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



*Dr. Abubakar Abdullahi*

## 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

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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. Moreover, 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 19<sup>th</sup> 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

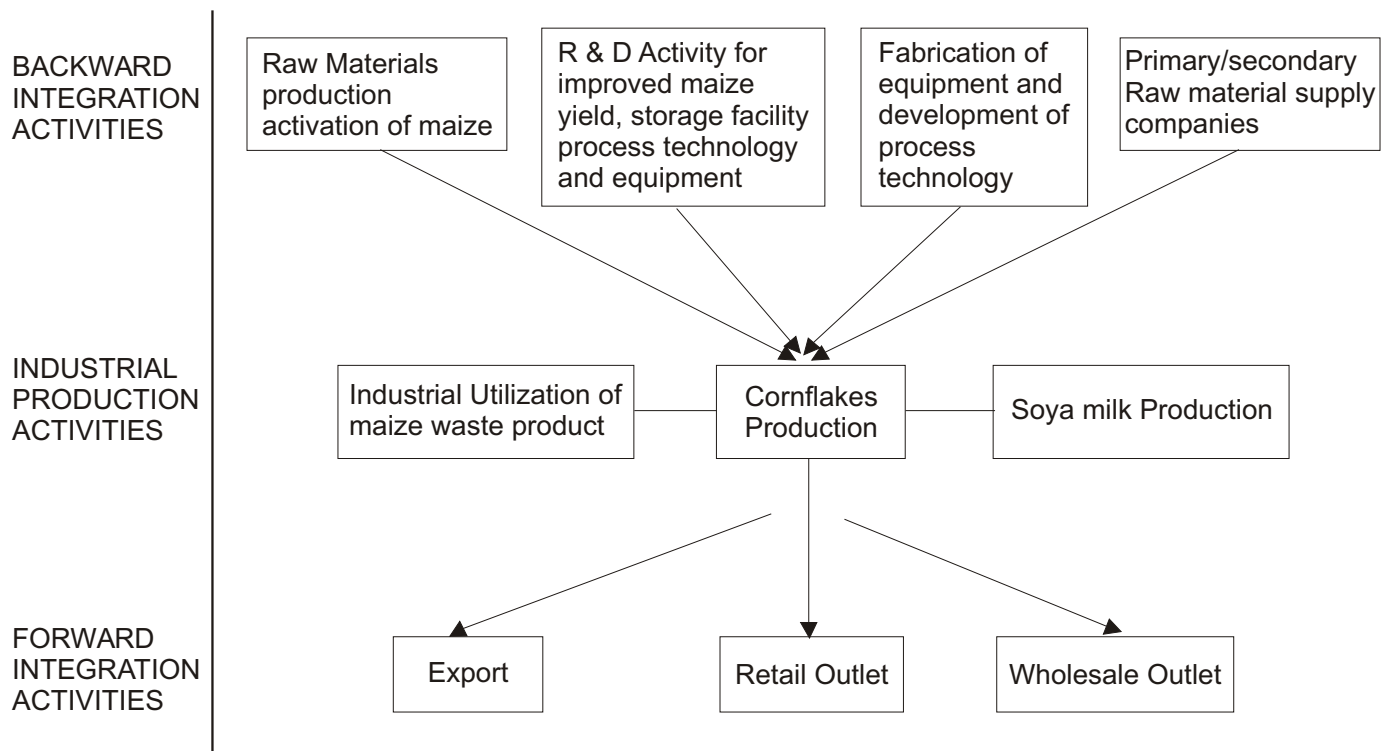
flakes production. This will help to reduce considerably the imported maize grains either in the form of rolled or flaked

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 31<sup>st</sup> 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.

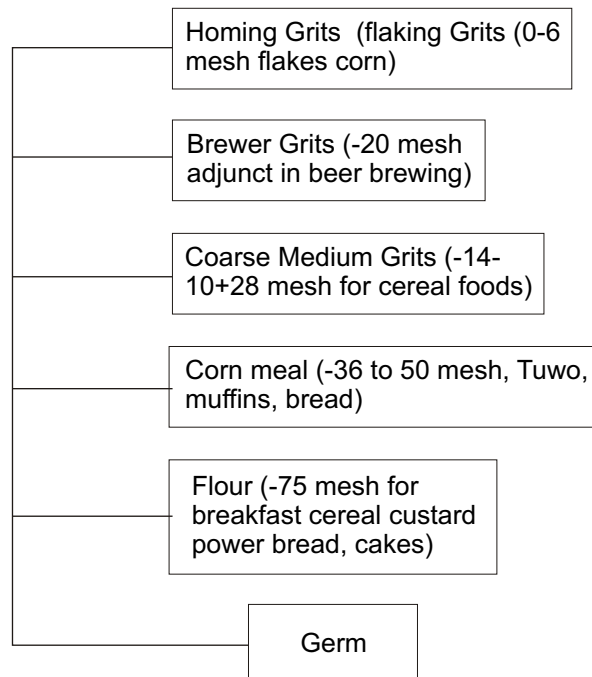
## 2.2 INDUSTRIAL LEVEL PRODUCTION ACTIVITIES

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.

### MAIZE GRAIN



**Figure 2.0** Industrial/Commercial Application of Maize Grain

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 polyethylene/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<sup>o</sup>c. 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

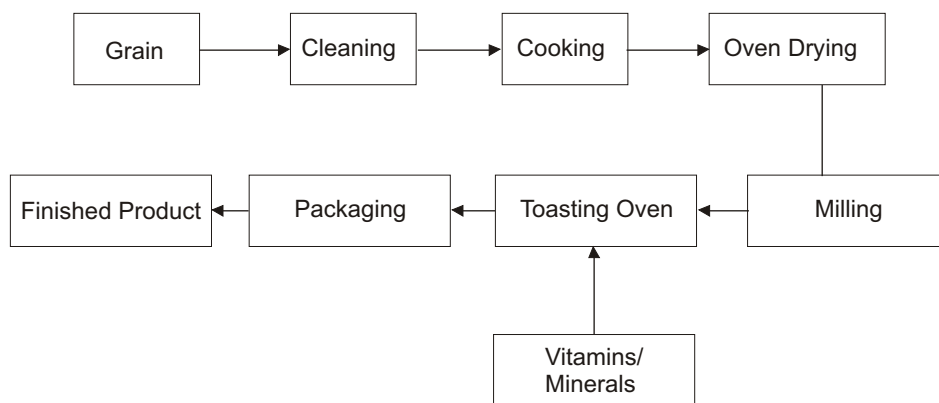
market in the West African sub-region. ECOWAS provides an economic integration programme, which would allow for easy marketing of the products in all Countries in the sub-region. Cornflakes production presents a good model for real sector development in Nigeria.

