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SYMPOSIUM ON PACKAGING PROBLEMS ON FOOD INDUSTRIES IN HOT COUNTRIES

SPONSORED BY

SCIENTIFIC RESEARCH COUNCIL OF IRAQ

AND

ARAB FEDERATION FOR FOOD INDUSTRIES

BAGHDAD - IRAQ NOVEMBER 18-20

FINAL REPORT

LUIS MADI

UNIDO

1. The expert was assigned to prepare papers on food safety, advanced food packaging and shelf life of packaged food and present at the SYMPOSIUJM ON PACKAGING PROBLEMS OF FOOD INDUSTRIES IN HOT COUNTRIES 18 - 20/November 89 in Baghdad, Iraq.

2. The duration of this contract started on 09.11.89 and expired on 22/11/89 when the expert left Baghdad.

3. Due to the importance of packaging for the Developing Countries, the expert prepared two papers to be delivered at the Symposium:

3.1. Food Packaging: Food Safety - Shelf-life and Storage Problems

3.2. New Technologies: International situation and the Development Countries Perspective

4. The first one was concerned to the main topics of the Symposium, i.e., presenting considerations about the most important aspects of packaging for developing countries, the packaging needs, how to improve our food products through packaging, the main hazards, corrosion, migration, packaging contamination, shelf life and the importance of the temperature in the qualit of food products.

5. The second one was related to the New Packaging Development for the food industries oriented to plastic material, considered the most important one for the Arab Countries. ~~The main aspects were one for the Arab Countries.~~ The main aspects were the knowledge of these developments from Western Europe, Japan and USA and how these technologies could be applied to developing countries, gradually. The Brazilian experience was emphasized, showing that what is good for these developed countries not necessarily is good for the developing countries. The importance of having Packaging Research Centers as CETEA, established by UNIDO is a important factor in order to assist the food and packaging industries. The main technologies considered were: Microwave Package, Retort Pouch, Modified and Controlled Atmosphere and Aseptic Package.

6- Due to the fixed program only the first paper was presented. Both papers were delivered to the Arab Federation for Food Industries and to UNDP office in Baghdad.

7- According to the contract, three copies of the paper one are presented in the ANNEX ' and three copies of paper two in the ANNEX 2.

8- In the Annex 3 it is presented the Program of the Symposium.

9- During the Opening Session of Symposium, with theparticipation of the Ministry of Industry and Commerce, Dr. Maysoon M. Jafar it was emphasize the importance of having a Packaging

Centre in Iraq in order to assist the local food and packaging industry.

10- In the ANNES 4 it is presented the addresses of the people that adressed the papers in the Symposium.

11- The Symposium also had the participation of members of the Biological Research Centre, the Arab Federation for Food Industries, representatives of the Industrial Area of Iraq and other foreign participants from United Arab Emirates, Kwait, Saudi Arabia, North Yemen and others Arab Countries. The list of the participants was not delivered by the organizers.

12- In the closing Session the Conclusions and Recommendations were presented by Dr. Falah S. Jabr, General Secretary of the Arab Federation for Food Industry (AFFI), that are presented in the ANNEX 5 (in Arab). The tranlation to English will be requested to the A.F.F.I.

13. The photos of the Symposium are presented in the ANNEX 6.These photos were also delivered to the Arab Federation for Food Industries.

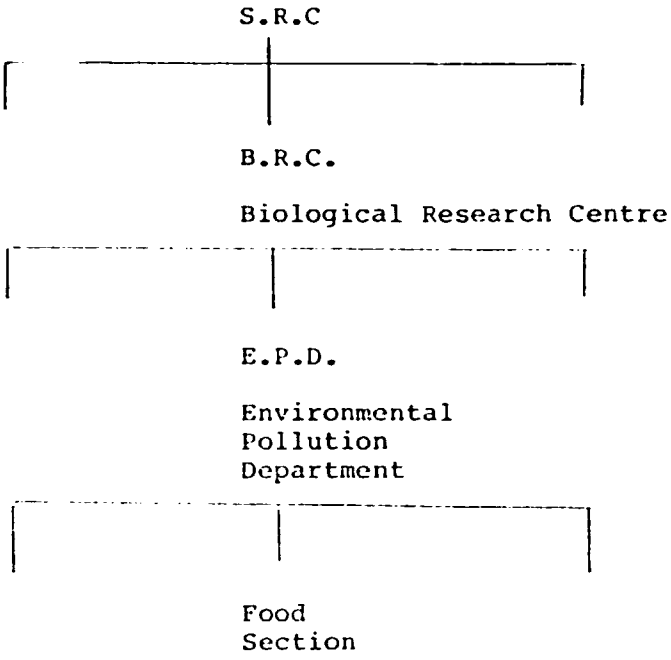
14. An Exhibition show with some Iraq food products was held together with the Symposiun. The main products exposed were: edible oil, dates and dates products, pasta, dairy products, juices and dehydrated drinks.

15. Beside the activities presented in the contract as presenting a paper, delivering copies of the paper and participating in the Symposium assisting the participants with the expert experience, the following activities were also carried out as:

15.1. Due to the need of information in the Arab Countries the expert gave to the Arab Federation for Food Industries the following documents:

- New Technologies for Storage Food Products
- General Aspects of Shelf Life of Food Products
- Migration of Plastics Components into Food Products

15.2. Meeting with Dr. Adnan S. Al. Samarraie, head of the Environmental Pollution Department, Dr. Mustafa R. Al. Gazali (Microbiologist) and Dr. Isam M. Jawad Food Scientist all of them from the Biological Research Centre. During this meeting the expert passed the experience of CETEA in Brasil that started as a Packaging Section of ITAL and today got a very important Packaging Center in Brazil. The basic Structure of the Scientific Research Centre is the following:



According to the expert experience, the most appropriate would be to start some packaging activities in the Food Section. The Biological Research Centre staff, have a tendency (due to their type of work) to see packaging mainly on the environmental aspects. Of course this is today one of the top subjects of this area, but for developing countries as Brazil and Iraq, there are other as transport and distribution, minimization of losses, shelf-life and delivery of food to the poor population, much more important than Packaging the Environment. The expert advise is to work in both reas. This statment was also presented in the Symposium 2. Another important aspect of the meeting was the need of integration between the B.R.C. and the private sector. Based on the expet experience this is the only way to assist the country. The Symposium shows that B.R.C. is alreacy starting to work in this way.
It was suggested to the Packaging Section to start some activities in the Food Packaging Area. CETEA will be available for some training if necessary.

15.3. Discussion with Dr. Falah S. Jabr, Secretary of the Arab Federation for Food Industries. The main important aspect of this conversation was to establish a good integration between CETEA and the Arab Federation. The Brazilian experience with the Arab Chamber of Commerce

may also be interesting. Dr. Jabr thinks that other Arab Countries should start activities in to the packaging area that was supported by the expert. The exchange of information between CETEA and Arab Federation will continue.

15.4. Discussion with Eng. Reyad Y. Al Sheitch from the Iraq Dates Processing and Marketing Co. This company started to use a thermoformed plastic tray to pack dates using gas flush for modified atmosphere. Due to the quality of the film used and to the heat sealing properties of the package it seems that this process is not usefull to this company. The expert took samples that will be analysed and discussed with them.
Another problem is the perforation of the 10kg vaccum package. This is due to the the sharp points of the dates and one way to reduce this perforation is increasing the nylon thickness of the film to enlarge the mechanical resistance. Mr. Neil Robson from ITC visited the company and gave also some recommendation to improve the system.

15.5. Meeting with Mr. Suhan S. Al - Adhami and representative of the Ministry of Industry and Commerce. As most of countries in the world, Iraq is also looking for Arternative Packages for some food products. The main products discussed were:

- Tomato Paste
- Edible Oil
- Preserve Vegetable
- Dairy Products

Considerations concerned the alternative packages for these products was given by the expert. This may help the Ministery of Industry and Commerce in order to clarify some doubts concerning future investiments for food packaging. Samples from brazilian products will be sent via the Iraq Embassy in Brazil (Counsul Saad).

16. CONCLUSIONS AND RECOMMENDATIONS

The existence of events as the "Symposium on Packaging Problems of Food Industries in Hot Countries" is vital for the development of this important area in the Arab region.

The expert experience obtained in Marrocos, Tunis, Jordan, South Iemen, United Arab Emirates and now Iraq show that will take some time for the packaging area to be considered part of the food system in these countries. There is a lot of things to do and the begining of creation of Packaging Nucleous in different Arab countries, urdoubtadely will be one of the most important activities for the development of this Area.

ANNEX I

FOOD PACKAGING

FOOD SAFETY - SHELF-LIFE - STORAGE PROBLEMS

LUIS MADI
CETEA - Coordinator

Packaging has proved to be a highly successful system for making products available in ever greater abundance and quality for the greatest number of people.

Packaging as a science and technology has proved to be capable of expanding and adapting to meet the needs both in developing and developed countries.

In developing countries the development of the industrialized goods is today dependent on the development of the packaging area. The consumption of packaging materials and packages will increase probably in a faster rate than the economy.

Since most industrialized goods need packaging for protection and distribution, in different countries it will find different degrees of consumption of packages and packaging materials.

In developing countries two important factors that can influence the development of the packaging industry are:

- The increase of the economic power of the population,

- The government programs for food distribution with the extraordinary consumption of packaging.

Concerning the packaging area, the developing countries are in reality a complex system, geographically as well as economically.

According to the World Bank, we can divide the developing countries into three categories:

- The producer of petroleum with large or small population that use their resources in the economic development of the country. Some of these countries are in the Middle East and Latin America.

- The countries that started the industrialization process at different levels and diversification in Latin America, Asia and Africa, that export to Europe, USA and Japan not only food processed products, but also industrialized goods.

- The less developed or under developed countries with no economic or agriculture program, no distribution system that form the most common image of the third world.

In these two first categories, the packaging industry has good potential for development.

In developing countries, it is necessary to concentrate efforts in the development of packaging for the internal market where most of the time, simple solutions, contribute in a great extention to minimize the losses of products, one of the biggest problem in these countries.

In the special area of food packaging, that concerns approximately

60% of the total packaging material,this aspect is worst, with losses of food products between 10 to 60%. In order to illustrate this problem Table 1 shows the losses of fresh fruits and vegetables in Less Developed Countries presented by F.A.O. (Food and Agriculture Organization of the United Nations 1981).

For the developing countries, until recently, the attention given to the packaging area was not so high. When the analysis of the packaging system began to show the influence of packaging materials in the increase of sales and product quality, in the decrease of losses and cost, than packaging began to be considered an "IMPORTANT ITEM" and most of our countries are discussing the importance of packaging and the needs of laboratories, centers and research institutes in order to work together with the packaging industries in the development of this important area.

One important aspect needs to be mentioned. Not all developing countries have the same technological development level. In this context we could divide them into in the following categories:

- More developed

- More or less developed

- Less developed

The technological needs of these categories will vary and it is important to have this aspect in our minds.

In the more developed countries the needs of technical assistance and packaging development is very high. On the other hand, in the more or less and less developed countries the biggest problem is the lack of packaging materials, for example.

In all these countries, the aspects of handling, storage and transport in general are very poor and with small improvement in the system, it is possible to reduce considerably the losses of the industrialized goods.

As a matter of illustration, some of the important problems in the food packaging area for the internal market are listed below:

- Packaging for fresh fruits and vegetables

- Corrosion problems

- Migration of packaging materials (plastic, etc.)

