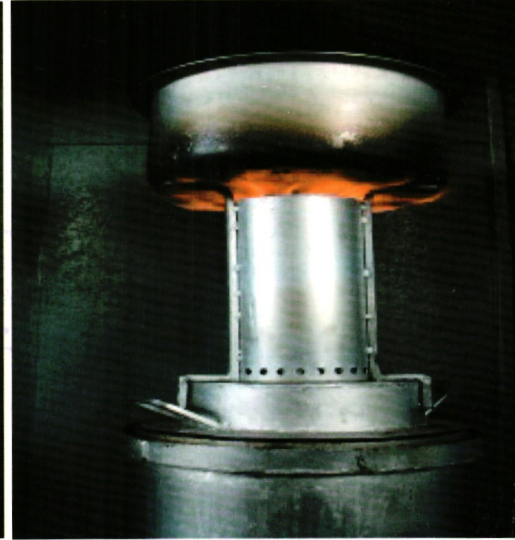
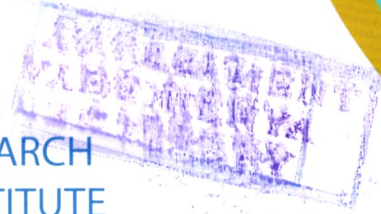




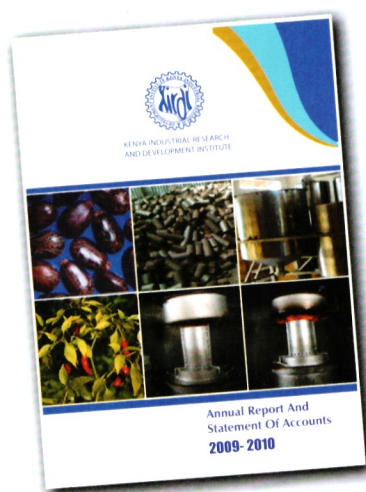
KENYA INDUSTRIAL RESEARCH  
AND DEVELOPMENT INSTITUTE



# Annual Report And Statement Of Accounts **2009- 2010**



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## Annual Report 2009-2010

Kenya Industrial Research and  
Development Institute  
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# CHAIRMAN'S STATEMENT

Dear Sir,

I hereby submit, on behalf of the Board of Directors of Kenya Industrial Research and Development Institute (KIRDI), the 2009/10 Annual Report and Statement of Accounts in accordance with the provision of section 20 of the Science and Technology Act, Cap 250 of the Laws of Kenya.

The Institute spent Kshs.518,909,203 to undertake activities for the year under review. Records provided by the Auditor General reveal a revenue income of kshs.554,055,210 this left a surplus of Kshs.35,146,007 before depreciation.

The following changes were made to the organizational structure of the Institute:

- Redefinition of the Institute's mission and objectives to make them more relevant to the current environment;
- Reviewing of the Institute's mandate;
- Strengthening of human resource capacity in KIRDI by improving staff remuneration;
- Modernizing research and other working equipment;
- Strengthening the institute's revenue base;
- Putting a strong, flexible, non-bureaucratic structure in place.

Apart from government funds, the Institute's financial support was drawn from international donor organizations. I am indeed grateful to all the organizations and well-wishers for their support of KIRDI's mission.

Finally, on behalf of KIRDI's Board of Directors, I thank the government and the staff of the Institute for all the achievements recorded in the 2009/10 period.

Chairman KIRDI

Board of Management

PAPERS LAID No. <u>14</u>	
Speaker N. A.	Clerk Assts
D/Speaker	C. H. Editor
Clerk N. A.	Reporters
D/Clerk	Library
P. C. A	Press

(Hon A. Duale)

By the Leader of the Majority Party on Tue 21/5/13





# DIRECTOR'S REPORT

During the period under review, KIRDI played a key role in facilitating the government's vision of transforming Kenya into a newly industrialized country by the year 2020. This has meant putting our clients (industry) first as we move the Institute towards a self sustaining centre of excellence. Our emphasis towards support to industry has been to ensure micro, small and medium enterprises acquire and manage technology for competitiveness on the global market.

During the year under review, the Research and Development departments of the Institute undertook various projects. Some of the projects included:

- The sustainable utilization of old currency bank notes and leather shavings in Kenya
- Development of high tension electrical insulator
- Production of hydraulic fluid and engine lubricant from castor oil
- Production of high quality sugar cane juice and improved jiggery products in Rangwe District
- Preservation and processing technology of dagaa (omena) through spice-smoked method in Migori and Mbita District
- Development of a Nutrient-rich porridge Flour from Finger Millet (*Eleusine coracana* [L.] Gaertn) and *tylosema fassoglensis*
- Phytochemical investigation of selected plant species from the asphodelaceae family for anti-plasmodial activity
- Optimizing utilization of orange-fleshed sweet potatoes as a source of vitamin A
- Development of a post consumer plastic waste washing machine.

Some of these projects continued from the previous financial year

The KIRDI' staff continued working in various projects and quite a number offered consultancy services to KIRDI clients and partners.

May I take this opportunity to express gratitude for the support given to the programmes, by the Board of Directors, the Kenya government, the donor community and the industrialists who have supported us either materially or morally.

Finally, may I also express appreciation for the support from KIRDI staff in implementation of the various programmes.



# FINANCIAL REVIEW

## Report of the Directors

### Directors

Prof. H. K. Maritim	-	Chairman
Prof. Tuilong Serem	-	Director
Mr. Fila Elema Isako	-	Director
Mr. J.M. Migiro	-	Director
Dr. W.A. Alusiola	-	Director
Wanjohi Ndirangu	-	Director

### Secretary

Dr. M.C.Z. Moturi

The Directors presented the audited accounts for the year ended 30 June 2009. Results

### Results

The accounts show:

A net surplus of the year	-	Kshs.1,456,025.00
Net accumulated deficit to date	-	Kshs.(39,016,540).

### Directors

The Directors, whose names are listed above are appointed for fixed terms of three (3) years and are not subject to retirements by rotation.

### Auditors

The Auditors, Kenya National Audit Office continue in office in accordance with the provision of section 5(3) of the State Corporation Act, 1986.

By Order of the Board

**Dr. M.C.Z. Moturi**

Secretary



# MANAGEMENT

## Board Members

Prof. H. K. Maritim  
Prof. Tuilong Serem  
Mr. Fila Elema Isako  
Mr. J.M. Migiro  
Dr. W.A. Alusiola  
Wanjohi Ndirangu

## Representatives from Ministries

Inspector General, State Corporations  
Permanent Secretary, Ministry of Industrialization  
Permanent Secretary, Ministry of Public Works  
Permanent Secretary, Ministry of Finance

## Heads of Departments and Divisions

### Heads of Departments

Mrs. Phyllis Ngunjiri	-	Research and Development
Dr. Moses Makayoto	-	Technology Transfer and Extension Services
Mr. Cornelly Serem	-	Finance and Administration

### Heads of Divisions

Mr. Jairus Ombui	-	Human Resource and Administration Division
Ms. Floice O. Mukabana	-	Finance Division
Dr.-Ing. Calvin Onyango	-	Food Technology Division
Dr. Felix Muhindi	-	Project Studies Division
Mr. Milton Omballah	-	Ceramics and Building Materials Division
Mr. Francis Polong	-	Environment Management Division
Mr. Patrick Kuloba	-	Engineering Division
Ms. Ingrid Wekesa	-	Chemical Division
Ms. Alice Waithaka	-	Textile Division
Mr. B.O.F. Odongo	-	Leather Division
Mr. Willis Makokha	-	Energy Division
Mr. Fredrick Musieba	-	Mushroom Division
Mr. James Nyagah	-	Quality Assurance

### Head of Centres

Eng. Joseph Kamau	-	Engineering Development & Service Centre
Mr. John M. Muriuki	-	Leather Development Centre
Mr. Edward Njagi (late)	-	Laboratory Services Centre
Mr. Justin K. Omwoyo	-	Information & Communication Technology Centre
Mrs. Mariana Owiyo	-	National Industrial Information Centre
Mr. Ronald Barongo	-	Kisii Centre
Dr. Linus K'osambo	-	Malindi Centre
Mr. Japheth Anuro	-	Homabay Centre
Ms. Sarah Sialuk	-	Eldoret Centre



# DIVISIONAL REPORTS

## HUMAN RESOURCE & ADMINISTRATION DIVISION

### Introduction

This is the 30th year since the inception of KIRDI as a parastatal

### Staff Mobility

As at June 2010 the number of staff stood at 323

### During the year under review, the following categories of staff were recruited;

Research Scientists	3
Accountants	2
Copy Typists	3
Artisans,	1
Axially	3
Documentalist	1

### The Institute lost the underlisted category of staff through expiry of contract/ /resignation/death

#### Expiry of contract

Research Scientists	7
Accountants	1
Administrators	1
Public Relations Officers	2
Secretary	1

#### Death

Research Scientists	1
Technologists	1
Documentalist	1
Auxiliary	1

### Training

During the review, several employees commenced training while others continued to pursue various courses, in both local and overseas institutions under various sponsorships.



