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PRELIMINARY STUDY ON THE CONSUMPTION PATTERN, DIET PREFERENCE AND STORAGE PRACTICE OF ROOT AND TUBER CROPS IN THREE SELECTED WOREDAS IN ETHIOPIA

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ABSTRACT: Ethiopia is one of the poorest and least developed countries in the world. Substantial portion of its population is under severe food insecurity. Root and tuber crops have a paramount contribution to the menu of many people in Ethiopia. Nonetheless, little scientific effort has been devoted to the development of root and tuber crops, especially the local ones. Root and tuber crops are consumed as whole (boiled) or supplemented with other food items. Root and tuber crops are rarely eaten uncooked. A cross sectional survey was conducted to assess the consumption pattern, diet preferences and storage practices of root and tuber crops in three selected woredas, in Ethiopia, namely Jarso, Sodo and Konso. Yam, cassava and enset were the most frequently consumed root and tuber crops in Jarso, Konso and Sodo woredas, respectively. The data revealed that consumption of yam, cassava and enset was high among low-income groups. Potato was the most preferred root crop in Jarso and Konso followed by sweet potato and cassava, respectively; whereas in Sodo enset was the most preferred root crop by the majority of the families. It was found that the majority of families in the study area did not store fresh root and tuber crops and even when stored, the period of storage was not beyond three months. However, some root and tuber crops such as qolto can be stored more than two years when sliced into pieces and dried in the sun. Root and tuber crops could play a vital role in ensuring household food security especially in times of drought and famine. There is, therefore, a need for an integrated national effort for the realization of their potential contribution to food security and in mitigating the consequences of drought. Root and tuber crops should get due attention by all concerned and a systematic approach have to be adopted in order to promote optimum production and utilization in Ethiopia.

Key words/phrases: Consumption pattern; Diet preferences; Root and tuber crops; Storage practices.

INTRODUCTION

Root crops include all forms in which food is stored in the swollen underground parts such as true roots or modified stems like tubers; all these structures are particularly well adapted to storage because of their protected position.

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Evidence from a variety of sources suggests that root and tuber crops may have been among the earliest to be domesticated in the humid tropics, preceding the cultivation of seed crops. Root and tuber crops of many different genera have formed part of the diet of primitive people at the food gathering and hunting stage of development (Burton, 1989).

There are a number of root and tuber crops cultivated in different parts of the world. Every country in the world grows some species of root crops (FAO, 1986). Root crops are second to cereals as staple food. Crops, other than cereals or root and tuber crops, rarely provide staple food for most households of the world (Kochhar, 1986). In most developing countries the dietary staples consist of starchy foods, which usually include some root crops. In developing countries, particularly those with high population density per unit area of arable land, it is obvious that the major segment of the population is resource poor, and that they have to obtain not only calories but almost all nutrients from their staple foods, which are generally either cereal or root and tuber crops (Rao, 1976). Although major 'root crops' such as potatoes, sweet potatoes and cassava are the staple foods in the diet of several million people, others like yams and taro are equally important, particularly in the wet tropics. Root crops are often the main dietary staple foods for low-income consumers (FAO/UN, 1990). Besides root crops, the leaves of cassava, sweet potato and cocoyam are commonly consumed in many tropical countries including Zaire, Papua New Guinea and Central Java in Indonesia, especially during periods of food shortage (Hahn, 1984). These leaves contribute some protein to the diet. They also contain minerals, particularly iron and calcium, and provide a valuable source of vitamins A and C. Increased consumption of these green leaves could help reduce the incidence of xerophthalmia in countries where nutritional blindness is prevalent. The use of edible cassava leaves as green vegetable is popular in Africa (Hahn, 1984).

The value of root and tuber crops lies in their starch and sugar content and their appetizing properties (Göhl, 1981). One of the most outstanding characteristics of root and tuber crops is their high production of carbohydrate per unit of land and time. Many root and tuber crops give high yield in tropical areas where grain is difficult to grow. According to FAO production yearbook of 1973, root and tuber crops in the tropics gave a greater yield per unit of land than the major grain crops (FAO, 1973). Therefore, on a relatively limited land, root and tuber crops can support a greater density of population compared to other basic food crops. The other great advantage of root and tuber crops is the fact that they continue to grow

and yield in the dry period (Terra, 1980). Root and tuber crops, like sweet potatoes and cassava, predominate the diets of people living in hot climates or near the sea (Rao, 1976). In general, root and tuber crops thrive best in a relatively cool climate and in a deep friable soil and have similar cultural requirements, needing little care after planting and still giving good yields. Some of them can be left in the soil without undergoing deterioration.

