains were estimated at 29 tons valued at N1.6m from Germany and U.K. Also, rolled or flaked oat grains imported within the same period was 714.5 tons valued at N44.09m. These type of grains constitute input materials required for production of various brands of corn flakes. Malt is another input to corn flakes production. In 2001, both roasted and non-roasted malt imported into the Country, amount to 39.1 tons valued at N2.1 billion. Vitamins and essential mineral irons are also imported. Sorghum malt is widely used in the brewery industry and can substitute

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imported malt for cornflakes production. Also, local maize variety can be improved upon to make them suitable for corn flakes production. This will help to reduce considerably the imported maize grains either in the form of rolled or flaked grains. The industrial application of maize grain showing the specifications for corn flakes production is presented below (figure 2.0).

The employment generation network in a cornflakes production hub is illustrated in Figure 1.

The employment generation potentials of cornflakes production can be viewed from three perspectives:

- *Backward integration activities*
- *Industrial production activities*
- *Forward integration activities*

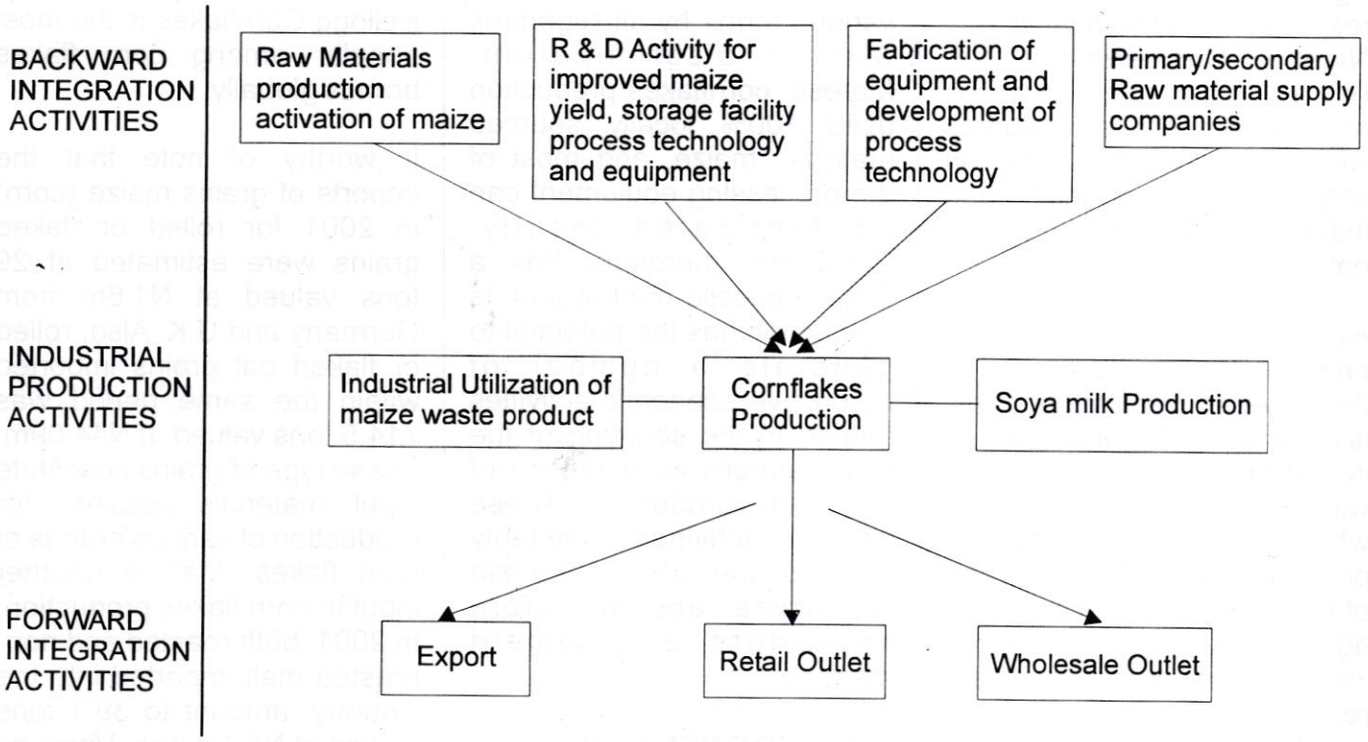

Figure 1

2.1 BACKWARD INTEGRATION ACTIVITIES

The backward integration activities could be engineered by the cornflakes production management process by the way of out grower activities involving clusters of farmers and thereby broadening the scope of employment generation.

Employment generation by the cornflakes Industry begins at the raw materials production level. Currently, maize is being cultivated on over 3 million hectares of land in Nigeria. However, the largest potential for maize production lies in the savanna, especially, northern guinea zone, based on climatic factors and relative maize performance in relation to local sorghum and millet.

The trend of Maize Production in Nigeria is as shown below: ('000 MT)

Year	Output ('000 MT)
1996	6,217
1997	6,285
1998	6,435
1999	6,115
2000	6,491

Source: CBN (2002): Annual Reports and Statement of Accounts for the year ended 31st December, 2000.

The national demand for maize grains by the flour mills was estimated at 7,583 tons in 2003 while within the same period, the price varied between N50, 000 to N55, 000 per ton.

