

Food Storage practices for Nutrition and Healthy Food

Dr. Seema Sonkar

(Assistant Professor)

Department of Food Science & Nutrition

College of community Science

Chandra Shekhar Azad University of Agriculture and Technology

Kanpur, INDIA

Introduction

- Food and nutrition security is defined as follows “when all people at all times have **physical, social and economic** access to food, which is consumed in **sufficient quantity and quality** to meet their dietary needs and food preferences, and is supported by an environment of adequate sanitation, health services and care, allowing for a healthy and active life. Dietary diversity or the ability to access a wide variety of different foods is central to this concept.

General categories (old and new labels are the same)	Detailed categories		
	Old label	New label	Description of conditions in the household
Food security	Food security	High food security	No reported indications of food-access problems or limitations
		Marginal food security	One or two reported indications—typically of anxiety over food sufficiency or shortage of food in the house. Little or no indication of changes in diets or food intake
Food insecurity	Food insecurity without hunger	Low food security	Reports of reduced quality, variety, or desirability of diet. Little or no indication of reduced food intake
	Food insecurity with hunger	Very low food security	Reports of multiple indications of disrupted eating patterns and reduced food intake

Food Security

Food Security exists when all people at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life.

Physical availability

Economic and Physical access to food

Food Utilization

Stability of the other three dimensions

Why Food Security?

1-Hunger

- Asia is the continent with the most hungry people - two thirds of the total. The percentage in southern Asia has fallen in recent years but in western Asia it has increased slightly.
- 66 million primary school-age children attend classes hungry across the developing world, with 23 million in Africa alone.

2- Malnutrition: a- UNDER NUTRITION b- OVERNUTRITION

Undernutrition

The result of prolonged **low levels of food intake** and/or low absorption of food consumed. Generally applied to energy (or protein and energy) deficiency, but it may also relate to vitamin and mineral deficiencies.

Undernourishment or Chronic Hunger

The status of persons, whose food intake regularly provides less than their minimum energy requirements.

The average minimum energy requirement per person is **about 1800 kcal** per day. The exact requirement is determined by a person's age, body size, activity level and physiological conditions such as illness, infection, pregnancy and lactation.

