Markets for fresh and frozen potato chips in the ASARECA region and the potential for regional trade:

Ethiopia, Tanzania, Rwanda, Kenya, Burundi and Uganda

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Comments are invited.

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Abstract

Potato is an important food and cash crop in eastern and central African countries. Potato production is growing faster than other major root crops and cereals. Yields are low due to shortage of appropriate varieties, chronic shortage of quality seed of the improved varieties, suboptimal cultural practices, and poor access to market.

Most potatoes produced in the ECA region are consumed fresh, mainly boiled. With population doubling every 25 years and urbanization continuing to grow by 13% in the next 10 years, feeding habits are rapidly changing in favor of easy-to-prepare foods such as chips. There is good potential for the growth of processing industry and also good market access for both fresh and frozen potato chips in the region. This study was conducted to make available baseline data on chips consumption, processing, marketing, potential for regional chips trade and its contribution towards improving the farmers livelihoods in the ECA region. The study was carried out from 2004 to 2006 in Burundi, Ethiopia, Kenya, Rwanda, Tanzania and Uganda. Two to three cities or towns in each of the countries were selected. A survey was made of household consumers, hotels, bars and restaurants using a structured questionnaire. Further information was also collated from supermarkets and local processors.

Demand for potato chips is increasing in the ECA region at household and retail outlets, with most of the growth in the retail outlets such as hotels, restaurants and supermarkets. On average 77% of the high income and 57% of the low income households process their own chips; similarly 80% of the retail outlets process chips for their own consumption. Chips processed in households and retail outlets are fresh and usually of poor quality. It is very common to find chips of variable thickness and length in a given package. Despite poor quality, chips processing in retail outlets is economically viable with net profits from processing 100 kg of potatoes ranging from US$ 11.0 in Tanzania to US$ 126.0 in Rwanda. At the time of the study Kenya had only one frozen chips (Njoro Canning) and four chilled chips processors, Uganda had one chilled chips processor, while the rest of the countries had none.

Due to lack of adequate and constant supply of good quality chips, five star hotels and big supermarkets import frozen chips either from South Africa or Europe at high prices. In Kenyan supermarkets chips made by Njoro Canning were selling much faster than imported ones because quality was acceptable and prices lower. In Kenya, Tanzania, Ethiopia and Uganda the prices of imported chips are higher than locally made chips by 632%, 198%, 228% and 301%, respectively. The experience of Njoro Canning shows that the region has potential to produce acceptable quality chips if potato varieties appropriate for chips making are available and the supply is reliable. This would save large amounts of hard currency for the region in the form of import substitution and the consumers would have access to acceptable quality chips at reasonable prices.

The potential for regional chips trade, especially frozen chips, looks very promising because of the existence of Common Market for Eastern and Southern Africa (COMESA) and East African Community (EAC) whose polices favour inter-regional trade in goods and services, and all the study countries are party to one or both.

Although regional chips trade is potentially lucrative, bottlenecks include limited access to processing varieties and processing machines, limited knowledge of processing techniques, high costs of electricity, lack of standards, insufficient and poor storage and transport facilities, poor road network infrastructure, inefficient utility service providers, lack of strong farmer associations, limited flow of information, and inadequate financial intermediaries. Moreover, loose linkages and partnerships between research, farmer organizations and stakeholders stand out as an important constraint.

To realize the benefits of regional chips trade for smallholder potato farmers and other stakeholders, improved access to appropriate varieties for processing, wide-spread knowledge of processing techniques, access to processing machines, strong links and partnerships between research, NGOs, farmer organizations, potato producers, processors and traders and enabling regional polices are vital. Working very closely with COMESA and EAC is of paramount importance to have an enabling regional policy in place.

Acknowledgments

The study team would like to extend its deepest gratitude to PRAPACE for its financial support and technical backstopping. ECAPAPA supported the study in Uganda, which is duly acknowledged. NARS of participating countries (EIAR-Ethiopia, KARI-Kenya, ISAR-Rwanda, ISABU-Burundi, Ministry of Agriculture, Food Security and Cooperatives of Tanzania) and IITA/Foodnet) are also highly acknowledged for their favorable administrative services and implementing the studies. We would also like to extend our gratitude to respondents for their cooperation in providing the information. This study was conducted by a team of scientists from each of the participating countries under the leadership of a socio-economist from EIAR-Ethiopia.

During the survey a number of managers of hotels, and bars & restaurants and their staff, households, processors, traders and NGOs were contacted and visited. We sincerely thank them for their willingness to interact with us and share their ideas, opinions, fears, critics and experiences.

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Markets for fresh and frozen potato chips in the ASARECA region and the potential for regional trade: Ethiopia, Tanzania, Rwanda, Kenya, Burundi and Uganda

1. INTRODUCTION

The markets for fresh and processed potatoes are distinct. In many countries the important source of new growth in demand is from the processed potato market, especially chips also called "French fries." In industrial countries potatoes are mostly eaten in processed form, with the largest volume as chips. According to the reports of Global AgriSystem (2005), total world trade of potato fries is estimated at 2.5 Million MT for 2000/01. The report also indicated that Netherlands, Canada, and USA are the major players contributing more than 90% of the trade. India is also becoming a substantial market for frozen French fries. It was also noted that the frozen French fries market in India is at a nascent stage with production in quality sector of over 3500 tons per annum, but it is growing at the rate of about 25% per year. The estimated domestic production of French fries in India is about 500 MT. It was reported that in 2005 US exports of frozen French fry only to mainland China was about 227,000 tons and to Greater China about 454,000 tons (Zhang *et al*. 2009).

In contrast, most potato in the ASARECA region is sold fresh and unprocessed. However, there is considerable potential to expand the consumption of processed potato products in urban centers in the ASARECA region. Potato is widely produced in the ASARECA region, ensuring a potentially reliable supply throughout the year. Moreover, potato is a common menu for most of the population, consumed in different ways. This context helps facilitate the expansion of potato consumption by adding value in processed form, mainly chips. The increased demand creation in turn helps boost potato production through utilization of improved technologies and innovations.

Adequate baseline information is lacking in the Eastern and Central Africa (ECA) region on potato processing and marketing practices. Hence, there is a strong need to investigate the potential of fresh and frozen potato chips and crisps (called chips in the US) processing and marketing to increase the contribution of potatoes to improving the livelihoods of the poor in the region.

This study assessed the existing scenarios and potential of chips processing for the domestic and export markets. The recommendations will lead to improved potato processing and marketing and increased production and productivity of potato through increased utilization of potato technologies. This will boost the potato sub-sector and contribute to CIP's aim to enhance productivity, value addition and competitiveness of potato system in eastern and central Africa.

Objectives of the study

The major objective of the study is to facilitate the development of a processed potato industry to improve livelihoods and increase incomes of communities in the ECA region.

Specific objectives

- Assess consumer preferences for chips in the retail outlets and households.
- Estimate the quantity of fresh and frozen chips processed and sold in the retail outlets.
- Assess the status and practices of chips processing industry in the ECA region.
- Describe and analyze the refrigerated storage and refrigerated transport infrastructure (the cold-store chain).
- Describe and analyze the status of trade tariffs for frozen chips in the ECA region.
- Identify and prioritize the constraints related to chips processing sector in the ECA region and suggest appropriate recommendations to stimulate the development of the sub-sector.
- Assess the potential of fresh and frozen chips as a new source of demand for potatoes in the ECA region.

The outputs of this study will be extensively and strategically disseminated to beneficiaries through various mechanisms, including publications, workshops, seminars and websites.

2. LITERATURE REVIEW

Evidence suggests that the potato sub-sector is expanding, with more value added products, such as potato chips, mainly due to increasing demands associated with growth of population and urbanization. Population in Sub-Saharan Africa (SSA) is doubling every 25 years (Seyfu, 2004). Poverty is widespread in SSA accounting for 32% of the world's poor, and 50% of the population lives on less than $1 per day. The FAO estimate (cited by Seyfu, 2004) also indicates that there are more than 180 million hungry people in Africa and food needs will double by the year 2025. In Africa, urban population is currently 40% and it will be 60% 20 years from now, implying that the issue of food security will remain high on the agenda of the region.

Reports have shown that potato sub-sector in Africa is expanding faster. For instance, during the period 1998-2004, estimates indicate that over 18 million metric tons of potato worth over US$1.9 billion was produced in Burundi, D. R. Congo, Eritrea, Ethiopia, Kenya, Madagascar, Rwanda, Sudan, Tanzania and Uganda (Berga and Nsumba, 2005). Potato production has also expanded to non-traditional areas. Adoption of improved varieties has also significantly improved household food security and income. It was also reported that regionally released varieties are being used for processing instead of imported ones in a few cases, substituting for imports. For instance, the use of processing potato varieties, such as Asante and Tigoni in Kenya resulted in an aggregate annual net benefit of KSh 10 million (Kabira, 2002). These varieties covered approximately 10% of all the area under potato production in 2002. Farmer-based improved seed production was also found to be economically viable. For instance, in Uganda, mean returns of 216% and 82% were obtained in 1998 and 1999, respectively, while in Kenya the use of Asante and Tigoni potato varieties increased farmers' returns by 22 – 53%. In Ethiopia, ownership of livestock and other animals has increased and overall living standards greatly improved from the incomes of improved potato sales (Agajie et al., 2002). In ECA, the net margin has increased by 280% by using improved potato varieties as compared to the use of traditional varieties. This evidence implies a huge potential for the expansion of the market for processed potato products, especially chips, in eastern and central African region.

FAO statistics of 2002 also indicate the fast growth of the potato sub-sector in Sub-Saharan Africa (SSA). The area under potato in SSA accounts for about 5% of the world potato area and it increased by about 250% in 2001 as compared to 1993. The area under potato in the eastern and central African region accounts for 71% of the total area In SSA. The statistics also indicate that the rate of growth in area coverage of potato in SSA is faster than other crops such as wheat, rice, maize, sweetpotato, cassava and yams. This is true partly because commercially-oriented farmers are responding to increased demand from the growing urban centers and subsistence-oriented farmers are responding to shrinking farm sizes. The revenue from potatoes is generally 10 times greater than that from grains. Policy makers have also noticed and believed that potato exports offer a potential source of foreign exchange. The findings also indicate that in most SSA countries potato is a highly commercial crop. Hence, to avoid the risks of commodity trade, policy makers seek value addition as part of trade through potato chips.

FAO statistics also indicate that world potato exports increased from 2% in 1983 to 5% in 2001. The value of frozen world potato trade has increased by about 10 times in 2001 as compared to the year 1980. This was because, frozen potato market is growing rapidly as a result of growth in franchised fast food restaurants, growth in global processing capacity especially among major

processors. Moreover, rising incomes and urbanization, and lower tariffs from WTO have contributed to the growth of frozen potato market. However, the value of export share of SSA in frozen potato trade was insignificant (about 0.07%) of world total.

Sub-Saharan Africa exports frozen potato worth $1,348,000 (9 exporters), while its imports are valued $5,083,000 (30 importers). Trade and production data indicate the potential of expanding potato production generally in SSA and particularly in the ASARECA region.

One of the factors that contributed to the fast growth of the potato sub-sector in general and processed potato products, particularly chips is the growth of urbanization. Potato chips were introduced as street food in cities and towns and consumption will increase as urbanization increases.

