Green Economy Cycle of the German Embassy

Workshop on Increasing Efficiency in Industries in the Agricultural Value Chain

Nairobi, October 26th, 2016
Green Economy Cycle
of the German Embassy

Master of Ceremonies

Andrew Kenda Mwenda

Word of Prayer

Dr. Margaret Muchui
Chief Executive Director of the Fresh Produce Exporters Association of Kenya (FPEAK)
Welcome by Organizers and Keynote Addresses

> Maren Diale-Schellschmidt  
Country Director of the Delegation of German Industry and Commerce in Kenya (AHK Kenya)

> Hon. Dr. Richard Leresian Lesiyampe  
Permanent Secretary at the Ministry of Agriculture, Livestock and Fishery of the Republic of Kenya  
represented by  
Abraham K. Barno, Senior Assistant Director Agro-Industries Development

> Michael Derus  
Deputy Head of Mission and Head of Economic Affairs of the Embassy of the Federal Republic of Germany in Kenya

Wednesday, 26.10.2016
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Nairobi, October 26\textsuperscript{th}, 2016

Maren Diale-Schellschmidt
Network of Organizations

In Germany

Statutory membership

app. 3.6 million enterprises

Voluntary membership

40,000 enterprises

International

Maren Diale-Schellschmidt, 26.10.2016
AHK: An institution with three functions

The AHK is: Service Provider which, as well as its official function and the interests of the members, also provides market-related advice and support in commercial enquiries.
AHK Energy/ Environment Desk: Agenda 2016/2017

Selection of past activities in 2016

> October 2016: **First Kenyan-German Water and Wastewater Week** together with and at the Kenya Water Institute (KEWI)

> August 2016: Workshop on **Sustainable Finance for Projects**

> June 2016: **2nd Green Economy Cycle Workshop on Green Buildings**

> May 2016: **1st Green Economy Cycle Workshop on Production Efficiency**

Key upcoming activities

> November 2016: German Business Delegation on **Mini-Grids in Kenya**

> December 2016: **4th Green Economy Workshop Cycle**

> March 2017: Kenyan Business Delegation to Germany, **Water Berlin International Trade Fair and Exposition**

> March 2017: German Business Delegation for **Efficiency in Industry and Buildings**

Maren Diale-Schellschmidt, 26.10.2016
Oktoberfest, October 2016

Oktoberfest 2016
OCTOBER 07TH & 08TH
ALCHEMIST BAR, (WESTLANDS) PARKLANDS RD.
TIME 7PM-2AM ENTRY KSHS 1,500

FEATURING THE BAND
THE DIRNDL JÄGER

TICKETS AVAILABLE AT
DELEGATION OF GERMAN INDUSTRY AND COMMERCE (AHK)
(Riverside Drive, opp. Prime Bank, Chase Bank Building)

ONLINE
TICKETSASA
(www.ticketsasa.com)
OR AT THE EVENT ENTRANCE

EXCESSIVE CONSUMPTION OF ALCOHOL IS HARMFUL TO YOUR HEALTH. STRICTLY NOT FOR SALE TO PERSONS UNDER THE AGE OF 18.

Maren Diale-Schellschmidt, 26.10.2016
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Session 1
Smart Concepts for the Optimization of Energy Usage

> Sebastian Schiffer
  Director of Energy Concepts Schiffer GmbH

> Geoffrey Ronoh
  Project Manager at the Strathmore University Energy Research Centre

> Hillary Rono
  Engineer at Kenya Tea Development Agency Holdings Ltd. (KTDA)
Session 1
Smart Concepts for the Optimization of Energy Usage

> **Sebastian Schiffer**  
  Director of Energy Concepts Schiffer GmbH

> **Geoffrey Ronoh**  
  Project Manager at the Strathmore University Energy Research Centre

> **Hillary Rono**  
  Engineer at Kenya Tea Development Agency Holdings Ltd. (KTDA)
Increasing Efficiency in Industries in the Agricultural Value Chain
My Profile

Dipl.-Ing. Sebastian Schiffer M. Sc.

Vocational training:
- Electronics engineer
- Civil engineer of electrical engineering
- Government certificated consultant in energy efficiency
- Master of Science in renewable energy and energy efficiency
EnergieKonzepte Schiffer GmbH is a diversified technology company focused on improving people’s lives through meaningful innovation in the areas of electrical power generated using locally available renewable sources.