Maize consumption in Nigeria is restricted to the production of baby food, animal feed and domestic local food forms like maize flour, ogi etc. The commercial production and supply of maize in Nigeria is being stepped down by narrow demand especially in the industrial sector occasioned by the absence of a good number of processing industries to utilize it. This situation has caused the production of maize in Nigeria to remain at subsistent household production level, primarily, to meet the needs of domestic food consumption.

In addition Cornflakes production requires the addition of vitamins, mineral salt, food flavor and food preservatives which are added in small quantities during the process of manufacturing. Other items include polythene bags and paper packages for packaging. The local production of some of these secondary raw materials is another means of employment generation in the Country.

Cornflakes production is currently being carried out by only two companies. These are NASCO Foods Ltd. and Nestle Foods in Lagos. As a result of this, the market is unsaturated. Establishment of more cornflakes factories will increase the demand for the crop and therefore trigger off increased raw materials production activities especially at large commercial scale.

This would also necessitate increased R & D activities at various centers such as International Institute of Tropical Agriculture and National Cereal for Research Institute and Universities engaging various technical personnel in various research work towards producing improved maize varieties, yield and high resistance to diseases with high nutritive value. In addition to this, research activities is on-going in areas of process technology and equipment fabrication as well as production of efficient storage facilities in order to ensure steady supply of maize to the cornflakes industry during off season.

2.2 INDUSTRIAL LEVEL PRODUCTION ACTIVITIES

At the level of industrial production activities, job opportunities have been identified in the area of utilizing the maize waste product for bags, car seats and shoe production. The use of milk and sugar to serve with cornflakes has become common in most Nigerian homes. Promotional activities for the use of soyamilk in place of tin milk can be carried out as a means of not only creating local substitute to the costly tin milk but also create resource-based employment opportunities in soyamilk production sub-sector.

2.3 FORWARD INTEGRATION ACTIVITIES

The forward integration activities would also create employment activities in the wholesale, retail and export trade of products. The forward integration activities can be catalyzed by the cornflake industrial production management process as a means of ensuring effective marketing of products.