Crissman (2001) observed that national development goals have to focus on agriculture-led economic growth through agro-industrialization, such as connecting farmers to value added markets. It was also noted that cross-border trade responds to different price cycles in nearby markets. For instance, high prices in Nairobi and low prices in Kampala induce flow into Kenya. Moreover, different cropping seasons among the regions induce cross border trades, although such trades are often unrecorded. For instance, the 1994-1995 survey of 11 Kenya-Uganda border posts found $1.8 Million in unrecorded root and tuber exports to Kenya. Such scenarios shed light on the possibility of strengthening regional trade.

Kabira (2002) indicated that some of the processing companies have plans to explore the possibility of exporting frozen chips to the neighboring countries. The processors also look for local markets in institutions like colleges, schools, hospitals, the armed forces and other companies. These companies have requested research institutes, such as, KARI-Tigoni to introduce another variety with similar or superior chipping characteristics to Tigoni to reduce dependency on one variety. Kabira's report suggests that since some processors are looking for options of export to neighboring countries, availing information on regional trade will be of great help.

A study by Agajie, *et al.* (2002) on production and marketing of potato in Ethiopia indicates that the total acreage of potato in Ethiopia exceeds 160,000 hectares with an annual production of 1.28 million tones. The production and use of potatoes has also shown a rapid increase in the highlands and mid-altitude areas compared to the 30,000 hectares under potatoes in the early 1980's. The current national average yield of potato in Ethiopia is estimated at 8 t/h. Moreover,

the post-harvest loss of potato is estimated at 30-50%. This prompted research to improve the productivity and reduce post-harvest loss of potato. As a result, several improved varieties and associated post-harvest handling techniques have been generated, and productivity has improved to as high as 25 to 40 t/ha. This could lead to an increase in the national annual production of potato of between 4.0 and 6.4 million tonnes. The study has also indicated that potato is one of the most important sources of on-farm incomes for the farmers in Ethiopia. In areas where there is relatively good market infrastructure, potato has become the leading cash crop and one of the most important food security crops to farmers. One of the major problems in potato marketing was low prices offered for ware potato. This was because consumption of potato is not diversified. This suggests the need for assessing chips processing sub-sector and the potential of expanding the market both domestically and regionally.

According to potato production and marketing study in Kenya by Okoboj (2001), annual production of potato in 1996 was about 499,000 metric tons. The study indicated that the author did not get any information concerning potato exports from Kenya to other countries in the region. However, it was unofficially estimated that about 10 trucks offload 40 feet trailer loads of potatoes weekly from Tanzania. This indicates that the demand for potato is high in Nairobi and the local supply deficit is supplemented by imports.

According to FAO estimates (www.faostat.org), Kenya produced only 360,000 metric tons in 2000 compared to 478,000 metric tons produced by Uganda. However, it is known that Kenya has a higher per capita consumption of potato products in urban areas than Uganda. All these statistics positively illustrate the possibility of expanding urban markets with processed potato products.
There is limited formal and informal trade taking place along the Uganda-Rwanda border (Okoboj, 2001). The study identified potato chips as the most popular potato product in urban areas evidenced by the increasing number of fast food outlets. The study also indicated limited border traders. For instance, some traders import potato from Rwanda to Uganda through the Katuna border. Potato trade between Uganda and Rwanda exists informally along other smaller border crossings in Kabale and Kisoro, such as the Kyanika border. Some traders occasionally bring potatoes from eastern D. R. Congo. This evidence indicates the possibility of strengthening cross border trades to enhance the production and productivity of potato. Such existing practices could be strengthened through formal support to ensure the availability of potato as a raw material for chips processing industries.

In general, evidence illustrates the considerable demand that exists for potatoes and potato chips in the world in general and in SSA countries in particular. Among the SSA sub-region, a large

proportion of potato is produced in the ASARECA region, implying considerable potential to expand chips marketing among the countries involved. In the ASARECA region, potato is one of the most important food security crops consumed by a large proportion of the population. However, there is a lack of market research on fresh and frozen potato chips processing, consumption and marketing in eastern and central African region. This report, therefore, bridges such a gap and presents baseline information on chips processing, consumption and marketing practices in selected major cities and towns of Ethiopia, Tanzania, Uganda, Rwanda, Burundi and Kenya. Moreover, the report investigates the potential that exists for chips processing, consumption and marketing as a new source of demand for potatoes.

3. METHODOLOGY

3.1 The study sites

The study was conducted in six eastern and central African (ECA) countries: Burundi, Ethiopia, Kenya, Rwanda, Tanzania and Uganda (Figure 1). The study in Ethiopia, Kenya and Uganda was conducted in 2004/05, while the one in Tanzania, Rwanda and Burundi was conducted in 2005/06. Two to three cities or towns in each of the six countries were selected for the study based on potato consumption or production (Table 1). Respondents of the cities were stratified into three homogenous categories based on their status of consumption and processing of potato chips. These were Hotels, Bars and Restaurants, and Households. In addition to these, information was collected from supermarkets and local processors. Since the processing and consumption practices of chips are closely related to different standards and level of wealth, hotels were further stratified into Five, Three, and One-star Hotels, while Bars and Restaurants were stratified into High and low Class categories. Households were stratified into High and Low Income groups.

Table 1. Sample cities and towns representing production and consumption zones.

Country	City/town representing potato consumption zone	City/town representing potato production zone
Ethiopia	Addis Ababa, Nazreth	Awassa
Kenya	Mombassa	Nairobi
Uganda	Kampala	Kabale
Tanzania	Dar Es Salaam	Arusha
Rwanda	Kigali	Gisenyi
Burundi	Bujumbura	Kayanza

When selecting the required samples of all the categories, a city or town was divided into different segments to make sure that every part of the city or town was included in the study. A total sample size of 225 Hotels, 317 Bars and Restaurants, and 948 household consumers and six chips processing companies were selected for the study (Table 2).

Table 2. Sample sizes for the study in the six countries of ECA.

Country	Towns	Hotels	Bars & Restaurants	Households	Processing companies
Ethiopia	Addis Ababa	31	26	83	-
	Nazreth	14	16	59	
	Awassa	17	14	69	
	Sub-total	62	56	211	
Kenya	Nairobi	15	19	89	5
	Mombassa	26	16	76	
	Sub-total	41	35	165	
Uganda	Sub-total	46	72	176	1
Burundi	Bujumbura	23	41	93	-
	Kayanza	6	5	51	
	Sub-total	29	46	144	
Tanzania	Dar Es Salam	5	28	70	-
	Arusha	8	12	70	
	Sub-total	13	40	140	
Rwanda	Kigali	23	42	67	-
	Gisenyi	11	26	45	
	Sub-total	34	68	112	
Grand Total		225	317	948	6

3.2 Data collection techniques and analytical tools

Three data collection stages were employed. In the first stage, extensive background information was collected from secondary sources, including published and unpublished materials, and web sites to deepen understanding of the marketing systems of processed potato products. In the second stage, descriptive information was collected from key informants and groups of respondents using a checklist. In this stage, a rapid market assessment survey was conducted to collect qualitative preliminary information from key informants and groups of respondents using a guideline. The first two stages helped design an appropriate questionnaire. In the third stage, the structured questionnaire was developed for different strata of respondents.

Three types of structured questionnaires were developed for different strata of respondents: Hotels, Bars and Restaurants, and households to collect quantitative information. The questionnaire was pre-tested to verify the validity of questions and the time for interviews. Even though the standard questionnaire was developed, some modifications were made after pre-testing according to the local circumstances of each country. Enumerators were recruited and trained to enable them to collect quality data using questionnaires. Data collected were processed using Excel and SPSS packages.

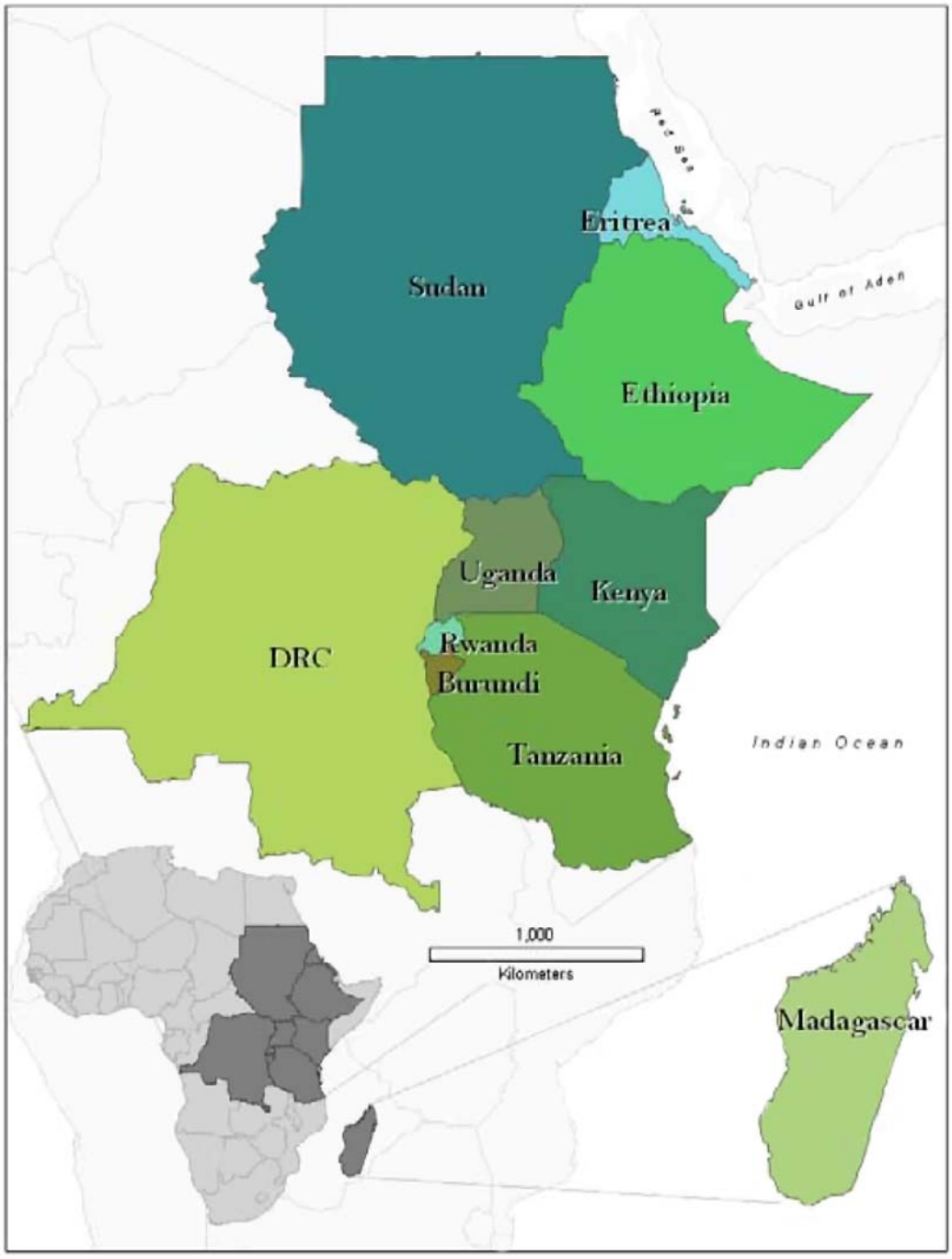

Figure 1.
The study countries in Eastern and Central Africa (ECA).