## ANNUAL TRAINING REPORT FOR THE FY-2009/10

NAME	DESIGNATION	COURSE PURSUED	INSTITUTION	SPONSOR	PERIOD	EFFECTIVE
	Scientist	Environmental Chemistry				To Oct.2010
Agnes Mueni Sammy	Senior Human Resource Officer	Executive MBA	Moi University (Nairobi campus)	Self	1 YR	Sep 2009 To Dec.2010
J. N. Kahura	Senior Internal Auditor	BBA (Accounts)	St. Paul University	Self	2 Yrs	Jan 2010-Dec 2011
Eunice Bolo	Internal Auditor II	Bachelor of Commerce (Finance Option)	KCA University	self	2 YRS	Jan 2010 To Dec.2011
Mores Njiru	Accounts Assistant	Bachelor of Commerce. (Finance Option.)	KCA University	Self	2% YRS	May 2009 To Dec.2011
Johnstone Kilwaye	Accounts Assistant	Bachelor of Commerce (Finance Option.)	KCA University	Self	2 % YRS	May 2009 To Dec.2011
Pheline Achieng	Accounts Assistant	Bachelor of Business Administration (Finance & Accounts option)	Kenya Methodist University	Self	2 YRS	Jan 2009 To Dec.2010
Thomas Sitienei	Accounts Assistant	CPA Final	Pinnacle College	Self	6 MONTHS	July.2009 To Dec.2010
Kevin Kirui	Accounts Assistant	CPA III	Pinnacle College	Self	1 1/2 YRS	Feb.2010 To Jun.2011
Gerald E. A. Odero	Clerical Officer	KATC 1 & II, CPA II Section 3	K CA University	Self	3 % YRS	Aug. 2008 To Dec.2011
Beatrice Amugune	Personal Secretary II	Bachelors of Business Management	Moi University	Self	2 YRS	SEPT. 2007 TO DEC. 2009
Beatrice Amugune	Personal Secretary II	Secretarial Mgt Course	(GTI) -Mombasa	DPM	1 MONTH	12 <sup>th</sup> Oct To <sup>th</sup> Nov 2009
Jane Kamenwa	Personal Secretary II	Bachelor of Business Administration (Human Resource management)	Kenya Methodist University	Self	2 YRS	May 2008 To July 2010
Edna Masenge	Assistant Research	Masters of Science in	University of Nairobi	Self	2 YRS	Oct 2008

### Recruitment

During the financial year 2009/2010, the following category of staff was recruited to support various Centres and Divisions:

Research	2
Accountants	1
Artisan	1
Documentation Expert	1
Auxiliary	1



## KIRDI STAFF WELFARE ASSOCIATION

### KISWA BACKGROUND INFORMATION AND ELECTED OFFICE BEARERS- 2010

KIRDI staff welfare Association (KISWA) was formed in 1993 with the aim of promoting the staff welfare matters and mutual coexistence between the management and the rest of the staff.

KISWA held its 18th Annual general Meeting on 29th June 2010 and the following were elected to the office.

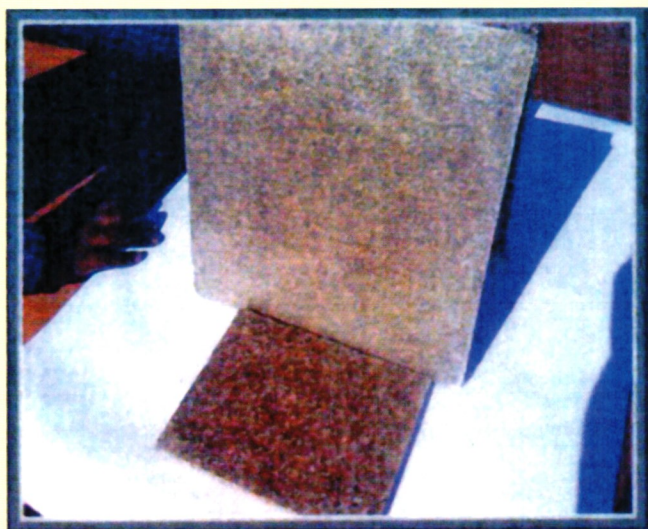
1.	Ms. Phylis Ngunjiri	-	Chairperson
2.	Mr. Johannes Nyaywera	-	Vice chairman
3.	Rogan Miheso	-	Secretary
4.	Mr. Patrick Muyanzi	-	Assistant Secretary
5.	Enos O. Okonji	-	Organizing Secretary
6.	Mr. Henry Ojuok	-	Treasurer
7.	Mr. Crispinus Andayi	-	Assistant Treasurer
8.	David Ongong	-	Committee Member
9.	Mr. Joseph Mutia	-	Committee Member
10.	Gladys Ambuka	-	Committee Member
11.	Caleb Opiyo	-	Committee Member
12.	Shem Odhiambo	-	Committee Member
13.	Kennedy Ocholla	-	Committee Member

KISWA in the last AGM revised its rates as follows:-

	<b>Old rate</b>	<b>New Rate</b>
- Membership fee	300	500
- Assistance fee	150	250
<b>Assistance:-</b>		
- Child	15,000	20,000



# THE SUSTAINABLE UTILIZATION OF OLD CURRENCY BANK NOTES AND LEATHER SHAVINGS IN KENYA



*Polyester Resin Products Based on Shredded Bank Notes*

## Introduction

It is well acknowledged that circulating currency notes are prone to wear and tear and that over time, they require to be withdrawn and replaced. In Kenya, all old currency notes are surrendered to the Central Bank of Kenya for destruction and safe disposal. The old notes are often destroyed by shredding and compacted into briquettes before disposal in the municipal dump sites.

However, in other countries these notes are utilized to produce building materials (e.g. roofing tiles, partition boards, ceiling and acoustic boards, among others). Preliminary investigations at the Kenya Industrial Research and Development Institute (KIRDI) indicate that there is potential in using the shredded currency notes as raw materials for making various products such as lightweight building blocks and shock absorbing/shatter resistant blocks. It should be noted that recycling of old notes offers long term environment friendly solution.

## Problem statement and Justification

In Kenya about 1000 kg of old currency notes is generated

every month. The current system of disposal is by shredding and forming briquettes before dumping in dumpsites. The current method of disposal is certainly not sustainable as it results in pollution of the environment. Alternative methods of utilizing old currency notes are therefore key to contributing towards a clean and healthy environment.

## Objectives

1. To develop alternative products from shredded old currency notes and leather shavings
2. To test the efficacy of various binders such as cement, PoP, geopolymer, resins in development of products based on the shredded currency notes

## Methodology

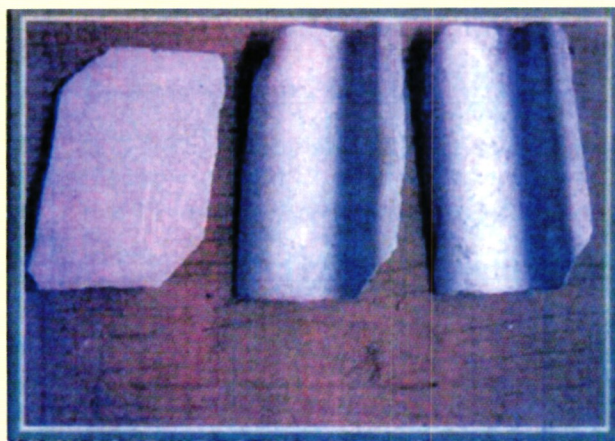
The old shredded currency notes were mixed with cement, Plaster of Paris, resin and geopolymer and various products formed and characterized.

## Results

The plaster of Paris binder was found to be the most suitable for both leather and paper products such as panels. The use of resin as binder was limited to the shredded currency notes. Resin didn't work well on leather shavings because they tended to absorb too much of it.

## Conclusion

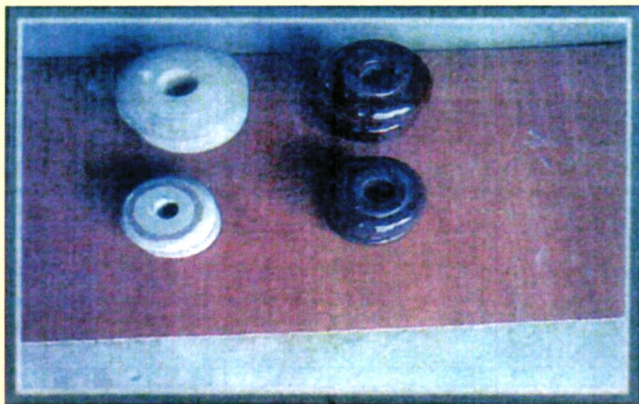
The results obtained so far indicate that there is a big potential in developing reinforced products which incorporate fibrous materials and cement stabilized soil.