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	-
Panthenate, mg:	-
Phosphorus, mg:	-
Magnesium, mg:	-
Selenium, mcq:	-
Zinc, mg:	-
Manganese, mg:	-
Copper, mg:	-
Exchange:	1 <sup>1/2</sup> Carbohydrates

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

Milled corn, sugar, malt flavouring, high fructose 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<sup>2</sup>**  
**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%)	<u>4,020.00</u>
Sub-total	<b>44,200.00</b>
<b>WORKING CAPITAL (3 MONTHS)</b>	
- Raw Material	4,875.00
- Salaries	1,110.00
- Overhead	258.00
- Utilities	<u>590.00</u>
Sub-total	<b>6,825.00</b>
Total N44,200 + N6,825	<b><u>N51,205.00</u></b>
<b>FINANCIAL PACKAGE</b>	
<b>FIXED INVESTMENT</b>	
- Land and Building	13,700.00
- Plant and Machinery	13,000.00
- Miscellaneous	<u>17,520.00</u>
	<b>44,220.00</b>
<b>WORKING CAPITAL</b>	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%)	<u>1,300.00</u>
<b>Total</b>	<b><u>8,800.00</u></b>

<b>PRODUCTION COST (FIRST YEAR)</b>		<b>(N '000)</b>
<b>A.</b>	<b>Raw Materials</b>	
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	<u>7,500.00</u>
		<b><u>19,500.00</u></b>
<b>B.</b>	<b>UTILITIES</b>	
-	Power	360.00
-	Fuel	1,800.00
-	Water	<u>200.00</u>
		<b><u>2,360.00</u></b>
<b>C.</b>	<b>SALARIES AND WAGES</b>	
-	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)	<u>2,160.00</u>
		<b><u>4,440.00</u></b>
<b>D.</b>	<b>MAINTENANCE AND REPAIRS</b>	1,830.00
	This is estimated at 3.0% of the cost of Plant and Machinery	
<b>E.</b>	<b>OVERHEAD COST</b> (Estimated at 5% of the preceding cost of production)	1,407.00
<b>F.</b>	Marketing Expense (2% of sales values)	1,800.00
<b>G.</b>	Depreciation (10%)	4,420.00
<b>H.</b>	Interest on Total Inv. (25%)	12,756.00
	<b>TOTAL COST OF PRODUCTION (FIRST YEAR)</b>	<b><u>48,513.00</u></b>
	<b>TURNOVER (PER YEAR)</b>	<b>=====</b>
	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	1½ year

## **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.

# EMPLOYMENT CREATION AND OPPORTUNITIES IN THE MANUFACTURING SUB-SECTOR: THE CASE FOR NEEM TREE IN NIGERIA



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and Indonesia). It is now believed to have originated from Assam and Burma in India. According to FAO (1974), neem is now widely distributed in dry tropical climates all over the world. The tree can also do well in semi-humid tropical climate but is not suited to sub-desert or desert climate except under irrigation, particularly in the early time of its growth.

The minimum annual rainfall requirement of the tree is 450mm, while 600mm is optimum. It can grow satisfactorily under low rainfall conditions if the underground water depth is not more than 18 metres. Neem tree grows poorly in waterlogged soils and can stand draught and high temperatures as well. Although a wide range of soil conditions is tolerated, neem prefers a pH of 6.5 or higher. It can do well on sand, silt, and heavy clays and even on dry stony soils (FAO, 1974).

Neem tree was introduced to Africa during the early part of 19th century probably by Indian immigrants who brought the tree to Mauritius. It is now widely grown in the following African countries:

- . **BENIN**
- . **GUINEA**
- . **NIGER**

- . **BURKINO FASO**
- . **IVORY COAST**
- . **SENEGAL**
- . **CAMEROON**
- . **KENYA**
- . **SOMALIA**
- . **CHAD**
- . **MAURITANIA**
- . **SUDAN**
- . **ETHIOPIA**
- . **MOZAMBIQUE**
- . **TANZANIA**
- . **GAMBIA**
- . **MALI**
- . **TOGO**
- . **GHANA**
- . **NIGERIA**

## INTRODUCTION

**N**eem (*Azadirachta indica* A Juss) is an evergreen tree that belongs to the family, *Meliaceae* and is known by the botanical name *Azadirachta indica* A Juss. It is a fast growing tree, well adapted to semi-arid conditions and grows well on poor shallow stony or sandy soils where agricultural crops give low yields despite the application of fertilisers. The powerful and extensive roots of the tree enable it to thrive well on these soils (Ruskin *et al.*, 1992). The tree can grow up to 30m tall and 2.5m in girths. It begins to bear fruits after 3-5 years, becomes fully productive in 10 years and can produce up to 50kg of fruits annually up to the age of 100 years or more.

The exact origin of neem tree is uncertain. Some say it is a native of the whole Indian sub-continent while others attribute it to dry forest areas throughout South and South-East Asia (Pakistan, Srilanka, Thailand, Malaysia

In each case, it is found particularly in the drier, low lying areas. In Nigeria, the tree was first introduced in 1928, where it was successfully established in Borno Province. Several thousand seedlings from the first plantation in Borno were transplanted in Sokoto, Katsina and Kano Provinces in the 1930's. There are now millions of neem trees

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in the northern part of the country as they form the major vegetations in towns and villages in the region (Kumar, 1988).

