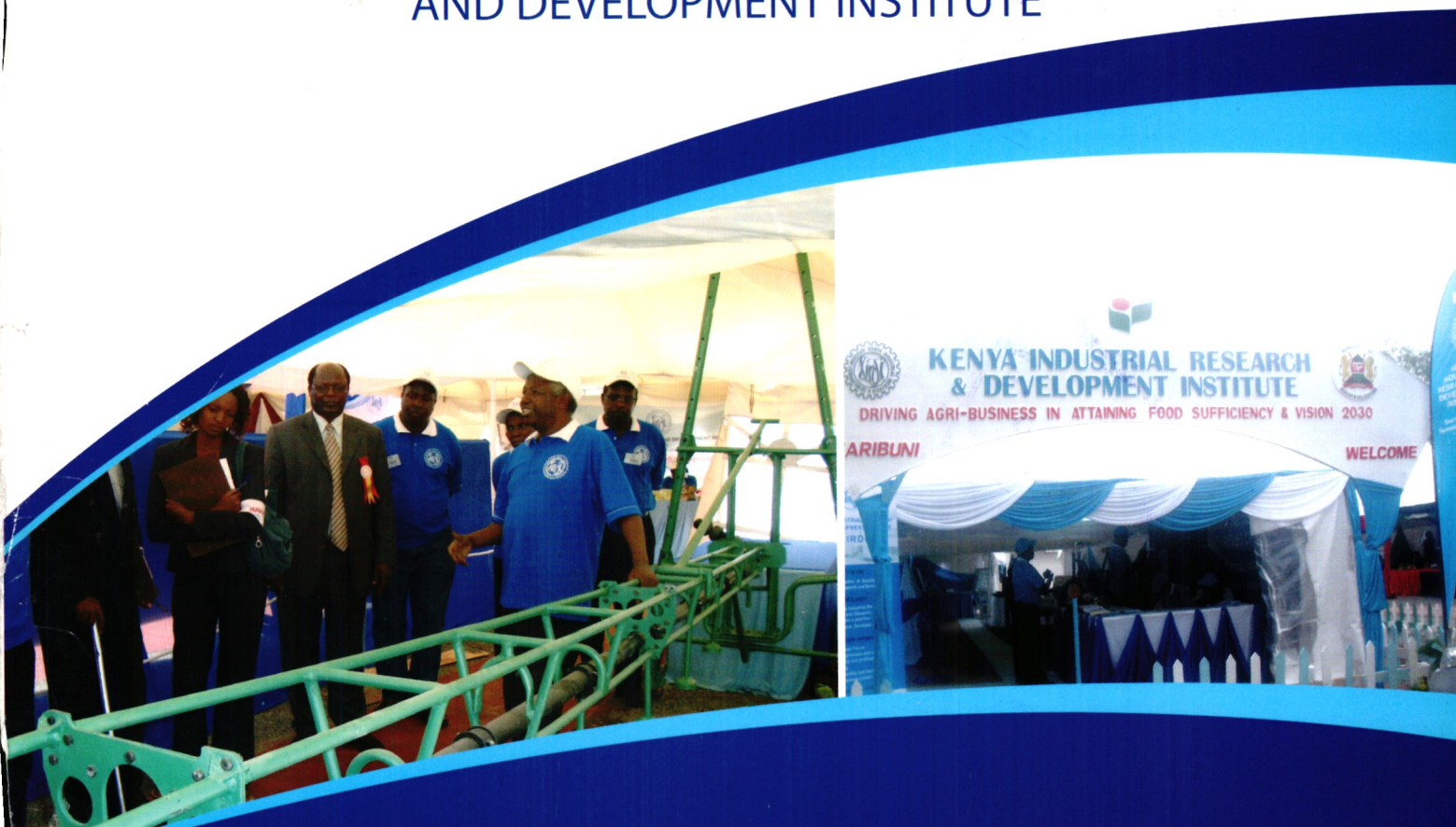




**KENYA INDUSTRIAL RESEARCH
AND DEVELOPMENT INSTITUTE**



**ANNUAL REPORT AND
STATEMENT OF ACCOUNTS**

2010/2011



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

-Hon A. Duale, MP



CHAIRMAN'S STATEMENT

Dear Sir,

I hereby submit, on behalf of the Board of Directors of Kenya Industrial Research and Development Institute (KIRDI), the 2010/11 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.661,465,572.00 to undertake activities for the year under review. Records provided by the Auditor General reveal a revenue income of Kshs.696,267,112.00 this left a surplus of Kshs.34,801,540.00 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 2010/11 period.

Chairman
KIRDI
Board of Management



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:

- Technical Feasibility Survey on potential of Mini- and Micro-Hydro electricity generation and distribution in western Kenya Region.
- Potential and Ethanol Production from Sorghum Stalks in Kenya.
- Development and Commercialization of Gassifier Stove Technology – Optimizing the functionality and Thermal efficiency of gasifier Stoves.
- Molecular Characterization of Wild Pleurotus Species in Kenya
- Effect of storage on the physic-chemical characteristics and acceptability of fresh cassava
- Chemical characterization of Hibiscus Sabdariffa L. (Roselle) calyces and evaluation of its functional potential and Technological applications in the Food Industry.
- Baseline Survey on Avocado processing in Kisii County
- Audit of OHs System in selected Leather Tanning Industries in Kenya
- Production of Capsicum Olearesin from African Birds Eye Chilli
- Honey processing Pilot Plant in West Pokot
- Technology Transfer for the efficient Production of Bricks and Clay Products in Kinwal-Museret in nandi Central District.
- Malindi mango Processing Pilot Plant
- The Banana processing Pilot Plant in Kisii

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. Tuikong Serem	-	Chairman
Mr. Elema Isako Fila	-	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 30th June 2010.

Results

The accounts show:

A net surplus of the year	-	Kshs.34,801,540.00 before depreciation
Net accumulated deficit to date	-	Kshs.34,262,859.00

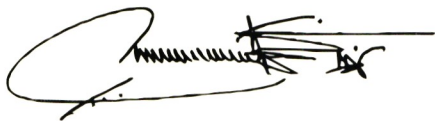
Directors

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 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. Tuikong Serem
Mr. Elema Isako Fila
Mr. J.M. Migiro
Dr. W.A. Alusiola
Mr. 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

Director - Dr. M. C. Z. Moturi

Heads of Departments and Divisions

Heads of Departments

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

Heads of Divisions

Mr. JairusOmbui	-	Human Resource and Administration Division
Ms. Floice O. Mukabana	-	Finance Division
Dr. Eng. 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

Heads of Centres

Eng. Joseph Kamau	-	Engineering Development & Service Centre
Mr. John M. Muriuki	-	Leather Development Centre
Mr. Edward Njagi	-	Laboratory Services Centre
Mr. Justin K. Omwoyo	-	Information & Communication Technology Centre
Mrs. Mariana Owiyo	-	National Industrial Information Centre
Mr. William Mutwiri	-	Kisii Centre
Dr. Linus K'osambo	-	Malindi Centre
Mr. Japheth Anuro	-	Homabay Centre
Ms. Sarah Sialuk	-	Eldoret Centre
Mr. John Githaiti	-	KIRDI Western Region Centre



HUMAN RESOURCE & ADMINISTRATION DIVISION

Introduction

This is the 30th year since the inauguration of the institute as a parastatal

Staff Mobility

As at June 2011 the number of staff stood at 332.

RECRUITMENT

Research Scientists	1
Artisans	1
Auxiliary Staff	3
Drivers	4

DEPARTURE

Resignation

Clerks	2
Administrators	1
Secretary	1
Scientists	3
Procurement Officers	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.

The underlisted staff were appointed in various leadership positions during the year under review.

- | | |
|----------------------|----------------------|
| 1. Enos O. Okonji | - Chairman |
| 2. J. O. Nyaywera | - Vice Chairman |
| 3. Rogan Miheso | - Secretary |
| 4. Patrick Muyanzi | - Ass. Secretary |
| 5. Henry O. Ojuok | - Treasurer |
| 6. Chrispinus Andayi | - Ass. Treasurer |
| 7. Rita C. Too | - Org. Secretary |
| 8. David O. Ongong | - Ass.Org. Secretary |
| 9. Kennedy O. Olweny | - Comm. Member |
| 10. Jospheh Mutia | - Comm. Member |
| 11. Carolyne Gitau | - Comm. Member |
| 12. C. Opiyo | - Comm. Member |
| 13. Shem P. Odhiambo | - Comm. Member |
| 14. Margaret Muhia | - Nom. Member |
| 15. Paul Kiri | - Nom. Member |
| 16. Shem Ossi | - Ksm. Rep. (Chair) |
| 17. Peter Galia | - Ksm Rep. (Sec.) |