The annual world production of root crops in tons is around 556,000,000, of which potato ranks first with a production of nearly 225,000,000. Others are sweet potato (135,000,000), cassava (105,000,000), yam (20,000,000) and taro (4,500,000) (Kochhar, 1986).

Ethiopia's economy is predominantly agriculture-based, with the majority of its population largely depending on the agriculture sector for its livelihood. Economically, Ethiopia remains one of the poorest third world countries. It is believed that there are several millions of people in Ethiopia who depend on root and tuber crops as their main staple food and others who use substantial quantities of root and tuber crops to supplement their food supply. The regions where root and tuber crops are produced are among the most densely populated in the country. As a result, a shortfall in production of these crops can affect a large number of people (IAR, 1981).

The root crops can be considered in three groups according to their priority in the national economy (IAR, 1981):

1. High priority: Enset (*Ensete ventricosum*), potato (*Solanum tuberosum*) and sweet potato (*Ipomoea batatas*).
2. Local root crops of importance in some areas but considered as secondary priority crops: Taro (*Colocasia esculenta*), yams (*Dioscoria alata*), anchote (*Coccinica abyssinica*) and hausa potato (*Plectranthus edulis*).
3. Introduced root crops that have uses for particular situations: Cassava (*Manihot esculenta*), carrot (*Daucus carota*) and beetroot (*Beta vulgaris*).

Except in few places, many of the root and tuber crops are not popular in Ethiopia due to lack of knowledge in their preparation and consumption. Their utilization is also not fully studied. The present preliminary study was designed, therefore, to find out the consumption pattern, diet preferences and storage practices of root and tuber crops in three woredas in Ethiopia to illustrate their potential as an alternative coping strategy to improve household food security in the country, especially in food deficit areas.

MATERIALS AND METHODS

Site and Participant Selection

The study was conducted in Jarso, Sodo and Konso special woredas. Jarso woreda is found in western Wollega zone of Oromiya Region, whereas, Sodo and Konso woredas are located in Southern Nations Nationalities and Peoples Region (SNNPR). The study involved a cross sectional survey. From each of the three woredas, one urban area (kebele) and three peasant associations were selected using simple random sampling. The households were also selected randomly. A representative of 100 households from each urban area and 300 households from each of the rural areas were selected by random sampling from each of the three woredas. The total number of households surveyed was, therefore, 1200. The families selected for the study represented all socio-economic groups.

Data Collection

Data on the consumption pattern, diet preferences, storage practices and socio-economic background were collected from women who resided in the sampled households through interview using a pre-tested structured questionnaire. Before starting the data collection, each participating family was visited and the purpose of the study and procedures were explained.

The data was collected by enumerators recruited from each region among candidates who had completed high school education and were involved in related field studies in the areas. A one-day training was given to the selected enumerators on interview techniques and filling structured questionnaires. The questionnaires were administered under the close supervision of the investigators and local coordinators. In addition to the questionnaires, data collection was also carried out using a number of focus group discussions (FGD), twelve in each woreda, mainly done by investigators using trained translators who knew the local language. The number of participants in each group discussion differed depending on the particular community. However, eight to twelve people were included for each session. The method of selection of participants for the focus group was "purposive" or "convenience" sampling. Key informants were also interviewed from each of the study woredas.

Data Analysis

The analysis of the information was an on-going process that began with data collection and continued until the final report was written. After every focus group discussion, the information was prepared for analysis, and the

questionnaires completed each day were examined in the field by the investigators and local coordinators, to check for any missing data, consistency of answers and for proper filling of the questionnaires. Data from completed questionnaires were entered and analyzed using SPSS/PC software package version 10.0 for windows. Data cleaning was carried out to ensure that data have been correctly entered into the computer. For data analyses, descriptive statistics was involved where cross tabulation and simple frequency counts enabled relevant inferences.

RESULTS

Socio-demographic Characteristics

The average family size in Jarso and Konso woredas was five, and four in Sodo woreda. The educational status and occupation of the women who reported the household consumption and storage practices varied widely among the families studied (Table 1). The majority were illiterate in all of the study woredas. Approximately 24.1, 15.8 and 4.6% of families were literate in Jarso, Konso and Sodo woredas, respectively. Of these, 90% had education up to high school level; only 10% had college education. From the information obtained, the major occupation was agriculture (71.2%) and (77.6%) in Jarso and Konso special woredas, respectively. In Sodo woreda, only 1.5% were farmers. About 97.9%, 13.7% and 7.9% of the women were housewives in Sodo, Jarso and Konso woredas, respectively. Selling local beverage stood third in the list of occupation in all of the study woredas: 8.7% in Jarso, 9.4% in Konso and 0.5% in Sodo. Other occupations included government employment and weaving.

