

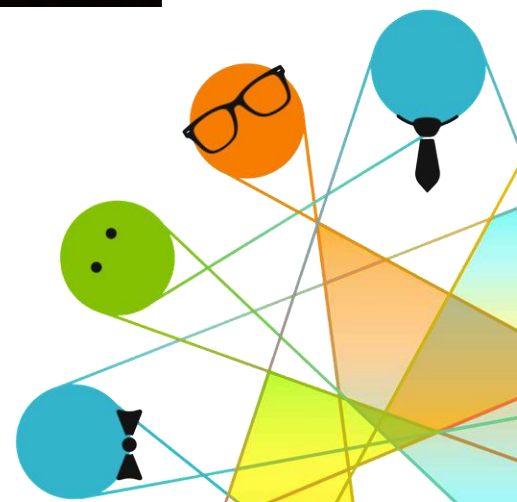


## lab of tomorrow

March 8 - 10, 2016 | Berlin, Germany

**Challenge: Food not Waste – Developing innovative business solutions  
for the food waste problem in Kenya**

Background paper:  
**Food not Waste - Kenya**





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## 1. Scene Setter



### Kenya - Key Facts

Capital:	Nairobi
Area:	580,000 sq km
Total Population 2013:	44.4 Million
Urban Population 2013:	24.78%
GDP:	US\$ 44.9 Billion
GNI Per Capita 2013:	US\$ 860

According to the UN Food and Agriculture Organization (FAO) about one third of all food produced worldwide every year is lost or wasted.

Taking into account the growing world population which is estimated to reach 9 billion by 2050, food loss and food waste not only pose an economic and financial problem but also one that affects the survival of people. If food loss and waste can't be reduced, food production will need to increase worldwide requiring staggering investments. Further, agriculture heavily draws on resources and is responsible for 70% of the earth's freshwater withdrawals, 80% of deforestation and about 35% of greenhouse gas emissions.

Every year consumers in industrialized countries waste almost as much food as the entire food production of Sub-Sahara Africa. **Sub-Sahara Africa in turn has the highest potential to address food losses and food waste as it has the highest per capita losses of any crop in any developing region.**

The GIZ Lab of Tomorrow – Food not Waste – wants to tap this potential in Kenya and develop solutions together with European and African stakeholders. Therefore, this report compiles scientific research, interviews and site visits done by AHK Kenya in 2016 and sheds light on practices and the status quo in order to enable the participating stakeholders to develop solutions.



## 2. Definitions

### Food Loss and food waste

Food loss and waste refer to the edible parts of plants and animals that are produced or harvested for human consumption but that are not ultimately consumed by people.

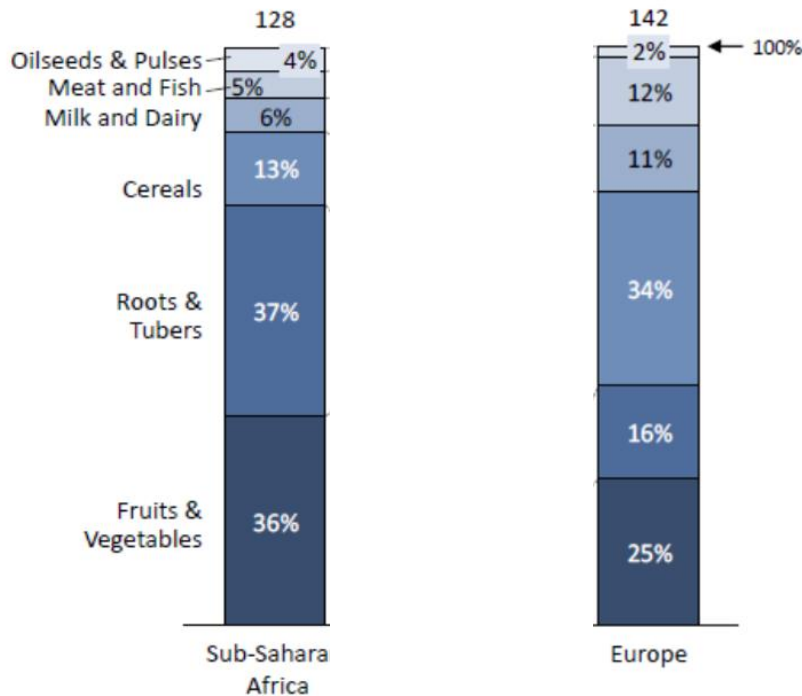
**Food Loss:** The decrease in edible food mass at production, postharvest, processing, and distribution in value chains directed to human consumption