Training

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

STAFF MEMBERS STILL ON TRAINING FOR THE FY.2010/ 2011

NAME	DESIGNATION	COURSE PURSUED	INSTITUTION	SPONSOR	PERIOD	EFFECTIVE	REMARKS
Phoebe NasicheFumbi	Auxiliary Staff	Diploma in Supply Chain Management	East Africa Institute of Information Studies	Self	1 YR	JAN 2011	On- going
PhelineAchieng	Accouts Assistant	Master of Science -Entrepreneurship	Jomo Kenyatta University of Agric.&Technonology	Self	2 YRS	JAN 2011	On-going
P. G. Muturi	Administration Officer	Bachelor of ARTS in Leadership Management	St. Paul's University	Self	2 ½ YRS	FEB 2010	O-going
Virginia W. Kimani	Assistant Research Scientist	Master of Science on Biotechnology	Jomo Kenyatta University of Agriculture & Technology	Self	2 YRS	SEP.2010	On- going
Paul O .Odoyo	Accounts Assistant	Bachelor of Business Management (BBM).	Moi University (Nairobi Campus)	Self	2 YRS	AUG 2011	On-going
John WanjalaMakokha	Assistant Research Scientist	Master of Science In Chemistry	University of Nairobi	Self	2 YRS	OCT.2010	On-going
JosephhNyakoni Marcellus	Assistant Research Scientist	Master of Philosophy in Information Technology	Moi University	Self	2YRS	AUG. 2010	On- going
Patrick AnjuOkome	Auxiliary Staff	Diploma in Supply Chain Management	Kenya Institute of Management	Self	2 1/2 YRS	JAN.2010	On- going
Nathan A. Bogonko	Assistant Research Scientist	Master of Science in Energy Technology	Jomo Kenyatta University of Agriculture & Technology	Self	2 YRS	SEP.2010	On- going
Jackson Omamo	Engineering Technician I	Masters of Arts in Project Planning & Management	University of Nairobi	Self	2YRS	NOV.2010	On - going
Teresa C. Amenity	Human Resource Officer	Bachelor of Arts in Human Development Science	Tangaza College	Self	2 YRS	JAN 2011	On- going
Judy A. Ouma	Research Scientist	PhD in Economics	University of Nairobi	Self	3 YRS	AUG. 2010	On- going
Martha K Induli	Research Scientist	PhD in Natural Products	Makerere university	Self	3 YRS	OCT.2009	On- going
Phylis W Ngunjiri	Research Scientist	PhD in Nutrition	Wageningen University (Netherlands)	Netherlands Fellowship Programme (NFP)	3 YRS	OCT.2010	On- going
Lucy A.Onjula	Copy Typist	Diploma in Secretarial Studies	Blanes College of Business Studies	Self	2 YRS	AUG. 2010	On - going
Rukia K Nyakwara	Office Assistant	Diploma in Business Management	Kenya Institute of Management	Self	2 ½ YRS	JUN. 2009	On- going
Mililah W Mariga	Coy Typist	Diploma in Business Management	Kenya Institute of Management (KIM)	Self	2 YRS	April 2010	On- going
Rita C Too	Lab. Technologist	Bachelor of Science in Chemistry	Kenya Polytechnic University College	Self	1 ¼ YRS	JAN. 2011	On-going
John Orari	Human Resource Assistant	Diploma in Human Resource Management	Kenya Institute of Management	Self	2 YRS	JAN. 2011	On-going



EVENTS

The following events took place under the year under review.

1. Launch of Mobile Shower Irrigation Technology

The launch of the Mobile Shower Irrigation technology took place on the 22nd December at KIRDI south C Grounds. This state of the art machine that will turn around the lives of farmers and improve the country's food security was developed by an entrepreneur incubated at KIRDI in collaboration with officers in the Engineering Development and Service Centre. The occasion was graced by the Permanent Secretary Ministry of Industrialization, Eng. KibichoKaranja and KIRDI Board of directors. After the launch, there was an end of year party for KIRDI staff before breaking for the Christmas holiday.



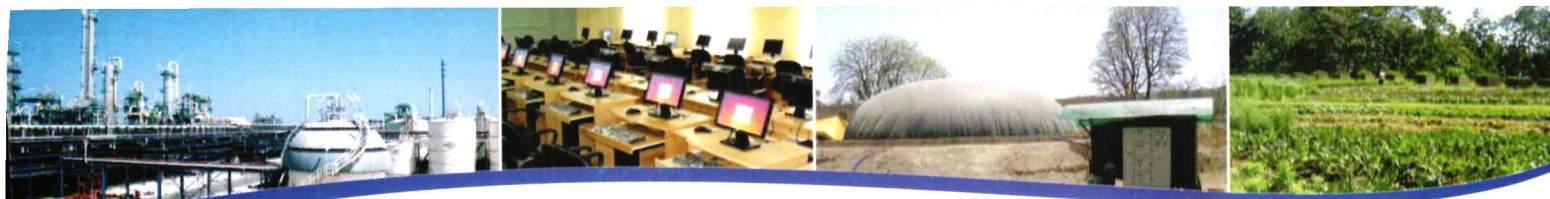
The guest of honor, P.S - Ministry of Industrialization Eng. KaranjaKibicho launches the Mobile shower irrigation machine as the Director and board members look on



The KIRDI director addressing staff during end of year party



The mobile irrigation technology at work watering plants.



2. Nakuru Technology Expo

The ministry of Labor -Department of micro & small enterprises development organized a technological Innovations and Business Clinic held on 25th – 29th may 2011 at Nyayo garden, Nakuru and KIRDI being a major stakeholder participated in the event.

The forum brought together 165 exhibitors for 5-days where technological demonstrations and a Business Clinic were mounted. The Business clinic was meant to capacity build the MSEs through paper presentation by the invited experts while the Business clinic ran for 3-days. A total of 9,600 people visited the stands and Majority of exhibitors registered good business and requested for a repeat of the same. The event was graced by Prof. Shaukat Abdulrazak, Secretary/CEO, National Council for Science and Technology as the Guest of Honor at the opening ceremony and closed by the Vice-Chancellor, Jomo Kenyatta University of Agriculture and Technology, Prof. Mabel Imbuga.



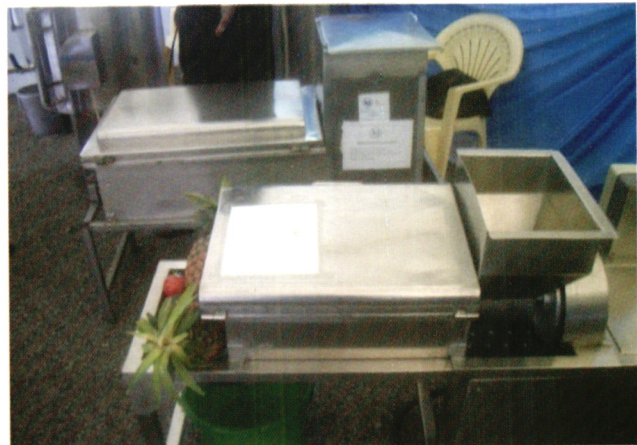
The Guest of Honor Prof. Shaukat Abdulrazak, Secretary/CEO, National Council for Science and Technology addressing the exhibitors and the general public during the opening ceremony.



Vice-Chancellor JKUAT, Prof. Mabel Imbuga presenting technology award winners



Guest of Honor Jane Arang'a, Director, Micro and Small Enterprise Development addressing the Business Clinic participants during the opening ceremony



Value addition equipment's displayed at the KIRDI stand



3. Nairobi International Trade Fair (NITF)

The NITF took place on Monday 27th September 2010 to 3rd October 2010. KIRDI participated by exhibiting various research, technology and innovation technologies.

The theme of the Nairobi International Trade Fair was, 'Driving Agribusiness in Attaining Food Sufficiency & Vision 2030' (KuendelezaBiasharaYaKilimo, iliKujitoshelezaKwachakulanaruwaza 2030).

The Minister for Agriculture, Hon. Amb. Chirau ali Makwere and the Board of Directors of KIRDI, led by the Chairperson of the Board, Eng. (Dr.) Siphila Mumenya visited the Institutes Stand and appreciated the technologies on display. The Minister further observed that such technologies are crucial in supporting value addition of the agricultural produce, as well as create employment and generate wealth.



KIRDI Stand at NITF Jamhuri Grounds



KIRDI Board of Directors touring the stand at the NITF



The public touring KIRDI stand at the trade fair.



EVALUATION OF TECHNOLOGIES FOR LOW-COST BRIQUETTES AGRICULTURAL RESIDUES



Briquettes chopped by machine into convenient size

Project Description

The interest in the utilization of biomass as a natural resource and energy source has increased greatly especially due to the fact that net biomass does not emit CO₂ and that wrong disposal method can lead to either heavy expenditures or create a hazardous environment. According to sessional paper No 4 of 2004 and energy act 2006, there is need for the development of biomass technologies for energy and licensing businesses in charcoal trade. Since trees from forests have been for long considered as a 'free-good' where no charge is levied on the raw material, over-exploitation coupled with inefficient production and use of fuel-wood and charcoal have resulted to a diminishing forest cover countrywide, and particularly in western Kenya. Will efficient conversion of agro-waste to energy, packaged and sold as a commodity in the market, be the best intervention to these problems? This study was undertaken to address this question and ascertain the viability of this venture in a local set up.

Target

To use the mature technology of low-cost briquettes that can light quickly, burn longer without unpleasant smell or dust and investigate the potential use of other agro-wastes in addition to sugarcane bagasse.