- (Rual) Electrification, (decentralized and mobile power systems)
- Desalination of seawater
- Irrigation and drinking water systems with (mobile) solar or wind energy supplies
- Mobile solar-powered reefers and deep-freeze containers (mobile)
- Heating & cooling

The above is but a sample selection of the many applications we cover....
We want to deliver the highest quality customer products and services for all aspects of our business on time, every time. We make it a point to build long term relationships with our partners and customers based on a complete understanding of their requirements.

We guide our customers through every aspect of product development, from the initial question of the energy needs, to a complete long term working solution.

Since its establishment in the year 2013 EnergieKonzepte Schiffer GmbH has developed into a substantial business, offering customers solutions in every field of renewable energy.
What is Efficiency in the Agricultural Farming?

(Cost)Efficiency = Energy efficient devices + renewable energy production

Everything with less consumption, you don`t need to generate/ pay
Renewable energy = the sun don't write you a bill

Most problems/ costs in agriculture in many African countries are:

- Less water → Irrigation
- Declining food → Correct storing of produced food
- Transport → Cool chain
- More earnings → processing

In one word → Infrastructure
Example Lightning = Bulb
60W
= LED
60W (9 x 6.5W)

219 kWh per a
3646 KES per a

24 kWh per a
395 KES per a

Savings over lifetime: 1338 kWh or 22,270 KES
Energy efficiency devices

The calculation example of the lightning is contagiously to all electrical devices:

- **Air Condition** with 60% less consumption
- **Fans** with 70% less consumption
- **LED-Lamps** and tubes with 90% less consumption
- **LED-TV** with 80% less consumption
- **Fridges and Freezer A+++** with 75% less consumption
What are the possibilities/ solutions in Farming?

<table>
<thead>
<tr>
<th>Possibility</th>
<th>Solution</th>
<th>Needs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less water</td>
<td>→ Irrigation</td>
<td>→ Power for pumps</td>
</tr>
<tr>
<td></td>
<td>→ Water efficient Irrigation</td>
<td>→ Water efficient Irrigation system</td>
</tr>
<tr>
<td>Declining food</td>
<td>→ Correct Storing</td>
<td>→ Dryer &amp; Power for Dryer</td>
</tr>
<tr>
<td></td>
<td>→ Drying, Cooling &amp; Deep</td>
<td>→ Cool store &amp; Power for it</td>
</tr>
<tr>
<td></td>
<td>freezing</td>
<td>→ Storage Silo &amp; Power for it</td>
</tr>
<tr>
<td>Transport</td>
<td>→ Partners needed</td>
<td></td>
</tr>
<tr>
<td>More earnings</td>
<td>→ processing</td>
<td>→ Power for processing</td>
</tr>
</tbody>
</table>
Efficiency in industries in agricultural with renewable energy solutions
Our farm concept: Project incl. irrigation, drinking water supply, deep freezing container, cooling container, cereal dryer and storage
Water pump system with borehole (Moshi, Tanzania)  
(Irrigation of farm and filling of fish ponds)

Data Farm:
- 21 acre (8.4ha)
- 8 Employees
- 9.1 acre (3.6ha) used as farmland
- Two working Fish ponds,
- 6 Greenhouses planned
Power supply container

Technical Data:
- Wellpump 5kW; 5-9.5 m³/h
- Riverpump 4kW; 12-16 m³/h
- Output power Inverter 30kVA, 3-Phase
- Storage Battery 48kWh installed (24kWh usable)
- 65 Panels with 16.5 kWp, Output 65-70kWh per Day
Power Container (6m²)

Technical Data:
- Inverter output power: 5 kVA (1-Phase) – 12kVA - 36kVA (3-Phase) – 60kVA – 500kVA (3 Phase)
- Photovoltaic generator: 3 kWp - 45kWp – open end
- Battery capacity (usable): 8,9kWh – 84kWh – open
- Mounting material always provided, insulated container, panels (Made in Germany), fuse box

Energy supply with mobile cereal dryer
Efficient irrigation system

Efficient irrigation = water efficient + energy efficient

Floating irrigation

1 acre

40 % – 50 %

Water efficiency

Sprinkler irrigation

1 acre

1 acre

60 % – 70 %

Water efficiency

drip irrigation with humidity meter

1 acre

1 acre

1 acre

90 % – 95 %

Water efficiency

With the same amount of water and pump energy, it is possible to irrigate three times more land.
Efficient irrigation system

Efficient irrigation = water efficient + energy efficient

Combination of drip irrigation and automatically irrigation steering with humidity meter make it water and energy efficient

80% - 90% less water amount than sprinkler, means 80%-90% less energy consumption
Power supply for water pumping