## COMPOSITION OF NEEM

Neem contains several active ingredients, which act in different ways under different circumstances. Mode of action of the ingredients against pests includes working as growth-regulatory, antifeedant and repellent.

One of the first active ingredients isolated from neem is **azadirachtin**, which has proved to be the tree's main agent for battling with insects. It appears to cause 90% of the effect in most pests. This ingredient is so potent that a mere trace of it on plants prevents some insects from even touching such plants. On an average, neem kernels contain between 2 and 4 mg of **azadirachtin** per gram of kernels. The highest figure reported so far (9mg/g), was measured in sample from Senegal. Other ingredients, which are mainly concentrated in seeds, are **nimbin**, **nimbidin**, **salanin** and **meliantriol**.

Certain minor ingredients also work as antihormones. Research has shown that some of these minor neem chemicals even paralyse the swallowing mechanism and so prevent insects from eating (Jacobson, 1986). Example of these newly-found ingredients from neem include **deacetylazadirachtinot**. It is isolated from fresh fruits,

appears to be as effective as azadirachtin assays against the tobacco budworm (Jacobson, 1986).

## Uses of Neem Products

Neem products have a very wide application but the prominent and documented ones include the following:

### 1.0 As pesticide

Neem is far more than a tough tree that grows vigorously in difficult sites. Among its many benefits is the control of farm and household pests (Ahmed, 1985; Banjo and Mabogunje, 1999; Owolade and Osikanlu, 2000; Gahukar, 2000; Lale and Mustapha, 2000). Some entomologists now conclude that neem has remarkable power for controlling insects and have strong believe that it will usher in a new era as a safe natural pesticide. Extracts from its extremely bitter seeds and leaves may, in fact, be the ideal insecticides. As they attack many pestiferous species; they seem to leave people, animal and beneficial insects unharmed, they are biodegradable and appear unlikely to quickly loose their potency to a build-up of genetic resistance by pests. All in all, neem seems likely to provide non-toxic and long-lived replacement for some of today's most suspect synthetic pesticides (Ruskin *et al.*, 1992).

Researchers at the U.S. Department of Agriculture have been studying neem since 1972 (Ruskin *et al.*, 1992). In one of the laboratory

experiments, it was found that the plant's ingredients foil even some of the most voracious garden pests of America. For instance, in one trial, each half of several soybean leaves was sprayed with neem extracts and placed in a container with Japanese beetles. The treated halves remained untouched, but within 48 hours, the other halves were consumed right down to their woody veins. In fact, the Japanese beetles died rather than eat even tiny amount of neem-treated leaf tissue (Ruskin *et al.*, 1992). In another test in Ohio, soybeans sprayed with neem extract stayed untouched up to 14 days while untreated plants in the same field were chewed to pieces by various species of insects seemingly over night (Ruskin *et al.*, 1992).

### 2.0 As medicinal

Since antiquity, neem has been renowned for healing and the tree, therefore, commands a special status particularly in the Indo-Pakistan region where it is regarded as the "Village dispensary". Leaf juice and decoction which possess anthelmintic, antiseptic, diuretic, emmenagogic, emollient and purgative properties, are also used traditionally for the treatment of eczema and ulcers. Leaves and flowers are applied as poultice to remove boils and to treat headaches. The bark, which has antiperiodic and astringent properties, is used for treating fever, leprosy and scrofula (Ruskin *et al.*, 1992). Neem oil is traditionally incorporated in medicinal hair oils and also used for the



treatment of rheumatism.

Practitioners of the Indian Ayurvedic medicine system have been preparing the neem in oral doses for malarial patients for centuries. Neem's antimalarial activity was reported in Ayurveda books as far back as 2000 B.C. (by Charaka) and 1,500 B.C. (by Sushruta). Even outside India, in Nigeria and Haiti, for example, neem-leaf tea is used to treat malaria.

Certain extracts of neem leaf and neem seed have been proved effective against malaria parasite (Dhar and Zhang, 1998). A compound, **gedunin** is another limonoid found to be as effective as quinine on malaria-infected cell cultures (Khalid *et al.*, 1986; 1989). In another development, it was reported in India that components of the ethanol extract of neem leaves and seeds were found effective against chloroquine-sensitive and chloroquine-resistant strains of the malaria parasite (Badam *et al.*, 1987). Although all the different extracts tested suppressed the growth of parasites within 72 hours, the most potent were the ethanol extracts of neem leaves and the medium-polar extracts of neem seeds (Badam *et al.*, 1987)

### 2.1 As fungicide

Neem preparations have proved effective against fungi (Dubey, 1998; Das and Kumar, 1999; Sindham and Hooda, 1999). Laboratory study conducted by Khan and Wassilew (1987) has shown that neem preparations caused

toxicity to cultures of 14 common fungi that infect the human body. They included members of the following genera:

- Trichophyton: an "athletes foot" fungus that infect hair, skin and nails;
- Epidermophyton: a "ringworm" that invades both skin and nails of the feet;
- Microsporum: a ringworm that invades hair, skin and (rarely) nails;
- Trichosporon: a fungus of the intestinal tract;
- Geotrichum: a yeastlike fungus that causes infections of the bronchi, lung and mucous membranes; and
- Candida: a yeastlike fungus that is part of the normal mucous flora but can get out of control, leading to lesions in mouth (thrush) vagina, skin, hands and lungs.

### 2.2 As antibacterial agent

Neem oil was reported (Schneider, 1986) to have suppressed *Staphylococcus aureus*, a pathogenic bacterium and a common source of food poisoning and many pus-forming disorders (for example, boils and abscesses). The bacterium also causes secondary infections in peritonitis, cystitis, and meningitis. In a similar development, *Salmonella typhosa*, the much-feared

bacterium, which lives in food and water causing typhoid fever, food poisoning and a variety of infections, was suppressed by application of neem seed oil (Patel and Trivedi, 1962).