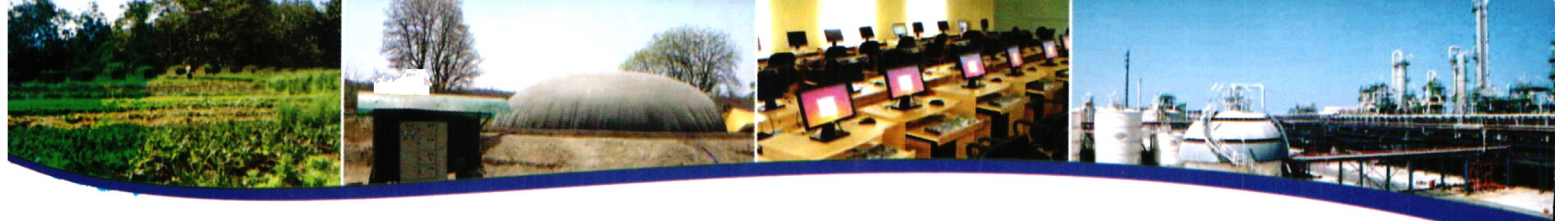
Results

The calorific value for the bagasse briquette was high compared to other agro-wastes briquettes.

The burning period for the bagasse briquettes was longest when compared to briquettes from the charcoal dust, sawdust and rice husks. Briquettes can be produced manually or using an electric motor.

Conclusion and recommendations

Appropriate stoves that burn the briquettes well should be developed and promoted. Identification of areas with



Manual & Motorized briquetting Machines

sufficient biomass for briquettes production, sources of low cost but good quality machines are the important steps KIRDI will undertake to promote biomass briquettes for energy production and use in Kenya. Cost-benefit analysis, which could not be done in this desk-based research, is a crucial factor to be considered before up-take of any waste-to-energy project to be sure of positive energy balance. Regarding capital investment, this review could not establish the ground because none of the technologies cited have been proved viable for large-scale commercial application. Nevertheless, clear facts that emanated include the great competition for some waste e.g. bagasse feedstock – which implies this raw material, can no longer be considered as waste rather a commodity worth a price.

TECHNICAL FEASIBILITY SURVEY ON POTENTIAL OF MINI- AND MICRO-HYDRO ELECTRICITY GENERATION AND DISTRIBUTION IN WESTERN KENYA REGION

Target

To identify suitable sites for the installation of min-hydro electricity generation units.

Results

The survey identified fourteen sites with water heads varying from 6m to about 40m, being representative of a low-flow season. Flow-rates ranged between an average of 0.5 m³/s in streams to about 13m³/s in rivers capable of generating from 20 kW in streams to 981 kW in rivers. The land use land cover change analysis showed that there has been 12% reduction of closed forest, and about 90% reduction of open grasslands since 1986. This was mainly due to increase in population and cultivated fields which increased by 19%. This will affect the current potential of electricity generation.

Conclusion

Afforestation will be necessary to sustain water flow-rates for the MMHEG plants. The survey showed that it was technically possible to establish MMHEG plants and the most suitable turbines being Kaplan and Francis considering the head, operation efficiency and the number of units to be employed.



POTENTIAL OF ETHANOL PRODUCTION FROM SORGHUM STALKS IN KENYA



Sorghum stalk

Project Description

Petroleum fuel, a non-renewable fossil based fuel constitutes up to 22% of the commercial energy in Kenya. To date, Kenya has not managed to discover any reserves of fossil deposits within her territory and hence relies on importation of all its petroleum fuel demands spending about 100 billion Kenya shillings per annum. Based on the concept of sustainable development, Kenya's reliance on petroleum fuel imports as the major commercial fuel is unsustainable; therefore it is necessary to shift to alternative fuels that can be made from energy resources which are renewable and locally available. Biofuels offers an answer to this. The government is keen to promote development of indigenous energy resources and in particular those that are also environmental friendly. Part of the efforts in this direction would be to explore the potential of locally grown plants as sources of alternative fuel. Ethanol can easily be made from biomass as the technology for this is well established and ethanol use as a fuel proven.

Target

To determine the potential of selected sorghum varieties grown in Kenya for ethanol production.

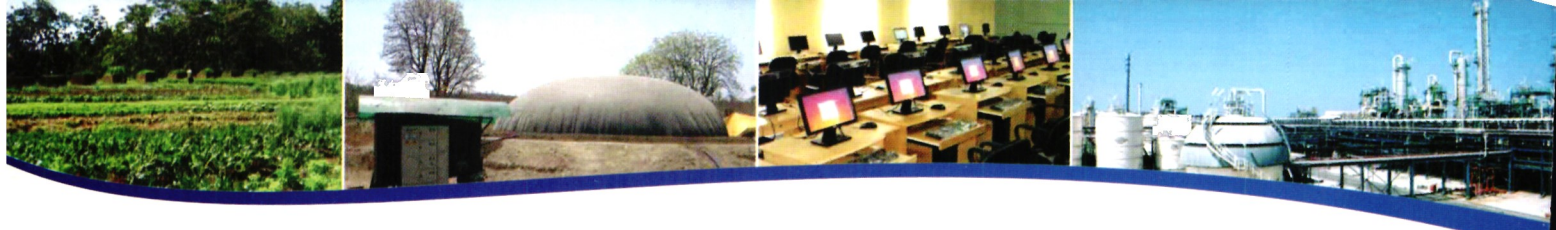
Results

The maturity period for the varieties studied was within the range of maturity period of sorghum-3-4 months. The stalks contained sufficient juice for mechanical extraction with the sugarcane crusher. The study established that sucrose levels increased as the sorghum matured.

Conclusion

The juice contained sugars hence can be fermented for ethanol production. At the last sampling, when the grains are dry, the stalks still have juice and the sugars and it's recommended that it's at this stage when the

The stalks to be used as a feedstock for ethanol production should be harvested when the grains are dry. This presents a win-win situation where ethanol for fuel and the grains for food are obtained.



Recommendation

Cross breeding studies to be undertaken to obtain cultivars with high sugar and juice levels.
 Post harvest handling studies to be done to establish the optimal conditions for storing the stalks to delay deterioration of the sugars and juice.

DEVELOPMENT AND COMMERCIALIZATION OF GASIFIER STOVE TECHNOLOGY - OPTIMIZING THE FUNCTIONALITY AND THERMAL EFFICIENCY OF GASIFIER STOVES

Project description

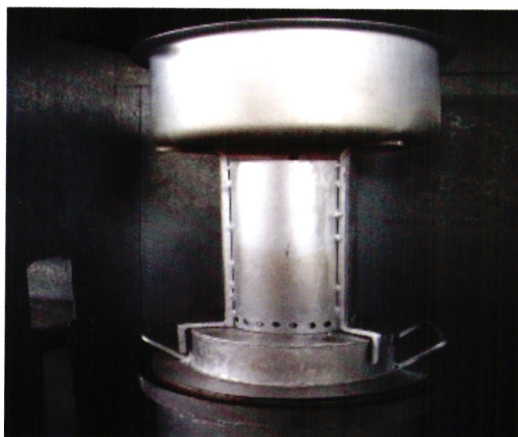
Biomass gasification offers a cleaner, more efficient and convenient option than direct combustion. In gasification systems, biomass is converted into char and producer gas (a mixture of carbon monoxide (CO), hydrogen (H₂), and methane (CH₄)). Gasifier systems can be used to produce heat for various processes including cooking, drying, steam generation and pasteurization. Various agricultural wastes can be gasified. In the financial year 2009/2010, four gasifier stoves were developed in KIRDI and after testing, it was recommended that the stoves need to be optimized before they are transferred to various stakeholders. Testing the Gasi-101, Gasi-201 and Gasi-301 revealed the need for the following improvements:

- (i) Redesigning the burners to reduce emission of CO and increase thermal efficiency,
- (ii) Use of refractory bricks instead of metal to increase the life of the stove, (iii) Use fuel canisters to facilitate variation of fuel amount to be used,
- (iii) Improving the turn down ratio of the stoves through using suitable voltage controls,
- (iv) Situating the reactor of Gasi-101 outside the kitchen, then piping the producer gas to a burner located within the kitchen

Target

To design and develop a gasifier stove that significantly improves the functionality and efficiency of gasifier stoves by:

- Investigating the contribution of secondary and tertiary air in reduction of CO emissions and increasing thermal efficiency,
- Investigating the role of gas nozzles in reduction of CO emissions and increasing thermal efficiency,
- Utilizing fuel canisters to facilitate operation period and fuel type flexibility,
- Utilizing a combination of forced and natural draft,
- Determining the role of gas piping,
- Investigating the role of gas mixing column in CO emissions and thermal efficiency,
- Investigating the role of fuel canisters in facilitating continuous operation and fuel amount flexibility,
- Utilizing a ceramic interior to increase durability and heat retention,
- To test the already developed gasifier stove to determine if it significantly improves the functionality and efficiency of gasifier stoves



Gasifier stoves



Results

Optimization of gasifier stoves in terms of functionality and thermal efficiency is possible and was successfully done with the development and testing of the Gasi-501 gasifier stove.

