An Investigation into The Role of Women in Preservation of Indigenous Vegetables using Traditional Methods among The Luo of East Alego, Western Kenya

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DECLARATION

I declare that this is my original work. It has not been presented for a degree in any other University.

8/11/2010

Audia Oyugi Atogo **Date**

This project has been submitted with my approval as a University Supervisor.

8/11/2010

Dr. Salome Bukachi **Date**

DEDICATION

I dedicate this project to my daughters Vivian and Elizabeth and my parents whose inspiration and love motivated my earnest quest for knowledge to serve the local communities.

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ABBREVIATION/ACRONYMS

USAID	United States Agency for international Development
UNIFEM	United Nations Fund for Development of Women
FAO	Food and Agriculture Organization
GOK	Government of Kenya
CTA	Centre for Agricultural and Rural Cooperation
UNICEF	United Nations Children's Fund
FDA	Food and Drug Administration
PEM	Protein Energy Malnutrition
VAD	Vitamin A Deficiency
IDD	Iodine Deficiency Disorders
JAMA	Journal of American Medical Association

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ABSTRACT

The main study was designed to investigate the women's role in preservation of indigenous vegetables using traditional methods. Fieldwork was conducted in East Alego Location, Western Kenya.

The main objectives of the study were: to investigate women's role in preservation of indigenous vegetables using traditional methods; to explore the perception of women on traditional methods of vegetable preservation and to examine the challenges faced by women in using traditional methods of vegetable preservation.

Data was obtained through structured interviews, key informant interviews and focus group discussions. Simple random sampling method was used to obtain a sample size of 30 respondents. Focus group discussion was purposive based on women groups involved in agricultural activities. Similarly, key informants' choice was based on the elderly women presumed to have the authentic knowledge on traditional methods of vegetable preservation.

Quantitative data was obtained through structured interviews and analysed using Statistical Package of Social Sciences (SPSS) and presented in the form of frequencies and graphs. Quantitative data was obtained through key informant interviews and focus group discussion. Data obtained was analysed according to the emerging themes and presented in form of verbatim quotes and pie chart.

The main findings of this study indicate that people no longer use traditional methods of vegetable preservation especially drying. Vegetable preservation methods has been a challenge to women therefore during rainy season when vegetable is in abundance, a lot of it is wasted. The only method of vegetable preservation still in used is fermentation though most people do not use it because they eat a lot of fresh vegetables. From the findings it became clear that women lack the knowledge of vegetable preservation especially drying method.

The findings of the study, also gathered that people were very enthusiastic about the information and most of them said they must start the practice again since they normally throw away a lot of vegetables during rainy season then after the rains they have nothing in their stores.

The study concluded that preservation of vegetables is a good idea but most people lacked the information. It also concluded this would make them have supply of vegetables throughout the year. It also confirmed that traditional methods of preserving vegetables are under-exploited in the region. The few who have the knowledge do not pass it on to the next generation and more so, they do not use it.

CHAPTER ONE

Background to the Study

1.1. Introduction

Nutrition plays a central role in alleviating food insecurity and ill health in developing countries (Kimiywe *et al.* 2007). In the recent times, humans have focused on fewer plant species, mostly exotic plants, thus resulting to narrow food focus. This narrow focus has led to a decline in original knowledge needed to identify and prepare wild plant species; locally affecting the population's nutritional status, especially in the developing world (Griveti and Ogle 2000; Ogoye-Ndegwa and Aagaard-Hansen 2003). Despite the nutritional and medicinal value of indigenous vegetables, these vegetables are treated as weeds during high season when they are in plenty. Methods of preservation are very important deterrent to the wider utilization of these vegetables. Information about traditional systems is no longer transferred from one generation to the next therefore, the knowledge gap between the older generation in the rural areas and urban youth in particular is widening (Mnzava, 1989).

Many researchers, (Johns and Kokwaro 1991; Cooper *et al.* 1992; Humphry *et al.* 1993; Jacks 1994; Abbiw 1997; Asfaw 1997; Mathenge 1997; Okafor 1997; Chweya and Eyzaguirre 1999; Maundu *et al.* 1999a; Maundu *et al.* 1999b) have emphasized advantages of consuming indigenous vegetables as compared with introduced exotic leafy vegetables such as cabbage. Firstly, the nutritional value of the indigenous leafy vegetables is higher (Nordeide *et al.* 1996; Uiso and Johns 1996; Shackleton *et al.* 1998).

Secondly, they ensure food security since most indigenous vegetables are drought and pest resistant (Odiaka and Schippers, 2004). Thirdly, most species have a potential for income generation because they grow throughout the year and can be harvested with minimal inputs (Jacks 1994). However, there is fear of losing the indigenous knowledge therefore large quantities of vegetables are lost due to poor handling and storage (Maudu, 2004).

Many people lack adequate amounts of rich nutritious foods needed for health and a productive life. Chronic under-nutrition affects some 215 million people in sub-Saharan Africa, that is, 43 percent of the population (FAO, 1996). Deficiencies of iron, vitamin A and iodine are also widespread; about 300 million people are affected every year, and a much greater number are at

risk of these deficiencies. Indigenous vegetables such as Gynandropsis (*Akeyo or Dek)* have very high concentrations of iron and calcium while Tribulus terrestris L. (*Okuro*) has calcium (Orech *et al*, 2007) that can alleviate the problem of malnutrition in Kenya.

Malnutrition increases people's vulnerability to infections, causing numerous deaths. In Kenya, malnutrition is a national problem whose root cause needs to be addressed (Kenya Government, 1981). FAO (1996) believes that in the face of this bleak situation, major efforts are required by national governments and the international community to bring about reductions in malnutrition and micronutrient deficiencies.

Research by Orech *et al*, (2007) has shown that indigenous vegetables both wild and domesticated contain macronutrients and micronutrients, which are very crucial in reducing malnutrition and other diseases. Some of the minerals found in indigenous vegetables are iron, zinc, magnesium, potassium, phosphorus and calcium as well as vitamins A, B and C (Orech *et al*, 2007). According to World Health Organization (2000), deficiencies in mineral consumption are widespread in developing countries leading to various illnesses such diabetes, anemia, cardiovascular disease, diabetes, hypertension disorders and others. Therefore, preservation of these vegetables and eventual consumption will be a sure way of reducing malnutrition in Kenya.

This study explored the traditional methods of indigenous vegetable preservation that seem to have been discarded leading to post-harvest wastage of vegetables. During bumper harvest, especially in Africa, many of these vegetables go to waste due to lack of appropriate storage facility and preservation methods. Most people lack the knowledge of nutritional value of these vegetables therefore treats them as weeds. Producers of the indigenous vegetables tend to sell their produce in a hurry at a cheap price to avoid loses thereby leaving them with very little to serve their families adequately or just leave them in the gardens to die off. However, these vegetables can be preserved in dried form to be used in times of need and for economic gains while maintaining the nutrients. Modern methods of preservation are unreachable to many people in the rural areas, and could sometimes lead to poor health because freezing kill most vitamins in vegetables (UNIFEM, 1988).

In many African countries from the Niger to Zambia, women use solar drying techniques for fruits, vegetables, mushrooms, and tuber, which contain important quantities of vitamin A and iron and the sale of these products at the local market provide good income. Seasonal vegetable scarcity accentuates the severity and incidence of malnutrition. Steps should be taken to promote traditional methods of preserving these surpluses for use during times of need, and develop food security products that can be produced in the villages using appropriate technology (Keya, 2001). Some of these vegetables can also be used to increase income generation opportunities to create a greater financial base at family level and even nationally (Lemunyete & Bruntse, 2003).

Food preservation techniques have not been given as much consideration as the production and conservation methods. A report from the United Nations Food and Agriculture Organization warns of the dangers posed by developmental initiatives that ignore indigenous knowledge. The loss of this knowledge exposes communities to food insecurity yet women play a significant role in the application and preservation of this indigenous knowledge (Kilongozi *et al*, 2005). This study therefore, seeks to explore the role of women in preservation of indigenous vegetables using traditional methods for adequate supply of food as well as reduction in post harvest wastage in East Alego.

1.2 Problem Statement

Food preservation has been a longstanding and historic problem of rural communities yet women are known to be the custodians of indigenous knowledge of food preservation (Habib, 1988). The traditional knowledge was passed down from parent to child (usually mother to daughter) and belongs to the undervalued body of "indigenous knowledge". Most of this knowledge has not been documented and is in danger of being lost as technologies evolve and families move away from traditional food preservation practices (Battcock & Azam-Ali, 1998).

Food goes bad because there is no adequate modern technology such as ice or refrigeration. The results of this are enormous financial losses and constrained economic and social development. While food losses can occur before and during harvest, greater losses are realised during storage.

Traditional methods of food preservation in Kenya are under exploited. Perishable farm produce such as indigenous vegetables are wasted, sold at throw away prices during the peak seasons due

to inadequate post harvest storage facilities and lack of effective processing or preservation techniques, leading to high wastage levels and low capacity utilization (Agona *et al*, 2002). Many indigenous and traditional plants have edible leaves and preservation of these vegetables in rural areas improves household diets during the dry season while reducing malnutrition.

The methods that were traditionally used to convert food crops into edible food have remained unnoticed in planning and research aimed at increasing food security and nutritional levels. Research have always emphasised more on modern food processing, and the application of sophisticated technology. This shows how traditional methods are not backed by dominant economic interest in research. Another reason is the male bias in research leaving local food preservation methods used by women in the area of research and action (Brandtzaeg, 1979).

