

PHD AND MSC STUDENTS UNDER DIFFERENT PROJECTS IN THE DEPARTMENT OF FOOD SCIENCE, NUTRITION AND TECHNOLOGY

The Department of Food science, Nutrition and Technology continues to train high quality graduate and post-graduate students each year while fulfilling one of its core mandates in the world. Towards this end, the department has continued to competitively attract research grants both locally and internationally where most of the post-graduate students get their sponsorship to further their studies. Some of the projects with specific students are summarized herein.

i) Project proposal abstracts for students - RELOAD project: Meat value chain

Assessment of Hygiene, Quality and Post-Harvest Losses in Small and Medium Enterprises Handling Meat in Kenya



Student: - Sharon Chepkemai
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Department of Food Science, Nutrition and Technology
Funding Agency: RELOAD Project

Supervisors: - Lamuka P. O; Abong' G. O and Kunyanga C.

The high perishability and post-harvest losses (up to 50%) of fresh meat handled by small and medium enterprises butcheries in Kenya, results in reduced profitability and contributes to the operators' food insecurity. The high perishability and post-harvest losses are due to unhygienic handling, inadequate supply of potable water, lack of cold storage and transportation facilities and lack and/or high cost of grid electricity. The meat is transported, stored and handled at high ambient temperatures, low relative humidity and under unhygienic conditions. This accelerates meat deterioration and water loss. SMEs butchery operators also lack adequate knowledge, technical skills and awareness on standard operating procedures and Good Hygienic Practices (GHP) in meat handling. The objective of this study is to evaluate the current hygienic meat handling practices of SMEs butcheries, identify main points of post-harvest losses and recommend interventions strategies for improved hygienic meat handling and reduced post-harvest losses in SME butcheries in Kenya.

Quantification of Quality and Safety Post-Harvest Losses in the Camel Milk Value Chain in Isiolo, Kenya



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Camel milk production is faced with high post-harvest losses due to physicochemical, biochemical and microbiological changes which lead to quality deterioration and milk spoilage. However the magnitude of these quality and quantity losses at different stages along the camel milk value chain and contribution of the different quality parameters have not been quantified. The objective of this study is therefore to determine the risk factors that lead to the camel milk losses and quantify these losses at different stages along the camel milk value chain. This will be achieved through field survey and analytical study. The field survey will involve observation, questionnaire administration and focused group discussion with the various stakeholders involved in camel milk production and marketing. The analytical study will involve determination of physicochemical, biochemical and microbiological characteristics that affect the quality and safety of the camel milk at various stages of the value chain. The quantification of these losses will determine the stage of the value chain where the losses are predominant and where mitigation will be most appropriate for viable commercialization of camel production.

Assessment of Hygiene practices and Beef Carcass Quality of Small and Medium Enterprise Slaughterhouses in Kenya



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Funding Agency: RELOAD Project

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Beef production highly contributes to food security, income and employment generation and improved livelihood for most communities in Kenya. It is a primary source of livelihoods for pastoralists and agro-pastoralists in arid and semi-arid lands (ASALs). The beef industry has been ranked as one of Kenya's fast rising economic sector through provision of meat for export and domestic markets. However, majority of the small and medium enterprises (SMEs) slaughterhouses serving the domestic meat market experience high post-harvest losses. They operate under inadequate pre-slaughter good practices and poor hygiene and environmental conditions at slaughterhouses which lead to reduced carcasses quality and spoilage of carcasses after slaughter. The objective of this study is to assess and improve hygiene practices and beef carcasses quality in these SME slaughterhouses to reduce post-harvest losses. Curbing post-harvest losses arising from meat spoilage will improve income from domestic and potential export markets thus increasing the contribution of the livestock sector to rural households' livelihoods and the country's Gross Domestic Product.

ii) Project proposal abstracts for students - EAAPP cassava post-harvest value addition project

Development of a Solar Assisted Cold Storage Facility for Storage of Fresh Cassava



Student: - Zipporah C. Keter
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Funding Agency: Eastern Africa Agricultural Productivity programme (EAAPP)

Supervisors: - Mbuge, D; Lamuka, P.O; Okoth, M. W and Shibairo, S.

Despite high production of cassava in the coastal and western regions of Kenya, its development as a commercial crop to farmers and processors is limited by its' roots post-harvest deterioration. This renders the roots unmarketable within 24-72hrs after harvest. Although chilled storage has been reported to prolong the post-harvest shelf-life of fresh agricultural produce; the inadequate grid energy supply and availability in the rural areas of Kenya has serious implication on its use. However, the abundant solar energy as an option to grid energy in the coastal and western regions has not been exploited in the development of commercial cassava sector. The objective of this study is to determine optimum storage conditions (temperature and relative humidity) for different cassava cultivars and develop a solar powered chilled storage system for fresh cassava tubers. This system will increase the tubers' post-harvest shelf life and enable bulking of cassava roots, thus facilitating commercial value addition and reduced post-harvest losses.

