



FOOD RESEARCH INSTITUTE
(Council for Scientific and Industrial Research)

DIRECTORY OF PROJECT PROFILES ON
PRODUCTION UNITS FOR SOME
GHANAIAN FOODS

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GHANA

VOLUME. 1

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PRODUCTION UNITS FOR SOME
GHANAIAN FOODS

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VOLUME. 1

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All the staff of the Food Research Institute who have developed products whose profiles are included in this directory.

FOREWORD

The Food Research Institute (FRI) was established by the Government of Ghana as part of the Council for Scientific and Industrial Research (CSIR). The Institute among other things, has the objective of "carrying out a co-ordinated programme of applied research in the storage, processing, preservation, marketing and utilization of foods with the aim of contributing towards the development and improvement of Ghana's food industries and increasing agricultural productivity".

In line with the above objective, the Institute has developed, through research, various methods of processing and preserving some Ghanaian foods in order that their manufacture can be industrialized. This will create the opportunity for investment in local food industry by entrepreneurs thereby leading to further development in this important area of economic activity.

The profiles of the manufacturing units for these newly developed methods of processing and preservation have been compiled into a Directory of Project Profiles on production units for FRI developed products. It is hoped that these profiles will constitute yet another avenue of introducing research results to industry and the public. This will help bridge the information gap between research institutions and the user agencies.

Essentially, the objective of the directory is to introduce the developed methods of processing and preservation of some Ghanaian foods to the prospective small scale investors.

The general approach of this directory (following the outline of the ECA directory of project profiles for small scale industries) is to indicate to the prospective entrepreneur the basic requirements essential when considering the establishment and successful operation of any of the manufacturing units on the small scale.

The directory provides information on the major machinery and equipment required to undertake the production process. It also provides a brief information about the production process. Besides, it gives an indication of the minimum cost (in cedis) required to establish each of the manufacturing units. These costs have been estimated at 1992 prices. Furthermore, it provides information on the sources of raw materials, machinery and equipment.

Although there has not been any econometric estimation of the potential market for the product, the directory gives an indication of the available and potential markets (both local and foreign) for the products.

It must be clearly emphasised that no attempt has been made to indicate the financial profitability/viability of the production units. In addition, technological details relating to the production process have also not been provided.

The directory envisages that potential investors will contact the Food Research Institute for the technological details, and if necessary, a full scale feasibility analysis of any of the production units to be established.

It is the view of the FRI that this directory will serve its purpose of providing valuable information to potential small scale entrepreneurs. Any suggestions which will help improve the directory of project profiles will be most welcome.

Director.

COWPEA FLOUR PRODUCTION UNIT

Cowpea is an important grain - legume consumed throughout Ghana. It may be boiled whole and eaten with staples or it may be soaked in water, dehulled and ground into paste for preparing traditional dishes. This traditional method of processing cowpeas employs a laborious and time consuming process which results in the production of a perishable moist meal. The moist meal cannot be easily preserved, therefore only a limited quantity can be produced at a time.

The high protein content of the cowpeas makes it a very important item in the diet, and requires that its use must be encouraged.

The production unit to be established is a commercial cowpea flour production unit which produces a dry product of more durable quality with an output level higher than pertains in the traditional processing method. This will facilitate ready preparation and frequent consumption of cowpeas. The flour can be used in making protein rich dishes including cakes, aprapransa, stews, porridge, kose etc. The profile relates to a processing capacity of 40 tons of the raw material per month.

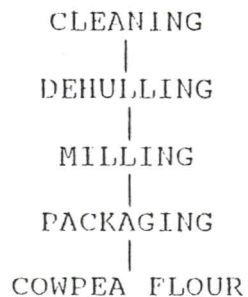
1.	(a) <u>Raw material per month</u>	<u>Estimated Cost ₵</u>
	Cowpeas	11,500,000
	(b) <u>Packaging Material per month</u>	
	Polythene bags with printed labels	2,074,800
	(c) <u>Utilities per month</u>	
	- Water	57,500
	- Electricity	115,000
	- Fuel and oil	320,000
	- Transportation	575,000
	(d) Contingencies per month (10% of a,b & c)	1,464,230
	(e) <u>Fixed Capital</u>	
	i. Land & Building (annual rent)	840,000
	Land - 250 square metres	
	Building - 200 square metres	
	- processing Hall	
	- storage for raw material	
	- storage space for finished product	
	ii Machinery and Equipment	
	- Two 16hp lister diesel engines	2,000,000
	- One cleaning machine capable of cleaning 2.5 tons per day	1,500,000
	- One dehuller with a capacity of 2.5 tons/day	2,000,000
	- One hammer mill with a capacity of 2.5 tons/day	2,000,000

- One platform type weighing scale 250kg capacity	480,000
- Three weighing scales up to 5kg capacity each	60,000
- Three heat sealers	171,000
- Two cooling water tanks, each with a capacity of 900 litres	80,000
- One 2250 litre galvanized water reservoir	800,000
iii Ancillaries (10% cost of machinery and equipment)	837,100
iv Installation charges (10% cost of machinery and equipment)	837,100
Minimum total fixed cost	10,885,200

f. Process Description

This production unit employs a modern approach to the production of cowpea flour. The method of production is capital intensive. The grains are cleaned in a seed cleaner which separates the waste materials from the bulk grains. The cleaned raw material is then fed into the dehuller for the removal of the hulls. The dehulled grains are milled and packaged in polythene sachets for sale.