According to Food and Agriculture Organisation (FAO), nearly forty-one countries in Africa do not have sufficient food to feed their population and at the same time have limited access to capital to import food (FAO, 1996) while wild indigenous vegetables are treated as weeds. To save humanity, there is need to address food security issues by relying on appropriate approaches to food preservation. It is therefore important to understand the social norms and economic factors that influence women's opportunities to exploit and manage these methods.

In the rural areas, some indigenous vegetables (wild and domestic) grow on their own in large quantities during rainy seasons. In most cases, these vegetables are left to die off in the farms yet they can be preserved for use in times of need. Contemporary methods of food preservation are very costly and unreachable to a majority of the population, more over they are known to be detrimental to human health. The concern is that the introduction of 'western foods' with their glamorous image will displace these traditional foods, therefore making traditional food preservation methods under utilized (FAO, 1995).

The purpose of this study, therefore, examined the role of women in preservation of indigenous vegetables using traditional methods with a view to promoting food security and reducing post-harvest wastage among the people of East Alego.

This study attempted to answer the following research questions:

1). What role do women play in preservation of indigenous vegetables using traditional methods in East Alego?

2) What is the perception of women on traditional methods of preserving indigenous vegetables?

3) What challenges do women face when using traditional methods of vegetable preservation in East Alego?

1.3 Objectives of the Study

1.3.1 General Objective

1. To explore the role of women in traditional methods of indigenous vegetable preservation in East Alego, Western Kenya.

1.3.2 Specific Objectives

1.) To assess the role of women in preservation of indigenous vegetables using traditional methods in East Alego.

2.) To explore the perception of women on traditional methods of indigenous vegetable preservation.

3.) To examine challenges faced by women in using traditional methods of indigenous vegetable preservation.

1.4 Justification of the Study

Despite the use of modern technology to increase food production, the world over is still experiencing food shortages (FAO, 1996). Coupled with the global warming currently being experienced all over the world, any attempt to correct food crisis is very crucial.

Food by its nature begins to go bad the moment it is harvested (Nummer, 2002). Traditional methods of food preservation are a sure way of improving this situation especially in the rural area where a lot of food goes to waste especially after harvest. The study tried to understand the problem of frequent shortage of locally produced food. Access to stable and sustainable food supplies is a precondition for the establishment of food security at the household level and consequently at national level. Preservation practices was identified as a precondition to regular flow of food into the household throughout the seasons for its members. Similarly promoting appropriate and readily available technology for home preservation such as drying of vegetables and fruits at home was identified as one factor that can reduce wastage and ensure better

utilization of fresh produce available in abundance during the harvest season (FAO/USDHEW, 1986).

Among the urban poor in Kenya around 80 percent of family income goes directly to the purchases of food and in the rural areas, few households have reached self-sufficiency. In both urban and rural areas, malnutrition is widespread, with mothers, children and the elderly at risk. The rural and urban poor suffer from food insecurity and poor nutrition caused in a large measure by poverty and lack of nutritional balance in the diet they can afford. Deficiencies of micronutrients such as iron and vitamin A are a common occurrence among children and adults. Yet these vitamins are contained in indigenous vegetables, which are treated as weeds or wasted during peak harvest season. As a result, there are high unit costs of food translating to reduced consumer purchasing power (Onsogo, 2001).

The Food and Agriculture Organisation of the United Nations (FAO), recognises that the problem of food security cannot be tackled in isolation because it is an integral component of other development issues. Traditional methods of food preservation play an important role in ensuring the food security of millions of people around the world, particularly marginalised and vulnerable groups (FAO, 1995), however, these technologies risk being displaced by economic development and cultural change (Spotlight, 1998).

The granaries that were used as food store in the past were made of sticks that served as insect repellant to minimize infestation of stored grains (Farnandez, 1994:10 quoted in Akong'a 1998). Grain containers, sealed gourds and hand-woven baskets were also used to preserve and store grains. The design was to keep away moisture. According to (Parrish, 1994) the sealed containers act as an elementary form of fumigation chambers. Among the Luo and Luyia, ash serves as preservative for grains especially peas and beans after a thorough drying. Among the Luyia, grains in bulk were stored in pots or special granaries sealed using cow dung to serve as cement. Cow dung made the granaries airtight and too hot for pests to survive. Some communities used storage above the kitchen hearth to keep grains dry and free from pests because of the heat and smoke. Sorghum in particular can be kept in such a store for more than 10 years (Akong'a, 1998).

The findings of this study is expected to contribute to existing literature on the traditional methods of food preservation and the role of women in utilizing these techniques. The findings could be useful to academicians who might want to build on this study in future. The findings of this study may also enhance the knowledge of food preservation using traditional methods. The findings may provide useful information to policy makers in terms of post harvest management. This study may also provide information that could be used to improve the socio-economic status of indigenous vegetable producers by limiting the amount of wastage. Consequently, it may contribute information, which could be used in alleviating the feminization of poverty since women are the main producers of food in many societies.

1.5 Scope

The study aimed at investigating the role of women in preservation of indigenous vegetables using traditional methods in East Alego location, Western Kenya. The study focused on the role of women, their perceptions and challenges they face in using the traditional methods of food preservation.

1.6 Limitations

Due to time and financial limitation, the study was conducted in one location only in Siaya district. The sample size was small therefore; the findings of this study cannot be generalized for the entire district.

CHAPTER TWO

Literature Review

2.1 Introduction

The literature review is divided into six parts namely; Overview of food production and processing, global perspective of traditional methods of food preservation, traditional methods of food preservation, women and traditional food production and preservation, nutrition and traditional methods of food preservation, Effects of contemporary methods of food preservation, and socio-economic impact of traditional methods of food preservation.

2.2 Overview of food production and processing

For many thousands of years, people collected their food from the wild or hunted animals large and small. The "hunter-gatherer" mode was sufficient for small groups in favorable environments, but as population grew and people pushed into areas less endowed with easily obtainable food, they sought more reliable sources of nutrition.

Ensuring sufficient food supply is one of the most basic challenges facing any human society. Organized and efficient food production supports population growth and the development of cities and towns, trade, and other essential elements of human progress. Women are the majority of the Third World's rural population and their role as producers of food is increasing. The worldwide demographic and social changes tend to push women in Third World countries into the agricultural sector contrary to developed countries (USAID, 1982).

In the Andean region, women engage in agricultural fieldwork such as planting and weeding, processing of agricultural products, feeding, grazing, milking and shearing of animals and to a great degree in marketing. In Kenya, the productivity of women farmers is high compared to that of men who receive equivalent farm services (USAID,1982). Most men in Western Kenya work in urban centers leaving women in the rural to work in the farm (Waters-Bayer and Reij, 2001).

In Cameroon the role of men and women in farming, were distinct but complimented one another. For example, men were allocated rice production while women were expected to participate in transplanting and harvesting rice while at the same, continue with subsistence farming for the family. In the highest areas of northwestern Cameroon, potatoes were grown by

women farmers as a cash crop. The major crop was harvested in July, but thereafter followed a two-month period of heavy rains during which time the traders did not come to the villages to buy potatoes because the tracks and roads were largely impassable. The village women, with no experience of successful potato storage, had no means of bridging the gap until late September or October and thus harvested and marketed potatoes in July at the low prices typical of a glut period. The remainder would be left in the field to rot (FAO, 1987).

In Asia, women provide up to 90 per cent of the labour for rice cultivation. In Colombia and Peru, women perform 25 to 45 percent of agricultural field tasks. In Egypt, women contribute 53 per cent of the agricultural labour. Men are found more often in agricultural wage labour and cash crop production, while women are mostly found producing food for their families and local markets (Karl, 2009).

According Karl (2009), "The vast majority of urban and rural households in the developing world rely on food purchases for most of their food and stand to lose from high food prices. High food prices reduce real income and worsen the prevalence of food insecurity and malnutrition among the poor by reducing the quantity and quality of food consumed".

2.2.1 Global Perspective of Traditional Methods of Food Preservation

The technique of drying and fermentation is probably the oldest methods of food preservation practiced by humankind (Odum, 2006). Other methods of preservation that have been there from the time of hunter gatherer period is drying, smoking, use of ash and special containers, salting, root-cellaring, hanging and clamping. The removal of moisture prevents the growth and reproduction of microorganisms causing decay and minimises many of the moisture mediated deterioration reactions (Dauthy, 1995).

It brings about substantial reduction in weight and volume minimising packing, storage and transportation costs and enable storability of the product under ambient temperatures, features especially important for developing countries. The sharp rise in energy costs has promoted a dramatic upsurge in interest in drying worldwide over the last decade (Dauthy, 1995, FAO, 1996b).

In Zambia, the main method of preservation is sun drying, and the most common local vegetables that are preserved include bean leaves, pumpkin leaves, cowpea leaves, *mulembwe, mankolobwe* and mushroom. Preservation of local vegetables is increasing as other sources of relish, in particular local game meat (monkeys, duiker and holy beg (small goats) and water buck), are becoming less plentiful (FAO, 1992).