Consumption Pattern and Diet Preferences of Root and Tuber Crops

Of all the root and tuber crops consumed, yam was consumed most frequently in Jarso woreda, whereas enset and cassava were the most frequently consumed root and tuber crops in Sodo and Konso special woredas, respectively (Table 2).

Among the families surveyed, 23.6% in Jarso incorporated yam in the recipes once or more than once a day. About 11% of families in Jarso consumed the crop 3 to 6 times per week and 16.4% included the crop in their diet twice a week. Only 7.3% of families in Jarso did not consume yam at all. Potato, the most preferred root crop in Jarso, was consumed less frequently during the period of this survey. Only 2.8% of the families included the crop in their diet more than once a day and only 0.5% consumed potato once a day.

Table 1 Socioeconomic characteristics of respondents by woredas.

Socio-economic indicator		Woreda		
		Jarso	Konso	Sodo
Family size		5	5	4
Education (%)				
	Illiterate	75.9	84.2	95.4
	Literate	24.1	15.8	4.6
Main occupation (%)				
	Farming	71.2	77.6	1.5
	House wife	13.7	7.9	97.9
	Local beverage	8.7	9.4	0.5
Self-assessed HH [a] economic status (%)				
	Low	55.1	42.6	50.5
	Average	38.1	51.7	45.1
	High	6.9	5.7	4.4
Interviewer assessed HH economic status (relative to others in PA [b] or kebele) (%)				
	Low	46.6	28.6	37.2
	Average	44.0	51.0	50.5
	High	9.5	20.4	12.3

[a] House hold

[b] Peasant Association

Table 2 Proportion of families consuming root and tuber crops (%).

Woreda	Type of Root and Tuber crops	Frequency of consumption								
		More than once a day	Once a day	3-6 times per week	Twice a week	Once a week	Twice a month	Once per month	Occasionally [a]	Never
Jarso	Potato	2.8	0.5	2.1	12.5	18.7	9.7	12.5	1.4	39.7
	Sweet potato	3.8	5.9	10.2	17.7	23.4	8.0	8.7	0.5	21.7
	Yam	9.3	14.3	11.0	16.4	20.8	6.1	9.4	5.6	7.3
	Hausa potato	-	2.1	1.2	9.2	11.1	5.2	11.1	1.4	58.6
	Taro	0.5	1.4	0.7	9.0	11.1	9.7	13.5	3.5	50.6
	Anchote	1.4	0.7	0.7	3.5	7.8	16.5	20.3	39.5	9.5
	Beetroot	-	-	-	0.2	1.2	0.2	0.7	0.5	97.2
	Carrot	-	-	-	-	1.7	0.2	0.9	0.2	96.9
	Buryi	-	-		0.2	0.3	0.9	1.2	0.6	96.8
Sodo	Enset	78.6	2.5	3.1	3.0	7.4	1.0	2.3	2.0	-
	Potato	1.5	5.6	6.4	18.7	29.0	7.4	18.5	3.8	9.0
	Sweet potato	-	-	-	0.3	0.8	0.5	3.3	3.6	91.5
	Beetroot	-	0.3	3.6	2.6	3.3	2.6	7.7	6.7	73.3
	Carrot	-	0.3	2.3	2.8	2.8	2.8	6.4	8.2	74.4
	Hausa potato	-	1.0	0.8	6.7	1.3	0.3	0.8	0.3	89.0
Konso	Potato	0.7	4.7	0.5	5.4	28.1	2.0	13.8	0.2	44.6
	Sweet potato	0.2	3.0	0.5	2.0	23.2	2.0	15.8	1.0	52.5
	Cassava	9.5	12.8	7.0	11.0	22.0	3.7	7.5	2.0	24.5
	Beetroot	-	-	-	0.7	2.2	-	3.0	1.2	92.9
	Carrot	-	0.2	-	0.5	2.2	-	2.5	0.7	93.8
	Yam	0.7	1.7	-	1.0	2.0	-	2.0	2.0	90.6
	Qolto	-	1.5	0.2	0.5	4.7	0.2	4.4	2.7	85.7
	Kulaya	-	0.2	0.2	-	1.2	0.2	1.0	0.2	96.8
	Taro	-	0.2	-	-	0.2	0.2	0.2	-	99.0

[a] Occasionally = holiday, birthday, wedding, or other ceremonies.

