LOSS ASSESSMENT IN THE PRODUCTION, PROCESSING AND STORAGE OF TOMATOES AND ONIONS IN KANO STATE

BY

NNAKENYI CHUKWUMA INNOCENT
2003/14838EA

BEING A FINAL YEAR PROJECT
SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF BACHELOR OF ENGINEERING (B.ENG.) DEGREE IN AGRICULTURAL AND BIORESOURCES ENGINEERING.
FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA.

NOVEMBER, 2008.

DECLARATION

I hereby declare that this project is a record of a research work that was undertaken and written by me. It has not been presented before for any degree or diploma or certificate at any University or Institution. Information derived from personal communications, published and unpublished works of others were duly referenced in the text.

.....
Nnakenyi C. Innocent
(2003/14838EA)

18/11/08
.....
Date

CERTIFICATION

This project entitled "Loss Assessment in the Production, Processing and Storage of Tomatoes and Onions in Kano State" by Nnakenyi C. Innocent, meets the regulations governing the award of the degree of Bachelor of Engineering (B.Eng.) of the Federal University of Technology, Minna, and it is approved for its contribution to scientific knowledge and literary presentation.

.....
Engr P. A. Idah
Supervisor

18/11/08
Date

.....
Engr Dr. (Mrs.) Zinash D. Osunde
Head of Department

24/11/2025
Date

.....
External Examiner

18/11
Date

DEDICATION

This research work is dedicated to Almighty God, the author and finisher of our faith, who has been my strength throughout my studies in this great institution to acquire a Bachelor Degree in Agricultural and Bioresources Engineering.

To my parents, Mr. and Mrs. Christopher N. Nnakenyi and my uncle Mr. David Nnakenyi for the great financial support. To my grand parents, uncles, aunts, cousins, brothers and sister for their prayers, words of encouragement and advice which motivate me in actualizing my aim of being a graduate.

ACKNOWLEDGEMENT

I acknowledge the Almighty God for his faithfulness towards my life and for giving me the strength, wisdom and understanding to embark on this project work.

I also acknowledge my supervisor, Engr. P. A. Idah for his understanding, Patience and guidance throughout the period of this research work. Also to all my lecturers that have impacted knowledge and moral values in me throughout my academic pursuits in this great institution.

I must sincerely thank my Head of Department (HOD), Dr (Mrs.) Zinash D. Osunde encouragement and new innovations in the department. I also thank the families of Dr N. A. Oyedum, Engr Emeka Ozoadibe, Elder Boniface Okoli and Late Clifford Umeh for their support materially and financially to the achievement of my academic pursuits.

To my brothers and Sister: Godson, Solomon, Samson, Miracle, John. My Cousins: Amara and Ifunanya.

I wish to acknowledge all my course mates for their support and help throughout my studies; I wish them success in their entire endeavour. My friends: Clara, Ada, Collins, Onyinye, Uchechi, Bright, Victoria, Daniel, Nkasi, Ijeoma, Peace, Ifeanyi, Sunday and Daniel. May God bless them.

TABLE OF CONTENT

ABSTRACT

Since the losses encountered in the production, processing and storage of tomatoes and onion in Kano state are much, farmers in the srare need to be notify on how to manage this losses. This research work is a step to minimizing losses.

This research work was carried out in Kano state on order to quantify the losses in the production, processing and storage of tomatoes and onions. This research was carried out using a questionnaire in four main local governments where tomatoes and onion are produced, processed and stored in Kano state.

The records for the production, processing and storage of tomatoes and onions in the four main local government areas were collected and used to quantity their losses. The losses recorded were as follows; the losses in onions showed that Bichi local government loss 62.73%, Dala local government loss 61.07%, Gwarzo local government loss 87.73% and lastly Kura local government loss 88.47% while tomatoes showed that Bichi local government loss 95.14%, Dala local government loss 40.74%, Gwarzo local government loss 83.18% and lastly Kura local government loss 80.94%. The results were further discussed and recommendation were made on how to minimize losses.

This research work will go a long way to help farmer minimize losses in production, processing and storage of tomatoes and onions in Kano state.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background of the Study

Vegetable crops such as tomatoes and onions are perishable food items which deteriorate few days after harvest. This is mainly due to their high moisture contents and physiological activities. Vegetable crops production and its attended security is an important aspect of a nation's economic stability (Abdullahi et al, 2007). Efforts are being put in to reduce losses during production, processing and storage of these crops in addition to retaining their quality parameters. It requires access to fertile land, water and in some cases fertilizers, pesticides and herbicides, particularly in poor and developing countries of the world, and because of its importance in measure of any growing economy, it requires all the inputs it deserve. Therefore, vegetable crops need special attention in this regards there is more to do because great percentage of harvested fresh great percentage of harvested produce usually go into waste annually (Olorunda, 1979). It is estimated that about 20% - 50% of the harvested produce are lost. Tomato is commercially important throughout the world both for the fresh fruit market and the processed food industries.

These vegetables (tomatoes and onions) are of great nutritional value. They are important sources of vitamins and minerals, thus, essential components of human diet. Consequent upon this, there had been increased trade/commerce activities surrounding these commodities (Egharevba, 1995).

1.2 Statement of the Problem

Vegetable crops such as tomatoes and onions are important world wide. There seems to be no limit to their use by any nationality.

Vegetable production forms a substantial percentage (about 25%) of the major food crops cultivated in the tropics and so it the source of livelihood for a considerable section of the population (Kra and Bani, 1988).