### 2.3 As antiviral agent

In India, there is much interesting but anecdotal information attributing antiviral activity to neem. Its efficacy particularly against pox viruses is strongly believed, even among the medical personnel. Smallpox, chicken pox, and warts have traditionally been treated with a paste of neem leaves - usually rubbed directly onto the infected skin (Rao *et al.*, 1969). Experiments with small pox, chicken pox and fowl pox suggest that there may be a true biological basis for this practice. Crude neem extracts were found to have absorbed the viruses; effectively preventing them from entering uninfected cells (Rao *et al.*, 1969; Rai and Sethi, 1972). Unfortunately, no antiviral effects were seen once the infection was established within the cell. Thus the neem was effective in prevention, but not cure.

### 3.0 As dental care agent

Millions of people in India and Africa use twigs as "toothbrush" every day. Dentists have endorsed this ancient practice, finding it effective in preventing periodontal diseases (Elvin-Lewis, 1980; Henkes, 1986). It is unclear whether the benefit is due to regular gum massage



or preventing plaque building or due to neem's inherent antiseptic action or all the three.

A German company uses neem (extract of bark) as the active ingredient in toothpastes and other oral hygienic preparations. The company claims that its test proved neem bark to be highly effective in preventing and healing gum inflammations and periodontal disease.

#### 4.0 As birth control measure

Scientists at India's Defense Institute of Physiology and Allied Sciences (DIPAS) have isolated a neem oil extract (NIM 76) that they believe can be refined into a new birth control product (Ruskin *et al.*, 1992). Neem oil *in vitro* proved to be a strong spermicidal agent. Rhesus monkey and human spermatozoa became totally immobile within 30 seconds of contact with undiluted neem oil (SaiRam and Ilavazhagan, 2000)

*In vivo* studies in rats (20), rabbits (8), rhesus monkeys (14) and human volunteers (10), have proved that neem oil applied intravaginally before sexual intercourse prevented pregnancy in all the species (Sinha *et al.*, 1984). In a related development, neem oil was reported (Upadhyay *et al.*, 1990) to have a long-term and reversible blocking of fertility after a single intrauterine application. In a study they conducted, female Wistar rats of proven fertility were given a

single dose (100 U1) of neem oil by intrauterine route; control animals received the same volume of peanut oil. Whereas all control animals became pregnant and delivered normal litters, the rats treated with the neem oil remained infertile for variable period ranging from 107 to 180 days even after repeated mating with males of proven fertility. The block in fertility was, however, reversible as half of the animals regained fertility and delivered normal litters five months after treatment, without any apparent teratogenic effects

Male antifertility activity of neem product was also studied in mice, rats, rabbits and guinea pigs by daily oral feeding of a cold-water extract of fresh green neem leaves (Sadre *et al.*, 1983). The infertility effect was seen in treated male rats, as there was 66.7% reduction in fertility after 6 weeks, 80% after 9 weeks, and 100% after 11 weeks. During this period, no decrease in body weight or manifesting toxicity was observed. There was a marked decrease in the mortality of spermatozoa. The infertility in the rats was not associated with loss of libido or with impotence and the animal maintained normal mating behaviour. The male infertility activity was however reversed four to six weeks after the treatment was discontinued (Sadre *et al.*, 1983; Aladakatti and Ahamed, 1999).

#### 5.0 Neem Products as Nitrification Inhibitors

Long before the introduction of chemical fertilisers, neem (*Azadirachta indica* A Juss) based cakes were used as organic manures in agriculture. Dhillon and Khajuria (1996) observed that neem base cakes have tremendous potential to improve the nitrogen use efficiency from its current low level of 20 to 40%. Mishra *et al.* (1975) also reported that following the application of margosa (neem) seed cake (MSC) powder at rates equivalent to 0.02, 0.05, 0.1, 0.2, 0.5 and 2.0% C to soils amended with  $(\text{NH}_4)_2\text{SO}_4$  as a source of nitrogen, nitrate formation was delayed. They recommended the addition of MSC at 0.2% C rate to reduce nitrogen loss through leaching and also to assist in building up organic matter in the soils.

Singha, (1984) showed that application of neem cake along with urea considerably increased nitrogen use efficiency of wheat crop. The beneficial effect of the neem cake was ascribed to its ability to slow down urea hydrolysis and extend the period of nitrogen availability to growing crops. This, according to him, could also reduce malignant effects of ammonium accumulation on growing crops. Similarly, Singha *et al.* (1984) showed that neem seed oil coated urea produced better

maize yield than uncoated urea.

Bains *et al.* (1971) in field trials in India, found that an acetone extract of neem kernel was an excellent nitrification inhibitor, even better than sulphur-coated urea. Ammonia volatilisation, urea hydrolysis and leaching which all contribute to losses of applied urea were all reduced when urea was blended or coated with neem seed cake.

In a related study, Ibrahim (2004) also found that coating of urea with neem kernel powder increased its efficient utilisation which resulted in significant increase in maize grains yield and also eliminated the need for second application of urea during the growing period.