Cowpea Flour Processing Flow Chart



g. Human resource requirement

<u>Category</u>	<u>No.</u>	<u>Salary per month ₪</u>
Production Manager (Food technologist)	1	102,000
Storekeeper (Accountant)	1	70,400
Purchase/Salesman	1	70,400
Mechanic	1	39,400
Miller	1	39,400
Semi-skilled workers (packaging)	3	118,200
Unskilled workers	6	186,600
Total salaries and wages		<u>626,400</u>
Perquisites (25% salaries & wages)		<u>156,600</u>
Total		<u>783,000</u>

Minimum total investment required to establish the unit

h. i. Minimum total fixed capital	
- Land & Building	840,000
- Machinery and equipment	9,208,100
- Installation charges	837,100
	<u>10,885,200</u>
ii. Minimum Total Variable Capital	
- Raw material	11,500,000
- Packaging material	2,074,800
- Utilities	1,067,500
- Human resource requirement	783,000
- Contingencies	1,464,230
	<u>16,889,530</u>

Minimum grand total capital
investment required to establish
the unit (Fixed + Variable capital) 27,774,730

2. Sources of raw material

The main raw material, cowpea can be procured from food distribution companies like GFDC, Ejura farms etc. Since it is advisable and economically prudent that such units be established in the major cowpea producing areas, the following areas may be good sources: Tamale, Bimbilla, Akatsi, Agbozume, Abor.

3. Sources of machinery and equipment

- i. Agricultural Engineers Limited, Ghana
- ii. Metal and Motors Engineering, Ghana
- iii. British/Canadian agricultural Engineering companies

DEHYDRATED FERMENTED MAIZE MEAL PRODUCTION UNIT

The dehydrated fermented maize meal is an intermediate product. The basic raw material, maize is an important food-grain consumed throughout Ghana in various forms. Some of the food products from maize include kenkey, banku, and porridge for children. In the preparation of these food products maize is first steeped in water. It is then washed and milled. The milled grain is mixed with water to form a dough and allowed to ferment over a period before being cooked for food. The presence of the right level of moisture in the dough stimulates fermentation which renders the shelf-life of the dough very short. The dehydrated fermented maize meal has a longer shelf-life and can be stored for up to six months. It provides an alternative for preserving the dough for a longer period as there would be no significant change in quality and taste. Furthermore, it is expected that its long shelf-life will ensure relatively stable prices for both the maize and the intermediate product. The profile proposes a processing capacity of 10 tons of the raw material.

1.	a. <u>Requirements of raw material per month</u> Maize	<u>Cost ₵</u> 1,400,000
	b. <u>Packaging material per month</u> Labelled polythene bags	270,000
	c. <u>Utilities per month</u>	
	- Water	14,000
	- Electricity	70,000
	- Transportation	170,000
	d. <u>Contingencies per Month</u> (10% cost of a, b & c)	182,400
	e. <u>Fixed Capital</u>	
	i. Land and building 250 sq. metres (processing, packaging and storage) (annual rent)	840,000
	ii. <u>Machinery and equipment</u>	
	- One Attrition mill capable of milling 500kg. per day	483,000
	- One cabinet-hot air dryer (500kg capacity)	5,000,000
	- One heat sealer	57,000
	- One weighing scale-platform type (250kg. capacity)	480,000

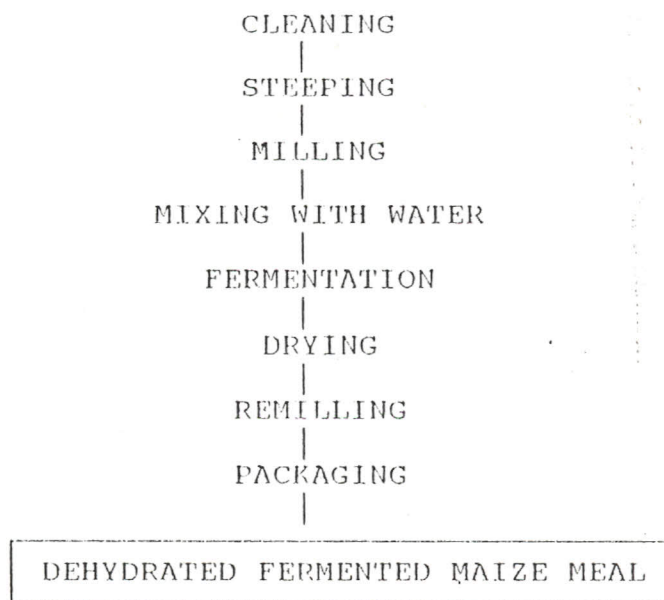
-	One weighing scale up to 5kg capacity	20,000
-	Thirty plastic drums (112.5 litre cap)	300,000
-	Ten large aluminium bowls	140,000
iii	Ancillaries (10% cost of machinery and equipment)	655,000
iv.	Installation charges (10% cost of machinery and equipment)	655,000

f. Process description

Maize is sorted, cleaned through winnowing and steeped in water. It is then washed and milled. The milled grain is mixed with water to form a dough which is allowed to ferment over a period. The dough is then dehydrated in a cabinet-hot air dryer and remilled. The dehydrated fermented maize meal is ready for packaging. The recovery rate is about 80%.