2.2.3 Traditional methods of food preservation

For many years, food preservation has been second to food production. Fermentation is one of the oldest forms of food preservation technology in the world. Fruits were dried by the ancient people to protect them from spoiling while fruit juices were fermented to make wines and vinegars. Cereals and vegetables were stored in special containers to protect them against moisture and decay; olives were preserved by salting; and meats were salted, dried, and smoked. The use of sugar and vinegar in preserving fruits and vegetables came much later. The preservation of foods by sterilization in sealed containers is a development of the nineteenth century and dates from its discovery by Nicholas Appert in France about 1800. Cold storage, as a means of preserving all perishable products has during the past century, developed into a very great industry (Cruess, 1918).

Long before freezing became available, people used man-made methods of food preservation as indicated below. Food processing and preservation and activities cover three main fields namely: modern methods such as refrigeration, canning, food additives and irradiation. Traditional methods such as drying, salting, smoking and fermentation were used in the past.

Drying

For centuries, great effort has been devoted to finding ways of preserving fruits and vegetables and protecting it from microorganisms, insects and other pests. Different methods remained in practice by humans for preservation like drying using radiations from sun, which probably were the first techniques developed for preserving fruits, vegetables, meat, fish, etc. In South Dakota, the elders teach the young about the traditional practice of sun-drying corn and berries and buffalo meat (Saboe, 2003). Drying is the excellent way of preserving fruits, vegetables and meat. In Taita-Taveta district of Kenya, some foods were preserved by sun drying, particularly grains, beans and similar items. Green vegetables may be boiled, dried and stored in pots for use

during dry season. Meat was also dried and kept (Were and Soper, 1986). In some cases, the meat was hanged on the roof above fireplace to further enhance the loss of moisture (Were & Soper, 1986:50). Vegetables, mushrooms and cowpeas leaves were also sun-dried and stored. Akong'a (1998), indicated that the Luo and Luyia had special containers for cereals that prevented the cereals from pest infestation and moisture. Cereals were stored in granaries made of plants that repel pests and cow dung to firm the structure.

In Uganda, sun drying is the mode of preservation that is most common, as observed by researchers. Fruit drying is mainly conducted during the December – March and June – August months of the year when there is plenty and reliable sunshine. Dried fruits also have a large number of end-users including use in the dried fruit and nut industry, the breakfast cereal industry, the confectionery industry, the bakery industry, other food processors making dairy and baby food products, and are consumed directly (Brett *et al*, 1999 in Agona, Nabawanuka and Kalunda, 2002).

The Far East countries like the Philippines are big suppliers of dried fruits and are well established on the market. Thailand is the primary supplier of dried pineapple, papaya, and mango (ADC, 2001). Other regional suppliers of dried fruit include Burkina Faso.

African indigenous vegetables were blanched, freeze-dried then developed into vegetable products with extended shelf-life using simsim (Sesamum orientale L.) or groundnuts. These vegetables are consumed as snacks after transformation from perishable produce into stable foods. This can aid global transportation and distribution and improve population's income and food supply (Habwe, 2009).

According to UNIFEM 1993, drying of fruits is the most appropriate way of preserving many fruits in the rural area. The advantage of going traditional is because the technology is easily understood and the cost of equipments is low (UNIFEM, 1993:9) and some methods like smoking involve no cost except labour.

Smoking

Smoke contains certain compounds of a creosote nature that act as powerful preservatives. It also imparts an agreeable flavor to meats. The food absorbs the smoke flavors while at the same time

the smoke dries out the food, removes the moisture and concentrates the foods flavor (Webb, 2002). Meat and fish can be smoked and kept for future use. The process of smoking fish include; cleaning, brining, drying, smoking and storing (Domowe, 2005).

2.2.3 Women and traditional food production and preservation

Agriculture is the backbone of food production. According to Kabeer (1998), women and children (girls) provide almost all the labour for food crop production. Globally it is recognized that women produce approximately over fifty percent of food worldwide (FAO, 1995). In spite of their high contribution, women hardly control income from agricultural production, including that of the surplus sales in food crops where their labour input is highest.

In Gambia, forty women were trained on food processing and preservation in April, 2009. The aim was to train women on how to process and preserve the produce they harvested from their gardens that would keep them from perishing at an early time. The training also aimed at reducing post harvest wastage and to enhance the availability of nutritious foods hence reduce frequent food shortage of locally produced foods, vital in improving the nutritional status of children and pregnant women (Ceesay, 2009 in Daily Observer).

A study done by Abukutsa in (2007) indicated that the growing, processing and marketing of leafy vegetable is normally done by women especially among communities in the western part of Kenya. This was the case among Luyia and Luo communities but not for the Kisii community, where gender distribution was 50%. The observation in Kisii district could be attributed to the fact that as a crop develops from subsistence status to a commercial commodity men tend to become more involved. These vegetables have been reported to be highly nutritious containing 100% of the recommended daily allowance for vitamin A and C, iron and calcium and 40% for protein in their fresh leaves. The identified species also have medicinal properties and mature very fast, producing seed under tropical conditions unlike the temperate species. Because of their many advantages, these vegetables should be preserved so that they develop into commercial crop for both the local and export markets. This will help alleviate poverty and improve the food and nutrition situation of communities in the study areas (Abukutsa, 2007).

According to (FAO, 1995) women produce more than 50 percent of the food grown worldwide yet they are the ones who suffer most when there is famine. Research has often come up with wonderful technologies to increase agricultural production but many a times they are not adopted because they are not user friendly to women who are the main producers of food. Other areas of critical concern where women farmers are not receiving adequate attention in research institutions are on-farm storage, pest control and reduction of food losses, and food preservation and preparation techniques (World Bank, 1994). For the purposes of this study, the focus will be on preservation of vegetables using traditional methods.

2.2.4 Nutrition and traditional methods of food preservation

High post-harvest food losses', arising largely from limited food preservation capacity, is a major factor constraining food and nutrition security in the developing countries. Seasonal food shortages and nutritional deficiency diseases are still a major concern. Protein-energy malnutrition (PEM) and the various micronutrient deficiency disorders including vitamin A deficiency (VAD), nutritional anemia due to deficiencies of iron, folic acid and vitamin B12, and iodine deficiency disorders (IDD) remain important public health problems. Approximately 50% of perishable food commodities such as fruits, vegetables, roots and tubers, and about 30% of food grains such as maize, sorghum, millet, rice and cowpeas are lost after harvest. All theses are a result of ineffective or inappropriate food processing technologies, careless harvesting and inefficient post-harvest handling practices (Aworh, 2008). In addition, the nutritional deficiencies can be reduced through preservation and consumption of indigenous vegetables as described by (Orech, *et al* 2007).

2.2.5 Effects of contemporary methods of food preservation

In 2005, an article published in the Journal of the American Medical Association (JAMA), the Center for Disease Control estimates that 112,000 deaths a year are caused by obesity. Food additives commonly used in packaged food can make one fat, cause cancer, diabetes, heart disease, high blood pressure and hormonal imbalance. Nitrates and nitrites used in processed meat form powerful agents causing cancer (Farlow 2007). In her book, Farlow argues that "there are 3000 different chemicals added to food, and safety testing of these chemical additives is generally done by the company that produces the chemicals or uses them in the food they

produce". Fraser, (1980) concurs with Farlow that additives and preservatives such as nitrate causes cancer (Fraser *et al* 1980). Other diseases related to preservatives are respiratory problem, joint pains, gastro-intestinal, neurological problems, obesity, brain damage and many others.

Food and Drug Administration (FDA) under the authority of the food, Drug and Cosmetic Act of 1983 and Amendments in 1958 and 1960 approves consumptions of about 3000 food additives for use in the United States but the proposed additives still threaten human life. The same Amendment Act prohibits the approval of an additive if it is shown to cause cancer in humans or animals (Burgess and Mason, 1987). There is need for organically certified products, which sell for several times the price of regular product (ADC Bulletin 2001).

2.2.6 Socio-economic importance of traditional methods of indigenous vegetable preservation

There is a rapid acceptance of these indigenous vegetables (IVs) among the socially elite in Kenya and this means that the production is now becoming a potentially profitable venture and will soon no longer be a simple women's crop, meant only to supplement the family diet (Shiundu *et al* 2007). Evidence is emerging that African leafy vegetables (ALVs) Policy makers should be made aware of this strategy for purposes of enhancing food security and curbing malnutrition in the rural areas while improving economic empowerment of households. are now a much sought-after item on menus of back-street eating venues, in the five-star hotels and are now served, even in Parliament. In Uganda indigenous vegetables have been commercialized such as 'Malakwang' (*Hibiscus spp*), 'Nakati' (*Solanum gilo*), 'Katunkanna' (*Solanum indicum subsp.Disticum*), 'Doodo' (*Amaranthus dubious*), and 'Bbugga' (*Amaranthus lividus*) particularly around the city of Kampala and in other urban areas and men have taken the lead in production rendering women only to be contented with retail trade component of the traditional vegetables (Shiundu *et al* 2007).

Sun drying vegetables is a cheap method of preservation because it uses the natural resource/ source of heat: sunlight. This method can be used on a commercial scale as well at the village level provided the climate is hot, relatively dry and free of rainfall during and immediately after the normal harvesting period. At the same time dried vegetables have certain advantages over those preserved by other methods. They are lighter in weight than their corresponding fresh

produce and, at the same time, they do not require refrigerated storage. However, if they are kept at high temperatures and have a high moisture content they will turn brown after relatively short periods of storage (Dauthy, 1995).

