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PROBLEMS OF FOOD PACKAGING IN GHANA

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PREFACE

The necessity to provide informative guidelines in certain aspects of food manufacturing in Ghana is on the increase because of the rapid growth of the food industries.

One such aspect is in food packaging - which is the use of containers and components plus decoration or labeling to protect, contain and identify merchandise and facilitate use of products.

Today, virtually all manufactured or processed foods require packaging in some phase of production or distribution. Increasingly, this packaging function demands specialised skills, machines and facilities to produce packages that meet one or more of four basic needs of protection, utility, motivation and profitability. Unfortunately, the packaging function in food manufacturing is little understood in this country.

In an effort to make those who are concerned in one way or the other with food manufacture, aware of the importance of food packaging that this report has been prepared. The report discusses the many problems with packaging in metal, glass and flexible containers and in traditional packaging materials and makes suggestions and recommendations. It calls on some agencies of the government to co-operate with the food packager in providing his basic needs - the packaging materials.

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INTRODUCTION

The word "package" originally meant a "bale or bundle of goods". In the food industries, the word is normally used to mean the basic unit in which a food article is initially packed and delivered to the ultimate purchaser or consumer. Consequently, "package" has come to mean any receptacle or carton in which a food commodity is packed as well as any wrappings in which it is enclosed and put up for sale.

Food is packaged for four primary reasons:-

a) to protect the product from contamination by macro-organisms, and filth;

b) to retard or prevent either loss or gain of moisture;

c) to shield the product from oxygen, other gases or odours and light;

d) to facilitate handling and prevent physical damage during handling.

A wide variety of materials is available for making packages for food products. However, for a material to be satisfactory for food packaging it must be clean and free from substances that might affect the flavour, odour, composition or micro-biological quality of the packaged food, and in the case of paper packages, the stock should be virgin chemical or mechanical pulp.

In Ghana, foods are packaged in metal and glass containers, flexible packaging materials and traditional packaging materials. In most cases the primary purpose of the container is to ensure protection of its contents from contamination or deterioration and/or serve as a unit of sale. Very often due regard is not paid to other attributes of the container. The problems which some of these attributes present as well as other areas of food packaging which need immediate attention, are discussed in this report.

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PACKAGING IN METAL CONTAINERS

The metal container used for packaging in Ghana is the tinplate can. The tinplate is actually made of steel bearing a thin coating of tin applied either by hot-dipping or by electrodeposition. For some foods, such as fruits, vegetables and meat products, the tinplate whether hot-dipped or electrolytic, needs to be protected against chemical interaction of the contents and the metal by an organic protective coating of lacquer. The formulation of a lacquer suitable for coating the interior of food containers is not an easy matter, as in addition to possessing a high degree of adhesion, elasticity, and toughness, the lacquer must be odourless, non-toxic, and unaffected by the foodstuffs with which it comes into contact, and must not impart any flavour to the can contents. Furthermore, the lacquer must be stable over a wide temperature range and not breakdown during processing.

Some Food Cans In Use:

Table 1 shows some of the common food cans used in Ghana. The nomenclature usually employed in can dimensions avoids the confusion incident to conflicting local names of cans. In this system the cans are identified by a statement of their dimensions (overall diameter and over-all height). Each dimension is expressed as a number of three digits. The left-hand digit gives the number of whole inches, while the two right-hand digits give the additional fraction of the dimension expressed as sixteenths of an inch. Thus a $3\frac{1}{16}$ inch diameter and $4\frac{11}{16}$ inches high can, is referred to by the canner as 301 by 411.

Most of the locally-manufactured cans however, do not conform to international standards because no production control of the cans is undertaken.

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Table 1

SOME COMMON FOOD CANS
USED IN GHANA

Can Name	Diameter (ins.)	Height (ins)	Canner's Designation	Net contents (Fl.ozs)	Some Foods for which ordinarily used
No.1 Tall Can	$3\frac{1}{16}$	$4\frac{11}{16}$	301 x 411	15	Garden eggs groundnut soup, pineapple juice, okro, snail, kontomire, palm oil
A $2\frac{1}{2}$	$4\frac{1}{16}$	$4\frac{11}{16}$	401 x 411	26	Fruits, Vegetables, e.g. tomato puree, corn-on-the-cob, sliced yams, pineapple juice, pineapple slices.
-	3	$2\frac{10}{16}$	300 x 210	8	Pepper puree, Mango juice
$2\frac{1}{2}$ oz	$2\frac{3}{16}$	$1\frac{8}{16}$	203 x 108	2	Tomato puree (small size)
-	$2\frac{2}{16}$	$3\frac{11}{16}$	202 x 311	6	Tomato juice

Problems with packaging in metal containers:

In Ghana, the principal problems with packaging in metal contains are: corrosion of metal containers; labelling coding of cans; and foreign flavours in canned foods.

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Corrosion of Metal Containers:

One of the chief sources of loss in the canning industry is corrosion, as all types of foods tend, in some measure, to attack the interior of the tinplate container. Furthermore, the outside of the container may also be subjected to atmospheric corrosion.

In Ghana, some of the tinplate containers used in the canning industry are fabricated locally from imported lacquered and unlacquered tinplate sheets. In the fruit and vegetable canning industry corrosion is very common, and the main types of corrosion found in this industry are:- a) Internal corrosion; b) External corrosion.

Internal Corrosion:

The principal manifestations of internal corrosion are:-

i. the formation of hydrogen swells and perforations;

ii. the discoloration of the interior of the can and/or its contents.

Hydrogen Swell

This is a description of cans which bulge as the results of formation of hydrogen following internal corrosion of the can. Containers or cans for fruits and vegetable packs are either plain, (i.e. unlacquered) or lacqured tinplate. In the plain cans corrosion tends to occur by the gradual solution of the tin coating over wide areas and the simultaneous deposition of hydrogen at the bare area of steel, with some local action at the steel itself. The local action on the steel becomes so rapid that enough gas is produced to distend the ends of the can.

In the lacquered can, the lacquer film covers both steel and also the tin coating, but the fabrication of the lacquered sheet damages the lacquered film and at times causes fracture of the tin coating, particularly at the side seam and the shoulder of the can end. At these points corrosion is likely to occur. To improve the coverage of lacquers, cans should be lacqured after fabrication by

flushing, or spraying. No facilities, however, exist for post-lacquering of fabricated cans in canneries where can fabrication is undertaken. Initially, the cost of post-lacquering cans may be greater than plain cans, but the increase must be offset against the decrease in losses due to corrosion and the elimination of the risk of discoloration which is liable to occur in cans where the lacquer coating is damaged and the metal surface exposed.

Table 2 shows the weights of three batches of exhausted and sealed A $2\frac{1}{2}$ cans of pineapple slices in syrup which were supposed to have a weight of 30 ozs. (852.5 gms) after retorting. Such overfilling can cause distortion of can ends during storage.

Table 2

Wt. of slices + syrup (exhausted and double-seamed) in A $2\frac{1}{2}$ cans

Batch 1 (ozs)	Batch 2 (ozs)	Batch 3 (ozs)
31.4	31.9	31.9
32.1	31.6	32.9
31.9	31.3	30.6
31.5	30.6	30.6
31.9	30.9	31.3
31.8	31.8	32.1

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Discoloration of the interior of the can and/or its contents:

This type of discoloration may be due to "sulphurstaining" or detining.

