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Characteristics of the industry, constraints in processing, and marketing of potato crisps in Kenya

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Crisps, processing, characteristics of firms, constraints

1 SUMMARY

There has been an increase in the number of potato crisps processors in Kenya in the last few decades. However, the characteristics of these firms are not clearly known. This study was designed to characterize the potato crisps processing industry in Kenya in terms of varieties used, pre-processing handling practices and constraints encountered. The potato crisps industry was surveyed between December 2009 and February 2010 using a structured questionnaire. Using labels of a total of 24 brands of potato crisps found selling in 80 supermarkets and kiosks in Nairobi, the processors were identified, contacted, visited and interviewed. Together 23 processors were identified and these had processing plants in Nairobi and Nakuru. The information collected included size of firm, range of products, constraints in processing crisps, marketing of the product and the variety of potatoes processed. The number of employees in the processing industries ranged from 2 to 250; 61 % of the processing firms had 5 or less employees, 22 % had 6-10 employees and only 4 % had 100 or more employees. In addition to potato crisps, 60 % of the firms also processed peanuts, 30 % processed chevda and potato sticks, 26 % processed pop-corns, 13 % processed banana crisps, 9 % processed cassava crisps and 4 % also processed arrow roots crisps, spices, peas and herbs. About 4 % identified the main constraints as lack of proper equipments and market, 64 % complained of lack of potatoes and its poor quality while 43 % indicated lack of finances to increase volume of production. As pertains to produce sales, 83 % of the processors sell their products directly to supermarkets, 4.3 % through wholesalers and 13 % directly to individuals and shops. Dutch Robjyn was the potato cultivar of choice for many processors and other cultivars were used in processing during periods of scarcity of cv. Dutch Robjyn. A large number of processors (70 %) stored their raw potatoes for relatively short periods of time ranging from 2 days to 3 weeks. A few (30 %) processing firms, stored potatoes for a month or longer. The potato crisps processing industry in Kenya is largely dominated by small scale processors who process crisps only as one of a diversity of other products. The industry is faced with several constraints including raw potato price fluctuations, scarcity and poor quality of potatoes, lack of facilities, skills and information on raw potato storage. The industry relies heavily on one variety that is not

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always available for all the processors. This information is important for potato breeders and postharvest technologists to avail sufficient suitable potato cultivars for crisping.

2 INTRODUCTION

Most potatoes in Kenya have until recently been consumed unprocessed, mainly in the area of production in the rural areas. However, consumption of potatoes has increased in urban centers as evidenced by the increasing number of fast food restaurants and processing industries, especially Nairobi city (Walingo *et al.*, 1998). The attractiveness of potatoes lies in the diversity of possible cooking methods including baking, roasting, boiling, stewing, frying and the manufacture of products including crisps and French fries. Processing and marketing of crisps for instance has become a major commercial activity in urban centers. Our earlier study showed that the Nairobi city dwellers eat potato crisps twice a week on average, mainly as snack (Abong' *et al.*, 2010).

Processing of crisps has undergone tremendous growth over the last three decades. In early 1980s, only five potato crisps processors could be located in Nairobi city (Durr and Lorenzl, 1980). In 1995, there were at least fifteen processors with an average production of 61 tons per month and by 2004 the number of enterprises was estimated at more than 20 (Walingo *et al.*, 2004). Manufacturers of potato crisps have specific requirements with regard to variety, quality of raw materials to process quality products and quantity of the fresh potatoes they are prepared to purchase (Walingo *et al.*, 1998). In Kenya, unfortunately, no varieties are grown specifically for processing. Processors, however, were reported to prefer the elongated white-skinned varieties; Nyayo and Roslin Tana for processing of fries (Abong' et al., 2009), while the round red-skinned Kerr's Pink and Dutch Robyjin were preferred for crisps (Kabira, 2007). With only one variety and skewed production, it is possible that the growing industry does not get sufficient suitable raw materials. They are therefore forced to turn to alternative cultivars with quality characteristics close to the preferred in order to sustain processing capacities. This often leads to products of diverse quality characteristics, some of which do not conform to the international crisps specifications.

Little information is available regarding the current trends and possible constraints in processing and marketing of potato crisps in Kenya. This study was therefore designed to characterize the potato crisps industry in Kenya in terms size and diversity of firms, the varieties of potatoes processed, marketing, number of products and constraints in processing.