Vegetable crops (tomatoes and onions) play an important role in contributing to the metabolic needs of the body and should therefore be recognized as important in feeding the nation. These crops (tomatoes and onions) undergoes tremendous chemical changes once planted, and separated from the parent plant until finally spoilage set in as a result of attack from bacteria and fungi. The problem in the production, processing and storage of vegetable crops such as tomatoes and onions arise from the texture, colour, flavour and respiratory activities, which affect the commercial value of them. For example during production, processing and storage tomato and onion become sweeter due to either the acidic contents or the hydrolysis of starch to sugar. Therefore, modification of temperature can be used to increase production and storage of vegetable crops.

Another problem encountered during production processing and storage of vegetable crops (tomatoes and onions) may arise from mechanical damage, physical injury, insect attack and microbial deterioration.

Also losses occur during transportation, due to heavy stacking of vegetable crops (tomato and onion) packed in bags or baskets inside a vehicle due to vibration, the outcome of these improper packing is that the produce on top exerts pressure on the one's under and the pressure generated creates room

for damage while the temperature generated within the heap creates conducive condition for rotting of the brushed ones with subsequent changes in texture, and flavour.

The major set-back in the preservation of vegetable crops (tomatoes and onions) arises from rapid post harvest deterioration which leads to spoilage. Vegetable crops such as tomatoes and onions ripe very quickly and must be sold out-rightly otherwise heavy losses are bound to be encountered or sustained during storage.

The way and manner these losses occur during production, processing and storage needs to be ascertained. It is difficult to come across these figures in these produce thus making it difficult to plan for post-harvest reduction in I

1.3 Objective

The main objective of this project work is to quantify the losses during production, processing and storage of tomatoes and onions in Kano State, with a few to provide basic data that can be used to avoid these losses though appropriate handling.

1.4 Justification

Tomato and onion have become one of the most widely grown and commercially important vegetable crops both for the fresh fruit market and the processed food industries. It is grown in a wide range of climates in the field, sometimes under protection in plastic green houses or in heated glass houses. Hitherto, much of the information on tomatoes and onions are fragmented and there is need for a research to be conducted in order to ascertain the quantity lost during production, processing and storage. This finding from research often

failed to reach those involved directly or indirectly in commercial vegetable crops productions, processing and storage.

Vegetable crops like tomato and onion which are both produced in large quantities deteriorate quickly if not properly stored. They serve as a rich source of vitamin (vitamin A and C), calcium, iron and traces of fat. They also provide most of the indigestible fibre (roughage) in our meals and thus, assist the evacuation of waste from the colour of the body thereby preventing constipation.

The work is to give a thorough review of the loss assessment of these vegetable crops (tomatoes and onions) in production, processing and storage.

1.5 Scope of the Study

This study is limited to the assessment of losses in the production, processing and storage of tomatoes and onions.

CHAPTER TWO

2.0 LITERATURE REVIEW

Vegetable crops such as tomatoes and onions are perishable commodities and important ingredients in the human dietaries. Due to their high nutritive value, they make significant nutritional contribution to human well-being (Abdullahi, et al, 2007). They are cheaper and better source of the protective foods. If they can be supplied in fresh or preserved from throughout the year for human consumption, the nutritional picture will improve greatly. Fruit quality has also been a very important consideration in processing tomato and onion. Proper storage is critical in maintaining high quality tomatoes and onions. Tomatoes and onions should be stored in a cool, dry, well ventilated building. When tomatoes are harvested at the green ripe stage having reached final fruit size i.e. when they are smooth-shrined beginning to turn a lighter colour at the opposite and to the calyx and redial they can be stored for 20days at 13°C, turning they slowly pink during this phase

By value, onions rank in the top 10 vegetables produced in the United States. They are believed to be indigenous to Asia and have been cultivated in this country since 1629. Flexibility of the onion in the American diet is the main reason it is used so extensively in the United States. In recent years, the United States has exported about 3 percent of its total annual `dry bulb' onion production. This publication provides agronomic characteristics, production information, potential market contacts and an example economic and cash flow budget for dry land onion production in North Dakota (Randy, 2007).

Kano state in Nigeria is the center of a prosperous, densely populated agricultural region in which vegetables, millet, sorghum, peanuts, and beans are produced. It is an important market center for peanuts, livestock, grains, and other foodstuffs from the surrounding area. Agriculture is the largest sector in Kano state in term of provision of employment and income to its populace. Over 70% of the working populations are directly or indirectly engaged in agricultural activities which include clearing of Lands, Wet season farming, irrigation Farming, storage and distribution of farm produce and annual husbandry. The state has the following as the main crops being produced: groundnut, Guinea corn, Maze, Sugarcane, Gum Arabic, Rice, honey, ginger, pepper, coloring leaves, sugarcane herbs and different kinds of vegetables. The Livestock comprise Cattle, Sheep, Goats, and Donkeys Camels and Horses are reared in the state. About 90% of the Land in Kano state is arable. There are very few areas covered with rocks, thick forests or water that can not be used for faming (Sani et al, 2007).

2.1 Belief History of Tomatoes and Onions

Tomatoes and onions grow well in moist but not soggy soil, and well-timed furrow or drip irrigation is effective. Wilting in the late morning indicates that the crop should be irrigated.

Processing tomatoes are attacked by a number of important arthropods, plant diseases and nematodes which significantly reduce fruit yield and quality. Weeds compete with tomato plants, further reducing attainable yield. Worldwide, losses due to these pests are estimated to be about 34.4% of attainable tomato

yield under current production practices. Without crop protection, losses would increase to 77.7% of attainable yield.