In meat products like corned beef which contains sulphur-containing proteins, hydrogen sulphide or organic sulphur compounds are liberated when heated. These compounds then react with the tin and any exposed iron of the tinplate to form tin and iron sulphides which are dark in colour. The stains usually follow definite patterns due to the preferential staining of the tin surface. The degree or intensity of staining varies with the tinplate, the protein and protein-like substances and pH of the meat contents, and the ease with which the sulphur compounds are liberated.

The staining is also affected by the presence of oxygen inside the pack. These stains in most cases, do not affect the nutritional value or the palatability of the food and are only objectionable from the aesthetic angle.

In order to prevent sulphur-staining such foods should be packed in cans lined with sulphur-resisting lacquer (known as S.R. lacquered cans). This lacquer contains zinc oxide, which combines with the sulphur forming zinc sulphide, forming non-dark pigmentation of the tin compound.

Some cans, containing fruits and vegetables have also been observed to show excessive interior staining. Such staining have been observed in canned garden eggs (Solanum melongena) double concentrates of mango pulp (magnifera indica) and tomato concentrates (Lycopersicum esculentum) as shown in plate 1 page ..... In the garden eggs and mango pulp concentrate packs, both the interior of the can and the contents were heavily stained as to render the contents unfit for human consumption. The discoloration in these packs was due to the attack on the tin-plate by the can contents. In most cases the internal surface of the can developed an irregular pattern known as "feathering".

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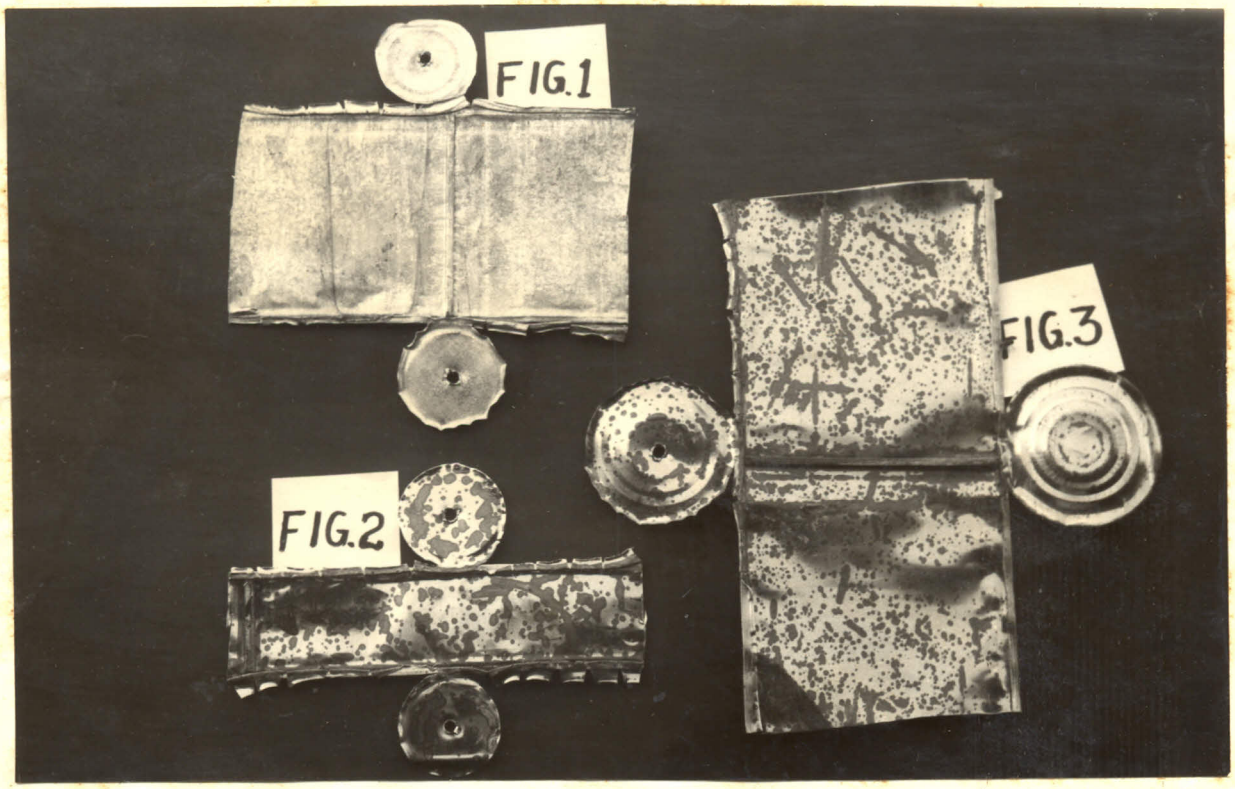

Interior Corrosion in locally-canned products

Fig.1. Pineapple Cubes; Fig.2. Tomato Puree

Fig 3. Tomato Puree (Large size)

Plate 1.

The extent of this pattern development is generally not a good guide to the tin content of the food, but severe attack can result in the whole internal surface of the can taking on a dull grey colour which is easily recognised.

External Corrosion:

Although, the internal corrosion of the pack is of primary importance, corrosion of the exterior surface of the can must be taken into account, as addition to the unsightly appearance of the container severe external corrosion may lead to losses through perforations of the can.

In most examples of external corrosion, the tin coating is cathodic to exposed steel and the latter corrodes preferentially, leading eventually to the formation of rust at discontinuities in the coating.

Moisture on Cans:

The type of external corrosion occuring most in our canning factories is that due to moisture on cans. There are several examples of this. One such example is the frequent casing of wet cans at temperatures sufficiently low that they do not dry quickly. The average temperature of the contents of the can is required to be between 95 to 100°F (35 to 37.8°C) at the time of casing.

This ensures that the cans retain enough heat to dry off surface moisture. Cans put into cases at temperatures much below 95°F (35°C) therefore stay wet for a considerable time since the heat remaining in the cans is not sufficient to evaporate the moisture from the surface of the cans. The effect is even aggravated when the cased cans are pilled in the inner portions of large stacks, especially when they are cased in fibreboard containers. Rusting usually commences at the side and end seams where the tinplate has been subjected to the greatest mechanical strain during fabrication.

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The occurrence of such corrosion can be controlled by controlling the cooling process so that cans are at the right temperature when they are cased.

Another common type of corrosion in warehouses is the condensation of moisture on the surface of the can from the surrounding air. In the canning industry it is called "sweating" and occurs only when the temperature of the can surface is at or below the dew point that is sufficiently colder than the surrounding air to condense moisture from it. The prevalence of high humidity and temperature in cannery warehouses makes conditions optimum for sweating. Proper air circulation and ventilation around stacks and adequate temperature control to keep warehouse atmosphere dry can minimize the danger of sweating.

Rust formation due to sweating is also of frequent occurrence in the stores and on the shelves of most departmental stores.

In some factories, storage areas for both empty and filled cans are in close proximity to processing floors and steam escaping into these areas cause rusting after condensation on the cans. Where storage areas are near to processing rooms, the latter should either be well ventilated so as to take moisture laden air away from warehoused goods or hoods should be provided for equipment which gives off steam.

Abrasion:

Abrasion of the tin coating through handling anywhere in the cannery invites rusting by exposing the base steel of the tinplate. Improper handling in can runaways, gravity drops, retort baskets, and of tinplate sheets before fabrication, as to expose the base steel of the tinplate, is common in our canneries and this leads to rust formation.