- Lack of specification of packaging and packaging materials

- Development of packaging for food products

Commodity	Production (1000 tonnes)	Estimated Loss %
Roots/Tubers		
Carrots	557	44
Potatoes	26,909	5-40
Sweet Potatoes	17,630	35-95
Yams	20,000	10-60
Cassava	103,486	10-25
Vegetables		
Onions	6,474	16-35
Tomatoes	12,755	5-50
Plantain	18,301	35-100
Cabbage	3,036	37
Cauliflower	916	49
Lettuce	-	52
Fruits		
Banana	36,898	20-80
Papaya	931	40-100
Avocado	1,020	43
Peaches, apricots nectarines	1,831	28
Citrus	22,040	20-95
Grapes	12,720	27
Raisins	475	20-95
Apples	3,677	14

Data from National Academy report, 1978

Table 1 - REPORTED PRODUCTION AND LOSSES FIGURES IN LESS DEVELOPMENT COUNTRIES.

- Others

For the export market, the situation is completely different. Generally, the countries that import goods, establish the packaging material or the packaging system in order to accept these products. At this point, markets can be lost or conquered depending on the packaging disponibility. Of course, there are other factors that will influence the development of these markets and as product quality, total quality control system, distribution system and costs.

In this context, one of the biggest problem for the industries in the developing countries is the lack of technical and commercial informaton/knowledge, in order to be able to solve their packaging problems in an effective way.

This is extremely important in the food packaging area and today a series of developing countries is planning the creation of packaging laboratories and packaging centres.

The Brazilian experience in creating CETEA - The Food Packaging Technology Center aimed at working together with the industry and the government for the development of the packaging area, is a very good example.

In the packaging system, i.e., during production, transport, storage and distribution of food products, the deterioration and losses of these products are function of a series of factors concerned with the physical, biological and human aspects. An adequate package has a very important role in reducing or minimizing these losses and this contribution is still more important in developing countries such as Brasil and Iraq where the climatic conditions are severe.

Basically packages are specified not only based on the protection needs of the food products, but mainly considering the PACKAGING SYSTEM wich considers the production, storage and distribution conditions.
The main packaging function is to:

- Contain the product

- Protect the product

- Identify, inform and sell the product.

For our countries, maybe the most important function is to "Protect the Product" so that the consumer will have a safe, nutritive and adequate product.

The Knowledge of the hazards that affect the food products from the production till the consumption are very important for the development as for the specification of a package. The Figure 1 shows the main factors that will influence in the quality of the food products.

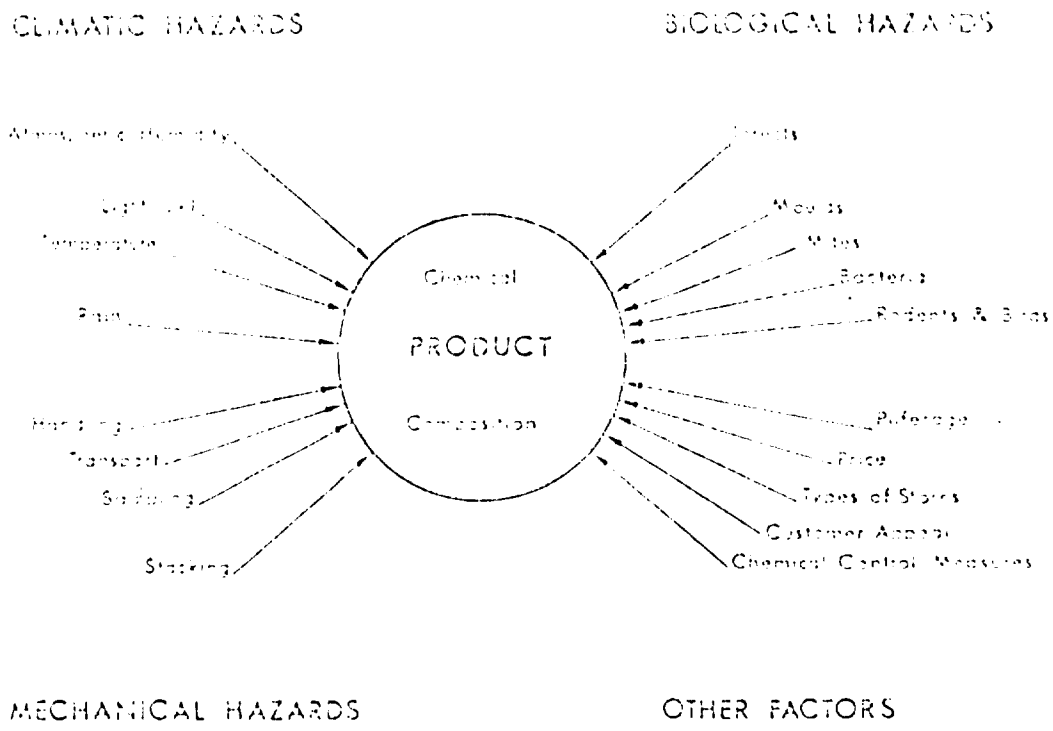


FIGURE 1. IMPORTANT FACTORS IN SELECTING A PACKAGING UNIT FOR FOOD STORAGE.

HAZARDS RELATED TO FOOD PRODUCTS

A very important consideration concerning the packaging is related to the caracteristics of the food products.

In a global way, it can be said that the problems concerning with the contamination of food products related to packaging can be divided in two main categories:

- Contamination due to the inadequated use of packaing

- Contamination due to the packaging material or due to the interaction between food and package.

The contamination due to the inadequate use of packaging is basicaly the hazards presented in the Figure 1 as: Climatic, Biological, Mechanical and others.

The contamination related to the interaction of the food-package is more complex and today the most important are:

- Contamination of metal packages in canned foods as lead, tin and iron;

- OFF-FLAVOR contamination

- Contamination of packaging material due to migration as plastic monomers, additives and other packaging components.

In order to better understand these contaminations, it is important to visualise that packaging of food products is a technique used thousands of years ago. Concerning with this new product distribution system, the packaging revolution started on 40 - 50 with the introduction of new consumer habits.

As consequence of this social and technological revolution, new materials, packaging and systems were developed in a short period of time with an introduction of new concepts of SAFETY OF FOOD AND PACKAGED PRODUCTS.

Today, society is much more concerned with the health aspects of the packaged foods as well as with the ecological and environmental aspects.

On the other hand, there is no doubt that without a Packaging System, today, there is no way to feed our society, and the benefits that the Packaging brings to the society are much more important than the problems (SAFETY ASPECTS) involved on this area.

Another crucial aspect is related to the Developing Countries as Brazil for example that is, what is more important today: to feed the population that is still starving, to minimize the food losses that are very high or to be concerning with the SAFETY ASPECTS well presented and analysed in the most developed

countries? The answer is not so simple, it needs a balance and maybe we should work in these two areas simultaneously.

Contamination of heavy metals on canned food

Canning is maybe the most used process in the preservation of food products. For developing countries, were the "cold chain" is expensive and not well developed this process is undoubtedly the most important.

Concerning the safety aspects, we have first the microbiological that is more related to the food processing that is today well understood with a minimal problem to the consumer.

There are also safety problems due to the inadequate handling, transport and storage or corrosion problem that as consequence will induce a microbiological contamination. These physical mecanical problems were minimized in the last 20 years and today represents almost no risk to the consumer.

Another important aspect is related to the corrosion of canned products with the migration of lead, tin and iron.

Iron and tin are still used to determine the shelf life of canned foods as estipulated by the World Health Organization, but with no big problem with the health aspects.

Lead is the most important metal related to the health aspects. This was one of the critical points in the exportation of canned food by developing countries, the lead contamination, with the well known toxicological contamination.

The metal packaging industry, overcomed this problem with the introduction of the electro-welded cans, i.e., these three-piece cans electro soldered with Zero lead in the side seam. Today most of the canning lines of developing countries are replacing the lead-tin solder by the new welded systems as it can be seen in the slides.

Off-flavor contamination

The different food products have a specific sensibility the contamination by off-flavors due to the packaging materials.

One of the most important aspects of the packaging is to avoid the development of off-flavor in the food products. Off-flavor is a result of a complex balance between chemical groups into the foods. Any modification of this equilibrium will result in the development of off-flavor.

The most important factors in the development of these off-flavors are:

- Off flavor can migrate to the product through the packaging material.

- Food ingredients (components) can migrate through the package changing the natural flavor of the product.

- The food product can react with the oxygen existed inside the package.

- Microrganism or enzimes can develop off-flavor in the food product.

- Off-flavor can be developed by the interaction between food and package.

This last example is important mainly for flexible packaging where the migration of residual solvents is the most important.

In this paper consideration of off-flavor contamination will be presented for the following food product category:

1- Fresh products;

2- Frozen products;

3- Dehydrated products;

4- Canned products;

5- Cereals;

6- Sugar;

7- Chocolates;

8- Beverages;

9- Edible oil.

CETEA has been working in this area in the last 10 years and has published a manual entitled: "Migration of Plastic Packaging Components into Food Products"(1) that will be given to the organizers.

Through these 10 years of experience, CETEA introduced the well known "HOT JAR TECHNIQUE" to the Brazilian Packaging Industry, that can control and identify most of the residual solvents that can cause this contamination.

Concerning with the content of these residual solvents, the quality control of the flexible packaging materials can only be done if it is known, the maximum levels of these components where the sensoric evaluation can detect the off-flavors.

In the stablishment of these standards, many factors must be considered such as: nature of the flexible film, type of structure, origin of the residual solvent printing operation and lamination, nature of the solvents and type of the food.

In the technical literature there are standards used in Europe, that are presented in the Table 2, or suggested by Gilbert that is 10mg/m2 for all solvents.

ORIGIN	SOLVENT	MAXIMUM LIMIT SUGGESTED mg/m2 of material
LAMINATION	ETHYL ACETATE	20
	METHYL-ETHYL-KETONE	15
	METHYL-ISOBUTYL-KETONE	10
PRINTING	ETHYL ACETATE	30
	ISOPROPYL ACETATE	10
	ISOPROPYL ALCOHOL	30
	ETHANOL	100
	HEPTANE	30
	TETRAHYDROFURAN	15
	METHYL ETHYL KETONE	10
	TOLUENE	10
	TRICHLORO ETHYLENE	100

TABLE 2. STANDARD LIMITS OF RESIDUAL SOLVENTS USED IN EUROPE.

Another important work done by CETEA, with printed polipropilene film to be used on snacks and biscuits, showed the following maximum levels.

- ETHYL ACETATE ---------- 4mg/m2

- ETHANOL ---------- 50mg/m2

- TOLUENE ---------- 10mg/m2

- ISOPROPYLALCOHOL ---------- 10mg/m2

On laminated materials, it could be used the following limits:

ETYL ACETATE ---------- 10mg/m2

TOLUENE ---------- 10mg/m2

ETHANOL ---------- 50mg/m2

Migration of plastic monomers

Concerning the migration of plastic monomers into food products, the two most important are: PVC (Polyvinyl chloride) and POLYSTYRENE.

In 1973 after many years of use of PVC as food packaging material, it started the first complaint concerning with this material. Small quantities of Vinyl Chloride (V.C.) were found in alcoholic beverages packaged on rigid bottles. In 1974 the first papers showed the existance of tumors on livers on workers exposed to high VC concentration (1000 ppm).

The publication of these experimental works and the Delaney Clause made the FDA to review the use of PVC for food products.