2.2 Study on Vegetables (Tomatoes and Onions)

According to Idah et al, 2007, fruits and vegetables are of great nutritional value. They are important sources of vitamins and minerals, thus, essential components of human diet. Consequent upon this, there had been increased trade/commerce activities surrounding these commodities (Egharevba 1995). Vegetable production forms a substantial percentage (about 25%) of the major food crops cultivated in the tropics and so it is the source of livelihood for a considerable section of the population (Kra and Bani 1988). In spite of their importance in the diet, per capita consumption of vegetables and fruits in the developing world is only 100 g compared with 220 g in the more advanced countries (Messian 1992). In the quart to fight hunger and malnutrition, significant increase in food production have been achieved through the use of improved seeds, fertilizers, production practices etc. In Nigeria, enormous quantities of fruits and vegetables are produced and staggering figures are sometimes given as estimated annual production. For example, figures like 3.8 million tonnes of onions, 6 million tonnes of tomatoes, 15 million tonnes of plantain and 35 million tonnes of citrus have been quoted as annual production figures for some fruits and vegetables, which are really large quantities of food crops (Oyeniran, 1988; Erinle 1989). However, it is the amount of the produce available to the consumer rather than the level of production that is more important. Fruits and vegetables in their fresh forms contain high percentage of water. They are living and hence carry out their physiological function of respiration thereby absorbing and releasing gases and other materials from and to their environment. These

activities lead to their deterioration in transit and storage, which is more rapid under conditions of high temperature and humidity. As a result, heavy losses are encountered in these crops.

No one knows exactly how much food is lost between harvest and consumption. The supplied figure for post-harvest loss estimates for fruits and vegetables are difficult to substantiate except on limited, controlled experimental basis. Nonetheless, it is noted that losses as high as 50% are common in fruits and vegetables between rural production and town consumption in the tropics (Oyeniran, 1988).

These losses noted, occurred during transportation, storage and marketing (Daramola 1998; Okhuoya 1995). Several factors are responsible for these damages and losses in the fresh produce. One of these factors is vibration resulting from the transport vehicles as they traverse undulation and irregularities on the roads (Jones et al., 1991). Another factor is attributed to the use of unsuitable packaging containers. To curtail or minimize these damages require detail studies to identify the specific parameters involved. Until the locations of handling losses in the system are identified, opportunities to reduce them would be limited. In this study, a survey was conducted to identify and assess the various vehicles and devices currently being used to distribute fresh fruits and vegetables in Nigeria. This is with the view to observing the existing mode of handling, transportation and identifying the stages where losses occur along the path from the producers to consumers.

2.3 Tomato processing

Processing tomatoes are grown or large acreages with highly mechanized production systems. Direct field seeding and harvest mechanized, which require high plant population to achieve the concentrated fruit set needed for mechanical harvest, have fastened the development of compact, highly determinate processing cultivars to fit the systems of culture and harvest used. These features must be combined with other essential horticultural characteristics-disease resistance, firm fruit, earliness, ability to set fruit at adverse temperature, resistance to rain induced cracking of fruit, tolerance to major ripe fruit rots, ease of fruit separation, and adequate vine cover-which are needed for adaptation to the environment in which the cultivar will be grown.

Fruit quality has also been a very important consideration in processing tomato breeding program. Several individual parameters of quality-colour, pH, total acidity, soluble solids, total solids and viscosity are recognized and their relative important depends upon the processed product for which the cultivar is to be used. Improved fruit quality has been a major objective of breeding programs supported by the food processing industries since it influences both quality and case yield (no of case of processed product per unit of raw fruit) of the finished product.

Case yield, in turn depends upon specific quality attributes that influence the amount of fruit required to produce a unit of processed product. Tomato paste standards, for example, are based upon final soluble–solid content of the finished product. As a consequence, high–soluble–solids cultivars yield more cases per ton and require less energy in concentration than do low – solids cultivars. For a product such as catsup, in contrast, viscosity (or consistency)

may be the primary quality attribute influencing the number of cases of finished product produced per ton of the fruit. In the highly competitive food industry, varietals or location differences in case yield may be the difference between success and failure in producing a particular processed product.

2.4 Processing and Storage Quality

Fruit characters that contribute to processing quality and case yield (case of final product per ton of fruit) have been well studied and defined. Five distinct parameters are commonly used to evaluate processing quality. The purpose of each is to quantify raw fruit quality to meet standards established for specific processed products. Careful fruit sampling is important in obtaining reliable measures of fruit quality. Under mature and/or over ripe fruit may give erroneous values for certain quality parameters since fruit is continuously changing during ripening and senescence. A moderate-sized sample (5.7lb) of uniform fruit is desirable to minimize variation in estimating quality. This is the crop which there is the greatest correlation between fruit maturity and storage temperature. When tomatoes are harvested at the green ripe stage having reached final fruit size i.e. when they are smooth-shrined beginning to turn a lighter colour at the opposite and to the calyx and redical they can be stored for 20days at 13°C, turning they slowly pink during this phase. They will then reach complete maturity 2-3 days later, when kept at ambient temperatures picked when they are pink, when they can be left at 10°C for 1 week if there is a requirement to reduce the rate of fruit maturity. Ripe tomatoes can be kept for several days at 4°C but fruit quality is lost.