Malnutrition

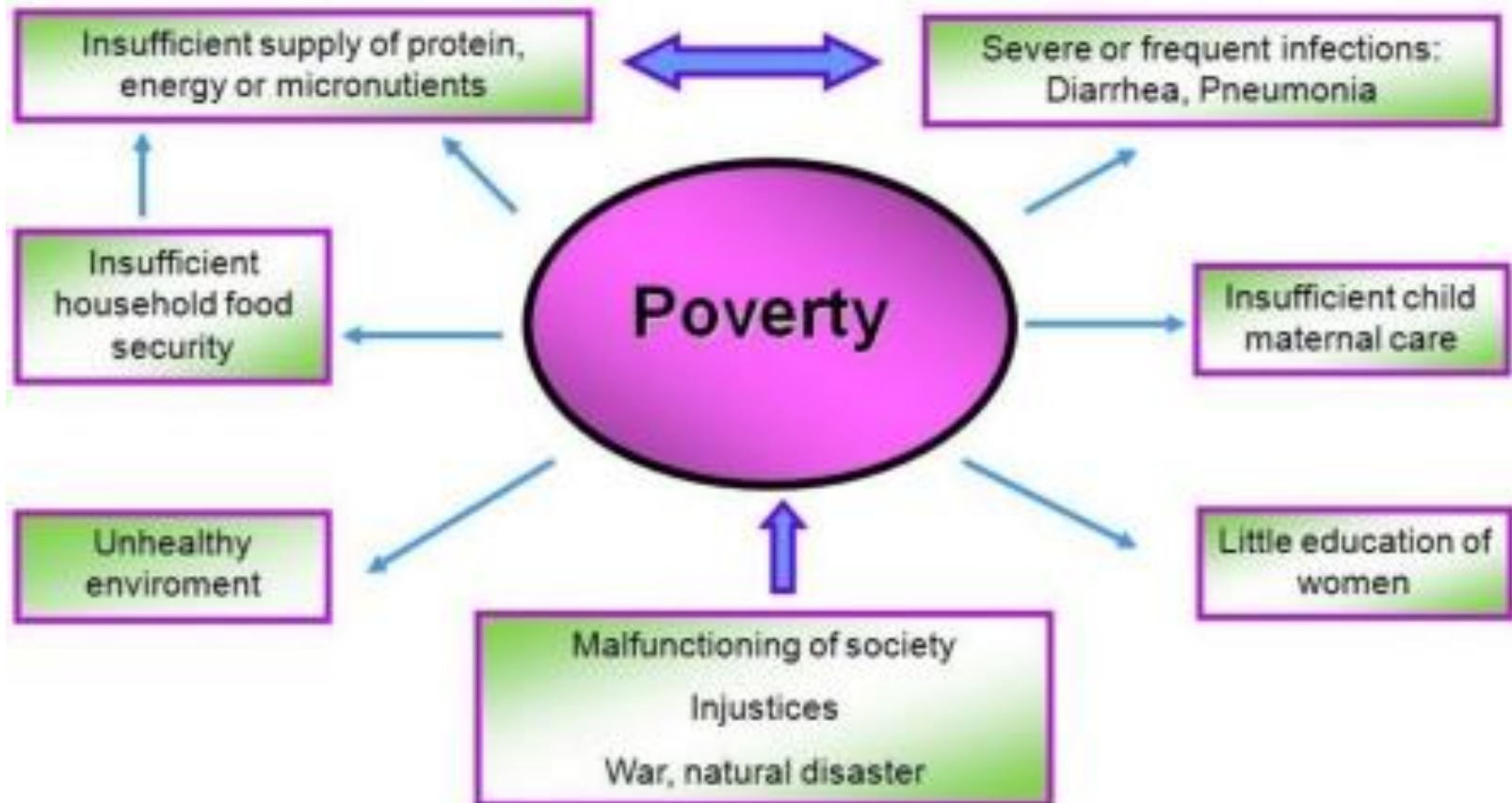
A **broad term for a range** of conditions that **hinder good health**, caused by inadequate or unbalanced food intake or from poor absorption of food consumed. It refers to **both undernutrition** (food deprivation) and **overnutrition** (excessive food intake in relation to energy requirements).

Under nutrition



Secondary Malnutrition





Micronutrient Malnutrition



Rickets (Vitamin D deficiency)

- Deficiency in:
 - Vitamin A
 - Iodine
 - Iron
 - Zinc
 - Calcium
 - Vitamin D
 - B Vitamins
 - Vitamin C

Iodine Deficiency



Picture removed due to copyright

Goiter (thyroid enlargement)

- Iodine deficiency
 - affects 740 million people worldwide
 - single greatest cause of preventable **brain damage** in babies
 - Goiter
 - Stillbirth
 - Miscarriages
 - Mental Retardation
- Prevented by iodized salt
- Best sources of natural iodine
 - **Sea weed**
 - **Sea food**

Over nutrition



- **Consumption of too many calories**
 - Obesity
- **Medical problems**
 - Heart disease
 - Diabetes
 - Cancer
- **Global problem**
 - Overnutrition has surpassed undernutrition
 - Worst in middle and high income countries
 - Rising in low income countries
 - Can co-exist with undernutrition
 - Same country
 - Same household
 - Projected to get worse as incomes rise
- **Industrial food**
 - High in calories

HEALTHY BALANCED DIET

Fruit & Vegetables

They contain vitamins and minerals, and plant chemicals called phytochemicals.



Breads, Rice & Potatoes

They are rich in vitamins and minerals, and the wholegrain varieties contain plenty of fibre.



Meat, Fish, Eggs & Beans

They provide nutrients that are vital for health and maintenance of your body.



Foods & Drinks

Such as herbs, vitamins, minerals.



Milk & Dairy Foods

They can keep bones strong and prevent high blood pressure.