Products:
- Deep well pumps, pure solar use possible
- Max. height 170 m - max. output 1 m³/h – 2000 m³/h
- Surface pumping systems
- Pressure hold systems
- Irrigation and drinking water incl. infrastructure
- Mobile supplies
Power for security lights

Additional equipment:
• Inside and outside lighting incl. switches and sockets
Solar powered drinking water supply

Water pump system with pressure tank in Himo (Tanzania)

Additional equipment:
- Drinking water pressure pump, automatically running
Reefer and deep-freeze container

EK Cool Power:
- 40ft highcube reefer
- Outside steel
- Inside stainless steel
- Max. -60°C (Special construction)
- Standard 2-4°C and -18°C

- Alu T-Floor
- Internal capacity 65m³
- Striped compartmental curtain
- Optional crushed ice production
Reefer and deep-freeze container

EK Cool Power options:
- 1x 40ft Highcube Reefer, 1x Energy Supply
- 3x 40ft Highcube Reefer, 1x Energy Supply
- 5x 40ft Highcube Reefer, 1x Energy Supply
- 10x 40ft Highcube Reefer, 1x Energy Supply

Options:
- Crushed or block ice production (Sweet water or salt water source, external container)
- Power supply of external users possible
- Hybrid power with wind and solar
- Mobile (if the side is changing, the containers can be move)
- Boxes (ca. 30 - 700l) for rental space
Grain dryer and silo storing

Drying of: Wheat, Mize, Barley,….

Safety storing in silos

Powered by solar

Best quality food for you & your family, clients and animals

Big Advantage: Sales during all seasons possible
Additional farming solutions of EnergieKonzepte
Solar powered oil mills and pellet press

Products:
- Up to 600kg/h
- For wooden or fish feed pellets

• 18-30kg/h depends on the seeds
• 100 different seeds possible
• Cold pressing
Aerator for fishponds

Make sure that you fish has the optimal oxygen supply (up to 40% faster growing)

- Swimming aerator
- Up to 240m³/h
- Incl. steering with oxygen meter
Each photo has an interesting story to tell!
Session 1
Smart Concepts for the Optimization of Energy Usage

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> **Hillary Rono**  
Engineer at Kenya Tea Development Agency Holdings Ltd. (KTDA)
Increasing industrial efficiency in the Agricultural value chain

Strathmore experience

26 Oct 2016
About Strathmore Energy Research Centre (SERC)

• Founded in 2012 as a Research Centre within Strathmore University

• **Mission:** To be a catalyst towards greater adoption of renewable energy technologies (RETs) and best practices in energy efficiency

• **Focal areas:** Solar PV & Thermal, Bioenergy, Energy Efficiency

• Service to society & positive influence to our students
SERC Services

Consultancy  Training  Research & Testing
The 600 kW grid-tied PV system
The 600 kW grid-tied PV system

Average monthly production of 67,529 kWhrs
The Promotion of Energy Efficiency in the Food Sector Project

- Partnership with SERC and GIZ/PA
- The Energy Management Regulations, 2012
- Need to build capacity on RE/EE technical/managerial level
- Slow or limited implementation of ECMs
- High energy costs - ca. 20% of total costs p.a.
Project Goal and Objectives

• Goal - ensure that the dairy and tea sectors have a pool of skilled energy management expertise to champion adoption of energy efficient technologies within the sectors.
  – To ensure at least 50 professionals successfully undergo CEM training.
  – At least 40 facilities from the Dairy and Tea sector are supported comply with the EMR, 2012
  – Post-audit dissemination workshops
  – Awareness creation
  – Establish a baseline and benchmark for both industries to encourage further improvement

Project period April 2016 - March 2018
PARTNERS SELECTION CRITERIA

- Criteria for Facilities/Companies:
  - In the Dairy and Tea Sector
  - Consuming 180,000 kWh of energy annually.
  - Willing to conduct energy audits (at subsidized rates) and implement findings.
  - Willing to sponsor staff to the CEM training at subsidized rates.
  - Consent to the processing facility data to be used for research and publication purposes; and
  - Participate in awareness creation events for the Project
  - Willing to sign an MoU with SERC/GIZ PAG

- Partners can express interest (EOI) via email: patieno@strathmore.edu

- Looking as many applications as possible - support of associations to spread the word.
PARTNERS SELECTION CRITERIA