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Type of Product:

The packing of acid fruits and of products in brine, even under the most carefully controlled conditions, cannot be accomplished without some degree of spillage, and the external surface of the can is, therefore, constantly exposed to the possibility of corrosion caused by contamination from this source. For example when acid fruits like pineapples are processed the fruit acid spilled onto the exterior of the can is constantly transferred into the processing and cooling water resulting in constantly increasing acidity of the water and thereby making conditions very conducive to corrosion development.

Also, brine used in packing tomatoes and garden eggs, cause an increase in the salt content of the cooling water through spillage and thereby lead to corrosion. At times, cans may have dirt or spillage material on their exterior surface which usually becomes baked on during heat-processing, after which they are extremely difficult to remove, and thus leads to corrosion in storage. Such corrosion developments can be overcome by effective washing of sealed cans.

Labelling

One aspect of food packaging which has not received proper consideration in food manufacture in Ghana is labelling. For, on some canned foods, incorrect net weights of the contents have been declared. On others, the incorrect net weights have been cancelled and the correct ones substituted in handwriting. Apart from marring the appearance of the label, such cancellations raise some doubts in the minds of consumers as to the genuineness of the declaration of the actual weight of the can contents. At times the meanings of can contents are also obscure because of improper labelling. An example of this is shown on a label on a tomato puree which reads:

Ing: Preserv. & Essence Solidity 28-30%

Choice of colour and design of labels are substandard in some cases and the effect produced by the colours are at times unattractive. Many locally-canned foods in Ghana therefore, do not have a "buy-me" appeal.

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Label design is an art and must be practised as all arts are practised. However, there are no food labelling design artists in Ghana to undertake such jobs and manufacturers depend solely on their own creations - creations which may be totally lacking in sales appeal. Enough individual talents, however, exist in the country to undertake food labelling design and these can be made use of. Advice can also be sought from institutions which deal in some measure with food packaging.

Coding of Cans

Systematic warehousing requires proper indentification of cans and segregation by lots in storage. Quality control of production and cannery operations can be recorded in the finished product only by accurate pack coding. This means embossed or ink stamped codes on the cans, segregation of lots in storage, and plain identification by carton and warehouse stack card making.

Pack coding is not practised much in the few food cannery establishments in Ghana, because their importance may not be realized. Codes, for example, may show raw product quality, variation in any part of the process, alteration in formulae, errors in preparation of processing which may be reflected in quality, and line and time of packing. Time of packing here means not only dates but divisions of the operating day into shorter periods. In the event of spoilage lots can be isolated in blocks from the main products. In addition products of poor quality can be isolated and controlled.

A system of can coding that can easily be understood by those who handle the cans in the warehouse, and which separates the pack according to whatever variables effect quality may often prevent losses that could occur through inability to make accurate separation of finished products. However, the separation of the pack into unnecessary number of small lots adds to warehouse labour cost, consumes warehouse space, and increases the possibility of error in handling through the warehouse.

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Foreign Flavours in Canned Foods

The general Ghanaian public continues to be suspicious of locally canned foods even though such foods may be quite safe for human consumption.

One of the many attributes of quality of canned foods of which the public is suspicious is that of off-flavour or foreign flavour. The most common causes of these are: the use of insufficiently fresh raw material; the use of water whose composition is not known; the use of the wrong type of lacquered can. Regarding the last factor, the effect is frequently surprising, and it may amount to just an unpleasant flavour or to a complete lack of flavour according to circumstances. For an example, a groundnut (peanut) soup which was originally processed with fresh beef as one of the ingredients and expected to retain beef flavour tasted as though the soup was prepared with chicken after a period of storage.

Upon examination of the can it was observed that the lacquer has worn off and has become incorporated into the soup. However, the soup in question was not rendered unfit for human consumption.

3. PACKAGING IN GLASS CONTAINERS

Glass is an amorphous, solid solution of oxides of silicon, calcium, sodium and other elements existing in a vitreous state. Glass has the four outstanding qualities of rigidity, transparency, an almost total inertness and ability to be molded into an infinite number of accurately specified shapes. The rigidity of glass is utilized as a factor of strength, as well as to provide a physical barrier for the protection of its contents. Its chemical inertness obviates the need for linings, coating or other protective substances and thus eliminates its reaction with the contents and prevents a natural increase in the cost of the package. The moldability of glass makes it adaptable to both standardized and specialized shapes. Its transparency permits the contents to be inspected at the time of packing and at the point of purchase. Together with its properties of odourless, ease of sealing, opening and resealing, ease of filling

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and high storage stability and extended shelf-life of foods packed in it, it is no wonder that glass is selected as a packaging material for a wide variety of foods in Ghana.

Foods Packaged in Glass Containers:

Among the foods for which glass containers are used as packaging material are:-

a) Alcoholic beverages, predominantly beer
b) Soft drinks and carbonated soft drinks such as lemonade, coca cola, pepsi cola etc.
c) Spirits, such as gin, whisky, brandy etc.
d) Edible vegetable oils such as palm oil (seasoned and unseasoned), groundnut oil, coconut oil, etc.
e) Fruit juices and squashes of lime, lemon and orange;
f) Vegetable products such as tomato puree, tomato ketchup;
g) Preserves such as jam, marmalade;
h) Sauces such as peepper sauce;

Problems with packaging in glass containers:

In spite of the above properties, glass containers have certain disadvantages which include its weight and fragility, and the effect of light on its contents. Moreover, although glass containers are chemically inert, their closures are not. Also, the unavailability of the right type of bottles for specific purposes, their relative cost as compared to the cost of their contents, and the limitations or requirements imposed on these containers by equipment or lack of equipment in food processing establishments present additional problems for their use in Ghana.

The effect of light on contents:

Some bottled carbonated soft drinks and edible vegetable oils are displayed for sale in the public markets (see plate 2 page ...) and along street walks often in the heat of the sun. Although the heat may contribute to quality changes in these foods, it is rather the light which sets up photo-chemical reactions in these packs resulting in loss in nutrients and the development of light-struck flavours and bleaching.

Edible palm kernel oil (lighter colour) and palm oil (darker colour) displayed for sale in the sun in a public market. Note the various labels on the bottles and on the conical funnel.

Plate 2

Fragility:

Breakages in foods and drinks bottling factories constitute one of the biggest problems. Evidence shows that the bursting of bottles in production line is closely correlated with cracked bottles and that about 80% of cracks in bottles are caused by damage during the washing process, primarily due to violent contact with the brush slates and funnels where washing machines are used. Where bottle washing is done manually, improper handling as well as thermal shock received by bottles results in cracks and subsequent breakages. Many bottles used in food packaging have been in circulation for a considerable length of time and surface abrasion caused by frequent usage has reduced their strength potentialities. Consequently, they crack and breakage under small thermal shocks due to temperature differentials associated with hot-filling and small impacts with other bottles.

The availability of glass containers

Only in the beer and carbonated soft drinks trade that the bottles and caps are easily available and are standardized. This is due, in a large measure, to the large quantities consumed and the fact that purchases of these drinks can only be made with empty bottles. In other trades like the edible oil trade, different types, shapes and sizes of bottles are used, especially in the public markets. Here the bottles range from one-quarter of pint size to a pint size, and of different shapes. Because of the scarcity of bottles every customer is required to provide his or her own bottle into which the purchased quantity is emptied. In this case the cost of the bottle is not reflected in the cost of the oil as it is in the case of factory bottled oils. In many food bottling establishments the only type of bottle used is the pint beer bottle. This is because of its ready availability and the fact that for the fill-in weights required, there are no other bottles available.