Factor affect food security:

- Drought
- Flood
- Poor transportation
- Low farmer income
- Plotting of fertile land for building

How drought affects food security?



Foods



Productive land



Production %

(Causes affected Crop production, Plotting of Fertile land, Natural causality, Drought Flood)



Availability of the Food



Availability of safe food

Safe food according to RDA
for population



Storage



OBJECTIVES

- To Assess the socio-economic status of respondent of Cold storage, Farm storage and Home storage.
- To Assess the Method and technology adapted by respondent of Cold storage, Farm storage and Home storage for storage of food items.
- To Assess the sensory quality of Apple and Carrot from Cold storage and wheat from Farm storage and Home storage and compare with fresh.
- To Assess the nutritional quality of Apple and Carrot from Cold storage and wheat from Farm storage and Home storage and compare with fresh.

Food Storage

- ❖ Storage is the art of keeping the quality of agricultural materials and preventing them from deterioration for specific period of time, beyond their normal shelf life.
- ❖ Proper food storage helps maintain food quality by retaining flavour, colour, texture and nutrients, while reducing the chance of contracting a food-borne illness.
- ❖ Food spoilage and deterioration is not an accident. It is a naturally occurring.

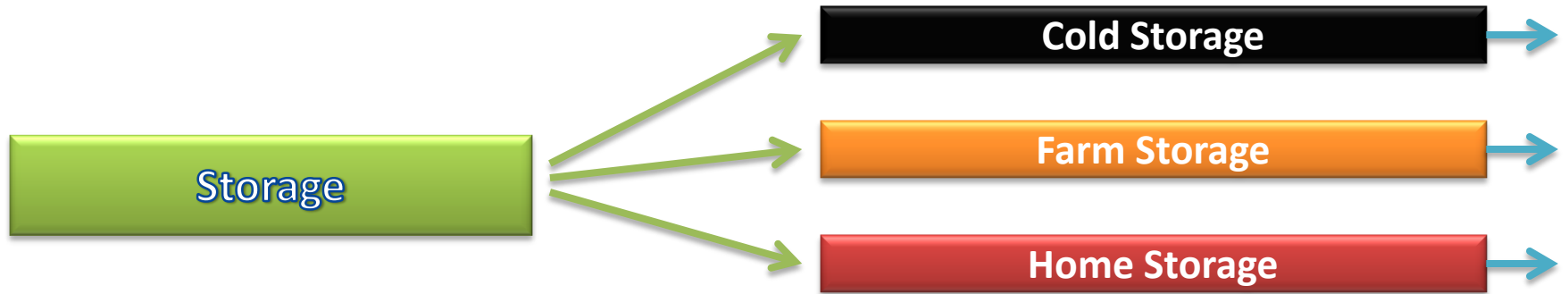
Affected Food Items by Insect Pest

INSECTS	FOOD ITEMS
Flour mite	Cereal, Cereal products, Dried fruits, tobacco
Pulses weevil	Many pulses including kidney bean
Pulse beetle	Many pulses except soybean and kidney bean
Rice moth	Rice, Maize, Soybean, Groundnut, Dried fruits, Flour
Rusty grain beetle	Maize, Wheat
Indian meal moth	Rice, Wheat, Maize, Sorghum
Red four beetle	All cereals, pulses, oilseeds, spices
Red weevil	All cereals, pulses, oilseeds, spices