Criteria for Trainees:
• Degree in engineering, agriculture and environment related courses;
• Work experience of more than 3 years in a middle management position, preferably in processing, maintenance and projects.
• Demonstrated interest in energy management based on previous work or professional examples
• At least 30% should be from either gender
• Willingness to share knowledge

Keep checking on the SERC website https://serc.strathmore.edu/ for application details

Or Send an email to Prisca Atieno - patieno@strathmore.edu

Next CEM training is scheduled for 5th Dec 2016
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Progress Made by KTDA

26th October 2016
Introduction

- KTDA Holdings Ltd. Is a private company owned by small scale tea farmers numbering about 560,000

- The holding company has several subsidiaries including:
  - KETEPA
  - Chai Trading
  - Greenland Fedha
  - TEMEC
  - KTPC
Energy Consumption Scenario

- All factories operate electrical and thermal equipment e.g. Motors, boilers, stand-by generators, air heating radiators, lighting etc
- The total power demand for all the factories is about 40 MW and the total electricity consumed per annum is about 163 million kWh
- Factories also consume a total 400,000 tonnes of biomass
- Wood has been sourced from catchment area but factories are now developing their own...
Tea Manufacturing Process

- Process Summary

<table>
<thead>
<tr>
<th>Stage</th>
<th>Process</th>
<th>Energy Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Withering</td>
<td></td>
<td>Electricity, Heat</td>
</tr>
<tr>
<td>CTC (Cut, tear &amp; curl)</td>
<td></td>
<td>Electricity</td>
</tr>
<tr>
<td>Fermentation</td>
<td></td>
<td>Electricity</td>
</tr>
<tr>
<td>Drying</td>
<td></td>
<td>Electricity, Heat</td>
</tr>
<tr>
<td>Sorting &amp; Packing</td>
<td></td>
<td>Electricity</td>
</tr>
</tbody>
</table>
Energy Conservation in KTDA Factories

- Efforts put in place in order to improve energy utilization:
  - Energy audits – to identify and quantify opportunities
  - Training and awareness
  - Retrofitting/replacement of inefficient equipment
  - Change of design/technology

- Opportunities for saving energy can be grouped into 3
  - Operational
  - Maintenance
  - Equipment design/efficiency
Measures Implemented

- Trained all senior factory managers from 66 factories: GIZ, Strathmore and KTDA
- Trained engineers on energy management and energy auditing GIZ, Strathmore and KTDA
- Training of factory supervisors ongoing: targeting all factories: ETP and KTDA
- Continuous awareness creation among KTDA employees
Measures Implemented

- Firewood sheds
- Installation of air pre-heaters
Measures Implemented

- Installation of advance energy monitoring system – being piloted at Litein T.F.
- Replacement of inefficient withering fans
- Installation of continuous withering units commenced
- Heat recovery in driers being implemented
- Planned piloting of VSDs
- Use of energy efficient motors planned once suppliers give what they promise
Impact

- In the 2 years the average energy intensity across all factories has been cut from 33.6 MJ/kgMT to 31.4 MJ/kgMT: 6.7% reduction in energy consumption
- Electricity intensity cut by 4% and firewood intensity by 7%
- Estimated energy cost savings KSh. 240 million
Challenges

- Lack of good suppliers
- New technology seen as high risk
- Few experts to implement energy efficiency projects
- High cost of retrofitting/replacing some equipment
Green Economy Cycle of the German Embassy

Workshop on Increasing Efficiency in Industries in the Agricultural Value Chain

Nairobi, October 26th, 2016
Session 2
Production and Post-Harvest Losses are Profit Losses: Addressing the Loss Challenge

> Anthony Mutiso Kyalo
  Operations Manager at Fresh Produce Exporters Association of Kenya (FPEAK)

> Grant Brooke
  Chief Executive Officer at Twiga Foods

> Marah Köberle
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Production and Post-Harvest Losses are Profit Losses: Addressing the Loss Challenge

Presentation in a Workshop on Increasing Efficiency in Industries in the Agricultural Value Chain.

Anthony Mutiso– FPEAK
Golden Tulip Hotel, 26th October 2016
The Fresh Produce Exporters Association of Kenya (FPEAK) is Kenya’s premier trade Association representing growers, exporters and service providers in the horticulture industry.

- Formed in 1975, when export horticulture was in its infancy
- Members of the Association are involved in growing and/or exporting fresh cut-flowers, fruits, and vegetables
- FPEAK provides a focal and coordination point for the horticulture export industry
**FPEAK ACTIVITIES**

- **Timely Market information:** Industry members benefit from FPEAK’s information services on relevant industry info.