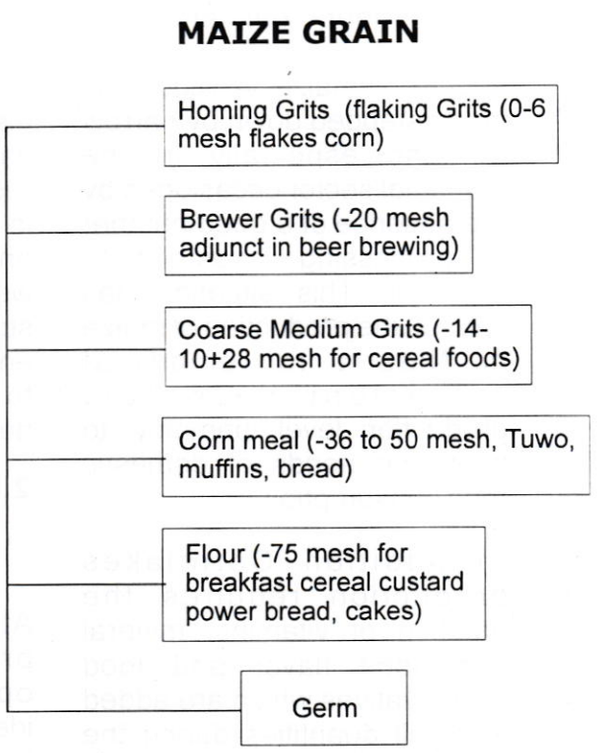

Figure 2.0 Industrial/Commercial Application of Maize Gain

To produce cornflakes, the maize chosen must be of the highest quality. Below are some of the quality requirements (Table 1.0).

Table 1.0 Quality Requirements of Maize (corn) for Flakes

Colour	Approved yellow Colour
Moisture	Range 10% - 14%. Too much moisture result in mouldiness. Too dry, makes it difficult to turn into flakes
Contaminants	Less than 5% kernels that sprouted are rejected as well as mouldy, diseased or insect damaged.

3.0 MACHINERY AND EQUIPMENT

The need to scale down the level of production would create demand for an appropriate and adaptable equipment. This situation will advertently create jobs in the areas of fabrication of processing equipment and their components, as well as replaceable parts for operating industries.

The major technical risk is the ability to produce products of good quality characteristics as required by end users. Selection of equipment is clearly of vital importance. The critical process stages in production have been identified and the efficiency of the processes are determined by the choice of technology. The technology for cornflakes production is now standardized. The equipment required are as follows:

		Sets
1.	Baby boiler	1
2.	Eureka separator	1
3.	Carter disc separator	1
4.	Dicky siffer	1
5.	Blocking machine	1
6.	Rotary steam cookers	2
7.	Mixer	2
8.	Agitator/Lump breakers	2
9.	Cooler	1
10.	Sweep driers	1
11.	Tempering tanks	2
12.	Rotary Oven (roaster)	1
13.	Flaking machine	1
14.	Screening and cooling equipment	1
15.	Packing bins	2
16.	Inspection tables	2
17.	Weighing scales	1
18.	Polyethylene bag sealing machine	2

Plant Site Planning

There is no restriction in respect of the location of the plant; however, the plant will be operated more successfully if the following conditions are met:

a. convenient supplies of raw materials.
b. efficient transportation facilities.
c. sustainable supply of electricity and water.
d. availability of labour.

4.0 PRODUCTION PROCESS

Good quality hybrid maize (yellow or white) are cleaned and polished to remove dirt and immature grains. The polished grains are broken into fairly large pieces with mill disc and cooked under pressure. The cooked maize is steamed for two hours and mixed with flavoring materials made up of sugar, salt, malt and water. At the end of this, the grit has about 33% moisture content. A uniform translucency in the grits indicates adequacy of cooking. The grit is taken to an agitator or lump breaker and then discharged into a dryer to reduce the moisture content to 15% - 20%. The dried material is kept in tempering tanks for a few hours to allow for uniform distribution of moisture. This is very essential for uniform pressing in the flakes and thickness. The tempered material is then put into a flaking machine for flaking. The flakes are transferred into ovens for roasting. The roasted flakes are inspected, graded and packed immediately in polyethene/waxed paper to maintain high level of crispiness.