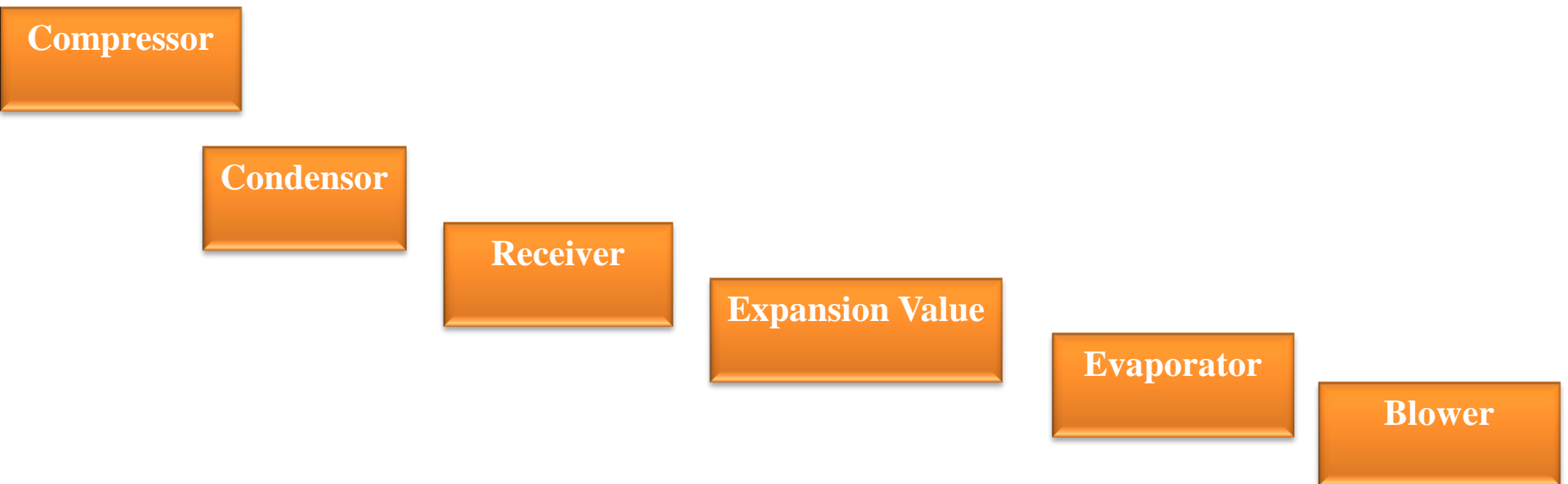
Causes of food spoilage

- Micro-organism
- Enzymes
- Air
- Light
- Insects
- Temperature

Types of Food Storage



Construction of cold storage plant



Cold Storage

- ❖ Multi commodity cold stores are provided with multiple chambers enabling them to store a wide range of fresh horticulture products with respect to their storage capability requirements for temperature, humidity and atmosphere. Temperature management is one of the most important tools for extending shelf life of fruits (Lee et al 2000).
- ❖ facilities for eligible commodities corn, grain, sorghum, oats wheat, barley, rice soybeans, peanuts, minor oil seed etc. many farmers sell off their grain immediately after harvest to avoid low price (Procter,1994). High wastage and value loss are due to lack of storage infrastructure at the farm level (Ramesh, 1990).

Recommendation temperature and relative humidity and approximate storage life of fruits

Fruits	Temperature (0C)	Relative Humidity (%)	Approx. Storage life
Apples	0-2	90-95	1-12 month
GRAPES	-1- 1	85-90	2-8 weeks
Mangoes	13	85-90	2-3 weeks
Oranges	0-4	85-90	3-4 week
Watermelons	10-15	90	2-3 weeks

Recommendation temperature and relative humidity and approximate storage life of Vegetables

Vegetables	Temperature (0C)	Relative Humidity (%)	Approx. 90-95Storage life
Roots & Tuber:			
Onions	0	65-75	1-8 month
Potatoes	1.5-4	90-95	5-10 month
Carrot	0	95-100	7-9 month
Other Vegetables			
Cabbage	0	98-100	5-6 month
Cauliflower	0	95-98	2-4 week
Egg plants	12	90-95	1 week

Farm Storage

- ❖ Farm storage facilities for eligible commodities corn, grain, sorghum, oats wheat, barley, rice soybeans, peanuts, minor oil seed etc. many farmers sell off their grain immediately after harvest to avoid low price (Procter,1994). High wastage and value loss are due to lack of storage infrastructure at the farm level (Ramesh, 1990).
- ❖ Quality losses affect the economic value of the food grains fetching low prices to farmers
- ❖ Natural contamination of food grains is greatly influenced by environmental factors such as type of storage structure, temperature, Ph, moisture etc.

