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# SURVEY ON SOME CONSTRAINTS FACING COOKING OIL SELLERS AT SELECTED MARKETS IN ACCRA

BY

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## SUMMARY

A survey was conducted at selected markets in and around Accra to find out from cooking oil-sellers the constraints they face with respect to ensuring that their oil maintains keeping qualities during handling and sale. In addition the survey also covered their sitting places, sanitation and kind of containers used to hold the oils.

Data was collected from oil-sellers of five markets namely Agbobloshie, Kaneshi, Mallam Atta, Kasoa and 31st December markets using a pre-tested questionnaire about their background, sales and problems they face.

The results indicate that in general the oils start showing signs of spoilage after one month's handling and storage by the sellers. 59% of the sellers had no education but they had various ways of preventing the spoilage characteristics of the oils when they occur.

Some of the problems they faced regarding the sale of the oils were low profits, unsteady demand for the product and competition. 80% of the sellers needed help in the area of finance to expand their business.

Up to about 90% had inappropriate sitting places; there was exposure of the oils to sunlight which speeds up rancidity of the oils. They used dirty bottles/ containers to store the oils. There was also the problem of adulteration of the oils and had poor hygienic practices.

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## 1.0 INTRODUCTION

Fats and oils are important builders of physical energy and the main source of bodily warmth. They also carry the fat-soluble vitamins in our diets. The importance of fats and oils therefore cannot be overemphasized however their stability is limited because they are subject to a very important type of deterioration known as rancidity. Rancidity is caused by at least two different kinds of chemical changes: hydrolysis and oxidation. (Ihekoronye and Ngoddy, 1985)

Lipolysis also seriously degrades the quality of fat and oil systems. As a result of lipolysis, the smoke point of cooking and frying fats is severely depressed and fried foods such as cakes, bean balls and doughnuts exhibit cracked surfaces, increased tendency to brown and increased fat absorption. (Opeke, 1982)

Problems such as the cleanliness of the containers used to store the oils, the handling, and storage conditions are some sources of deterioration of oil quality. The development and revision of quality standards for food products requires a thorough study of the food products which could be in the form of a market assessment of the product's quality or an evaluation of product quality at the point of production or both (Kordylass, 1991)

The main objective of this survey was to find baseline information from small scale coconut oil, palm oil, and palm kernel oil sellers about problems they faced with respect to quality and shelf life of the products and how they solved/managed them.

## 2.0 BACKGROUND

### 2.1 The Oil Palm

The oil palm, *Elaeis guineensis* Jacq. is a monocotyledonous plant. Within the species *E. guineensis,* different varieties and types can be distinguished that show definite

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## 2.0 BACKGROUND

### 2.1 The Oil Palm

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characteristics with respect to the quantity and quality of the extractable oil. The simple classification of the oil palm fruit is based on its internal structure; especially the thickness of its shell, and the fruit form may be described as belonging to one of the following groups:

*Dura:* shell (endocarp) 2-8 mm thick, comprising 20-25 % weight of fruit; medium mesocarp content of 35-55% mass.

*Tenera:* Shell thin, 0.5-4mm thick, medium to high mesocarp content (60-95%)

*Pisifera:* Shell-less and of little commercial value. Its importance is found in the breeding of commercial palms.

The oil palm is largely cultivated in the equatorial regions of Africa, Southeast Asia and America. Of all the oil-bearing plants, oil palm is the highest yielding (Purse glove, 1975). In the humid regions of West Africa, yields amount to about 4.5 tonnes of oil per hectare per annum. Global production data for palm oil indicate that in 1985 slightly in excess of 7.6 million tonnes were produced; major contributing countries are Malaysia, the Philippines, and Nigeria. Palm kernel production figures for the same year reached 2.6 million tonnes (FAO, 1986)