About 84.2% of families in Sodo consumed enset either daily or more than once a day or at least once a week. Meanwhile, potatoes were consumed more than once a day by 1.5% of families in Sodo and at least once a day in 5.6% of families; all the other root crops in the area, including hausa potato and sweet potato were consumed less than once a day. On the other hand, 12.8% of families in Konso consumed cassava daily and 9.5% of families in the area consumed cassava more than once a day, while 24.5% of families did not consume cassava at all. Consumption of the most frequently consumed root and tuber crops were related negatively to household income-status in all the three woredas (Fig. 1, 2 and 3). The main nutritional value of root and tuber crops lies in their potential to provide one of the cheapest sources of dietary energy, in the form of carbohydrates. Root and tuber crops are rich in carbohydrate but all are deficient in proteins (Table 3). Therefore, root and tuber crops are important food crops in the fight against hunger and starvation in Ethiopia if properly utilized and enriched with other food items.

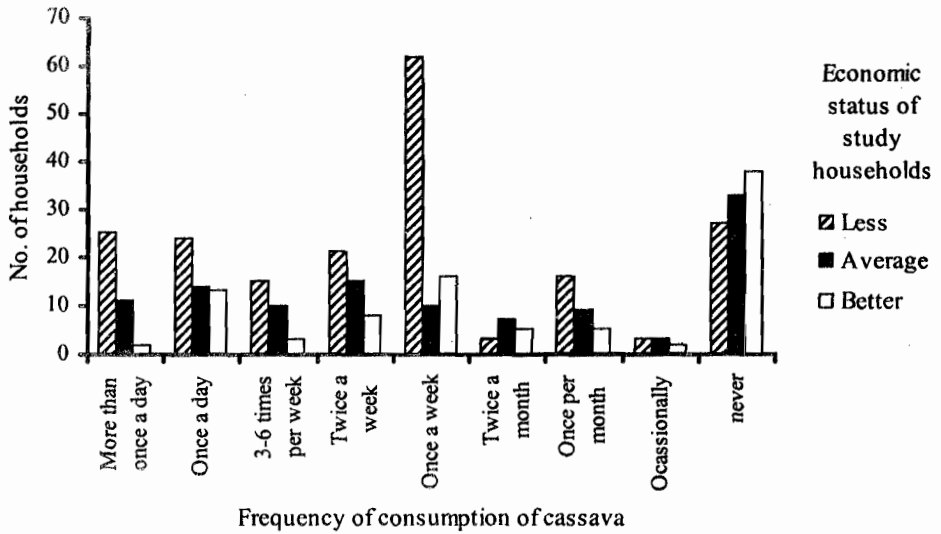

Fig. 1. Frequency of cassava consumption by household economic status.

Although potatoes were not consumed daily by most of the families, 38.1% of the families in Jarso ranked potatoes as their first choice (Table 4). The reasons for this popularity were its shorter cooking time (easy to prepare), cheap price and easy availability in the local market. About 32% ranked sweet potato first. The reasons given were its delicious taste and easy digestibility. Carrots were the least preferred root crops in the area.

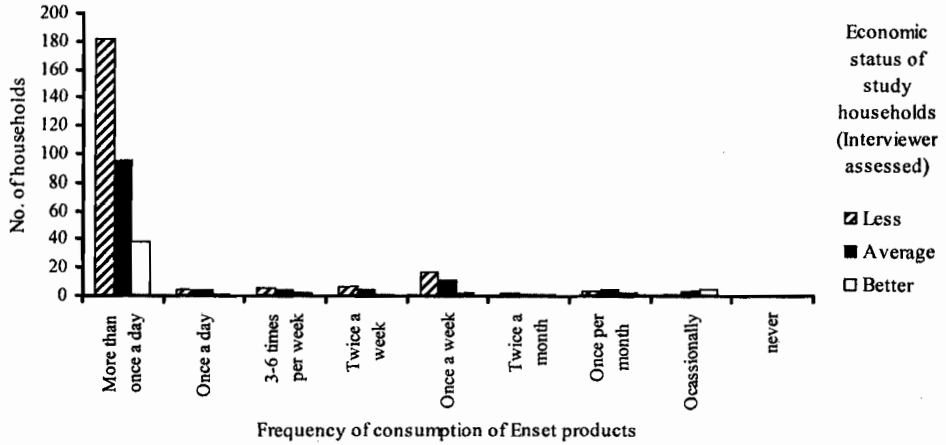

Fig. 2. Frequency of the consumption of yam by household economic status.