*Productions formed from shredded currency note*



# DEVELOPMENT OF HIGH TENSION ELECTRICAL INSULATOR



*Electrical Insulators*

## Introduction

Insulators are non conductors of electricity used for separating the electric conductors from touching each other. They support electrical conductors or electrical devices to prevent the loss of electric charge or current from them. In electric power transmission, it is important to electrically isolate high voltage conductors from each other and from earth ground. This isolation is done using an insulator. Insulators are used to: (i) insulate, (ii) support power transmission lines.

A typical insulator is constructed from a material which has a very high resistance to electric current. Electrical insulators may be connected to and carried by power lines or supports them in various ways. For example, high voltage suspension insulators are used to suspend power transmission lines from overhead supports on poles and towers. Insulators of organic or inorganic materials such as ceramic glass, plastic and resin are used for separating conductors so as to prevent undesired flow of current from the conductors to other objects. High-voltage insulators for overhead lines have long been produced from ceramic, electrically insulating materials such as porcelain or glass. High voltage insulators of ceramic materials are mainly used in outdoor switching stations and outdoor lines. They comprise of an elongated insulation body which is equipped with shields for the formation of a leakage path which is matched, to the atmospheric conditions. The length of the insulator, and the number and diameter of the sheds, are chosen in dependence on the operating voltage of the insulator and on its operating environment, those parameters increasing with the higher operating voltage and the more severe the operating environment, in terms of pollution due to water, acids, and salts for example. To provide the necessary mechanical and electrical characteristics, porcelain insulators are typically quite heavy.

## Problem statement and Justification

Good quality ceramic raw materials are widely available in Kenya and there is capacity to produce porcelain

insulators locally, the domestic consumption of high tension insulators is so substantial that it has to be met by importation. It is economically sound to develop this industry in order to meet the local consumption of insulators and export the surplus.

Previous field and laboratory investigations indicate availability of quality ceramic raw materials in Kenya. Technology for making porcelain insulators is well developed. In this connection the ceramics pilot plant at KIRDI provides a good basis for the development in Kenya. State of the art materials testing facilities for characterization purposes are available in various public and private institutions in the country. This is a market driven development putting into account that the demand for insulators is high due to the aggressive electrification program being undertaken by the Government of Kenya.

## General objective

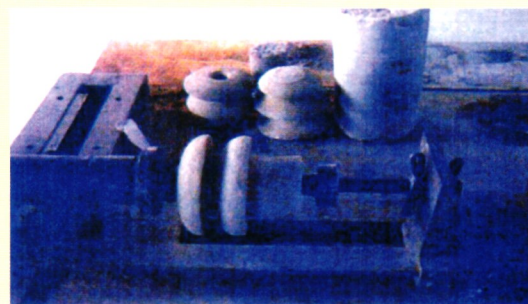
To assess the possibility of making porcelain insulator from local ceramic raw materials.

## Specific objectives

1. To develop a triaxial body based on clay, feldspar, and silica.
2. To develop a glaze for the triaxial body.
3. To determine the characteristics of the body as an insulator.

## Methodology

Raw materials were processed and the triaxial body based on clay, feldspar, and silica formulated. A glaze was developed and applied on the triaxial body. This body was tested in the laboratory to determine its characteristics as an insulator.



*Shaping insulators from clay materials*

## Results

Preliminary investigations on the raw materials indicate the possibility of making high tension electrical insulators from locally available raw materials.

## Conclusion

It is economically sound to develop this industry in order to meet the local consumption of insulators and export the surplus.



# PRODUCTION OF HYDRAULIC FLUID AND ENGINE LUBRICANT FROM CASTOR OIL



*Castor Seeds*

## Introduction

Castor plants grow in many parts of the Kenya as wild plants. Although many farmers in the countryside know that oil can be produced from Castor seeds, production technology is still elusive and they only use of the plant as firewood-a source of energy. In the recent visit to Embu and Masinga, we learnt that few farmers are already cultivating this crop. They obtain the seed from the wild varieties. These regions have a great potential for production of Castor oil crop. However, due to lack of appropriate oil extraction technology and lack of market for the oil product, these regions have declined in cultivation of Castor crop. There was a drop in Castor acreage from 98 acres in 2007 to 5 acres in 2008. However, with a new initiative in Mwingi, more acreage was expected in 2009.

## Problem statement and Justification

Castor Oil extraction technology is the main constraint in production of not only Castor Oil but also other vegetable oils i.e. sunflower, groundnut, *Jatropha curcas*, *Croton megalocarpus*. Those farmers that may have the technology may also be discouraged from producing Castor Oil due to allergenic compounds found on surface of the plant that affect the nervous system. However, with proper safety precautions coupled with availability of technology, many farmers will take on cultivation and production of castor oil.

## Objectives

1. To determine the potential of production of Castor oil in Kenya.
2. To visit Castor growing areas in Eastern Province

## Methodology

Visits were made to the provincial and District Agricultural Offices and Castor farmers in Embu, Masinga and Machakos region.

Clear pale amber oil was obtained after dehydration and filtration of the crude castor oil. The oil was characterized and its characteristics compared with those in the American Standard of Testing and Materials (ASTM). The parameters analyzed were: specific gravity; saponification value; iodine value; moisture and volatiles; acid value; and ash content.

## Conclusion

The process for extracting castor oil from castor seeds was developed. The parameters analyzed above are adequate for testing the castor oil in engines as lubricant or as hydraulic fluid in hydraulic system.



# PRODUCTION OF HIGH QUALITY SUGARCANE JUICE AND IMPROVED JAGGERY PRODUCTS IN RANGWE DISTRICT



*Samples of the mature sugarcane before extraction of sugarcane juice*

## Introduction

Sugarcane is usually processed into sugar in various sugar factories in the region. These factories contract farmers to produce the cane but are unable to fully honour their contractual obligations. Farmers usually incur big losses due to bureaucracy and inefficiency in the process of harvesting and delivery of mature sugarcane to the factories. Due to these challenges, the farmers have been forced to look for alternative processors to avoid losses. Jaggeries have come up to try and alleviate the problem by milling the excess cane and produce crude sugar called jaggery, which is used as a sweetener in the food industry. However, the product range from the jaggeries is limited. The quality of the few products produced has been wanting. This study was undertaken to diversify the product range and improve their quality. Cane juice is one those products that can be developed to enhance profitability and relevance of the jaggeries in the western Kenya region.

## Problem statement and Justification

Sugar cane farmers depend on sugarcane processing firms as the outlet for sale of their produce. However, a lot of wastage occurs during transportation and processing. Farmers have turned to jaggeries as an alternative. Jaggeries are faced with various challenges namely limited markets, quality assurance and limited number of products. The main objective of this study was to develop capacity in the jaggeries by improving processing procedures and product quality.

## Objective

To add value to sugarcane at the jaggeries through product diversification by introducing high quality processing and packaging procedures of cane juice.

## Methodology

Mature sugar cane were collected and trimmed. They were washed and passed through a diesel run sugarcane mill to extract the juice. Cane juice was collected in a clean stainless steel bucket.

The yield of the cane juice was determined. Samples were preserved under refrigeration for laboratory analysis. Measured quantities of juice were taken and evaporated at different rates and conditions to produce jaggery products. Measured quantities of juice were taken and tested under different preservation conditions. Sugar cane juice blends with other fruit juices or liquid products were made. Different flavours and colours were used in the formulation of sugar cane juice blends. Different packaging methods were evaluated for the various products. Sensory evaluation tests were carried out using the locals and potential customers as panelists.

## Results

A variety of jaggery products were produced namely sugar cane juice and sugar cane juice powder.

## Conclusion

This study has shown that a variety of products can be produced from mature sugar cane. The viability of such a processing venture would mainly depend on the quality of products produced, packaging, availability of market and type of markets, availability of raw materials and cost.



# IMPROVED PRESERVATION AND PROCESSING TECHNOLOGY OF DAGAA (OMENA) THROUGH SPICE- SMOKED METHOD IN MIGORI AND MBITA DISTRICT

## Introduction

Dagaa production in Kenya has been on the increase since 2004 and has bypassed the dominant Nile perch production since 2005. The total production of Omena in Kenya currently stands at 68,000 metric tonnes wet weight out of the total Lake Victoria's annual landings of about 144,000 metric tonnes constituting 47% of the total fish catch. In Kenya, the main production areas are concentrated in Suba, Bondo and Migori districts of Kenya as the majority of Omena nets are found in these districts. Most of Omena in Kenya is marketed through the animal feed industry channel (70%) and only 30% is available for human consumption resulting in serious competition for the commodity between direct human food and raw material for animal feed.