DEHYDRATED FERMENTED MAIZE MEAL

PRODUCTION FLOW CHART



g. Personnel (skills and labour requirements)

Category	No.	Salary rate per month ₵
Manager	1	102,000
Storekeeper (purchases & supplies)	1	39,400
Miller/Mechanic	1	31,100
Unskilled workers	4	124,200
Total salaries and wages		296,700
Perquisites (25% of salaries and wages)		74,175
		370,875

h. Minimum total capital required to establish the unit

i. Minimum total fixed capital	8,630,000
ii. Minimum total variable capital	
- Raw materials	1,400,000
- Packaging material	270,000
- Utilities	154,000
- Personnel	370,875
- Contingencies	182,400
Minimum grand total capital investment required to establish the unit (Fixed & Variable capital)	11,006,875

2. Sources of raw material

Raw material is available locally. Some of the sources include Ghana Food Distribution Corporation, Ejura Farms and Farm gates.

3. Sources of machinery and equipment

Locally made dryers together with the other machinery and equipment are available from trade sources. Some of the sources are as follows

- i. Agricultural Engineers Ltd.
- ii. Metal & Motors Engineering
- iii. Department of Agricultural Engineering, UST Kumasi

DEHYDRATED FERMENTED CASSAVA MEAL PRODUCTION UNIT

Ghana produces several thousand tons of cassava annually. Part of this crop is consumed directly without processing. However a large proportion of the crop is processed into other food and industrial products. One of such products is "agbelima" or cassava dough. The traditional "agbelima" is a wet product produced from grated and fermented cassava tuber. It has a rather short shelf-life because the fermentation process continues even under storage.

Dehydrated fermented Cassava meal introduced by the Food Research Institute is a means of stabilizing the product and thereby increasing its shelf-life. The establishment of a Dehydrated fermented cassava meal production units in the cassava growing areas will help reduce to a large extent post-harvest losses and stimulate increased production. Other advantages include opening avenues of employment for the rural youth, and the possibility of selling the product as a non-traditional export item. The proposed processing capacity is 40 tons of the raw material.

i.	a. <u>Raw material per month</u>	<u>Cost ₵</u>
	cassava	2,925,000
	b. <u>Packaging material per month</u>	
	Polythene bags with printed labels	390,000
	c. <u>Utilities per month</u>	
	- water	29,250
	- Power	146,250
	- Fuel & Oil	146,250
	d. <u>Contingencies Per Month</u>	
	(10% of a, b & c)	363,675
	e. <u>Fixed capital</u>	
	i. Land and building (Annual rent)	1,008,000
	Land - 300 square metres	
	Building - 200 square metres	
	- Processing hall	
	- Storage space for raw material	
	- Storage space for finished product	

ii. Machinery and equipment

- Cassava grater with a cap. of 2 tons per day	390,000
- Cassava dough press with a cap. of 2 tons per day	850,000
- Disintegrater with a cap. of 2 tons per day	125,000
- Heat sealers	114,000
- Two weighing sacles up to 5 kg cap. each	40,000
- Weighing scale-platform type up to 250kg.cap.	480,000
- Cabinet hot air dryer with a cap. of 1 ton per day	5,000,000
- One mill with a milling cap. of 1 ton per day	483,000

iii. Ancillaries

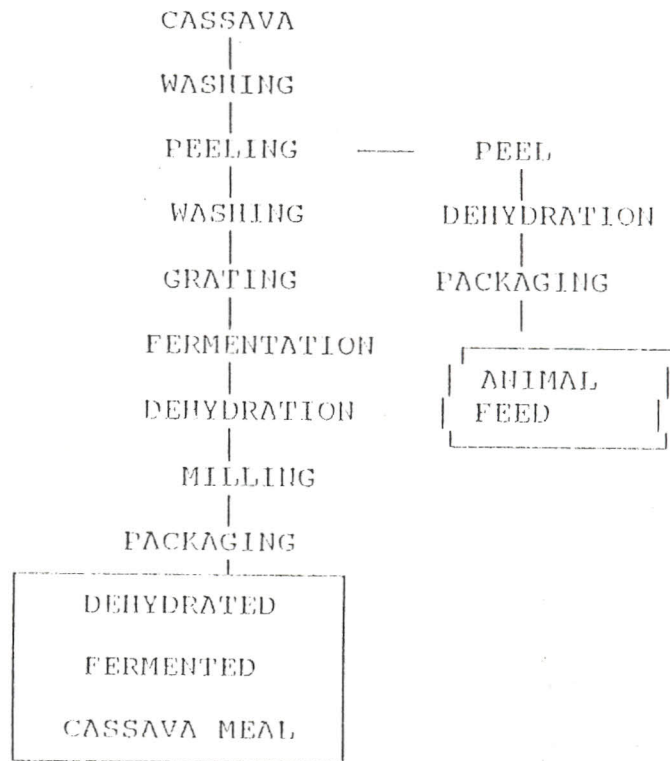
(10% cost of machinery and equipment)	748,200
Minimum total fixed cost	

iv. Installation charges

(10% cost of machinery and equipment)	748,200
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f. Process Description