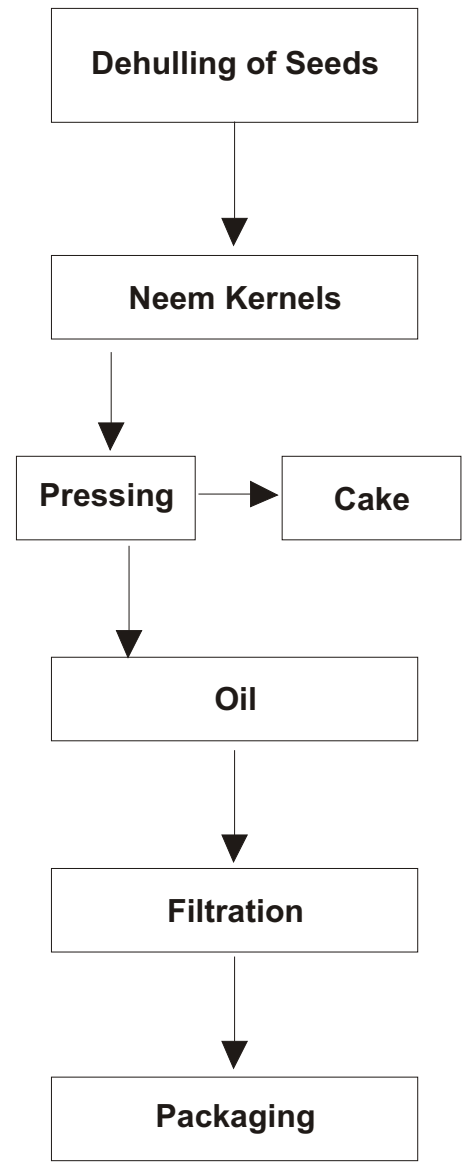
Ready to use substances derived from neem, as urea-coating agents are now commercially available in India. The most common are Neemagold (Shri Mangalam Agro Tech Ltd, Varanasi, India), Nimco (containing 5% neem bitter tetranortriter penoids). Application of these products (Neemagold and Nimco) as coating materials (Neemagold at 500g with 50kg-1 urea and Nimco at 1000g with 50kg-1 urea) increased significant the rice grain yield, plant height, number of tillers and N-uptake by grains, compared to uncoated urea (Singh and Chandel, 2000).

**INVESTMENT POTENTIALS**

Judging from its wide applications enumerated above, neem tree has tremendous investment potentials especially in pesticide, medicinal and fertiliser formulations in Nigeria. There is also great export potential especially in the production of neem oil, which has application in soap, cosmetics and health care industries.

There are many neem tree plantations particularly in the northern part of the country. Both the State and Federal governments have, for a long time, been establishing neem tree plantations in desert prone states to reduce desert encroachment. Recently, the Federal government has set up a task force on the exploitation of this great tree potentials and has further directed the governors of the desert prone states to raise millions of neem seedlings for the establishment of more plantations to guarantee steady supply of raw materials for the intended industries.

Although there are numerous investment opportunities in neem, the focus of this write-up is mainly on neem oil production for both local and export markets. The flow diagram for the production of neem oil is presented in Fig. 1 and is followed by the financial analysis on the project.



*Fig. 1 Flow diagram for the production of neem oil*

## FINANCIAL ANALYSIS ON PROFILE FOR NEEM SEEDS PROCESSING

### CAPACITY

The intended capacity is 3000mt Neem seeds per annum

INVESTMENT	AMOUNT (N'000)
Fixed cost	
Land and building	3,000.00
Machinery and equipment	4,000.00
Utilities	1,000.00
Process Vehicle	500.00
Preliminary & Pre-operational Expenses	200.00
Contingencies (10%)	870.00
	<u>9,570.00</u>
	=====

### Working Capital (3months)

Raw Materials	2,175.00
Salaries & Wages	543.00
Utilities	513.00
Working Capital Total	3,231.00
Total Project	12,801.00

### Cost of Production (1<sup>st</sup> Year)

#### (a) Raw Materials

(i) 3000 Mts of Neem Seeds	1,500.00
(ii) Packaging materials 60,000 pieces of 20 litres jerry can at N120 per piece	8,700.00

#### (b) Utilities

Power	1,000.00
Water	200.00
Fuel	850.00
Total	2,050.00

#### (c) Salaries & Wages

General Manager (1)	360	
Managers (2)	480	
Skilled Workers (4)	480	
Unskilled Workers (10)	720	
Others (4)	432	2,472.00

(d)	<b>Maintenance &amp; Repairs</b> This has been estimated at 3% of the cost of direct fixed cost	255.00
(e)	<b>Overhead Cost</b> This is estimated at 0.7% of processing costs	99.00
(f)	<b>Marketing expenses</b> This is estimated at 0.5 of revenue	441.00
(g)	<b>Depreciation</b> This is estimated at 10% of fixed costs	957.00
(h)	<b>Interest on total investment</b> This is estimated at 25% of 70% of Total Investment	224.00
	<b>Total Production Cost</b>	<b>16,914.00</b> =====
	<b>TURNOVER (REVENUE) 1ST YEAR</b> 1200 TONS OF OIL (40% YIELD) AT N29,500\TON	88,200.00
	Profit	71,286.00
	Return on Total Investment	556.9%
	Return on Sales	80.8%
	Return on Equity	1856.4%
	Break Even Point	13.2%

## **CONCLUSION AND RECOMMENDATION**

From the financial result of the above analysis, the project is economically viable and technically feasible. Neem Seeds as Raw Materials is in abundance and can be sourced at lower cost than estimated since no established outfit is currently utilizing it in the country. Market is available and the processing technology is simple as seed oil extraction is not a new technology in the country.

## EMPLOYMENT GENERATION AND OPPORTUNITIES IN THE MANUFACTURING SUB - SECTOR: THE CASE FOR THE MANUFACTURING OF FARM IMPLEMENTS



PROF. I. I. IHINODU

BY  
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issue is how to make agriculture continue to make significant contributions to the economy.

An important aspect of agricultural role is its factor contribution in terms of capital and labour transfer to other sectors of the economy. The potential of the sector as a major source of capital formation was well demonstrated right from the 1940s through the then marketing/commodity boards. In fact the various reforms of the boards confirmed that role. The role of facilitating labour transfer to other sectors is a two-edged sword and therefore not usually emphasized (Ihimodu, 1993). This is because the sector is still expected to perform the role of an employer in the ever growing labour market. All the same, labour has continued to move away from agriculture. Perhaps what we might need to focus is how to make agriculture attractive to those who remain in the sector, attract others outside it as well as provide alternative activities within the sector.