3 MATERIALS AND METHODS

3.1 Survey of potato crisps processors: This study was carried out between December 2009 and February 2010. A structured questionnaire which had been previously pre-tested was used to interview a total of 23 processors in Nairobi and Nakuru. The processors had been identified from labels of their products found selling in 80 supermarkets and selling outlets in Nairobi. The processors were contacted and interviewed. The 23 processors consisted of 19 from Nairobi and 4 from Nakuru. Data was collected from the senior management and pertained to raw materials for processing, size of operation, marketing of products and constraints in crisp processing.

3.2 Data analysis: Data were analyzed using Statistical Package for Social Scientists (SPSS) version 11.5. Chi-squire analysis was performed to determine relationships.

4 RESULTS AND DISCUSSION

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4.1 Characteristics of processing firms and constraints in processing : Results showed that majority (83 %) of the 23 processing firms surveyed, were located within Nairobi city while a few (17 %) were located in Nakuru town. This confirms earlier report by Walingo et al. (1997) that indicated the highest concentration of potato processors was in Nairobi city. The industries were of a wide range of size depending on the number of employees. The number of employees ranged from 2 to 250; up to 61 % of the firms had 5 or fewer employees, 22 % had 6-10 employees and only 4 % had 100 and more employees (Figure 1). This means that processing of potato crisps is mainly by small-scale processors.

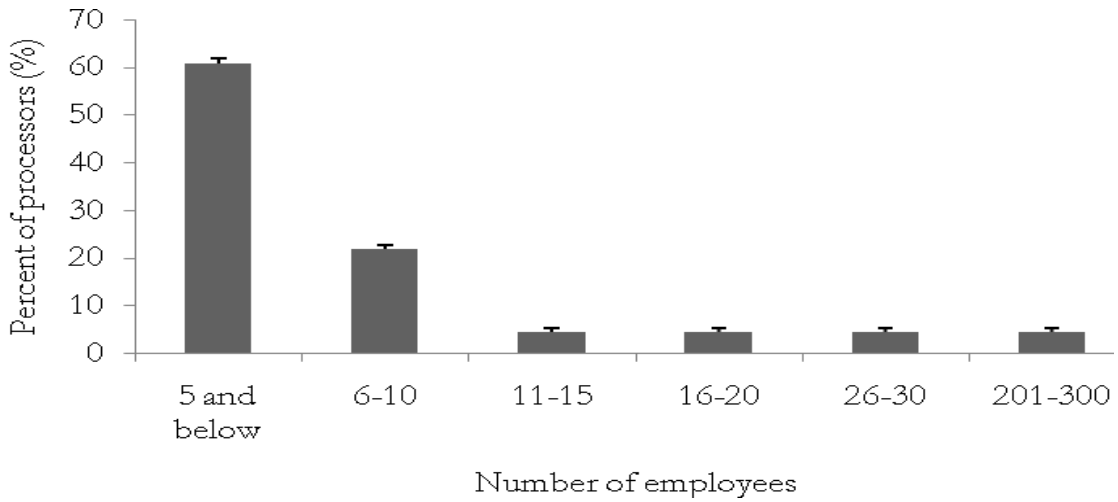

Figure 1: Employment capacity in crisps processing industries in Kenya. All values are given as mean ± standard errors.

Majority of the industries (48 %) had been processing potato crisps for the last 4-6 years compared to 17 % that had been established for over 10 years while only 4 % had been in the business for 1 year. The duration of operation did not, however, have any significant ($P > 0.05$) influence on either the volume of production or the number of employees showing that growth of the industry was in terms of numbers and not the individual industry size. The apparent lack of expansion in size of individual industries was attributed to lack of adequate financial support which had been cited as a constraint. The potato crisps processors were faced with several constraints. Approximately 4 % indicated lack of proper equipment and market, 64 % complained of lack of appropriate potatoes and 43 % indicated lack of finance to increase production capacity as a constraint. These results agree well with the observations of Walingo et al. (1997) and Kabira (2002).

The frequency of potato crisps manufacture by the processors ranged from twice a week to daily with majority of industries (44 %) processing 4 times a week. In each processing day, a majority of the industries (52 %) processed 50-100 kg of potato crisps. Only about 4 % processed 1 ton and above. This was in tandem with the nature and capacity of the crisps processing industry where the majorities are operating on small-scale. The frequency of processing was, however, not significantly ($P \geq 0.05$) associated with the processing capacity. The study established that up to 44 % of the processors produce crisps on order while 57 % generally produced for free market. This is contrary to the findings of Walingo et al. (1997) who reported that most processors would rely on orders placed by consumers.