**Food Waste:** Food fit for human consumption being discarded

Food Waste in developing nations: much is lost for lack of adequate storage facilities, roads, and refrigeration. Food loss and waste can occur at each stage of the food value chain. Examples include:

- **During production or harvest:** grain left behind by poor harvesting equipment; and fruit not harvested or discarded because they fail to meet quality standards.
- **During handling and storage:** food degraded by pests, fungus, and disease. During processing and packaging in the form of fruit unsuitable for processing.
- **Processed foods:** may be lost or wasted because of poor order forecasting and inefficient factory processes.
- **During distribution and marketing:** edible food discarded because it is non-compliant with aesthetic quality standards or is not sold before “best before” and “use-by” dates.
- **During consumption :** food purchased by consumers, restaurants, and caterers but not eaten.

### A comparison of food loss and food waste by region



Wastage by region and volume, millions of Metric tonnes (Rockefeller Foundation).

Food waste has the following impacts

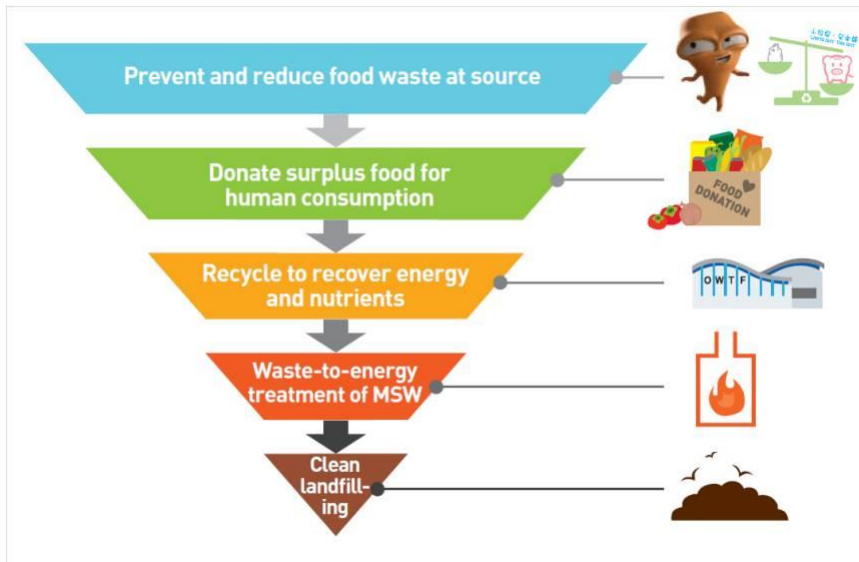
- Economic impact: costs of the food wasted, negative externalities , opportunity costs of farmland
- Social impact: farmers in debt, food insecurity, malnutrition



- Environmental impact: greenhouse gas emissions, soil degradation, waste of water and resources, energy consumption

### The Food Waste Pyramid

Food produced and fit for human consumption is best used for that purpose. The food waste pyramid prioritizes different activities concerning the reduction or alternative use of food waste.