Structures of Farm Storage

Earthen bin

Metallic bin

Bamboo/ Straw bin

Bags covered with
plastic sheet

Close room type
structure

Home Storage

- Home storage facilities for cereals, sugar, dry fruits, spices and herbs, condiments etc. at room temperature.
- Metals or plastics drums are often used as storage container in the house and serve for storage cereal and pulses.
- Household practices using locally available plant products are efficiently used for protection of food grains.
- Home storage have easily available and low cost

Household Food Insecurity

- A household had limited or uncertain availability of food, or limited or uncertain ability to acquire acceptable foods in socially acceptable ways (i.e., without resorting to emergency food supplies, scavenging, stealing, or other unusual coping strategies).

Food insecurity

“A situation that exists when people **lack secure access to sufficient amounts of safe and nutritious food for normal growth and development and an active and healthy life.”**

Chronic food insecurity

Transitory food insecurity

Seasonal food insecurity

Research Methodology

The present study was carried out in three districts of Uttar Pradesh (Kanpur, Varanasi, Chandauli and three district of Bihar)

- In this study the population refers to the people who belong to any type of storage:
 - (Sample size, Sample selection, Data collection, Tools of Data collection)
- Sensory Evaluation of fresh and stored food items:
 - The acceptability of apple & carrot from cold storage, wheat from farm storage and home storage were evaluated by 8 judges using a 9 hedonic scale.
 - (To test the liking or disliking of stored food items)
- Nutritional Analysis of fresh and stored food items:
 - The Nutritional analysis of fresh food items and food items from storage was done using the following parameters
 - (Moisture, Total Ash, Protein content)
- Statistical analysis
 - (Percentage, Arithmetic mean, Chi-squar test and Anova)

Result and Discussion

Table: Distribution of respondents of storage according to education

Education	Cold Storage		Farm storage		Home storage	
	f	%	f	%	f	%
Illiterate	-	-	1	2	1	2
5 th pass	-	-	2	4	3	6
8 th Pass	-	-	7	14	12	24
10 th pass	3	6	18	36	11	22
12 th pass	14	28	9	18	6	12
Graduate	33	66	13	26	17	34
Total	50	100	50	100	50	100
x ²	39.88***					

Table: Distribution of storage according to their Protection Measures

Protection Measures	Cold storage		Farm storage		Home storage	
	f	%	f	%	f	%
Insecticides	43	86.00	26	52.00	17	34.00
Herbal	-	-	11	22.00	12	24.00
Spices	-	-	4	8.00	5	10.00
Others	-	-	2	4.00	3	6.00
Nothing	7	14	7	14.00	13	26.00
Total	50	100	50	100	50	100
x ²	0.813 P>0.05					

Table: Distribution of storage according to their use of Packaging Materials

Storage	Packaging Material					
	Bags		Box		Container	
	f	%	f	%	f	%
Cold storage	27	54.00	23	46.00	-	-
Farm storage	29	58.00	-	-	21	42
Home storage	17	34.00	-	-	33	66
Total	73	146.00	23	46	54	108
x2	6.618*					

Table: Distribution of storage according to their knowledge of
Nutritional quality are affected after storage

Storage	After Storage the Nutritional Quality are affected			
	f	Store %	f	Fresh %
Cold storage	21	42.00	29	58.00
Farm storage	17	34.00	33	66.00
Home storage	19	38.00	31	62.00
Total	57	114.00	93	186.00
x ²	0.679*** P>0.05			

Table: Mean score of sensory evaluation of fresh Apple, Carrot, Wheat and stored

Food items	Farm storage		Cold storage		Home storage	
	Fresh	Store	Fresh	Store	Fresh	Store
Apple	-	-	8.2	7.2	-	-
Carrot	-	-			-	-
Wheat	7.9	6.9	-	-	8.1	6.9

Table: Mean of Nutritional Composition of fresh Apple, Carrot and Wheat

Food items	Farm storage			Cold storage			Home storage		
	Moisture	Ash	Protein	Moisture	Ash	Protein	Moisture	Ash	Protein
Apple	-	-	-	85.71	0.15	0.27	-	-	-
Carrot	-	-	-	88.30	0.95	0.96	-	-	-
Wheat	10.97	1.53	13.24	-	-	-	10.97	1.53	13.24