Green leafy vegetables such as leaves of cassava, sweet potato, papaya and pumpkin are widely eaten in Africa. They are rich in beta-carotene and minerals, inexpensive and can help to reduce hunger and malnutrition. Dried fruits and vegetables reduce bulkiness and weight therefore eases storage, transportation and avoids wastage. Storing and drying indigenous vegetables can provide families with a better diet all year round (CTA,2007).

2.3 Theoretical Framework

2.3.1 Women Empowerment Approach

There are many theories that can be used to support this study such as Social Relations Framework, Gender and Development and Caroline Moser's Gender Planning Framework. Caroline Moser's Framework can be used concurrently with Empowerment Framework because they compliment one another. This is because Caroline Moser's Gender Planning Framework focuses on strategic needs, gender equalities and how to address this at programme and policy level (Moser, 1993). For the purposes of this study, Empowerment Framework is more appropriate because it is useful across micro (project) and macro (country strategy) levels of analysis and also where focus is specifically on empowerment of women as in the case of this study. The framework has a strong political perspective that aims to change attitudes. The Framework was developed by Sarah Longwe in the 1990s.

The concept of empowerment was adopted after the Beijing Conference (1995). The Beijing Declaration (section 13), presents women's empowerment as a key strategy for development:

"Women's empowerment and their full participation on the basis of equality in all spheres of society, including participation in the decision-making process and access to power, are fundamental for the achievement of equality, development and peace". This framework was developed through Longwe's work with the Ugandan government and with UNICEF in the early 1990s.

The framework's intent is to help planners question what women's empowerment and equality means in practice, and asses to what extent a development intervention supports this empowerment. "Women's empowerment is a strategy of collective action by women, to analyse their own problems and to seek their own solutions. In the case of women's advancement in Africa, this process automatically involves the recognition of the patriarchal barriers of discriminatory belief, custom, regulation, and law", (Longwe, 1994). This framework helps to think through what women's empowerment and equality between women and men means in practice, and the extent to which an intervention is supporting women's empowerment. Longwe defines development as enabling people to change their own lives while escaping from poverty that arises from oppression and exploitation rather than lack of productivity (March *et al,* 1991). Women's gender concerns are the issues that arise when gender roles (rising from the customs and traditions of particular societies, not due to biological difference) involve unequal burdens of work and unequal distribution of resources and this is recognised as undesirable or unjust (Moser 1993).

2.3.2 Relevance of the Women Empowerment Framework to the study

This framework addresses the gender gaps arising from a given society by systems of gender discrimination. Such discrimination against women is pervasive at the level of tradition and social practice hence limit women's active participation in using traditional methods of food preservation. This framework therefore seeks to empower women at all levels so that they can be endowed with skills of appropriate technologies to curb post harvest wastage through preservation. The framework also looks into the access to and control of resources by women so that they can improve their livelihood both economically and socially.

Women's Empowerment Framework promotes women's collective participation in decision-making processes to promote the traditional methods of food preservation. The approach enables women to influence events so that one's own interest is protected. It ensures that women own resources and benefits are distributed so that both men and women get equal shares.

2.4 Assumptions

1. Women's role in preservation of indigenous vegetables using traditional methods promotes availability of food among the people of East Alego.

2. Women's positive perception on traditional methods of vegetable preservation has a positive impact on food status of households.

3. Women face challenges in using traditional methods to preserve indigenous vegetable.

2.5 Definitions of key terms

Gender is the culturally and socially constructed roles difference between men and women that varies from place to place and time to time.

Food is what human's ingest in order to sustain life (See Omosa, 1998). In this study it is any nourishing substance that is eaten, drunk, or otherwise taken into the body to sustain life, provide energy, and promote growth.

Food Preservation is the method of preparing food so that it can be stored for future use

Traditional method is the indigenous knowledge or local knowledge that is unique to a given culture or society.

Appropriate methods are methods, which are easily accessible and affordable.

Post-harvest is the period after harvest to the time food is processed for consumption or storage (Ritenour, 2003)

Indigenous vegetables are native (non-exotic) vegetables known to a particular society and consumed by them.

Food status is the state of food supply

Women's perception is the view of women on traditional methods of food preservation.

CHAPTER THREE

Methodology

3.1 Introduction

This chapter is divided into nine sections. The first section deals with description of research site, research design, study population, sampling population, sampling procedure, data collection methods, Data Processing analysis, ethical consideration and work plan.

3.2 Research Site

Location and Topography

Map 1: Siaya District Map by Administrative Units-2007

(Courtesy of Siaya District Development Officer - Source: Siaya District Development Plan 2008 - 2012)

Siaya District is one of the 12 districts that comprise Nyanza Province. It is bordered by Busia District to the North, Vihiga and Butere-Mumias Districts to the North-East, Bondo District to

the South, and Kisumu District to the South-East. The total area of the district is approximately 1520 km2. The District lies between latitude 0° 26' to 0° 18' north and longitude 33° 58' east and 34° 33' west.

The district is drier in the western part towards Bondo district and is wetter towards the higher altitudes in the eastern part. On the highlands, the rainfall ranges between 800-2000mm per annum. The lower areas receive between 800-1600mm. The long rains fall between March and June, with a peak in April and May.

The main food crops grown are maize, sorghum, beans, cassava, sweet potatoes and vegetables; while the main cash crops grown are sugar cane, cotton, Robusta and Arabic coffee respectively((District Development Plan 2002-2008). The population is estimated to be 480,184 persons (GOK, 2001b).

3.3 Research Design

This study was cross-sectional in nature and both qualitative and quantitative methods of data collection were used. The study ran for two weeks and was conducted in three phases. The first phase involved quantitative data collection method where a structured questionnaire was administered to the respondents. A total number of 30 women drawn from 30 households' were subjected to the questionnaires. The 30 households were drawn from the three sub-locations: Ulafu (10 respondents), Umala (10 respondents) and Olwa (10 respondents), which constitute East Alego location. Ten respondents from each sub-location were selected through simple random sampling. The researcher got a list of households from the sub-chief of each sub-location. The second phase involved conducting three focus group discussions of between 6-12 participants drawn from each sub-location. The choice of the groups was purposive based on those involved in agricultural activities. The list of women groups was acquired from the social development officer of the region. The third phase was key informant interview with elderly women who have the authentic knowledge on traditional methods of food preservation. This was to enable the researcher to probe issues arising from the survey and opinions regarding traditional methods of vegetable preservation. In each sub-location, one key informant was interviewed and in total three key informants were interviewed.

3.4 Study Population & Unit of analysis

The study population were all women of 20 years and above involved in agricultural activities in East Alego. An individual woman was the unit of analysis.

3.5 Sample Population and Sampling Procedure

Thirty women involved in agricultural activities were subjected to questionnaires with closed and open-ended questions. Due to the nature of the study, all the three sub-locations within East Alego Location were studied. In every sub-location, 10 households engaged in agricultural activities were randomly selected to come up with the sample population of 30 and only women were interviewed. Key informants were the elderly women, who presumably have the authentic knowledge on traditional methods of food preservation.

3.6 Data Collection Methods

Primary and secondary data sources were used through out the study to answer the research questions and satisfy the objectives

3.6.1 Secondary Data

Secondary data are those data generated from other people but have relevance to the study. This include the journals, papers, thesis, government publications and books. These sources continued to act as reference materials through out the study.

3.6.2 Primary data

Primary data are information gathered in the field through, surveys, focus group discussions and key informant interviews.

3.6.2.1 Survey Method

This was conducted through face-to-face interviews by use of a standard questionnaire. The aim was to gather information from women in the study area.

3.6.2.2 Focus Group Discussions

In every sub location, one focus group discussion was conducted. The choice of women group was purposive because it involved women groups engaged in agricultural activities only. Focus group discussions had the advantage of yielding useful information from women groups.

3.6.2.3 Key informants.

The key informants were the elderly women who have the authentic knowledge on traditional methods of food preservation. From each sub location, one elderly woman was interviewed. This was to allow the researcher to probe the emerging issues from focus group discussions.

3.7 Data Processing and Analysis

Quantitative data were analysed using SPSS computer software and the results presented in tables of frequencies, bar graphs and pie chat forms. Qualitative data were analysed thematically and presented in verbatim quotes.

3.8 Ethical Consideration

This study took into consideration appropriate research procedures and acknowledged all sources of information as much as possible. The informant's privacy was upheld and information given treated with maximum confidentiality and consent sort where necessary. The integrity of the institution (Instituted of Anthropology, Gender and African Studies – University of Nairobi) was also protected and no harm was done to any party.

3.9 Difficulties and solutions

The major difficulty the researcher faced was insufficient funds. Some households were very far apart and this forced the researcher to incur a lot of money on transport.. The second problem was with the informants who were very busy during the day because it was during rainy season and most of them went to the farm first before meeting me in the late afternoon. The third problem was the expectation of the informants who thought that researchers always have money to be disbursed to informants but this was sorted out when my contact person informed them I am a student and the understood.

CHAPTER FOUR

Role of women in preservation of indigenous vegetables

4.1 Introduction

This chapter presents the demographic characteristics of the respondents and research findings. Three methods of data collection were used namely face-to-face interviews by use of a standard questionnaire, key informant interviews and focus group discussions. The chapter focuses on the role of women in preservation of indigenous vegetables using traditional method, their perceptions and challenges faced by women in using traditional methods.