i) Cleaning Process

Before processing, the right quality maize must be chosen, usually; the ones with golden colour are preferable and must be free of unwanted materials such as small stones and other grains. Part of the cleaning process requires that the corn is steamed to soften it. Then, the germ and husk are removed. What is left after this is called "grit" from which the flakes are made. The raw grits which should be as large as possible are cooled and dried.

ii) Cooking Process

The cooking process starts when the raw grits are mixed with malted barley or sorghum (to enhance flavour) and cooked in steam pressure cookers at temperature of more than 100^{oc}. Vitamins, niacin, riboflavin and mineral iron are equally added. The cooking process lasts for an hour or two to soften the hard grits.

iii) Drying Process

After cooking the moisture content which is up to 33 per cent is reduced to 15-20 per cent by passing it through hot-air driers. The dried materials are tempered for some hours to allow a uniform distribution of moisture and ensure that only the correct size grits are used in making the flakes.

iv) Milling and Toasting

Before milling, steam is added to the grits to make them moist and warm. The corn grits are milled using large rollers which squeeze the grits flat and elongates the flakes. The flakes are tumble toasted in cylindrical oven for 30 seconds. The air in the oven is heated and the flakes tossed around in a rotating drum. The roasted flakes blister, develop their golden brown colour and become crisp. The flakes are cooled and ready for packaging.

v) Packaging

The flakes are packed and stored in large bin and packed in polythene or flakes bag sealed and ready for the market. The flow diagram showing the production process is presented in figure 3.0.

5.0 MARKET POTENTIALS

The industrial climate for cornflakes and related products is low in the recent years. The poor performance in the sub-sector is attributable to low customer purchasing power occasioned by high price. Other constraints are high cost of operations and infrastructural inadequacy.

The final product has high export potential and a large

market in the West African sub-region. ECOWAS provides an economic integration programme, which would allow for easy marketing of the products in all Countries in the sub-region. Cornflakes production presents a good model for real sector development in Nigeria.

There is a high demand for cornflakes in Nigeria especially among the working class who prefer it to other meals at breakfast time. In addition, it is also popular among those who found it difficult to cook after office hours. It is also considered as a fast food in offices during working hours because of light schedules. Children love to take cornflakes at any time of the day. It is popular among students, city dwellers, clubs and in hospitals. The demand is also high because it is recommended medically for slimmers or obesity patients. Thus, the market is fairly large and the demand characteristics will equally increase in consumer purchasing power.

There are currently no small manufacturers of cornflakes in the country. As mentioned earlier the present efforts are limited to large-scale producers such as NESTLE Foods and NASCO Foods. It is estimated that the national demand for cornflakes in Nigeria in 2000 was 200,000 MT, while the supply was 80,000 MT, leaving a shortfall of 120,000 MT per annum. This is partially met through importation.

Considering the nature of urban development and the increasing demand for easy-to-prepare cereal foods, there are indications that the demand might grow up to 30% by the end of 2004 from the 2000 figure.

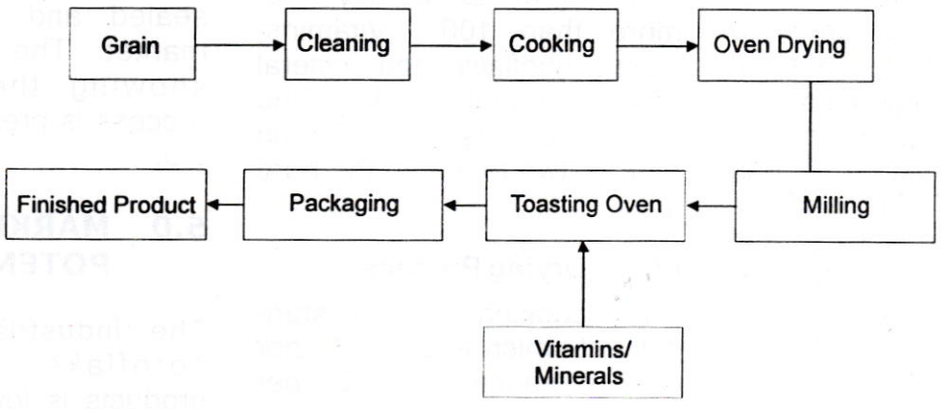

Figure 3.0 General process flow Information. The nutrition fact sheet of corn flakes is presented in table 2.0.