2.4.1 Colour

Fruit colour is often a key quality parameter used in grading raw fruit to reimburse producers. In addition to providing a measure of fruit maturity, colour also influences the grades and standards of the processed commodity. Colorimetric measurement of raw colour is now a standard practice in most tomato processing establishments.

2.4.2 Fruit pH

Fruit pH affects the heating time required to achieve sterilization of the processed commodity. Longer times are required as product pH increases. Values above pH 4.5 are considered unacceptable for fruit destined for unconcentrated products in which sterilization is achieved by preprogrammed heating times. For cultivar and breeding line comparisons, pH is measured directly with fresh juice prepared from a uniform sample fully ripe fruits. Over mature fruit will give erroneously high pH values.

2.4.3 Titration Acidity

Titration acidity provides a measure of organic acids (total acidity) present in fruit sample, which in turn estimates tartness. Total acidity and pH are not always closely correlated due to differences in the degree of buffering of pH by other fruit constituents. To determine titration acidity, 10ml of fresh raw juice is diluted to 50ml with distilled water. The volume of 0.1NNaOH required for titration to pH 8.1is multiplied by a correction factor (0.064) to estimate the titration acids as percentage of citric acid.

2.4.4 Viscosity

For many processed tomato products, viscosity is an important parameter of establishment grades and standards. Perceived quality of items such as juice,

catsup, tomato sauces, soup and tomato paste is influenced by consistency. Viscosity potential of raw fruit will influenced processed product consistency and the amount of raw product required to achieve a desired consistency.

2.4.5 Soluble solids

Quality standards for processed tomato pulp and paste are defined in terms of soluble solids content. This parameter of quality directly influences flavour and the degree of concentration required to manufacture products in which standards of quality are determined by solid content.

As a consequence, this parameter of quality has been of major interested to the processing industries that manufacture concentrated tomato products. Soluble solids are measured by placing two or three drops of filtered juice on the prism of a refract meter and directly reading the percentage of soluble solids.

CHAPTER THREE

3.0 MATERIALS AND METHODOLOGY

3.1 Research Methodology

This research study is to investigate the losses in the production, processing and storage of tomatoes and onions in Kano State. The information obtained were from farmers in different local government areas of Kano State. The farmers provided information through their responses to the designed questionnaire.

3.2 Questionnaire Development

The questionnaire administered took into account the farmer's year of experience, quantity of tomatoes and onions produced per year, quantity of tomatoes and onions processed per year and the quantity of tomatoes and onions stored per year. The quantity lost during production, processing and storage where also determined.

3.3 Method of Data Collection

The simple random selection method was employed to cover the entire local government areas. This involves the administration of the questionnaire to people concerned.

The villages in each local government studied were picked at random selection; one village was selected from each local government area.

3.4 Area of Study

The study of this investigation covers most of the Local Governments in Kano State only i.e. Bichi, Dala, Kura and Gwarzo. These are the main areas where tomatoes and onions are produced, processed and stored.

3.5 Instrument for Data Collection

The instrument used for the collection of this information is an open questionnaire.

3.6 Sources of Data

Primary source of data was obtained from farmers handling large and small hectares of land in Kano State mainly producing tomatoes and onions.

3.7 Method of Data Analysis

Simple statistical means, charts and frequencies were used to analyze the data collected.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

The result of the data obtained during the assessment as presented thus:

4.1 Experience of Farmers in Tomatoes Production

The results of the assessment on how long farmers have being in the business of tomatoes production, processing and storage are presented in the table 4.1. The results showed that

(i) In Bichi local government there were 30 respondents, 13.33% had being in this business between 6-10 years, 33.33% had being in this business between 11-20 years, 26.67% had being in this business between 21-30 years and lastly 26.67% had being in this business between 30 years and above.

(ii) In Dala local government there were 40 respondents, 35% had being in this business between 6-10 years, 20% had being in this business between 11-20 years, 15% had being in this business between 21-30 years and lastly 30% had being in this business between 30 years and above.

(iii) In Gwarzo local government there were 50 respondents, 26% had being in this business between 6-10 years, 20% had being in this business between 11-20 years, 40% had being in this business between 21-30 years and lastly 10% had being in this business between 30 years and above.

(iv) In Kura local government there were 30 respondents, 6.67% had being in this business between 6-10 years, 36.67% had being in this business between 11-20 years, 30% had being in this business

between 21-30 years and lastly 26.66% had being in this business between 30 years and above.

Table 4.1: Farmers in tomatoes business

BICHI LOCAL GOVERNMENT				
No of years	6-10	11-20	21-30	30 and above
No of Farmers	4	10	8	8
Percentage (%)	13.33	33.33	26.67	26.67
DALA LOCAL GOVERNMENT				
No of years	6-10	11-20	21-30	30 and above
No of Farmers	14	8	6	12
Percentage (%)	35	20	15	30
GWARZO LOCAL GOVERNMENT				
No of years	6-10	11-20	21-30	30 and above
No of Farmers	13	10	20	7
Percentage (%)	26	20	40	10
KURA LOCAL GOVERNMENT				
No of years	6-10	11-20	21-30	30 and above
No of Farmers	2	11	9	8
Percentage (%)	6.67	36.67	30	26.66

4.2 Experience of Farmers in Onions Production

The results of the assessment on how long farmers have being in the business of onions production, processing and storage are presented in the table 4.2. The results showed that

Most of the respondents are into the two businesses e.g. the farmers that were interviewed in Gwarzo local government are into tomatoes and onions production, processing and storage.