The gasifier stove configuration that was most efficient for all the fuel types was 1:5:20:3 or 2:5:20:3 (i.e one or two canisters: secondary air inlet height of 5mm: tertiary air and mixing column height of 20 cm and a flame nozzle diameter of 3 inches). This was because of the following:

- The Gasi-501 can be used with a variety of fuels, each canister of the stove can accommodate on average 4.3Kg, 2.4Kg, 1.8Kg and 2.2Kg of wood, coffee husks, rice husks and maize cobs respectively. Addition of a fuel canister doubles the duration of fire and the total operating time of the stove therefore it is possible to regulate the fuel consumption. If using wood as the fuel, the total operating time can be increased from 74 min to 148 min (2 ½ hours). In the Gasi-501, wood can be split into one foot pieces and placed in the gasifier vertically. This improves the functionality of the gasifier stove.
- The size fabricated and tested provided very high firepower, wood gave the highest firepower 113Kw, while coffee husks, rice husks and maize cobs gave 37Kw, 22Kw and 34Kw respectively. The stove can therefore be used by institutions.
- Introducing a 3 inch flame nozzle before the gas leaves the reactor and enters the burner concentrates the gas before it is mixed with secondary air and ignites. A narrower diameter will reduce gas output and result to extinguishing of the flame. However, for rice husks, a narrower nozzle will still work. The nozzle also assists with regulation of the draft and reduction of firepower, specific fuel consumption and CO emissions.
- While using wood or maize cobs, the Gasi-501 can be operated without the fan at natural draft because the effect of the tertiary air column. The fan however assists with lighting of the stove and can therefore remain.
- The choice of fan or blower to provide primary air depends on the type of fuel. The ac or dc fans available in the market are not appropriate for gasifying rice husks since they do not give enough airflow. A blower can therefore be used although it is expensive.
- The ceramic insulation reduced heat losses from the reactor. It was possible to torch the gasifier outer metal. Heat stored during gasification can be used to simmer or keep food hot for a long time.
- Ambient CO in the well ventilated workshop was within safe limits.

MOLECULAR CHARACTERIZATION OF WILD PLEUROTUS SPECIES IN KENYA

Project Description

Pleurotus species or oyster mushrooms are edible macro fungi which are highly valued for their nutritional and medicinal properties. Many traditional communities living around the indigenous forests collect and consume wild types during the rainy seasons. A number of wild *Pleurotus* species have also been domesticated and the consumption preferences of cultivated *Pleurotus* species have been in the recent past gaining popularity among the diets of many urban communities every year. However, the wild types are seasonal hence not a reliable source of nutrition for many people. Besides, wild types are increasingly undergoing extinction due to wanton destruction of their natural habitats resulting into narrow genetic lines for improving cultivated varieties. It is therefore important to understand genetic diversity of wild *Pleurotus* species to help in selecting wild strains for domestication and commercial cultivation. Limited studies on the genetic diversity and phylogenetic

Relationships within *Pleurotus* species have been done in other regions of the world. However, no work has been on the genetic diversity and phylogenetic relationships within the wild and cultivated *Pleurotus* species in Kenya.

Target

The aim of this study was to examine the genetic variability and phylogenetic relationships within and among the populations of wild and cultivated *Pleurotus* spp. in Kenya.



Wild pleurotus species

Results

A total of 71 wild *Pleurotus* genotypes were randomly collected from Kakamega forest, ArabukoSokoke forest, and Mount Kenya forest in Kenya. Thirteen varieties of cultivated varieties were obtained from the Jomo Kenyatta University of Agriculture and Technology. The genetic variability and the phylogenetic relationships within the 84 genotypes were evaluated using amplified fragment length polymorphism (AFLP) markers and internal transcribed spacer (ITS) genes respectively. AFLP analysis using five primer combinations generated 330 polymorphic loci among the 84 genotypes studied. Cluster analysis using the Unweighted Pair Group Method of Arithmetic ii Averages grouped 84 genotypes into three distinct clusters. The grouping of the genotypes did not correspond to their geographical distributions. The wild populations were more diverse ($H=0.27$) than the cultivated varieties ($H=0.24$) according to Neis measure of genetic diversity. The population from Arabukosokoke forest exhibited the most diversity whereas Mt. Kenya *Pleurotus* population was least diverse. Similarly, nested ANOVA indicated significant within population variability ($P < 0.001$; 89%). The phylogenetic tree based on the nucleotide sequence of ITS region in twenty two different strains of *Pleurotus* species was obtained by the neighbor joining and maximum parsimony methods. The studied genotypes allowed the identification of five different species as part of the genetic diversity of *Pleurotus* species in Kenya: *P. spodoleucus*, *Postreatus*, *P. pulmonarius*, *P.floridanus* and *Peryngii*. All the studied strains showed a closer relationship with each other indicating they share a common ancestry within the *Pleurotus* taxa. Identified species represent a broad genetic base for breeding programs, and good potential for commercial cultivation. However, further studies are needed, particularly in other parts of the country, in order to have a better assessment of the genetic diversity of *Pleurotus* species in Kenya. The study of additional genes is still needed to fully understand speciation processes in this group of fungi. Since use of ITS gene only to construct phylogenetic trees may not result in true representation of the phylogeny

EFFECT OF STORAGE ON THE PHYSICO-CHEMICAL CHARACTERISTICS AND ACCEPTABILITY OF FRESH CASSAVA

Project Description

Cassava roots are highly perishable and some varieties can start showing symptoms of deterioration within 24 hours after harvest. Due to this short "green life", it is therefore difficult to maintain the quality of fresh cassava to await transportation, preparation for consumption or even processing to acceptable products.

Objective

This study was designed to assess the shelf life of freshly harvested cassava at room temperature and under refrigeration temperature.



Fresh cassava at room temperature

Conclusion

After various analysis, the study concluded that retention of freshness by cassava during storage depended on variety and temperature of storage.

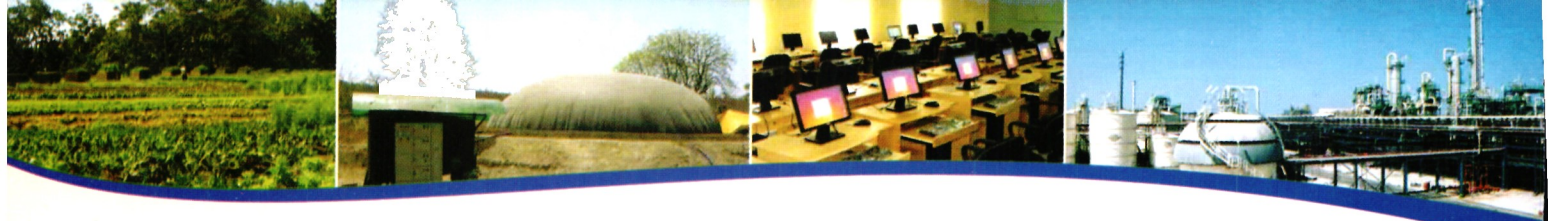
CHEMICAL CHARACTERIZATION OF HIBISCUS SABDARIFFA (ROSELLE) CALYCES AND EVALUATION OF ITS FUNCTIONAL POTENTIAL AND TECHNOLOGICAL APPLICATIONS IN THE FOOD INDUSTRY

Project Description

There is a growing demand for natural health food-products with antioxidant and bioactive capacity for health conscious consumers. With the global functional food and beverage market expected to reach \$109 billion by 2010, diverse sources of phytochemicals are being explored. Kenya cultivates a wide range of fruits and flowers but some with potential economic, nutritional and functional value remain underexploited. *Hibiscus sabdariffa L.* is one of these. Its seeds, leaves and calyces have been used elsewhere as vegetables, source of oil, refreshing drinks and food preserves. The rationale of this study was to gather information that will provide an incentive for commercial



Hibiscus sabdariffa(Roselle)



utilization of Roselle in Kenya.

Target

To characterize the chemical composition of *H.sabdariffacalyces* extract and explore potential applications in the food and nutraceutical industry.

Results

Consumer acceptability of Roselle products was 7 based on a 9 point hedonic scale.

Conclusion and recommendation

Antioxidant phenolic compounds in *H. sabdariffa* could potentially provide health benefits and support its medicinal use. Processing and storage conditions are critical in maintaining bioactivity. Roselle calyces could therefore find applications in the food industry; Manufacture of beverages, jam/jellies and natural food color development. Resource commitment is however needed to upscale its cultivation and utilization in Kenya.

BASELINE SURVEY ON AVOCADO PROCESSING IN KISII COUNTY

Project Description

There is very little processing of avocado and fruits in Kenya. About 5 to 7.5% of avocados produced in Kenya are processed. The main product derived from avocados is crude oil, which is either exported or sold locally to the cosmetic industry. Production of other products from avocado presents a major technological challenge because of the physico-chemical properties of avocado. Processing of avocado oil in Kenya is done by both small and large scale enterprises. There are currently four avocado large scale processing companies in Kenya, Natural oils (K) Ltd in Ruiru, All Green Ltd in Thika, Sunny Processors in Maragwa District and Olivado in Nairobi. The first three process crude oil which they export for further processing/purifying. The latter was to start processing in October, 2007 but this was rescheduled to a later date, and it was to process refined oil. The factory has other plants in Australia and New Zealand which process cold pressed (virgin) oils. The value of crude avocado oil in the international market could be as high as USD 100 per litre. Small scale processors do exist in various parts of the country but their levels (volumes and quality) are low. The SMEs process the avocado oil through drying and extracting with a manual ram press, they also utilize the oil for soaps, lotions and shampoos making, but their products haven't been analyzed by KEBs and is hence hard to ascertain their quality.



©2007 Agulbenfinito

Avacado produced in Kisii

Target

To conduct a feasibility study on avocado processing in Kisii. The specific objectives were:

- (1) To undertake an economic analysis for avocado processing in Kisii,
- (2) To undertake a technological needs assessment for avocado processing in Kisii,
- (3) To map the varieties of avocado grown in Kisii and their suitability for processing.