The modernization of agriculture has the potential to achieve the various objectives of creating employment, increasing productivity and output in both the sector and the entire economy, thus

contributing to the food security goal of the government. Agricultural modernization can be achieved through the application of modernized (mechanized/semi-mechanized) implements/ equipment. The domestic manufacturing of the implements rather than importation becomes imperative if the objectives are to be achieved.

This paper aims primarily at examining the prospects as well as the processes of manufacturing agricultural implements with a view to encouraging small/medium entrepreneurs to engage in the ventures. In section II the manufacturing activities are examined. Section III analyses the role which governments should play as well as highlighting the potential benefits of the enterprises. The final section concludes the paper with some recommendations.

### II MANUFACTURING OF FARM IMPLEMENTS

#### i. Types of Technology

Agricultural machinery and equipment are a major input in agricultural mechanization development. These implements range from those for land preparation, processing to basic farm

### INTRODUCTION

The Nigerian authorities are very much concerned about the agricultural sector because of its role in the growth and development of the economy. Its contributions have been manifest in the areas of Gross Domestic Product (GDP), employment generation, export and foreign exchange earnings, food security, etc. Before the oil boom of the 1970s, the sector had often been described as the mainstay of the economy. However, from the 1980s, there has been some significant decline in the various contributions of the sector. But, in response to the various policies embarked upon by government, the sector appears to be making the expected turn around. Between 1998 and 2002 for instance, the sector contributed an average of 40.5% to the GDP, which is a dramatic improvement over the contributions during the mid 1980s to mid 1990s. A major

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power. Agricultural implement manufacturing therefore offers what can be called appropriate farm technology for the country. It is therefore a step in the mechanization of the sector and the industrialization scheme of the nation.

The establishment of manufacturing units of farm machinery of various categories has created some employment and increased the incomes of the people as may be expected. The products of these manufacturing industry range from simple spades, hoes, cutlasses, shovels, to medium size power shelling and processing machines, dryers and storage equipment. It is important to note, however, that manufacturing of simple equipment should be more of priority to farmers now than the heavy agricultural equipment. This is because of the level of knowledge of farmers, the size of farm holdings, the fund to purchase the equipment, etc.

Observations of the manufacturing technology units currently in operation in Nigeria, which is similar to those of other developing countries, can be classified into the following three categories based on what is called technology levels.

Table 1 presents detailed characteristics of the three levels while Table 2 shows the techniques adopted, the materials used and the products of the three levels.

### - **Technology Level I**

This is a family type, worker/owner enterprise usually engaging not more than 5 persons, most of whom are family members who receive no wages. These actors are referred to as blacksmiths or roadside manufacturers. At this level, agricultural equipment are manufactured manually with little or no application of power tools or machinery. The products are simple agricultural hand tools and hand operated implements. Owners are local blacksmiths. Their small workshops are scattered all over the country. Ironically, not much attention has been paid to this category of operators in Nigeria unlike in other developing economies in Africa, Asia and Latin America.

### - **Technology Level II**

These are small scale/cottage manufacturing level operators. They employ between about 5 to 15 persons. Here, manufacturing of agricultural equipment is carried out mechanically or on a production line. The products are medium to large volume hand tools and simple equipment such as pumps, mills, grinders, crop protection equipment, hand operated threshers and shellers. Most of the units are located in urban and semi-urban areas and in industrial estates. This level appears to be capturing the attention of self-employment projects such as the National Directorate of Employment (NDE) programmes.

### - **Technology Level III**

These are medium/large scale manufacturers also called establishment manufacturers. They employ more than 15 persons, sometimes as large as 100 persons. Conventional, semi-automatic and automatic tools are used in the manufacturing process. Most of the units are sited in or near big cities and in industrial estates. There are not many of these establishments in Nigeria today, except those established by large companies.

Table 1 summarizes the various characteristics of each of the technology levels of indigenous manufacturing in Nigeria. The technology levels are categorized using the number of workers employed, the space occupied or workshop space, the equipment used and the output of the process. The predominant technology used in Nigeria is technology level I, the small scale roadside manufacturing unit technology. This is understandable given the skills required, equipment, raw materials needed, and other facilities. In addition, the capital required is a critical constraint that limits the scale of operation. Table 2 describes these requirements.

The Nigerian agricultural manufacturing industry is biased towards the production of processing equipment. Less attention is paid to land preparation and production protection equipment. The land preparation equipment produced are limited to simple



hand tools like hoes, cutlasses, shovels, spades, etc. Only large companies such as the John Holts Agricultural Engineering Company produce large equipment such as animal drawn implements and tractor drawn disc ploughs, harrows, etc. The companies import the materials and assemble the land preparation and crop production equipment.

## ii **The Capital Outlay**

The capital required for manufacturing agricultural implements would depend on the technology levels as indicated in Table 1. This would also vary according to the size of the production unit and the production process adopted. However, using information contained in Tables 1 and 2, the costs would range from a few hundred of thousand to several million Nairas. These costs can always be ascertained from reputable agricultural technological engineering companies. With higher levels, no single manufacturer would be expected to procure all the machinery required in the manufacturing of agricultural implements. It is expected that different manufacturers would specialize in the production of various parts of the equipment. These parts can then be procured and assembled.

## iii **Manpower Requirement**

As in the case of capital outlay, the manpower required would depend on the technology level which determines the sophistication

of the machinery. For example, for all the levels, there is the need for agricultural engineers, except for level I where only skilled artisans may be required. There is need for various grades of technologists, fabricators and unskilled labour. The number of staff required depends on the volume and types of the products. The services of these skilled labour can however be obtained on hiring basis. Table 2 shows the required manpower for each technology level.

## iv **Land/Workshop Space Requirement**

This requirement is a function of technology level, type and volume of production. In Table 1 the different space requirements are shown for the different technology levels. A good plan layout would save floor space, shortens the travel/movement of materials within the workshop, increase output and minimize costs. It would be important to also provide for smoke/dust removal from the workshop while a store for work tools and raw materials would also be required.