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A bottle manufacturing factory exists in Ghana but it is unable to meet the specific demands of some food bottling plants because of lack of specific molds for bottle fabrication. Regular production from these bottling plants therefore depends on the purchase of used bottles especially the pint beer bottles.

Closures for Glass Containers

Principally, closures for glass containers are required to seal the contents against leakage and contamination from external sources and to make the contents readily available to the user. In the brewing and soft drinks industries the closure most widely used is the crown cork, which has a series of flutes around its skirt and the capping chuck closes the flutes under a ring on the bottle finish holding it securely against considerable internal pressure. Since most other food bottling companies make use of the pint beer bottle it is natural that for sealing of the containers the crown corks are used. While the glass container is inert, the closures are not. In addition, used closures may not have the same sealing properties as unused ones. Moreover, it has been observed that the used closores or caps do not undergo through sanitizing before use. In such circumstances the closures either assist or are the source of contamination of the contents.

For some time now, preserves (jam and marmalade) manufacturers have been using the "Omnia" type of closure for their bottles. Recently, however a state corporation which is the largest manufacturer of preserves, and upon whom the small manufacturers depend for their bottles, has suddenly changed to using a different type of bottle and closure (twist-off cap) for their preserves thus creating a big problem for the small manufacturers with "Omnia" sealing machines.

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In public markets closures for glass containers consists of the widely-used crown cap, dressed soft wood shaped to fit tightly into the neck of the bottles and twisted waste stationery or paper, and deftly shaped dried corn sheath large enough to fit into the neck of the glass containers (See plate 3 page ...). For wide-mouth bottles, the closures consist of a newspaper or waste stationery spread over the top of the bottle and skirted around the neck to which it is held securely by a rubber band or a thread. Due to overfilling, closures used for glass containers in the public markets almost invariably glaze the top of the liquid contents or soak into the contents and thus pass into the contents any contaminants they may be carrying.

Labelling

Labelling in the food bottling industry is nore satisfactory than in the canning industry, especially in the beer, soft drinks, spirits and edible oil industries. It is only in these bottling firms where products are advertised and brand names popularized.

In small food bottling firms, labelling of bottled foods is practised but the design and colour of most labels lack sales appeal.

In the public markets where little is known of the technology of food packaging though it is practised, labelling is not considered necessary, because, the contents of the bottles, being easily recognizable, serve to identify the products. In some cases, labels on used bottles are not removed before they are filled with processed foods. Such a situation is shown in plate 2 page ... where used bottles with labels have been filled with palm oil and palm kernel oil respectively.

4. PACKAGING IN FLEXIBLE CONTAINERS

Flexible packaging materials include plastic films, aluminium foil, papers and paper boards which are wrapped about a product, or if preformed, require a physical support during filling. This therefore excludes rigid cartons of paperboard.

Bottled edible vegetable oil with dried corn sheaths as closures for bottles.

Plate 3

Types of flexible containers in use

Of the many flexible materials used for food packaging in Ghana, plastic films are the most widely used. Even within the plastic group, polythene is the only film which enjoys monopoly over the other materials.

Polythene enjoys this privilege because of the following reasons:

a) It is the only plastic film produced by the few plastic film manufacturers in the country and is therefore readily available;
b) Its cost is low, 1000 pouches 6" x 4" costing N¢5.40.
c) It is crease-resistant and can therefore be used to wrap any type of food product.
d) Its strength and toughness allows it to be used for packaging of foods with relatively sharp ends.
e) Its excellent properties of water proofness and moisture proofness enable it to be used in packaging the many dehydrated foods marketed.
f) Its decorative properties allows it to be printed;
g) It is heat-sealable on most heat-sealing machines;
h) Because it is fairly transparent foods packaged in it can be readily recognized by consumers.

Polythene is used in Ghana as a packaging material for all kinds of foods which include the following: gari (a fermented cassava product) cow peas, dried ground pepper, sugar, wet salt, roasted and unroasted ground nuts, fresh vegetables such as lettuce, sweet pepper tomatoes, stringed beans etc. Polythene is also used in "shrinkable" skin-tight packaging of dressed fowls and other meat products, and in the wrapping of bread.

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In addition to polythene, the following packaging materials shown in Table 3 are used to a limited extent.

Table 3

Material	U s e s
Cellophane	Packaging of sausages and biscuits;
Aluminium foil	Packaging of chocolates
Glassine	Packaging of some bakery products, and sausage rolls;
Waxed paper	Packaging toffee, bakery products;
Folding Paper-Board carton	Packaging of rice, tapioca;
Plastic containers	Packaging of dried, powdered hot pepper, powdered ginger and other dried products
Aluminium Foil/ Paper laminate	Vacuum packaging of roasted ground coffee and ground cocoa
Liquid-tight paper containers (Tetra packs)	Packaging of reconstituted milk

Problems with packaging in flexible containers

The use of flexible materials for food packaging, like other packaging materials, creates problems. There problems are aggravated when the choice of the packaging materials is limited and performance evaluation of packages are not undertaken. The most common of these problems are moisture and oxygen problems.

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The Moisture Problem

In the packaging of dry or moist solid foods the objective is to keep the moisture gain on loss through the package within limits to ensure acceptability throughout the maximum desired shelf-life at all seasons in the desired marketing area. Food manufacturers and packers are, however, ignorant of the desired shelf-life or keeping quality of their products, and therefore, depend on the "goodwill" of environmental conditions in marketing areas to promote shelf-life extension. In the departmental stores and public markets, moisture gain is observed in:-

a) biscuits becoming damp and soft, and thus losing their freshness and cripsness;
b) chocolates becoming soft due to moisture pick-up and high temperatures;
c) sugar and salt becoming moist and caking;
d) flour becoming moldy and attracting weevils;
e) ground dehydrated pepper becoming moldy and losing its pungency;
f) bakery products becoming moldy.

One of the contributing factors to the moisture gain in the foods packaged in polythene is ineffective sealing because many food manufacturers, packers and retailers have no sealing machines with which to heat-seal the all-purpose polythene punches. Often the open ends of the pouches are twisted and tied with a rubber band or thread. In most cases, these twisted ends cause moisture gain in dry foods resulting in quality changes.

In Ghana, the 300 gauge (0.003 in) polythene is the most widely used for food packaging. From all accounts, it appears that it is also the only one produced most by the few plastic film manufacturers. Where protection demands a thicker gauge, or a laminate of polythene it cannot be obtained. Cellophane and aluminium foil used are, however, imported and specifications for specific purposes are usually the recommendations of overseas food packers or film manufacturers. In some cases these specifications are unable to meet the requirements of local environmental conditions.

Evidence of this can be obtained from the bakery and confectionery trades where materials for packaging biscuits do not prevent moisture pick-up and loss of crispness.

Also, in the chocolate trade, protection from paper/aluminium foil is not enough and this results in moisture pick-up due to the high relative humidity and high temperature conditions prevalent in departmental stores.

The Oxygen Problem

Oxygen is probably the most destructive of the agents that have access to plastic packages.