The fruit of the oil palm usually forms in compact bunches in the axils of the lower leaves. The bunches are massive and almost spherical and weigh about 10 –90 kilograms (18 kg on the average) the bunch usually contains 60 –65 % fruit. There are terminal spines of spikelets and hard-modified leaves, which are elongated and are of various lengths. The fruits are attached directly by the base and range in shape from nearly spherical to ovoid or elongated, bulging somewhat at the top. They are about 2-5 cm long and 3-30 g in weight. The outer layer is smooth and shiny. The fruit has a fleshy part surrounding a hard seed. The pulp or the fleshy part makes up about 35-95% of the fruit and contains 35-60% oil. It also contains 10-20% longitudinal fibres. The fruit usually contains one seed but two to three seeds sometimes occur. The shell surrounding the seed makes up about 1-55% by weight of the fruit and also about 0.5-8.0 mm thick, very hard solid and dark brown in colour, with longitudinal fibres drawn out into a tuft at the base. There are three germ pores at the apex.

The oil palm produces two distinct oils: palm oil and palm kernel oil. Palm oil is obtained from the fleshy mesocarp of the fruit, which contains 45 to 55% oil. The oil melts over a

range of temperatures between 25 and 50°C (77- 122°F). It differs in colour from light yellow to orange to red, the depth of which depends on the pigments, especially carotenoids.

Palm kernel oil is obtained from the endosperm of the palm kernel; it is light yellow in colour.

## 2.2 Harvesting and pre-processing of palm fruits

The natural ripening of the fruit on the unharvested bunch takes about ten days for small bunches and thirty days for large ones. The ripening process starts at the tip of the bunch and progresses slowly towards the stem. Fruits at the tip of the bunch may therefore be ripe and detached while the remaining fruits are under-ripe or very under-ripe depending on how far they are from the stem. Usually only one bunch on a tree ripens at a time and ripe fruits begin to fall to the ground.

The bunches, 6-10 metres above the ground are harvested when under-ripe to prevent them from exploding when they hit the ground. However early harvesting does result in the loss of oil. About 10 –15% of the final oil synthesis occurs during ripening of the bunch on the palm tree and as a result of early harvest, this will be lost. The ripeness of the fruit and the ease with which the oil is extracted and recovered are closely related. If the fruit is either very under-ripe or over-ripe, the oil becomes difficult to extract and recover.

Bunches in the right state for harvesting are carefully cut without injuring the stalk. The larger bunches are halved or quartered with a cutlass or axe. This helps with the drying of the bunches so that the fruits loosen from the stalk. The bunches are stored in a dry place for four to five days protected by a canopy of palm fronds. During this time, the fruits loosen and are stripped of their fruits by hitting them on the ground or against a suitable grill, collected up, washed and boiled. Palm fruit does not keep well and for good quality oil extraction, the boiled nuts (which have become sterilized) must be processed with minimum delay.

Piling up fruits in mounds covered with palm fronds for a long period of time to loosen the fruits causes fermentation, mould infection and the breakdown of oil in the tissues. This is highly wasteful since a lot of oil is lost and quality of oil produced is also very poor.

### 2.3 Palm Kernels

From the nature of the palm fruit, the fleshy pulp of the fruit has to be removed in order to expose the unshelled palm kernel nuts. When left on the bare ground in small heaps, palm nuts gradually become mouldy. It is better to spread them out on a hard floor or mat to dry in the sun. It takes a few days of warm weather to dry the nuts. During drying, the kernels shrink slightly and become easier to remove when the nuts are cracked. When not properly dried, they go mouldy or soft rotten and may even be damaged by insects. (Kordylass, 1991).

Two main products are obtained from palm kernels besides the hard shells. These are palm kernel oil and palm kernel cake. The characteristic feature of palm kernel oil is its high content of saturated fatty acids, primarily lauric acid. Due to this high proportion of saturated fatty acids, palm kernel oil does not readily turn rancid.