4. RESULTS AND DISCUSSIONS

4.1 Ownership of retail outlets in ECA countries

The findings established that the main retail outlets for potato chips were hotels, and restaurants and bars. In Ethiopia, Kenya, Burundi and Rwanda 77%, 99%, 88%, and 95%, respectively of the retail outlets were privately owned (Table 3). On the other hand, in Uganda and Tanzania, all the retail outlets were privately owned. Generally, privately owned hotels are more likely to be free and flexible in decision making, risk taking and are more profit-oriented than those owned by the government. The implication is that the chances for easy adoption of new chips processing technologies and expansion of chips in these countries are high.

Table 3. Ownership of sampled hotels in ECA countries.

Ownership	ET		Ke		Rw		Bu		All countries	
	n	%	n	%	n	%	n	%	n	%
Private	47	77	75	99	30	88	71	95	223	91
Government	14	23	1	1	4	12	4	5	23	9
Total	61		76		34		75		246	

ET – Ethiopia, Ke – Kenya, Rw – Rwanda, Bu – Burundi

Moreover, all governments in the ECA region are increasingly privatizing state-owned enterprises aimed at enhancing their efficiency and competitiveness in the free market economic systems. Thus, the opportunity for development of the potato chips industry, among others, seems to be promising.

4.2 Experiences of retail outlets

The data showed varied scenarios in the hotels and other retail outlets. In Ethiopia, for example, the hotels had 20 years of experience on average ranging from 1 to 57 years and establishment of three star hotels dated back to early 1950's, while one-star hotels were established since late 1940's. In the case of Kenya, the hotels interviewed had on average 25 years of experience ranging from 1 to 102 years. Establishment of five-star hotels dated back to 1902 and that of three-star hotels to early 1950's, while most of the one-star hotels started in early 2000. This trend of hotel and restaurant establishment and development (Table 4) seems to have a direct effect on consumption of potato products (Figure 2). This indicates a 117% growth in volume of potatoes consumed by restaurants from 1997 to 2004, which translates to a simple 16.7% growth per annum.

Table 4. Registered Hotels and Restaurants in Nairobi in 1997 and 2004.

	Hotels		**Bars & Restaurants**	
Year	1997	2004	1997	2004
Nairobi	434	443	587	1275
Mombassa	201	268	210	165
Other Towns	1485	1541	723	707
National Total	2120	2252	1520	2147

(Source: Kirumba *et al.,* 2004*)*

In all the cities that were sampled for this study, chips are a common menu item in all the bars and restaurants which are either parts of the hotels or independent or particularly franchised-type fast food restaurants. In all cities that have influx of tourists like Mombassa, hoteliers use menus that are familiar to the visiting tourists and such menus invariably include chips.

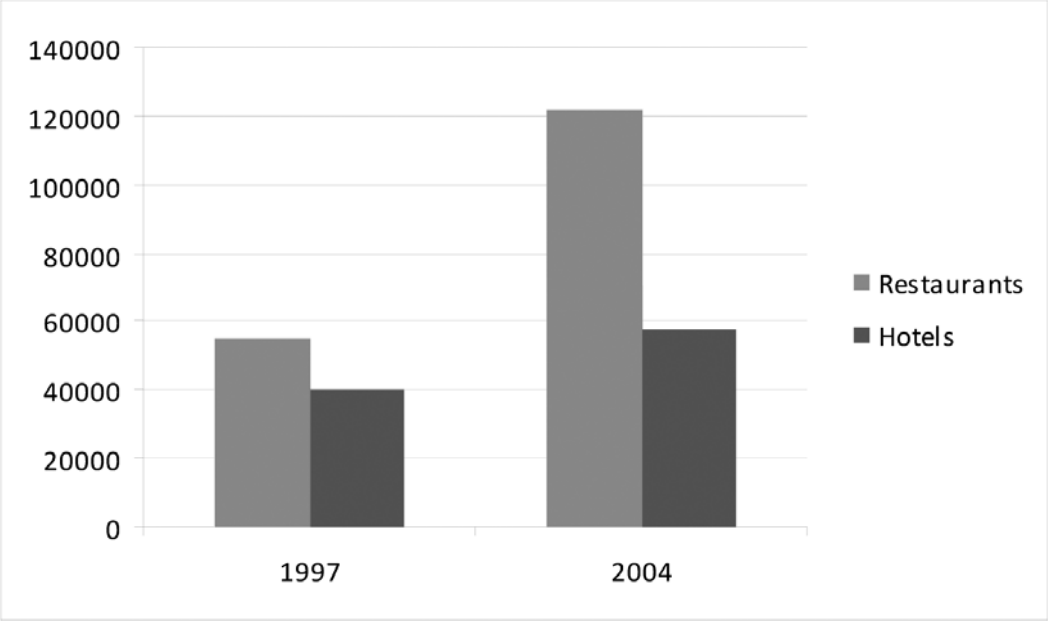

Figure 2.
Volumes of potato consumption in hotels and restaurants in Nairobi between 1997 and 2004.

The trend for establishment of bars and restaurants is illustrated by the data from Ethiopia (Figure 3). It indicates that 67% of the bars and restaurants were established recently during the free market economy. The current free market system of economy has encouraged private investments, including establishment of bars and restaurants with a corresponding increase in demand for fast foods, among which chips are rated highly.

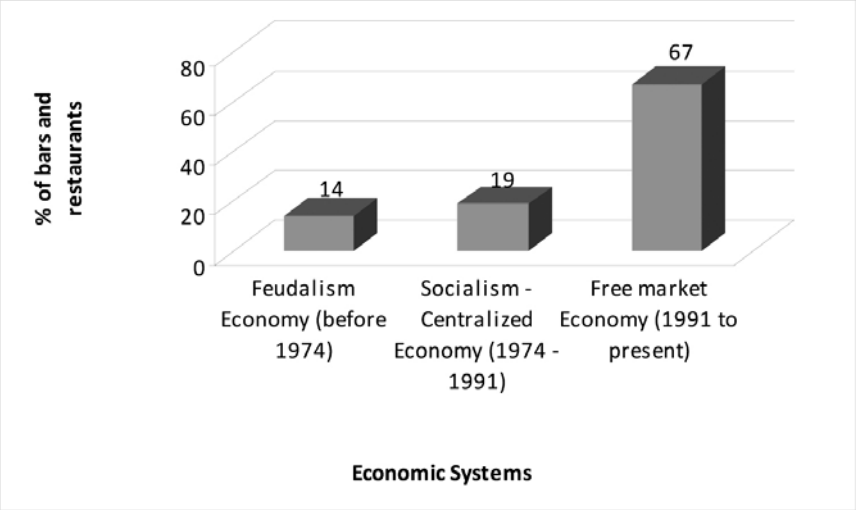

Figure 3. Proportion of bars and restaurants established in Ethiopia under different economic systems.

Trends similar to this were also observed in the other ECA countries. Therefore, the increasing numbers of such business enterprises gives an indication that there will be a growing demand for potato chips in the region.

4.3 Socio-economic characteristics of households

4.3.1 Age of respondents

Age is one of the socio-economic factors associated with utilization of chips and adoption of chips processing technologies. The average age of the overall sample respondents within the study areas of Burundi, Ethiopia, Kenya, Uganda and Rwanda was 39 years ranging from 11 to 75 (Table 5). If we assume that a person starts an independent family life at 19 years of age, a household on average has 20 years of experiences.

Table 5. Age of sample respondents in the households of ECA countries

Country	Burundi		Ethiopia			Kenya		Uganda		Rwanda		All countries
	Buj	Kay	AA	Na	Aw	Nb	Msa	Kla	Kbl	Ki	Gis	
N	82	51	83	57	69	89	76	116	60	67	45	795
Mean	38	35	32	42	32	39	59	35	34	43	43	39
Minimum	15	13	19	22	23	11	16	18	18	32	30	11
Maximum	75	70	60	61	53	55	85	60	60	55	51	75

n= Sample size

Buj – Bujumbura, Kay – Kayanza; AA – Addis Ababa, Na – Nazreth, Aw – Awassa; Nb – Nairobi, Msa – Mombassa; Kla – Kampala, Kbl – Kabale, Ki – Kigali, Gis - Gisenyi

The mean ages were higher in the city areas that were designated consumption areas and they varied from 32 in Addis Ababa and Awassa (Ethiopia) to 59 in Mombassa (Kenya). The maximum age of respondents also had a similar trend with Gisenyi-Rwanda being lowest (51) and Mombassa-Kenya highest (85).

4.3.2 Family sizes of households

The average family size of the sample households among the high and low income groups of the respondents in Burundi, Ethiopia, Kenya, Rwanda and Uganda is seven and ranges from a mean of 2 to 14 (Table 6). The average family sizes of high income households are higher than those of the low income households. The size of family has a role to play in adopting technologies that require human labor. For instance, chips processing technologies require labor for washing potatoes, peeling, chips making and frying. Moreover, family size affects the demand for products. Large family size, especially children and youths in a household in urban areas, might imply more demand for chips and since the high income groups have larger households, this creates a higher demand for foods associated with the rich such as chips.

Table 6. Family sizes of sample households in the ECA countries

Country	Burundi		Ethiopia		Kenya		Uganda		Rwanda	
	HI	LI	HI	LI	Hi	LI	HI	LI	HI	LI
N	63	80	101	110	85	80	87	89	67	45
Mean	8	7	6	5	10	7	7	5	7	6
Minimum	2	2	2	1	1	1	2	1	3	3
Maximum	20	18	12	12	19	12	13	12	9	9

HI – High income, LI – Low income;

4.4. Source and qualities of processing potatoes

4.4.1 Sources of potatoes for chips processing

Each country had specific varieties preferred for chips processing (Table 7) which, however, was affected by availability. In Ethiopia, 72% of the overall sample hotels purchase potatoes directly from wholesale vegetable markets, while 28% of the hotels get potatoes directly supplied to

them on a daily basis. Direct delivery helps hotels to ensure sustainable supply of the required quantity even at times of supply shortages. Potato varieties preferred by retail outlets in Ethiopia are locally known as Shashemene, Durame, Tolcha and Jalene.

Most chips processors in Kenya sourced their potatoes from produce markets near them. Availability in the market and price are the most important attributes chips processors consider when buying potatoes, though shape and size were an important aspect as well. Varieties preferred for making chips in Nairobi and Mombasa were Roslin Tana and Meru Mugaruro, respectively. Other varieties were Tigoni and Kerr's Pink, but the later was not commonly used due to inconsistent supply and higher prices.

The most common source of potatoes in Uganda is the retail market followed by supermarkets. An estimated 60% of the respondents from the high income class mentioned supermarkets as a source for their potato. This indicates the change in marketing chain of food, especially for the high income class. It also indicates a premium price for quality as the prices in supermarkets are much higher than those in retail outlets. On the contrary, the most common source of potatoes for the low income class is the retail market that enables low income consumers to obtain the small quantities they normally buy.

In Tanzania, the retail markets were the major sources of potatoes for chips processing, while some retail outlets obtain potatoes through suppliers. Source of potatoes for chips is mainly determined by the amount of potato required. For example, a retail outlet that processes five or six kilograms of potato per day may not require a supplier, while those that process 60 to 100 kilograms of potatoes per day require a supplier. A supplier finds it cheaper to buy from the wholesaler than from a retailer. Retail market is also a source of potatoes for 78% of households followed by wholesale market (15%). The common varieties preferred for chips processing are locally named as Arka, Kidinya and Kikondo.