- **Training/Capacity Building Programs:** training for technical staff and smallholder farmers to comply to acceptable standards on Good Agricultural Practices.

- **Pre-certification appraisals.** Farmer groups in preparation of GAP certification

  - **Advocacy and lobbying:** FPEAK continuously monitors the domestic and international policy environment and lobbies relevant institutions and governments for actions
Global Magnitude of Production And Post Harvest Losses; The Facts

- It is well accepted that agricultural production must be increased considerably in the foreseeable future to meet the food of a rising human population.
- The fruits and vegetables category and roots and tubers category lead in proportion of losses globally, with 20–30 percent lost across most regions.
- At $1 trillion, it’s an opportunity cost so large that it nearly equals the entire gross domestic product of sub-Saharan Africa.
By most official statistics that’s the value of food that gets lost or wasted every year in the production process — roughly 30 percent of the amount that gets harvested.

Every 1 percent reduction in post-harvest losses leads to $40 million in output gains, with farmers as key beneficiaries, according to the World Bank.

Approximately 65 million hectares could be saved by reducing food loss in the value chains (excluding consumer food waste) by 2030.

With respect to water, losses in the food value chain account for an estimated 12–15 percent of global water use.
The causes of food loss vary by region, crop, and supply chain. Large losses found in developed and developing countries often emerge from different causes.

The fruits and vegetables category and roots and tubers category lead in proportion of losses globally, with 20–30 percent lost across most regions.

Food lost across the entire food value chain is the third-largest opportunity to increase resource productivity and estimates the value of these gains at a whopping US$252 billion.

An Overview of Food loss based on studies by the Food and Agriculture Organization (FAO), loss amounts to about 1.3 billion metric tons per year, or roughly, one-third of food produced for human consumption.
Post harvest loss flow

Harvest 2-5% 2-5%
Selection 1-2% 1-5%
Processing 1-5%

Harvest 100%

Packaging 3-6%
Transport 1-5%
Storage 5-10%
Distribution 5-15%

Consumption
# Causes of Production and Post harvest losses

<table>
<thead>
<tr>
<th>Production</th>
<th>Post harvest</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Practice-Based</strong></td>
<td><strong>Practice-Based</strong></td>
</tr>
<tr>
<td>✓ Pest/disease/weather damage</td>
<td>✓ Anticipatory packing</td>
</tr>
<tr>
<td>✓ Improper handling</td>
<td>✓ Improper handling</td>
</tr>
<tr>
<td>✓ Premature harvest</td>
<td>✓ Pest/contamination in storage</td>
</tr>
<tr>
<td><strong>Market-Based</strong></td>
<td>✓ Natural drying</td>
</tr>
<tr>
<td>✓ Culling/selective harvesting/grading</td>
<td>✓ Spillage, Spoilage or bruising in transport</td>
</tr>
<tr>
<td>✓ Labour shortage</td>
<td><strong>Market-Based –</strong></td>
</tr>
<tr>
<td>✓ Low market prices</td>
<td>✓ Processing requirements</td>
</tr>
<tr>
<td>✓ Oversupply/overplanting</td>
<td>✓ Quality standards</td>
</tr>
</tbody>
</table>
Potential Solutions to Production Losses

**Practise based**
- Precision agriculture
- Integrated pest management
- Pest- and weather- resistant crops
- Training and agriculture extension
- Crop diversification

**Market based**
- Contractual modifications
- Concurrent picking
- New markets for off-spec/less-than perfect products
- Policies that support donations
Potential Solutions to Post Harvest Losses

**Practise based**
- Investments in storage and transport solutions and infrastructure
- Training and agriculture extension

**Market based**
- Contractual modifications
- New markets for edible damaged product
  - Food donations
Addressing the Loss Challenge

- Reducing these pre- and post-harvest losses provides a win-win opportunity.
  - Using more of the food we already produce can provide additional nutrition to feed those in need and eases the pressure on increasingly constrained land, energy, and water resources.
  - Benefits include revenue opportunities through new markets or products, cost savings through improved supply chain efficiency,
  - Meeting social goals related to food security and resource use. Some estimate savings in the millions of acres and hundreds of billions of dollars
INVESTMENTS IN LOCAL RESEARCH

- Even though the extent of losses is global, the solutions must be locally driven.

BASIC CAPITAL INVESTMENTS

- Capital investments that address specific causes of food loss can provide readily available solutions that are often low cost. Post-harvest transport and storage stages of the upstream food value chain are especially ripe for these.