Results

There is no known processor of avocados in Kisii region and its environs despite the region being a major avocado producing area. The farmers get very low returns (about KES 2 – 5 per Kg of avocados) by selling the produce to middlemen. Transformation of avocados to high value products such as oil and the derived soaps and cosmetics could elevate the value of avocados in Kisii region.

AUDIT OF OHS SYSTEMS IN SELECTED LEATHER TANNING INDUSTRIES IN KENYA

Project Description

The leather tanning industry uses various chemicals and consequently generates hazardous waste contributing to occupational health and safety. Vapours from degreasing and finishing solvents have relatively high toxicity while leather dust has been listed by European Commission (EC) as a potential carcinogen. Improper handling of hides and skins treated with pesticides may expose workers to toxic hazards, while chemical accidents and spills can also be sources of harmful human and environmental exposure. This has a very big negative impact on sustainable industrial development. The causes and current management of occupational health and safety in the leather industry need to be established for proper interventions to be taken.

Targets

- i) To evaluate and develop OHS systems in the leather tanning industry;
- ii) To establish the status and needs of occupational safety and health systems in the Leather tanning Industry in Nairobi and environs;
- iii) To develop recommendations and OHS systems for the Leather tanning Industry in Kenya.

Results

A report on the status and needs of OHS in the leather industry with recommendations has been developed and distributed to the tanneries in Nairobi and its environs. The study established the major causes of accidents in the leather industry and outlined preventive measures.

Conclusion

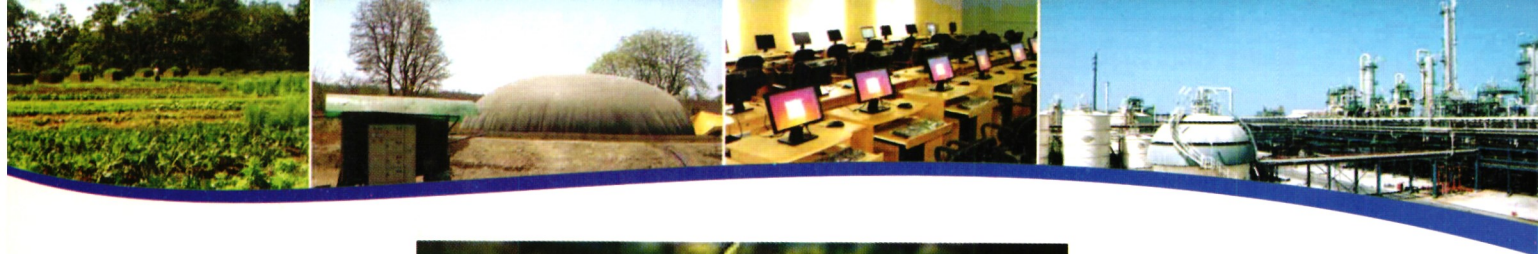
Workplace safety is immensely important for the very reason of improved productivity. Health and safety at work is an important matter that relate to the general health and well being of the worker and should be given due consideration in the company policy.

PRODUCTION OF CAPSICUM OLEORESIN FROM AFRICAN BIRDS EYE CHILLI

Project Description

Chilli is the fruit of plants from the genus *Capsicum*; members of the nightshade family Solanaceae. The African bird's eye chilli is of the species *Capsicum frutescens*. Non pungent chillis are commonly used in the production of paprika oleoresin where as hot chillis are highly preferred in the production of capsicum oleoresin because of their pungency. Pungency is due to the presence of six chemically related compounds called capsaicinoids (CAPS). However, capsaicin (8-methyl-N-vanillyl-6-nonenamide) and dihydrocapsaicin are responsible for almost 90% of the pungency in chilli with capsaicin accounting for almost 71% of the total CAPS. Being the most dominants CAPS, in pungent varieties of chilli, capsaicin content is used to determine the commercial quality of capsicum oleoresin. Capsicum oleoresin is a viscous liquid or semi-solid substance derived from finely ground chilli powder and contains the aroma and flavor of its source. Oleoresin of capsicum is extracted using volatile organic solvents such as hexane, ethanol and acetone. Capsicum oleoresin finds use in pharmaceutical industry in the manufacture topical and analgesic balms. Capsicum oleoresin is also largely used in food processing and flavoring industries like meat canning, sauces, softdrinks, and confectionery.

Target



African Bird Eye Chilli

- (1) To extract capsicum oleoresin from ABE chilli using different solvents,
- (2) To determine the capsaicin content of the different extracts,
- (3) To recommend the most suitable solvent for extraction of capsicum oleoresin based on the

Results

It was noted that ethanol gave the highest percentage yield of capsicum oleoresin (19.91 ± 0.11) where as hexane had the lowest yield (12.64 ± 0.13). Diethyl ether had the highest concentration of capsaicin $>6000\text{mg/mg}$, followed by ethanol and acetone. GCMS analysis found capsaicin to elute between 28.9 and 29 retention time.

Conclusion and recommendation

Diethyl ether is the best solvent for capsicum oleoresin extraction from African Bird's eye chilli grown in Kenya. Diethyl ether can be used in extracting oleoresin for industries such as paints and coatings where products are not for human consumption. However, in the pharmaceutical and food industries, ethanol is the preferred solvent. Raffinate from the extraction of capsicum oleoresin can be used in animal feed production as a source of fibre. However, residual capsaicin has to be removed completely. Protocols should be developed to determine how best the residual capsaicin can be removed and confirmation of this done using Mass Spectrometer solid probe.

HONEY PROCESSING PILOT PLANT IN WEST POKOT

Project Description

The apiculture industry in Kenya has great potential and has grown to a vital component in the livestock subsector .It has significant production linkages to rural communities and enterprises development in the districts a strategy aimed at poverty alleviation, wealth and jobs creation, food security and industrial development in these areas.

Targets

- To install Honey Processing Pilot Plant in West Pokot
- To improve quality of honey and hive products to the local, job creation, wealth creation

Results

The activities were largely centered on equipment installation, testing and commissioning. The Pilot Plant is already installed and is used for training entrepreneurs. It is worth noting that the successful test runs have been undertaken with the honey warmer to produce quality honey. The Pilot Plant is currently operating and is equally being used as a common manufacturing facility for SMEs in honey processing.



Honey processing equipment

CHEMICAL ENGINEERING PILOT PLANT IN SOUTH B

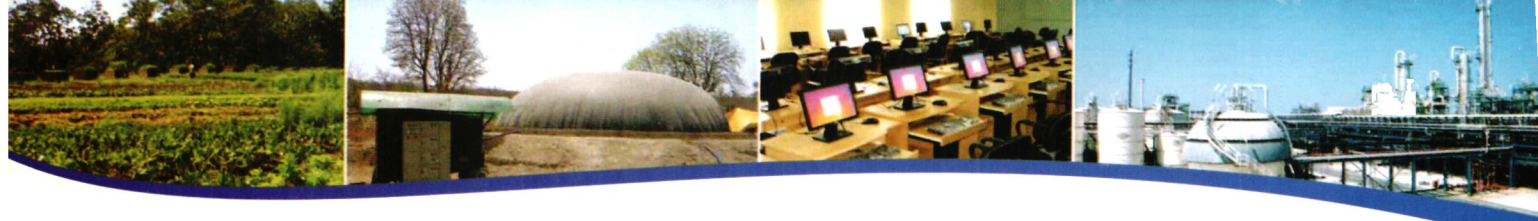
Project Description

KIRDI has a strong history in the area of Industrial research that has resulted in the development of various products. For research finding to translate into a commercial reality there needs to be uptake of the developed technologies by the relevant stakeholders (MSEs, Industries, private sector among other). However, the huge capital outlay that is required to set up a running plant that emulates industrial processes is a major hindrance to technology uptake. To accelerate product development and uptake (R&D and Technology transfer) efforts towards up scaling have been made through provision of pilot plant facilities at the Institute.



Some of the products produced by the pilot plant (Lotions, Hand gel and Detergents)

The Chemical Pilot Laboratory overall aim is to produce just the right amount of material, and accelerate product development by using in-between scale of processing equipment. Its unique capacity allows clients to conduct investigations that emulate industrial practice. Clients benefit from reduced costs and accelerated product development, ability to produce small quantities of high-value components for further research, and common manufacturing facilities. The pilot laboratory clientele is drawn from internal and external researchers, business incubation, and externally by other clients (capacity building programmes, trainings and CMF including contract manufacturing in R&D). It acts as an up-scaling platform for various chemical and allied technologies such as Extraction of essential oils, gum resin and oils from oil seeds. Technology for manufacture of soaps, detergents,



hygiene and cosmetic products.

Target

To rehabilitate the chemical pilot laboratory for better service delivery.

Target

Renovated pilot laboratory and Functional equipment (repaired / purchased).

Results

The overall impact of upgrading the pilot facilities would be to upgrade the industry's skill level and facilitate its transition into high technology production.