In Rwanda, there are no specific sources of potatoes for chips processing, instead potatoes are selected based on required attributes. However, high standard hotels such as Kivu Sun in Gisenyi and Intercontinental and Milles Collines in Kigali, have special suppliers who select good quality potatoes and deliver directly to them. The two commonly used potato varieties for chips processing are named Sangema and Mabondo.

The most important source of potatoes for 71% of retail outlets in Burundi is imports from Rwanda, which is dominated by a popular variety for chips making called Ruhengeri. Other retail outlets source their potatoes from local retail markets.

Table 7. Commonly available and preferred potatoes for chips processing in the study countries.

Country	Commonly available and preferred potatoes for chips processing
Ethiopia	Shashemene, Durame, Tolcha and Jalene
Kenya	Kenya Faulu and Tigoni
Rwanda	Sangema, Mabondo
Burundi	Ruhengeri imported from Rwanda
Uganda	Rutuku and Victoria, Sangema,
Tanzania	Arka and Kidinya

4.4.2 Quality attributes of potatoes preferred for chips processing

The four important quality attributes required from potatoes for making quality chips are smooth skin (86%), high dry matter content (84%), medium to large size (80%) and shallow eye depth (79%). Table 8 presents quality attributes demanded for chips processing by each of the study countries. Smoothness of skin has a direct association with extent of peeling loses. The smoother the skin, the less the peeling loss will be. Potatoes with high dry matter content are believed to yield quality and crispy chips. The size of potatoes is also associated with dimensions of chips, its length and width. The bigger the size of potato, the more attractive the chips will be because of length. For instance, in the case of Kenya the average yield of raw chips is between 50-75% of the original weight, and the final chips (processed) yield is 30-45%. This very low recovery percentage is as a result of poor quality of potato tubers. Potatoes endowed with these and other quality attributes are most preferred for chips making. However, a large proportion of retail outlets (72%) do not get potatoes that fulfill the required quality attributes (Table 9).

Table 8. Quality attributes of potatoes required for chips processing in retail outlets of ECA countries.

Quality attributes	Ethiopia		Burundi		Tanzania		Rwanda		Uganda		All countries	
	n	%	n	%	n	%	n	%	n	%	n	%
High dry matter content	68	58	49	65	--	--	101	99	111	94	329	84
Medium to big size	52	44	72	96	41	77	102	100	78	66	345	80
White/cream color	66	56	50	67	11	21	97	95	20	17	244	69
Smooth skin	40	34	--	--	49	93	100	98	108	92	297	86
Oval and round shape	49	42	45	60	--	--	--	--	--	--	94	51
Shallow eye depth	47	40	41	54	--	--	97	95	108	92	293	79

Table 9. Retail outlets that did not get potatoes with required quality attributes for chips making in ECA countries.

Country	n	%
Ethiopia	118	75
Kenya	35	46
Burundi	24	32
Tanzania	36	68
Rwanda	92	90
All countries	305	72

4.4.3 Consumer preferences of potato products in retail outlets

In almost all the ECA countries, potato is mainly consumed in the form of chips in the retail outlets (Table 10). The other potato products consumed in retail outlets are boiled, crisps, grilled, mashed and mixed sauce.

In Uganda, demands for and rankings of potato products generally vary with the category of retail outlets and also with the size of the enterprise. Within the restaurants, potato products feature as main components of dishes and are highly preferred to other food types, especially amongst the small to medium restaurants. However, within the hotels these products account for a smaller percentage and are mainly accompaniments. Hotels offer buffet with a variety of dishes unlike in the restaurants, where customers order a specific type of food. Chips are the most preferred potato product according to most retail outlets and their consumption is increasing at all socio-economic levels.

Table 10. Potato products consumed in retail outlets in the study countries.

Type of product	Burundi		Ethiopia		Tanzania		Uganda	
	n	%	n	%	n	%	n	%
Chips	59	79	75	64	53	100	110	93
Boiled	2	3	2	2	1	2	106	90
Others*	8	10	18	15	--	--	50	42

*includes crisps, fried/grilled, mashed, sauce

According to consumer preferences, 83% of retail outlets in the study countries preferred chips to other potato products, with 100% respondents putting chips first in Kenya, Tanzania and Rwanda. The percentage reduced to 65-79% in Uganda, Ethiopia and Burundi (Table 11). At the regional level, chips were reported to have become standard menus in hotels and restaurants and consumption of chips is increasing in all the income groups.

Table 11. Consumer preferences of chips in the retail outlets of ECA countries.

Country	n	% of retail outlets that preferred chips to other potato products
Ethiopia	97	66
Kenya	41	100
Uganda	76	65
Burundi	59	79
Tanzania	53	100
Rwanda	102	100
All countries	428	83

4.4.4 Consumer preferences of potato products in households

Consumption practices of potato products vary from country to country. In the households of almost all eastern and central African countries, consumption of boiled potato is most dominant cultural dish (Table 12). However, consumption of potato in the form of sauce in mixture with other spices is the most popular cultural dish in Ethiopia. Consumption of fried/grilled potato is also a common cultural dish in Tanzania.

The forms in which potato products are consumed are closely related to income levels of households. Low income households consume potatoes in the form of traditional dishes, such as mixed sauce and boiled, while the high income households consume potatoes in western type dishes such as chips, crisps, salads and others.

Table 12. Most consumed forms of potato products by households in ECA countries.

Type of potato product	Burundi		Ethiopia		Tanzania		Uganda	
	n	%	n	%	n	%	n	%
Chips	136	94	97	46	123	87.9	158	89.8
Boiled	139	97	156	74	123	87.9	163	92.6
Crisps	7	5	127	60	32	22.9	34	19.3
Fried/grilled	73	51	-	-	1	100	94	53.4
Mashed	15	10	-	-	7	5	21	11.9
Sauce	-	-	205	97	-	-	-	-

Different reasons were given for the varying potato product preferences. For example, in Tanzania high income households prefer potato chips because of what they called "good palatability" (68.1%), easy to prepare (62.9%) and chips can be obtained at low cost because ingredients for preparation are locally available (61.5%).

In Uganda, 70% of the households preferred chips to other potato products because of children. In Burundi, the preferences of potato products for household consumption varied according to age and income. The youth and children like potato chips and fried potato, while elders prefer boiled potato.

4.5. Chips processing practices in the ECA countries

4.5.1 The status of chips processing in retail outlets

In eastern and central African countries, 80% of the retail outlets purchase potatoes and carry out own processing of chips, usually on orders by customers (Table 13). In Tanzania and Rwanda, all the sampled retail outlets process chips in their own premises. The corresponding figures in Ethiopia and Burundi account for 58% and 66%, respectively. All the high standard retail outlets

and most of the low standard ones in ECA countries practice own processing of chips in their premises. Own processing of French Fries is also a common practice of retail outlets in other countries. For instance, quick service restaurants in India, such as Wimpy, was reported to process 70 MT of French Fries per day (Global AgriSystem, 2005).

Table 13. Processing practices of chips in retail outlets of ECA countries.

Country	n	% of retail outlets that process chips by themselves
Ethiopia	118	58
Kenya	76	78
Uganda	118	80
Burundi	75	66
Tanzania	53	100
Rwanda	102	100
All countries	542	80

At the time of the study, it was established that there was no enterprise or company that is engaged in processing, packaging and selling of ready-to-fry chilled or frozen chips in Ethiopia, Tanzania, Burundi and Rwanda (Table 14). However, five processors[1] (one frozen chips processor and the rest chilled chips processors) were identified in Kenya. Only one processor of chilled chips was also identified in Uganda. The practice of processing chilled and frozen ready-to-fry chips is relatively more advanced in Kenya.

In Kenya, 78% of the overall sampled hotels process their own chips and 22% get fresh chips supplied by processors on a daily basis. The processor in Njoro, named as Njoro Canning, focuses on processing and supplying frozen chips, while other processors supply fresh chips. We suspect that the number of processors may be higher than five, as they are unregistered and operate informally at the back of their business areas or houses.

Table 14. Status of chips processing enterprises in ECA countries.

Country	Status of chips processors
Kenya	Five chips processors were identified during the study (2004) All of the processors are not registered and operate informally and there could be even more processors Njoro canning processes and supplies frozen chips, while others process and supply fresh/chilled chips Two of the suppliers of fresh/chilled chips process 183 tons/annum Supplier of frozen chips (Njoro canning) processes 144 – 216 tons/annum
Uganda	Only one processor (Kitty Enterprise) was identified at the time of the study (2004) This processing plant was at its infant stage (only two years old) It was focusing on promotion and quality testing of chips It was processing at the time of the study 2 tons/annum
Ethiopia, Tanzania, Burundi, Rwanda	No enterprises that are engaged in processing, packaging and selling of ready-to-fry frozen/chilled chips were identified Post processing quality loss is their fear Their major problem is unawareness of processing, packaging, storage, etc. techniques in chips making

[1] In this study, processors imply enterprises that are engaged in processing and selling of ready-to-cook chips.

Njoro Canning has linkages with Tigoni Research Center, KARI, Kenya. Different varieties of potato were given to Njoro Canning for testing and evaluation of their chips quality. Njoro Canning contracts farmers to produce and supply potatoes. It processes and stores frozen chips in its storage depots located at Njoro, Nairobi and Mombassa. Having storage depots especially in Nairobi and Mombassa helps Njoro Canning to immediately supply frozen chips to retail outlets such as hotels and supermarkets on demand.

In Uganda, processing of chips is of recent phenomenon. Only one local fresh/chilled chips processor, Kitty Enterprise, was identified during the study. This processor started processing business in 2002, but still has a small processing capacity. Fresh chips are packaged in ordinary polythene bags on which the name of the company is printed. Kitty Enterprise supplies the packaged fresh/chilled chips to supermarkets, such as PAYLESS and UCHUMI. Some of the major problems of this enterprise were lack of skills and knowledge on processing and preservation techniques. These included determination of the shelf life of frozen chips, quantity of preservatives and additives that are adequate for quality chilled chips. Other problems faced by the processor included unsustainable supply and even lack of quality potatoes for chips making, poor post harvest handling of potatoes and lack of capital to strengthen the business. However, Kitty Enterprise plans to build a big factory for chips processing and export frozen chips to neighboring countries.

The major reason that initiated the retail outlets to start processing of chips in their own premises was to fulfill the demands of their customers as expressed by 40% - 96% of the respondents in the study countries. The second reason is that there is no company that processes and sells ready-to-prepare frozen chips in adequate quantities at reasonable prices. Even though frozen chips are imported by all the study countries except Rwanda and Burundi, most of the retail outlets still preferred own processing of fresh chips to purchasing frozen chips. This was for three reasons: first, the retail price of frozen chips is high and it will discourage customers. Second, trade in frozen chips is very limited and not easily and adequately available on the market and third, most of the customers tend to prefer the tastes of fresh chips to frozen chips.

4.5.2 The status of chips processing in households

In Eastern and Central African countries, the practice of chips processing is common in urban households. Seventy percent of the urban households on average process chips in their own houses (Table 15). It ranges from 45% of urban households in Tanzania to 86% in Rwanda. Chips processing in urban households is also closely related to wealth. Seventy seven percent of the high income and 57% of the low income urban households purchase potatoes and practice chips

processing in their own kitchens. In countries where there is no imports of frozen chips, such as Burundi and Rwanda, the proportion of urban households that process own chips is higher than other countries. Processing of fresh chips at household levels is also a common practice in Sudan. It was reported that French fries are either produced at household level, or purchased as imported deep-frozen food from super markets (NL EVD International, 2009).