Omena fishery plays a significant role in the livelihood of more than 4 million people in terms of employment, income and provision of nutrition thereby ranking as the most important fishery in its contribution to the local and East African regional economy. In Kenya, the fishery is worth between US \$ 40 and 50 million when export markets are considered. Lake Victoria has more than 290 species of fish species and among these are small sized species of fish known as Dagaa (omena in Kenya). There are considerable loss of these small fish due to lack of modern fish processing and preservation methods. In Kenya, fishermen use traditional method of sun drying. Consumption of Omena could be greatly enhanced if they are brought into human diet using modern and improved preservation methods.

## Problem statement and Justification

Traditional method of preservation of Dagaa by sun drying faces a lot of problems. During fishing season, high post harvest losses are often experienced due to heavy rains. Sometimes the rainy season is prolonged thereby preventing effective and fast drying. Spoilage of the product and post harvest losses is due to proteolysis of protein and hydrolysis of fats common in fish. This leads to a product with poor quality-having a bitter and soapy taste, thus low sales and acceptability.

In addition, this traditional method of preservation exposes the fish to foreign material like sand and filth, hence contaminating the product. Alternative methods of preservation, such as spicing, smoking and salting, could increase palatability and acceptability of the product at market.

## General Objective

To produce spiced- smoked omena acceptable for the local market throughout the whole year.

## Specific Objectives

1. To enhance shelf life of Omena.
2. To transfer improved preservation technology

## Methodology

Baseline survey carried out by the project team prior to the construction of the chorkor oven. The traditional oven had considerable disadvantages and was inefficient in capacity and fuel usage hence producing poor quality smoked fish and causing significant post harvest losses. The chorkor oven was then constructed by a mason and a carpenter who were selected from the local community. It was tested, refined and commissioned.

Samples of spice-smoked and sun dried Dagaa were



*Traditional oven used by the locals*



*Improved oven (Chorkor oven)*

taken to KIRDI South B Campus laboratories and analysed for moisture, ash, protein, dry matter and fat contents. Product testing and sensory evaluation for these products was done at the project site in Mbita.



## Results

### Construction of the Chorkor oven

The chorkor oven proved to have superior qualities over the traditional methods of smoking fish and locals appreciated its operation. The results showed that it was easy and safe to operate because it required little amount of firewood and no blowing of smoke into the eyes of the operator. Its firebox were very accessible and the trays could be changed quickly. The oven carried capacity up to one hundred and fifty kilogram (150kg) of dagaa with a minimum of twelve (12) kilograms per tray compared to the traditional one which smoked maximum capacity of twenty kilograms (20kg). It showed a significant level of efficiency as trays stacked on it formed chimney which effectively utilized heat and smoke thus producing high quality uniform product due to greater retention of heat and circulation of smoke inside the oven.

### Physical tests

The smoked product was golden brown in colour compared to sun dried dagaa which was silvery in colour. Texture appearance of the latter was rough may be because of the non-uniform drying in the sun while smoked dagaa appeared smooth due to uniformity drying during smoking process.

### Sensory evaluation

The golden brown colour of spice smoked dagaa (fig 1) having highest mean score attracted the sensory evaluators may be because of the spices and smoke during processing which turned the normal silvery colour of the dagaa (fig.2) to that appealing colour. The flavour and taste in spice-smoked appealed to the panelists. The spices and smoke



*Fig . 1 - Smoked dagaa*



*Fig. 2 - Sun dried dagaa*

had changed the bitter soapy taste experienced in sun dried dagaa.

### Conclusion and Recommendations

The study showed that *Rastrineobola argentea* ("dagaa") though small can be smoked to produce high quality smoked product that is tasty, has nice smell, appealing and acceptable to the consumers. The product can be produced throughout the year as opposed to the sun dried which is seasonal. The chorkor smoked fish had an attractive colour, good taste and quality smoked fish had all attractive colour, good taste and quality.

The chorkor oven technology for smoking fish needs to be transferred to the communities residing along the lake regions as it has high processing capacity, uses less firewood, easy and safe to operate and produces high quality smoked fish contrary to traditional oven which are unsafe to operate, have limited processing capacity and produces low quality products. The oven can also be used to smoke large fish like tilapia as long as the fish processors smoke the recommended fish size.



# DEVELOPMENT OF NUTRIENT-RICH PORRIDGE FLOUR FROM FINGER MILLET (*ELEUSINE CARACANA*) (L) GAERTN) AND *TYLOSEMA FASSOGLENSIS*



*Finger millet*



*Tylosema fassoglensis*

## Introduction

Finger millet [*Eleusine coracana*(L.) Gaertn] form a significant part of the diet in Kenya. Like other cereals, finger millet is rich in energy. Among the cereals, finger millet has one of the best nutritional and functional qualities for use as porridge (Serna-Saldivar et al., 1990). *Tylosema fassoglensis*, an edible plant growing in the wild in Western, Nyanza, Coast and Eastern provinces, has food and medicinal uses (Maundu et al., 1999). *T. fassoglensis* appears to contain a balanced amino acid profile, health-promoting fatty acids, and phytochemicals, and may promote health beyond basic nutrition (Dubois et al., 1995). Studies suggest that plants in the genus *Tylosema* may have health benefits such as immunity boosting, preventing hypertension, enhancing appetite, aiding longevity, treating diarrhoea, and alleviating stomach cramps and headache, (Maundu et al., 1999; Chingwaru et al., 2007). Finger millet and *T. fassoglensis* therefore have promising food applications for health and nutrition.

## Problem statement and Justification

Micro and small enterprises in Kenya currently produce pure flour and composite flour finger millet food products.

The products are generally neither pre-cooked nor fortified. Cereal products such as porridge are a popular because it is convenient, nutritious, and unlike solid foods, is amenable to consumption by sick persons. Pre-cooked and fortified porridge flour sold in the Kenyan market are made mainly from maize, soya beans and amaranth. They are manufactured by the multinationals Proctor & Allan and Promasidor. The complex nature and high cost of pre-cooking and fortification technologies by small scale enterprises in Kenya. Thus only the large enterprises have so far been able to adopt these technologies, and take advantage of the opportunities presented by these technologies. Pre-gelatinizing has become a standard technology for producing cereal products that meet consumer needs in terms of convenience, nutrition and sensory properties. This project was designed to use a simple process to partially pre-gelatinize finger millet. Practical, simple and inexpensive small scale technologies need to be availed to micro and small enterprises if they are to take advantage of opportunities in the cereal sector. *T. fassoglensis*, like pulses, has potential for use in composite flours, protein supplementation of bakery products and infant foods, extending meat products, and production of beverages and fermented products. Current



commercial utilization of *T. fassoglensis* involves a micro entrepreneur, who uses the plant material in formulation of food supplements. The MSME, Bull Pharmacy, markets the product as a nutritive food supplement under the trade name Sunguprot. Finger millet and *T fassoglensis* can be processed into nutrient-rich blended foods. These nutrient-rich foods are ideal for children, the elderly, pregnant and lactating women, the sick, and people with suppressed immunity which necessitate dietary intake at Required Daily Allowance (RDA) levels. Utilization of local staple food crops such as finger millet and indigenous edible plants such as *T fassoglensis* can improve health, nutrition, food security, and expand their commercial utilization. On an individual basis, plants lack balanced nutrients. However, when they are processed into composites, nutritious food can be obtained.

### Objective

To evaluate the impact of *T. fassoglensis* on physico-chemical properties and acceptability of finger millet porridge.

### Methodology

Raw seeds, partially defatted seeds and dried roots of *T. fassoglensis* were analyzed for proximate composition. The four millet varieties Okhale-I, Gulu- E, U 15, and P-224 were tested. Finger millet was boiled as a method of partially pre-cooking the grains. The partially pre-cooked grains were analyzed for macro- and micronutrients.

### Conclusion

The processed millet generally showed a decrease in micronutrient composition which can be attributed to effect of leaching. However, any macronutrients lost during processing can normally be replaced through fortification. The seeds of *T. fassoglensis* have potential food applications because they had high content of protein and fat. The roots also had high fiber content (16.40g/100g) hence exhibiting the potential for food and medical applications.



# PHYTOCHEMICAL INVESTIGATION OF SELECTED PLANT SPECIES FROM THE ASPHODELACEAE FAMILY FOR ANTI-PLASMODIAL ACTIVITY

## Introduction

Plant products have played a significant role in the treatment of various parasitic diseases. The species belonging to the family Asphodelaceae have long since been used in traditional medicine practice for the treatment of various ailments including malaria, rheumatism, diarrhea, dysentery and skin infections. Plants of this family are known to elucidate compounds that are credited with a number of bioactivities including strong anti-plasmodial activity. The aim of this study is to assess the anti-plasmodial activity of both the crude extracts and the isolated compounds of selected species belonging to the family Asphodelaceae.

## Problem statement and Justification

Artemisinin Combination Therapy (ACT) which is recommended for treatment of malaria has turned to be unaffordable for the common man and alternative solutions are urgently required. This first line drug may also become ineffective like its predecessor drugs because the parasites could mutate and become resistant to it.