## v **Sources of Raw Materials**

Manufacturers of agricultural equipment depend on raw materials such as flat sheets, rods, angle-iron, electrode, etc. to produce machines and tools. The major determinants to be used in the production process are machine design, capacity to utilize particular materials, location from the source of raw

materials, etc. It is important to note that while steel rolls, angle-iron and flat bars are produced in Nigeria, iron sheets are imported. This makes the materials highly costly as the prices are denominated in foreign currencies.

## vi **The By-Products**

The by-products from agricultural implement manufacturing industry are mainly metal chips and iron filings. These can, however, be recycled if the facilities exist. Therefore the level of waste is minimized.

## vii **Target Market**

For a considerable period of time to come it would be difficult to meet the domestic market for the products of this sub-sector, especially those of technology levels I and II. With government emphasis on agriculture, it is expected that the agricultural sector would be attractive to young people who would require simple machinery. The National Directorate of Employment (NDE) would provide some market for the products. The industry is also capable of serving the neighbouring West African countries but the domestic market would take a long time to be saturated.

## viii **Profitability**

With the growing population and the need to feed that growing populace in the face of limited large mechanized agriculture, it can be safely assumed that investment in the

manufacturing of small and medium scale agricultural machinery would be profitable. All that might be required is conducive environment for participating in the enterprise. This could be provided by both the public and private sector organizations/institutions.

### ix **Necessary Approvals**

As in the case of any business enterprises in Nigeria, anyone or organizations wishing to engage in the manufacturing of agricultural implements must be registered by the appropriate authority. The registration is usually done by the Corporate Affairs Commission (CAC). In addition, the products must be approved and certified as meeting the stipulated standard. The National Centre for Agricultural Mechanisation (NCAM) is the body charged with the responsibility for certifying the standard of agricultural tools and machinery in Nigeria. Prospective entrepreneurs would need to consult the Centre for necessary certification.

### **III THE ROLE OF GOVERNMENT**

Government has an important role to play in the development of agricultural implement manufacturing in Nigeria. This is because of its focus not only on industrial development of the country but also its emphasis on agriculture, food production, food security and employment generation. While agricultural implement manufacturing is an aspect of

industrial development, it also has the potential and capacity to increase agricultural production generally and food production in particular. Therefore, it can achieve the current government policy of food security. It can also generate substantial level of employment especially of fairly skilled labour.

Government role in agricultural implement manufacturing can be exercised in some major areas, namely, at the research policy level, funding, employment generation and marketing. Therefore government should put in place a research policy that focuses on the development of small farm implements. It is observed that most research efforts have, up to now, been concentrated on large scale farms and equipment such as tractors, bulldozers, etc, to the detriment of the small farmers and simple farm implements. Ironically, the small farmers dominate the Nigerian agricultural landscape and would continue to do so for a long time to come. Both the public and private institutions charged with the responsibility for research and design of small farm implements would need to be adequately funded. This would ensure that they are able to acquire the necessary equipment, train their staff and reward them appropriately to achieve their mandate. A scheme of transferring the knowledge to individuals and small organizations through training and apprenticeship could also be incorporated into the system by government. The registration and

standardization scheme for agricultural machinery should be publicized. As of now, it would appear that very few individuals and organizations are aware of the policy. The organization charged with that responsibility should be more visible than it has long been.

In order to accelerate the development of the sub-sector, government policy may at some point include a ban on the importation of some farm implements like hoes, cutlasses, rakes, shovels, etc. Although this may be seen as an incentive for developing the domestic capacity, it should evolve after ensuring that the existing production units have the capacity for meeting a substantial portion of the domestic demand for the products.

Funding of the ventures is a critical factor in the development of the sub-sector. It may not be expected that government would provide funds for the purpose directly. However, there are several avenues by which the government could intervene. Some of the public financial institutions could be mandated to allocate some proportion of their resources to finance the sub-sector. The institutions that come to mind include the Nigerian Agricultural Cooperative and Rural Development Bank (NACRDB) and the Bank of Industry (BOI).

Government can reduce the costs of operation in the sub-sector. The Nigerian steel complex could be made to produce appropriate steel materials, e.g. flat sheets

through the intervention of government. This would reduce cost as the raw materials would be sourced locally. One major reason why most of the existing manufacturing units are located in the urban areas is lack of development of the rural areas. For example, infrastructures like motorable roads, water supply, electricity, etc, are grossly in short supply if not totally absent in such areas. If attention is paid to providing these facilities in the rural areas, many of the enterprises would be sited there as the costs of production would reduce substantially. Marketing of the products of the manufacturing units does not seem to pose any difficulty for now. However, other potential markets could be explored. The NDE could be explored as a potential market. Since a large proportion of the participants in the programme focus on agro-based enterprises, they could be encouraged to have interest in the products of the manufacturing units. Markets could also be explored beyond the shores of Nigeria especially within the West African sub-region. This could be sought using diplomatic initiatives and through the various chambers of commerce in the different countries. Employment generation is a significant objective of government policy in Nigeria. There is hardly any policy initiative or reform being undertaken that does not have implications for employment generation, directly or indirectly. The volume of employment that can be generated by the industry is determined by the size and

number of the industrial units. As it has been observed in most business concerns in Nigeria, the small and medium size enterprises tend to generate very large volume of employment on the aggregate. It is therefore assumed that substantial employment can be generated by the sub-sector. Government should therefore be aware of this potential that can achieve one of its cardinal development objectives.

#### **IV CONCLUSIONS**

This paper examines the prospects of attracting entrepreneurs into the agricultural implement manufacturing enterprises because of the potential benefits for the promoters and the economy at large. Given the stage of development where agriculture has to be modernized to meet the food and raw material needs of the economy, the prospects for agricultural implement manufacturing cannot be in doubt. Similarly, the potential for employment generation appears to be fairly high, as show by the experience of other small and medium scale enterprises.

It is important, however, that favourable environment be provided for the enterprises in the sub-sector. These include access to fund in the public and private sector finance houses, domestic production of the relevant steel materials from the steel complex, appropriate guidelines to maintain standards, market accessibility, among others. Government intervention may also be required to protect the

market against cheap importation of the products.