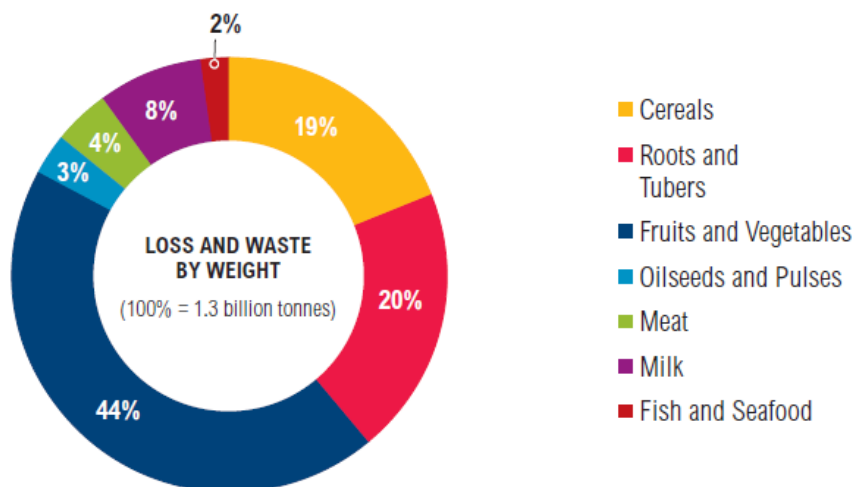


### Why are wasted fruits and vegetables in Kenya relevant?

Sub-Saharan Africa perishables (e.g. fruits, vegetables, roots and tubers) have the largest loss both in relative and absolute terms.

The following graphic illustrates that fruits and vegetable are the category of food with the highest food wastage (by weight)

Share of global food loss and waste by commodity



Source: WRI analysis based on FAO

### 3. Agriculture



Kenya's agricultural sector has a huge potential for food processing as well as cattle rearing because of the vast unoccupied land and the lengthy experience in animal husbandry. The agriculture sector is not only the driver of Kenya's economy, but also the means of livelihood for the majority of Kenyan people. **Horticulture exports make up 23% of Kenya's GDP**, being the country's greatest foreign exchange earner. **About 45% (6.5m) of the employed working-age population (14.3m) are directly engaged in small-scale family farming.** In total, the agriculture sector provides income to more than 80 % of the population. Only 2% (0.29m) of Kenya's employed working -age population have modern, formal wage jobs in the agricultural sector. Most jobs in the agricultural sector are informal, meaning little regulated, taxed and controlled by government.

Farmers in Kenya are mostly small-holder farmers with about 75% of agricultural output coming from farms around two to three hectares big (UNEP 2014).

**About 91% of Kenya's agricultural exports are in raw or semi-processed** form, resulting in huge export earning losses because of low value addition.

In Kenya, the agricultural sector comprises six major sub-sectors, namely (1) industrial crops; (2) food crops; (3) horticulture; (4) livestock; (5) fisheries and (6) forestry.

## Horticulture

With the horticulture sector, the main produce for export are: cutflowers, followed by vegetables, fresh fruits, processed products, herbs and spices.

### Vegetables (35% of total fresh produce exports)

The main product is the French (green) bean. The leading vegetables in value are Irish potatoes, tomatoes and cabbages. Demand for sugar snaps, snow peas and runner beans has increased. Other vegetables for export include the Asian vegetables such as Okra, Karela, dudhi, chilli and aubergine.

### Fresh Fruits

Major fruit export products include avocados, mangoes, pineapples, passion fruits, bananas, and strawberry

### Processed products

Main products include include canned pineapples, juices of mangoes, passion fruits and pineapples, canned vegetables, pickles, pastes, jams, jellies, marmalades and preserves.

### Herbs and spices

lemon grass, basil, dill, sweet Marjoram, oregano, parsley, rosemary, thyme, sage, chamomile, tarragon, etc.

## Value of Horticulture Production

The total domestic value in the horticulture sector in 2012 amounted to KES 217 billion (US\$2.5 billion) and shows an annual growth rate of 8%. Total production increased from 7.3 million tons in 2013 to 8.4 Million Tons in 2014, showing an increase of 16 percent (HCD Data Report).