(i) In Bichi local government there were 30 respondents, 13.33% had being in this business between 6-10 years, 33.33% had being in this business between 11-20 years, 26.67% had being in this business between 21-30 years and lastly 13.33% had being in this business between 30 years and above.

(ii) In Dala local government there were 20 respondents, 20% had being in this business between 6-10 years, 10% had being in this business between 11-20 years, 30% had being in this business between 21-30 years and lastly 40% had being in this business between 30 years and abcve.

(iii) In Gwarzo local government there were 50 respondents, 26% had being in this business between 6-10 years, 20% had being in this business between 11-20 years, 40% had being in this business between 21-30 years and lastly 10% had being in this business between 30 years and above.

(iv) In Kura local government there were 30 respondents, 11.12% had being in this business between 6-10 years, 33.33% had being in this business between 11-20 years, 33.33% had being in this business between 21-30 years and lastly 22.22% had being in this business between 30 years and above.

Table 4.2: Farmers in onions business

BICHI LOCAL GOVERNMENT				
No of years	6-10	11-20	21-30	30 and above
No of Farmers	4	5	4	2
Percentage (%)	26.67	33.33	26.67	13.33
DALA LOCAL GOVERNMENT				
No of years	6-10	11-20	21-30	30 and above
No of Farmers	4	2	6	8
Percentage (%)	20	10	30	40
GWARZO LOCAL GOVERNMENT				
No of years	6-10	11-20	21-30	30 and above
No of Farmers	13	10	20	7
Percentage (%)	26	20	40	10
KURA LOCAL GOVERNMENT				
No of years	6-10	11-20	21-30	30 and above
No of Farmers	3	9	9	6
Percentage (%)	11.12	33.33	33.33	22.22

4.3 Production

4.3.1 Quantity of Tomato Production

The results of the assessment on the quantity of tomato production are presented in the table 4.3.1. The results showed that the farmers in Bichi local government produce 80 tons of tomatoes (27.49%) per year, the farmers in Dala local government produce 60 tons of tomatoes (20.62%) per year, the farmers in Gwarzo local government produce 61 tons of tomatoes (20.96%) and lastly the farmers in Kura local government produce 90 tons of tomatoes (30.93%) per

year. Therefore, Kura local government is high in tomatoes production than other local governments.

Table 4.3.1: Quantity of tomato production

S/No	Local Government	Quantity of onions (tons)	Percentage (%)
1.	Bichi	80	27.49
2.	Dala	60	20.62
3.	Gwarzo	61	20.96
4.	Kura	90	30.93
		291	100

4.3.2 Quantity of Onions Production

The results of the assessment on the quantity of onions production are presented in the table 4.3.2. The results showed that farmers in Bichi local government produce 70 tons of onions (23%) per year, the farmers in Dala local government produce 65 tons of tomatoes (21.3%) per year, the farmers in Gwarzo local government produce 98 tons of tomatoes (32.1%) and lastly the farmers in Kura local government produce 72 tons of tomatoes (23.6%) per year. Therefore, Gwarzo local government is high in onions production than other local governments.

Table 4.3.2: Quantity of onions production

S/No	Local Government	Quantity of onions (tons)	Percentage (%)
1.	Bichi	70	23
2.	Dala	65	21.3
3.	Gwarzo	98	32.1
4.	Kura	72	23.6
		305	100

4.4 Processing

4.4.1 Quantity of Tomato Processing

The farmers process their produce into slice and dry tomatoes, tomato puree, tomato paste or ketchup.

The results of the assessment on the quantity of tomato processing are presented in the table 4.4.1. The results showed the farmers in Bichi local government process 20 tons of tomatoes (24.4%) per year, Dala local government do not process there tomatoes, Gwarzo local government process 30 tons of tomatoes (36.6%) per year and lastly Kura local government process 32 tons of tomatoes (39%) per year. Therefore, Kura local government is high in tomato processing than other local governments.

Table 4.4.1: Quantity of Tomato Processing

S/No	Local Government	Quantity of tomatoes (tons)	Percentage (%)
1.	Bichi	20	24.4
2.	Dala	-	-
3.	Gwarzo	30	36.6
4.	Kura	32	39
		82	100

4.4.2 Quantity of Onions Processing

The results of the assessment on the quantity of onions processing are presented in the table 4.4.2. The results showed that the farmers in Bichi local government do not process there onions, Dala local government process 10 tons of onions (16.7%) per year, Gwarzo local government process 30 tons of onions (50%) per year and lastly Kura local government process 20 tons of onions

(33.3%) per year. Therefore, Bichi local government is high in onions processing than other local governments.

Table 4.4.2: Quantity of Onions Processing

S/No	Local Government	Quantity of onions (tons)	Percentage (%)
1.	Bichi	-	-
2.	Dala	10	16.7
3.	Gwarzo	30	50
4.	Kura	20	33.3
		60	100

4.5 Storage

4.5.1 Quantity of Tomato Storage

The main means the farmers use for storage is oven air dry, silos or refrigerators.

The results of the assessment on the quantity of tomato storage are presented in the table 4.5.1. The results showed that the farmers in Bichi local government store 40 tons of tomatoes (28.98) per year, Dala local government store 50 tons of tomatoes (36.23%) per year, Gwarzo store 10 tons of tomatoes (7.25%) per year and lastly Kura local government store 38 tons of tomatoes (27.54%) per year. Therefore, Dala local government is high in tomatoes storage than other local governments.