TECHNOLOGY TRANSFER FOR THE EFFICIENT PRODUCTION OF BRICKS AND CLAY PRODUCTS IN KINGWAL-MUSERET IN NANDI CENTRAL DISTRICT

Project Description

Bricks form essential ingredients for providing affordable decent housing. Their production, sale and utilization contribute to income and employment generation. The negative impacts of current traditional production methods in Kenya are environmental degradation and demeaning employment conditions. Currently the production of bricks in Nandi District is carried out using the traditional clamp Kilns which are inefficient as they consume a lot of fuel wood resulting in environmental degradation and low incomes to the existing four Self Help Groups (SHGs) namely Terige, Kapnyeberai, Kapnyagon in Kilibwoni Division with a total of about 150 members (50 each of the groups) and Kingwal in Kapsabet Municipality with over 300 members. Kingwal is an Umbrella Self Help Group.

Target

This project aims at developing an efficient pilot brick and other building clay products demonstration, training and replication in two sites in Nandi District, namely 1) Terige-Kapnyeberai-Kapnyagon Self Help Groups (SHG) along Kisumu Kapsabet road in Kilibwoni Division, and 2) Kingwal Umbrella Self Help Group near Lessos in Kapsabet Municipality. Site one has about 150 members while site 2 has about 300 members.

Results

Increase skills of brick; improve the quality and quantity in brick and other clay products; Increase incomes of the brick makers in Nandi Central District



KINGWAL-Museret brick processing pilot plant



Brick making process



Firing of bricks

MALINDI MANGO PROCESSING PILOT PLANT

Project Description

The Malindi Mango Project is an on-going project. The initial phases of the project have been completed. These include, installation of batch processing equipment, completion of renovation and physical works on the pilot plant, testing of the processing equipment, preliminary production and laboratory analysis of raw mango pulp. The pending phases include pilot production of mango pulp, mobilization and training of farmers and entrepreneurs, establishment of quality management system, commercialization of the pilot plant, and handing over of the plant (KIRDI phase out). This is a technology transfer project whose aim is to establish a commercially viable mango processing plant. The plant will be piloted by KIRDI for a defined period to prove commercial viability and thereafter bought by a company.

Results

Installation and operationalization of the plant and capacity building

Achievements

i. Batch Processing Mango Processing Equipment Installed

A fruit pulper, pasteurizer, holding tanks, peeling table, washing trough and assorted accessories were installed at **KIRDI's Malindi Pilot Plant (Figure 1)**

Figure 1. 8 tonnes/per day fruit pulper, pasteurizer, holding tanks (left) and interior of Malindi Mango Pilot Plant showing processing in progress (right)

ii. Mango Processing Equipment Tested

The installed mango processing equipment was tested and report detailing the performance and R&D opportunities produced.

(i) **Test Production of raw pulp and ready to drink mango juice undertaken**

Production of pasteurized raw pulp and ready to drink mango juice – KIRDI FRESH, was done at KIRDI Malindi Mango Pilot Plant. Apple and Ngowe mango cultivars were processed and packaged at the plant. Test sale of



Testing of the fruit pulper (left) and pasteurizer (right) at Malindi



Mango Pilot Plant.



products were done in Malindi and Mombasa



Production line: peeling, pulping, pasteurization and cooling of mango pulp, at Malindi Pilot Plant (left) and bottled fresh mango juice stored in a fridge (right).

(ii) Mango Juice tested by KEBS and results compared with national standard

Samples of fresh, natural (without preservatives and additives) mango juice produced at Malindi Mango Pilot Plant were tested at Kenya Bureau of Standards. The test results indicated conformity to the national standards.

Market Tests carried out

Fresh mango juice produced at Malindi Mango Pilot Plant was sold at Malindi and Mombasa as a strategy of testing the market requirements, volume and expectations. A summary of the sales was analysed and documented.

Market study carried out

A brief market study was carried in the region to assess the consumption and market for fresh mango pulp and juice. Hotels and institutions were visited.

THE BANANA PROCESSING PILOT PLANT IN KISII

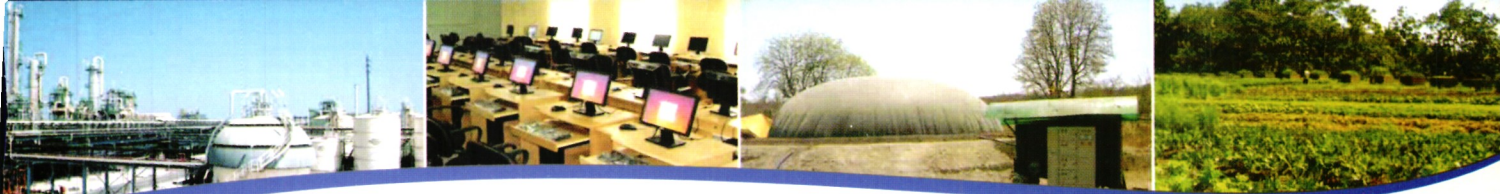
Project Description

In Kenya, like many other African countries, considerable attention has been given to increasing food production through development of high yielding varieties and expanding opportunities for availing growth promoting factors such as fertilizers and water. Much less effort has however been put into the post-harvest sector especially on starchy staples such as the banana, to ensure that all produce is safely harvested, preserved, processed and distributed to meet consumer demands. As a result, post-harvest losses of up to 40-50% have been recorded, which only serve as a disincentive to farmers. Extant literature suggest that it is the agro-processing industries in developed nations of North America, Europe and Asia that add 75% of the value to food products and employ the most people.

Banana production is an important economic activity in Kisii region of Kenya. Most of the bananas are marketed in their raw form, thus prices are highly erratic and often post-harvest losses are astronomical. Household-level processing using rudimentary technologies have been attempted by several entrepreneurs but the low quality of the products processed has limited its success. There is an established demand for processed banana products, especially flour, crisps and wine, within the region and in other parts of the country.

KIRDI is in the process of rolling out pilot plants in various parts of Kenya to add value to local raw materials. In Kisii, the institute has established a banana processing pilot plant to spearhead industrial development of banana in the region. The pilot plant has the capacity to process various banana products such as crisps, flours, baked products, juice and wine. It can also process other vegetables and fruits into a variety of products. There is need for a proper commissioning of the pilot plant whereby processes and products will be optimized before the plant is availed for other operations.

It is envisaged that the pilot plant will serve as a training and demonstration, and incubation centre on banana



Kisii banana processing plant

processing technologies. It will also be offered as a common manufacturing facility for interested entrepreneurs in the region. The pilot plant will also be used for conducting R&D activities on banana technologies. The ultimate goal is to make the pilot plant a centre of excellence and innovation in banana processing technologies.

Targets

To establish a banana processing pilot plant in Kisii

- i. To test and commission the banana processing pilot plant
- ii. To operationalize the banana processing pilot plant

- iii. To incubate 1 banana processing SMI at the pilot plant
- iv. To transfer banana processing technologies to 40 entrepreneurs in Kisii region

Results

The activities undertaken in the first phase of the project included, Site Identification and Acquisition; Environmental Impact Assessment; Renovation of the building; Equipments Acquisition & Fabrication; Installation of Machines and Equipment were achieved. The remaining activities i.e. Trial production, Training of entrepreneurs staff, Commercial Production, product development; commercialization will be undertaken in the second phase of the project in 2011/2012 financial year.



Banana Products



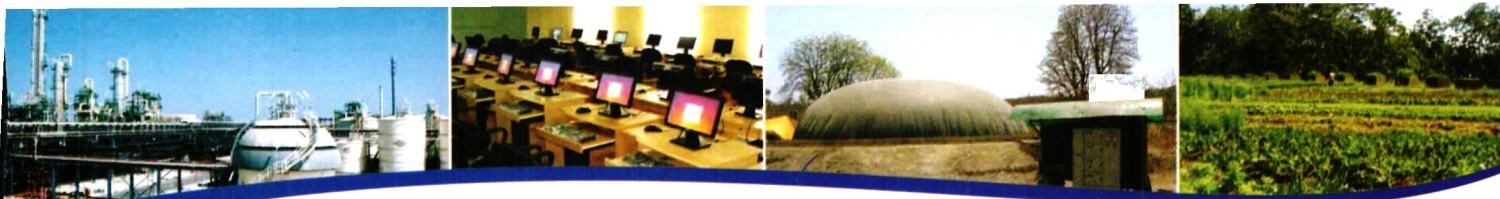
Banana processing equipment



A client checks one of the food processing technologies at the KIRDI stand during the Kisii ASK Show.

**Auditor General Report
&
Financial Statements
for the year ended**

30TH JUNE 2011



KENYA INDUSTRIAL RESEARCH AND DEVELOPMENT INSTITUTE (KIRDI)
Financial statements for the year ended 30th June 2011

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KENYA INDUSTRIAL RESEARCH AND DEVELOPMENT INSTITUTE (KIRDI)

Financial statements for the year ended 30th June 2011

Board of Management's Report

The Board of Management has the pleasure in submitting the Financial Statement of the Institute for the year ended 30th June 2011.