**Table: Trends of Horticulture Crops Performance, 2012-2014**

Indicator	2012	2013	2014	% Increase
Area (Ha)	529,482	596,574	684,912	15
Production ( millions MT)	6.49	7.26	8.43	16
Value (millions KES)	179,097	186,912	201,251	8
Export volume ('000' KG)	205,728	213,884	220,248	3.0
Export value (millions KES)	89,869	83,381	84,084	0.8

Source: HCD

### Horticulture Exports

After flowers, fruits and vegetables are the second and third most important exports. Horticultural exports in 2014 had a total value of 785 Million Euro (84 Billion KES) and measured 220,000 metric tons of produce.

**Table: Fresh Horticultural Exports**

Category	2012		2013		2014	
	Volume	Value	Volume	Value	Volume	Value
	(Tons)	(Million KES)	(Tons)	(Million KES)	(Tons)	(Million KES)
Flowers	108,306	64,964	105,554	55,976	114,764	59,893
Fruits	31,070	4,680	31,107	4,483	35,149	5,411
Vegetable	66,352	20,226	77,172	22,923	70,335	18,781
<b>Total</b>	<b>205,728</b>	<b>89,869</b>	<b>213,833</b>	<b>83,381</b>	<b>220,247</b>	<b>84,084</b>

## 4. The (Export) Value Chain and food wastage

Food loss and food waste occur at all stages of the agriculture value chain. In Sub-Sahara Africa, data suggest that fruits and vegetables are lost in the following stages of the value chain

- 10% during agriculture production
- 8.1% during postharvest handling
- 20.5% during processing
- 10.4% in distribution
- 2.5% at consumption level

The agriculture value chain is often described as from “Farm to Fork”, meaning from agricultural producer to the consumer. Depending on the produce and its form of consumption (processed/non-processed) the value chains for different products vary. Generally, the steps are as follows:







The Kenyan agricultural sector is diverse and complex with stakeholders ranging from smallholder farmers, to big multinationals, parastatal actors, associations and cooperatives. The following descriptions aim to inform about the main steps and actors in the Kenyan agricultural value chain. For each step the major causes of food waste will be explained.

## Production

Kenyan agriculture remains dominated by smallholder farmers (farms < 3 ha). However, in export value chain contract farming, also known as outgrower schemes, larger farms, often owned by the exporters, dominate.

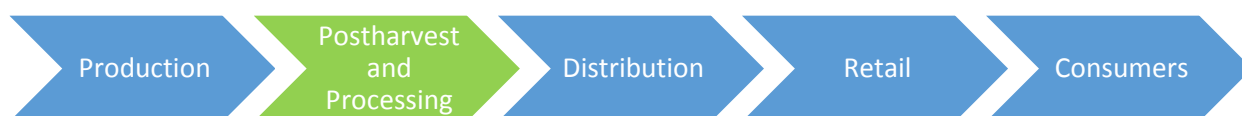
**Outgrowers** are small or medium sized farmers from whom horticulture exporters source vegetables and fruit which they don't grow themselves. This purchase process is normally regulated through contract farming. Outgrower schemes provide safety and plannability for buyers and farmers while farms can profit from the inputs and production services provided (grower management by exporter). Outgrower schemes exist for many vegetables such as green beans, sugar snaps, runner beans and snow peas.

**Contract Farming** can broadly be defined as binding arrangements through which a company ensures its supply of agricultural products by individual or groups of farmers. These arrangements or contracts often specify the quality, quantity, delivery date, price and delivery venue.

**Ingrowers/Exporters:** Most of the horticulture exporters manage their own big scale farms and are a one-stop-show for growing, processing, packing and exporting fruit, vegetable and flowers. About 100 growers, exporters and service providers in the horticulture industry are members of FPEAK, the Fresh Produce Exporters Association of Kenya.