Table 4.5.1: Quantity of Tomato Storage

S/No	Local Government	Quantity of tomatoes (tons)	Percentage (%)
1.	Bichi	40	28.98
2.	Dala	50	36.23
3.	Gwarzo	10	7.25
4.	Kura	38	27.54
		138	100

4.5.2 Quantity of Onions Storage

Most of the farmers said the main methods they use for storage; silos and open air i.e. they spread them on the floor where there is enough ventilation. The farmers said that open air method do not favour them always due to the hot weather.

The results of the assessment on the quantity of onions storage are presented in the table 4.5.2. The results showed that the farmers in Bichi local government store 40 tons of onions (25%), Dala local government store 50 tons of onions (31.25%), Gwarzo local government store 30 tons of onions (18.75%) and lastly Kura local government store 40 tons of onions (25%) per year. Therefore, Dala local government is high in onions storage than other local governments.

Table 4.5.2: Quantity of Onions Storage

S/No	Local Government	Quantity of onions (tons)	Percentage (%)
1.	Bichi	40	25
2.	Dala	50	31.25
3.	Gwarzo	30	18.75
4.	Kura	40	25
		160	100

4.6 Losses

4.6.1 Losses in Tomato Production

Most of the losses are either shrinkage, rot, mechanical injury or other means. They are either consumed by their families or thrown away.

The results of the assessment on the quantity of losses in tomatoes production are presented in the table 4.6.1. The results showed that the farmers in Bichi local government loss 5 tons of tomatoes (17.24%) per year, Dala local government loss 5 tons of tomatoes (17.24%) per year, Gwarzo local government loss 10 tons of tomatoes (34.48%) per year and lastly Kura local government loss 9 tons of tomatoes (31.04%) per year.

Table 4.6.1: Losses in Tomato Production

S/No	Local Government	Quantity of tomatoes (tons)	Percentage (%)
1.	Bichi	5	17.24
2.	Dala	5	17.24
3.	Gwarzo	10	34.48
4.	Kura	9	31.04
		29	100

4.6.2 Losses in Onions Production

During production the farmers said they normally encounter losses such as mechanical injury, rot, shrinkage and others. Most of the onions which are affected either by rot, shrinkage or mechanical injury are been consumed by their respective families.

The results of the assessment on the quantity of losses in onions production are presented in the table 4.6.2. The results showed that the farmers in Bichi local government loss 5 tons of onions (29.4%) per year, Dala local government loss 5 tons of onions (29.4%) per year, Gwarzo local government loss 5 tons of onions (29.4%) per year and lastly Kura local government loss 2 tons of onions per year.

Table 4.6.2: Losses in Onions Production

S/No	Local Government	Quantity of onions (tons)	Percentage (%)
1.	Bichi	5	29.4
2.	Dala	5	29.4
3.	Gwarzo	5	29.4
4.	Kura	2	11.8
		17	100

4.6.3 Losses in Tomato Processing

From the research it is seen that the farmers encounter losses during processing through rejection by the processing firms or companies. This is due to the size, shape etc. of the tomatoes. Therefore, most of the tomatoes for processing are been returned after selection either by hand or machine.

The results of the assessment on the quantity of losses in tomato processing are presented in the table 4.6.3. The results showed that the farmers

in Bichi local government loss 4 tons of tomatoes (19.1%) per year, Dala local government do not process therefore, no loss was encountered here, Gwarzo local government loss 9 tons of tomatoes (42.8%) per year and lastly Kura local government loss 8 tons of tomatoes (38.1%) per year.

Table 4.6.3: Losses in Tomato Processing

S/No	Local Government	Quantity of tomatoes (tons)	Percentage (%)
1.	Bichi	4	19.1
2.	Dala	-	-
3.	Gwarzo	9	42.8
4.	Kura	8	38.1
		21	100

4.6.4 Losses in Onions Processing

Most of the losses encountered during processing are due to rejection from the firm or companies, which may be as a result of their sizes, shapes etc.

The results of the assessment on the quantity of losses in onions processing are presented in the table 4.6.4. The results showed that the farmers in Bichi local government did not loss because they are not into processing, Dala local government loss 5 tons of onions (25%) per year, Gwarzo local government loss 5 tons of onions (25%) per year and lastly Kura local government loss 10 tons of onions (50%) per year

Table 4.6.4: Losses in Onions Processing

S/No	Local Government	Quantity of onions (tons)	Percentage (%)
1.	Bichi	-	-
2.	Dala	5	25
3.	Gwarzo	5	25
4.	Kura	10	50
		20	100

4.6.5 Losses in Tomato Storage

Most of the farmers complained that most of their losses are caused by fungal or bacteria.

The results of the assessment on the quantity of losses in tomato storage are presented in the table 4.6.5. The results showed that the farmers in Bichi local government loss 10 tons of tomatoes (58.8%) per year, Dala local government loss 4 tons of tomatoes (23.5%) per year, Gwarzo local government loss 1 tons of tomatoes (5.9%) per year and lastly Kura local government loss 2 tons of tomatoes (11.8) per year.

Table 4.6.5: Losses in Tomato Storage

S/No	Local Government	Quantity of tomatoes (tons)	Percentage (%)
1.	Bichi	10	58.8
2.	Dala	4	23.5
3.	Gwarzo	1	5.9
4.	Kura	2	11.8
		17	100

4.6.6 Losses in Onions Storage

The farmers said that most of the losses they encounter during storage are caused by bacteria and fungal attack.