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4.2 Diversity of products and packaging of crisps: The industries processed other products as a form of diversifying their markets. In addition to potato crisps, 60 % processed peanuts, 30 % processed chevda and potato sticks, 26 % processed pop-corns, 13 % processed banana crisps, and 9 % processed cassava crisps while 4 % also processed arrow roots crisps, spices, peas and herbs. The survey, however, indicated that 91 % of the firms processed potato crisps as the main product which ranked first in terms of sales. There was therefore lots of importance attached to potato crisps compared to other products that targeted the same market such as peanuts and chevda. Processing of other products was indicated by many firms as a means of diversification and spreading risks, rather than relying on a single product.

The unit weight of sale for potato crisps ranged from 10 g to 500 g with the most common package being 50 g or less and 101-200 g (Figure 2). Potato crisps are eaten as snack and the smaller units are convenient for school children while the larger packs are convenient and portable for older persons. Smaller packages were more easily affordable selling at between USD. 0.1-0.8.m It was noted that packages of 200 g or more were mainly from large-scale processors. All the processors packaged potato crisps in polythene which is the package of choice for many processors of snack foods. Most of the crisps had a shelf-life of 3-5 months, as was indicated on the packages.

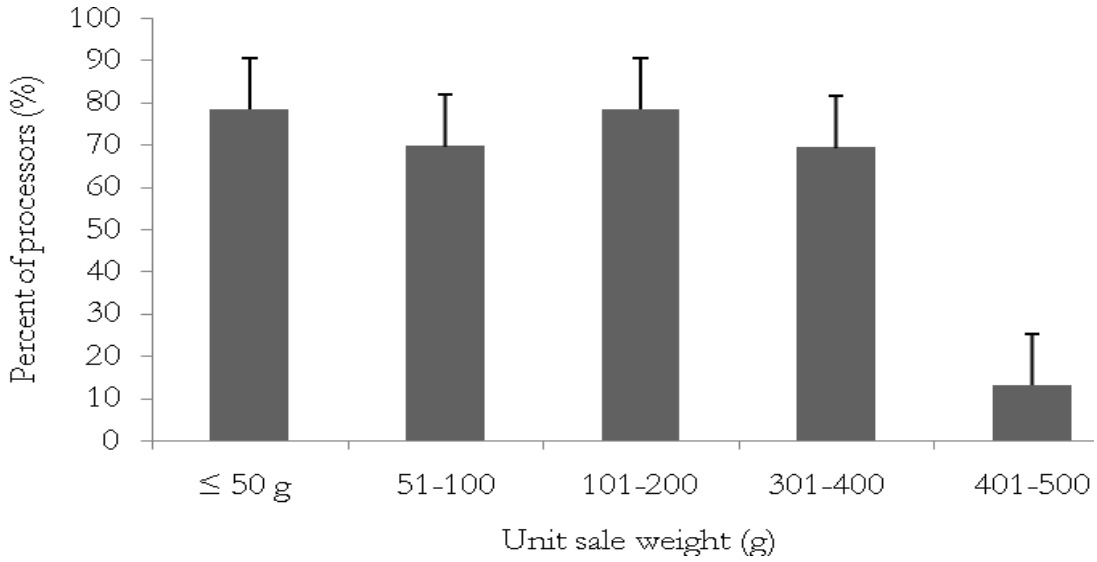

Figure 2: Unit sale weights of potato crisps processed by Kenyan industries. All values are given as mean ± standard errors.

4.3 Potato varieties and constraints in procument : Flesh color had significant ($P \leq 0.05$) influence on the choice and procurement of raw potato to most processors. Most processors (65 %) preferred the red skinned potatoes, 26 % preferred white skinned potatoes, while 9 % used both the red and white skinned potatoes for processing. The red skinned potatoes have been associated with good quality (golden yellow and crispy) crisps for a long time in Kenya (Walingo et al., 1997; Kabira, 2002). The major potato cultivars utilized in crisps processing by Kenyan processors were Dutch Robyjn (76 %), Tigoni (26 %) and Cangi (4 %). Dutch Robjyn has been the preferred potato cultivar for crisps processing for long time (Walingo et al., 1997). Other cultivars such us Tigoni and Cangi have been used in processing, mainly as alternatives when cv. Dutch Robjyn is in short supply. The choice of potato cultivar for crisps processing was based on good quality of produced crisps, i.e. uniform golden yellow color (61 %), availability of the potato (30 %) and affordability

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(4.3 %). The other criteria for the choice of raw potatoes were shallow eyes, smooth skin and round potato tubers since they produced good product yields because of low peeling and trimming losses. The major sources of cv. Dutch Robjyn for most of the processors (62 %) were Wakulima market in Nairobi and Bomet in the Rift Valley Province where the cultivar is grown in abundance. Wakulima market is a large open market centrally located in the city of Nairobi whose many processors around the city find easy access. Other markets include Nakuru town market and Kangemi markets in Nairobi.