This production unit employs a technically efficient method of producing the fermented cassava dough through the mechanization of the grating and pressing processes. The cassava tubers are first washed and peeled manually. The peeled tubers are washed and grated with a mechanical grater and allowed to ferment through a dewatering process over a period of time to form the fermented cassava dough. This is then dehydrated in a hot-air cabinet dryer and milled. It is then packed in polythene bags as dehydrated fermented cassava meal. The cassava peel will be dehydrated and sold as animal feed.

DEHYDRATED FERMENTED CASSAVA MEAL PROCESSING FLOW CHARTg. Human resource requirements

<u>Category</u>	<u>No.</u>	<u>Salary per month ₦</u>
Manager	1	102,000
storekeeper	1	70,400
Miller/Mechanic	1	39,400
Semi-skilled workers	2	78,800
Unskilled workers	8	248,800
Total salaries and wages		539,400
Perquisites (25% salaries & wages)		134,850
Total		674,250

h. Minimum total investment required to establish the unit

i.	Minimum total fixed capital	
	- Land & building	1,008,000
	- Machinery & Equipment	8,230,200
	- Installation charges	823,020
		<hr/>
		10,061,220
		<hr/>
ii.	Minimum total variable capital	
	- Raw material	2,925,000
	- Packaging material	390,000
	- Utilities	321,750
	- Human resource requirements	674,250
	- Contingencies	363,675
		<hr/>
		4,674,675
		<hr/>

Minimum grand total capital 14,735,895

2. Sources of raw materials

The raw material -cassava, may be obtained from farmgates. The following areas are recommended, Pokuase, Suhum, Adeiso, Hemang, Boguso, Atebubu, Kwame Danso, Nkoranza, Bechem, Bekwai, Juabeng, Kumawu etc. Packaging materials may be obtained from trade sources.

3. Sources of machinery and equipment

- i. Dept of Agricultural Engineering, UST
- ii. Agricultural engineers Ltd.
- iii. SIS Engineering Ltd
- iv. Metal and Motors Engineering
- v. Industrial Research Institute

GROUNDNUT PASTE PRODUCTION UNIT

Groundnut production occupies an important position in the agricultural programmes of farmers in Northern Ghana. It has many domestic and industrial uses. One major product from groundnut is the groundnut paste. The paste is used in the preparation of soups, stews, and as breadspread. The traditional preparation of groundnut paste involves a tedious process. Hence, households prefer to purchase the paste from the open market. However, groundnut paste sold in the open market is to a very large extent adulterated with cheap flours and may be unsafe for consumption because it may contain high levels of mycotoxins, especially aflatoxins.

The groundnut paste production unit referred to in this profile uses an improved and mechanized method in the roasting and dehulling processes leading to increased production. In addition a careful selection of the nuts takes place in order to remove damaged and rotten ones, thereby eliminating or substantially reducing the danger of aflatoxin contamination. Production on a large scale will offer a good number of employment opportunities and help stabilize to a large extent the price of groundnut. A large market exists especially in the urban areas, thus making the unit potentially viable. The proposed processing capacity is 20 tons of the raw material per month.

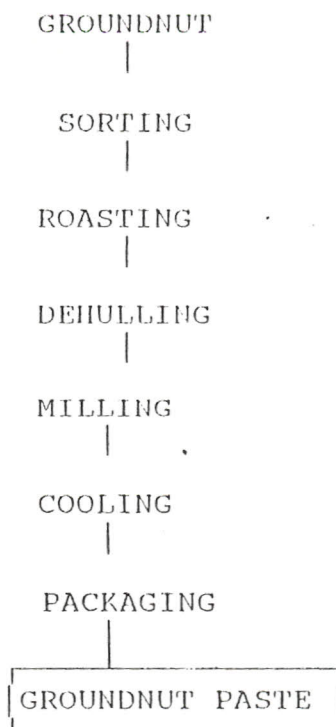
a. <u>Raw material per month</u>	COST ₵
Groundnut	6,200,000
b. <u>Packaging material per month</u>	
Labelled polythene bags	546,000
c. <u>Utilities per month</u>	
- Water	12,400
- Electricity	62,000
- Fuel, oil & wood shavings	62,000
d. <u>Contingencies per month</u>	
(10% cost of a, b & c)	688,240
e. <u>Fixed Capital</u>	
i. Land and Building (annual rent)	720,000
Land - 200 square metres	
Building - 150 square metres	
(processing, packaging & storage)	
ii. <u>Machinery and Equipment</u>	