4.2 Socio-demographic Characteristics of Respondents

Age

A total of 30 women participated in the survey. The frequency plot indicates that majority (40%) of the respondents were between ages 51 and 85 (Table 4.2). This could a reflection of the fact that most people of that age were widowed and actively participated in various groups.

Table 4.2: Age distribution of respondents

Age	Frequency	Percentage	Religion
20-39	8	27%	Christian
40-50	10	33%	Christian
51-85	12	40%	Christian

Education

Most (46.7%) respondents are illiterate. This is an indication that the respondents level of education is quite low. This could be attributed to the fact that majority of the respondents have no background on education.

Table 4.3: Informants' level of education

Level of education	Frequency	Percentage
Primary	6	20%
Secondary	9	30%
University	0	0%
None	14	46.7%
Other(Diploma)	1	3.3%

Marital Status

Most 56.7% (17) informants were married. The remaining 40% were widowed and one single as shown in (Table 4.4).

Table 4.4: Informants' marital status

Marital status	Frequency	Percentage
Married	17	56.7%
Widowed	12	40%
Single	1	3.3%

4.3 Role of women in preservation of indigenous vegetables

The study assessed the role of women in preservation of indigenous vegetables using traditional methods of preservation. Majority 93.3% (28) of the respondents felt that traditional methods of vegetable preservation have not been used in a long time. This is because they were informed to consume fresh vegetables. About 60% (18) of the respondents knew about the art of drying vegetables. However, all of the 60% (18) respondents talked about one type of vegetable, *vigna* (*boo* in Luo) and this was referred to as *manyonyo*. *Manyonyo* is the final product of dried *vigna* and can be kept in a closed pot or container that was sealed with cow dung throughout the year. This was to ensure that food is available through out the year and could be used during drought period. However, some 53.3% (16) respondents out of those who talked about drying (*manyonyo*) were not aware that other indigenous vegetables could be dried and kept for use in times of need. Other types of indigenous vegetables were however, fermented according to one

key informant. Women in the focus group discussions were in consensus that women had a role to play in preservation of vegetables.

Majority 80% (24) of respondents reported to have the knowledge of fermentation. Out of 30 informants interviewed, 33.3% (10) have the knowledge of both drying and fermentation and 53.3% (16) had the knowledge of drying vegetables. Another 13.3% (4) had no knowledge on traditional methods of food preservation as illustrated in (figure 1). This was also confirmed by focus group discussions and Key informant interviews that the well known method of vegetable preservation was fermentation. The knowledge of drying vegetable was extracted mostly from key informant interviews and other elderly women.

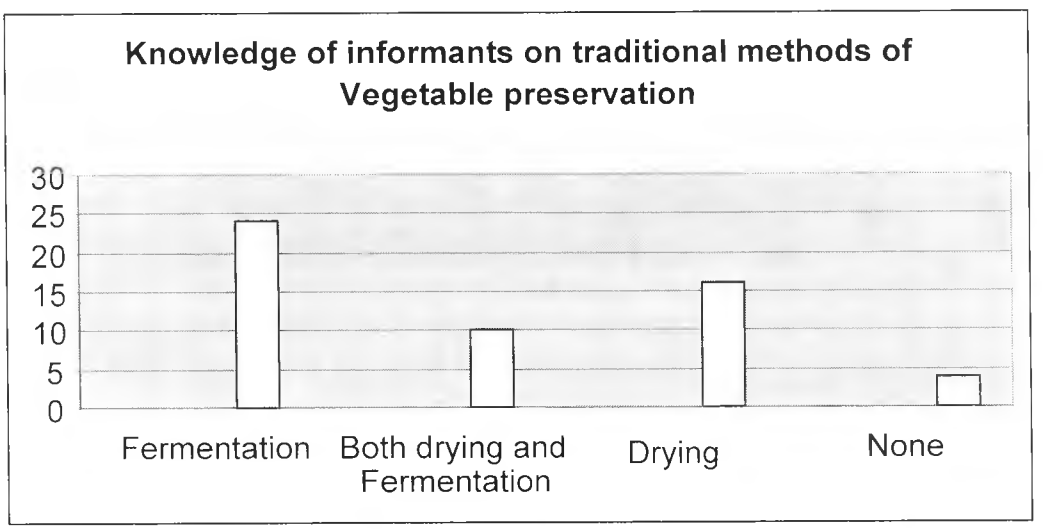

Fig.1 Knowledge of Informant on Traditional Method of Vegetable Preservation

4.4 Vegetable preservation methods still in use

From the study, it emerged that the method of drying vegetable is not used at all. Although some respondents have the knowledge, it was long discarded with the coming of modernization. Similarly, the discussants in focus group discussions were in agreement that vegetable preservation by use of sun-drying is not used at all though some people still use fermentation. Some key informants had the same idea that the commonly used preservation method was fermentation but drying was not used at all though in the early days they dried *vigna* (*manyonyo*).

Out of 30 respondents, 80% (24) of the respondents talked about preservation of vegetables through fermentation. Another 13.3% (8) stopped the practice of fermentation because people rely so much on eating fresh vegetables. However, about 53.3% (16) still ferment traditional vegetables but this method cannot stay a long as the dried vegetables. About 33.3% (10) had seen how vegetables were being dried especially from those who send vegetables to their relatives and friends abroad. While 20% (6) had neither seen nor heard about vegetable drying (figure 2).

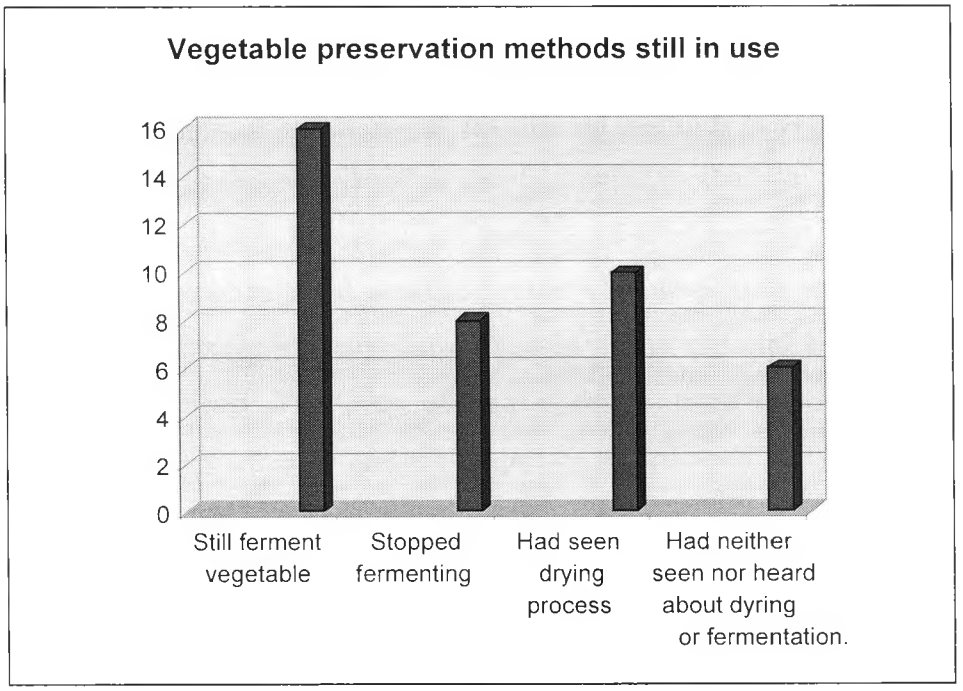

Fig. 2 Vegetable preservation known and are still in use

4.5 Post harvest effects

Post harvest effects are enormous according to the study. Due to lack of appropriate preservation and storage methods, a lot of food goes to waste during and after harvesting. Vegetable and fruits are the worst hit because no one has ever thought of preserving these products. When the vegetables and fruits are in season, people tend to have the same therefore those who take their produce tend to sell at very low prices and whatever remains is thrown away. One respondent reported that some vegetables that remained were treated as feeds for the animals. She expressed that indigenous vegetables were left to die off in the farms then after a short duration especially after the rains, they experience shortage of vegetables like it happened between the months of June and July 2010 just before the short rains began. .

4.6 Methods of food preservation known and frequently used

About 96.7% respondents reported that the main preservation method they know is drying. This is frequently used on cereals. In some cases fish can also be dried but after going through certain processes. Fish can also be smoked. Meat can also be dried but after salting and roasting. The only method of vegetable preservation that was frequently used and known to most people was fermentation (figure 2). However, some respondents find the process expensive because it requires a lot of milk.

4.7 Perceptions on the use of traditional methods in vegetable preservation

Most 83.3% respondents reported that traditional methods of indigenous vegetable preservation was an excellent idea because it is a measure of food security. The respondents stated that drying vegetables was abandoned because people were advised to eat fresh vegetables. They said that this led to wastage of vegetables when in plenty especially during rainy seasons when most families had plenty. They were of the opinion that those who took their vegetables to the market fetched very little money and the remaining was thrown away because they could not consume everything or just treated as animal feeds.

The discussants in focus group discussions were in consensus that vegetable drying was an excellent idea. One respondent in focus group discussion stated,

> *"This information just came at the right time. Just recently we were buying five stalks of sukuma wiki at Kshs. 5/=. I will share the information with my group members and during Kogelo Cultural Festival we will have to display our dried vegetables and if possible sell some",* **(Female, 50yrs, Ulafu, Siaya, Kenya).**

Key informants were of the opinion that vegetable drying was a very good idea that should be revived. One key informant said:

> *"In the early days we used to dry manyonyo and onyulo which were kept in sealed containers and this ensured that there was enough supply vegetables through out the year"* **(Female, 76yrs, Olwa, Siaya, Kenya)**.