TECHNOLOGY-ENABLERS

- Basic and cutting-edge agriculture tools are available to address food loss.
Addressing the Loss Challenge, Areas of Intervention. Cont’

CAPACITY BUILDING
- An increasing number of companies are finding ways to enhance the capabilities of their suppliers.

CONTRACTUAL MODIFICATIONS
- Existing contractual arrangements can be a cause of food loss because they often result in producers overplanting or leaving edible crops in the field.

NEW MARKETS
- New revenue can be generated by creating or tapping into alternative markets such as food banks, farmer’s markets, and online exchanges.
THANK YOU

Anthony Mutiso-
Fresh produce Exporters Association of Kenya ( FPEAK)

anthonymutiso@gmail.com; +254711214396
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The Lab of Tomorrow
Challenges meet Business Driven Solutions „Food not Waste“

Marah Köberle, AHK Kenya
lab of tomorrow – how it works

1. Development challenge as business opportunity
2. “Observe” identify and interview stakeholders
3. Three-day ideation & prototyping workshop in Germany interdisciplinary teams create business-driven solutions as prototypes
4. Feasibility study to validate assumptions and refine prototypes
5. On-site testing and iteration workshop
6. Project implementation

CONTACT
lab-of-tomorrow@giz.de
+49 30 72614-311
www.giz.de/lab-of-tomorrow
lab of tomorrow
challenge no. 2 – food not waste

Food not Waste – Developing innovative business solutions for the food waste problem in Kenya
DESIGN THINKING

- Understand
- Observe
- Ideate
- Prototype
- Test
UNDERSTAND AND OBSERVE
PROTOTYPE AND TEST
RESULTS

- Alternative Processing
- Smart Data Solutions
- Market Access
- Education

--> SCOPING STUDY ON BUSINESS IDEAS AND FOOD REJECTS
Three main approaches viable to commercialize food waste

- Approaches designed to differentiate in market

Absorb oversupply:
- Absorbing existing oversupply and buying at prevailing market prices
- Involves establishing similar systems to existing players who are unable to fully absorb market supply

Develop new processing:
- Targeting existing fresh markets with secondary processing option not currently utilized
- Targeted where market has been slow to act and there is minimal competition

Improve efficiency of waste aggregation:
- Building a more efficient collection & logistics system to collect produce at lower cost than existing systems
- Requires innovative solutions to logistics and aggregation of supply

Specific margin analysis needed to prove viability

- Food waste processing business premised on lower input costs to provide margins...
  - Approach 1 - oversupply keeps prices low
  - Approach 2 -- rejected produce otherwise discarded or sold into lower-price markets
  - Approach 3 -- Interventions to reduce system inefficiencies will minimize input costs & improve viability

...but high cost of processing in Kenya may overwhelm margins
- Kenya has relatively high electricity costs, high labor cost, and high transport costs to shipping and export ports

- End products must be sufficiently high value to provide margin
DATA: Access to information remains a key constraint for farmers & exporters

**Farmers**
- Most farmers lack credible, tailored information about crop management techniques needed to maximize yields
- In addition, access information on new & improved methods of farming is limited
- Farmers struggle to access weather information and, even when available, it is often not explained in an understandable, actionable manner

**Exporters**
- Exporters need information on market demand to help them respond to changing trends and guide farmer activities - leading to cancelled orders and rejected produce
- Inadequate or inaccurate information sources significantly limit ability of exporters to communicate with farmers and get them to adopt needed practices

**Good agricultural practices**
- Farmers face challenges in getting accurate and timely market price information to guide planning
- Inaccurate market price data can lead to side-selling and reduce exporters’ ability to aggregate from farmers in their networks
- Access to information on market prices would better inform investments for farmers and exporters

**Market price information**

**Demand projections**
CONTACTS

The lab of tomorrow is run by GIZ on behalf of Germany’s Federal Ministry for Economic Cooperation and Development.

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Please contact me if you are interested in participating in the “Lab of Tomorrow Iteration Workshop” on 17th November in Nairobi

|26th October 2016| Marah Köberle
Session 3 – Inputs
Best Practice Examples and the Way-forward

> James K. Karanja
Chief Finance Officer and Investments Advisor at Kevian Kenya Ltd.