The predominant deteriorating influence of oxygen in packaged foods in Ghana is the result of leakage or permeation of the package. As already indicated, polythene pouches for foods are not heat-sealed and even when they are heat-sealed there is almost invariably a small amount of oxygen within the package, because of improper sealing. As many of these foods are exposed to intense light especially in the public markets, considerable quality damage due to oxidation takes place. Such oxidative deterioration occurs in most dried or dehydrated packaged foods with high moisture content. In a dehydrated produce like ground pepper, for instance, the deteriorating influence of oxygen coupled with intense light results in bleaching. To prevent such oxidative deterioration vacuum packing is practised in the packaging of ground coffee, ground cocoa and some meat products such as bacon. Leakage or permeation of the package by oxygen can be controlled by proper packaging which include care in heat-sealing and vacuum packaging. For while the package can exclude oxygen, it cannot remove it from inside and only proper packaging can prevent the damaging effects of oxygen.

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Prepackaging Problem

Prepackaging is a modern method of merchandising, for it unitizes loose vegetables and makes them fit in with self-service retailing. Unlike canning, prepackaging is more a method of marketing than a method of preservation. It is therefore important that produce for prepackaging be of good quality to insure a package which will satisfy the consumer.

Regretably however, most vegetables selected for prepackaging have defective parts and because they are not trimmed most prepackaged vegetables on sale are commonly found to be in a state of deterioration - a state which is even aggravated by the fact that the polythene pouches used for the prepackaging are not ventilated and this results in moisture condensation within the pack and thus greatly accelerates the deterioration of the vegetables.

In order to enhance the sales value of prepackaged vegetables, produce selected for prepackaging must be without defective parts. If they happen to be defective, then they must be carefully trimmed to remove the defects.

It is also important that plastic films for prepackaging vegetables be ventilated to allow the entry of oxygen and the escape of carbon dioxide. For if the package does not permit air exchange, the oxygen is soon used up in respiration and fermentation begins. Soon alcohol and other harmful compounds which give vegetables off-flavours are produced.

Normal leakage through seams or poor seals should not be trusted as providing sufficient ventilation. The number and sizes of perforations for ventilation per package depends upon the product and the quantity being prepackaged and can be determined by tests. Often $\frac{1}{4}$-inch diameter holes are suggested for small packages weighing $1\frac{1}{2}$ pounds or less and 32 to 40 for larger packages 3 to 10 pounds. These suggestions are only guides and the best way to determine the number of holes is through experimentation.

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Careful handling from harvest to consumer can also increase the chances of successful prepackaging of vegetables. In addition, the stage of maturity or ripeness of vegetables is important. For instance, tomatoes for prepackaging need to be ripened only to marketable stage. For, if they are packed in the early turning stage, they ripen unevenly and make unattractive package.

It is a modern practice to cool harvested produce for prepackaging, promptly and adequately. Cooling at near 32°F (0°C) retards discoloration, decay and moisture loss, thus maintaining the quality of the product. In Ghana where large-scale prepackaging is not practised, the provision of ice-cold containers for cooling harvested produce intended for prepackaging is necessary. For successful prepackaging therefore the initial quality of the produce, its preparation, the cooling or refrigeration it undergoes after harvesting and the package ventilation are the most important considerations which out-weigh the type of plastic film used.

Labelling

Satisfactory labelling of packages is practised in the most products and biscuits trades. Most, if not all, the labels in these trades have definite sales-including points. These labels are, however, not made locally.

In other trades where paper is used as a container, such as rice, reconstituted milk and tapioca, labelling is also quite satisfactory. Except the reconstituted milk package, the others have their labelling made locally.

In most flexible packages especially polythene, no labelling is undertaken and the recognition of the package contents is used to serve as identification of the product. Such practice occurs both in the public markets and in the departmental stores.

5. TRADITIONAL FOOD PACKAGING

Traditional food packaging here refers to the packaging of traditional or staple foods in traditional materials. The techniques and materials used in such packaging have evolved from the different ways of traditional food preparations.

Traditional food packaging in Ghana is concerned primarily with using materials as vehicles for their contents or as units of sale for their contents. In the practice of such packaging, however, a certain amount of protection is afforded the contents.

Also, processors concerned with traditional food packaging are mostly illiterates who have little or no knowledge of food packaging as practised in technologically advanced countries - their vocation having been passed on to them by close relatives.

The materials used in traditional food packaging are of two main groups:

a) those for which the materials are used as wrappers or "trays" before being heat-processed, and

b) those already heat-processed for which the materials serve as retail units of sale.

Packaging in leaves and sheaths

Foods packaged in leaves and sheaths are, by and large, maize and cassava products of fermentation. The leaves used are of three main types:

a) plantain leaves (Musa paradisica);

b) leaves from the plant Thespesia populnes which belong to the family Malvacaea;

c) broad leaves from the plant Marantocloa spp. of the family Marantaceae.

There are also two other types of leaves but these are not used to any great extent and are more or less confined to one region of the country. These are: cassava leaves (Manihot spp) and leaves from the plant Tectona grandis which belong to the family Verbenaceae.

In addition to the leaves dried corn or maize sheaths (Zeamays) are used extensively.

Problems with packaging in leaves and sheaths

In order to package traditional foods, manual moulding and shaping into specific forms and sizes of the prepared raw materials are undertaken before wrapping with a layer or more of the leaves or sheaths. Where dried plantain leaves are used, three to six layers of the leaves are required and the entire surface of the food contents is covered.

Examples of foods so packaged are Fanti Kenkey*, see Plate 4 page ..., Ashanku* and Nsihu*. Leaves from the plant Thespesia populnes are, however, not used as such, but rather as a baseplate onto which the moulded raw prepared food is placed before being heat-processed as in Abolo*. At times the sides of the food are also covered as in Ablongo*. Thus in the first case about $\frac{2}{3}$ of the food contents is exposed to external contamination. Also, foods which are packaged in corn sheaths always have about $\frac{1}{10}$ part exposed to external contamination.

Colour and flavour changes in materials and their contents

A common phenomenum which occurs with using some leaves as packaging materials is the change in their colour. In plantain leaves, the dark brown colour changes to almost black when under the action of boiling water. In the process of colour change, certain water-soluble pigments of the leaves are exuded and become dissolved in the cooking water. The food contents in the course of the cooking process, imbibes a certain amount of this water and thus aids in giving the food a characteristic flavour. In addition, the outer surface of the food contents acquires a darkened surface due apparently, to the contact between the wrapper and the outer surface of the food contents. Examples of these are found in Fanti Kenkey* and Ashanku*. In the case of corn sheaths the colour change is not marked, but a characteristic flavour results due apparently, to the combined reaction between the food, and the water-soluble and volatile constitutents of the sheath.

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*Milled, fermented and cooked maize preparations.

Traditional food (Kenkey) packaged in different forms. The wrapper/packaging material for the middle foodstuff is sun-dried banana leaves while sun-dried corn sheaths are used as wrappers for the other two.

Plate 4

In packaged foods which have a greater part of the contents exposes, charring of the leaves occur where the thermal processing is baking and a relatively little change in colour where the thermal process is steam-cooking. In both cases, it is difficult to say with any degree of certainty whether the colour changes in the leaves have any effect on the characteristic flavour of the food contents.

Shelf-life of traditionally packaged foods

Many of the foods packaged in leaves and sheaths have very short shelf-life. This can be attributed in the main, to the inadequate protection provided by the packaging materials and the uncontrolled methods of preparation.

Laboratory experiments (See Tables 4, 5, and 6) show that some of these foods can be kept for only two days without any evidence of spoilage. However, in most cases dessication of the exposed surfaces of such foods takes place. Foods which are fully wrapped with three to six layers of leaves, however, can be kept up to fourteen days and still be dible in spite of visible mold growth on the external surface of the packaging material.