The toxicity aspect of PVC has two parts: the first one is the exposition to the VC through the breathe of this monomer, for example in the PVC industry. In 1974 the USA established as 1ppm the maximum daily exposure (8 hours) on resin industries.

The second area is the possibility of consumption of minimum quantities of VC, as result of migration from the packaging to the food products.

The migration of VC into the food is consequence of the incomplete resin polimerization. It is estimated that 90% of VC are converted into PVC. The 10% can be lost in the atmosphere or been recovered into the processs again. Small quantities of monomers are free in the resin and can be lost in the different parts of the packaging production.

After the packaging production, the losses of these small quantities of monomers can migrate through the package into the food, and the PVC can be responsable for the incidental aditivation, as it is defined by the Food and Drug Administration.

Internationally the sactisfatory level of residual VC on packages is 1ppm. It is also very important to mention that in the last years, the technological developments reduced the residual monomers of resins in the acceptable 1ppm level.

In practice, the VC level on packaging materials is much lower than 1ppm and the VC migration into foods is below the detection limit that is between 2 and 10p.p.b. depending on the food product.

The problem with the use of polystyrene as food packaging material relates to the presence of non polymerized material in the structure, mainly the styrene.

Studies have known that there is no carcinogen danger in the digest in of this monomers. Another very important aspect is

concerning with the migration of polystirene into food, is the caracteristic odor and the off-flavor that appears in the product. Many researchers say that the off-flavor due to the migration is detected in much lower quantities than the toxicological quantities.

A complete explanation of these two item are deeply discussed in CETEA book: " Migration of Plastic Packaging Components into Food Products"(1).

SHELF LIFE AND STORAGE PROBLEMS

Food products, industrialized or not, are submitted to some chemical, physical, microbiological or/and enzimatic changes that acting independently or in conjunction can modify these original qualities leading to a deterioration process.

In order to minimize these losses or changes in the product, processing and packaging technologies were developed. The maintenance of the acceptable quality of the foods based on a series of parameters is sometime classified on shelf life.

Another definition of Shelf life is: the period from the production to the consumption where it has an adequated quality based on the nutritive value, flavor texture, and appearance.

The shelf life varies with the type of food, storage, temperature and package used as it can be seen in the Figure 2.

The performance of the package and the result of the maintenance of the product qualities, will depend among other factors, on the adequate combination of packaging materials and packaging systems. This can be showed in Figure 3.

Different processing and packaging systems are now available to be used in order to mantain the most important parameters of quality of food products.

These basic parameters are: nutritive value
microbiological growth
organoleptical qualities

For consumers, most of the time the last one is the most important parameter as it can be easily measured by some qualities of the product as texture, flavour, odor, colour, etc. It is important to enfasize that any change in these qualities will directly affect the consumption of the food.

On the other hand, from the technological point of view, there is a serie of other parameters to be considered when using different processing and packaging systems:

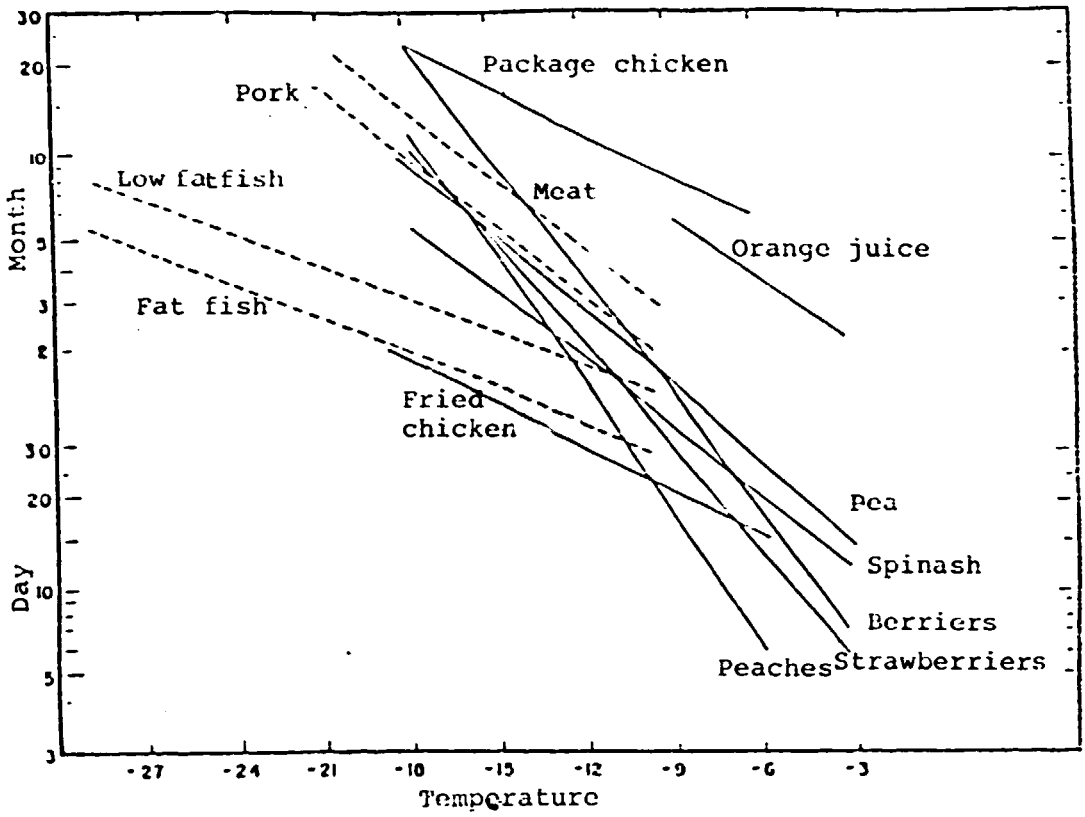


FIGURE 2. INFLUENCE OF TEMPERATURE IN THE SHELF LIFE OF FOOD PRODUCTS.

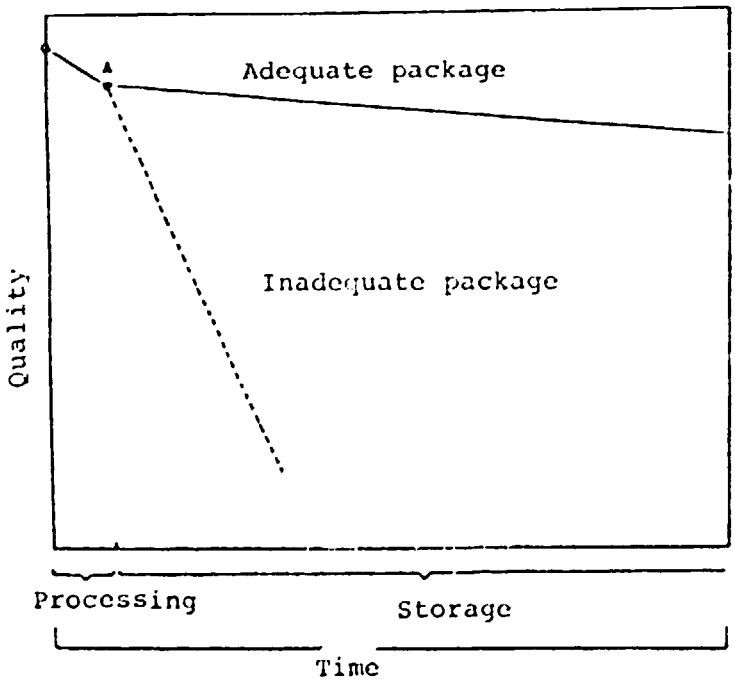


FIGURE 3. LOSS OF PRODUCT QUALITY DURING PROCESSING AND STORAGES.

- infestation

- oxydation and hydrolysis of facts

- oxydation of pigments

- browning

- changes due the increase or loss of humidity

- loss of nutritive value

- food-packaging interation

Practical consideration and examples regarding these parameters will be discussed during this presentation.

Today, the food packaging technology is coming to a point where the developing of new packaging materials and equipments have provided possibility of inovating even the food processing system. It started mainly after the development of the plastic industry that by the direct and hard competition with the traditional packages like metal cans and glass containers, accelerated the needs of research in alternative materials and packaging systems. The main objective was to have lighter packages, with less consumption of energy and extended shelf life, for the product.

Storage condition (mainly temperature) is probably one of the most important factor, in the deterioration of food products as well as in reducing the shelf life of these products.

For developing countries (some hot countries) as Brasil and Iraq this special parameter is crucial and is a "must" to scientists, food engineers, and packaging technologist to understand this process very well. A very important publication on this area was written by CETEA: General Aspects of Shelf life Food Products (2), that will be given to the organizers.

In the following tables taken from the above paper, it is presented a serie of data concerning with the shelf life of the different categories of products. In the ANNEX 1 of this paper it is presented the Bibliography Reference of the above mentioned paper.

(1) Migração de Componentes de Embalagens Plásticas para Alimentos. FERNANDES, M.H.C.; GARCIA, E.E.C. e PADUA, M. CETEA/ITAL/SBCTA. 1987. 175 pgs.

(2) Aspectos Gerais sobre a Vida-de-Prateleira de Produtos Alimentícios. CABRAL, A.C.D. e FERNANDES, M.H.C. CETEA/ITAL. 1980. 81pgs.

TABLE 2. ESTIMATED SHELF LIFE OF PERISHABLE FOOD PRODUCTS (0.5 - 5°C).

PRODUCT	PACKAGING MATERIAL	SHELF-LIFE	REFERENCE
MILK			
Homogenized and	Glass, Plastic, Laminated	5 to 8 days	45
	Plastic	5 days	21
Sterilized (UHT)	Laminated	12 months	31
Condensed	Cans	15 months	31
Evaporated	Cans	24 months	31
Milk Cream	Cans	6 to 9 months	31
CHEESE			
Parmesan	Plastic or Paper	6 months	45
	Glassine Paper	6 months Min.	21
Gouda	Plastic or Paper Glassine Paper	3 months	45
Camenbert	Plastic or Laminate	2 to 3 weeks	45
	with aluminium	2 to 3 days	21
Mozzarella	Plastic	2 to 3 months	45
White Cheese	Plastic or Laminates with Aluminium	10 days	45
"Cheddar"	Plastic	6 months 4°C	31
		18 months 1°C	31
	Plastic or Can	3 months	
FRESH MEAT			
Beef	Plastic	5 days	45
	*	1 to 6 weeks	59
Fat Beef	*	7 to 12 days	59
Pork meat	Without package	1 day	21
	Plastic	5 days	45
Cold cuts meat	Without package	4 to 5 days	45
Chicken	Plastic	3 days	45
	*	1 week	59
Rabbit	*	1 to 5 days	59
Fish	*	5 to 15 days	59

CONT.

CONT.

PRODUCT	PACKAGING MATERIAL	SHELF-LIFE	REFERENCE
PROCESSED MEAT			
Bacon	Plastic (Vaccuum)	3 to 4 weeks	45
Frankfurt	Plastic (Vaccuum)	3 to 4 weeks	45
		2 weeks	21
Pork Frankfurt	Plastic (Vaccuum)	2 weeks	21
Ham	Plastic (Vaccuum)	3 to 4 weeks	45
	Cans	2 years	45
Fat Meat (Cured)	*	until 3 years	59
FRESH FISH			
Cod Fish -	Without package	14 days 0°C	21
		1 day 15°C	21
Salmon	Without package	12 days 0°C	21
		1 day 15°C	21
PROCESSED FISH			
Dry salted cod fish	Without package	1 year 0°C	21
		4 months 15°C	21
Herring	Without package	1 month 0°C	21
Smoked	*	3-4 months 15°C	21
		6 to 8 months	1
EGGS			
Fresh	*	3 to 6 weeks	45
		1-2 weeks 25°C	45
Frozen	*	1-12 months 0°C	1

* Package not especified

TABLE 3 . ESTIMATED SHELF LIFE OF PERISHABLE AND SEMI PERISHABLE FROZEN FOODS.