The results of the assessment on the quantity of losses in onions storage are presented in the table 4.6.6. The results showed that the farmers in Bichi local government loss 10 tons of onions (33.33%) per year, Dala local government loss 2 tons of onions (6.67%) per year, Gwarzo local government loss 10 tons of onions (33.33%) per year and lastly Kura local government loss 8 tons of onions (26.67%) per year.

Table 4.6.6: Losses in Onions Storage

S/No	Local Government	Quantity of onions (tons)	Percentage (%)
1.	Bichi	10	33.33
2.	Dala	2	6.67
3.	Gwarzo	10	33.33
4.	Kura	8	26.67
		30	100

4.7 The Losses during Production, Processing and Storage of Tomatoes and Onions.

The results of the assessment on the quantity of losses during production, processing and storage of tomatoes are presented in the table 4.7: The result showed that Bichi local government loss 95.14%, Dala local government loss 40.74%, Gwarzo local government loss 83.18% and lastly Kura local government loss 80.94%.

Table 4.7 (1): Losses in tomatoes

Local Government	Bichi	Dala	Gwarzo	Kura
Production	17.24%	17.24%	34.48%	31.04%
Processing	19.1%	0	42.8%	38.1%
Storage	58.8%	23.5%	5.9%	11.8%
Total Percentage loss	95.14%	40.74%	83.18%	80.94%

The results of the assessment on the quantity of losses during production, processing and storage of onions are presented in the table 4.7: The result showed that Bichi local government loss 62.73%, Dala local government loss 61.07%, Gwarzo local government loss 87.73% and lastly Kura local government loss 88.47%.

Table 4.7 (2): Losses in Onions

Local Government	Bichi	Dala	Gwarzo	Kura
Production	29.4%	29.4%	29.4%	11.8%
Processing	0	25%	25%	50%
Storage	33.33%	6.67%	33.33%	26.67%
Total Percentage loss	62.73%	61.07%	87.73%	88.47%

4.8 Problems that the Farmers are facing

Most of the farmers complained about the losses they encountered during production, processing and storage of tomatoes and onions, they said its mainly lack of materials, lack of equipments and low capital. The farmers therefore appeal to Kano State Government to assist them with loan in other to enhance production, processing and storage of tomatoes and onions in the state.

Many of the farmers appeal for Kano State Government to give lands to them in order to enhance production. They also appeal to the state to help them acquire more machinery such as modern tractor for faster production.

The farmers also appeal to the state government to train farmers in the area of processing in order for them to be able to process their produce.

4.9 Conclusions and Recommendations

4.9.1 Conclusions

In Nigeria (Kano state) where the socio-economic development of the country is still at the slow pace, most families find it difficult to put a complete meal with all the necessities for good health together. Having carried out this research it found that the farmers are not exposed to mechanized farming and this make them loose a lot of money knowing that one basket of tomatoes cost two thousand five hundred naira (₦2, 500.00) while one bag of onions cost fifteen thousand naira (₦15, 000.00).

It can be concluded that the production, processing and storage of tomatoes and onions can boost the economy of the country, put more money in our pockets and put more food on our tables.

4.9.2 Recommendations

Most of the farmers complained about the losses they encountered during production, processing and storage of tomatoes and onions, they said it's mainly lack of materials, lack of equipments and low capital. The farmers should be assisted by the Kano state government in order to boost the production, processing and storage of tomatoes and onions in the state.

This project work will provide a report that will assist other upcoming farmers in order to know the quantity of tomatoes and onions to produce, process and store at a particular time.

Kano state government should increase the loan they give to farmers, since the production of tomatoes and onions can improve the state's economy through exportation.

REFERENCE

Dr. Badayi M. Sani: The Structure of Kano Economy Senior lecturer, Department of Economics, Bayero University Kano.

Jones, C.S.; Holt, J.E.; and Schoorl, D. (1991): A model to predict damage to horticultural produce during transport. J. Agric. Engin. Res. 50: 259-72.

Kra, E. and Bani, R.J. (1988): Handling and transportation of vegetables in Ghana. Agricultural mechanization in Asia, Africa and Latin America. AMA 19(2): 52-54.

Daramola, A.M. (1998): Post harvest handling of indigenous fruits and vegetables: status, problems and prospects. Paper presented at the Meeting of Experts on Indigenous Crops and Animal Research and Development, Nigeria.

Messiaen, C.M. (1992): The tropical vegetable garden: Principles for improved and increased production with application to the main vegetable types. Translated and Adapted by P.R. MacCrimmon, CTA McMillan, London, England, pp.187-245.

Egharevaba, R.K.A (1995): Post harvest physiology of fruits and vegetables. J. Trop. Postharvest 2: 51-73.

Oyeniran, J.O. (1988): Report of the nationally coordinated research project on fruits and vegetables in nigeria. Proc.Nat. Workshop on Improved Packaging and Storage Systems for Fruits and Vegetables in Nigeria. Ilorin, Nigeria.

Idah P. A. (2007): Fruits and vegetables handling and transportation in Nigeria. Department of Agricultural Engin., Federal University of Technology, Minna Niger.

Dr. Badayi M. Sani (2007): Senior lecturer, Department of Economics, Bayero University KanoThe Structure of Kano Economy

Federal University of Technology Minna

School of Engineering and Engineering Department of Agricultural Engineering

Topic: - Loss Assessment in the production, processing and storage of tomatoes and onions in Kano State.