The experimental results show that merely wrapping these foods in other packaging materials such as aluminium foil or polyethylene film does not extent their shelf-life but in some cases may rather contribute to rapid spoilage.

Availability, cost and supply of packaging materials

The results of a survey (See Appendix ....) show that the packaging materials, leaves and sheaths, especially the leaves, are obtained from specific areas in the country and that some of them are seasonal. For example, corn sheaths are in abundance during the corn harvesting season, June to August. During this period the price of a sack load ranges from N₵0.30 to N₵1.20 which becomes N₵1.20 to N₵4.00 during the off-season - a fantastic 300% to 400% price increase.

TABLE 4 (i)

G A KENKEY

DAY	% RH/°C	UNWRAPPED SAMPLE (CONTROL) Observed Changes	
		Flavour	Appearance
1	70/27.5	Normal	Normal, fresh
2	76/26.0	Slight	Product - dry and hard externally; no change in wrapper
3	70/27.0	same as above	Product dry outside with white mould growth light brown colour change outside.
4	74/26.5	Same as above	Mould growth becomes multicoloured wrapper extremely dry and product very hard.
5	72/27.0	Same as above	Same as above

TABLE 4 (ii)

G A KENKEY

DAY	% RH/°C	SAMPLE IN POLYTHENE BAG Observed Changes	
		Flavour	Appearance
1	70/27.5	Normal	Normal, Fresh
2	76/26.0	Slight	Mould appears: packaging materials, corn sheath, starts to dry out.
3	70/27.0	Same as above	Mould growth becomes extensive.
4	74/26.5	Same as above	Mould growth now extensive and prominent; condensed water vapour whitish.
5	72/27.0	Same as above	Same as above

TABLE 4 (iii)

G A K E N K E Y

DAY	% RH/°C	SAMPLE IN ALUMINIUM FOIL Observed Changes	
		Flavour	Appearance
1	70/27.5	Normal	Normal, Fresh
2	76/26.0	Slight	White mould growth
3	70/27.0	Pronounced	White mould growth becomes extensive
4	74/26.5	Smell mouldy	Product completely deteriorates; mould of all shades of colour now covering product
5	72/27.0	Same as above	Product now difficult to identify - due to high degree of spoilage; complete coverage with mould

TABLE 5 (i)

FANTI KENKEY

DAY	% RH/°C	UNWRAPPED SAMPLE (CONTROL) Observed Changes	
		Flavour	Appearance
1	70/27.5	Normal	Normal, Fresh
2	76/26.0	Slight	Slight mould growth
3	70/27.0	Same as above	Slight mould growth
4	74/26.5	Same as above	Mould growth lessens; contents of packages begin to harden
5	72/27.0	Same as above	Same as on day 4 but with slight increase.

TABLE 5 (ii)

F A N T I K E N K E Y

DAY	% RH/°C	SAMPLE IN POLYTHENE BAG Observed Changes	
		Flavour	Appearance
1	70/27.5	Normal	Normal, Fresh
2	76/26.0	Slight	Steam condensed in polythene: slight mould growth on wrapper
3	70/27.0	Same as above	Steam still condenses in polythene white mould
4	74/26.5	Same as above	Condensed water vapour becomes whitish in colour; white mould growth becomes extensive.
5	72/27.0	Same as above	Same as in day 4 but with slight increase.

TABLE 5 (iii)

F A N T I K E N K E Y

DAY	% RH/°C	SAMPLE IN ALUMINIUM FOIL Observed Changes	
		Flavour	Appearance
1	70/27.5	Normal	Normal, Fresh
2	76/26.0	Slight	Water vapour condenses inside foil; product appears fresh but mould growth begins.
3	70/27.0	Same as above	White mould growth becomes extensive
4	74/26.5	Same as above	White mould growth increasingly extensive
5	72/27.0	Same as above	Wrapper still moisture laden; product considerably soft; white and yellow mould growth extensive.

TABLE 6 (i)

A G I D I

DAY	% RH/°C	UNWRAPPED SAMPLE (CONTROL) Observed Changes	
		Flavour	Appearance
1	70/27.5	Normal	Normal, Fresh
2	76/26.0	No change	Same as above
3	70/27.0	Mould growth smell foul	White mould growth becomes evident
4	74/26.5	Same as above	Edge of contents changes to yellowish green
5	72/27.0	Same as	Black and white mould growth appear both on the contents and on the wrappers

TABLE 6 (ii)

A G I D I

DAY	% RH/°C	SAMPLE IN POLYTHENE BAG Observed Changes	
		Flavour	Appearance
1	70/27.5	Normal	Normal, Fresh
2	76/26.0	Slight changes	Appears fresh soft; wrapper colour changes from green to yellow
3	70/27.0	Same as above	Same as above. Also condensation of water vapour inside wrapper
4	74/26.5	Same as above	Wrapper colour changes from yellowish to brownish. Evidence of external mould growth.
5	72/27.0	Same as	Colour change in wrapper becomes prominent; mould growth becomes extensive.

TABLE 6 (iii)

A G I D I

DAY	% RH/°C	SAMPLE IN ALUMINIUM FOIL Observed Changes	
		Flavour	Appearance
1	70/27.5	Normal	Normal, Fresh
2	76/26.0	No change	White mould growth appears condensation of water vapour within the wrapper
3	70/27.0	Slight change	Mould growth becomes pronounced
4	74/26.5	Strong odour of product	Extensive mould growth. Colour change in contents· wrapper colour changes from green to yellow
5	72/27.0	Mould smell of product	Edges of contents become watery

In order to have good quality materials for packaging, it is important that the purchaser and the supplier agree on certain specifications on the materials. No such agreement is, however, entered into the purchase of traditional packaging materials. This is because the supplier, on one hand, is unable to give specifications as to the types of materials he is able to supply, and on the other hand the purchaser is unable to give specifications as to the type of material required as he has no knowledge of particular specifications. The supplier therefore, supplies what he can lay hands on and the purchaser purchases whatever is offered. One thing which the purchaser makes certain of, however, is that purchases are made from proven suppliers who can be relied upon and with whom bargaining prices can be entered into.

Labelling

In packages where portions of the food contents are exposed, such portions serve to identify the contents. However, they do not indicate the quality of the product and only previous experience with that particular food ensures this. Where no part of the contents of a package is exposed, the only way of knowing the contents is from a previous knowledge.

The methods used in packaging, the materials used, and the fact that most of the foods are consumed within a day or two after processing make labelling of the packages unnecessary in some cases.

In addition, the packaging materials do not lend themselves to printing.

Labelling may be necessary when methods of processing these foods and the materials used in their packaging as well as their methods of presentation, have all been changed.

Packaging in used newspapers, newsprints, used cement bags

Foods for which used newspapers, newsprint, used cement bags etc. and leaves are the wrappers include fried or roasted plantain, fried or roasted yams and cocoyams, roasted groundnuts, smoked or fried fish, roasted pork, cooked rice and beans etc. as shown in

Appendix ... The foods are often sold along road sides and in and around the public markets, for the most part of a 24-hour day.

Problems with packaging in used wrappers

There are two main problems:

a) Contamination of the food contents from external sources;

b) Contamination of the food contents from the wrappers.

Contamination from external sources

The preparation of these foods along road sides and in and around public markets expose them to external contamination of all kinds. Such contamination include dust, exhaust fumes from motor vehicles, filth from flies and other insects, filth from human food handlers etc.