Palm kernel cake is obtained after extracting oil from the palm kernels, which have previously been freed from their hard outer shells. The composition of the cake varies with the type or variety of palm oil and method and efficiency of palm kernel oil extraction. It is used as an animal feed. (Hartley, 1977)

## 3.0 THE COCONUT TREE

### 3. 1 Production and Distribution

The coconut palm *Cocos nucifera* L., is a monocotyledon. It has neither a taproot nor a root- stock with divided branches; instead, many thousands of long roots of uniform thickness emerge from the base of the swollen bole or stem. Coconuts are by far the most important nuts in the world. (Popenoe, 1969).

They are grown for different purposes in various part s of the world. Due to their wide distribution, the original habitat has for a long time been a matter of controversy. The distribution of the coconut palm extends over the islands and coasts of most of the tropics and even in some places beyond the tropics. Today, the main coconut growing areas of the world lie geographically within about $22^{O}$N and S of the equator.

The annual coconut crop of the world, estimated at approximately 17 million nuts, comes from an area of 3.5 million hectares distributed mainly over the tropical coasts of India, Indonesia, the Philippines, Sri- Lanka, Central America and Africa. Over 80 different varieties have been described in the literature (FAO, 1970) many of these have been

described as are reported to be simply "ecological types" which have evolved as a result of adaptation to certain environments.

Recent classifications distinguish between definite genetic characteristics, in particular the mode of pollination, with further breakdown into types within these varieties.

Accordingly, there are tall and dwarf varieties. World coconut and copra production in 1984 was 31 million tonnes and 3.7 million tonnes respectively. The largest producer of coconut is Indonesia accounting for nearly 31%, followed by the Philippines (21%) of the word output. The Philippines is the leading copra producer in the world, accounting for nearly 38% of world copra production (FAO, 1984)

## 3.2 Uses of the coconut palm

Burkill (1935) describes the coconut palm as "one of natures" gifts to man because of its numerous uses. Of the more than hundred products made directly or indirectly from coconuts, seven are imp0ortant in world trade. These are:

a. Whole coconuts (tender and green as well as dry and mature.
b. Copra-- dried kernel of the nuts used for shredding and pressing oil.
c. Coconut oil-- extracted from copra or directly from the meat.
d. Coconut oil cake-- the residue after extraction of oil.
e. Desiccated shredded coconut.
f. Coconut skim milk and coconut protein.
g. Coir—fibre from the husks.

Coconuts provide food, oil, medicine, fibre, timber, thatch, mats, fuel and domestic utensils. The oil is used for cooking, anointing the body, illumination, lubrication and making soap. Coconut oil also finds a lot of uses in industry, including the manufacture of detergents and resins. Because it has a high melting point, coconut stearine is a valuable confectionery fat; it is also used as a substitute for cocoa butter in the manufacture of candles. Coconut cake is widely used as food for cattle and poultry.

The water in the cavity of the fresh green unripe fruit is commonly drunk as a beverage throughout the tropics; it is a cool, slightly aromatic and somewhat aerated as it is saturated with carbon dioxide derived from the respiration of internal residues.

The shell accounts for about 25 per cent of the weight of the husked nut and are used as fuel, particularly in copra kilns. Half shells are also used for making bowls, cups scoops

and ladles. The shells take a high polish and can be carved and decorated. They are also used for making buttons, combs, bangles and musical instruments.

Coir is obtained from the husks of the mesocarp, which is removed in the preparation of copra. In southern India, much of the coir is made into yarn; superior quality yarn is manufactured into mats, matting, rugs and carpets, while inferior grades are used for ropes and twine.

Coir fibre has a natural resilience and durability and is water resistant. It is useful in the making of cables.

The leaves of the coconut palm are plaited and used for thatching, mats, screens hats, baskets and other articles. The midribs of the leaves are also made into brooms and baskets.

### 3.3 Nutritional significance of oil/fat

Oil provides twice as much energy as the same quantity as carbohydrate and is therefore considered to be a valuable part of a well balanced diet. Oil also contains a range of fat-soluble vitamins (A, D, E, and K) and essential fatty acids, both of which are necessary for the healthy functioning of the body.