- One mechanical roaster with a capacity of 1 ton per day	390,000
- One groundnut dehuller with a capacity of 1 ton per day	160,000
- Milling machine capable of milling 1 ton per day	483,000
- One platform type weighing scale 250kg. capacity	480,000
- Two heat sealers	114,000
- Two weighing scales up to 5kg cap.	40,000
- Forty aluminum pans	400,000
- Twenty aluminum trays	200,000
iii. <u>Ancillaries</u> (10% cost of machinery and equipment)	226,700
iv. <u>Installation charges</u> (10% cost of machinery and equipment)	226.700
Minimum total fixed capital	3,440,400

f. Process description

Fresh groundnut is sorted through picking and roasted. The roasted groundnut is dehulled and milled. This is allowed to cool overnight and packaged in polythene pouches. The recovery rate is about 67%.

GROUNDNUT PASTE PRODUCTION FLOW CHART



g. Human resource requirement

Category	No.	Salary per month ¢
Manager	1	102,000
Storekeeper (purchases & supplies)	1	70,400
Miller/Mechanic	1	39,400
Semi-skilled labour	6	236,400
Unskilled labour	4	124,400
Total salaries		572,600
Perquisites (25% of total salaries)		143,150
Total		715,750

h. Minimum total investment required to establish the unit

i. Minimum total fixed capital

- Land and building	720,000
- Machinery and equipment	2,493,700
- Installation charges	226,700
	<u>3,440,400</u>

ii. Minimum total variable capital

- raw material	6,200,000
- packaging material	546,000
- utilities	136,400
- human resource requirement	715,750
- contingencies	688,240
	<u>8,283,990</u>

Minimum grand total capital investment required to establish the unit
(Fixed & variable capital).

11,726,790

2. Sources of raw material

Groundnut may be obtained from Northern Ghana and other agricultural sources.

3. Sources of machinery and equipment.

Almost all equipment are manufactured locally. The rest may be obtained from trade sources. The Industrial Research Institute of Ghana manufactures the dehuller and roaster on request.

KOKONTE FLOUR PRODUCTION UNIT

Kokonte flour is processed from dried cassava chips. Its consumption by most households is limited by the unhygienic method of processing and handling the flour mainly through the drying process. This production unit applies a more hygienic method of drying the chips using well constructed solar dryers (during the sunny periods) or the cabinet hot-air dryer. The kokonte production unit can be established in villages, and rural areas and is expected to generate a number of employment opportunities at various levels. The proposed processing capacity is 12 tons per month of the raw material.

1. a) <u>Raw material per month</u>	<u>Cost ₦</u>
Cassava	840,000
b) <u>Packaging Material per month</u>	
Polythene bags	117,000
c) <u>Utilities</u>	
- Water	8,400
- Electricity	42,000
- Fuel and Oil	42,000
d) Contingencies per month (10% cost of a, b & c)	104,940
e) <u>Fixed Capital</u>	
Land and Building (annual rent)	1,008,000
Land - 300 square metres	
Building - 200 square metres	
ii. <u>Machinery and equipment</u>	
- One weighing scale-platform type with a capacity of up to 250kg	480,000
- Two weighing scales with a capacity of up to 5kg each	40,000
- Two heat sealers	114,000
- Drum grater with a capacity of 1 ton per day	390,000
- Solar dryers	375,000
- Disintegrator	125,000
- Electrically driven sifter/manual sieve	125,000
- Attrition mill	483,000
iii. Ancillaries (10% cost of machinery and equipment)	211,200
iv. Installation charges (10% cost of machinery and equipment)	211,200

f. Process description

Cassava is first peeled and washed. The resulting material is then dried. Two drying methods are used. Depending on the type of drying equipment, the cassava is either grated or sliced. Where the unit uses a cabinet hot-air dryer the peeled cassava is first grated and spread out to ferment before being dried. With a solar drying unit in operation however, it is recommended that the peeled cassava is sliced into small pieces before being put into the dryer. The dried product is subjected to disintegration and milling followed by sifting, and packaged as kokonte flour.

g. Human resource requirements

Category	No.	Salary Rate Per Month ¢
Manager	1	102,000
Storekeeper (Accountant)	1	70,400
Miller/Mechanic	1	39,400
Unskilled labour	8	243,800
Semi-skilled labour	2	78,800
Total salaries and wages		539,400
Perquisites (25% salaries Wages)		134,850
		674,250

h. Minimum total investment required to establish the unit

i. Minimum total fixed capital

- Land & Building (annual rent)	1,008,000
- Machinery & Equipment	2,132,000
- Ancillaries	211,200
- Installation charges	211,200
	3,562,400

ii. Minimum total variable capital

- Raw material	840,000
- Packaging material	117,000
- Utilities	92,400
- Human resource requirement	674,250
- Contingencies	104,940
	1,828,590

Minimum grand total capital investment required to establish the unit (FIXED & VARIABLE CAPITAL) 5,390,990

2. Sources of raw materials

The major cassava producing areas are good sources of the raw material. Some of these areas are Suhum, Adeiso, Bogoso, Bechem, Atebubu.