Contamination from wrappers

One source of contamination of the food contents is from printed matter from newspapers. This occurs mostly with fried food-stuffs. Where the ink used in printing contains obnoxious substances the foods so contaminated become harmful. A research into the cumulative effect on the body system of such contaminated foods is necessary. Another source of contamination is from used portland cement bags. In most cases, the cement bags used as wrappers contain small amounts of cement which are picked up by the food contents. Where the foods contain water or oil, a reaction between them and the cement is likely, as cement is known to bind with water in the presence of oxygen. The effect of consumption of small amounts of cement in this fashion is not known and needs investigating by both medical and food research workers. A third source of food contamination by the wrappers relate to accumulated dirt and filth on the used papers during handling and storage. Leaf wrappers may also have dirt on them but in most cases they are relatively cleaner and more sanitary as a packaging material.

.../36.

DISCUSSIONS AND RECOMMENDATIONS

Sanitary aspects of handling and storing packaging materials

Packaging materials are used to protect food from contamination. Therefore, they must be handled and stored as to preclude all possibilities of their becoming contaminated before they are used in packaging operation.

Metal Containers

It is necessary that empty cans be washed before filling. The washing of the cans prior to receiving their contents will prevent the inclusion of foreign materials such as metal, glass, stones, and other extraneous materials such as insects or pest fragments in the packaged food. Can washing will prevent unfavourable consumer reaction. Not only should cans be cleaned before filling but it is important that they should prevent a clean appearance for effective merchandising.

Containers should be stored in rooms which prevent the ingress of vapours or dush of any description.

Glass Containers

As most food bottling establishments depend on used bottles, it is important that proper discretion is exercised in the thorough cleaning and sanitizing before filling. Even when glass bottles from a storage supply is to be used, adequate cleaning and sanitizing with suitable detergents are necessary.

Bottle closures should also be sanitized with hot water and detergent before re-using.

Glass containers should be stored in clean, sealed shipping cases until ready for use.

Flexible Packaging Materials

Flexible packaging materials such as paper and films of all kinds, should be kept sealed in their original shipping containers until ready for use. Any opened packages which are not completely used should be closed and sealed until needed. Care must be exercised

to prevent exposure of the packaging materials to excessive heat as much of it can be dried out to the degree where disintegration will take place - a condition that ruins the packaging value and invariably results in considerable economic loss.

Traditional packaging materials

It is important that traditional packaging materials be adequately cleaned before use to remove dirt, insect fragments and insect eggs and rodent dropings from them. Adequate storage area free from flies, dust, and not infested with rats, and well-ventilated should be provided for such materials. Storage containers should also be adequately clean.

Labelling and sales appeal

The importance of careful labelling and choice of bright and attractive design cannot be over-estimated, as besides indicating to the consumer and contents of the container, a well-chosen label is often a selling feature for a new product. However, rules governing packaging and labelling should not be short-changed in favour of attractive packaging. The information to be furnished should be considered on its merits according to the nature of article packaged. As a guide in labelling food packages the following suggestions are made:

a) Full description of the article or commodity;
b) Size, weight or number of units etc. where necessary;
c) Instructions for use, recipes and other recommended uses;
d) Legal marking, when a law requires certain information to be shown;
e) Dates of manufacture and expiration for items having limited life;
f) Trade mark or name of manufacturer, and country or origin:
g) Advertising matter.

Mislabelling, deceitful design and negligent packaging and adulteration can lead to financial losses and, with Ghana's food laws and regulations promulgated, lead to serious legal consequences, and can cause irreparable damage from the loss of consumer goodwill.

Package Design

Apart from the functional aspects of packaging, it is also important to emphasize package design. For effective merchandising the package must do more than protect the food. It must be able to capture the imagination of the consumer in order to create an immediate motivation to buy. The package must be abreast with changed situations and ways of living.

It may therefore be necessary for some large food processing establishments to engage the services of design artists, with lively imagination, and who are versed in the vagaries of fashion and how they affect style, to design both functional and effective packages.

Evaluation of packages and packaging materials

There has been public outery, in recent months, for the need to improve the quality of locally-made products. The hardiest hit in this public feeling, are packaged food products. This is because most of the locally-produces foods are inferior in quality to their imported counterparts. It is true to say that locally-produced food products are not evaluated in terms of their merchandising performance. Such evaluation involves the testing of the packages and their shipping containers as well as the materials used in their fabrication, for the basic purpose of predetermining their probable performance when put in actual use.

Performance tests on complete or on properly determined segments of packages are the key to the selection of the best functional designs and also to the maintenance of acceptable quality once the proper designs have been selected. Such tests should include storage tests for packaging materials and their contents, to determine probable keeping qualities under climatic conditions in possible areas of distribution; thermal and impact breakages tests on glass containers; moisture, oxygen and strength properties tests on flexible packages and traditional materials; to name but a few. Such tests can prevent wasteful initial expenditure as well as damages to improperly protected packaged products and can act as a means of achieving substantial packaging economies.

Provision of Packaging Materials:

Flexible materials

The use of flexible packaging materials especially, plastic films, is fast increasing in Ghana. Unfortunately, the types in use are woefully inadequate to meet the packaging demands of various foods. Apart from polythene, most of the other materials such as cellophane, folding carton, and aluminium foil, are all imported by their users. To help improve the shelf-life of some packaged foods as well as cutting down the over-dependence on polythene for all flexible packaging needs, it is important that these materials are produced locally. Thus the granting of individual import licences to some food establishments for these packaging materials should cease and the licences should be transferred to firms dealing with such materials to import machinery and raw materials for the local production of the packaging materials. Any firm given such opportunity, whether government or otherwise, should be made to give a guarantee of recruiting professionally qualified personnel for producing the food packaging materials. To be able to make such new venture economically viable there should be a relaxation of the import tax on raw materials for the production of these packaging materials. Regarding aluminium foil the possibility of establishing a firm to manufacture it from our local aluminium products must be seriously considered.

Metal Containers:

All the state canneries and a private cannery in the country, have facilities for the manufacture of round open-top cans. In spite of this, these canneries especially the state canneries, have been importing very large quantities of cans for their food products simply because import licence for tinplate sheets for fabrication of the cans is not being granted. It is important that import licences be granted for the purchase of lacquered and/or unlacquered tinplate of the right composition in order to put the

many idle can making machines, which have cost the country so much foreign exchange, into operation. With enough tinplate available, these canneries can make enough cans to feed their factories and also sell some to small food manufacturers and eventually to non-food business concerns like the petroleum industry. The success of this venture will depend on the recruitment of qualified can making and decorating personnel and the training of local man-power in can making.

Alternatively, a can manufacturing factory can be established to manufacture all types of cans for both the food and other industries which use cans while leaving canneries to make their own cans. In such a factory, research and development work on can making and can decoration could be undertaken for any industry.

Wrappers

Food contamination by wrapping materials is very common in Ghana. It is, therefore, necessary for municipal or town councils to pass bye-laws must be rigidly enforced. However, before rigid enforcement is undertaken, alternative materials, cheaply priced and of good quality, should be readily available for use.

It is important at the moment, for medical and food research organizations to conduct investigations into food contamination by such wrappers with a view to assessing the extent of their effect on the human body.