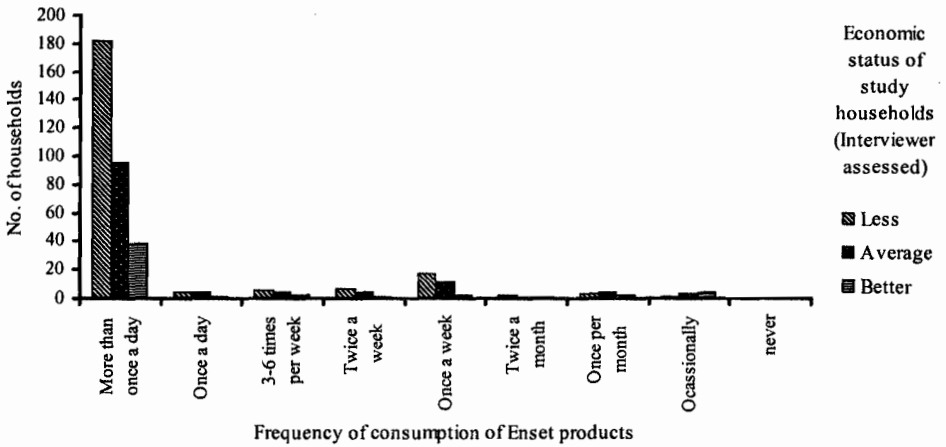

Fig. 3. Frequency of consumption of enset products by household economic status.

The most preferred root crops in Konso woreda, too, were potatoes for similar reasons. Some of the families claimed that potatoes were good for child health and development. About 36% of the families in Konso ranked potatoes as first choice, while about 30% of the families ranked cassava as their first choice.

Table 3 Nutritional values of selected root and tuber crops (Source: West, 1988; EHNRI, 1997).

Type of root and tuber crops	Food Energy (cal)	Protein (g)	Fat (g)	CHO$^{\Psi}$ (g)	Calcium (mg)	Phosphorus (mg)	Iron (mg)	Beta-carotene equiv (µg)	Thiamine (mg)	Riboflavin (mg)	Niacin (mg)	Ascorbic acid (mg)
Enset	196.0	0.90	0.2	46.5	77.0	60.0	10.1	0.00	0.04	0.05	0.00	1.00
Hausa potato	69.0	1.5	0.2	14.6	29.0	90.0	9.3	-	-	-	0.70	-
Potato	103.7	1.3	0.1	23.0	14.0	57.0	2.3	0.00	0.08	0.08	1.00	14.00
Sweet potato	136.0	1.3	2.0	27.1	52.0	34.0	3.4	0.00	0.08	0.05	0.90	9.00
Anchote	98.1	3.2	0.1	19.4	119.0	0.00	1.3	0.00	0.00	0.00	0.00	-
Taro	124.2	2.2	0.2	27.4	29.0	42.0	2.0	0.00	0.12	0.06	0.5	14.00
Carrot	42.0	1.7	0.4	6.9	31.0	33.0	1.3	4780.0	0.04	0.03	0.50	3.00
Yam	98.1	3.1	0.1	19.5	119.0	13.3	1.8	-	-	-	-	-
Cassava	140	1.2	0.2		68	42	1.9	-	0.04	0.05	0.6	31.00
Buryi[a]	154.6	1.70	0.2	35.6	4.00	74.00	1.50	0.00	0.16	0.15	0.40	17.00

- denotes data not available

$^{\Psi}$CHO denotes carbohydrate

[a]Minor root crop of local importance in Jarso

Table 4 Distribution of respondents by order of preference of commonly available root and tuber crops in three woredas.