There is thus an urgent need to seek new cures for malaria and the process has to be repeated consistently because the parasites become resistant to the new cure after only a short time. The Plant Kingdom offers a good potential for identification of lead structures for subsequent drug development. Anthracene derivatives such as anthraquinones have been identified as anti plasmodial agents in *Aloe* species. Species are known to elaborate anthracene derivatives, the compounds responsible for the wide use of *Aloe* in medicine and agriculture.

There are a number of *Aloe* species that grow in the wild in Kenya. These are widely used in folk medicine. In several Kenya communities, one of the major uses of these plants is the cure of malaria and other infections. Information on the chemistry of the Kenyan species of these plants is rarely available. Furthermore information on the anti plasmodial activities of *Aloe* species is scanty.

Therefore, there is a need to conduct phytochemical and anti plasmodial studies on Kenyan *Aloe* species. Such studies will also be useful for chemotaxonomic purposes as the relationship among different taxa is not clearly defined. Knowledge of the composition of these plants with regard to anti plasmodial and antimicrobial activity would have far-reaching solution to healthcare in the tropics.

## Objectives

The general objective of this research was to evaluate the anti plasmodial activity of the constituents of the stems of *Aloe secundiflora*.

The specific objectives of the research were;

- c). To establish the antiplasmodial activity of the stem extract of *Aloe secundiflora*.
- d). To characterize the isolated compounds.
- e). To determine the antiplasmodial activity of the isolated compounds.

## Methodology

Field trip to the Marigat area was undertaken In June, 2009 and two *Aloe* species (*A. turkanensis* and *A. secundiflora*) collected. The collected materials were prepared at KIRDI South B Campus laboratories and analyzed for quinonoid compounds.

*In-vitro* anti-plasmodial assay was undertaken where five compounds were tested.

## Results

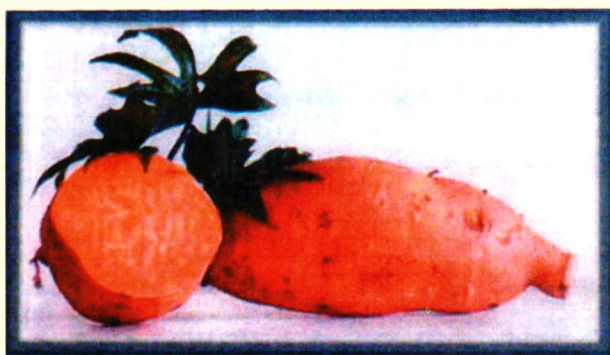
Twelve quinonoid compounds (including seven anthraquinones, three naphthaquinones, a pyrone and a coumaric acid derivative) have been isolated both from the rhizomous stem and leaves of *Aloe secundiflora*. Five of the compounds were subjected to *in-vitro* anti-plasmodial assay with the results received showing good activity.



# OPTIMIZING UTILIZATION OF ORANGE-FLESHED SWEET POTATOES AS A SOURCE OF VITAMIN A

## Introduction

Sweet potato, *Ipomoea batatas* (Lam), has been regarded as a low status crop in most parts of the world. In Kenya, it is grown as a subsistence crop and is regarded as a poor man's crop, and this image had resulted in low production. However, in recent years there has been an increase in production of sweet potatoes because the government has selected it as one of the target crops to



*Orange-Fleshed Sweet potatoes*

help enhance food security in the country. This strategy has targeted drought resistant crops of which the sweet potato belongs. As a result, sweet potato has been receiving increasingly greater attention from the agriculturalist and ecologists because, in addition to being drought resistant, it can also grow in soils with limited fertility and does not require fertilizer or pesticides. The main growing areas are Western, Nyanza, Central and Eastern Provinces. In the past, the crop was grown for domestic consumption but of late there has been commercial production. The crop is mainly sold fresh in Nairobi and Mombasa City.

## Problem Statement

KIRDI has been promoting processing of orange fleshed roots in Western Kenya since year 2000 with the aim of preserving the sweet potatoes, increasing their utilization and in effect combat vitamin A deficiency in this region. The processing methods promoted have mainly been on use of sweet potato flour to make bakery products. These products are not part of staple diet of the rural people targeted in the promotions who may view them as a luxury. This

may have had a negative effect on the response to the promotions. This project was undertaken to investigate ways through which utilization of orange fleshed sweet potatoes as a source of vitamin A could be optimized through incorporation in foods that are regularly consumed.

## Objectives

1. To determine the optimum levels of sweet potato flour to be incorporated in a maize composite for nutritional and economic benefits
2. To determine the degradation of Vitamin A and the shelf-life of the resultant flour.

## Methodology

Sweet potato flour was processed at pilot scale, with capacity for 5 kg of roots by batch. The processing unit was equipped with a mechanized grater, electric chipper (table top), a manual press, and an electric oven.

### **Flour processing had the following steps:**

- a. Washing of the roots for withdrawal of the field derived dirt,
- b. Manual peeling with knives,
- c. Washing followed by immersion of the roots in water until processing, in order to avoid enzymatic oxidation (darkening of the roots) after peeling,
- d. Roots were grated and a humid mass was obtained and then transferred to polyethylene bags, which allowed water flowing, while other batches were chipped,
- e. Manual press for water withdrawal,
- f. The resulting pie was crumbled with the help of a grater,
- g. Drying and fermentation steps.

The orange fleshed sweet potatoes samples were subjected to various experimental treatments. In order to determine the shelf life of flour, the moisture levels were measured and different packaging materials tested. The sweet potato flour was packaged in polyethylene bags and kept in a dark place for 12 months.

## Conclusion

There is the need to optimize the drying process to minimize the loss of carotenoids.



# DEVELOPMENT OF A POST CONSUMER PLASTIC WASTE WASHING MACHINE



*Testing of the Plastic waste washing machine*

## Introduction

The plastic industry in Kenya has been one of the fastest growing sectors in Kenya with a large number of Community Based Organizations (CBOs) and individual micro-businesses involved in collecting and sorting post consumer plastic waste but they lack requisite linkages and technologies that are essential to make the business profitable. The recycling technologies applied by the existing CBOs are inefficient, expensive and pose health risks. The field study carried out in the first phase of the project identified a gap in the methodologies applied in the recycling of post consumer plastic waste. The poor washing techniques applied were a major concern.

The plastic washing machine was identified as a priority that would enhance the efficiency of cleaning of the waste and solving the associated environmental and health problem.

## Problem statement and Justification

A large volume of the plastics are generated every day and end up as waste. They end up causing significant load to the solid waste management at the Dandora dumpsite. Besides the littering problem, the plastic waste, cause a number of environmental and health hazards that include: choking of animals and soils; blockage of sewer lines, waterways and rivers and blight of landscapes and trees. When stagnant and dirty water are blocked as a result of plastic waste, water borne diseases like typhoid, malaria and cholera break out.

Plastics contribute indirectly to air pollution because open air burning of plastics is a common practice. Flimsy plastic bags have also been associated with "flying toilets", another growing concern in the slums of the city.

Plastics also contribute to the depletion of non-renewable resources because they are made from mineral products. They also lead to accumulation of non-biodegradable waste due to the nature of the materials used in their production.

The challenges posed by post consumer plastic waste can be turned into opportunities through application of appropriate recycling technologies. The overall objective of the project was to develop an efficient, cost-effective post consumer plastic waste washing machine to assist the SMEs engaged in recycling of plastic waste.

## Specific objectives

To document post consumer plastic waste recycling challenges in Nairobi and its environs

To design and fabricate a plastic waste washing machine

To commission the machine in the presence of SME's

## Methodology

The equipment was designed and fabricated at the KIRDI Engineering Development and Services Centre (EDSC). It was tested and validated before commissioning.

## Results

The machine was developed and tested. It was working well but there were a few challenges. For example, the cleaned papers could get stuck and needed to be retrieved now and then. The machine will be modified to enhance efficiency.





KENYA INDUSTRIAL RESEARCH  
AND DEVELOPMENT INSTITUTE

**Annual Report  
And Financial Statements  
For The Year Ended  
30TH JUNE 2010**







# KENYA INDUSTRIAL RESEARCH AND DEVELOPMENT INSTITUTE (KIRDI)

## Board of Managements Report

The Board of Management has the pleasure in submitting the Financial Statement of the Institute for the year ended 30th June 2010.

## Legal Status

The Kenya Industrial Research and Development Institute (KIRDI) is a statutory research organization established under the Science and Technology Act chapter 250 revised edition of 1979. KIRDI is the country's principal national institution responsible for industrial research and development. It falls under the Ministry of Industrialization.

## The KIRDI Vision and Mission

The vision of the institute is to be a centre of excellence in Industrial Research and Development.

Its mission is to undertake Industrial Research and Development and disseminate findings that will have a positive impact on the national development.