The process of oil extraction produces a by-product known as oilcake. This is very nutritious, and can be used either as animal feed or as an ingredient in the production of other food products. (FAO, 1986)

### 3.4 Storage and deterioration of fats and oils

At least two entirely different kinds of chemical changes: hydrolysis and oxidation are responsible for rancidity. Rancidity is a very important type of deterioration in oils and fats. The hydrolysis of fats /oils results in the liberation of chemical components of which oils/fats are composed i.e. fatty acids and glycerol.

Oxidation results in the breakdown of fatty acids into the formation of other compounds, which have unpleasant odours or flavours. Oxidation requires the presence of oxygen and the reaction is accelerated by heat, trace metals, moisture and acid released from the fat by hydrolysis. Most of the conditions that promote oxidative rancidity also encourage hydrolysis.

Rancidity may develop in foods or crops containing a high percentage of fats, as well as those with more or less purified fats and oils when conditions are created for these reactions to take place. When rancidity begins to develop, the rate of instability becomes progressively greater and there is no need to reverse the change. Conditions that cause the development of rancidity must therefore be avoided. This is done by careful handling and proper drying of the oil-containing crops and also by packaging fats and oils in airtight, lightproof containers.

When they are naturally saturated, fats are relatively stable and resistant to the development of oxidative rancidity. They are also stable when they are highly hydrogenated and when they contain some substances known as anti- oxidants that can block oxidative reactions. Anti- oxidants are present in naturally unrefined vegetable oils/fats but refined vegetable oil/fat do not have enough of these substances to be relatively repellent to rancidity. Natural anti-oxidants appear in the form of vitamin E, also known as *tocopherols,* and are relatively plentiful in vegetable fats.

Rancidity is objectionable because it produces disagreeable odours and flavours and after a period of time, undesirable changes in colour and consistency occur. Rancid fats make food unpalatable. Moreover, the development of rancidity stops vitamin A activity in the oil. It may also have undesirable physiological effects on the human body when consumed.

## 4.0 TRADITIONAL METHODS OF PREPARATION OF THE OILS IN GHANA

### 4.1 Palm oil

The traditional production of palm oil from palm fruit involves boiling followed by pounding. Loosened fruit as well as fruit still in the short stalks is boiled. The fruit may be pounded in a deep wooden mortar with a pestle or trampled either in a stone lined concrete or clay lined pit dug into the ground or in a wooden dug- out canoe filled with cold water. The pounded mass is stirred in hot water and the fibres are washed and pressed or squeezed by hand to remove the pulp containing the oil. The process is repeated several times until most of the pulp is washed out of the fibres. The extracted watery pulp is passed through a fine mesh screen or sieve to remove any fibres that were not collected by hand. The extract is then boiled for several hours and the oil, which appears on top of the

extract, is skimmed off and put to boil over an open fire to clarify. The oil obtained from this processing method is referred to as "soft oil".

Another method of processing yields "hard oil" where the fruit is allowed to go through fermentation by burying the fruits for some days before processing. The microbial and enzymatic reactions that occur during fermentation break down the pulp and the oil contained in the fibres is released. The fermented fruits are then macerated and the oil is extracted as above with further boiling. The palm oil produced solidifies very rapidly even at $32^{O}C$ ( $90^{O}F$) and is classified as hard oil. (Cornelius, 1977)

### 4.2 Palm Kernel Oil

Palm nuts obtained after the extraction of red palm oil are dried in the sun for a few days. The nuts are then cracked in mortars or with stones. Cracked kernels are roasted in a heavy metal pan over an open fire with constant stirring. The oil, which comes out, is slightly burned but as the roasting continues it becomes dark brown. When the kernels turn black and seem to have turned into charcoal, almost all the oil has been extracted and the roasting stops. The kernels are then discarded and the oil is allowed to cool and bottled.