Table 2.0 Nutrition Facts

Serving Size: 1 cup (28q/1.00z)	
	Amount per serving
Calories:	100
Calories from Fat:	0
Total Fat, g:	0
Saturated Fat g:	0
Monounsaturated, g	-
Polyunsaturated, g:	-
Cholesterol, mg:	0
Sodium, mg:	200
Potassium, mg:	25
Total Carbohydrate, g:	24
Total Dietary Fiber, g	1
Soluble Fibre, g:	-
Insoluble Fiber, g:	-
Sugar, g:	2
Sugar Alcohol, g:	-
Other Carbohydrates, g:	21
Protein, g:	2
Vitamin A, IU:	500
Vitamin C, mg:	6
Calcium, mg:	0
Iron, mg:	8.1
Vitamin D, IU:	40
Vitamin E, IU:	-
Thiamin, mg:	.375
Riboflavin, mg:	.425
Niacin, mg:	5
Vitamin B6, mg:	.5
Folic Acid, mg	
Vitamin B12, mg	-
Panthothenate, mg:	-
Phosphorus, mg:	-
Magnesium, mg:	-
Selenium, mcq:	-
Zinc, mg:	-
Manganese, mg:	-
Copper, mg:	-
Exchange:	$1^{1/2}$ Carbohydrates

Generally, the ingredients used in cornflakes production include the following:

Milled corn, sugar, malt flavouring, high fruitose corn syrup.

Salt, iron, niacinamide, sodium ascorbate and ascorbic acid (Vit C), pyridoxine hydrochloride (Vit B6), Riboflavin (Vit B2), thiamin hydrochloride (Vit B1), Vitamin A palmitate, folic acid, vitamin B12 and vitamin D.

6.0 PRODUCTION CAPACITY

This profile envisage setting up of a plant equipped machinery listed in section 3.0 to operate 8 hours shift per day and 300 working days per year and should be able to produce 300 tons of cornflakes per annum.

Raw Materials

The raw materials include maize (corn) grain and other ingredients such as malt, sugar, vitamin and minerals.

MANPOWER REQUIREMENT: 19
LAND SPACE REQUIRED: 10,000 M^2
PROJECT INVESTMENT COST

	(N '000)
Land acq. and compensation	2,500.00
Land Development	1,200.00
Buildings	10,000.00
Machinery and Equipment	13,000.00
Vehicles	4,000.00
Furniture and Fittings	3,000.00
Utilities (Gen. set, Boreholes & Storage Tank etc)	5,000.00
Preliminary & Pre-operational exp.	1,500.00
Contingence (10%)	4,020.00
Sub-total	**44,200.00**
WORKING CAPITAL (3 MONTHS)	
- Raw Material	4,875.00
- Salaries	1,110.00
- Overhead	258.00
- Utilities	590.00
Sub-total	**6,825.00**
Total N44,200 + N6,825	**N51,205.00**
FINANCIAL PACKAGE	
FIXED INVESTMENT	
- Land and Building	13,700.00
- Plant and Machinery	13,000.00
- Miscellaneous	17,520.00
	44,220.00
WORKING CAPITAL	6,825.00
TOTAL INVESTMENT US$ 349.843 at N140 = 1US$	51,025.00
RESIDUAL VALUE (After 10 years)	
1. Land (100%)	2,500.00
2. Building (50%)	5,000.00
3. Machinery & Equipment (10%)	1,300.00
Total	**8,800.00**