## Board of Management

The current Board of Management comprises of:

### (a) Appointed Members

1. Prof. Tuikong D. K. Serem
2. Mr. John M. Migiro
3. Mr. Elema Isako Fila
4. Dr. Wycliffe A M Alusiola
5. Prof. Wambui Kogi-Makau
6. Mr. Benjamin Kibet Mitei
7. Mr. Wanjohi Ndirangu
8. Dr. M.C.Z. Moturi, CEO and Secretary to the Board



**(b) Ex-Officio Members**

- |                        |   |                                             |
|------------------------|---|---------------------------------------------|
| 1. Permanent Secretary | - | Ministry of Industrialization               |
| 2. Permanent Secretary | - | Ministry of Finance                         |
| 3. Permanent Secretary | - | Ministry of Public Works                    |
| 4. Inspector General   | - | Inspectorate of State Corporations          |
| 5. Executive Secretary | - | National Council for Science and Technology |

**Other Relevant Information**

**Principal Bankers:**

1. National Bank of Kenya  
Harambee Avenue  
NAIROBI
2. Barclays Bank of Kenya  
NIC Branch  
NAIROBI

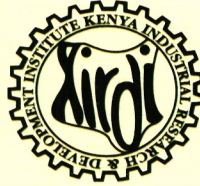
**Principal Advocates:**

1. Guserwa and Co. Advocates  
P. O.Box 8384 - 00200,  
NAIROBI
2. Maangi Kitonga & Co Advocates  
P. O. Box 41880 - 00100,  
NAIROBI

**Registered Office:**

Popo Road, South- C, NAIROBI





**KENYA INDUSTRIAL RESEARCH AND DEVELOPMENT INSTITUTE (KIRDI)**

**STATEMENT OF BOARD DIRECTORS' RESPONSIBILITY**

The Science and Technology Act (Cap) requires the Board of Directors to prepare financial statements for each financial year, which include a balance sheet showing in detail the assets and liabilities of the Institute, a statement of income and expenditure, and such other statements that the Board may deem necessary. It also requires the Board to ensure the Institute keeps proper books of account and other books and records in relation to the Institute and to all undertakings, funds, investments, activities and property of the Institute. The Board is responsible for safeguarding the assets of the Institute.

The Board accepts responsibility for the annual financial statements, which have been prepared using appropriate accounting policies supported by reasonable and prudent judgements and estimates, in conformity with generally accepted accounting practice and in the manner required by the Science and Technology Act, chapter 250 revised editions of 1979. The Board is of the opinion that the financial statements give a true and fair view of the state of the financial affairs of the Institute and of records which may be relied upon in the preparation of the financial statements, as well as adequate systems of internal financial control.

Nothing has come to the attention of the Board to indicate that the Institute will not remain a going concern for at least the next twelve months from the date of this statement.

Signature:.....

Date: ..... 21/01/2011

AG. Chairman: **PROF. TUIKONG O.K. SEREM**

Signature: .....

Date: ..... 21/01/2011

Director: **DR. M. C. Z. MOTURI**



## REPUBLIC OF KENYA

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Fax: +254-20-311482  
Email: [cag@kenao.go.ke](mailto:cag@kenao.go.ke)  
Website: [www.kenao.go.ke](http://www.kenao.go.ke)

P.O. Box 30084-00100  
Nairobi



### KENYA NATIONAL AUDIT OFFICE

## REPORT OF THE AUDITOR-GENERAL ON KENYA INDUSTRIAL RESEARCH AND DEVELOPMENT INSTITUTE FOR THE YEAR ENDED 30TH JUNE 2010

### REPORT ON THE FINANCIAL STATEMENTS

I have audited the accompanying financial statements of Kenya Industrial Research and Development Institute set out on pages 5 to 16, which comprise the statement of financial position as at 30 June 2010, and the statement of comprehensive income, statement of changes in accumulated funds and statement of cash flows for the year then ended, and a summary of significant accounting policies and other explanatory information in accordance with the provisions of Article 229 of the Constitution of Kenya and Section 14 of the Public Audit Act, 2003. I have obtained all the information and explanation which, to the best of my knowledge and belief were necessary for purpose of the audit.

#### Management's Responsibility for the Financial Statements

Management is responsible for the preparation and fair presentation of these financial statements in accordance with International Financial Reporting Standards and for such internal control as management determines is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

The management is also responsible for the submission of its financial statements to the Auditor-General in accordance with the provisions of Section 13 of the Public Audit Act, 2003.

#### Auditor-General's Responsibility

My responsibility is to express an opinion on these financial statements based on the audit and report in accordance with the provisions of Section 15 of the Public Audit Act, 2003. The audit was conducted in accordance with International Standards on Auditing. Those standards require compliance with ethical requirements and that the audit be planned and performed to obtain reasonable assurance about whether the financial statements are free from material misstatement.

An Audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditor's judgement, including the assessment of the risks of material mis-statement of the financial statement, whether due to fraud or error. In making those risk assessments, the auditor

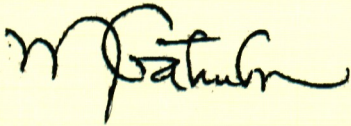


considers internal control relevant to the entity's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the effectiveness of the institute's internal control. An audit also includes evaluating the appropriateness of accounting policies used and the reasonable of accounting estimates made by the management, as well as evaluating the overall presentation of the financial statements.

I believe that the audit evidence obtained is sufficient and appropriate to provide a basis for my audit opinion.

### Opinion

In my opinion, the financial statements present fairly, in all material respects, the financial position of the institute as at 30 June 2010, and of its financial performance and its cash flows for the year then ended, in accordance with International Financial Reporting Standards and comply with the Science and Technology Act, Cap 250 of the Laws of Kenya.



A.S.M. GATUMBU  
AUDITOR-GENERAL  
Nairobi

9th February 2011





## KENYA INDUSTRIAL RESEARCH AND DEVELOPMENT INSTITUTE (KIRDI)

### STATEMENT OF FINANCIAL POSITION AS AT 30<sup>TH</sup> JUNE 2010

ASSETS	NOTES	2009/2010	2008/2009 restated
<b>NON CURRENT ASSETS</b>			
Property and Equipment	2a	330,183,720	175,676,906
Work in Progress	2a	10,879,238	159,293,862
R & D projects	27	132,395,771	132,395,771
		473,458,729	467,366,539
<b>CURRENT ASSETS</b>			
Stores and inventories	2b	36,432,519	40,893,295
Accounts Receivable	3 & 4	12,845,622	12,148,757
Cash and Cash Equivalents	6	12,746,826	10,780,841
Deposits	5	464,138	464,138
Total		62,489,105	64,287,031
<b>TOTAL ASSETS</b>		<b>535,947,834</b>	<b>531,653,570</b>
<b>ACCUMULATED FUNDS &amp; LIABILITIES</b>			
Capital Grants G.O.K	24	475,540,536	475,540,536
Project Grants	8	3,207,679	3,207,679
General Reserves	25	(39,016,540)	(31,505,820)
Donations UNIDO	26	83,515,167	83,515,167
Accumulated Funds		523,246,842	497,188,603
Current Liabilities			
Accounts payable (Creditors)	7	12,700,992	34,464,967
<b>TOTAL ACCUMULATED FUNDS &amp; LIABILITIES</b>		<b>535,947,834</b>	<b>531,653,570</b>

Signature.....  
 Ag. Chairman: Prof Tuikong D.K. Serem

Date: 21/01/2011

.....  
 Director: Dr M.C.Z Moturi

21/01/2011  
 Date: .....







**KENYA INDUSTRIAL RESEARCH AND DEVELOPMENT INSTITUTE (KIRDI)**

**STATEMENT OF COMPREHENSIVE INCOME FOR  
THE YEAR ENDED 30TH JUNE 2010**

	NOTES	2009/2010 KSHS.	2008/2009 KSHS.
<b>INCOME</b>			
Re-Current Grant	9a	290,000,000	221,432,906
Other income	9b	35,687,096	20,457,774
Development grants		228,368,114	86,796,567
		554,055,210	328,687,247
<b>EXPENSES</b>			
Staff Cost	10	268,852,905	229,369,969
Administrative Expense	11	93,746,739	57,614,313
Insurance Expense	12	1,530,189	1,042,882
Project Consultancy Expense	13	82,388,715	5,385,684
Technical Expense	14	15,476,082	6,972,387
Maintenance Expenses	15	18,649,393	17,0719,627
Traveling And Subsistence Expenses	16	37,954,688	21,638,637
Depreciation Expenses	2a&2b	23,689,982	21,905,534
Decrease in stock		310,492	
		542,599,185	360,949,032
<b>SURPLUS/ (DEFICIT) FOR THE YEAR</b>			
General Reserve B/F		11,456,025	(32,261,785)
PRIOR PERIOD ADJUSTMENTS		(50,129,979)	(8,517,800)
Balance C/D		(342,586)	(9,350,394)
		(39,016,540)	(50,129,979)