PRODUCT	PACKAGING MATERIAL	TEMPERATURE °C	SHELF-LIFE MONTHS	REFERENCE
MEAT AND FISH				
Beef	Plastic or laminated	-18	10 - 12	45
	*	-12	4	59
	*	-18	9	59
	*	-23	12	59
Pork	Plastic or laminated	-18	6	45
	*	-18	3	13
	*	-12	3	59
	*	-18	6	59
	*	-23	8	21
Cured pork meat	Plastic or carton	-18	2	21
Hamburguer	Plastic or carton	-18	3	21
Bacon	*	-12	2	59
	*	-18	6	59
	*	-23	8	59
Hen	Plastic or laminated	-18	12	45
	*	-12	4	59
	*	-12	1	59
	*	-18	3 - 5	59
	*	-23	8 - 10	59
Chicken	*	-18	6	59
	*	-23	9	59
Pre-cooked turkey	Plastic	-18	3 - 6	13
Rabbit	*	-18	4	59
	*	-23	6	59
Fish	Plastic or Carton	-18	4 - 5	21
	*	-12	6	59
	*	-18	6	59
	*	-23	9	59

CONT.

CONT.

PRODUCT	PACKAGING MATERIAL	TEMPERATURE oC	SHELF-LIFE MONTHS	REFERENCE
Low fat fish	*	-12	6	59
	*	-18	10 - 12	59
	*	-23	14 - 16	59
Pre-cooked low fat fish	*	-18	12 min.	13
Fat fish	*	-12	4	49
	*	-18	6 - 8	59
	*	-23	10 - 12	59
	*	-18	6 - 8	13
Salmon	Plastic or Carton	-18	2 - 3	49
Cod fish	Plastic or Carton	-18	3 - 4	49
Cooked Lobster	Plastic or Carton	-18	2 - 3	49
Lobster	*	-12	3 - 4	59
	*	-18	8 - 10	59
	*	-23	10 - 12	59
Shrimp	Plastic or Carton	-18	2 - 3	49
Cooked Shrimp	Plastic or Carton	-12	3 - 4	59
	Plastic or Carton	-18	8 - 10	59
	Plastic or Carton	-23	10 - 12	59
	*	-12	3	59
	*	-18	6	59
	*	-23	9	59
EGGS				
	*	-18	12 min.	13
	*	-23	12	59
	*	-18	3	59
Butter	*	-18	3	59
	*	-23	12	59

CONT.

CONT.

PRODUCT	PACKAGING MATERIAL	TEMPERATURE °C	SHELF-LIFE MONTHS	REFERENCE
FRUITS AND VEGETABLES				
Fruits	Plastic	-18	8	59
		-23	12	59
		-12	6	59
Cristalized fruits		-18	12 min.	13
Concentraded fruit juice	Can	-18	2 years	45
Vegetable	Plastic	-18	15	45
	Plastic	-18	8	21
	Plastic	-12	8	59
	Plastic	-18	9	59
	Plastic	-25	12	59

* Not especified package.

TABLE 4. ESTIMATED SHELF-LIFE FOR OIL, FAT AND RELATED PRODUCTS.

PRODUCT	PACKAGING MATERIAL	TEMPERATURE °C	SHELF-LIFE	REFERENCE
Vegetable oil	Glass, plastic or can	25 Max.	12 months	45
	Glass or can	25 Max.	12 months	21
	Plastic	25 Max.	6 months	21
Corn oil	Glass	25 Max.	4 months	21
Olive oil	Can	25 Max.	4 months	21
Salad dressing	Glass	25 Max.	12 months	45
Mayonaise	Glass	25 Max.	12 months	45
Margarine	Aluminium foil, plastic or paper	0,5-5	6 weeks	45
Margarine	Retail package	0,5-5	3 - 6 months	21
Butter	Retail packaging	0,5-5	6 - 8 weeks	45
	Retail packaging	0,5-5	5 days	21
	Institutional package	5	1 month	31
Peanut butter	Glass	25 Max.	12 months	45
Pork fat	-	10-25	90 days	21
Bacon	Plastic	0,5-5	4 weeks	21
	Plastic	0,5-5	2 weeks	21
	Plastic	0,5-5	3-4 weeks	45
Snack	Plastic	25 Max	3-4 weeks	45
Fried soybean	Can	23	3 months	04
	Polypropilene	23	3 months	04
Fat frozen fish	-	-12	4 months	59
	-	-18	6-8 months	59
	-	-23	10-12 months	59

TABLE 5 . ESTIMATED SHELF-LIFE OF FOOD PRODUCTS SENSIBLE TO HUMIDITY.

PRODUCT	PACKAGING MATERIAL	SHELF LIFE	REFERENCE
Dehydrated products	Can, Glass or Laminated with Aluminium	4 months - 1 year	21
Biscuits	Plastic	15 weeks	45
American Bread	Glassine paper	1 - 4 days 25°C	45
	Plastic	3 weeks 25°C	45
Cake mixture	Glassine paper	6 months 25°C min.	45
Soup mixture	Laminated with aluminium	1 year	21
Instant coffee	Glass	9 months	45
Ground coffee	Can	9 months	45
Sugar	Paper	2-3years 25°C 60%U.R.	45
Potato flokes	Plastic or Laminated	10 months	21
Flowers	Paper	2 years 25°C 60%U.R.	45
Integral dryed milk	Polyethilene	4 months or 30°C 80%U.R.	23
		45 days 38°C 90%U.R.	23
	Can	6 months	23
Non fat dryed milk	Can, Polyethilene,(500g), Laminated with aluminium	6 months	23
	Can	6 months 30°C	31
		16 months 20°C	31
		14 months 5°C	31

TABLE 6 . MAXIMUM STORAGE TEMPERATURE (°C) FOR FRUITS JUICES AND VEGETABLES JUICES FOR THE MAINTENANCE OF 90% OF VITAMIN.

VITAMIN	STORAGE TIME (months)	PRODUCT			
		ORANGE	PINEAPLE	TOMATO	CARROT
Ascorbic Acid	12	20	28	24	-
(Vitamin C)	18	14	25	22	-
	24	8	21	19	-
Thiamin	12	-	27	23	-
(Vitamin B1)	18	-	27	19	-
	24	-	27	16	-
Carothenoid	12	-	27	-	27
(pro-vitamin A)	18	-	-	-	27
	24	-	-	-	27

TABLE 7 . ESTIMATED SHELF-LIFE OF CANNED FOOD PRODUCTS.

PRODUCT	STORAGE CONDITION °C	SHELF LIFE	REFERENCE
VEGETABLES			
Asparagus	-	24 months	21
	25 or less	12-18 months	45
Beans	-	36 months	21
	25 or less	12 months	45
Hearts of palm	-	12 months	34
Spinach	-	48 months	21
Tomato(juice)	-	24 months	21
Tomato(hole)	-	30 months	21
Tomato (concentrate)	-	12 months	35
Tomato (pure)	25 or less	12 months	45
Other vegetables	25 or less	36 months	45
		24 months	21
	20 or less	12 months	45
	-	9-15 months	21
FRUITS			
Citrus fruits	-	13 months	21
Fruit salad	-	36 months	21
Fruit in general	-	24 months	21
Fruit juice(low calorie)	-	3-6 months	21
Fruit and vegetable juice	-	24 months	21
MEAT			
Cured meat	25 or less	48 months	45
Meat and cereals	25 or less	48 months	45
Meat and vegetables	25 or less	36 months	45
BABY FOOD			
Liquid sterilized	25 or less	4 months	45
Miscellaneous	hermetic sealed	24 months	45
MISCELANEOUS			
Soft drinks	25 or less	6-9 months	45
Beer	25 or less	12 months	45
Edible oil	25 or less	12 months	45

ANNEX 1

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NEW TECHNOLOGIES: INTERNATIONAL SITUATION AND THE DEVELOPMENTS COUNTRIES PERSPECTIVE

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2.1. INTRODUCTION

One of the main activities of a Center of Research and Technological Assistance is to be at the forefront as far as the gathering of information related to its areas of activity is concerned.

The Food Packaging Technology Center ("Centro de Tecnologia de Embalagem de Alimentos - CETEA") of the ITAL ("Instituto de Tecnologia de Alimentos" - Food Technology Institute), through the present work, wishes to present considerations on some technologies mainly for plastic food packaging, currently regarded inthe Developing Countries as one of the most dynamic sectors.

In his work "Megatendências - Brasil" (Megatrends - Brazil - In Portuguese), NORBITY (14) expresses the following opinion, that I consider very important in this introduction, due to the fact that other developing countries could have the benefit of the Brazilian experience: "In a country like Brazil, where different stages of evoluation can be observed in each phase (agriculture, industry, information), there exist, to be sure, fantastic opportunities for creating short cuts in the process of overcoming each stage. This has already happened within "Industrialized Brazil", where industries have gone from primitive production stages to technological state-of-the-art stages, creating highly competitive products in the world market. The same thing happens witht agriculture nowadays in Brazil. Althtough there are regions in Brazil where agriculture is primitive, there are also others where it is highly industrialized and informatized".

Brazil's great strength lies in this paradoxical scenario. If the potential for shortcuts is well managed, the country, because its basic extraordinary force, will be able to more rapidly decrease the gap that separates it from advanced countries, rendering feasible the "Brasil 2000" objective (to become an advanced country at the turn of the century).

The competitiveness of Brazil's industrial activities will depend on information. The most dramatic example of this is the case of Japan versus the US. Japan was able to place itself ahead of the US as far as industrial information is concerned. The results, measured by Japan's present competitiveness, are unquestionable.

The social development in Brazil and a better distribution of the income, needed in all respects, including for the development of an ever stronger internal market, will in the near future lead the country to a non-competitive position with regard to labor costs: we will witness the rise of other Third-World countries more competitive in this dimension. This has already happened to Japan, and is happening to other countries. It will happen to Brazil. The main factors that will compensate for the change in this dimension will be: a correct long-term position (and the attendant policy of investments in key, long-term projects) and

the strategic use of information.

In addition, Brazil shall necessarily need to plan its economic activities with acute refinement in order for the information of the agricultural and industrial activities of its society as a whole to give rise to economic activities relevant to the internal and global markets. Such activities shall partake of an optimized utilization of human resources "displaced" by information from the traditional agricultural and industrial activities: on the first stage, unqualified and partially qualified human resources, and on the second stage, better educated (so long as more is invested on education in Brazil and so long as labor is trained for the strategically more relevant economic activities) and better paid (greater social development, better income distribution).

Brazil has never been as well-positioned economically as it is today. Nowadays the country is highly diversified (it's no longer the coffee country). Its strong presence in the agricultural and industrial areas also makes good sense, intelligent use being made of its vast natural resources and also in the area of information, through which "strategic shortcuts" may be created.

However, Brazil will only be able to optimize its potential, will only maximize the results of this stand, if it successfully faces its greatest and fundamental challenge: The improvement of its educational system and a considerable in the access of the whole population to a quality education.