Development of Process Technology for Production of Cassava Roots and Leaves Flakes



Student: Christine K. Katama
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Department of Food Science, Nutrition and Technology
Funding Agency: Eastern Africa Agricultural Productivity programme (EAAPP)

Supervisors: Okoth M.W; Abong G.O and Shibairo S

Cassava is an important food crop in sub-Saharan Africa and it provided most of households' daily energy requirements. However, the potential for cassava crop to economically improve nutrition and economic status of rural households is not fully realized. Cassava roots are low in nutritional value (1.4% proteins, and 0.6% ash) as compared to staples like maize, sorghum and millet. Therefore, households that continuously consume cassava roots as staple food are exposed to nutrient malnourishment especially protein and mineral deficient. Cassava leaves although contain high protein (29.3%), mineral (6.4%) and dietary fiber (26.9%) content are rarely utilized households' diets, The fortification of cassava roots with cassava leaves can ensure household food and nutrient security. However, it is only the roots that processed into products like chips, flour crisps and baked products.

Cassava processing is also still done at traditional level and lacks appropriate technology for small scale processing of high end markets. This project therefore undertakes to determine the nutrients content of root and leaf of popular cassava cultivars grown in the coastal region of Kenya and develop a small scale processing technology for production of cassava root and leaf flakes.

Anti-Nutrient Content of Different Cassava Cultivars' Leaves at Different Maturity Stages and Its Utilization as a Vegetable in Coastal Region, Kenya



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Funding Agency: Eastern Africa Agricultural Productivity programme (EAAPP)

Supervisors: - Lamuka, P.O; Abong', G.O and Wanjekeche E.

There has been wide promotion of cassava production and utilization in Kenya for improved food security. Cassava roots are widely used as a basic diet by majority households. In Kenya some communities utilized cassava leaves as vegetables. The use of cassava leaves has a positive nutritional balance because of their rich contents of amino acids, vitamin and minerals. However, the presence of anti-nutrients is a hindrance to the harnessing of full nutritional benefits of the leaves. In Kenya, different cultivars of cassava have been bred for high yields, drought and disease resistance. However, limited information exists on the utilization of the leaves and the level of the nutrients and anti-nutrients in different cassava cultivars' leaves. This study will establish the utilization of cassava leaves as vegetables among the Coastal people; determine the level of anti-nutrient in different cassava cultivars' leaves and effect of maturity stage and processing on anti-nutrient and nutrient levels. This will establish the cultivar and maturity stage with lowest anti-nutrient content and best processing method for reduction of anti-nutrients hence improve the utilization of the nutrients in cassava leaves.

Impact of an improved Solar Drier on Quality and Safety of dried Cassava



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Degree: - MSc Food Safety and Quality
Department of Food Science, Nutrition and Technology
Funding Agency: Eastern Africa Agricultural Productivity programme (EAAPP)
Supervisors: - Abong' O G; Lamuka P.O and Okoth M.W

Cassava (*Manihot esculenta* Crantz) is an important food crop that contributes to increasing food security, incomes and generating employment opportunities in the rural areas. After harvesting, cassava roots are rendered unmarketable within 24-72hrs due post-harvest deterioration. Traditional rural processing of cassava chips is usually done under unhygienic conditions. The roots are not washed prior to grating/chipping. The chips are sun dried on virtually any available surface in the open air such as flat rocks in the field, on the shoulders of paved roads, on flat rooftops, in a flat basket, or more commonly on bare ground. Drying may take from one day to three weeks. Sun drying is slow and often encourages the growth

of mould and other microorganisms. There is a lot of hand handling of the chips during the entire process. Therefore the chips and flour from milled chips is usually of poor quality and safety and can cause adverse health effects to consumers. This study will determine cyanide and aflatoxin levels and microbial contamination of cassava chips and flour in market within Coastal and Nairobi regions and design a solar dryer that will produce quality and safe chips for flour making.

The Role of Cassava in Nutritional Status of Households in Coastal Kenya



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Protein energy malnutrition due to inadequate intake of dietary proteins has been a concern in the international nutrition community for almost half a century. In Kenya for example, 16% of children below 5 years are underweight and 35% are stunted. While the causes of these anthropometric abnormalities are multi-factoral, some of these children subsist on diets with inadequate protein content. Although many staple crops have a low protein content, cassava has been shown to have the lowest protein-energy ratio (approximately 2%) compared to other staple crops. Though the leaves have a higher proportion of proteins than the roots, they remain greatly underutilized compared to the roots, especially as food for children. Majority of the households relying on cassava as a staple crop also double up as low income households hence making the problem of child malnutrition worse since adequate dietary diversification for the young children is usually difficult to achieve. The objective of this study is to establish the level of cassava consumption and especially protein energy intake of children below 5 years in cassava consuming households in the coastal region of Kenya.

Analysis of Cassava supply Chains and the Potential for Commercialization in Kenya: A Case of Coast and Western Regions



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Food security and poverty mitigation are some of the most important factors that Kenya government must deal with to achieve the vision 2030. One of the strategies towards achieving this has been promotion of cassava production through use of high yielding and drought and disease resistant cassava cultivars by the Ministry of Agriculture, Kenya Agricultural Research Institute and other agencies. These have promoted the production of cassava in many parts of Kenya, where cassava is largely grown by small scale farmers for domestic use and to a limited extend for

sale. Handling of cassava production as an income generating activity and as an attractive next available option for livestock feed, especially during periods of high prices for other feeds' raw materials has not been fully exploited. Recent studies have dwelt on marketing opportunities of cassava with little mention of supply chain issues. Though the marketing arrangements are informal, the specific players in the supply chain, quantities produced and handled and the cost of value addition at each stage of supply chain have not been established. This study seeks to analyze the cassava supply chains and the potential for commercialization in Kenya, with coast and Western regions and Nairobi terminal market as a case study.