Many of the processors (44 %) procure potatoes daily, 39 % procure once a week and a few (17 %) procure twice a week. Only 1 % procured raw potatoes once a month. These is explained by the fact that most processors are small-scale and had no adequate storage facilities and knowledge on how to prevent losses that are likely to be incurred during storage such us greening and rotting. Most large-scale processors, however, have adequate storage facilities and the necessary knowledge for proper storage, and can thus purchase potatoes on average once a month.

Raw potatoes were obtained in 110 kg gunny bags at average price of USD. 19-26. This price, however, fluctuates within the year ranging from USD. 19 to USD. 58, depending on seasonal availability. The raw potatoes are plenty early in the year, February-March and also in September-October during and after the two harvest seasons. The potatoes are in low supply between April and July at which time their prices rise considerably. The low supply is mainly occasioned by poor harvest during some seasons mainly due to unpredictable drought or political disturbances in the production areas.

During acquisition of raw potatoes, processors face a number of constraints. Top on the list is price fluctuation and low quality of raw potatoes, unavailability of suitable varieties throughout the year, lack of information on techniques and technology of storage, and high transport costs. A large number of processors (70 %) stored the raw potatoes for short periods of 2 days to 3 weeks. A few (30 %) larger processing firms stored potatoes for a month or longer since they had appropriate storage structures and information. This explains the finding that 17 % of the processors experienced losses of raw potatoes due to rotting and greening. Raw potato storage is an important step and requires absolute care and skills to maintain quality of crisps (Kabira and Lemaga, 2006).

4.4 Potato crisps processing technology

The general processing operations were the same for almost all the processors and consisted of washing, peeling, slicing, washing, drying, frying, cooling and oil draining, salting or flavouring, and finally packaging. Potato crisps' flavouring has been widely adopted by processors who use a range of flavors including onion, cheese, masala, tomato, garlic and mixtures of thereof. Slicing and frying stages of crisps processing pose a major challenge according to many processors as they determine crisp sizes and oil contents. These stages are internationally practiced and are critical in potato crisps processing for the desired quality in terms of colour and amount of oil absorbed (O'Connor et al., 2001; Cuesta et al., 2001; Kita *et al.*, 2007; Ziaiifar *et al.*, 2008; Abong, *et al.*, 2009).

The major type of fuel used by most of the processors (52 %) who were mainly small-scale was sawdust and firewood. However, 31 % used electricity and 17 % used charcoal. Contrary to expectations, fewer processors were using electricity due to the current high tariffs levied on electric power in Kenya that in turn lead to higher costs of production.

Table 1 shows the types of frying oils commonly used by processors in Kenya. There was no significant ($P > 0.05$) association between processing capacity and the choice of oil used. The largest number of processors (35 %) used Rina vegetable oil; a good number (30 %) used Cheff and Elianto corn oils, 26 % used golden fry vegetable oil while a few (4 %) used Ufuta and Postman vegetable oils. None of the surveyed processors used solid fats. All the processors were conscious of quality as affected by the choice of oil, which was chosen for production of good crisps colour and to prevent them from sticking together when cooled after frying. On average, the frying oil was changed after 17-24 hours. However, the spent oil was occasionally used for frying other products such as peanuts and popcorns. Potato peels were either discarded or given out for feeding animals.

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Table 1: Major frying oils used by potato crisps processors in Kenya

Brand	Oil type	Manufacturer	City and country	Percent of crisps Processors (%)
Rina	Vegetable oil	Kapa Oil Refineries Ltd.	Nairobi, Kenya	35
Cheff	Corn oil	Premier Oil Mills Ltd.	Nairobi, Kenya	30
Elianto	Corn oil	Bidco Oil Refineries	Thika, Kenya	30
Golden fry	Vegetable oil	Bidco Oil Refineries	Thika, Kenya	26
Ufuta	Vegetable oil	Bidco Oil Refineries	Thika, Kenya	4
Postman	Vegetable oil	Kapa Oil Refineries Ltd.	Nairobi, Kenya	4

4.5 Crisps marketing and marketing constraints: A majority of the processors (83 %) sold their products directly to supermarkets, 4 % to wholesalers and 13 % to individuals and kiosks (figure 3). Although the market channel was not significantly ($P \geq 0.05$) influenced by processing capacity, most kiosks and individual buyers received products mainly from small processors. An earlier study by Walingo et al. (1997) indicated a customer base of 60 % by supermarkets and 40 % by wholesalers indicating extent change in crisps market dynamics over the past decade.