Type of root and tuber crops	Jarso woreda				Sodo woreda				Konso special woreda			
	Order of preference				Order of preference				Order of preference			
	1	2	3	4+	1	2	3	4+	1	2	3	4+
Cassava	NG	NG	NG	NG	NG	NG	NG	NG	30.3	20.2	14.0	9.1
Qolto/Amoche	NG	NG	NG	NG	NG	NG	NG	NG	6.7	7.5	38.7	23.0
Yam	17.5	36.4	26.7	7.1	NG	NG	NG	NG	6.9	20.2	18.3	15.3
Kulaya	NG	NG	NG	NG	NG	NG	NG	NG	4.5	4.5	6.2	14.6
Enset	NG	NG	NG	NG	95.9	1.3	2.6	0.3	NG	NG	NG	NG
Hausa potato	-	4.3	7.1	8.3	-	2.5	7.7	17.7	NG	NG	NG	NG
Anchote	10.8	16.9	26.7	27.4	NG	NG	NG	NG	NG	NG	NG	NG
Taro	1.9	15.6	24.6	37.2	NG	NG	NG	NG	-	-	-	-
Buryi	-	1.3	5.7	6.3	NG	NG	NG	NG	NG	NG	NG	NG
Potato	38.1	NG	5.0	5.4	3.1	91.5	3.3	1.8	36.0	12.3	2.2	4.4
Sweet potato	31.7	25.5	1.6	4.3	-	0.3	78.5	16.9	11.4	29.4	10.7	25.9
Beetroot	-	-	2.6	1.4	0.7	2.3	5.1	0.5	-	1.7	4.4	-
Carrot	-	-	-	2.6	0.3	2.1	2.8	62.8	4.2	4.2	5.5	7.7

NG denotes the crop not grown in the area.

1 = First choice; 2 = Second choice; 3 = Third choice; 4+ = Fourth choice and above.

Cassava was preferred mainly because it was claimed to be tolerant to extreme stress conditions including considerable period of drought. Some said that cassava was their famine insurance crop because it was available during times of drought. The other reported reasons included were easy cultivation and preparation of variety of meals from it. Taro was the least preferred root crop by most families in Konso woreda. The most preferred root and tuber crop in Sodo was enset. More than 95% of families included this crop in their diet regularly, and it was preferred to other root and tuber crops in the area. The main reason given for the preference of enset was its

drought resistance coupled with its year-round availability. The respondents also reiterated that enset was their main food and they were accustomed to eating it for generations. Some said that enset was good in times of food shortage and they had not been starved due to enset plant. On the other hand, the least preferred root crop in Sodo was sweet potato.

Root and Tuber Crops Storage Practices

Among the families covered in the survey in Jarso woreda, it was found that more than 40% stored some of the root and tuber crops in the area. Yam, taro and anchote were safely stored underground in the soil. The root crop stored by most families in Jarso was taro. About 30% of the families stored taro underground in the soil. Similarly, yam and anchote were stored underground in the soil by 25.1% and 21.7% of the families, respectively. The majority of the families in Konso did not store the crops at all. When this was done, however, cassava, 'qolto' and 'kulaya' were the root and tuber crops stored by the families in the area. Relatively more families (4.6%) in the area stored cassava, while very few numbers of the families in the area stored 'kulaya' (0.5%) and 'qolto' (2.6%). Various methods of storage practices for root and tuber crops were reported in Konso woreda. Approximately 3.9% of families stored cassava in 'angula', a small basket like storage material made from bamboo, after scrapping its cover, slicing it to pieces and drying under the sun. On the other hand, 'qolto' was stored in powder form in 'angula' by 2.2% of families. 'Kulaya' was stored underground in the soil only by 0.5% of families. Among the various products of enset, the corm can be boiled and eaten immediately after harvesting. The scrapings from the leaf sheaths of the pseudostem and some of the pounded corm can also be fermented into 'kocho'. Kocho can be prepared into different dishes. About 65% of families in Sodo woreda had such storage practices. Root and tuber crops were stored mainly by low-income group of families in all of the study woredas (Table 5). There would hardly be any disagreement with the fact that root and tuber crops played an important role in the household food security especially in times of main crops failure for the poor rural population at large.

Table 5 Proportion of families storing root and tuber crops by household economic status in three woredas.

Household economic status	% families		
(interviewer assessed)	Jarso	Sodo	Konso
Low	20.8	35.6	3.5
Medium	14.9	23.4	2.2
High	4.5	6.4	1.0