For centures, relations between countries were predominantly political. Nowadays, many economical considerations exist. With the rise fo a global economy and on account of the strong interdependence among countries, economic considerations will predominate. The hope is that the creation of this single economy, on a world wide level, shall naturally lead to a better understanding among nations and to a lasting world peace.

The role played by entrepreneurs in creating a new economy, in revitalizing a society, is extremely important. They are the ones who provide a revitalization from the botton to the top, a process of great strength and vigor.

On the other hand, given the conditions created by the information society, knowledge and know-how are critical factors for the whole enterprise. This is a major change from the industrial society, in which capital always played the most important role.

In the industrial period, many could have the know-how, but capital was a barrier to the introduction of a new economic sector. In the information society, even if capital is available, it's not possible to be succesful without know-how.

In this new economy, access to the economic system is easier than it was in the industrial society. In this sense, a society based

on information and know-how is more egalitarian than one based on capital.

Therefore, it is the search for technological knowledge that will probably lead a country, especially Brazil, to a satisfactory social and economic development.

In this context, the packaging sector and, in particular, that of food packaging, is nowadays one of the most promising.

Until recently, packaging was considered a "necessary evil", unfortunately regarded this way or as a cost-increasing factor. This period is over and Brazil, as well as the developed countries, sees packaging as an excellent mechanism for raising a country's standard of living, as a factor that helps change a society's habits, making the consumer's life easier.

2.2. THE WORLD PACKAGING MARKET

Nowadays, the packaging sector is a high-priority one, and in the last few years it has acquired significant in the production, distribution and commercialization of industrial and in natura products, both at the national level and in the export activities.

To have an idea of the size of this market at a worldwide level, investments in the area (19) are show in Table 2.1.

Institutionally, the packaging area is well structured and organized. There exist international agencies such as the United Nations Industrial Development Organization - UNIDO and the International Trade Center with specific programs in the Packaging Area. The Organization of American States also has specified programs in the area of food packaging.

As for Federations and Associations, the best known and most active is the World Packaging Organization. Then come regional Federations and Unions, such as the Asian Packaging Federation (APF), North Amerircan Packaging Federation (NAPF), European Packaging Federation (EPF) and the Latin American Packaging Federation (ULADE), for example.

Recently, Brazil was able to quite efficiently structure the packaging area with a series of Associations and Sindicates pertinent to the sector, the most important are listed below:

Associations

ABRE - Associação Brasileira de Embalagem
ABIA - Associação Brasileira das Indústrias de Alimentação
ABIGRAF - Associação Brasileira da Indústria Gráfica
ABIPLAST - Associação Brasileira da Indústria do Plástico

ABIEF - Associação Brasileira da Indústria de Embalagens Plásticas Flexíveis
ABEFEPS - Associação Brasileira de Empresas Fabricantes de Embalagens Plásticas Sopradas

TABLE 2.1. WORLD INVESTMENT IN PACKAGING - 1986.

COUNTRY	US$ BILLIONS OF US$
USA	60
CANADA	10
LATIN AMERICA	20
ASIA	50
AUSTRALIA	10
OTHER COUNTRIES	100
TOTAL	250

ANFPC - Associação Nacional dos Fabricantes de Papel e Celulose
ABCP - Associação Técnica Brasileira de Celulose e Papel
ABPO - Associação Brasileira de Papelão Ondulado
ABRASP - Associação Brasileira de Papelão Ondulado
ABAL - Associação Brasileira do Alumínio
ATBIAV - Associação Técnica Brasileira das Indústrias Automáticas de Vidro
ABIMAQ - Associação Brasileira das Indústrias Automáticas de Vidro
ABRAS - Associação Brasileira de Supermercados
HORTINEXA - Associação Nacional dos Exportadores de Hortigranjeiros
ABIQUIM - Associação Brasileira da Indústria Química
ABFRM - Associação Brasileira dos Fabricantes de Rolhas Metálicas
APFPC - Associação Paulista dos Fabricantes de Papel e Celulose
ABIEA - Associação Brasileira das Indústrias de Etiquetas Adesivas
AFIPOL - Associação Brasileira dos Produtos de Fibras Poliolefinas

Unions

Sindicatos das Indústrias de Artefatos de Borracha no Estado de SP
Sindicato da Indústria de Papel, Papelão e Cortiça no Estado de SP
Sindicato da Indústria de Especialidades Têxteis do Estado de SP
Sindicato da Indústria de Estamparia de Metais do Estado de SP
Sindicato da Indústria de Fiação e Tecelagem em Geral do Estado de SP
Sindicato das Indústrias Gráficas no Estado de SP
Sindicato da Indústria de Material Plástico do Estado de SP
Sindicato da Indústria do Papel, Celulose e Pasta de Madeira para Papel no Estado de SP
Sindicato da Indústria do Papelão no Estado de SP
Sindicato da Indústria de Resinas Sintéticas no Estado de SP
Sindicato da Indústria de Tintas e Vernizes no Estado de SP
Sindicato da Indústria de Vidros e Cristais Planos e Ocos no Estado de SP
Sindicato Interestadual da Indústria de Máquinas
Sindicato da Indústria de Produtos Farmacêuticos do Estado de SP
Sindicato da Indústria de Perfumaria e Artigos de Toucador no Estado de SP

However, in order to really evaluate the development of the packaging area in the country, one must know a series of data or indicators, such as:

- Production of packaging material;
- Consumption of packaging materil;
- Relation between the exportation and importation of materials and packaging in units or values;
- Porcentage of packaging material production with respect to the GNP;

- Production and/or consumption of packaging machines;
- Relation between national income and the per capita packaging material consumption.

The Figure 2.1. shows the World per capita consumption of packaging material and packaging in 1970, 1979 and 1983.

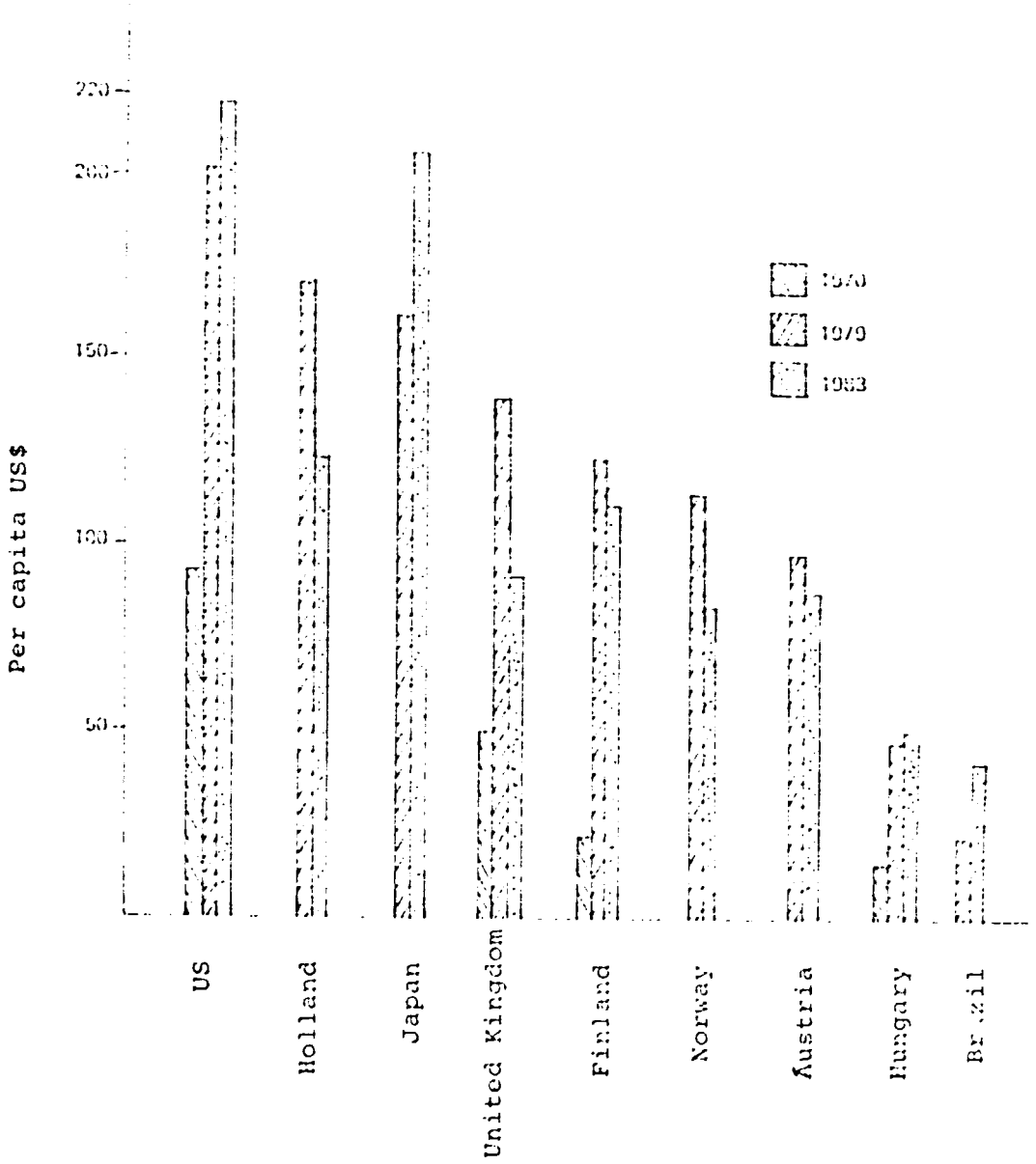

FIGURE 2.1. World per capita consumption of packaging material and packaging in 1970, 1979 and 1983 (3).

More recent data are listed in Table 2.2 (6), where the per capita packaging material consumption in 1986 is shown. These date indicate that the consumption is still very low in Brazil compared to that in developed countries, showing how great the market potential is in our country.

When the world packaging market is analysed emphasizing new technologies, the reference sources are practically only the European, Japanese and North-American markets. Nowadays, almost all techological innovations come from Japan and Europe, and, with rare exceptions, from the US. The utilization of packaging in Japan is very particular and nevertheless produces most of the technological innovations which could be suitable for medium or long term introduction in Brazil.

The packaging used in Europe and in the US has the greatest potential when one looks for an extrapolation of what would be suitable for short, medium or long term introduction in Brazil.

To have an idea of the size of these markets, Table 2.3. shows the estimated packaging consumption in the European countries and Table 2.4. shows the estimated packaging consumption in Western Europe, the US and Brazil in millions of tons, in 1984 (17).

On the other hand, the choice of a certain type of material or of a certain type of packaging for a food product is a function of a series of factors which must be carefully analysed for each country and at each moment.

The main aspects which influence the choice of packaging for food products are:

- Legislation
- Recycling
- Existence of raw material in the country
- Technological dependence
- Cost
- Changes in eating habits
- Distribution system
- Marketing development
- Activity of sector associations and sindicates

Table 2.5. (17) shows an interesting example that illustates how complex the choice of a material or packaging is. In this Table, one sees that in France and Germany baby food is packaged in glass, and basically and in cans in the United Kingdom. Carbonated soft drinks are basically packaged in PET bottles in the United Kingdom and mainly in glass in Germany and France. Beer is packaged in glass in France and Germany, whereas in the United Kingdom the packaging used most often is cans.
A more detailed analysis of this market shows that in the United

TABLE 2.2. PER CAPITA CONSUMPTION OF PACKAGING MATERIALS IN SELECTED COUNTRIES, IN 1984 (4).