### 4.3 Coconut Oil

Coconut oil is extracted from freshly removed kernels after the nuts are cracked. The brown outer skin is scrapped off and the meat is grated on simple hand graters or milled into pulp. The pulp is put into muslin or loosely woven cotton bags and squeezed to remove the thick white " coconut milk" which is very rich in oil. The residue is mixed with hot water and is once again squeezed to remove the remaining milk. The coconut milk extract is then allowed to stand for 10- 12 hours in a cool place. The cream rises to the top and is skimmed quickly and is strained through a cloth and then heated to remove any water present. The fat melts and appears as a thick layer on top of the mixture. Any impurities fall to the bottom and the layer of the oil on top is collected, heated and bottled. This method is about 50% efficient.

Most of the coconut oil prepared traditionally is extracted from the dry coconut kernel (copra). The copra is grated and then pressed to remove the oil. This oil is of high quality and is used for cooking. The first residue is heated or steamed and the oil is once again pressed out and is then clarified by heating to reduce moisture levels. Alternatively, the kernels are washed, steamed slightly, roasted or soaked in water and then pounded or

ground into fine pulp. The pulp obtained is soaked in water and left overnight after which it is boiled. The oil that appears at the top is skimmed off and re-boiled to reduce moisture content. The oil is then allowed to cool and bottled.

## 5.0 METHODOLOGY

The survey was conducted using a questionnaire, which was administered through personal discussions and interviews.

### 5.1 The Questionnaire

The questionnaire covered the following areas:

-Sellers' background/biodata.

-Source of oil/ fat.

-How long the respondents /sellers kept the oils.

-Handling practices and type of containers used

-Sanitation and environment of sellers.

-Spoilage parameters observed by respondents.

- How the sellers managed/solved the problems.

- Miscellaneous problems associated with the sale of oil products.

A copy of the questionnaire used in the survey is shown in appendix 1.

### 5.2 Selection of respondents and survey sites

The respondents interviewed were categorized into three groups according to the type of oil(s) they sold; however, most of them sold more than one of the oils.

From Accra and nearby Kasoa, five markets were selected. These are: Agbobloshie market, Kaneshi market, Mallam Atta market, Kasoa market and 31$^{st}$ December market.

In each market place, at least ten sellers were randomly selected and interviewed across the ages.

## 6.0 RESULTS AND DISCUSSION

### 6.1 Biodata and background of Respondents

In all 52 respondents were interviewed. Most of these respondents sold one or more of the oils. The distribution according to what they sold is as follows:

16 respondents sold coconut oil, 19 sold palm oil and 17 are palm kernel oil sellers. Only one of the respondents was male. They sold between 2- 12 jerry cans of oil in one batch of sale. 59% of the sellers had never been to school and their ages ranged between 18 and 50 years. Figure 1shows the age distribution of the cooking oil sellers.

68% of the sellers had poor environmental conditions for selling food items in general and some of them from observation had poor hygienic practices.

### 6.2 Source of oils

All the sellers bought the oil on small scale from producers. About 80 % of the sellers got the oil from one source. 74% of the palm oil sellers said they obtained it from producers from Akyem Wenchi in the Eastern Region of Ghana who brought it to Agbobloshie market in Accra for sale. Others (21%) said they obtained it from the Volta Region of Ghana. 50% of the palm kernel oil sellers said they got the oil from Akyem Wenchi in the Eastern Region whist 15% said they got their oil from secondary sources. Few others obtained their oil from Swedru and Bawjoase markets in the Central region of Ghana.

For coconut oil, nearly 90% of the sellers said they bought it from Nzema in the Western Region of Ghana. 8% said they got it from secondary sources. Some of the bottles they used to store the oils looked dirty from old stock of oils they contained thus contaminating them. There was also adulteration of the oils from the mixtures they made, mixing oil from different sources stored under different conditions.