## KENYA INDUSTRIAL RESEARCH AND DEVELOPMENT INSTITUTE (KIRDI)

### STATEMENT OF CHANGES IN ACCUMULATED FUNDS FOR THE YEAR ENDED 30th JUNE 2010

	Project Grants	Capital Grants	Revenue Reserve	UNIDO	TOTAL
As at 1 <sup>st</sup> July 2008	Ksh 14,188,761	Ksh 297,989,217	Ksh (8,517,800)	Ksh 83,515,167	387,175,345.00
G.O.K Grants Project Grants received/utilised Prior year adjustments Surplus/(Deficit) for the year	(293,996)	151,919,433	(9,350,394) (32,261,785)		151,919,433 (293,996) (9,350,394) (32,261,785)
As at 30th June 2009	13,894,765	449,908,650	(50,129,979)	83,515,167	497,188,603
	Project Grants	Capital Grants	Revenue Reserve	UNIDO	TOTAL
As at 1 <sup>st</sup> July 2009	Ksh 13,894,765	Ksh 449,908,650	Ksh (50,472,565)	Ksh 83,515,167	496,846,017
G.O.K Grants Project Grants received/utilised Prior year adjustments Surplus /(Deficit) for the year	10,687,086	25,631,886	0 11,456,025	0 0	25,631,886.00 (10,684,086.00) 0.00 11,456,025.00
As at 30th June 2010	3,207,679	475,540,536	(39,016,540)	83,515,167	523,246,842







## KENYA INDUSTRIAL RESEARCH AND DEVELOPMENT INSTITUTE (KIRDI)

### STATEMENT OF CASH FLOWS FOR THE YEAR ENDED 30<sup>TH</sup> JUNE 2010

	2009/2010 KSHS	2008/2009 KSHS
<b>CASH FLOW FROM OPERATING ACTIVITIES</b>		
Adjustment for items not involving movements of cash:	11,456,025	(32,261,785)
Depreciation expenses		
Provisions	23,689,982	21,905,534
	-	270,000
Surplus/Deficits before working capital changes	35,146,007	(10,086,251)
<b>WORKING CAPITAL CHANGES</b>		
Stock	-	-
Debtors	310,492	(4,667,969)
Deposits (clearance account)	(696,865)	(4,736,233)
Creditors and Accruals	-	1,187,485
Changes in Working capital	(21,763,975)	(10,528,785)
Net inflow From Operating Activities	(22,150,348)	(18,745,502)
Cash Flow in investing Activities:	12,995,659	(28,831,753)
Purchase of Property and Equipment	(25,631,887)	(35,795,353)
R & D Projects	-	(84,124,080)
Cashflow from financing:	(25,631,887)	(119,919,433)
Capital grants	25,631,887	151,919,433
Prior year adjustment	(342,586)	(3,161,706)
Changes from Donor project funding	(10,687,086)	(293,996)
Net inflow from financing activities	14,602,215	148,463,731
Net increase/Decrease in cash	1,965,987	119,631,978
Cash at the beginning of the year	10,780,841	11,068,296
Cash at the end of the year	12,746,828	10,780,841





## KENYA INDUSTRIAL RESEARCH AND DEVELOPMENT INSTITUTE (KIRDI)

### NOTES TO THE ACCOUNTS FOR THE YEAR ENDED 30TH JUNE 2010

#### 1. Principle accounting policies

The institute is a non-profit making body and the accounts are prepared on the basis of government accounting procedure as modified to include the revaluation of certain assets.

##### (a) Fixed Assets (Non-Current Assets)

The fixed assets are stated at cost or as revalued on existing use basis from when the institute started self accounting i.e. 1st July, 1980.

##### (b) Depreciation

Provision is made for depreciation on the straight-line method designed to write off the original cost or valuation of fixed assets other than land, and work in progress over the actual life of the asset. A whole year's depreciation is charged on assets acquired nine months or more prior to the closure of the financial year and none to those acquired three months or less to the end of the financial year.

The annual rates for this purpose are: -

1. Building.....	2%
2. Machines.....	12.5% or as per valuer's recommendation
3. Motor vehicles.....	25%
4. Office furniture & equipment...	12.5% or as per valuer's recommendation
5. Computers.....	30%

##### (c) Income

The major source of income of this institute are the grants from the government and the nominal charges of analysis fees from industrial manufactures and potential entrepreneurs who need laboratory reports on their products. Income is recognized on an accrual basis.

##### (d) Bad Debts

Bad debts are written-off after all efforts to collect them have been exhausted.

##### (e) Currency

Financial Statement has been presented in Kenya Shillings.

##### (f) Stores and Inventory

Stock is valued at cost with the exception of donations which is reported at Revaluation.

##### (g) Retirement Benefits/Gratuity

The Institute operates a Retirement Benefit Scheme which is managed by Trustee Board under the Retirement Benefits Regulations (RBA) regulations. Further monthly remittances are made to a custodian for staff serving on Contract Terms which is eventually paid as gratuity at the expiry of the Contract.





## KENYA INDUSTRIAL RESEARCH AND DEVELOPMENT INSTITUTE (KIRDI)

### Note 2 a FIXED ASSETS SCHEDULE FOR 2009/2010

	LAND	WORK IN PROGRESS	BUILDINGS	MACHINERY & EQUIPMENT	MOTOR VEHICLES	FURNITURE & FITTINGS	COMPUTERS & EQUIPMENT	TOTAL
	SHS	SHS	SHS	SHS	SHS	SHS	SHS	SHS
VALUE/COST As at 1/7/2009	26,865,000	-	270,099,688	116,353,700	23,407,484	23,539,150	19,401,551	479,666,573
Additions during the year		10,879,238	-	48,000	12,786,000	341,649	1,577,000	25,631,887
<b>TOTAL</b> 30 <sup>th</sup> June 2010	26,865,000	10,879,239	270,099,688	116,401,700	36,193,484	23,880,799	20,978,551	505,298,460
Accumulated Depreciation b/f	-	-	30,401,976	72,714,112	12,883,871	13,574,552	15,121,293	145,038,390
Depreciation for the year Adjustments/ Dept	-	-	2,216,117	7,575,820	3,507,871	3,895,964	2,343,926	19,539,698 (342,586)
Total Dep. Net Book Value 30.06.2010	26,865,000	10,879,238	32,618,093 237,481,595	80,289,932 36,111,768	16,391,742 19,801,742	17,470,516 6,410,283	17,465,219 3,513,332	164,235,502 341,062,958
<b>Net Book Value</b> 30.06.2009	<b>26,865,000</b>	<b>159,293,862</b>	<b>80,403,850</b>	<b>43,639,588</b>	<b>10,523,613</b>	<b>9,964,598</b>	<b>4,280,258</b>	<b>334,970,769</b>

NOTE 2b	2009/2010	2008/2009
<b>STORES AND INVENTORY</b>		
Stock-loose tools	30,435,419	34,585,703
Stock-General stores	5,997,100	6,307,592
<b>Total</b>	<b>36,432,519</b>	<b>40,893,295</b>
<b>Depreciation for the year</b>		
Fixed Assets		19,539,698
Amortization of loose tools		
2008/2009	34,585,703	
2009/2010	30,435,419	4,150,284
<b>Total</b>		<b>23,689,982</b>





## KENYA INDUSTRIAL RESEARCH AND DEVELOPMENT INSTITUTE (KIRDI)

### NOTES TO THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 30<sup>TH</sup> JUNE 2010

	2009/2010 KSHS	2008/2009 KSHS
<b>Note 3</b>		
<b>DEBTORS</b>		
Balance 1980/81 to 30/06/2002	4,169,360	4,169,360
Harambee sacco	1,507,775	
Kiswa	351,879	
Fruit processing project (Eldoret)		77,839
<b>TOTAL</b>	<b>6,029,014</b>	<b>4,247,199</b>
<b>Note 4</b>		
<b>ADVANCES AND PREPAYMENTS</b>		
Traveling imprest (local)	2,045,577	424,651
Traveling imprest (overseas)	779,870	373,941
Temporary imprest	801,255	4,672,657
Standing imprest	349,500	216,628
Salary advance	523,796	438,782
Salary in advance	459,027	422,125
Excess medical	1,723,864	1,219,055
Plot scheme	133,719	133,719
<b>TOTAL</b>	<b>6,816,608</b>	<b>7,901,558</b>
<b>Note 5</b>		
<b>DEPOSITS(utilities)</b>		
Fuel		
Oxygen		
Hospital	66,000	66,000
Electricity-Kisumu	30,000	30,000
Electricity-South C/Eldoret	10,000	10,000
<b>TOTAL</b>	<b>308,138</b>	<b>308,138</b>
	50,000	50,000
	<b>464,138</b>	<b>464,138</b>