				(N '000)
PRODUCTION COST (FIRST YEAR)				
A.	Raw Materials			
	i.	500 MT of Maize at N20,000/MT (at 80% capacity utilization)		10,000.00
	ii.	Ingredient and Sugar		2,000.00
	iii.	Packaging		7,500.00
				19,500.00
B.	**UTILITIES**			
	-	Power		360.00
	-	Fuel		1,800.00
	-	Water		200.00
				2,360.00
C.	**SALARIES AND WAGES**			
	-	Managing Director	(1)	600.00
	-	Production Manager	(1)	480.00
	-	Accountant	(1)	420.00
	-	Sales Men	(3)	360.00
	-	Chemist	(1)	420.00
	-	Others	(12)	2,160.00
				4,440.00
D.	**MAINTENANCE AND REPAIRS**			1,830.00
	This is estimated at 3.0% of the cost of Plant and Machinery			
E.	**OVERHEAD COST** *(Estimated at 5% of the preceding cost of production)*			1,407.00
F.	Marketing Expense *(2% of sales values)*			1,800.00
G.	Depreciation (10%)			4,420.00
H.	Interest on Total Inv. (25%)			12,756.00
TOTAL COST OF PRODUCTION *(FIRST YEAR)*				**48,513.00**
TURNOVER (PER YEAR)				
300 MT of cornflakes at N300,000/MT				90,000.00
Profit before tax				41,487.00
Rate of Return on Sales				46.1%
Rate of Return on Total Inv.				81.3%
Break-Even point				39.6%
Pay back Period				1½year

7.0 FINANCING CORNFLAKES PRODUCTION

The following sources of finance for industrial ventures such as cornflakes production are available in Nigeria:

1. Bank of Industry (BOI)
2. Nigerian Agricultural Credit and Rural Development Bank (NACRDB). To take care of credit facilities for backward integration programme for sustainable raw materials (Maize) production.
3. Small and medium Industry Equity Investment Scheme (SMIEIS)
4. Commercial Banks, etc

8.0 NECESSARY APPROVALS

Companies willing to go into cornflakes production would in the first place have to obtain Certificate of Incorporation from Nigeria's Corporate Affairs Commission (CAC).

Cornflakes production involves the manufacturing of food for human consumption. So, as a food product, NAFDAC registration is imperative. It is therefore necessary to consult NAFDAC to find out the requirements for registration of a food product such as cornflakes. However, the processing and general factory infrastructures, environment and products must meet the NAFDAC's standard. It is advisable to seek and obtain NAFDAC's consent from the onset of factory installation to where the final product is released to the market. NAFDAC's approval certificate and stamp would therefore be imprinted on the products labels. The Standard Organisation of Nigeria (SON) certificate would also have to be obtained.

9.0 CONCLUSION AND RECOMMENDATION

Cornflakes production is a promising viable business considering the increasing rate of urbanizing and our penchant for fast foods. Moreover, the demands of children for breakfast cereals especially in preparation for school and even in leisure times made the cornflakes business a promising and worthwhile venture for consideration by any aspiring entrepreneur.

The technical, financial and viability of cornflakes production has been studied. The return on investment is quite feasible at over 81.3% per annum. The market prospect for the product is bright and there are positive and over-whelming indications for expansion. The raw material requirement are locally available.

Furthermore, as small scale cornflakes businesses emerge, there will be increase in demand for maize. This will imply maize being cultivated thereby creating employment opportunities in terms of backward integration and necessary linkages in the value chain.

The manufacturing process proposed for this project is very appropriate. A reputable company with a good track record would supply the machinery and equipment proposed.

The financial and economic analysis shows the viability of the project. Therefore the project is highly recommended for implementation in Nigeria by any willing investor. It is pertinent to note that this document is a pre-feasibility study on the manufacture of corn flakes and a comprehensive feasibility report is necessary for the establishment of the project.