3. Sources of machinery and equipment

Most of the major equipment can be obtained from agricultural machinery companies in Ghana and other West Africa countries.

In Ghana, the following companies are good sources:

- i. Hormeku Engineering Ltd.
- ii. Metal and Motors Engineering
- iii. Agricultural Engineering Ltd.
- iv. Food Research Institute.
- v. Industrial Research Institute.

GARI PRODUCTION UNIT

Gari processing is a popular activity in the cassava growing areas of Ghana. It is an important carbohydrate food consumed nationwide. It is very popular among students in boarding institutions and presently has a high potential in the export market. The production of Gari from cassava tubers forms one of the diverse ways in which post-harvest losses relating to cassava can be minimized. Well roasted gari has a relatively long shelf-life.

Traditional production of gari is hazardous and time-consuming. This profile relates to a unit that minimizes the hazards through the mechanization of the grating and pressing processes. The proposed processing capacity is 40 tons per month of the raw material.

i.	a) <u>Raw material per month</u>	<u>Cost ¢</u>
	Cassava	2,925,000
	b) <u>Packaging materials per month</u>	
	Polythene bags with printed labels	337,500
	c) <u>Utilities per month</u>	
	- Water	29,250
	- Electricity	146,250
	- Fuel and Oil	146,250
	d) <u>Contingencies per month</u>	
	(10% of a, b & c)	358,425
	e) <u>Fixed capital</u>	
	i. Land & Building (annual rent)	1,200,000
	Land 400 square metres	
	Building - 300 square metres	
	(processing, storage, packaging)	
	ii. <u>Machinery and equipment</u>	
	- Hydraulic press	850,000
	- Diesel-driven drum grater with a capacity of 2 tones per day	390,000
	- Cassava disintegrator with a capacity of 2 tons per day	125,000
	- Wheel-driven sieve	125,000
	- Four mechanical roasters capable of roasting 2 tons per day	308,000

- Vibrating sieve for grading	375,000
- Attrition mill	483,000
- One weighing scale, platform type with a capacity of up to 200kg	480,000
- two weighing scales up to 5kg capacity each	40,000
- Two heat sealers	114,000
iii. Ancillaries (10% cost of machinery & equipment)	329,000
iv. Installation charges (10% cost of machinery & equipment)	329,000

f. Process description

Peeled cassava is washed and grated. It is then allowed to ferment over a period and dewatered through pressing. The resulting product is sieved and roasted. The roasted product is resieved and packaged as Gari.

g. Human resource requirements

<u>Category</u>	<u>No.</u>	<u>Salary per month(₦)</u>
Manager	1	102,000
Storekeeper (Accountant)	1	70,400
Miller	1	39,400
Mechanic	1	39,400
Semi-skilled labour	2	78,800
Unskilled labour	10	311,000
Total salaries & wages		641,000
Perquisites (25% salaries & wages)		160,250
Total		801,250

h. Minimum total investment required to establish the unit

i. Minimum total fixed capital	
- Land and building	1,200,000
- Machinery and equipment	3,290,000
- Ancillaries	329,000
- Installation charges	329,000
	<u>5,148,000</u>

ii. Minimum total variable capital	
- Raw material	2,925,000
- Packaging material	337,500
- Utilities	321,750
- Human resource requirement	801,250
- Contingencies	358,425
	<hr/>
	4,743,925
	<hr/>
Minimum grand total capital investment required to establish the unit (Fixed & Variable Capital)	9,891,925.

2. Sources of raw material

The only raw material, cassava may be obtained from the cassava growing areas. Some of these sources include Suhum, Adeiso, Bogoso, Bechem. Atebubu, Nkoranza etc.

3. Sources of machinery and equipment

Almost all the equipment and machinery are fabricated in Ghana. Some may also be obtained from Nigerian manufacturing companies. Local companies such as Agricultural Engineering Ltd. have in stock most of the major equipment.

The Industrial Research Institute of Ghana is an institution that can fabricate some of the equipments on request.

NB: The Gari production unit, Dehydrated fermented cassava dough production unit and the kokonte flour production unit can all be established as a single unit since almost the same machinery and equipments are required for the production processes.

BAMCORN PRODUCTION UNIT

The search for nutritious meals has been the lot of many researchers in the developing world, including Ghana. One of such meals developed by the Food Research Institute of Ghana is BAMCORN - a maize - bambara bean product. A roasted maize meal alone is low in protein. It's fortification with a legume therefore enriches the maize meal significantly with a relatively higher protein value. In spite of the fact that the amino - acid profile of the bambara bean indicates that it is not the best among the grain legumes, a lot of consumers have high preference for its flavor, making the product acceptable. Bamcorn will provide a nutritious breakfast for a varying number of households in Ghana. It will also find a large market in schools and health centres. The production of Bamcorn on a large scale will help stimulate increased production of bambara beans. This profile relates to a processing capacity of 20 tons of the raw materials.