Table 15. Households processing chips in the study countries.

Country	High income		Low income		Overall	
	n	%	n	%	n	%
Ethiopia	78	77	19	17	97	65
Kenya	72	85	10	13	82	76
Uganda	60	68	50	57	110	63
Burundi	57	89	65	81	122	85
Rwanda	45	100	48	72	93	86
Tanzania	75	54	35	25	110	45
All countries	387	77	227	57	614	70

4.5.3 Quantity of chips processed in retail outlets, households and processors

Retail outlets in ECA countries have different capacities of chips processing, ranging from 6.1 tons/annum/retail outlet in Burundi to 33 tons/annum/retail outlet in Tanzania (Table 16). Since households process chips for their own consumption, the quantity processed per household is small, ranging from 0.05 ton/annum in Ethiopia to 0.7 ton/annum in Rwanda.

Each of the three chips processors in Kenya on average processed 117 tons of chips per annum. The infant chips processing enterprise in Uganda processed only 2 tons/annum of chilled chips. With increasing demand, the quantity of chips processed in retail outlets and processors is expected to increase. In general, the small quantities processed indicate that trade in chips in ECA countries is not yet strong even though there is a high potential for chips demand and quality potato production suitable for chips making.

Processing of French fries was the most progressed economic activity in South Africa. Reports indicate that the South African potato processing industry has grown over the past ten years at a rapid pace and it is still growing fast. The growth of French fries processing industry was mainly ascribed to the expansion of fast food industry, the growth of average income of population and the rapid rate of urbanization (Aartappels, 2010). The report has also indicated that in the year 2008/09, about 380,000 tons of potato was used mainly for French fries processing.

Table 16. Average quantity of chips (tons/annum) processed in retail outlets and households of some ECA countries.

Country	retail outlets	households	processors
Tanzania	33.0	0.30	----
Kenya	29.0	0.10	117
Rwanda	6.1	0.70	---
Uganda	19.3	0.07	2
Ethiopia	10.1	0.05	---
Burundi	7.3	0.15	---

4.5.4 Economic profitability of chips processing in retail outlets

Even though chips processing is not a developed sector in the ECA countries, estimation of profitability in retail outlets indicates that it is a worthwhile investment. From processing of 100 kg of potatoes, a net profit of USD 11.0 was obtained from retail outlets in Tanzania (Table 17) and the corresponding profit from processing 100 kg of potatoes in Ethiopia and Burundi about USD 69 (Tables 18 and 19). The profit rose to USD 126 in Rwanda (Table 20). Although the magnitude of the profit varied from country to country, it was positive and highly encouraging. The high potential of ECA region for potato production is also a good opportunity to take advantage of investments in chips processing.

Table 17. Economic profitability of processing 100 kg of potatoes into chips in Tanzania.

Item	Unit	Type of retail outlet/company		Overall sample of retail outlets
		Hotel	Bars & restaurant	
Cost Particulars:				
Purchase of potatoes	TAS	43,272.73	42,192.5	42,425.49
Transport	TAS	2,181.82	2,055.00	2,082.35
Labor / processing	TAS	2,962.5	2,230.00	2,788.1
Quantity of fresh chips fried/ lt of oil	Kg	12.8	11.8	12.3
Price of cooking oil	TAS	1,265.4	988.75	1,056.60
Cost of cooking oil	TAS	9223.58	7088.83	7,732.94
Additives	TAS	238.46	119.4	152.34
Cooking fuel	TAS	1,500.00	1,200.00	1,350.00
Frying pan charges	TAS	150.0	140.0	145
Total costs	TAS	59529.09	55025.73	56676.22
Benefit particulars:				
Amount of fresh chips obtained from 100	Kg	93.30	84.60	90.02
Weight of fried chips obtained from 100	Kg	43.0	41.0	42.0
Sale price of one kg of fried chips	TAS	1857.69	1495.90	1583.85
Benefit from sells of fried chips	TAS	79880.67	61331.90	66521.70
Benefit from peels of potato	TAS	1,200.00	1,000.00	1,100.00
Gross benefits	TAS	81080.67	62331.90	67621.70
Net benefit in local currency	TAS	21551.58	7306.17	10945.48
Net benefit in hard currency	USD	21.558	7.31	10.95

TAS = Tanzanian Shillings. One USD = 1000 TAS (2005/06)

Table 18. Economic profitability of processing 100 kg of potatoes into chips in Ethiopia.

Particulars	**Unit**	**Value per 100 kg of potatoes**
Costs		
Purchase of potatoes	Birr	127.55
Transportation of potatoes	Birr	8.31
Labor for processing chips	Birr	30.00
Additives (such as cooking oil)	Birr	51.52
Depreciation value of processing utensils	Birr	2.50
Frying fuel	Birr	22.5
Total cost	**Birr**	**242.38**
Benefits		
Sale of one kg of Chips on average	Birr	18
Quantity of fresh chips that could be produced from 100 kg of potatoes	Kg	56.00
Quantity of fried chips obtained from 100 kg of potatoes	kg	46.00
Gross benefits	**Birr**	**828.00**
Net benefit in local currency	**Birr**	**585.62**
Net benefit in hard currency	**USD**	**68.90**

One USD = 8.5 Birr (2004)

Table 19. Economic profitability of processing 100 kg of potatoes into chips in Burundi.

Particulars	**Unit**	**Value per 100 kg of potatoes**
Costs		
Purchase of potato	BUF	25000
The transport of	BUF	1000
labour	BUF	1500
The quantity of chips fried/ litre of cooking oil	BUF	5
Additives	BUF	3088.80
Frying fuel	BUF	5138.10
The price of one litre of cooking oil	BUF	1 500
The cost of cooking oil	BUF	24000
Total cost	BUF	59726.90
Benefits	BUF	
The quantity of fresh chips they get out of 100 kg of potato	BUF	80
The quantity of fried chips they get from 100 kg of fresh chips	BUF	64
The sale price of 1 kg of fried chips	BUF	2000
Gross benefits	BUF	128000
Net benefit in local currency	BUF	68273.1
Net benefit in hard currency	USD	68.96

One USD = 990 FBU (2005/06).

Table 20. Economic profitability of processing 100 kg of potatoes into chips in Rwanda.

Designation	Unit	Value (Frw)
Cost		
Purchase of potato	RWF	8000
Labor cost	RWF	1000
Transportation	RWF	200
Additives (cooking oil)	RWF	11200
Total cost	RWF	20400
Benefits	RWF	
Sale of one kg of fried chips on average	RWF	1500
Quantity of chips obtained from 100 kg of potatoes	RWF	60
Gross benefits	RWF	90000
Net benefit in local currency	RWF	69600
Net benefit in hard currency	USD	126.09

One USD = 552 FBU (2006).

4.5.5 Import and export status of frozen chips in ECA countries

Although domestic processing is the major source of chips in the ECA countries, limited quantity of frozen chips is imported in Ethiopia, Kenya, Uganda and Tanzania from Europe and South Africa. Companies import frozen chips and distribute to retail outlets, mainly higher star hotels and supermarkets. In Ethiopia, very limited amounts of frozen chips, not exceeding 25 tons, is imported from Europe (mainly from Belgium, Holland and Germany) each year to be used in only two five-star hotels. However, no imported frozen chips is available in supermarkets or other retail shops. In the case of Kenya, Uganda and Tanzania, relatively large quantities of frozen chips are imported from South Africa and it is also easily available in big supermarkets, such as Uchumi and Nakumatt in Kenya, Shoprite in Uganda and U-turn in Tanzania. For instance, only one company in Tanzania imports about 73 tons of frozen chips per annum and distributes to hotels, restaurants, supermarkets and fast food retail outlets. Importing will remain an important option as far as there is no competitive enterprise in the ECA countries that can process and supply quality and adequate amounts of frozen chips to domestic market in a sustainable manner. Import of frozen potato chips is also a common experience of other ASARECA member countries, such as Sudan. Processing and marketing of frozen French fries are not a strong practice in Sudan and the domestic demand is almost entirely fulfilled by imports from Egypt, Saudi Arabia, Malaysia and European countries (NL EVD International, 2009). It was also reported that Sudan is a promising market potential for Frozen French fries as import is increasing from year to year.

Burundi and Rwanda did not import frozen chips at the time of this study (2005/06). Burundi, rather, imports potatoes from Rwanda for chips processing. One hotel in Rwanda (Hotel des

Milles Collines) used to import frozen chips from Belgium via Sabena airways. However, Rwanda was not importing at the time of the study because of lack of importer.

No export of frozen chips was, however, reported in all the ECA countries. The processors in Kenya and Uganda are still at infant stages and they are not able to meet even the domestic demands. Njoro Canning in Kenya is stronger than all the other processors in ECA countries and it has the potential to export to neighbouring countries in the near future.

4.5.6 The cold store chain for chips

The cold store chain is not a well developed service for frozen chips in the ECA countries. This is because there is no production of frozen chips in all of the study countries, except Kenya. Njoro Canning enterprise in Kenya has a relatively well developed cold storage depots in Mombassa and Nairobi since it produces frozen chips.

Other enterprises that provide cold store services are those that import frozen chips. Importers of frozen chips in all the ECA countries, except Rwanda and Burundi, have cold storage chambers for imported frozen chips. Almost all the retail outlets and high income households in all of the countries have refrigerators mainly to store soft drinks, alcohols and perishable stuff. The practice of storing fresh chips in refrigerators is very limited since chips are produced on demand for immediate consumption. Some retail outlets store fresh chips in refrigerators until requests are received to save time when order for chips is highest. Among the retail outlets that do not use refrigerator to store fresh chips, most of them believed that storing fresh chips in refrigerator reduces the quality.

Njoro Canning, Kenya, in addition to depots it has in Nairobi and Mombasa, has one cold store at the factory enough to store 200 tons and one refrigerated truck for delivery. Nairobi Airport Service (NAS) has Cold stores and Refrigerated trucks to handle customers' goods at a fee. Horticultural Crop Development Authority (HCDA) has about half a dozen refrigerated trucks which are available for hire. Big supermarkets that are involved in trade of imported frozen chips in all the importing ECA countries have also cold storage chambers.

In Uganda, Kitty Enterprise does not have a well developed cold storage system for potato chips except refrigerators. Once processed, the chips are quickly delivered to the retail outlet. In the case of Rwanda, only Intercontinental Hotel in Kigali and Kivu Sun Hotel in Gisenyi have cool storage chambers.

In Tanzania, except for the cold store chain operating for Bright Choice Company in handling imported food items, including frozen chips, none of the interviewed retail outlets and households had cold store chain in operation. Bright Choice Company, the only importer of frozen chips to Tanzania, has a well-established cold chain facility, including refrigerated cars and insulated vans for short distance delivery of their products.

In the case of Burundi, hotels have refrigerators but the majority of them don't store fresh chips because they prepare for immediate consumption on order. Hotels of very high class have cold rooms, but they don't store potato chips. Some bars and restaurants of high class have cold chambers.

4.5.7 Transportation chain for chips

Refrigerated transport services are vital especially for perishable commodities such as potato chips. In all the ECA countries, they use refrigerated transport services for chips from ports or points of supply to points of distribution.