> Ana Salvatierra-Rojas
University of Hohenheim, Institute of Agricultural Engineering in the Tropics and Subtropics
Session 3 – Inputs
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> **James K. Karanja**
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> **Ana Salvatierra-Rojas**
  University of Hohenheim, Institute of Agricultural Engineering in the Tropics and Subtropics
INCREASING EFFICIENCY IN INDUSTRIES IN THE AGRICULTURAL VALUE CHAIN

BEST PRACTICE

BY KEVIAN KENYA LIMITED
26TH OCTOBER 2016
INTRODUCTION

Food Agriculture Organisation (FAO) defines food security as “when all people have physical, social and economic access to sufficient safe, and nutritious food that meets directly needs and food preference for an active and healthy life at all times.

Government has cardinal responsibility to ensure food security to its citizens since this has direct effect on the social and economic stability of a country.
In 2009, the World Summit on Food Security stated that the "four pillars of food security are availability, access, utilization, and stability".

Very few countries have achieved full food sufficiency, and hence the need for countries to address how to increase efficiency in food production while ensuring environmental sustainability.

Best practice to achieve this is by use of quality planting materials for increased yield, leading to less post- harvest losses.
FOOD INDUSTRY SYSTEM

- Each step in the food industry system — food production, processing, transportation, storage, distribution and marketing — has some impact on the environment, and there is much concern about environmental pollution.

- Due to the highly diversified nature of the food industry, various food processing, handling and packaging operations create wastes of different quality and quantity, which if not treated could lead to severe disposal and pollution problems.

- The wastes, if not recovered by appropriate methods and technologies for upgrading, bioconversion or reutilization, represent a loss of valuable biomass and nutrients.
Efficient waste treatment is necessary to minimize waste in food processing and manufacturing operations through advanced manufacturing practices.

There is also need for constructive utilization of what is unavoidable by bioconversion of by-products and waste into animal feeds and industrial chemicals.

This leads to decreased environmental loadings as a consequence of better integrated waste management.
Kevian Kenya Limited is a leading player as a processor in this sector.

According to FAO, the primary steps in processing fruits and vegetables include:

1. Reception
2. Temporary storage
3. Washing fresh produce (also known as surface treatment) to reduce the overall potential for microbial food safety hazards. This is an important step since most microbial contamination is on the surface of fruits and vegetables.
4. Sorting
5. Removal of leaves, skin, and seeds
6. Blanching – heat treatment to inactivate enzymes
7. Washing and cooling
8. Packaging
9. Clean up
Waste-water and solid wastes are the primary area of pollution control within the fruit and vegetable food-processing industry. 

Their waste-water is high in suspended solids, and organic sugars and starches and may contain residual pesticides. 

The total amount of material generated is a function of the amount of raw material moved through a processing facility.

Advancements in research have been made in reducing the volume of waste water generated in food processing operations.

Most fruit and vegetable processors use traditional biological means to treat their wastewater. Advancements in the degradation chemistries of pesticides have aided in reducing their quantities and toxicity in process wastewater.

Kevian Kenya Limited has invested heavily in the latest water treatment technology to ensure that its waste water is compliance with the international standards as required NEMA.
KKL PARTNERSHIP WITH SMALL SCALE FRUIT AND VEGETABLE FARMERS

- Kevian has over the years worked with small scale farmers to ensure that they are able to have farming as a sustainable business.

- In partnership with GIZ, KKL has managed to organize over 10,000 farmers into cluster groups which are located in the eastern, lower eastern and northern coast of Kenya.

- The farmers were supported with high yielding and disease resistant mango seedlings in addition to good crop husbandly.

- They were also able to access appropriate credit from financial institutions since there is ready market for their produce.

- Kevian (K) Ltd buys mango fruits from the small scale farmers to meet all its mango concentrate requirements.
## OTHER ENVIRONMENTAL CHALLENGES FACING FOOD PROCESSING INDUSTRY

<table>
<thead>
<tr>
<th>CHALLENGE</th>
<th>KKL INTERVENTION</th>
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</thead>
<tbody>
<tr>
<td>I. Noise pollution and vibration</td>
<td>I. Use of state of the art technology.</td>
</tr>
<tr>
<td>II. Waste and effluent disposal</td>
<td>II. Ensures compliance with NEMA and EHS standards.</td>
</tr>
<tr>
<td>III. Utilization of best available technology</td>
<td>III. Use of state of the art technology</td>
</tr>
<tr>
<td>IV. Minimal displacement of local community, and payment of optimal compensation where displacement is inevitable</td>
<td>IV. KKL does not grow its fruits and vegetables</td>
</tr>
</tbody>
</table>
OTHER ENVIRONMENTAL CHALLENGES FACING FOOD INDUSTRY CONT...