Table: Mean of Nutritional Composition of stored Apple, Carrot and Wheat

Food items	Farm storage			Cold storage			Home storage		
	Moisture	Ash	Protein	Moisture	Ash	Protein	Moisture	Ash	Protein
Apple	-	-	-	84.02	0.10	0.19	-	-	-
Carrot	-	-	-	87.02	0.74	0.79	-	-	-
Wheat	9.90	1.02	11.87	-	-	-	9.04	1.00	11.46

Conclusion

- The study indicates that during storage maximum respondents were use insecticides as fumigant to protect the food items.
- The construction conditions of cold storage were better than farm storage and home storage.
- Maximum respondents were did not know that after storage the nutritional and sensory quality are affected after storage.
- The nutritional evaluation indicates that the increasing storage duration decreases the moisture, ash, protein content of Apple, Carrot, and Wheat.

- Sensory quality test revealed that different attributes such as color, appearance, tastes and flavor declined with storage resulting decreased in overall acceptability score from 8.2—7.2 in apple from cold storage, 8.0- 7.0 in carrot from cold storage, 7.9-6.9 in wheat from farm storage and 8.1-6.9 in wheat from home storage. So it is important to give priority to fresh food items.
- During storage, chemical insecticides always used under safe limits or chemical insecticides are replace by natural insecticides such as neem leaves, dry chillies ect. Because chemical insecticides are hazardous for health and they decrease the quality of food items.

RECOMMENDATION-

- Training of cold, Farm, storage, owner should be given.
- Monitoring of cold and farm storage should be planned by govt. officials.
- Storage period should be checked from nutritional and economic point of view.

References

- Adejuno,B.A. and Raji.A.O. (2007). Technical Appraisal of grain Storage Systems in the Nigerian Sudan Savannah, AgriculturalEngineering *International the CIGR E Journal*. Overview No.11
- Brahmanand, P.S . KUMAR, S. Chowdhry,S. Roy,S. Singandhupe, Singh, R.B. Nanda, R. Chakarbarthy, P. Srivastava ,S. K and Behner, M.S. (2013).Challenges to Food Security in India. *Journal Article Current Science*, Vol-104, pp7-10.
- Dr. Marzella Wustefeld(2013). UNSCN. Meeting of the Minds Nutrition Impact of Food System. Food and Nutrition Security.
- Dean, W.R. Sharkey , J.R.Nalty, CC. XU , J.(2014). Goverment Capital Intimate and Community Social Capital and Food Security Status in Older Adults with Different income Levels. *Rural Sociology*. Vol-9 (4). Pp505-531.ISSN0036-)112.
- Lee, S.K and Kader, A.A(2000). Pre- Harvest and Post Harvest Factors Influencing Vitamin c Content of Horticulture Crops. *Postharvest Biology and Technology* . V-20. Pp207-220.

- Pal, Sweta. Karwariya, Priyanka. Shukla, Shaleen. Kunwar, Neelma. Vashishtha, Priya.(2008).Multimedia based Package on Food Security to Create Knowledge and Awareness of Farm Women . *Progressive Agriculture*. Vol-8(1).pp95-96.ISSN:0972-6152.
- Proctor, B.L.(1994). Grain Storage Techniques Evolution and Trends in Developing Countries , *FAO Agricultural Services Bull.109.FAO, Rome. Italy*. Pp154.
- Republic of Kenya (2013)National Food and Nutrition Security Policy.
- Ramesh, A. (1999). Priorties and Contraints of Post Harvest Technology in Asia. *Japan International Research Centre for Agricultural Sciences, Tokyo*, pp.37.
- Waggoner, Sara. Katherine, Waggoner.(2004). Food Safety Knowledge and Practices of Food Recovery Agency Worker before and after Food Safety Training. LSU. *Master'Thesis* 3702

THANK YOU.