PACKAGING MATERIALS	BRAZIL		US	FRANCE	W. GERMANY	ITALY	HOLLAND	ENGLAND
	TOTAL POPULATION	ECONOMICALLY POPULATION						
PLASTIC	2,5	6,6	11	11	13	8	11	8
PAPER	2,2	5,9	19	14	14	15	22	14
PAPER BOARD	6,9	18,2	70	29	23	18	26	24
CARTON	1,8	4,9	23	11	12	7	12	12
STEEL	4,3	11,3	30	10	8	7	17	18
ALUMINUM	0,2	0,4	4	1	1,5	0,7	1,2	1
GLASS	4,4	11,7	47	39	41	26	34	35
TOTAL	22,3	59,0	214	115	112,5	83,7	135,2	112

TABLE 2.3. ESTIMATED PACKAGING CONSUMPTION IN WESTERN EUROPE, THE US AND BRAZIL IN MILLIONS OF TONS - 1984.

COUNTRY	metal	ALUMINUM	GLASS	PAPER BAGS	CORRUGATED PAPERBOARD	CARTONS	PLASTIC	CELLOPHANE
W. GERMANY	475	100.4	2.768	176	2.000	400	1.200	10
FRANCE	575	50.7	3.015	172	1.800	380	875	7
UNITED KINGDON	650	55.3	1.739	164	1.400	508	700	16
ITALY	425	77.0	1.862	160	1.750	500	700	9
SPAIN	300	39.5	1.030	95	900	250	400	6
BELGIUM	125	7.9	400	25	300	66	220	3
THE NETHERLANDS	250	0.6	600	29	400	84	220	4
SWEDEN	100	8.8	100	49	300	90	200	1
NORWAY	80	4	60	25	90	22	100	-
DENMARK	100	5	100	40	210	75	90	1
FINLAND	80	0.5	46	16	135	30	100	-
SWITZERLAND		12.8	236	11	170	86	130	2
AUSTRIA		4.8	208	20	180	59	100	-
GREECE		4.6	81	18	20	40	100	1
IRLAND		0.5	90	15	85	23	50	1
PORTUGAL		3	239	40	180	30	80	1
TOTAL	3.400	375	12.600	1.065	10.000	2.650	5.200	62

TABLE 2.4. ESTIMATED PACKAGING CONSUMPTION IN WESTERN EUROPE, THE USA AND BRAZIL IN MILLIONS OF TONS - 1984.

COUNTRY	METAL	ALUMINUM	GLASS	PAPER BAGS	CORRUGATED PAPER BOARD	CARTON	PLASTICS	CELLOPHANE
WESTERN EUROPE*	3.700	370	13.000	3.100	10.000	2.800	5.000	98
USA	3.500	1.200	14.000	3.500	17.000	3.000	5.000	40
BRAZIL	566	20(26)	594	302	931	248	398	10

* TOTAL CONSUMPTION OF THE COUNTRIES LISTED IN TABLE 2.3.

TABLE 2.5. COMPARATIVE PACKAGING CONSUMPTION IN THE UNITED KINGDOM, FRANCE AND WEST GERMANY IN 1985 (millions of units).

PRODUCT	PACKAGING	U. KINGDOM	FRANCE	W. GERMANY
BABY FOOD	GLASS	105	250	160
BABY FOOD	CAN	140	-	-
FRUITS AND VEGETABLES	CAN	1000	1800	-
FRUITS AND VEGETAGLES	GLASS	LITTLE	100	200
CARBONATED SOFT DRINKS	PET BOTTLES	585	100	LITTLE
BEER	GLASS	75	3000	1650
BEER	CAN	1950	150	-
MINERAL WATER	PVC BOTTLES	20	2300	-
YOGURT	PLASTIC	1135	5100	3050
YOGURT	GLASS CUP	LITTLE	200	80
GLASS PACKAGING PRODUCTION (1000ton)	-	1656	2738	2990
METAL PACKAGING PRODUCTION (1000ton)	-	766	535	245
POPULATION (millions of inhabitants)	-	56,3	54,6	61,4

Kingdom the PET industry worked hard and managed to capture the soft drink market. On the other hand, in this same region, the metalhic packaging industries did an excellent job, practically capturing the beer industries and, nowadays, to talk to an Englishman about beer means talking about beer packaged in cans.

This aspect has not been well understood in Brazil or other development countries. The utilization of certain types of packaging, rather, the markets for the various kinds of packaging, are directly related to the activities of sector associations and unions, which fortunately have already been created, but as yet have not realized their full potential.

2.3. NEW TECHNOLOGIES

What's the meaning of new technologies or what is thought of new technologies in food packaging? More specifically, what is to be understood as new food packaging technologies: flexible or semirigid packaging?

Answering these questions is difficult, mainly because of the fact that what's new in one place isn't necessarily new in another place.

Aseptic packaging is a typical example. Brazil entered the aseptic packaging area with the Tetra Pak system before the US. For them, this is a technological innovation that's now changing the American market.

Intensive coverage of new technologies has been provided by the main periodicals in the food and packaging area, such as Alimentos & Tecnologia (2), Food Processing (18), Packaging (20), Food Manufacture International (4), The Journal of Canada and Beverage Processing Industries (21), N. U. Export International (22), and Packaging Encyclopedia (9), showing the importance of this area in the world market.

Along with the search for new technologies, a fundamental change in the packaging area must be pointed out. Up until a few years ago, a can was made of metallic material, and glass was glass. There existed an industry of metallic packaging, one of glass packaging and so on for other materials. Nowadays, industries are diversifying, not because they want to, but because they need to, for packaging is becoming more modern and more and more a compound and optimized product.

"Gone are the days when a can had be made of metal, when a bottle was obviously made of glass , when fast food was a new thing. We have witnessed the appearance of totally new ways of making things and this process will tend to accelerate", points out Wilmern^. Jankins (3).

This subject, covered in Chapter, of the present work, should be one of the main preoccupations of the Developing Countries

packaging and food industries.

As mentioned previously, as far as new technologies are concerned, there are three world leaders: Japan, Western Europe and the US.

The utilization of packaging in the Japanese market, as emphasized before, is very distant from the Brazilian needs and only a few cases will be analysed in this chapter. This does not mean, however, that one shoudn't know, and pay attention to, the new technologies created in Japan, where one finds the most advanced packaging technology know-how in the world.

The CETEA, in an effort to play its role as a Center of Excellence in this area, intends to publish a document on precisely the techological development in the area of food packaging in Japan. However, more emphasis will be placed on situations in the US and in Western Europe.

2.3.1. UNITED STATES

One of the works that best depicts the American situation is the one by ERICKSON (8), involving a survey of 2014 companies in the US. Table 2.6. shows the top 10 Packaging Trends in the US, with microwavable packaging first and aseptic packaging second. Still more important are the top 17 trends in Packaging Concepts shown in Table 2.7. and the Top 20 Trends in food packaging are shown in Table 2.8.

The preference for microwable packaging in the US is verified by RICE (18) who showed, in 1987, that within approximately 3 years 80% of the American homes will have microwave ovens. In 1987, more than 50% already had them. According to the statistics of the Stouffer Foods Corporation, in the end of 1986, the consumption of frozen foods for microwave ovens increased 90% in the last 3 years and about 43 million servings of food and beverages are prepared in the US every day. Over 60% of the homes where both spouses work out now have microwave ovens, as do 29% of the homes of retired persons.

For the food industry, these data are very convincing and clearly define the need to develop products packaged in microwavable packaging.

The demand for this type of packaging has a negative effect on aluminum trays which, in a way, are identified by the consumer as unsuitable for use in microwave ovens. This subject is apparently controversial and requires further research and studies for a better definition.

In the sorvey presented by RICE (18), 55.1% of the food companies stated that they were going to use more aluminum trays, in 1989, 32.7% were going to use the same amount, and 12.1% were going to use less. In comparison, for plastic trays, 56.1% stated that

TABLE 2.6. TOP TEN PACKAGING TRENDS IN THE USA FOR 1989.

	PERCENTAGE OF COMPANIES PLANNING GREATER USE IN 1989
1. MICROWAVABLE PACKAGING	79,3
2. ASEPTIC PACKAGING VINYL	68,6
3. EVOH (ETHYLENE VINYL ALCOHOL)	68,6
4. TAMPER-EVIDENT CLOSURES	66,7
5. PEELABLE LIDDING	65,7
6. CERTIFIED VENDORS	63,6
7. HIGH-BARRIER PACKAGING	63,5
8. TAMPER-EVIDENT PACKAGING	63,5
9. PET PACKAGING	60,4
10. IN MOLD LABELS	60,2

TABLE 2.7. TOP PACKAGING CONCEPTS IN THE US (1988-89).

PACKAGING CONCEPT	CONCEPT CURRENTLY USED %	NEW CONCEPT BE USED IN 1988 %	In 1989 use		
			More %	Same %	Less %
1. ASEPTIC PACKAGING	8,3	1,3	68,6	29,3	2,1
2. BLISTER PACKAGING	16,6	2,0	59,4	36,4	4,2
3. CERTIFIED VENDORS	14,8	1,2	63,6	35,7	0,6
4. CONTACT PACKAGING	24,0	1,2	50,0	43,9	6,1
5. CONTROLLED-ATHMOSFERE PACKAGING	7,7	0,7	53,3	46,1	0,6
6. HIGH-BARRIER PACKAGING	9,5	1,2	63,5	35,6	1,0
7. MICROWAVABLE PACKAGING	4,5	1,2	79,3	19,8	0,9
8. MULTIPACKS	10,9	0,6	54,8	44,7	0,4
9. PLASTIC SQUEEZE BOTTLES	10,5	0,6	45,8	52,0	2,2
10. DISPLAY PACKAGING	9,4	0,7	52,7	43,3	3,9
11. RETORTABLE POUCHES	1,3	0,3	48,6	48,6	2,9
12. RECLOSABLE POUCHES	6,3	0,7	48,6	49,3	2,2
13. SINGLE-SERVE PACKAGING	9,8	0,5	57,4	41,7	1,0
14. SKIN PACKAGING	3,0	0,2	31,7	60,3	2,9
15. TAMPER-EVIDENT PACKAGING	13,4	1,5	63,5	36,5	-
16. UNIT-DOSE PACKAGING	5,5	0,4	58,6	39,7	1,7
17. VACUUM PACKAGING	6,5	0,4	44,1	53,7	2,2

TABLE 2.8. TOP 20 FOOD-PACKAGING TENDS IN THE USA FOR 1989.

TYPE OF PACKAGING	PERCENTAGE
1. MICROWAVABLE PACKAGING	81,3
2. TAMPER EVIDENT CLOSURE	76,6
3. ASEPTIC PACKAGING	71,3
4. TAMPER EVIDENT PACKAGING	70,9
5. SHRINK BAND CLOSURES	69,9
6. ETHYLENE VINYL ALCOHOL (EVOH)	68,2
7. PET PACKAGING	67,8
8. HIGH BARRIER PACKAGING	67,1
9. SHRINK-BAND LABELS	64,7
10. POLIVINYLIDENE CHLORIDE (PVDC)	63,2
11. IN MOLD LABELS	62,5
12. PEELABLE LIDDING	61,7
13. INNER SEALS	61,6
14. ETHYLENE VINYL ACETATE (EVA)	61,3
15. PLASTIC CANS	61,0
16. SINGLE SERVE PACKAGING	60,6
17. DISPENSING CLOSURES	60,0
18. PLASTIC SQUEEZE BOTTLES	60,0
19. METALLIZED FIM	60,0
20. CORRUGATED CASES	59,7

they were going to use more, 38.3% the same and 5,6% less.