### 6.3 Quantity of oil bought for sale

The results of the survey show that all the sellers bought the oils in small-scale quantities from the processors. The oils were measured with jerry cans, which has a volume of 5 gallons. The sellers bought on the average 8 jerry cans in one batch sale. A representation shown in Figure 3 shows that only 11% of the sellers buy and sell more than 10 jerry cans in one batch.

### 6.4 Observed Physical changes in the oils

69% of the oil sellers said they did not observe any physical changes in the oils as they sold them. Those sellers who observed the physical changes complained about spoilage parameters such as presence of bad smell, presence of extraneous matter, development of colour and deterioration of taste.

According to the sellers, these developments started to show after about one month of handling and storage. Out of these three oils palm oil was first detected to start deteriorating, followed by palm kernel oil and coconut oil.

### 6.5 Methods of solving problem of spoilage by the oil-sellers

The spoilage parameters mentioned by the sellers include smell, mouthfeel, taste and colour. Colour changes were the first spoilage characteristic to be observed by the sellers. This could be attributed to exposure of the oils to air containing dust and other particulate matter.

The second spoilage parameter as observed by the sellers was smell. Free fatty acid formation by lipolysis and action of the enzyme lipase present in oils could be the cause. The free fatty acids formed might have been oxidised to give products, which give these off-flavours.

Taste was the next spoilage parameter observed. The changes in taste could also be due to the fact that by–products of rancidity such as peroxides have been formed and since these have their own tastes, they tend to change the original taste of the oil.

Finally mouthfeel changes were detected and can also be due to the products of rancidity.

Some of the deterioration occurs during storage of either the raw material from which the oil/fat is produced, or in the fat itself after extraction and leads to hydrolysis of the triglycerides to yield free fatty acids. Increase in free fatty acid content of an oil/fat can affect mouthfeel, taste and smell of the oil/fat.

Solutions to the problem of smell and taste used by the sellers are frying all or part of the oil with one of the following or a combination: *momone*, onions ginger and other spices. These impart their characteristic desirable flavours to the oils thus masking the off-flavours. This treatment also improves the taste of the oil according to the sellers.

Allowing the oil to stand and then sieving through very fine mesh to remove extraneous matter was the management procedure to check the problem of colour in the oils.

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## 6.6 Miscellaneous problems faced by oil-sellers

Some of the problems faced by the oil sellers were low profits, poor sales competition and unsteady demand. They attributed low profits and poor sales to the fact that some customers now buy from producers at low prices. Unsteady demand for the oils, especially for coconut oil and palm kernel oil, the sellers explained, was seasonal. Traditional fish processors bought a lot of these oils for frying when fish was in season.

Palm oil on the other hand had a general rate of sale. Consumers used it for the preparation of soups, stews and other dishes all year round.

About 80% of the oil sellers said they needed help in the area of finance to expand their business. Others said they had problems with a place of storing leftover oils after the day's sales.