**CHALLENGE**
- Involvement of local community in production of raw materials, to minimize conflicts with the locals.
- Give preference to locals in provision of labour in the processing plants.
- Manufacturing process to include recycling potential e.g. into bio fuels for power generation
- Use of green energy instead of hydro and diesel to run the processing plants

**KKL INTERVENTION**
- KKL relies on supplies from small scale farmers throughout the country. This ensures the company is a full participant in both social and economic support of farmers in Kenya
- Most of the employees in both sites are from the factory neighborhoods.
- KKL recycles the waste into bio fuels e.g. mango waste is dried and used for firing of boilers.
- We are exploring the use of solar energy for electricity generation to run the plants, with a view to reduce reliance on hydro power
Q & A
Session 3 – Inputs
Best Practice Examples and the Way-forward

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Chief Finance Officer and Investments Advisor at Kevian Kenya Ltd.

Ana Salvatierra-Rojas
University of Hohenheim, Institute of Agricultural Engineering in the Tropics and Subtropics
“Workshop on increasing efficiency in industries in the agricultural Value chain”

Solar powered milk cooling system for the small dairy farmers in Kenya

Ana Salvatierra, Victor Torres Toledo, Klaus Meissner, Joachim Müller

Universität Hohenheim
Institute of Agricultural Engineering
Tropics and Subtropics Group
Stuttgart, Germany
Temperature profile during transporting

![Graph showing temperature profile over time]

- **Temperature (°C)**
  - **Milk** (green line)
  - **Ambient** (blue line)

- **Time of day**
  - 07:04 to 10:48

- Key events:
  - 08:00: Initial milk temperature.
  - 08:30: Temperature start to drop.
  - 10:00: Ambient temperature fluctuates.

The graph illustrates the temperature changes of milk and ambient environment over time during the transport process.
Temperature effect on bacterial development in raw milk

Source: Tetra Pak 2016
Solar powered milk cooling system
Solar power cooling system

- DC Freezer
- 2kg Ice-blocks
- Batteries
- Adaptive Control unit
- 600 Wp PV
Adaptive control unit

Adapted cooling power to solar energy availability

- Charge Controller
- Data logging
- Adaptive control unit

Graph showing:
- Solar Power
- Ice maker Power

Key:
- Max. power mode
- Efficient mode
- Sleep mode
- Stop

Energy saved in the batteries

Power (W)

Solar time (h)
On-going field testing project in Tunisia

■ 7 Farms with a capacity between 60 to 120 liter per day
■ Field assessments from April 2016 until December 2017
Temperature effect on bacterial development in raw milk

Source: Tetra Pak 2016
Temperature profile - Insulated milk can

- Ambient
- Normal can
- Insulated can
- Fast cooling (4 °C)

- 1.4 \(10^6\) bacteria/ml
- 0.7 \(10^6\) bacteria/ml
- 0.6 \(10^6\) bacteria/ml
Project in Kenya
■ PARI project 2015 until 2017
■ Pilot testing
□ Cooperative
□ Collecting
□ Farm
Insulated milk can with ice compartment

- Ambient
- Without insulation
- With insulation

Temperature (°C)

Time (h)

© Salvatierra | Institute of Agricultural Engineering | Tropics and Subtropics Group
Performance assessment by simulations

Autonomy of 4 days under unfavorable weather conditions
- 12 kg/day with 90% reliability in Tunisia
- 16 kg/day with 100% reliability in Kenya
Business Opportunity

- Price premium due to higher milk quality.
- Increase of milk production due regular milking times, storage of evening milk and less milk rejection.

**Milk cooling cost around 0.06 €/L for a payback period of 3 years**
(Milk price at farm level in Sidi bouzid : 0.37€/L)

System commercialization by

Cooling capacity: 60 L/day
Total cost around 2700€ (excl. vat)
Session 3 – Panel
Best Practice Examples and the Way-forward

> **Violet Nyando**
  External Relations, Policy, Lobby and Advocacy at the Kenya National Farmers Federation (KENAFF) and Chair of the Agriculture Sector Board of the Kenya Private Sector Alliance (KEPSA)

> **Dennis Odera**
  Africa Business Consultant at WeFarm Ltd.

> **Sebastian Schiffer**
  Director of Energy Concepts Schiffer GmbH

Facilitation by

> **Andreas Kaiser**
  Head of the Energy Desk of AHK Kenya
Lunch

Green Economy Cycle of the German Embassy

Workshop on Increasing Efficiency in Industries in the Agricultural Value Chain

Nairobi, October 26th, 2016
Well connected in Kenya and East/ West/ South Africa

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