Another technology on the rise in the US today is aseptic packaging, which occupies the second place among the top 10 packaging trends. Among the users of this technology, 68,6% intend to use it even more in 1989. The percentage of utilization is largest, in the fruit, vegetable and preserve industries. About 75% of these users intend to utilize more this type of packaging in 1989. It whould be pointed out that the delay in the introduction of this technology in the North-American market is due mainly to the country's excellent refrigeration system, to the low cost of energy and to the little incentive given by the US to the development of this technology (18).

Another very important aspect has to do with the legal acceptance of the aseptic technology, which occurred in the US only in 1980. The major obstacle involved the definition of the product and the process by the regulatory agencies.

These data confirm the survey carried out by Food Processing in the 100 largest food industries in the US, where there clearly was a ceretain disatisfaction with regard to the application of the results of research and development. The reasons for the frustrations or delays of these applications vary a little, but certainly the main one has to do with the restrictions imposed by the FDA.

Another widely discussed technology in the US today is MAP/CAP. MAP/CAP is not a new technology. The idea of utilizing modified gaseous atmospheres to prolong the useful life of food products has been used for many years in packaging, snacks, nuts, integral powdered milk and even frozen chicken in institutional packaging. The MA/CAP phenomenon that's occuring now is linked to the application of new ideas, that is to say, consumer packaging for frozen fresh products such as beef, chicken, fish, cheeses, pizzas, baked products, fruits and vegetables (18).

The food and packaging industries have sufficient experience in this area. The American consumer is most interested in buying products with this type of packaging and with an extended useful life. Why then, RICE (18) asks, are European countries ahead of the us? Part of the answer probably involves the distribution-chain distances, much longer in the US than in Europe. According to specialists, for MAP/CAP to succed, the distribution chain should not be too long, mainly because of the need for an adequate control of the refrigeration chain.

Another area of great expectations at the international level which for several reasons has as yet not satisfactorily penetrated the American market is that of retortable pouches. During the last few years, the CETEA has closely followed the world development in this area, a broad research activity having been funded by the OAS during 1981-85. Again, in the American situation, the FDA was mainly to be blamed for difficulties in the approval of this packaging.

On account of Japan's decisive participation in this market, the matter will be the object of a survey of marketing data for this country.

According to DIERNISSE (7), the growth rate in the consumption of food product packaged in roetortable pouches was approximately 100%, as can be seen in Table 2.9.

In Japan the percent growth for this packaging was smaller, since the retortable pouch has been a succesful packaging there since 1975, exhibiting significant consumption since 1980.

Growth in Europe has been affected by differences in habits, as well as by commercial barriers. According to DIERNISSE (7) this situation is changing, buth growth will continue to be smaller than in Japan.

As mentioned previously, the growth of this packaging in the US was adversely affected by the restrictions imposed on the approval of the adhesive used in the substrate lamination. The US Armed Forces continue to be the largest users of this type of packaging. It is believed that the American market will be dominated by small foreign companies, except for equipment and packaging materials.

In 1985, less than 0,5% of all food products processed in the USA was packaged in retortable pouches, compared to approximately 10% in Japan (13). In general, what one sees are completely different approaches in these three markets. The American market basically chose the institutional area and the Armed Forces. The European market chose bulk containers, from 500g to 1kg, and the Japanese market is fairly well established in 100 - 200g single portions.

In this context, mention should be made of the participation of semi-rigid retortable packaging in the American market.

The sales of semi-rigid plastic containers for food products should reach 4.7. billion units in 1991, having an approximate value of US$320 million, as can be seen from Figure 2.2. Over 75% of such containers (cans, pots, trays and tubes) will be used to market products whose conservation will not require refrigeration, and which may also be used in microwave ovens. The remaining 25% will take over the market usually occuped by glass and cans.

According to the report on Retortable Plastic Containers (5), new food products will spend US$240 million on packaging in 1991. Among the main products to be packaged, one can mention meat products, pasta with sauce, complete meals and single food portions. Food products that already exist, such as baby food and sterilized soups, will consume another US$80 million. Initially, "plastic cans" should grow faster than retortable trays and tubes since metallic and glass containers are already available.

TABLE 2.9. WORLD CONSUMPTION OF FOOD PRODUCTS PACKAGED IN RETORTABLE POUCHES (Millions of pouches).

PLACE	YEAR				AVERAGE ANNUAL GROWTH
	1970	1975	1980	1985	1980/1985
EUROPE	*	20	70	500	48
JAPAN	*	230	760	2.800	30
USA	*	*	50	500	58
REST OF THE WORLD	*	*	*	1.000	-
TOTAL	1	250	880	4.800	40

* LESS THAN ONE MILLION.

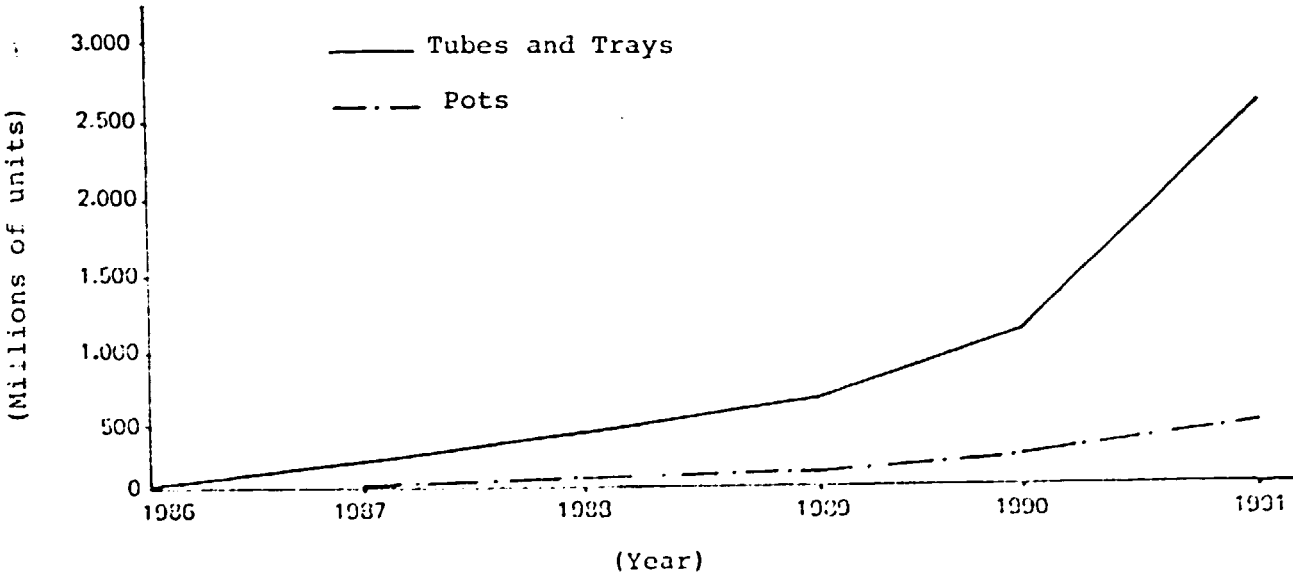

FIGURE 2.2. Consumption of retortable pouches in the US.

However, the report predicts that tubes and trays will overtake the plastic can around 1990, on account of their lower cost and greater functionality. It is predicted that in 1991 heat-formed tubes and trays will occupy 46% of the market for heat-formed and heat-processed plastic containers.

Another excellent market study, "Metal cans and the Impact of Plastic Development" by OMEGA Research Associates, Inc. (15), indicates that despite all the competitiveness that it has been showing, the plastic can should not become more economical than the metallic can in the short run. What one observes is a change or use alterations from one product to the other.

2.3.2. Western Europe

As far as the development of packaging in the Western European market is concerned, it should be pointed out that the prediction is economic stability, with a small but stable growth, without major mishaps, in the next 5 years (15).

Despite the high standard of living in Europe, the factors that caused the rapid growth in packaging consumption in the 50's and 70's will not be repeated as intensily in the future. Among these factors, one can mention: population growth, changes in the geographic structure, increase in the standard of living, changes in the packaging and distribution system, limited environmental awareness and protection, high level of consumption of packaged products and increase in consumer facilities.

PARDOS (4) presents a more organized form for analysing the growth of the packaging market in Europe:

- Analysing the growth of the packaging market in the last 25 years, one find 3 great moments of development valid for all of Europe, with a small difference in the regions from the North to the south, and not entirely valid for southern Europe;

- In the last 25 years, growth in the packaging area has been supported by the chain of great innovations;

- At first, between 1960 and 1972, there occurred the distribution of products in stores and supermarkets (self-service), growth of mass travelling and tourism, increase in food consumption outside the home and the appearance of food-vending machines;

- The packaging market innovated in the sale of fresh products (consumption containers), normally sold in bulk or simply wrapped at the place of sale, such as meat, eggs, fruits and vegetables. There also occurred the introduction of plastic packaging in simple materials such as PEBD;

- On a second stage, between 1973 and 1980, there took place the rationalization of the self-service distribution system, increase

in consumerism and the questioning of environmental pollution and energy consumption, afterwards converted into safety and health. As for packaging, the most important points were the great increase in glass packaging through recycling and the growth of different plastic materials in applications where paper, carton, aluminum, tin and glass could be technically and economically replaced. The search was for lighter, finer, smaller, cheaper, more attractive and more versatile containers.

- On a third stage, in 1980, one saw the consolidation of the trends of previous years. Nowadays the packaging industry in Europe is "mature" and changes are more qualitative than quantitative. At this stage, a change takes place in the market of traditional packaging materials. On account of the competition provided by the plastic packaging area, the materials regarded as traditional have reacted and are now competing much more efficiently.

One thus verifies, in the last few years, the appearance of lighter glasses with plastic labels, thinner tin sheets, organic coatingns in metals, self-adhesive labels, sturdier corrugated paperboard boxes, collapsible plastic multilayer tubes and the development of carton containers for teh aseptic system, among others.

According to the results of the survey on packaging technology carried out by MARKET POWER (12) and which covers the next 10 years in the area of food and beverage packaging in the United Kingdom, West Germany, France, Holland, Belgium and Italy, the demand for most types of packaging will grow more than 10% in the next 10 years, except for glass which, according to the results, will grow less than 10% in weight, mainly due to the reduction in bottle weight.

In Europe, in 1985, the total consumption of food and beverage packaging was 253 billion units and a growth of 16.3% is expected ofr 1995, reaching 295 billion units.

As for metallic packaging, one expects unit growth, despite the losses resulting from the appearance of plastic and carton containers. According to the MARKET POWER SURVEY (12) the use of cans for food and beverages will experience strong growth.

The glass container wil be more vulnerable to structural changes and label replacement will probably show a unit growth of about 11.6% (12).

Carton containers will also grow on account of the use of aseptic systems. In the rigid plastic area, Market Power predicts of growth of 75% in the next 10 years.

Demand for flexible packaging will grow from 71,685 million units in 1985 to 83,702 million units in 1995.

Microwavable packaging is among the major technological

development in the packaging area in Europe. This packaging is already established in the US where, as previously mentioned, over 50% of the homes already have this appliance; it should be pointed out that approximately 20% of the homes in the United Kingdom also have this system, which should experience a larger growth in other Western European countries. It is estimated that the percentage of homes having microwave ovens is 3 - 4% in Germany and 5% in France (11). If the expected growth rate is 40% in England, it should also be significant in the other countries.