Another key informant stated:

> *"Who can eat dried vegetable in the modern day where fresh vegetables are the most preferred to dried or fermented vegetables? Our children and grandchildren cannot eat dried*

*vegetables. Even we old people are used to eating fresh vegetables to the extent that it never occurred to us that we can still dry vegetables and keep"(***Female, 54yrs, Umala, Siaya Kenya).**

In general, 83.3% of respondents felt that reviving vegetable preservation through sun drying is an excellent idea to keep vegetables and even for economic purposes. Another 10% (3) felt it was a good idea. However, 6.7% had no idea as illustrated in the pie chart below (figure 3).

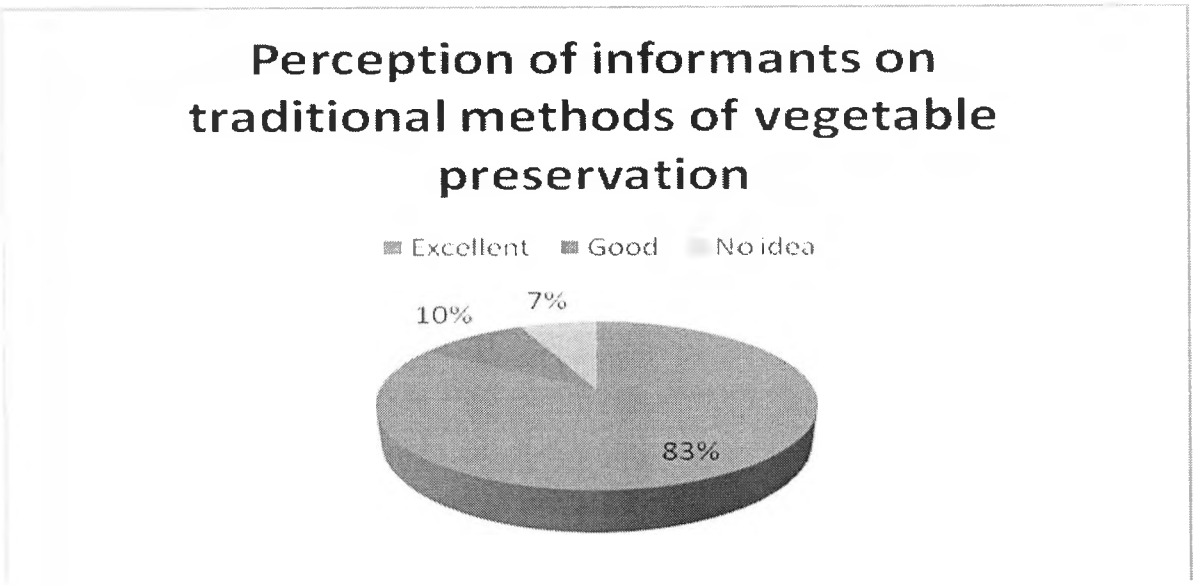

Fig 3. Perceptions of Respondents on Traditional methods of Vegetable Preservation

4.8 Challenges faced by women in using traditional methods of vegetable preservation.

There were many challenges that were faced by women in using traditional methods of indigenous vegetable preservation. These challenges range from lack of knowledge, introduction of exotic vegetables, lack of capital, time.

Lack of Knowledge

Most 80% (24) respondents did not know how to preserve vegetables through drying method. However, some respondents preserved their vegetables through fermentation. Though fermentation is still being used to some extent, some people 13.3% (8) do not use it because it requires a lot of milk, which many people do not have. Key informants who were of ages 50-85 reported that they had the knowledge of drying vegetables especially *vigna (manyonyo)* but

abandoned the method because of the introduction of exotic vegetables. Secondly, they reported that with the introduction of modernity, almost 53.3% of the respondents resorted to eating fresh vegetables and other modern types of food rather than indigenous vegetable.

Lack of knowledge was confirmed by the discussants in focus group discussions. The discussants felt that most women do not have the knowledge of vegetable drying except fermentation. Some respondents 33.3% (10) reported that they had seen dried vegetables but did not know how to do it. Not all respondents were aware that all vegetables could be dried, except *vigna* (*boo*) and Sesamum calycimum-botanical name (*onyulo*).

Lack of time

Half of the respondents 50% (15) who had the knowledge of vegetable preservation stated that they do not have time for drying vegetables. They reported that the work burden is overwhelming on women. They spend most of their time in the farms and after that; they are committed in other social duties such as women group meetings, community functions, making ways to provide for their families and many others. As concerns lack of time, the discussants in an FGD agreed that women have so much work load thus they might not have time to dry vegetables hence they prefer fresh vegetables. While drying will require that, they monitor the process for some time and make sure it is dried well for preservation, Key informants also confirmed that time was a major concern since women participate in various activities such as house chores and community work.

Introduction of exotic vegetables

The introduction of exotic vegetables with their glamorous look became more appreciated in the rural areas. The respondents 53.3% (16) reported that people find exotic vegetables easy and faster to prepare than the indigenous vegetables. However, even with the introduction of exotic vegetables, a lot of it is wasted during peak season as reported by 60% (18) of the respondents. Only 26.7% (8) respondent reported that they had seen dried sukuma wiki ready to be sent to relatives in the USA. Introduction of exotic vegetables was confirmed by the discussants in FGD that the exotic vegetables are easier to prepare and this may have contributed to the abandoning of traditional methods of vegetables preservation. The key informant also stated that the

introduction of exotic vegetables contributed to the discarding of traditional methods because the vegetables taste better when eaten fresh. Secondly, they were not aware that even the exotic vegetables can also be dried.

Attitude on indigenous vegetables

Some respondents 33.3% (10) reported that indigenous vegetables were treated as food for the poor because some of them were just picked from the field. The methods of preservation were not appreciated by the modern humanity. According to one Key informant:

> *"Who in this modern world can eat dried vegetables yet we were told to eat fresh vegetables which have a lot of vitamins. These are practices that we abandoned many years back and I do not see people preserving vegetables" (***Female, 62 yrs, Ulafu, Siaya, Kenya**)

They also reported that the hygiene of preservation is not guaranteed because in the 19th century we did not have so many diseases like today. "*There were no diseases such as typhoid*", one respondent reported. This was also confirmed by the discussants in focus group discussions that some people had a very low opinion on indigenous vegetables since some of them were just picked from the field.

4.8.5 Lack of market

About 66.7% (20) respondents reported that they lacked market for their vegetables and that could be one reason why they abandoned the practice. However, they were enthusiastic that vegetable in dried form will be easier to market in local and international markets. The cost of transportation will be lower because the quantities will be smaller and easy to handle than fresh vegetables. This will on the other hand boost their economic power and contribute to economic development of the whole nation. Lack of market was reported by the respondents and confirmed by focus group discussions and key informant interviews (Figure 3).

As concerns lack of market, the discussants in FGD came to agreement that lack of market is a major problem however, they stated that if they can get market for the dried vegetables, they will revive the practice. The key informants were also in agreement that lack of market was a major challenge.

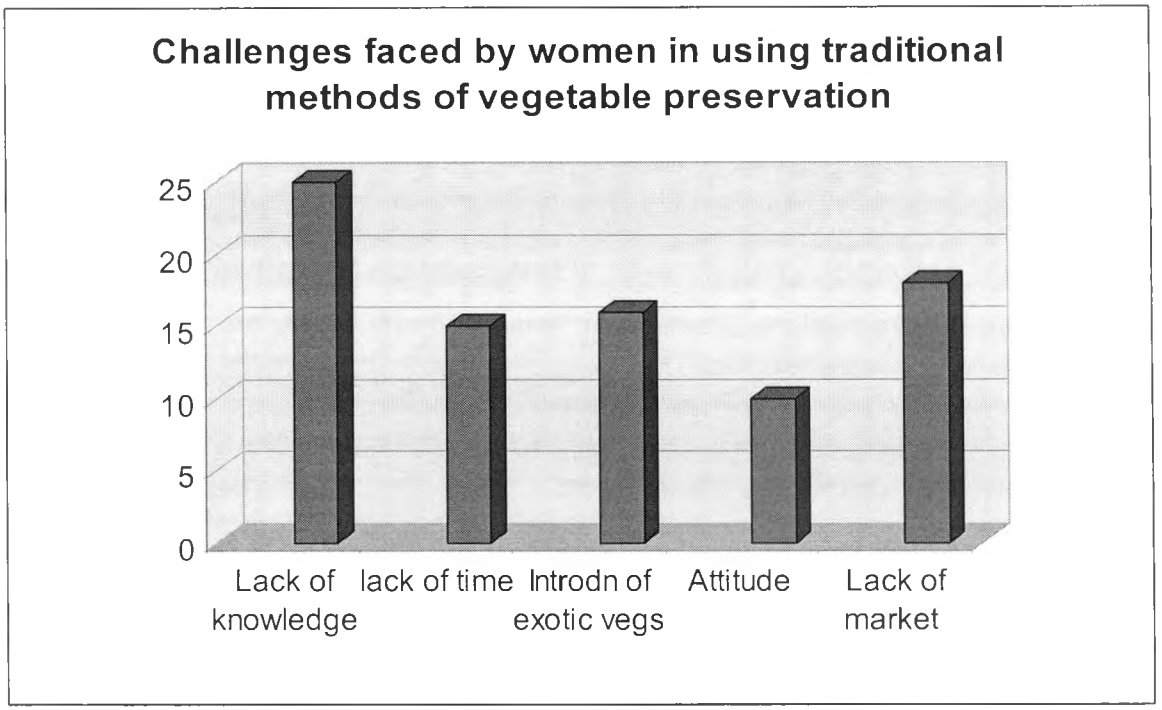

Fig. 3. Challenges face by women in using traditional methods of indigenous vegetable preservation

CHAPTER FIVE

Discussions, Conclusions and Recommendations

5.1 Introduction

In this chapter, the findings are interpreted to show traditional methods of food preservation are under exploited, the perspective of women in traditional methods of vegetable preservation and the challenges they face in using these methods.