This questionnaire is designed in order to collect information on the losses during production, processing and storage of tomatoes and onions in Kano State. The information sorts for in the course of this research are purely for academic exercise and not for any other purpose. The data obtained will help in planning for minimizing the losses. Thank you.

Personal data

Name: _____

Address: _____

Local Government: _____

Production Process

1. How long have you been in the business of production, processing and storage of tomatoes and onions? (a) 1 – 5 years (b) 6 – 10 years (c) 11 – 20 years (d) 21 – 30 years (e) above 30 years
2. Which of the crop do you produce?

   (a) Both tomatoes and onion? [ ]

   (b) Just tomatoes only? [ ]

   (c) Just onions only? [ ]
3. What area of land do you normally cultivate per year? (a) 1-10 hectares (b) 11 – 20 hectares (c) 21 – 40 hectares (d) 41 - 50 hectares (e) above 50 hectares

4. What quantity of tomatoes do you produce a year? (a) 5 – 30 baskets (b) 31 – 60 baskets (c) 61 – 90 baskets (d) above 90 baskets
5. What quantity of onions do you produce a year? (a) 5 – 30 bags (b) 31– 60 bags (c) 61 – 90 bags (d) above 90 bags
6. What quantity of onions do you take to the market immediately after harvest? (a) 5 – 30 bags (b) 31 – 60 bags (c) 61 – 90 bags (d) above 90 bags
7. What quantity of tomatoes do you take to the immediately after harvest? (a) 5 – 30 baskets (b) 31 – 60 baskets (c) 61 – 90 baskets (d) above 90 baskets
8. What quantity of tomatoes do you consume with your family? (a) 5 -30 baskets (b) 31 – 60 baskets (c) 61 – 90 baskets (d) above 90 baskets
9. What quantity of onions do you consume with you family? (a) 5 – 30 bags (b) 31 – 60 bags (c) 61 – 90 bags (d) above 90 bags
10. What quantity of the fresh tomato is lost? (a) 5 – 10 baskets (b) 11 – 20 baskets (c) 21 – 30 baskets (d) above 30 baskets
11. What quantity of the onion is lost? (a) 5 – 30 bags (b) 31 – 60 bags (c) 61 – 90 bags (d) above 90 bags
12. What type of losses do you normally encounter in fresh tomato? (a) rot (b) mechanical injury (c) shrinking due to loss of water (d) others (specify)
13. What type of losses do you normally encounter in onion? (a) rot (b) mechanical injury (c) shrinking due to loss of water (d) others (specify)

Processing Process

14. Do you process the tomatoes you produce? Yes / No
15. Do you process the onions you produce? Yes / No
16. Do carry out the processing yourself? Yes / No.
17. What product do you normally process the tomato? (a) Puree (b) Paste (c) Sliced or dried (d) ketch (e) others (specify)
18. What do you process your onions into? (a) Seasoning (b) Sliced or dried (c) others (specify)
19. What quantity of tomatoes do you process per year? (a) 5 – 10 baskets (b) 11 – 20 baskets (c) 21 – 30 baskets (d) above 30 baskets
20. What quantity of onions do you process per year? (a) 5 – 30 bags (b) 31 – 60 bags (c) 61 – 90 bags (d) above 90 bags
21. What quantity of the tomato is lost in processing? (a) 5 – 10 baskets (b) 11 – 20 baskets (c) 21 – 30 baskets (d) above 30 baskets
22. What quantity of the onion is lost in processing? (a) 5 – 30 bags (b) 31 – 60 bags (c) 61 – 90 bags (d) above 90 bags
23. What quantity of the tomato do you take to the market after processing? (a) 5 – 10 baskets (b) 11 – 20 baskets (c) 21 – 30 baskets (d) above 30 baskets
24. What quantity of the onion do you take to the market after processing? (a) 5 – 30 bags (b) 31 – 60 bags (c) 61 – 90 bags (d) above 90 bags

Storage Process

25. What quantity of fresh tomato do you store? (a) 5 – 10 baskets (b) 11 – 20 baskets (c) 21 – 30 baskets (d) above 30 baskets
26. What quantity of onion do you store? (a) 5 – 30 bags (b) 31 – 60 bags (c) 61 – 90 bags (d) above 90 bags
27. What method do you employ for storing your fresh tomatoes? (a) Refrigerator (b) Oven air (c) others (specify)
28. What method do you employ for storing you onions? (a) Refrigerator (b) Oven air (c) others (specify)
29. What kind of attack do you normally encounter in the stored tomatoes? (a) Fungal (b) Bacteria (c) Others (specify)
30. What kind of attack do you normally encounter in the stored onions? (a) Fungal (b) Bacteria (c) Other (specify)
31. What quantity do you lost to spoilage (tomatoes)? (a) 5 – 10 baskets (b) 11 – 20 baskets (c) 21 – 30 baskets (d) above 30 baskets
32. What quantity do you lost to spoilage (onions)? (a) 5 – 30 bags (b) 31 – 60 bags (c) 61 – 90 bags (d) above 90 bags
33. What kind of problem do encounter doing storage? (a) Lack of equipment (b) Lack of materials (c) No capital (d) Others (specify)
34. What type of assistance would you like to be given? (a) Provision of storage facilities (b) Provision of processing equipment (c) Finance (d) Transport facilities (e) Others (specify)

35. Comment freely on the problems involved in the production, processing and storage of tomatoes and onions.

_____

_____

_____

_____

36. How do you want these problems solved so as to reduce the losses?

_____

_____

_____

_____