The higher volume of sales to the supermarkets indicates that most of the crisps processors comply with Kenya Bureau of Standards (KEBS) quality requirements since supermarkets acceptance criterion is pegged on meeting the strict KEBS standards certificate among other factors. Most of the potato processors (91 %) were aware of the standards for potato crisps as required by KEBS. This was confirmed by display of up-to-date certificates at the processing premises of individual firms.

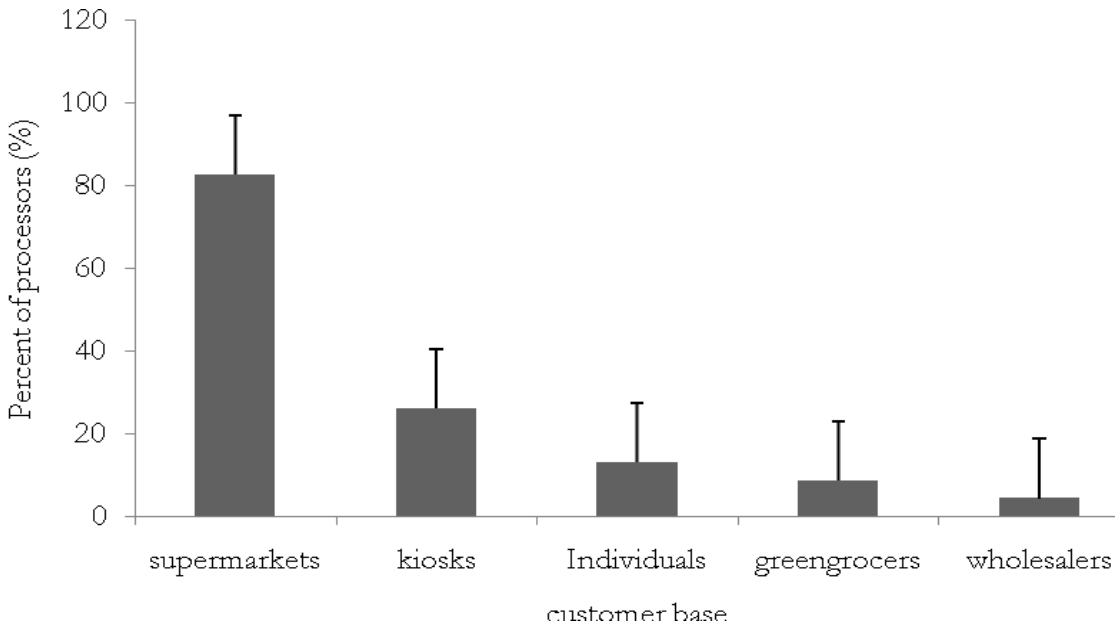

Figure 3: Major customers for potato crisps in Nairobi and Nakuru, Kenya. All values are given as mean ± standard errors.

To most of the processors (61 %), the market had experienced growth in terms of sales volume compared to two years ago. Results from our earlier study indicated that consumption of potato crisps in Nairobi was on the rise (Abong' *et al*., 2010). The demand for potato crisps was, however, noted to vary with seasons; higher sales were recorded during school holidays and during festive seasons. A few (21 %), especially small-scale processors recorded higher sales during school days. This is because most of them depend on kiosks which serve school going children on school days.

Major problems encountered by processors during sales and marketing of potato crisps included cancellation of orders and increasing cost of processing (9 %), procurement of Kenya Bureau of Standards certificate (4 %), high competition (30 %) and ethnic bias (13 %) especially when looking for orders from the shops. This indicates that many processors have to compete for the available market

5 CONCLUSIONS AND RECOMMENDATIONS

The potato crisps processing industry in Kenya is dominated by small scale processors who process crisps only as one of a diversity of other products. The industry is faced with several constraints including raw potato price fluctuations, scarcity and poor quality of potatoes, lack of facilities, skills and information on raw potato storage. The industry relies heavily on one variety that is not always available for all the processors. A large number, mainly small scale processors stored their raw potatoes for quite a short period of time ranging from 2 days to 3 weeks due to lack of sufficient storage facilities and knowledge. It would be important to train these processors on basic storage requirements. This information is important for potato breeders and postharvest technologists to avail sufficient suitable potato cultivars for crisping.

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