## KENYA INDUSTRIAL RESEARCH AND DEVELOPMENT INSTITUTE (KIRDI)

<b>Note 6</b>		
<b>Cash and Bank balance</b>		
HQ(main Account)	687,097	58,537
LDC A/C	988,969	188,660
EDSC A/C	2,039,173	937,150
Danida Bsp's A/c	0	0
KWRC revenue A/c (closed)	0	87
Kisumu imprest A/c	112,297	665
LSC A/c	2,405,372	53,276
BBK A/c	2,781,245	8,097,628
NIIC/Projects Account	3,678,415	1,444,838
Cash in hand	54,258	0
<b>TOTAL</b>	<b>12,746,826</b>	<b>10,780,841</b>

**Note 7**

<b>Accounts payable (Creditors)</b>		
Payroll deductions	3,015,425	3,569,394
VAT	0	3,974,717
Other Creditors	7,988,846	20,372,612
Provision for audit fee	540,000	810,000
Miscellaneous deposits	1,156,721	5,738,244
<b>TOTAL</b>	<b>12,700,992</b>	<b>34,464,967</b>
<b>Note 8.</b>		
<b>Projects</b>		
ASARECA Project	(113,936)	0
Coffee OTA Project	0	872,849
UNIDO biogas project	(3,282,613)	1,531,647
KAPP oil project	123,980	875,000
IFS	857,850	91,128
WIFIP hycinth project	563,500	625,000
ATPS-ICT	158,891	158,891
Horticultural ADB	55,803	55,803
Mini-hydo project	84,813	84,813
ATPS-Heavy metals.	0	119,040
DANIDA-Fish leather /Arc welding	8,969,238	9,480,594
KAPP Banana project	(357,578)	
DANIDA-Honey project	(2,913,269)	
DANIDA-Brick making project	(1,171,410)	
Lake and sea resources	232,410	
<b>TOTAL</b>	<b>3,207,679</b>	<b>13,894,765</b>
<b>Note 9a</b>		
Recurrent Grants	<b>290,000,000</b>	<b>221,432,906</b>
<b>Note 9b</b>		
Other income		
Research grants	-	
Rents and sundry revenue	7,820,206	
Increase in stock	27,866,890	15,789,805
<b>TOTAL</b>	<b>35,687,096</b>	<b>20,457,774</b>





## KENYA INDUSTRIAL RESEARCH AND DEVELOPMENT INSTITUTE (KIRDI)

EXPENSES		
Note 10. STAFF COST	2009/2010 KSHS.	2008/2009 KSHS.
Basic salary	119,842,430	114,424,539
House allowance	55,664,282	34,691,161
Other personal allowance	21,477,383	20,253,341
Medical Allowance	10,706,899	9,744,862
Medical Expenses	6,328,080	2,751,372
Passage and Leave	6,823,500	2,043,600
Training expenses	6,599,843	3,563,911
Group life GPA	2,995,689	3,660,524
Fees commission and Honoraria	2,053,787	4,275,438
Gratuity, Pension and NSSF	36,361,012	33,961,221
<b>TOTAL</b>	<b>268,852,905</b>	<b>229,369,969</b>
<b>Note 11. ADMINISTRATIVE COSTS</b>		
Transport operation expenses	2,889,828	3,381,812
Postal and telecom expenses	5,783,906	1,547,044
Telephone expenses	3,077,160	1,321,416
Official entertainment	13,301,149	10,371,247
Board Exp. & Director's Salary & Allow	20,467,876	7,166,460
Electricity	5,617,426	5,038,639
Gas purchase	1,291,802	124,430
Water and conservancy	1,407,962	809,928
Publishing and printing	2,935,314	1,192,079
Purchase and Consumables	3,089,299	1,803,629
Uniform and clothing	654,953	541,330
Library expenses	777,679	415,953
Purchase of stationery	7,366,673	3,689,787
Advertising and publicity	2,873,574	2,673,769
Show expenses and market research	1,624,694	910,968
Rent and rate(non-residential)	4,287,928	1,858,875
Computer expenses	6,128,810	5,545,665
Hire of transport and machinery		
Misc and other charges	929,700	1,274,072
Purchase of plant and equipment		
Contribution to other bodies	1,251,518	1,209,837
Contracted guards & cleaning services	7,489,488	6,467,373
Provision for audit fee	500,000	270,000
<b>TOTAL</b>	<b>93,746,739</b>	<b>57,614,313</b>
<b>Note 12 INSURANCE EXPENSES</b>		
Insurance of properties	1,530,189	1,042,882
<b>Note 13</b>		
Project and consultancy services		
Research feasibility studies & projects	82,388,715	5,385,684
	82,388,715	5,385,684







## KENYA INDUSTRIAL RESEARCH AND DEVELOPMENT INSTITUTE (KIRDI)

<b>Technical expenses</b>		
Laboratory chemicals	2,848,279	1,176,578
Contracted professional services	12,061,357	4,903,176
Rental of gas cylinders	152,249	120,953
Refined fuels & lubricants-production	414,197	771,680
<b>TOTAL</b>	<b>15,476,082</b>	<b>6,972,387</b>
<b>Note 15</b>		
<b>Maintenance Expenses</b>		
Maint. of office furniture & equip	2,674,819	5,927,895
Maint. of build. & stations-non res.	9,474,976	5,029,942
Maint. of plant machinery & equip.	4,167,932	4,813,757
Maint. exp-motor vehicles	2,331,666	1,248,033
<b>TOTAL</b>	<b>18,649,393</b>	<b>17,019,627</b>
<b>Note 16</b>		
<b>Traveling and subsistence</b>		
Traveling and accommodation	37,954,688	21,638,637
<b>Note 17</b>		
<b>INCOME</b>		
Recurrent grant	290,000,000	221,432,906
Other revenue	35,687,096	20,457,774
Development grants	228,368,114	86,796,567
<b>TOTAL</b>	<b>554,055,210</b>	<b>328,687,247</b>



**Note 18 (INCORPORATION)**

The Kenya Industrial Research and Development Institute (KIRDI) is a statutory organisation established under the Science and Technology Act Cap. 250, and is domiciled in Kenya

**Note 19 Stock Adjustment**

	General stores	Loose-tools
Opening stock .....	6,307,592	34,585,703
Net decrease/Amortisation .....	(310,492)	(4,150,284)
<b>Closing stock</b>	<b>5,997,100</b>	<b>30,435,419</b>

**Note 20 Recurrent grants**

The institute receives grants from exchequer for personnel emoluments, operations and maintenance costs.

**Note 21 Development grants**

These represents grants received from various Donors and credit agreements including government contribution for research and development activities.

The total amount received was Ksh 254,000,000 out of which Ksh 228,368,114 was attributed to income and expenditure statement and Ksh 25,631,887 as capital grants.

**Note 22 Recurrent and Development expenditure**

The expenditure is financed by both recurrent and development funds

**Note 23 Reserves**

These represents the institute's accumulated funds Account as balances brought forward for revaluation reserve and surplus/deficit arising from the income and expenditure Account.





## KENYA INDUSTRIAL RESEARCH AND DEVELOPMENT INSTITUTE (KIRDI)

### Note 24 Capital G.O.K Grants

The ksh 475,540,536 stated as Capital grants is accumulation of Developemtn releases going way back to 1980 when the institute began self Accounting

### Note 25 General Reserves

The General Reserves Account figure of Ksh (39,016,540) is arrived as follows:-

2009/2010 Balance b/f	(50,129,979)
Surplus for the year	11,456,025
Prior year adjustment	(342,586)
	<u>(39,016,540)</u>

### Note 26 Donation-UNIDO

Donations represent loose fools donated to the institute in the 1990s by UNIDO amounting Ksh 83,517,167

### Note 27 R & D Projects

These is composed of expenditure amounting Kshs 132,395,771 transferred from Development vote to R&D recognition that R&D projects will generate future economic benefits.

The institute intends to patent its research discoveries which includes prototye development designs and pilot plants.

### Note 28 Donor funded projects

	Amount received	Expenditure
UNIDOBiogas project	735,275	5,549,535
KAPP Oil project	Nil	751,020
WIFIPHyacinth project	Nil	61,500
KAPP Banana project	Nil	357,578
Danida honey processing	Nil	2,925,632
Danida-Brick making	7,500,000	8,676,414
IFS-sweet potato project	874,765	108,046
Asareca project	543,748	657,684
Lake and sea resources project	300,000	67,590
Fish Leather project	Nil	511,356
	<u>9,953,788</u>	<u>19,666,355</u>

### Note 29 Abbreviations

OTA -Coffee Ochratoxin A project funded by European Union

UNIDO-United nations industrial development Organisation

KAPP-Kenya Agricultural productivity project of KARI

IFS- International Foundation for Science

WIFIP-Development of fertilizer from water hyacinth in lake region Project

ATPS-Africa Technology policy studies Network

ADB - Africa Development Bank

DANIDA-Danish Industrial development agency





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