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 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**

- | | | |
|-------|---|---------------|
| i. | Eng. Dr Siphila Wanjiku Mumanya | - Chairperson |
| ii. | Prof. Tuikong D. K. Serem | - Director |
| iii. | Mr. John M. Migiro | - Director |
| iv. | Mr. Elema Isako Fila | - Director |
| v. | Dr. Wycliffe A M Alusiola | - Director |
| vi. | Prof. Wambui Kogi-Makau | - Director |
| vii. | Mr. Benjamin Kibet Mitei | - Director |
| viii. | Mr. David Muriithi Githendu | - Director |
| ix. | Dr. M.C.Z. Moturi, CEO and Secretary to the Board | |

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KENYA INDUSTRIAL RESEARCH AND DEVELOPMENT INSTITUTE (KIRDI)
Financial statements for the year ended 30th June 2011

(a) Ex-Officio Members

- i) Permanent Secretary
Ministry of Industrialization
- ii) Permanent Secretary
Ministry of Finance
- iii) Permanent Secretary
Ministry of Public Works
- iv) 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
P.O. Box 30650-00100, NAIROBI

Independent Auditor: Auditor-General, Kenya National Audit Office,
P.O. Box 30084-00100, NAIROBI



KENYA INDUSTRIAL RESEARCH AND DEVELOPMENT INSTITUTE (KIRDI)

Financial statements for the year ended 30th June 2011

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 edition 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

02/04/2012

Date:

Chairperson: **ENG. DR. SIPHILA WANJIKU MUMENYA**

Signature:

02/04/2012

Date:

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



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Website: 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 30 JUNE 2011

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 2011, 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 misstatement 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.

Unqualified Opinion

In my opinion, the financial statements present fairly, in all material respects, the financial position of the institute as at 30 June 2011, 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.

Edward R. O. Ouko

AUDITOR-GENERAL


Nairobi
12 April 2012



KENYA INDUSTRIAL RESEARCH AND DEVELOPMENT INSTITUTE (KIRDI)
Statement of Financial Position as at 30th June 2011

ASSETS	NOTES	2010/2011	2009/2010 restated
NON CURRENT ASSETS			
Property and Equipment	2a	396,218,263	330,183,720
Work in Progress	2a	72,940,517	16,188,634
R & D projects	27	132,395,771	132,395,771
		601,554,551	478,768,125
CURRENT ASSETS			
Stores and inventories	2b	28,929,893	36,432,519
Accounts Receivable	3 & 4	2,695,370	12,845,622
Cash and Cash Equivalents	6	67,442,573	12,746,826
Deposits	5	764,138	464,138
Total		99,831,974	62,489,105
TOTAL ASSETS		701,386,525	541,257,230
ACCUMULATED FUNDS & LIABILITIES			
Capital Grants G.O.K	24	559,039,639	475,540,536
Project Grants	8	(739,777)	3,207,679
General Reserves	25	34,262,859	(31,505,820)
Donations UNIDO	26	83,515,167	83,515,167
Accumulated Funds		676,077,888	530,757,562
Current Liabilities			
Accounts payable (Creditors)	7	25,308,637	10,499,668
TOTAL ACCUMULATED FUNDS & LIABILITIES		701,386,525	541,257,230

*Restated as explained in Note 29

Signature 

Date:02/04/2012.....

Chairperson: **ENG. DR. SIPHILA WANJIKU MUMENYA**

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

Date:02/04/2012.....



KENYA INDUSTRIAL RESEARCH AND DEVELOPMENT INSTITUTE (KIRDI)

STATEMENT OF COMPREHENSIVE INCOME FOR THE YEAR ENDED 30TH JUNE 2011

	NOTES	2010/2011 KSHS.	2009/2010 restated KSHS.
INCOME			
Re-Current Grand	9a	443,000,000	290,000,000
Other income	9b	20,716,215	35,687,096
Development grants		232,550,897	228,368,114
		696,267,112	554,055,210
EXPENSES			
Staff Cost	10	324,878,041	258,852,905
Administrative Expense	11	118,703,107	73,278,863
Board Exp. & Director's Salary & Allow.	30	23,650,876	20,467,876
Insurance Expense	12	2,935,727	1,530,189
Research feasibility studies and projects	13	71,428,625	74,877,995
Technical Expense	14	19,290,845	15,476,082
Maintenance Expenses	15	33,867,621	18,649,393
Travelling And Subsistence Expenses	16	63,358,388	37,954,688
Depreciation Expenses	2a&2b	33,694,639	23,689,982
Decrease in stock	2b	3,352,342	310,492
		695,160,211	535,088,465
SURPLUS (DEFICIT) FOR THE YEAR			
General Reserve B/F		1,106,901	18,966,745
Bad debts written off		(31,505,820)	(50,472,565)
Revaluation surplus		(4,168,360)	
Balance C/D		68,831,138	
		34,262,859	(31,505,820)

* Restated as explained in Note 29.



KENYA INDUSTRIAL RESEARCH AND DEVELOPMENT INSTITUTE (KIRDI)

STATEMENT OF CHANGES IN ACCUMULATED FUNDS FOR THE YEAR ENDED 30th JUNE 2011

	Project Grants	Capital Grants	Revenue Reserve (Restated)	UNIDO	Total (Restated)
As at 1st July 2009	Ksh 13,894,765	Ksh 449,908,650	Ksh (50,472,565)	Ksh 83,515,167	Ksh 496,846,017
G.O.K Grants		25,631,886			25,631,886.00
Project Grants received (utilised)	(10,687,086)		18,966,745	0	(10,687,066.00)
Surplus/ (Deficit) for the year					18,966,745.00
As at 30th June 2010-restated	3,207,679	475,540,536	(31,505,820)	83,515,167	530,757,562
G.O.K Grants		83,499,103			83,499,103
Project Grants received/utilised	(3,947,456)		68,831,138		(3,947,456)
Revaluation surplus			(4,169,360)		68,831,138
Bad debts written off			1,106,901		(4,169,360)
Surplus /(Deficit) for the year					1,106,901
As at 30th June 2011	(739,777)	559,039,639	34,262,859	83,515,167	676,077,888

* Restated as explained in Note 29.



KENYA INDUSTRIAL RESEARCH AND DEVELOPMENT INSTITUTE (KIRDI)

STATEMENT OF CASH FLOWS FOR THE YEAR ENDED 30TH JUNE 2011

	2010/2011 KSHS	2009/2010 restated KSHS
CASH FLOW FROM OPERATING ACTIVITIES		
Adjustment for items not involving movements of cash:	1,106,901	18,966,745
Depreciation expenses	33,694,639	23,689,982
Bad debts written off	(4,169,360)	-
Surplus/Deficits before working capital changes	30,632,180	42,656,727
WORKING CAPITAL CHANGES		
Stock	3,352,342	310,492
Debtors	10,150,252	(696,865)
Deposits	(300,000)	(23,965,299)
Creditors and Accruals	14,808,427	
Changes in Working capital	28,011,021	(24,351,672)
Net inflow From Operating Activities	58,643,201	18,305,055
Cash Flow in investing Activities		
Purchase of Property and Equipment		
R & D Projects	(83,499,103)	(30,941,283)
	(83,499,103)	(25,631,887)
Cashflow from financing:		
Capital grants		
Prior year adjustment	83,499,103	25,631,887
Changes from Donor project funding		(342,586)
Net inflow from financing activities	(3,947,456)	(10,687,086)
Net increase/Decrease in cash	79,551,647	14,602,215
Cash at the beginning of the year	<u>54,695,745</u>	<u>1,965,987</u>
Cash at the end of the year	12,746,828	10,780,841
	67,442,573	12,746,828

Restated values are referred to in Note 29 as under:

- Cash from operating activities Note 29(3)
- Creditors and Accruals Note 29(1)
- Purchase of Property and Equipment Note 29(2)



KENYA INDUSTRIAL RESEARCH AND DEVELOPMENT INSTITUTE (KIRDI)

Financial statements for the year ended 30th June 2011

Notes to the accounts

1. Principal 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.



KENYA INDUSTRIAL RESEARCH AND DEVELOPMENT INSTITUTE (KIRDI)

Financial statements for the year ended 30th June 2011

Notes to the Accounts

(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.

(h) Government grants

Recurrent and Development grants have been accounted for in the income statement in the year received. Capital grants are accounted for over the periods necessary to match them with the related costs which they are intended to compensate on a systematic basis.



KENYA INDUSTRIAL RESEARCH AND DEVELOPMENT INSTITUTE (KIRDI)

NOTES TO THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 30TH JUNE 2011

Note 2 a								
FIXED ASSETS SCHEDULE FOR 2010/2011								
	LAND	WORK IN PROGRESS (Restated)	BUILDINGS	MACHINERY & EQUIPMENT	MOTOR VEHICLES	FURNITURE & FITTINGS	COMPUTERS & EQUIPMENT	TOTAL (Restated)
	SHS	SHS	SHS	SHS	SHS	SHS	SHS	SHS
VALUE/COST As at 1/7/2010	26,865,000	16,189,174	270,099,688	116,401,700	36,193,484	23,880,799	20,978,551	510,608,396
Additions during the year		56,751,343	-	6,002,920	16,601,940	716,400	3,426,500	83,499,103
Revaluation (Disposal)			68,831,138		(5,439,000)			68,831,138 (5,439,000)
TOTAL 30th June 2011	25,865,000	72,940,517	338,930,828	122,404,620	47,356,424	24,597,199	24,405,051	657,499,637
Accumulated Depreciation b/f	-	-	32,618,093	80,289,932	16,391,742	17,470,516	17,465,219	164,235,502
Depreciation for the year Adjustments/ Dept	-	-	6,778,617	7,428,410	10,854,856 (5,439,000)	1,506,573	2,976,899	29,544,355 (5,439,000)
Total Dep. Net Book Value 30.06.2011	26,865,000	72,940,517	39,396,710 299,534,116	87,718,342 34,686,278	21,807,598 25,548,826	18,976,089 5,621,110	20,442,118 3,962,933	188,340,857 469,158,780
Net Book Value 30.06.2010	26,865,000	16,188,634	237,481,595	36,111,768	19,801,742	6,410,283	3,513,332	346,372,354