In the case of Ethiopia, the company that imports frozen chips from Europe is the only enterprise that has refrigerated facility to transport frozen chips from the port of Djibouti to Addis Ababa.

In Kenya, transport services are available through road networks, railways, air freights and ports. Kenya Railways has specialized facilities which could handle frozen chips including mechanically refrigerated bogies and iced perishable wagon.

In Tanzania, Bright Choice uses ship (shipping agent: MAERSK SEALAND), vans and cars (all refrigerated) for transportation of frozen chips. Frozen chips come from South Africa by ship in refrigerated containers. At Mombassa and or Dar es Salaam ports, the product is taken in refrigerated trucks to the company yards where the product is stored in refrigerated chambers. Refrigerated vans and or cars distribute the frozen chips to customers.

In Rwanda and Burundi, there is no demand for refrigerated transport service since there is no import of frozen chips.

4.5.8 Credit facilities in ECA countries

Despite the fact that all the retail outlets have access to credit services in Ethiopia, only 32% of them had taken credit either to construct new hotels or re-habilitate existing ones. The main sources of credit for the hotels are banks. Other retail outlets did not take credit because they had

adequate capital and there was no need for credit. Some of the state owned hotels get subsidy from the government and they did not want to take credit. Since they can provide collateral, all the hotels have expressed that credit services were favorable to them, but faced problems related to credit services. The government is also encouraging investors through provision of long-term loans. In general, credit facilities in Ethiopia are favorable for investments in worthy enterprises.

Hotels and restaurants in Rwanda can access credit easily from different financial institutions like banks, Co-operatives and microfinance institutions. Although credit services are available, all (100%) hotels, and Bars & Restaurants visited did not get credit and the reasons given are that they use own capital, high interest rates for some banks and lack of land to expand their businesses.

In Kenya, entrepreneurs both small and large could easily access credit facilities from micro-finance institutions, commercial banks, and farmers co-operatives.

In Burundi, the loan is provided by banks, saving and loan cooperatives and socio-professional mutuality. The loan forms that are found in Burundi are: short term credit for small equipment, midterm and long term credits for important investments. Midterm and long term credits require mostly guarantee or mortgage. There also exists an informal loan system where traders lend money to other traders at high interest rates. The traders with less means borrow money from big traders who are credible with banks. The loan system existing in Burundi is not favorable to small entrepreneurs due to lack of guarantee or mortgage. The two main constraints to credit system in Burundi thus are lack of guarantee or mortgage and high interest rates. It is necessary to improve the credit system in order to promote the potato chips industry.

In Tanzania, a high percentage of respondents (87.8%) admitted that credit facilities were available and could be accessed. Respondents from bars and restaurants said that the credit they had accessed was used as capital. On the other hand, many respondents said that they had no need for credit. High interest rates and difficulties in getting loans are main problems related to credit services in Tanzania. It appears that respondents were not interested in getting credit because the repay back period was very short.

Whereas there are several financial institutions in Uganda, the majority of entrepreneurs interviewed did not take credit because of fear of failure to pay back the debts. All the small processing units interviewed did not access credit services. Borrowing is not a particularly attractive option. There is fear to obtain credit mainly due to the small volume of sales. On the

other hand, the lending costs are high. However, liquidity problems limit the scale of individual trading business, resulting in high costs of operation, high prices and low demand.

4.5.9 The status of trade tariffs in ECA countries

Government policies in the ECA countries are favorable for importations and investments. The states have established investment promotion agencies to create favorable conditions for investment. There are also Bureaus of Standards and Quality Control in the countries to control the qualities and standards of imported goods. This safeguards the health of consumers and quality of products.

In general, there is favorable trade policy in the ECA region. The existence of Common Market for Eastern and Southern Africa (COMESA) and East African Community (EAC) trade policy favors inter-regional trade in goods and services. All the countries covered in this study, with the exception of Tanzania are members of COMESA and Kenya, Uganda and Tanzania are members of the EAC. Then, all the study countries are members of either COMESA or EAC or both and this makes them beneficiaries of inter-regional trade agreements. Trade liberalization program of COMESA aims to create a single economic space in which there is free movement of goods, services, capital and labor (Chanthunya, 2004). The EAC also aims at widening and deepening cooperation among the partner states through policies and programs. In the economic sphere, the EAC will focus on regional integration of trade and investment policy, monetary and fiscal policy, and labor and capital markets (Economic analysis paper No. 2.1, 2001). The trade policy agenda of the EAC aims at turning the three partner countries into a single investment and trade area, in order to increase the volume of trade among them and with the rest of the world. The ultimate goal is to promote rapid economic growth and development, generate employment and uplift the standard of living of the East African people. Eventually, goods, labor, and capital will move freely among the three countries. EAC has now expanded to include Burundi and Rwanda, for which policies will have to be developed. This will further enhance easy and free regional trade.

The government policy in Rwanda is very favorable for importation investment in whatever business. A Rwanda Investment Promotion Agency (RIPA) has been created to promote investments by setting up favorable conditions. There exists also the Rwanda Bureau of standards which controls the quality of imported and exported goods.

Trade tariffs for frozen chips in Ethiopia are treated similarly to those of other products imported into the country. Importers are expected to pay 30% duty, 15% VAT and 3% withhold tax when

importing frozen chips, which is the requirement for other imported products. However, there are no non-tariff barriers to import frozen chips as far as it fulfills the standard quality requirements. The status of trade tariffs, therefore, is favorable to import frozen chips to the country.

Kenya Bureau of Standards (KBS) plays a big role in regulating the quality of industrial products, but it plays an insignificant role in agricultural products through issuing import permit to importers of agricultural goods at a cost of KSh. 1500 per permit. Uchumi and Nakumatt supermarkets import frozen chips from Mc-Cain (Canadian agrifood company) through its Subsidiary company of McCain South Africa. South Africa is a member of COMESA and accedes to the region's trade agreement of free trade on agricultural goods. If this company was out of COMESA, it could attract a 5% (1999 budget) import duty.

Burundi has the most favorable environment for imports of agricultural products. In Burundi, the agricultural products from abroad were taxed until the end of the year 2005. However, such products are not taxed anymore except for imported rice. The case of Tanzania is also similar to the other study countries. Import permit can be easily obtained from Plant Health Services Department in the Ministry of Agriculture, Food Security and Cooperatives. The ministry requires that any importer shall present a phytosanitary certificate from the exporting country before issuing an import permit. The importer pays US $20 for the import permit. For instance, importer of frozen chips, Bright Choice Company, faced no obstacles as far as importing and trading in frozen chips was concerned.

All the evidence suggests that there is a favorable environment in the Eastern and Central Africa Region for regional integration in trade for goods, services, capital and labor. Therefore, promoting trade in frozen chips in the ECA region is justifiable and is an untapped potential.

4.6 Marketing channels of chips in the ECA countries

The marketing channel of chips in the ECA countries is simple since chips processing is not a developed industry. The simple marketing channels of chips are presented in three different scenarios as follows depending on the source of chips.

4.6.1 Scenario 1: Retail outlets as a source of chips

The most common scenario of chips marketing channel in the ECA countries is flow of chips from retail outlets to consumers. Retail outlets (mostly hotels, bars & restaurants and mobile box retails) process and prepare ready-to-eat chips themselves and directly serve to consumers.

4.6.2 Scenario 2: Processors as a source of chips

In the ECA countries, only Kenya and Uganda have started processing and trade in either fresh[2], chilled[3] or frozen chips[4]. These infant processors sell their products to retail outlets (mostly hotels and supermarkets) from where the processed product goes to consumers (Figure 4). This scenario is for the case of only Kenya and Uganda.

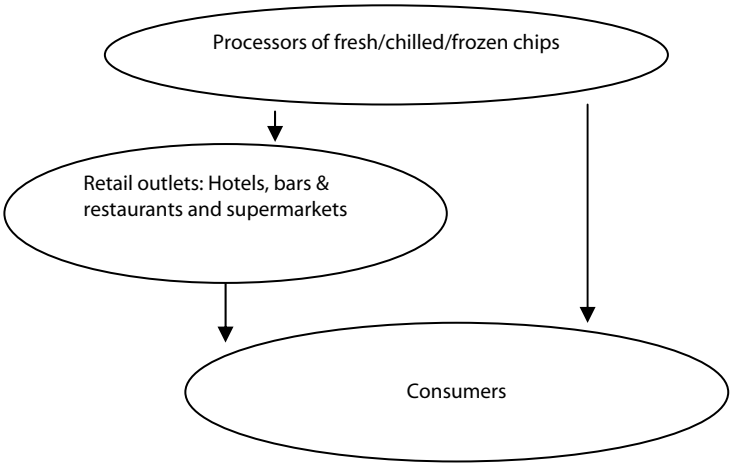

Figure 4.
The simple marketing channel of locally processed chips for scenario 2.

4.6.3 Scenario 3: Imports as a source of chips

The third source of chips in the ECA countries is imports. Few companies import frozen chips either from South Africa or Europe and distribute to retail outlets, from where eventually the chips reach consumers (Figure 5). This is the case of Ethiopia, Kenya, Uganda and Tanzania.

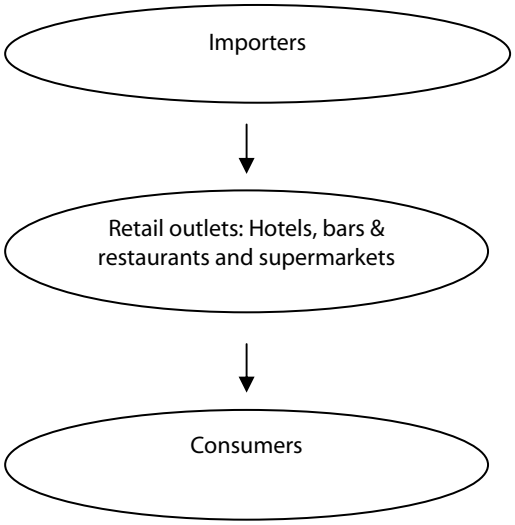

Figure 5.
The simple marketing channel of imported chips for scenario 3

[2] Fresh chips refer to and are ready for frying with being chilled or frozen
[3] Chilled chips refer to chips cooled at -4 degrees centigrade
[4] Frozen chips refer to chips frozen at -18 degrees centigrade

4.7 Demand trends of chips

The study revealed that the demand for chips is increasing in the eastern and central African countries. Sixty three percent of the retail outlets in the ECA countries reported that the annual demand for chips is steadily increasing over years. The increase in demand is especially high in retail outlets (88%) in Ethiopia (Table 21). The demand in Tanzania is also showing a net increment as evidenced by 47% of retail outlets. In other countries, the annual demand is either variable or stable. None of the ECA countries reported a decrease in demand for chips.

Table 21. Annual demand trends of chips consumption in retail outlets of ECA countries.

Country	Steadily increasing		Variable, but mostly increasing		Stable	
	n	%	n	%	n	%
Tanzania	25	47	10	19	18	34
Kenya	27	36	33	44	16	20
Rwanda	46	45	56	55	0	0
Ethiopia	104	88	2	2	12	10
Burundi	13	17	20	27	22	29

Some of the major cross-cutting reasons that contributed to the increasing demand of chips in the ECA countries are the following:

1. Increasing urbanization and urban population

Urbanization and urban population are constantly increasing in the ECA region. Evidence by UNFPA indicates that the first three African countries that recorded the highest rate of urbanization are Burundi, Rwanda and Uganda. According to the State of Uganda Population Report 2007, the growth rate for cities in 2005/6 was 15.4 per cent (Glenna, 2007). Because of increasing urbanization and the corresponding expansion of service sectors, the consumers' taste is also changing towards consuming value added products, such as Chips.