**Table I: Characteristics of the Three Technology Levels of Indigenous Manufactures in Nigeria.**

S/No.	Criteria For Categorization	Blacksmith/Roadside Manufacturer (Technology Level I)	Establishment Manufacturer (Technology Level II)	Establishment Manufacturer (Technology Level III)
1.	Staff	One skilled artisan with apprentices	One experienced technologist, a range of skilled and unskilled labour. At least one administrative Staff	At least one qualified and highly experienced engineer/technologist, one supervisor and a range of skilled and unskilled labour.. A range of administrative staff
2.	Space	Single room for workshop. Frontal exhibition of product and scraps of materials.	Enough for workshop, showroom, and administration. Storage usually open yard	Large enough for distinct workshop, showroom, storage and administrative office. Usually self contained with walled compound.
3.	Equipment	May have electric power driven tool in single phase only. No form of precision work undertaken.	Electric power driven equipment available and basic workshop tools. Precision work usually contracted out.	Electric power driven equipment, basic workshop tools and machines for precision work.
4.	Production output	Small number of single machines, usually copied. Turn over, a few thousand Naira.	Products are of good quality, large number of simple machines. Turnover above. N200, 000.00.	Products are of high technical quality based on drawings. Evidence of research and development, and after service. Turnover, about one million Naira.

**Table 2: Techniques Involved, Materials used and Products in the Three Technology Levels**

Types, Processes/ Products	Technology Level I	Technology Level II	Technology Level III
Machinery	Small hand tools hammer, chisel, hacksaw, small coal fired furnace, pedal operated grinding wheel, welding, bending and drilling equipment.	Power operated drilling machines, milling and grinding machines, electrical and gas welding sets, electrical, coal and gas fired furnaces, hand operated roller and bender.	Drillers, multispindle drillers, milling machines, power forges and hammers, boring machines, threshing and tapping machines, gear cutting, heat treatment machines.
Facilities	Limited supply of water and electricity.	Adequate power and water supply.	Adequate power and water supply
Materials used	Mostly mild steel-EN series, occasional MS steel, round and angle section.	Various grades of casting and steel galvanized MS sheet, round, flat angle, springs and bearings (mostly imported)	Special high carbon steel and spring steel, bearings, breaks, wheels, hydraulic system hardware instruments.
Material Processing	Carburizing, hardening and tempering is not used for lack of appropriate steel and facilities.	Heat treatment facilities are used, scientific carburizing and hardening.	Carburizing and nitriding for cast hardening, trough hardening and tempering, etc.
Products	Spades, shovels, spading forks, digging hooks, hoes, animal drawn equipment.	Animal drawn implements, ploughs, tillers, hoes, diggers, sprayers, manually operated processing machines, power driven processing machines e.g. cassava grater.	Power combination machines, power trifiers, furrow disc ploughs, pumps, seed drillers, storage bins, threshers, etc.
Quality Control	Non-existing, conventional ruler is used for measurement	There is inspection system, micrometers, height gauges, clippers. etc.	Special sections with precision equipment, visual, optical and electronic inspection equipment.

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## EMPLOYMENT CREATION AND OPPORTUNITIES IN THE MANUFACTURING SUB-SECTOR: THE MILLINERY INDUSTRY IN NIGERIA



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Nigerians; a sizeable number of people would still go any length to over-indulge their sense of fashion, of this category are the hats lovers who now have a wide range of both imported and locally produced hats.

functioned along colonial sentiments. Much of it were imported into the country from United Kingdom and the United States of America. The first attempt at creation saw the imported hats undergoing slight modifications especially in the area of accessories. Perhaps, to reflect our characteristic flamboyance, these imported hats were decked with synthetic rose flowers and hand-made bows. Then beading, which was first lifted from the orients and adapted locally, took the center stage. Now feather accessory have become the vogue, and promises to remain so for a long while to come. The simple practice of enhancing the "raw" imported hats with elaborate decorative accessory, accounted for the vast stock of allied millinery accessory that has flooded the markets. This position has not changed, rather there has been a rapid spread of interest for hat making amongst established fashion houses who felt they could add the millinery tentacle to their venture. Those of us in the front line, have stayed on course by the rigour of hard work and innovative creativity. Any body can learn hat making skills and procedure but sustainability in the millinery industry is a function of creativity, foresight and artistic venturesome-ness. At Graces Hats we produced what was popularly referred to as fabric hats, more than ten years ago.

### INTRODUCTION

The critical factor of dwindling economic power has not in any way diminished the informed conclusion based on general observation that Nigeria is a "high fashion nation". Phrases like "fashion conscious" and "fashion crazy" are frequently used to portray the total commitment of the average Nigerian to display more than average sense of fashion. The social bubble occasioned by the obnoxious weekend parties especially in our big cities has created a fashion "madness" that has become like an unquenchable fire. It is estimated that a vast chunk of the nation's populace must attend at least one party per week. The irony is that most of the fashion and accessory displayed by the fun-seeking crowd may not have been paid for. In these days of "tokunbo boom" when even the obnoxious second hand wears like shoes, bags, clothing, have gone out of the reach of most

### 1. THE ESTABLISHMENT OF MILLINERY FACT- ORY IN NIGERIA

I can authoritatively say that, the millinery industry, as we know it today in Nigeria was non-existent until 1980. It was about this time that I stumbled into the millinery venture. People around me discovered that I had an unusual talent of lumping materials together to come out with graceful designs that have such style that many of my friends wouldn't attend the weddings without consulting me. There are many potential hat designers on the prowl today looking for an enabling environment to launch out. I am hoping that this modest article would be helpful to these talented individuals.

While mainstream millinery industry could be said to be fairly new in Nigeria, it would be wrong to give even the slightest suggestion that Nigerians are new to hats. Before the advent of the current millinery effort in Nigeria, the hat fashion

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