The views of the local people varied on the subjects of the length of time for which root and tuber crops could be stored. The study revealed some variations in the length of time for which processed enset could be stored. About 15% of the families in Jarso stored yam for only a month and 10.4% stored the crop up to three months. On the other hand, the period of storage for taro was three months in 16.4% of families and in case of anchote the storage period was up to three months as reported by 9.8% of the families. Approximately 14% and 12% of families in the area stored taro and anchote for a month, respectively. The period of storage for cassava was not more than 3 months in 3.5% of families. Few families (1.1%) stored cassava for longer periods (3 to 6 months, 6 months or more). 'Kulaya' and 'qolto' were usually left in the farm and used for consumption when there was food shortage in the area. These root and tuber crops were claimed to stand longer dry periods and were stored for years. Hence, their cultivation can significantly improve household food security in areas like Konso that are prone to recurrent drought and famine. 'Qolto', when sliced, sun dried and ground, its flour remained in good condition for more than a year. Only 1.5% of families in the area stored 'qolto' flour for about a year. About 0.7% of families claimed that 'qolto' flour could be stored for more than two years when kept in a dry place. In Sodo woreda, 65.2% of the families stored enset in the form of 'kocho'. 'Kocho' was stored in a pit. About 26% of the families stored 'kocho' for 6 to 12 months, while 13.8% stored it for 3 to 6 months. About 15% of the families in the area stored enset for less than a month; where as only 10% were found to store enset for a period 1 to 3 months. Despite the disparity on the length of storage time, all families claimed that enset was a drought resistant plant, available throughout the year and stored for longer period of time. The results showed that although food crisis in Ethiopia required broad and fundamental action on the overall food production, there was surely one front where efforts should be rewarded, root and tuber crops.

DISCUSSION

All families in the study areas generally followed more or less the same consumption pattern although differences in food preference were evident. The consumption pattern revealed that cassava, yam and enset constituted the main part in the diet of the people in the areas. Although cassava was a recently introduced root crop, it became an acceptable foodstuff and constituted one of the most important crops in the diet of the Konso people. However, cassava can only form the basis for an adequate diet if it is

consumed with other protein rich foods (FAO/UN, 1990). Reduction in the consumption of cassava or yam is usually accommodated by an increase in the consumption of other crops such as potatoes and sweet potatoes. The three traditional meal times of a household are a heavy breakfast, a late lunch and a late supper. Most dishes, prepared from root and tuber crops, could be served at breakfast, lunch and dinner. This indicated that the crops contributed significantly to the basic diet of many people in these areas. The diet of people in the study areas was poorly balanced because root and tuber crops are low in protein (EHNRI, 1997). Therefore, nutrition education needs to be carried out by all concerned for appropriate mixing of locally available root and tuber crops with cereals and legumes to improve the nutritive quality of the traditional diet. In the study areas, families mentioned that the consumption of root and tuber crops increased when food shortage occurred, especially during the pre-harvest period of major crops and when the root crops became abundant in their respective seasons. Most root and tuber crops are rarely eaten uncooked. However, the different snacks consumed by the children were comprised not only of roasted potato, sweet potato and yam but also raw cassava, 'kulaya' and sweet potato.

Root crops are consumed not only by adults but are also important food items in the diets of children. Infants are often weaned to an adult diet consisting of cassava in Ghana and Nigeria. In Zaire, cassava *fufu* was the second most popular solid food for children under the age of one year, while in Cameroon, cassava was commonly given to infants 6 to 11 months old (FAO/UN, 1990).

One study in Ethiopia indicated that, anchote processed into flour, might be used as a supplementary food for infants, young children and lactating mothers if it was appropriately supplemented with cereals and legumes (Habtamu Fufa and Kelbessa Urga, 1997). Hausa potato was also used traditionally for feeding young children and invalids (IAR, 1981). Bulla mixed with milk was a common infant and young child food in Sodo. In Konso, a gruel or porridge prepared from cassava and cereal flour was commonly given to children.

Over all, low-income families consumed root and tuber crops more frequently. The daily consumption increased as the family economic status decreased. The pattern showed that yam, enset and cassava were popular among the low-income groups in Jarso, Sodo and Konso woredas and were not uncommon dishes in the higher-income group families as well. This finding exemplifies the importance of these crops to the people in the areas.

It is also found that relatively higher number of low-income families stored root and tuber crops. This also indicated that root and tuber crops were important for poor families and provided an insurance against famine.

The selection of food stuffs depends on many factors, including familiarity, taste, palatability, conformity, prestige, security, love, deprivation, religion, income, price, and availability, as well as the availability of substitutes and complements (Mead, 1943; Babcock, 1961; Brandow, 1961; Olayide and One, 1969; Mckenzie, 1974; Olufokunbi, 1982). The most common reasons given by the respondents in the study woredas for the selection of one root crop over the other included drought resistance, easy availability, easy cultivation, easy preparation and cheap market price. The reasons for preferences forwarded by the respondents can be useful in establishing government policy that aims at increasing the production and utilization of locally available root and tuber crops.