Urban population of Africa accounted for 40% in 2004 and it will be 60% in 20 years from now (Seyfu, 2004). According to recent evidence, the urban population growth rate of Africa is averaging almost 5% per annum. This creates an increasing demand for food, including chips. Urban population in the age groups below 30 accounts for more than 70% of the population and this category demands chips more than the older age categories.

2. Increasing tourism industry

Tourism industry is increasing over the years in the ECA region. According to World Tourism Industry statistics, the growth of tourism industry in SSA was the highest in 2004. In all of Africa, the tourism industry grew by an estimated 10 percent, significantly more than the

global average of 5.5 percent (World Tourism Industry, 2005). Especially Mozambique and Kenya were the fastest growing tourism destinations in 2005.

3. Affordable prices of chips

Youngsters like chips since its price is affordable as compared to prices of most other food items. Chips are sold on the road sides and in kiosks in various packs that can be sold for as low as less than half a dollar, which is suitable for people of various income groups.

4. Increasing incomes of urban households

Income of urban population is increasing from year to year in Africa. The phenomenon of increasing urbanization and tourism industry is closely linked to increasing income of urban households. This contributes to the increasing demand of value added products, such as chips. According to the report on the context of urban development, SSA, the economic growth that has taken place in recent years in Africa is mainly urban-based (The Urban Transition in SSA, 2007).

In all of the ECA countries, the most distinctly observable source of new growth in demand is from processed potato market in the form of chips. In urban areas, especially in big cities and towns, chips are a common menu item in restaurants. These restaurants include those found in hotels, independent restaurants and especially franchised-type fast food restaurants. In towns that have influx of tourists, hoteliers use menus that are familiar to the visiting tourists and this includes chips. Demographic trends show that urban growth rates are especially high and that this growth will continue into the future and these markets will become ever larger and more important. It is also important to note that urban areas are also home to most of the economically upper and middle-income families with sufficient incomes to afford higher value processed potato products like chips. The increasing number of hotels and restaurants also indicates an expected increase in potato consumption in cities and other urban centers. For instance, potato consumption in Nairobi grows at a rate of 17% per annum.

4.8 Future prospects and potentials of regional trade in frozen chips

4.8.1 Scenario analysis

The prices of imported frozen chips are very high compared to prices of domestically processed chips with the price increments ranging from 198% in Tanzania to 632% in Kenya (Table 22). The high price for imported frozen chips ensues mainly from high transaction costs involved from the point of processing to point of consumption.

Table 22. Price comparisons of domestically processed and imported chips in ECA countries.

Country	Locally processed chips (USD/kg)	Imported chips (USD/kg)	% increase
Kenya	0.77	5.64	632
Uganda	0.84	3.37	301
Ethiopia	1.22	4.00	228
Tanzania	1.86	5.55	198

The big price gap between domestically processed and imported chips creates a good opportunity for the emergence of domestic processors and regional trade in frozen chips in the ECA countries. In general, the following major conditions favor emergence of the potential regional trade in frozen chips among the ECA countries:

1. Low Transaction Costs

Transaction costs of domestic processors will be relatively low and the prices will accordingly be lower than imported ones provided that they are able to process and supply acceptable quality of frozen chips.

2. Promising demand for domestically processed frozen chips

Domestically processed frozen chips are demanded in the market. For instance, Njoro Canning in Kenya processes and supplies acceptable quality frozen chips to supermarkets at a price that is about 80% lower than that for imported frozen chips. According to the views of Uchumi and Nakumatt supermarkets, Njoro Canning frozen chips are cleared/sold faster than imported frozen chips. No complaints were received from customers on the quality of Njoro Canning frozen chips.

3. Favorable trade environment in the ECA region

There are no trade restrictions between East and Southern African countries because of COMESA trade agreement. COMESA has 19 member states, including all of the countries covered in this study with the exception of Tanzania. According to the information from COMESA Secretariat (Chanthunya, 2004), COMESA trade liberalization program states that the main objective of trade liberalization is to create a single economic space among its member countries in which there is free movement of goods, services, capital and labor. This is achieved through instruments such as tariff reduction and removal of non-tariff barriers. Moreover, the principle of free trade regime in COMESA is non-discriminatory. It means same treatment of like products from all member countries and same treatment of foreign like product as domestic product. There is also a "Zero-tariff" rule on goods from COMESA countries and no "Non-tariff barriers" on COMESA goods. All these evidence suggests the existence of favorable environment for trade among the COMESA countries.

4. Potentially adequate and sustainable supply of the raw material

Since ECA countries are potentially high producers of potatoes, there can be adequate and sustainable supply of the raw material, as far as the required attributes for quality of potatoes for chips making are maintained. The area under potato is also indicating a tremendous increase over time. For instance, in Ethiopia, the area under potato increased by about 400% in the early 2000s as compared to the 1980s (Agajie et al, 2002). Some evidence in Africa such as FAO statistics of 2002, also support that the area under potato in SSA has increased by about 250% in 2001 as compared to the area coverage in 1993. Among the SSA sub-region, the share of area under potato in the ASARECA region accounted for 71%. According to FAOSTAT database, potato production is also estimated to be growing at a rate of 10% per annum in the ASARECA region and this ensures availability of adequate supply for the raw material. The statistics also indicate that the growth in area under potato in SSA is highest as compared to the area under other crops, such as wheat, rice, maize, sweet potato, cassava and yams. The fast growth for the area of potato was because commercially oriented farmers are responding to increased demand from growing urban centers. Moreover, subsistence oriented farmers are responding to ever shrinking farm sizes. This is because, revenue from potatoes is generally 10 times greater than grains, and energy per hectare per month from potatoes is five times that of grains. Policy makers have also noticed and believed potato exports as a potential source of foreign exchange. In the ASARECA member countries, this quantity of raw material means that about 900,000 tons of chips can be produced in the whole of ASARECA member countries. All the evidence supports that there is a reliable and adequate potential of potato supplies for processing industries.

5. Economic feasibility of investments in chips processing

Economic profitability analyses of chips processing in ECA countries indicate that chips processing is a rewarding, lucrative and remunerative investment. For instance, an economic profit ranging from USD 11.00 to 126.00 per 100 kg of potatoes was obtained from chips processing in different ECA countries.

These opportunities suggest the potential trade in frozen chips that can be created between ECA countries. In the short run, there is a possibility for Njoro Canning to penetrate markets of neighboring countries, such as Ethiopia, Uganda, Tanzania, Rwanda and others.

4.8.2 Projections

The ten ASARECA member countries produce potatoes accounting for 71% of the total production in Sub-Saharan Africa (SSA). Evidence indicates that in 2004, the total production of potatoes in the ASARECA region was estimated to be over 14 Million Tons (Berga, 2004). According to sub-sector analysis study for potato and sweetpotatoe, 80% of the total potato produced is ware, 10% goes for seed and 10% is waste (ASARECA, 2005). Out of the total for ware, 85% of it is consumed in its boiled and other forms while 15% of the ware goes for processing. Out of the potatoes allocated for processing, 90% of it goes for chips processing and the remaining goes for crisps and others. After processing, the recovery percentage of chips is 60% while the remaining is peels during processing. The diagram indicating the potential production of chips in the ASARECA region is indicated in Figure 6.

According to the potato sub-sector analysis (PRAPACE and ECAPAPA, 2004) in the ASARECA region 10.8% of the total potato produced is allocated for chips processing. After processing, net chips production will be only 6.5% of the total potato produced. With this conservative estimate, ASARECA region had the potential of producing 907,200 tons of chips per annum by 2004 (Figure 6).

For countries that are covered in this study, the potential production of chips was also estimated, based on an average of 12 years of potato production. Its forecast was also made for 2015, assuming a 10% growth of potato production per annum. Accordingly, the countries considered in this study have the potential of producing 234,201 tons of chips per annum by 2008 (Table 23). By 2015, the same countries have a potential of processing 296,371 tons of chips per annum. These facts suggest that appropriate and favorable intervention options need to be set in place to exhaust the potential of chips trade in the ECA region.

Table 23. Estimates of potential chips production in ECA countries by 2008 and 2015.

Country	Potential chips production by 2008 (tons/annum)	Potential chips production by 2015 (tons/annum)
Burundi	3102	3927
Ethiopia	35719	45210
Kenya	60345	76319
Rwanda	50630	64083
Tanzania	43253	54746
Uganda	41152	52086
All countries	234201	296371

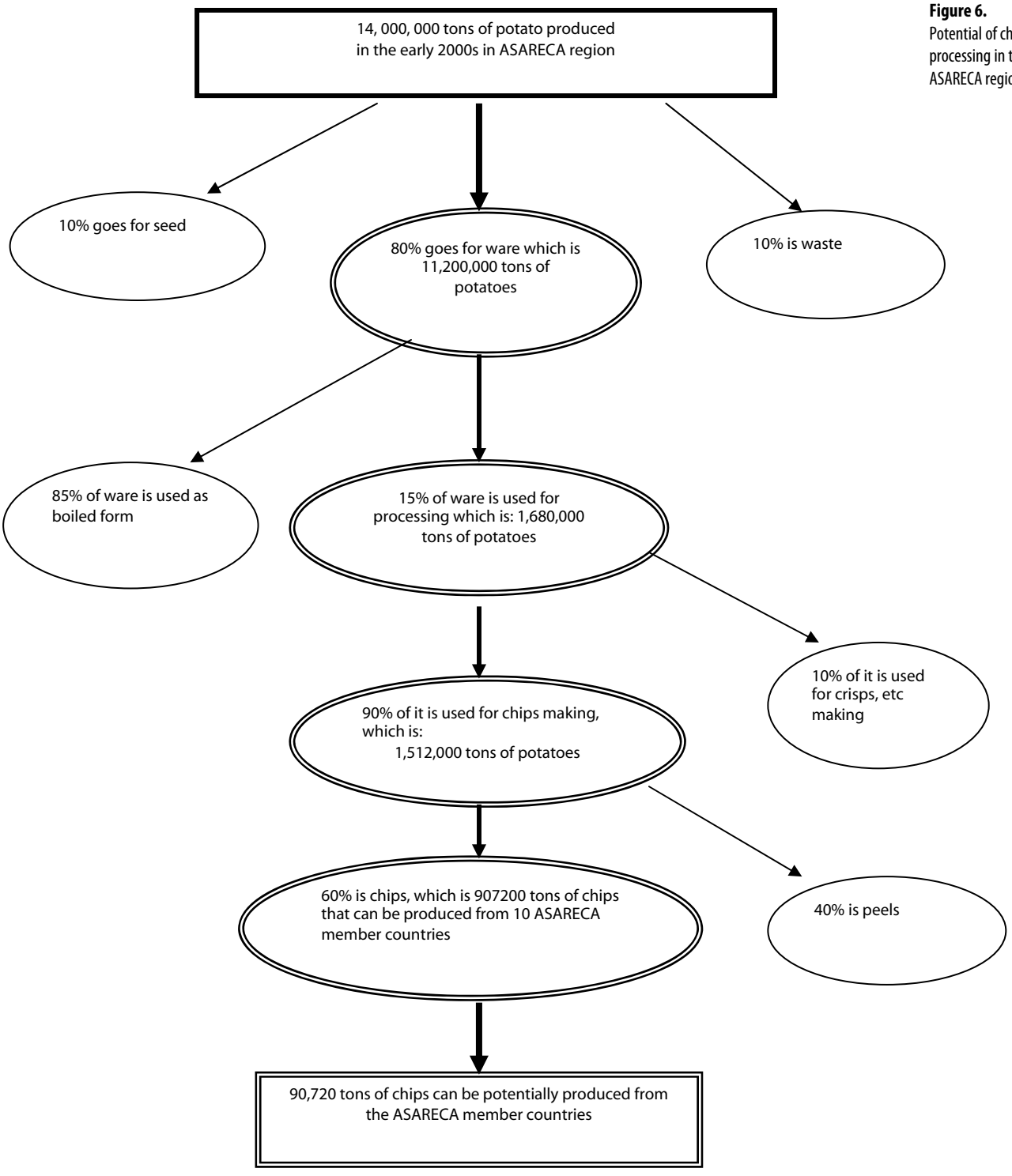

Figure 6.
Potential of chips processing in the ASARECA region.