* Restated as explained in Note 29

NOTE 2b	2010/2011	2009/2010
STORES AND INVENTORY		
Stock-loose tools	26,285,135	30,435,419
Stock-General stores	2,644,758	5,997,100
Total	28,929,893	36,432,519
Depreciation for the year		
Fixed Assets		29,544,355
Amortization of loose tools		
2009/2010 bal.	30,435,419	
2010/2011 bal.	26,285,135	4,150,284
		33,694,639

Revaluation surplus

The cost of Building has been adjusted by Ksh 68,831,138 as a result of net increase arising from revaluation of Block D and Block E



KENYA INDUSTRIAL RESEARCH AND DEVELOPMENT INSTITUTE (KIRDI)

NOTES TO THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 30TH JUNE 2011

	2010/2011 KSHS	2009/2010 KSHS
Note 3		
DEBTORS		
Balance 1980/81 to 30/06/2002	0	4,169,360
Harambee sacco	0	1,507,775
Kiswa	0	351,879
TOTAL	0	6,029,014
Note 4		
ADVANCES AND PREPAYMENTS		
Traveling imprest (local)	155,500	2,045,577
Traveling imprest (overseas)	139,460	779,870
Temporary imprest	709,270	801,255
Standing imprest	40,000	349,500
Salary advance	3,825	523,796
Salary in advance	-	459,027
Excess medical	1,513,596	1,723,864
Plot scheme	133,719	133,719
TOTAL	2,695,370	6,816,608
Note 5		
DEPOSITS(utilities)		
Fuel	366,000	66,000
Oxygen	30,000	30,000
Hospital	10,000	10,000
Electricity-Kisumu	308,138	308,138
Electricity-South C/Eldoret	50,000	50,000
TOTAL	764,138	464,138



KENYA INDUSTRIAL RESEARCH AND DEVELOPMENT INSTITUTE (KIRDI)

NOTES TO THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 30TH JUNE 2011

Note 6	2010/2011	2009/2010
Cash and Bank balance		
HQ(main Account)	6,943,288	687,097
LDC A/C	2,019,884	988,969
EDSC A/C	2,381,363	2,039,173
BBK-Bank guarantee	34,104,000	0
Kisumu imprest A/C	1,006,244	112,297
LSC A/C	1,936,639	2,405,372
BBK A/C	14,679,446	2,781,245
NIIC/Projects Account	4,371,709	3,678,415
Cash in hand	-	54,258
TOTAL	67,442,573	12,746,826
Note 7		
Accounts payable (Creditors)		Restated
Payroll deductions	1,517,602	3,015,425
Retention money	3,943,980	0
Other Creditors	16,904,505	5,787,522
Provision for audit fee	810,000	540,000
Miscellaneous deposits	2,132,550	1,156,721
TOTAL	25,308,637	10,499,668
Note 8.		
Projects		
ASARECA Project	(113,936)	(113,936)
UNIDO biogas project		
KAPP oil project	(3,282,613)	(3,282,613)
IFS	(318,843)	123,980
WIFIP hycinth project	0	857,850
ATPS-ICT	546,500	563,500
Horticultural ADB	158,891	158,891
Mini-hydo project	55,803	55,803
	84,813	84,813
DANIDA-Fish leather /Arc welding		
KAPP Banana project	8,367,432	8,969,238
DANIDA-Honey project	(357,578)	(357,578)
DANIDA-Brick making project	(3,459,071)	(2,913,269)
Lake and sea resources	(2,511,085)	(1,171,410)
TOTAL	89,910	232,410
	(739,777)	3,207,679
Note 9a		
Recurrent Grants		
	443,000,000	290,000,000
Note 9b		
Other income		
Research grants		
Rents and sundry revenue		
Increase in stock	0	7,820,206
TOTAL	20,716,215	27,866,890
	0	0
	20,716,215	35,687,096

* Restated as explained in Note 29.



KENYA INDUSTRIAL RESEARCH AND DEVELOPMENT INSTITUTE (KIRDI)

NOTES TO THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 30TH JUNE 2011

EXPENSES		
	2010/2011 KSHS.	2009/2010 KSHS.
Note 10. STAFF COST		
Basic salary	142,481,475	119,842,430
House allowance	70,529,016	55,664,282
Other personal allowance	33,781,898	21,477,383
Medical Allowance	10,394,800	10,706,899
Medical Expenses	6,549,288	6,328,080
Passage and Leave	4,412,612	6,823,500
Training expenses	10,752,497	6,599,843
Group life GPA	4,715,287	2,995,689
Fees commission and Honoraria	4,802,112	2,053,787
Gratuity, Pension and NSSF	36,459,056	36,361,012
TOTAL	324,878,041	268,852,905
Note 11. ADMINISTRATIVE COSTS		
Transport operation expenses	3,281,908	2,889,828
Postal and telecom expenses	7,337,021	5,783,906
Telephone expenses	1,835,168	3,077,160
Official entertainment	17,957,445	13,301,149
Electricity	5,814,613	5,617,426
Gas purchase	1,291,954	1,291,802
Water and conservancy	1,793,992	1,407,962
Publishing and printing	9,534,350	2,935,314
Purchase and Consumables	11,777,283	3,089,299
Uniform and clothing	-	654,953
Library expenses	3,727,452	777,679
Purchase of stationery	16,649,284	7,366,673
Advertising and publicity	5,513,367	2,873,574
Show expenses and market research	3,109,388	1,624,694
Rent and rate (non-residential)	3,121,151	4,287,928
Computer expenses	15,157,245	6,128,810
Hire of transport and machinery	-	-
Misc and other charges	2,225,825	929,700
Purchase of plant and equipment	-	-
Contribution to other bodies	990,079	1,251,518
Contracted guards & cleaning services	7,315,609	7,489,488
Provision for audit fee	270,000	500,000
TOTAL	118,703,107	93,746,739
Note 12 INSURANCE EXPENSES		
Insurance of properties	2,935,727	1,530,189
Note 13		
Research feasibility studies & projects	71,428,625	74,877,995

The expenditure on R & D projects amounting ksh 71,428,625 includes travel expenses related to feasibility studies, project preparation and designs.

* Restated as explained in Note 29.



KENYA INDUSTRIAL RESEARCH AND DEVELOPMENT INSTITUTE (KIRDI)

NOTES TO THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 30TH JUNE 2011

Note 14 Technical expenses	2010/2011 KSHS.	2009/2010 KSHS.
Laboratory chemicals	9,345,314	2,848,279
Contracted professional services	9,355,585	12,061,357
Rental of gas cylinders	75,769	152,249
Refined fuels & lubricants-production	514,177	414,197
TOTAL	19,290,845	15,476,082
Note 15 Maintenance Expenses		
Maint. of office furniture & equip	11,640,103	2,674,819
Maint. of build. & stations-non res.	10,569,914	9,474,976
Maint. of plant machinery & equip.	9,018,001	4,167,932
Maint. exp-motor vehicles	2,639,603	2,331,666
TOTAL	33,867,621	18,649,393
Note 16 Traveling and subsistence		
Traveling and accommodation	63,358,388	37,954,688
Note 17 INCOME		
Recurrent grant	443,000,000	290,000,000
Other revenue	20,716,215	35,687,096
Development grants	232,550,897	228,368,114
TOTAL	696,267,112	554,055,210

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	5,997,100	30,435,419	
Net decrease/Amortisation	(3,352,342)	(4,150,284)	
Closing stock	2,644,758	26,285,135	



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 316,050,000 out of which Ksh 232,550,897 was attributed to income and expenditure statement and Ksh 83,499,103 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.

Note 24 Capital G.O.K Grants

The ksh 559,039,639 stated as Capital grants is accumulation of Development releases going way back to 1980 when the institute began self Accounting

Note 25 General Reserves

The General Reserves Account figure of Ksh (34,262,859) is arrived as follows:-

2009/2010 Balance b/f	(31,505,820)
Surplus for the year	1,106,901
Revaluation surplus	68,831,138
Bad debts	<u>(4,169,360)</u>
	<u>34,262,859</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 prototype development designs and pilot plants.

Note 28 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

Note 29 Restated values

Restatement of prior year comparatives (marked*) is attributable to the following variations:

- 1) The value of creditors (referred to in note 7.) was reduced by ksh 2,201,324 on reconciliation
- 2) Work in progress (Note 2a) was adjusted after inclusion of ksh 5,309,396 in respect of payments made to contractors previously charged as revenue expenditure
- 3) The expenditure on Research feasibility studies and projects (Note 13) has been reduced by a total of ksh 7,510,720 against Accounts payable and expenditure on fixed assets that were charged to the Account.
- 4) General reserves (Note 25) comprising accumulated deficit balance was reduced by ksh, 7,510,720 as a result of reduction of outstanding creditors and capitalisation of expenses for fixed assets referred in (3) above.

Note 30 Board expenses

Expenses of conferences and Board amounting ksh 23,650,876 comprises the Director's remuneration Ksh 5,867,600, Board sitting allowances Ksh 10,176,676 and expenditure on various seminars and conferences amounting Ksh 7,606,600.



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