5.2 Discussion

Role of women in preservation of vegetables

The study was designed to assess the role of women in preservation of indigenous vegetables using traditional methods of preservation. Information gathered in the field indicates that women are the sole producers of indigenous vegetable and that it was their role to make sure it is persevered well. Vegetable preservation was predominantly women's role to ensure that there was enough food for the family throughout the year (Shrestha *et al.*, 2004). According to Nirmala *et al,* (2007), rural women are often the major players in utilizing wild traditional food plants including vegetables. They hold and maintain the knowledge about gathering locations and seasons, preservation, processing, and culinary uses of such plants. Women were also involved in cultivation and trading of traditional vegetables to strengthen their economic status within the families. In the recent times, vegetables drying are not very practical among households in East Alego. Women do not dry vegetables and keep in containers like those that they used to do in the past. During the time of the study, none of the women had preserved vegetables. According to (Battcock and Azam-Ali, 1998), Most of this knowledge has not been documented and are in danger of being lost as technologies evolve and families move away from traditional preservation methods.

Findings from the study showed that the only method of preservation the respondents were well conversed with is fermentation. This method is equally good though it cannot keep vegetables as long as the dried vegetables. The only problem is that it requires a lot of milk for fermentation and this was not always available in many households. Only a very small section of the

respondents was not aware of any type of vegetable preservation. Currently, none of the respondents participates in preservation of indigenous vegetable using sun drying. Some people still use fermentation method especially when there is plenty of milk and vegetables.

Key informants who were elderly women, at one point in time preserved *vigna* (*Manyonyo*), using sun-drying method that made vegetables stay as long as possible. However, the introduction of exotic vegetables has been on the rise at the expense of indigenous vegetables partly promoted by development programmes (Shrestha *et al.*, 2004) that devalued traditional methods.

Majority of the respondents felt that traditional methods of vegetable preservation are no longer in use. This is because most people in the rural consume a lot of fresh vegetables. Those who had the knowledge of vegetable preservation no longer dry vegetables. However, those who had the knowledge of drying vegetables knew about one type of indigenous vegetable, *vigna (boo* in Luo) that was referred to as *manyonyo. Manyonyo* is the final product of dried *vigna* and could be kept in a closed pot or container that was sealed with cow dung throughout the year. This was to ensure the availability of food through out the year and could be used during lean period. Other respondents also mentioned another type of indigenous vegetable called (*onyulo*) *Sesamum calycimum*- botanical name that could be dried just like the *vigna*. However, the respondents were not aware that other types of locally available indigenous vegetables could be sun dried just like *vigna* and *onyulo*.

According to the field report, a lot of vegetable was lost during harvesting and post harvesting period because they did not have the knowledge of vegetable preservation and this led to inadequate supply of vegetables during drought period. Odiaka and Schippers (2004) concur with Keya, (2001) that indigenous vegetables ensure food security since most of them are drought and pest resistant. Most species have a potential for income generation since they grow throughout the year and can be harvested with minimal inputs (Jacks 1994). However, there is fear of losing the indigenous knowledge while large quantities of vegetables are lost due to poor handling and storage (Maudu, 2004).

The informants reported that focus has been so much on fresh vegetables and their modern way of processing thus making the traditional methods of food preservation go unnoticed. Brandtzaeg (1979), argues that research have always emphasised more on modern food processing, and the application of sophisticated technology. This shows how traditional methods are not backed by dominant economic interest in research. The male bias in research has defocused local food preservation methods used by women in the area of research and action (Brandtzaeg, 1979). Therefore, women in East Alego do not preserve vegetables using drying method except for a few who still do fermentation but participate a lot in production of these vegetables. Unlike Kisii, women still dry vegetables but due to the increasing demand of indigenous vegetables, Kisii men have also ventured into the production and preservation of these vegetables because indigenous vegetables have gone commercial (Abukutsa, 2007).

This study has found that, promotion of exotic vegetables with their glamorous look contributed to the loss of knowledge on traditional methods of vegetable preservation because people were encouraged to eat fresh vegetables rather than fermented or dried vegetables. A report from the United Nations Food and Agriculture Organization warns of the dangers posed by developmental initiatives that ignore indigenous knowledge. In the olden days the indigenous vegetables would be dried then kept in a container (*dak*) or sacks. This method of keeping vegetables ensured adequate supply of vegetables through out the year. The loss of this knowledge exposes communities to food insecurity yet women play a significant role in the application and preservation of this indigenous knowledge (Kilongozi *et al*, 2005). Currently in East Alego, preservation of vegetables using traditional methods.

The perceptions of respondents on traditional methods of vegetable preservation

Findings of the study showed that the respondent's perception was very positive on the use of traditional methods to preserve indigenous vegetables. They felt that women should be endowed with more skills on traditional methods of vegetable preservation since most respondents had either forgotten and some had never seen how vegetables were sun dried. They reported that this was a very good idea, if drying of vegetables would be implemented, it could contribute to improving the economic status of the households while enhancing food security and curbing the problem of malnutrition, which, is very common in Sub-Sahara Africa and affects more of

children and women. A section of the respondents indicated that it was good and worth trying, while a minimal number indicated that they had no idea on traditional methods of food preservation. According to the respondents, the promotion of fresh vegetables made them abandon this practice while it was worth keeping especially in the rural area where the only available form of preservation is by use of sun light.

The discussants in FGD came to agreement that preservation of vegetable through drying is a good idea with some of them indicating that they would start the practice immediately. Key informants were also of the same idea, though they highlighted that migration to urban center's has interfered so much with the way messages or information was being passed on in the past..

Information gathered in the field indicates that promotion of traditional methods of vegetable preservation can reduce post harvest wastage of vegetables while at the same time improve food security within households (Keya, 2001). The respondents felt that traditional methods of vegetable preservation would salvage post harvest wastage of vegetables. In African countries such as Niger and Zambia, women use solar driers to dry vegetables and fruits to be used in times of need while at the same time, the sale of these products increases income generation opportunities so as to create a greater financial base at family level and nationally (Lemunyete & Bruntse, 2003). The discussants in FGD agreed that traditional methods of vegetable preservation can improve food security within households and even nationally. Key informants were also of the idea that traditional methods of food preservation are a sure way of having food all year round.

The study established that vegetable drying was a very noble idea that would make them have food all year round with some respondents citing periods when they suffered due to lack of vegetables. In the year 2008/09, pastoralist in Northern Kenya experienced a a severe loss during drought after loosing their cattle. In the same line of taught, there should have been a way of drying the meat and reselling when there is none. In South Africa, excess meat (*biltong*)is dried and sold in supermarkets as a delicacy of South Africans. The word *biltong* is from the Dutch *bil* ("rump") and *tong* ("strip" or "tongue),Wikipedia.

Challenges faced by women in using traditional methods of food preservation

Despite the positive perception on traditional methods of vegetable preservation, the respondents cited some challenges that could be a hindrance their use of the methods. These were; lack of knowledge, lack of time, lack of market, promotion of exotic vegetables and attitude.

Lack of information

From the study it emerged that most respondents were ignorant about the traditional methods of vegetable preservation. They only method they were conversant with was fermentation, which is still being used by a few individual. However, most of the respondents did not know how to dry vegetables. The few old women who had the knowledge knew how to dry *vigna* and *onyulo* only, the expressed their concern that they did not know how to dry other types of indigenous vegetables. Very few respondents had the knowledge of preservation methods though the practice of passing information from the old to the young especially from mothers to daughters no longer happens. Lack of information on traditional methods of vegetable preservation was identified as the key factor hindering women from preservation of vegetables. One informant cited that if they had the information they would not have wasted vegetables the way they have been doing. From the FGDs, participants also felt that the main challenge they faced was lack of knowledge.

Lack of time

The respondents also reported that workload is too much and some of them may not have time to dry vegetables because they are always out for other community responsibilities, however with proper management it is very possible to manage all duties while taking care of the welfare of the family. The respondents expressed their concern that they had too much responsibilities and this would require that they wait for the vegetables the whole day. They also expressed their fear that if the vegetables were left unattended to, someone would steal them.

Introduction of exotic vegetables

From the study, the respondents cited introduction of exotic vegetables and modernization that threw away traditional practices because the practices were termed as remote and backward methods of food preservation. Some respondents reported that the exotic vegetables are easier to

cook because one only needs tomatoes, onions and oils then cook within a period of five minutes. This easy way of cooking made many household leave indigenous vegetables without considering the nutritional valus of indigenous vegetables. Key informant interviews confirmed that one of the challenges women faced in using traditional methods of vegetable preservation, was the introduction of exotic vegetables. Key informants also stated that there has been laxity of the elderly people to pass on the information on traditional methods of vegetable preservation to the younger generation.