Farm workers are trained to pick only sellable produce. Fruit and vegetable which don't meet the requirements are left on the ground. Feedback Global, a NGO which campaigns against food waste, interviewed farmers growing green beans which reported an average of 14% farm level waste. Produce wasted is usually ploughed back in the ground.

## Postharvest and Processing



Postharvest handling describes the activities directly following the harvest. Typical activities include transport, cleaning, sorting, storing, cooling, packing and processing.

Postharvest handling starts the moment the produce is harvested from the plant and aims to slow deterioration of the product and to prepare it for the human consumption.

For the example of Kenyan bean farming, the fresh harvested beans grown by outgrower farmers plucked in the morning will be transported to a storage shed of a farming cooperative or directly to a grading shed (depending on the size of the farm and the amounts of beans grown). From there, the produce is transported to the exporter who washes and sorts the produce again, making it ready for export.





In the case of green beans, processing includes a practice called “topping and tailing” meaning cutting off the tops and/or tails of the beans to make them fit in pouches for transport. These cut-offs can be considered food waste. “Controlled or modified atmosphere packaging” is common for green beans and other fresh produce aimed for the export market. Modified atmosphere packaging means to reduce the respiration rate of the produce after harvest to increase shelf life. Fresh produce often is packed in specific perforated bags to control oxygen and carbon dioxide. Sometimes nitrogen is added to the package. Further processing might require cutting of produce, e.g. for pre-packed stir fry mixes.



Tipping and Tailing of green beans, packaging in punnets<sup>1</sup> ; Stir Fry Mix<sup>2</sup>



Trimmed green beans from Kenya<sup>3</sup>

The locations and capacities of the pack houses of the exporters vary. While Vegpro reports all its processing done in their facilities in Cargo Village at the Jomo Kenyatta International Airport in Nairobi, Kenya, other exporters have processing plants close to their farms.

<sup>1</sup> (photo courtesy EAGA)

<sup>2</sup> Source: mysupermarket.eu

<sup>3</sup> (photo source [http://www.affinitycanada.com/blog\\_email.php?id=45](http://www.affinitycanada.com/blog_email.php?id=45))



## Grading Shed Waste

Further sorting and food waste occurs in the grading sheds. Trained workers are sorting through the produce to make sure only cosmetically perfect produce is sent to the exporter.

The NGO Feedback reports 22% rejects on grading shed level. Produce is often fed to live stock or used as compost. Some farmers reported to dump the produce as amounts of rejects were too high for the cattle to eat.

## Pack house rejects

In the exporter pack houses another step of sorting and grading takes place to make sure the produce complies with the buyer's standards. To estimate how much produce has to be ordered to comply with the standards (and to estimate how much produce will be wasted) some exporters use standard packability percentages (SPP). The NGO Feedback reports that one exporter they talked to had an SPP for baby carrots of 50%, meaning the exporter expects to waste 50% of the carrots delivered by farmers due to cosmetic standards.

There are two mayor causes for food waste in the export horticulture sector on exporter's level:

### 1) *Cosmetic specifications*

Strict cosmetic specifications concerning shape, size or color of fruit and vegetable (not related to safety or nutrition value of the product) defined by the buyer (e.g. European supermarkets) result in major amounts of produce being rejected

### 2) *Last minute forecast adjustments and cancellations*

Order cancellations or last minute adjustments from the top of the supply chain (retailers or traders/middle men) lead to farmers and/or exporters of fresh produce being left with large amounts of fresh products and no market for their product.

Often secondary markets (e.g. the domestic market) can't absorb the produce because of high quantities or local consumption patterns which often leads for the rejected produce being dumped or sent back to the farm.



Crates of produce ready for being brought back to the farm.

Processing also comprises industrial processing, e.g. producing juices and fruit pulps, canning or drying of fruit and vegetables. Limited capacities, technical limits and limits on processing and production processes as well as insufficient storage in the industrial processing plant result in food waste in industries.