1. a)	<u>Raw materials per month</u>	<u>Cost(¢)</u>
	Maize (10 tons)	1,140,000
	Bambara beans (10 tons)	4,300,000
b)	<u>Packaging material per month</u>	
	Labelled polyethylene pouches	864,000
c)	<u>Utilities per month</u>	
	- Water	54,400
	- Electricity	54,400
	- Fuel & oil	54,400
	- Transportation	272,000
d)	Contingencies per month (10% of a, b & c)	673,920
e)	<u>Fixed capital</u>	
	(i) Land and Building (Annual rent)	720,000
	Land - 200 square meters	
	Building - 150 square metres	
	- Processing hall	
	- Storage for raw materials	
	- Storage space for finished product and offices.	
	(ii) Machinery and equipment	
	- Four mechanical roasters with a capacity of 1 ton/day	308,000
	- Attrition mill	483,000

-	Horizontal trough mixer capable of mixing 100kg at a time	400,000
-	Two heat sealing machines	114,000
-	Floor mounted balance up to 250kg capacity	480,000
-	Two weighing scales up to 5kg capacity	40,000
-	40 plastic drums (1125 litre capacity)	400,000
-	Aluminum trolleys	200,000
(iii)	Ancillaries (10% cost of machinery & equipment)	242,500
(iv)	Installation charges (10% cost of machinery & equipment)	242,500
	Minimum total fixed cost	3,630,000

f. Process description

The raw materials are cleaned through winnowing to remove extraneous materials. The resulting materials are then washed, roasted and allowed to cool. The roasted and cooled materials are ground separately in an electrically-driven beater mill. Some quantities of each material are mixed. This is packaged for sale as Bamcorn. It has a recovery rate of about 80%.

Bamcorn processing flow chart



g. Human resource requirement

<u>Category</u>	<u>No.</u>	<u>Salary per month(¢)</u>
Manager	1	102,000
Storekeeper (purchases & supplies)	1	70,400
Miller/Mechanic	1	39,400
Unskilled workers	7	217,700
Total salaries and wages		429,500
Perquisites (25% salaries and wages)		107,375
Total		536,875

h. Minimum total investment required to establish the unit

(i) Minimum total fixed capital

- Land & building	720,000
- Machinery & equipment	2,667,500
- Installation charges	242,500
Total	3,630,000

(ii) Minimum total variable capital

- Raw material	5,440,000
- Packaging material	864,000
- Utilities	435,200
- Human resource requirement	536,875
- Contingencies	673,920
	7,949,995

Minimum grand total capital investment
required to establish the unit
(Fixed and variable capital)

11,579,995

2. Sources of raw materials

All the raw materials are available locally.
Some of the sources are: Bimbila, Tamale, Bolgatanga,
Techiman, Nkoransa, Sunyani etc.

3. Sources of machinery and equipment

The various machinery and equipment required for this unit can be obtained from trade sources locally or through importation.

TATALE MIX MAKING UNIT

"Tatale" is a kind of pancake made from ripe plantain and fermented maize dough. It is seasoned with some condiments, fried in palm-oil and served alone or with beans either as a main meal, snack or desert.

The preparation of tatale follows a tedious process. The establishment of Tatale Mix making units will make available a dehydrated intermediate convenience food product which makes the preparation of tatale less cumbersome. The Tatale Mix has a relatively long shelf-life and serves as a means of preserving ripe plantain. This profile relates to a production capacity of 10 tons of the finished product per month.

1.	a.	<u>Raw materials per month</u>	<u>Cost (₦)</u>
		Plantain (55tons)	3,350,000
		Maize	308,000
	b.	<u>Packaging material per month</u>	
		Labelled polythene bags	162,000
	c.	<u>Utilities</u>	
		Water	36,580
		Electricity	182,900
		Fuel & oil	36,580
		Transportation	182,900
	d.	Contingencies per month (10% cost of a, b & c)	425,896
	e.	<u>Fixed Capital</u>	
	i.	Land & building (annual rent) (Storage, processing Packaging, Office)	720,000
	ii.	Machinery and equipment	
		- Communiting mill	400,000
		- Attrition mill	483,000
		- Aluminum pans	200,000
		- Heat sealer	57,000
		- Hot-air dryer	5,000,000
		- One weighing scale up to 200kg. capacity	480,000
		- One weighing scale up to 2kg. capacity	20,000
		- Plastic drums	100,000
		- Horizontal trough mixer	400,000

iii.	Ancillaries (10% cost of machinery & equipment)	712,000
iv.	Installation charges (10% cost of machinery & equipment)	712,000

f. Process description

Well riped plantain is peeled and milled into pulp. A dehydrated maize meal is added to the pulp. The two products are thoroughly mixed in a mixing trough. The resulting product is spread on stainless steel trays and dried in a hot-air dryer. The dried product is milled and packed in polythene bags of convenient sizes as "Tatale Mix".