The storage of most of the fresh root and tuber crops is generally less satisfactory as they are easily infested with pests and undergo deterioration, even under good storage conditions. For this reason, root and tuber crops are immediately sold or converted into meal for household consumption. However, some of the root and tuber crops, like anchote, taro, yam, cassava and qolto can be stored for certain periods. In areas like Konso woreda, root and tuber crops have an overwhelming contribution to the household food supply. 'Qolto', 'kulaya' and cassava can be left in the soil for longer period without undergoing deterioration. These crops can be stored underground and sustain longer period of drought. Thus, they give additional food security to the population especially in times of main crop failure. When there is shortage of production in the major grain crops, root and tuber crops constitute the basis of the diets in the area. The local people know them as famine insurance crops. Similar observations were also made in other parts of Africa, such as the Congo or in the Guinea coast where yams, manioc, taro and sweet potatoes appeared daily on the tables of the families (Rao, 1976).

Every society has developed indigenous ways of conducting activities connected with meeting food requirements. Issues raised include how food is acquired, which foods are selected for consumption, how they are prepared for eating, who eats them, with whom, when, how and in what quantity they are eaten (Okere, 1983; Fieldhouse, 1986). When people do not get enough of the right foods to eat, they become malnourished, get ill or even die. Malnutrition remains as the most serious problem in developing

countries. Zones where root crops are consumed do not necessarily coincide with a high incidence of malnutrition (FAO/UN, 1990).

In Ethiopia, malnutrition is one of the major public health problems. One of the most prevalent deficiencies in Ethiopia is protein-energy malnutrition (CSA, 2001), in which an overall energy deficiency forces the metabolism to utilize the limited intake of protein as a source of energy. Thus, root crops could play a more significant role as additional sources of dietary energy and spare protein. Increasing the consumption of root crops could help save the much needed protein provided essentially by other foods such as cereals and legumes. The problem of malnutrition in Ethiopia is high and on the increase due to low agricultural production, low and inadequate food consumption and high disease burden (Zewditu Getahun *et al.*, 2001). Despite their low nutrient content (Table 5), root and tuber crops are nonetheless indispensable in countries like Ethiopia, where the majority of the poor face the devastating problem of hunger. When served in combination with other nutritious foodstuffs like legumes, the nutritional value of the meals from root/tuber crop is enhanced. Legumes are excellent sources of protein (20-40%), which is approximately three times that of cereals. Legumes also contain higher amount of carbohydrates (59-60%) and are fairly good sources of vitamins and minerals (Aykroyd and Doughty, 1977). As many people continue to suffer the tragic consequences of hunger and undernutrition in Ethiopia, the importance of root and tuber crops should increasingly be appreciated, provided they are supplemented with a variety of other foods.

CONCLUSION AND RECOMMENDATION

Root crops make an important contribution to the diet of many people in Ethiopia, being consumed as a staple food, or as a supplement to other food crops. Despite their importance, root and tuber crops have received far less attention than other crops by researchers. The available information is scanty and several of the studies, which have been made, are now difficult to access. Further investigation on root and tuber crops requires viable and a more complete study and focus should be made on the following areas: -

1. Regional studies need to be made on the local root and tuber crops, their role in prevailing farming system, the economics of production, nutritional values, anti-nutritional constituent, uses, processing and food preparations. Such an understanding is imperative for policy changes in diet and nutritional developments to be effective.

2. Research, mainly focused on the production, post harvest handling, product development, processing, marketing and the contribution of root and tuber crops to rural incomes, food security, health and nutrition is needed for appropriate policy interventions.
3. Detailed study focusing on indigenous processing methods of the root and tuber crops and household consumption pattern should also be made in response to seasonal variations in local food supply. In the light of the current food crises facing Ethiopia, there is need for more studies on household and community dietary habits for effective recommendations.
4. More resources should be allocated to research and documentation of information on indigenous root and tuber crops, as a means towards improving them and enhancing their use.
5. Programs aiming at broadening the food base and poverty alleviation for sustainable livelihood in the drought affected areas should be considered along with the production, utilization and conservation of indigenous root and tuber crops.
6. There is a need to identify policies and other factors that are detrimental to the conservation, production and utilization of indigenous root and tuber crops in each region.
7. Traditional method of farming needs to be up-graded and special attention should be given to producing and marketing of economically viable root and tuber crops.
8. Concerted effort should be made to improve the utilization of root and tuber crops from harvesting through storage and marketing to consumption.
9. Finally, there is one overriding concluding remark to keep in mind. Root and tuber crops should be brought to the forefront for more intense and comprehensive research to promote their important contribution to food security and economic development in Ethiopia.

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