APPENDIX

TRADITIONAL FOOD PACKAGING*

Type and Description of material	Dried Maize cob sheath	Fresh Green Leaves belonging to the family Malvaseae called Thespesia Populnes
Cost	Price per sack when in season 30Np-N¢1.20 price during off season N¢1.20-N¢4.00	Bundle of about 70 leaves costs 3Np.
Where obtainable	Ayika. Dobro, Koforidua, Nsawam, Tafo, Somanya etc.	Agbogba, Ofaako Oyarifa etc.
Uses	For packaging Ga Kenkey Fomfom, Akpiti	For packaging Aboloo Also, used in bread baking, the loaves being placed on the leaves.

* See glossary for the meaning of unfamiliar words.

Type and Description of Material	Dried Banana leaves with the mid-rib removed	Green leaves, Broad, Simple, smooth with entire margins and belonging to the family of Marantaceae
Cost	15Np-20Np. per bundle	Bundle of 80 - 90 leaves costs 3Np.
Where obtainable	Akim Oda, Odobin, Braku Fosu, Ansah etc.	Bedru, Swedru, etc.
Uses	For packaging Ablongo* and Kenkey*	For packaging Agidi*

* See glossary

APPENDIX

TRADITIONAL FOOD WRAPPERS

Type and Description of Material	Newsprint
Cost	A pound (lb.) costs 8NP.
Where obtainable	From the offices such as Daily Graphic Corporation
Uses	Meat, Tatale*, Yakayake*, Fish, Roasted and Fried Red Plantain, Cocoyam and yam, Cake, Bread Kalewele*, Kenkey, Doughnuts, Tigernuts, Roasted and boiled Groundnuts, Aprapransa*, Apiti, Kakro*, Nkyekyerewa*, More and Rice and Stew

* See glossary

Type and Description of Material	Used Exercise Books
Cost	Depending upon the sizes, but normally sold at 3Np. per copy. It is also usually obtained free of charge.
Where obtainable	From school children, Teachers and students.
Uses	Roasted and boiled groundnuts, Bread, Kenkey*, Fried and Baked Red Plantain, Kalewele*, Cake, Doughnuts, Tatale*, Yakeyake*, Fish, Meat, Apiti*, Kakro*, More*, Yam, Koliko*.

* See glossary

Type and Description of Material	Newspapers
Cost	100 Units for NØ0.40 Bundle (500 Units) for NØ2.00 but usually sold at NØ2.50-NØ3,00
Where obtainable	From the offices of Daily Graphic and Ghanaian Times. Also from readers
Uses	Roasted and boiled groundunuts, tigernuts, bread, kenkey*, fried and baked red plantain, kelewele*, cake, doughnuts, yakayake*, tatale*, fish, meat, fried and baked or roasted yam and cocoyam, kakro*, apiti* and aprapransa*.

* See glossary

Type and Description of material	National Pools Coupons
Cost	10 Units cost 5 to 6Np.
Where obtainable	From the workers and officials of the Football Pools Authority
Uses	Wrappers for roasted and boiled groundnuts, rice and stew, tigernuts, tatale*, pepper, kenkey*, bread, doughnuts, smoked and fresh fish, tomatoes aprapransa* etc.

* See glossary

Type and Description of Material	Portland Cement paper
Cost	1 Unit costs 3Np. a bundle or 6 units cost 10Np.
Where obtainable	Obtained from building contractors, masons and mostly from the labourers on building sites.
Uses	As wrappers for cooked rice and stew, kenkey, doughnuts, fried ripe plantain, roasted and boiled groundnuts, fish, tatale* and aprapransa*.

* See glossary

Type and Description of Material	Leaves belonging to the species of the family Maranteceae
Where obtainable	Obtained from villages around Bogoso, Bososo, Nsawam and Tafo
Cost	30 single units cost 6Np.
Uses	See uses of Portland Cement paper

* See glossary

Type and Description of Material	Radio Review Magazine
Cost	3 booklets cost 3Np.
Where obtainable	Obtained from workers, many of whom are from the Broadcasting Corporation
Uses	See uses of Portland Cement Paper

* See the glossary

Type and Description of Material	Leaves belonging to the species of the family Marantaceae
Cost	A bundle containing 25 - 30 units costs 3Np. A bundle with 80 single units cost 7Np.
Where obtainable	From villages around Bososo, Koforidua, Somanya and Tafo
Uses	Meat, Fish, Tatale, Aprapransa*, More*, Gari*, Agidi*, Kolanuts, Rice and Stew, Kenkey* and Fried and Roasted red Plantain.

* See glossary

Type and Description of Material	Typewriting papers (Green, Blue, Pink and yellow types)
Cost	The cost varies from place to place and also depends on the quality. A bundle may cost 9Np.
Where obtainable	Obtained from officers and workers from different offices
Uses	Roasted and boiled groundnuts, Fried and bakes red plantain, doughnuts, pepper, tomatoes, Aprapransa*, Tatale, Kenkey*, Rice and Stew, Kakro*, Bread, Koliko* and Yakayake*.

* See glossary

Type and Description of Material	Commercial and Industrial Bulletin
Cost	The cost varies from place to place
Where obtainable	Obtained from workers and other officials dealing with such documents
Uses	Yakayake*, Tatale, Bread, Rice and Stew, Kakro*, Roasted and boiled groundnuts, Fried and baked Plantain, Yam and cocoyam, doughnuts, fish, meat, kenkey and pepper

* See glossary

GLOSSARY OF UNFAMILIAR TERMS USED IN THE REPORT

Food Commodity	Description
Ablongo:-	Maize dough mixed with pounded ripe plantain and pepper and oven-baked
Aboloo:-	Prepared from washed, dehusked, and ground maize, The meal is left to ferment for about 8-10 hours. About $\frac{1}{3}$ of the meal is first boiled with water into a fairly thick porridge and then added to the remaining raw meal. A little flour, yeast and salt are added and then the mixture is allowed to ferment for the above time. It is then spooned on to leaves and steamed.
Agidi:-	A maize product made by soaking maize grains for one or two days, then milled. The milled product is then mixed with water and strained two or three times using a fine sieve or a piece of muslin cloth. The filtrate is then left to set and ferment for about 8-10 hours. The supernatant liquid is decanted and the paste boiled with some of the fermented liquid, then packaged hot into leaves where it cools and solidifies into a jelly-like mass.
Agushi:-	Dried water-melon seeds

Food Commodity	Description
Akpiti:-	Maize dough mixed with a small quantity of pounded ripe plantain wrapped up in leaves and then oven-baked
Fomfon:-	Prepared from maize which has been dehusked then thoroughly washed before grinding into a meal. The meal is left to ferment for 8-10 hours, and then made into balls and packaged before being cooked. The final product resembles kenkey but has a whitish appearance
Kakro:-	Prepared from fully ripe plantain that has been pounded and mixed with maize dough in the proportion of 3:1 and made into balls and then fried in oil
Kelewele:-	Ripe plantain cut into small slices of about 1½"-2" long then soaked in a mixture of ground pepper and/or ground ginger and salt for a brief period and then fried in oil
Tatale:-	Either prepared by cutting ripe plantain into chips and frying or pounding fully ripe plantain, mixing it up with dough in 3:1 proportion and frying to produce a diclike product.

Food Commodity	Description
Waatsey:-	Brown rice plus beans eaten with either stew or fried pepper mixed with salt, ginger and dried shrimps
Yakayake:-	Prepared from partly dried and sifted cassava dough to which salt has been added. It is then steamed in small quantities. It fan be served with soup or stew.

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