5.4 CONCLUSION

The main focus of this study was to investigate the participation of women in preservation of vegetables using traditional methods. The study set out to assess the role of women in preservation of vegetables, explore the perception of women on traditional methods of vegetable preservation and lastly examine the challenges women face in using these methods.

The study found that women do not participate so much on preservation of vegetables using traditional methods. The few who were participating ion preservation were using fermentation only. It came out clear from the study that women who had the knowledge on vegetable drying were elderly women who in the early days may have participated in preservation of *vigna (manyonyo)*. From the study, it is evident that lack of knowledge on preservation of vegetables was a major constraint in using traditional methods of preservation. Those who had the knowledge did not pass it to the younger generation.

From the study it was found that traditional methods of vegetable preservation were discarded due to development programs that introduced exotic vegetables with their glamorous appearance and the promotion of fresh vegetables. However, there are a few women who still dry vegetables occasionally to send to their relatives and friends abroad. Fermentation of vegetable has also been discouraged but some women still use it. Most women do not use fermentation because it requires a lot of milk which most of them do not have as reported in the study.

The perceptions of women on traditional methods of vegetable preservation was very positive. Most of them were very enthusiastic to start the process of drying vegetable during this short rain

period when there is plenty of vegetables. Some women stated that it would improve their financial base since they would be able to sell some during lean period. Information gathered in the field also indicates that promotion of traditional methods of vegetable preservation can reduce post harvest wastage of vegetables while at the same time improve food security within households (Keya, 2001). In African countries such as Niger and Zambia, women use solar driers to dry vegetables and fruits to be used in times of need while at the same time, the sale of these products increases income generation opportunities so as to create a greater financial base at family level and nationally (Lemunyete & Bruntse, 2003). In focus group discussion, the participants agreed that traditional methods can improve food security within households if the implementers reconsider reviving the methods.

Despite the positive perceptions of women on traditional methods of vegetable preservation, women still face challenges in using these methods. Most women lack the knowledge of vegetable preservation and this emerged to be the main problem. It is therefore the prerogative of the government to ensure that this knowledge of traditional methods of vegetable preservation is disseminated to the grass level to reduce post harvest wastage of vegetables and ensure food security. The other challenges that women faced in using traditional methods include lack of market, the introduction of exotic vegetables and the attitude of people on indigenous vegetables. People are oblivious about the fact that these vegetables may contribute to alleviating malnutrition that is very common among then the vulnerable groups.

From the study, traditional methods of vegetable preservation in Kenya are under exploited. Perishable farm produce such as indigenous vegetables are wasted, sold at throw away prices during the peak seasons due to inadequate post harvest storage facilities and lack of effective processing or preservation techniques, leading to high wastage levels and low capacity utilization (Agona *et al*, 2002).

As the world's population continues to grow, reliable and sustainable improvement in food security is required to meet the demands of this growing population. At the same time, there is need to eradicate malnutrition by promoting the consumption and preservation of indigenous vegetables that contain a lot of macro and micronutrients, hence protect human against

infections. The preservation and sustainable utilization of indigenous vegetables are key in improving agricultural productivity and sustainability. It also contributes to national development and, food security and alleviation of poverty.

5.5 RECOMMENDATIONS

- There is need for public awareness campaign on traditional methods of vegetable preservation, as it emerged from the study that people are ignorant about these methods. Respondents were not aware that preservation of vegetables can make them have supply of vegetables through out the year. There should be well-structured channels of information dissemination on traditional methods of vegetable preservation at grass-root level.
- Women should be empowered with the knowledge and skills on the traditional methods of vegetables preservation and other foods in general.
- There should be a policy on traditional methods of food preservation for easy implementation. Policy makers should be made aware of this strategy for purposes of enhancing food security and curbing malnutrition in the rural areas while improving economic empowerment of households.
- The government as well as stakeholders such as non-governmental organizations, donor agencies should be proactive in improving food security by funding the promotion of traditional methods of vegetable preservation.

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APPENDICES

APPENDIX I

5.1 Introductory Letter

My name is ...**Audia Oyugi Atogo** I am a student from the University of Nairobi conducting research on Food Preservation methods in this area. The study is purely for academic reasons. All your responses including your personal identity will be treated with confidentiality and the information shall not be disclosed without your authority. The findings of the study may be used for future academic or policy making.

Your participation shall be of great value to this study.

Thank you.

Audia Oyugi Atogo
MA Gender and Development Studies
University of Nairobi

APPENDIX II

Questionnaire

A. Background information

1. Name ? (optional .....
2. Age
3. Marital status?

   1). Single 2). Married 3). Others (please specify

4. Religion?

   1) Christian 2) Muslim 3) Others (please specify)

5. What is the highest level of education/training attained?

   1) None 2) Primary 3) Secondary 4) University 5) Any other

B. Vegetable Production

1. Which vegetables do you grow in this region?

Local name	English name	Storage	Preservation method
Ododo mayom	Smooth pigweed		
Soi, Soi	Amaranth		
Ododo mar kudho	Spiny pigweed		
Kadhira	Wild mustard		
Apoth madongo	Jute		
Mitoo madongo	Sunnhemp		
Susa	Pumpkin		
Akeyo, Dek	Spider flower		
Osuga	Black nightshade		
Boo	Vigna, cowpeas		
Any other			

(Please indicate how the above products are preserved and stored in the boxes)

2. For how long have you been farming?

   1) 2-4 years 2) 5-10 years 3)10-20 years 4) over 20years

3. Have you ever suffered from food shortage soon after harvest? If yes, why?

   _____

   _____

4. Are there seasons when you get surplus? If yes, what do you do with the surplus?

1) Preserve 2) Sell 3) Leave in the farm 4) Other

5. How do you store your food after harvest? Why? Please give reason why you prefer that:

1) In the granaries 2) In the house 3) Other

6. What methods of food preservation do you use before storing the harvest?

1) Drying 2) Salting 3) Preservatives 4) Other, Give reasons why?

7. Are there periods when you are forced to sell food due to inability to preserve the surplus harvest? Yes No (please tick or circle appropriately)

8. Which traditional methods of vegetable preservation do you know?

1) Fermentation 2) Salting 3) Drying 4) Other

9. Which one do you use frequently?

1) Smoking 2) Salting 3) Drying 4) Other

10. Why? Give reasons

_____

_____

_____

11. How do you view the use of traditional methods in preservation of vegetables?

1) Excellent 2) Good 3) Fair 4) Bad

12. Have you tried drying vegetables? Yes No

13. a) Would you like to try if the knowledge is availed to you?

Yes No

b) If yes, at what capacity?

1) Large scale 2) Moderate 3) Small scale 4) Other

14. How often, do women preserve vegetables?

1) Very often 2) Sometimes 3) Not at all

15. Which methods do you use for preservation of vegetables?

1) Drying 2) Salting 3) Fermentation 4) Other

16. How effective are the methods used in preservation of vegetables?

1) Very effective 2) Effective 3) Not quite 4) Not at all

17. Which ones are the most preferred? (Please list and state why)

_____

_____

_____

18. What problems do you encounter in using traditional methods of vegetable preservation?

1) Lack of capital to enhance the capacity

2) Requires a lot of time

3) Lack of training and skills

4) Any other

19. How do you address the problem of post harvest wastage? (Please explain)

_____

_____

_____

20. Have you tried addressing the problem using the available resources?

1) Sun 2) Fire 3) Other

21. Do you think the use of traditional methods of vegetable preservation can improve the availability of food within households? If yes, Why? Please explain

_____

_____

22. How will the use of traditional methods of food preservation contribute to the socio-economic status of households? If yes, How? Please explain

_____

_____

23. Any other comment._____

_____

_____

Thank you.

APPENDIX III

Focus Group Discussion Guide

1. Which methods are frequently used in preservation of vegetable in this area?

_____

Why?_____

_____

_____

2. Who participates in vegetable preservation?

_____

Why?_____

_____

3. How do you view the use of traditional methods in preservation of vegetables?

_____

_____

_____

4. What challenges do women face in using traditional methods of vegetable preservation?

_____

_____

_____

5. How do you handle post harvest wastage problems?

_____

_____

6. What benefit do you think promotion of traditional methods of food preservation can bring to households?

_____

_____

7. How do you think preservation of vegetables using traditional methods will address the problem of food crisis in this region?_____

_____

Thank you.

APPENDIX IV

Key Informants guide

1. What is your level of education? 1) Primary 2) Secondary 3) University

2. What is your main source of livelihood? 1) Working 2) Farming 3) Any other

3. Which methods are frequently used in preservation of vegetable in this area?

_____

Why?_____

_____

4. Who participates in vegetable preservation?

_____

Why?_____

_____

5. How do you view traditional methods of food preservation?

_____

_____

6. What challenges do women face in using traditional methods of vegetable preservation?

_____

_____

7. How do you handle post harvest wastage problems?

_____

_____

8. What do you do with excess production of vegetables ?

9. If traditional methods were promoted in this area, would you be ready to adopt it, if yes how do you think it would benefit you?

_____

_____

10. How do you think preservation of vegetables using traditional methods will address the problem of food shortage in the region?_____

Thank you.