## Distribution



In the export value chain distribution describes the transport to the target country and buyer. Due to wrong storage, delays in flight or shipping or wrong handling (e.g. containers is standing in the sun while loading) further food may perish and therefore be lost. Food waste mostly occurs if further rejects occur during the delivery controls in the target country.

## Retail and Consumers



The retail sector in the Kenyan domestic market is made up of a formal and informal market. The formal market is – comparable as in developed countries – comprised from supermarkets and retail shops of various sizes. Data suggest that 30 per cent of Kenyans do their shopping in formal retail outlets (Business Daily March 3, 2015) while 70% shop the ‘traditional way’, meaning convenience outlets - table tops, kiosks and market stalls. According to TwigaFoods, Nairobi alone has 18,000 small or medium sized vendors.

Retailers in the export value chain are multinational supermarket chains such as Walmart, Metro or Carrefour as well as local supermarkets. Consumers include households, restaurants, catering and food service companies and public institutions such as universities and hospitals.

Food waste in distribution might be related to limits within the distribution system, errors in order forecasting and management of reserves, deterioration of products or packaging as well as marketing and sales strategies. Food waste on consumer level may relate to excess purchases, planning mistakes and excess portions prepared.

## 5. Tackling the Challenges

### Certificates and Labels

**Pesticide Use:** Agriculture associations such as FPEAK warn that pesticide use in Kenya is high. The Daily Nation, one of Kenya’s major newspapers announced in January 2016 “Tests on samples of foods in markets and supermarkets have shown dangerous levels of toxins like calcium carbide, hydrogen peroxide, polychlorinated biphenyl-laden transformer oil, formalin and lead”. An interview with a representative of FPEAK revealed wrong use of fertilizers or use of forbidden fertilizers as a



major cause for contamination of fruit and vegetable grown in Kenya. While the export market is stronger controlled and GlobalGAP or EuropeanGAP certified, especially fruit and vegetable grown for the domestic market are affected.

Therefore, FPEAK tries to introduce KenyaGAP and target horticulture farmers in Kenya aiming for safe food, conservation of the environment and health and safety of farm workers.

**Organic:** According to available data the number of certified organic farmers in Kenya has doubled to 70,000 in three years<sup>4</sup>. It is estimated that a maximum of 4% of fruit and vegetable exports carry an organic label. Various smallholder farmers who are producing organic, don't have the capacity or funds to get labelled.

### Local Consumption Patterns

Many varieties grown in Kenya are solely produced for the export market. Vegetables such as green beans, sugar snaps, snow peas or broccoli are often considered "mzungu food" (white food) and not sought after in local markets. To use local markets as backup markets for rejected produce tastes and products have to be marketed and developed.

## 6. Way Forward

Value addition industries such as industrial processing reduce food waste, give food a longer shelf life, target new markets and create jobs. Value addition can be targeted for the local or export market. Examples are drying of fruit and vegetable (dried mango), frying (banana chips), fruit pulp and juices, matoke flower or canning.

Another option is to find secondary markets for the rejected produce. Match making tools such as apps pairing food waste and market may need to be adapted or developed.

Although waste to energy is one of the last steps of the food waste pyramid, Vegpro, one of Kenya's biggest growers found a solution to its food loss and waste through biogas:

A site visit at Tropical Power with its Gorge Farm anaerobic digester plant in Kenya, which happens to be Africa's first grid-connected biogas plant, offered insight in their model:

Every year, the facility will be processing about 50,000 tonnes of organic crop waste sourced from VegPro Group's neighbouring farm as well as 8 to 10 tons of food rejects and waste from its Nairobi pack house to generate 2MW energy.

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<sup>4</sup> <http://www.howwemadeitinafrica.com/how-this-kenyan-startup-is-tapping-into-the-organic-farming-market/>



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