g. Human resource requirements

<u>Category</u>	<u>No.</u>	<u>Salary per month(₦)</u>
Manager (Biochemist)	1	102,000
Storekeeper (purchases & sales)	1	70,400
Miller/mechanic	1	39,400
Skilled personnel	1	39,400
Unskilled personnel	4	124,400
Total salaries & wages		336,200
Perquisites (25% salaries & wages)		84,050
Total		420,250

h. Minimum total investment required to establish the unit

i. Minimum total fixed capital

- Land & building	720,000
- Machinery and equipment	7,140,000
- Ancillaries	712,000
- Installation charges	712,000
	<u>9,284,000</u>

ii. Minimum total variable capital

- Raw materials	3,658,000
- Packaging materials	162,000
- Utilities	438,960
- Human resource requirement	420,250
- Contingencies	425,896
	<hr/>
	5,105,106
	<hr/>

Minimum grand total capital investment required to establish the unit (Fixed & variable capital).

14,389,106

2. sources of raw materials

Plantain: Brong Ahafo Region, Western Region, Eastern Region, Ashanti Region

Maize: Ejura farms, Ghana Food Distribution Corporation, Techiman, Nkoranza etc.

3. Sources of machinery and equipment

Most of the machinery and equipment are available in local agricultural engineering companies. The hot-air-dryer and the communiting mill may be imported.

INSTANT FUFU POWDER PRODUCTION UNIT

Fufu is a thick paste prepared from boiled and pounded starchy staple. These staples include cassava, yam, cocoyam and plantain. Usually, two of the above mentioned staples are blended in order to obtain special textural properties. It is eaten with soup made with vegetables, spices, meat and fish. Pounding makes fufu preparation laborious, therefore the introduction of instant fufu powders will remove the drudgery in its preparation.

The instant fufu powder has both local and foreign market assurances making its manufacturing unit a potentially profitable and foreign exchange earning venture. The fufu powder manufacturing units can be established in towns, villages and rural communities in Ghana. They will provide employment opportunities at different levels. This profile relates to yam fufu powder with a proposed production capacity of 10 tons per month of the finished product.

i	a. <u>Requirements of raw materials per month</u>	
	- Yam tubers	7,600,000
	- Cassava	182,800
	b. <u>Packaging material per month</u>	
	Labelled polythene bags	390,000
	c. <u>Utilities per month</u>	
	- Water	155,660
	- Electricity	389,140
	- Fuel & Oil	389,140
	d. <u>Contingencies per month (10% of cost of a, b and c)</u>	910,680
	e. <u>Fixed capital</u>	
	i. <u>Land and building</u>	1,008,000
	Land - 300 square metres	
	Building - 200 square metres (storage, processing, packaging & office space)	
	ii. <u>Machinery and equipment</u>	
	- Cabinet hot-air dryer	5,000,000
	- Hammer mill/Attrition mill	483,000
	- Large Aluminium saucepans	200,000
	- Industrial stoves	301,500
	- Heat sealers	114,000
	- Cassava grater with a capacity of 1 ton per day	390,000
	- Weighing scale-platform type up to 250kg capacity	480,000
	- Weighing scale up to 2kg capacity each	40,000
	- Trough mixer	400,000

iii. Ancillaries (10% cost of machinery and equipment)	753,350
iv. Installation charges (10% cost of machinery and equipment)	753,350

f. Process description

The production process involves the peeling, washing and cutting of the main raw material-yam. The raw material is then cooked and dried in a cabinet dryer. This is followed by milling to obtain fine yam flour. The flour is blended with starch produced from grated cassava to produce the fufu powder. It is recommended that the unit must have two different lines with one line producing the wholly yam flour and the other producing the starch.

g. Human resource requirement

<u>Category</u>	<u>No.</u>	<u>Salary per month ₦</u>
Manager (food technologist)	1	102,000
Storekeeper (Accountant)	1	70,400
Purchases/Salesman	1	70,400
Miller	1	39,400
Mechanic	1	39,400
Semi-skilled personnel	2	78,800
Unskilled personnel	12	373,200
Total salaries & wages		773,600
Perquisites (25% salaries & wages)		193,400
Total		967,000

h. Minimum total investment required to establish the unit

i. Minimum total fixed capital	
- Land & building	1,008,000
- Machinery & equipment	7,408,500
- Ancillaries	740,850
- Installation charges	740,850
	9,898,200

ii. Minimum total variable capital	
- raw materials	7,782,800
- packaging materials	390,000
- utilities	933,940
- human resource requirement	967,000
- contingencies	910,680
	10,984,420

Minimum grand total capital investment required to
establish the unit (Fixed & Variable capital)
20,882,620

2. Sources of raw materials

Cassava: suhum, Adeiso, Boguso, Atebubu, Bechem

Yam: Brong Ahafo and Northern regions of Ghana

Cocoyam: Eastern, Central and Ashanti regions of Ghana

Plantain: Brong Ahafo, Eastern, Western and Ashanti regions
of Ghana.

3. Sources of machinery and equipment

i. Metals and Motors Engineering

ii. Agricultural Engineering Ltd.

iii Ghana National Trading Corporation (Technical Division)