4.9 Cross-cutting problems in chips processing and trade in the ECA region

The following cross-cutting problems were identified in processing and marketing of chips in all the study countries.

1. Unavailability and un-sustainable supply of quality potato for processing into chips

Availability of sufficient amounts of potatoes that meet the required quality attributes such as high dry matter content, medium to large size, white to crème color and oval or elongated shape is generally limited in all the ECA countries. Because of seasonal nature of production, their supply is also irregular and unsustainable. Potato commonly available at the market is very poor in quality and does not fulfill the most important quality attributes required for chips processing. Poor quality of potatoes results in high losses (about 40% on average) and poor quality of chips and other products. It is mainly because of this problem that countries are importing frozen chips to meet customers' demands for quality chips. This has forced spending of hard currency by the countries on imports of frozen chips.

2. Lack of adequate knowledge and skills on chips processing, storage and frying techniques

Lack of knowledge and skills of chips processing, packaging, frying, storing, additives, preservatives and others is significant in all the countries. The processors, retail outlets and households practice chips processing mostly by trial and error. Information is lacking on dimensions of chips (length, width, etc), type and quantity of oil to be used, suitable equipment, packaging, the duration fresh chips should be stored in refrigerators, types and amounts of additives and preservatives, etc. As a result, the quality of chips processed is mostly poor even though consumers still by them. Considerable proportion of chips is not sellable and this limits the market. For instance, crisps processors in Ethiopia described that it is because of lack of knowledge in the above areas that they did not yet start processing of chips.

3. Non-existence and unawareness of standards for chips processing

Retail outlets of high standards and processors complained non-existence or unawareness on the quality standards for chips. They do not have idea about how quality chips should look like. Especially customers of high class retail outlets (such as hotels and bars & restaurants) demanded quality chips for health concerns. This problem has forced the use of poor quality chips and the resulting low prices.

4. Absence or limited availability of enterprises engaged in processing and selling of ready-to-cook chips

The reason why most of the retail outlets are processing chips by themselves is because of lack of companies that processes and sell ready-to-fry frozen chips. Even though there is a processor of frozen chips in Kenya, it cannot meet the demand of chips in the country. Availability of enterprises specialized in processing, packaging and selling of ready-to-fry frozen chips would potentially increase the demand and growth of the chips industry.

5. Poor knowledge of chips by customers

The retail outlets, especially low standard ones that did not yet start processing of chips said they had never received requests for chips from their customers. This implies that considerable proportion of the population is lacking awareness about chips.

5. CONCLUSION AND RECOMMENDATIONS

5.1 Conclusions

1. Commercial chips processing enterprises are either absent or not yet well established in the six study countries. These sectors are in their infant stages in Kenya and Uganda, and not yet started in Ethiopia, Tanzania, Rwanda and Burundi.
2. According to the existing data, retail outlets such as hotels, bars and restaurants play major roles in chips trade by practicing own processing in their premises. In the six countries high standard hotels, especially two stars and above, and high class bars and restaurants themselves process and trade in ready-to-eat chips. The processed ready-to-eat chips are mostly fried and consumed within that retail outlet premises based on orders of their customers.
3. The overall quantity of chips processed and marketed in the retail outlets and processing sectors is still very low in all the study countries, but there is variability among them.
4. The lack or unsustainable supply of potatoes that fulfills the required quality attributes for chips processing was reported to be a major problem in all of the ECA countries. Even though few varieties are available that are relatively better for chips processing, their supply is very limited, unsustainable and seasonal.
5. The demand for chips is increasing from year to year in the ECA region due to growing urbanization, increasing tourism industry, and the change in food habits.
6. ASARECA region has a huge potential of potato production, including the countries where this study was conducted. In this region, potato production grows at a rate of 10% per annum. This implies that the potential to sustainably supply raw material, potatoes, for chips processing exists.
7. In all the study countries, processors of potato products, retail outlets and household consumers emphasized that there is lack of adequate knowledge and skills in the processing and frying techniques of chips.
8. All the six study countries lack established quality standards for chips processing. As a result, chips that are prepared by processors, retail outlets and individual households have variable qualities and standards. Even in the same package, it is common to see different qualities of chips in terms of length, thickness, crispiness, color and other merits.
9. In all the study countries, there are favorable conditions on trade tariffs, investments and inter-regional trade in general. All these countries are members of either COMESA or East African Community (EAC) or both.
10. The cold store and transportation chains are not well developed in the ECA countries, as a result there is less trade in frozen chips in the region. The cold store chain available is limited

to companies that import frozen chips and retail outlets that store and distribute frozen chips to consumers.

11. Among the study countries, four of them (Kenya, Uganda, Ethiopia and Tanzania) import frozen chips to meet demands of high class retail outlets and high income urban households.
12. Chips processing is observed to be an economically feasible and remunerative investment as evidenced by case studies of four countries: Tanzania, Burundi, Ethiopia and Rwanda. Scenario analyses and projections indicate that trade in chips is a promising business sector in the ECA region.

5.2 Recommendations

5.2.1 Major intervention options

Different intervention options for research, extension, development and policy need to be implemented in a participatory and integrated approach to overcome the cross-cutting constraints and strengthen trade in chips in the ECA region. Intervention options include:

1. Limited supply of quality potato varieties for processing into chips.

- Promote the existing varieties of potato that are relatively good for processing through various methods, such as fliers, public media, manuals, posters and others
- Research should focus on generating potato varieties that possess attributes for chips processing demanded by the market.
- Establish ware potato producers association and link them to markets to ensure sustainable supply. These associations should be from different agro-ecologies in each country with different seasons of potato production.

2. Lack of adequate knowledge and skills on chips processing, storage and frying techniques.

- Promote available information and training on improved chips processing, packaging, frying, and storage techniques to retail outlets, processors and households. This could be achieved through mass media, such as radio, TV and news papers and print media, such as fliers, manuals, recipes, posters and other relevant materials.
- Research needs to be strengthened in generating improved chips processing technologies as per the needs and quality standards of each country. Beneficiaries should be involved in the research processes from planning to consumption stages.

3. Non-existence and unawareness of standards for chips processing:

- Develop country standards on potato chips according to consumer preferences and existing policy scenarios. These standards should take into consideration available regional and international standards for potato chips as reference.
- Harmonize country standards and establish regional potato chips standards to promote inter-regional trade in frozen chips.
- Promote the established country and regional standards to create awareness

4. Absence or limited availability of enterprises engaged in processing and selling of ready-to-fry chips:

- Encourage and strengthen existing processors (in the case of Kenya and Uganda). This can be achieved through promotion of their products and exempting them from taxes until they are well established. This will help them to register and sell their products formally.
- Promote investments in chips processing. This could be achieved through dissemination of available baseline information on access and availability of quality raw materials, increasing demand for chips, profitability of chips processing, the possibility of regional trade, favorable investments and trade conditions in the region and other aspects.

5. Poor knowledge of chips by customers

- Promote chips through electronic and print media
- Conduct market promotion by giving sample chips free of charge for a limited time as compliments for customers.

5.2.2 Stakeholders involvement and their major roles

Stakeholder involvement is vital for joint planning, implementation, and monitoring and evaluation of the interventions. It is important for cost and responsibility sharing and avoiding re-inventing the wheel by organizations as a result of doing the same thing without proper communication among themselves. The key stakeholders that need to create partnerships and common platforms to overcome the major problems and strengthen chips processing sub-sector are the following with some of their roles:

1. The National Agricultural Research Institutes (NARIs)

- Creating strong links between research institutes and processors. Processors should be considered one of the key stakeholders in the course of research. For instance, involving the processors in needs assessment and variety tasting for processing

qualities, inviting them in experience sharing forums and the like. Other stakeholders, such as supermarkets, hotels and other retail outlets, farmers, traders, transporters and middlemen should also be involved where necessary.

- Research institutes should give priority in generating and providing quality potato varieties for chips processing. For instance, Ethiopia, Uganda and the rest of the ECA countries could adopt processing varieties, known as Kenya Faulu and Tigoni, from Tigoni Research Center, KARI-Kenya. They can incorporate these varieties in their research agenda at adaptation trial stage rather than at early stages of breeding. The same thing could be done to disseminate other varieties with good processing traits such as Victoria and Rutuku from Uganda and Kinigi from Rwanda, as more processing varieties are being researched upon.
- Demonstrate the processing technologies to the beneficiaries and create their awareness in a systematic and pragmatic approach
- Verify economic viability of chips processing and assess their social and cultural acceptability
- Monitor and evaluate linkages between stakeholders for the smooth functioning of the integration
- Provide technical backstopping for the stakeholders

2. The Bureaus of Agriculture/Departments of Extension

- Transfer the knowledge and skills of potato production and processing technologies via appropriate mechanisms
- Incorporating processing technologies in its regular extension program and disseminate to wide ranges of beneficiaries
- Help in organizing seed and ware potato producers to ensure sustainable and adequate supply of raw material for the processors.
- Provide technical backstopping for the stakeholders
- Create strong links with processors and producers of potato

3. The policy sector

- Establish standards for potato products, especially chips.
- Create favorable conditions for the infant processors to help them get credit services

- Create enabling conditions for the informal processors to be exempted from taxes until they are well established in their business and then encourage them to be registered and operate formally.
- Facilitate potato producers to be organized formally, for instance, in the form of "Seed and Ware Potato Producers Unions" and help them obtain legal entity and provide technical backstopping, such as auditing, training and others.
- Help the potential frozen chips processors in finding markets for export, especially in COMESA member countries.

4. Development Organizations, such as NGOs, Regional and International Organizations

- Help the potential processors in creating enabling conditions for financial services, such as Micro Finance Institutions, capacity building, organizing processors, linking processors to retail outlets, transfer of chips processing technologies through appropriate routes to technology transfer such as pamphlets, posters, mass-media, etc.
- Regional and International organizations (ASARECA programs, CIP and others) could help in technical backstopping and capacity building (such as, organizing experience sharing visits, on-the-job trainings, stakeholder consultations, etc.).
- Regional and International Organizations could also help in providing competitive grant funds for research and extension works that target strengthening potential chips processing sector.
- Transferring findings of the study through websites, publications, organizing workshops and other relevant forums.

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