**Fig 1 : Distribution of age groups of the Respondents**

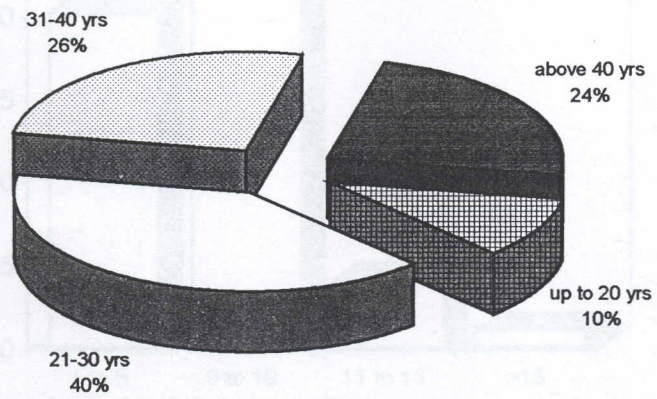


**Fig 2: Sellers' Educational background**

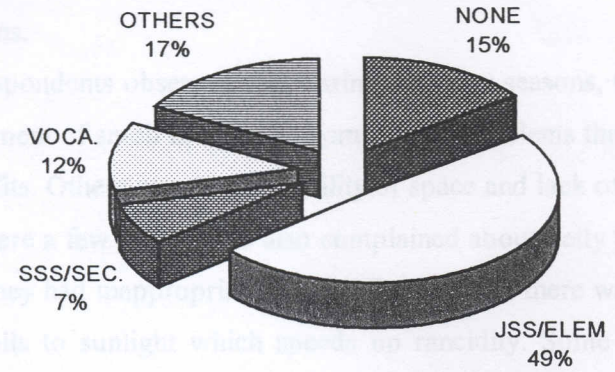
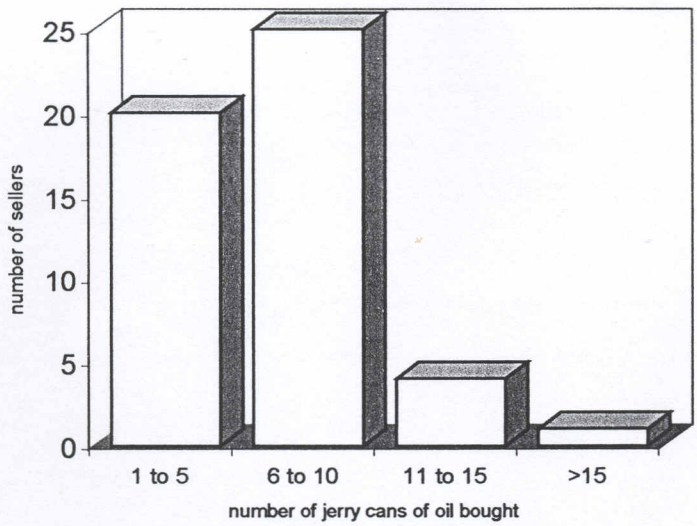



**Fig 3: Quantity of oil bought for sale**



## 8.0 CONCLUSION

Deterioration of most of the oils start after one month of storage and handling by the oil sellers but some, according to the sellers can keep for several months with proper keeping conditions.

Most respondents observed that during the rainy seasons, there was an increase in the rate development of smell in the oils. Some of the problems the sellers had were poor sales and low profits. Others were unavailability of space and lack of funds to expand their business. There were a few others who also complained about petty theft on the market, especially at night. They had inappropriate places of sitting and there was also the problem of exposure of the oils to sunlight which speeds up rancidity. Some sellers exhibited poor hygienic practices.

Appendix1:

**QUESTIONNAIRE ON SOME CONSTRAINTS FACING COCONUT OIL, PALM OIL AND PALM KERNEL OIL**

Market Name..... Location.....

Date..... Questionnaire No.....

**SELLER'S BACKGROUND**

1. Name of Respondent.....
2. Age..... years 3. Sex.....

3. Education (a) Elementary/JSS (b) Vocational (c) Secondary/SSS (d) University (e) None (f) Others

**SALES AND CONSTRAINTS**

1. Type of oil/fat sold.....
2. What are your seating conditions as you sell the oils?.....
3. How long have you been selling oils/fats?.....
4. What volume of oil do you purchase for sale in one batch?.....
5. How long does it take to sell one batch?.....
6. What kind of containers do you use to store the oils?.....
7. Do you observe any physical changes before and during marketing? (a) Yes (b) No
8. If yes state them.....
9. How do you solve/manage the above-mentioned problems?.....
10.

| **Problem related to** | **Rank** |
|---|---|
| Smell of oil | |
| Taste of oil | |
| Colour of oil | |
| Mouthfeel | |

11. What help do you need? Finance.... Place for selling.... Place for storing the leftover at night in the market place... Other (specify).....
12. What are your other problems with the sale of oil?.....

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