Today's needs are for containers and packaging materials that can be used in microwave ovens. According to EIU (11) this rules out metallic packaging, but offers opportunities to glass, plastics and carton.

As for aseptic packaging, and the aseptic packaging system in Europe, the best work found on food and beverages was a survey carried out by Lean R. Frotscher Associates (London) between April and September of 1987. A compilation of the results published in the European Packaging Newletter (1) and in Export 87 (22) is presented next.
"This article is based on a survey carried out between April and September of 1987 of the current market potential in Western Europe for aseptic containers and packaging system for food and beverages".

This study is based on 600 interviews done in 11 European countries, as well as on a fairly extensive theoretical research. The development of over 200 different market sectors is reviewed and presented, and access is provided to the future potential of aseptic containers and of the products thus packaged. The study also includes an extensive technical section, which provides a profile of the processing and filling systems, based on interviews at companies that already utilize them.

There exist close to 1,600 aseptic packaging plants in Western Europe. Carton filling systems account for over 85% of all system installed. About 80 - 85% of these plants use the Tetra-Pak system and 15 - 20% the PKL - Combibloc system. Because of the dominant position occupied by Tetra-Pak, aseptic packaging is for many people a synonim for Tetra-brik.

Preformed and form-fill-seal plastic pots account for over half of the remaining installations. There are over 10 suppliers of these systems including Bosch, Gasti, Hamba, Ampack, Metal Box and Benco. Plastic bottle installations are supplied by Remy, Rommelag and Serac and aerosol filling systems are also supplied by Serac. Bag-in-box systems are supplied by Bowater, Colorced, Oettel and Elpo.

Systems for aseptic filling of pouches are supplied by Prepac and Thimmonier and Bosch, but these systems can only fill plastic film pouches which provide only 15 - 20 days shelf-life for milk. Systems for filling metallized pouches are supplied by Liecster.

Between 150 and 200 new plants are installed each year, about half of which replace existing installations and half are new installations. With the cost of an aseptic system varying betweeen US$400,000.00 and US$1.6 million, the market for system suppliers is estimated at US$100 million.

At present about three quarters of new systems are for cartons, but this proportion will fall slinghtly over the next few years. There will be more interest in system for the aseptic filling of thermoformed plastic containers, plastic bottles and glass, and also, to a limited extent, bag-in-box.

In 1986 approximately 13 billion liters of product were filled into an estimated 20 billion containers. This figure is set to increase to 16 billion liters filled into about 26 billion containers an annual increase of about 4.5% in volume packed, but nearer to 5.5% in unit terms, indicating a proportionally higher value of packaging by 1991.

Cartons currently account for around 90% by volume of all aseptically packed products; their market share will decline. Over 95% of cartons are used for milk and fruit juice. Over 80% of cartoning installations are Tetrabrik, the remainder Combibloc. New systems are being developed by S.I.G. and a Metal Box/Elopak. Cartoning developments will focus on an improved ability to fill particulates. Innovations in this area are to expected from Tetra-Pak in the next two years. Other developments will involve larger cartons (Combibloc has installed the first 2-liter cartoning system), and new shapes to avoid the commodity image of the "brick" shape. The commodity image of "brick" packed products in the main reason why fillers look for filling systems which provide product differentiation through packaging.

Although cartons will lose overall market share in aseptic packaging, they will still be the favored packaging method for many new applications because the technology and reliability of the Tetrabrik and Combibloc systems are well established.

Nearly 4 billion thermoformed plastic containers were aseptically filled in 1986, although they accounted for only 3% of the volume of product packed. Nearly half of these packs were single portion (14 ml) cups for caterers, for milk, cream and coffee cream. Other cups are mainly 125gm for filling yogurt, desserts and cream. This market (excluding mini-portion packs) will grow rapidly, with strong growth in products such as desserts and fruit compote. The market will be helped by the improved reliability of some of the aseptic filling systems.

Another important sub-market will be for containers which can be heated in microwave or contentional ovens. These will be used for soups, ready meals, drinks or desserts (already on the market in the U. K.). This will vary with the ownership of microwave ovens from 2% to 20%, depending on the European country.

Environmental protection legislation may have quite an effect on the future of plastic containers in Europe.

Aseptic filling of plastic bottles is mainly restricted to fruit juice and milk in some European countries. The Serac and Kemy systems are regarded as reliable; and this market will show good growth as an alternative pack to the carton, mainly in the lower added-value markets such as milk, fruit drinks, cream and flavored milk.

Aseptically filled aerosols have gained a substantial share of the cream and topping markets in the U.K. and Belgium. However, concern regarding the environmental damage caused by aerosols may injure their prospects, particularly in Germany.

Aseptic filling of sachets and pouches is used for shorter shelf-life UHT milk and also ice cream mix. It offers a low cost alternative with some interesting opportunities.

Bag-in-box systems are well established for the bulk filling of fruit and tomato products. Suppliers have had considerable difficult in developing reliable systems for low-acid products, although Bowater, Coloreed and Oettel are now marketing such systems. Non dairy cream, ice cream mix, milk shakes and cream are now filled in this manner, in addition to fruit juice products. The potential market will depend on the reliability of the system and in caterers'reactions to the bag-in-box concept, which will compete with cartons, pouches and plastic bottles. This market is likely to grow rapidly, provided that systems are reliable, although fruit juice for caterers may remain the major market.

There is considerable interest in the aseptic filling of glass, particularly in Germany, for fruit juice, baby food, fruit and vegetables. Busch, Serac and other companies are developing systems for the aseptic filling of glass, and if such systems are proved reliable, an interesting market may develop in Europe.

Other developments will include packs with special shapes, opening and handling features to provide marketing and presentation advantages over standard cartons. An example of this is the Busch Hyperpack.

Of the 13 billion liters of liquid and viscous products packed in 1986, over 90% was accounted for by milk and fruit juice. However, as a detailed country study reveals, this figure and the fruit juice/milk split varies greatly from country to country. Future growth also shows great variation between the different European countries. Liquid milk currently accounts for about two thirds of all product aseptically packed in Europe. The total milk market is declining and UHT milk sales will grow at only about 2% per year.

To illustrate the great differences between various European countries, the following example is useful: The proportion of UHT

milk consumption compared to other milk varies from about 75% in France to 1% in Scandinavia, showing a vastly different potential for aseptic packaging. The Belgian consumption of sterilized milk is much higher than in any other European country, and a shift to UHT milk represents a move to a relatively "fresher" product.

Most of the aseptic filling systems in Europe are operated by dairies. Because of this experience, and due to the decrease in milk consumption, the dairies have searched more and more for alternative products that could be aseptically packed, including soups, or have developed other foods or beverages containing milk or cream. With the right product packed in the right container, dairy products may enter new and large markets.

Aspetic packaging is already established for several other dairy products, including milk, flavored milk, yogurt, desserts, ice-cream mix, milk shakes, coffee milk, evaporated/condensed milk, etc.

Growth forecasts in these markets vary widely from country to country, some of the markets being static or on a downturn; however, in most countries rapid growth is expected in the consumption of desserts, cream and coffee milk. Several new products will be introduced, including dairy and non dairy products.

Fruit juice and fruit drinks account for almost 25% of aseptically packed products in Europe. Sales are forecast to increase strongly over the next five years, although the rate of increase will vary in different countries owing to great differences in per capita consumption.

The market is becoming increasingly segmented, and there is much interest in new types and sizes of pack. Bag-in-box and plastic pouches are available as retail packs, and 2-liter cartons and portion plastic cups have recently been introduced in France. The carton will continue to dominate this market, but other types of packs will establish a small share of this growing market.

The technical barriers to the aseptic packaging of fruit are rapidly being overcome, and major canners have successfully filled fruit compote containing particulates. Crushed and strained tomatoes are already filled aseptically into cartons. Although consumer acceptance has varied, this market looks very promissing. Already 3% of Italian retail products are packed aseptically.

The aseptic packaging of vegetables presents a more long-term opportunity.

Baby milk will be aseptically packed until a really safe system for filling glass containers is developed.

Some major pet-food companies are now carrying out development work for using aseptic packaging.

Several developments in aseptic packing processes are more dependent on technology than on market needs. Technological innovations and development work in the companies may reach their peak, bearing little relation to market needs. This is not necessarily bad, as companies must constantly search for new and better ways of doing business, motivating personnel and remaining competitive. However, this may lead to the development fo new technologies which require a survey of market opportunities. Packaging and food processing companies should keep in mind the benefits of aseptic technology:

To the consumer:

- Product quality improvement
- Lower costs
- Greater convenience

To the company
- Lower distribution and storage costs
- More convenient shelf-life

Few aseptically-packed products will provide all these advantages. In most cases, advantages in one item (e.g., quality improvement) will be balanced by disadvantages in another area (e.g., higher costs), such as soups in cartons. Food processors should ascertain that a new development offers a clear cost benefit ratio on the advantage side.

Aseptic technology affords the opportunity for developing new products. Some markets demand the constant introduction of new products, whereas others require measures for the improvement of products already available, in particular because the supply of new products is larger than their absorption capacity.

It must also be keept in mind that while many consumers would like to see an improvement in the quality of the products that they buy, a substancial minority does not have an increasing purchasing power or would rather not have its food expenses increases. There is a constant market for low-cost food, as well as a market for independent small distributors of several long-life products.

These results provide only an overview and as it was shown in the study by Frotscher Associates and Warrick Research, there are major opportunities for food processors and manufacturers of packaging equipment and materials, depending on the market sector and on the country.

The demand for fresh and high-quality products is very large in Europe and the MAP/CAP certainly fulfill these requirements. The distributors profit more and have better quality control and longer shelf-life for the product. The consumers, in turn, gain product quality, longer product life and convenient use (PARSON (15)).

In Europe the main food products packed in MA/CA are: fresh meat, chicken, fish, cheese, pasta and fresh fruits and vegetables.

PIERRE J. LOUIS, in the European Packaging Newsletter (1) fully agrees that this technology has great development potential, but points out some concerns and fears of the food producers with regard to abuses in the distribution and storage temperatures.

The European market shows some advantages over the North-American market as far as the use of this technology is concerned.

- shorter product preparation and distribution times;

- demand for longer product shelf-life;

- short food-distribution distances.

2.3.3. Brazil and Developing Countries

As mentioned in the introduction to this work, Figure 2.1., Table 2.2. and 2.3., the packaging consumption in the developing countries is still very modest when compared to the industrial facilities in this area and the potential for consumption power.

In this context, the use of new packaging technologies or of new food containers in these countries is very difficult to assess due to the complexity of the factors involved. Nevertheless, some aspects should be pointed out that are pertinent to the subject of this work, namely, microwavable flexible and semi-rigid containers, aseptic systems, heat processing and modified atmosphere packing.

Mirowavable containers

The market potential for this type of container is obviously associated with the increase in the utilization of microwave ovens and frozen foods. It is estimated that 17,000 microwave ovens sold in Brazil in 1982 and 132,000 in 1988, in other words, an increase of about 100% per year or of 780% during this period.

On the other hand, world consumption of microwave ovens was 14,000,000 in 1982 and 28,000,000 in 1988, an increase of 100% during the period.

Another analysis that can be carried out involves the segments of society having the highest purchasing power. Assuming that these segments have a population of about 16,000,000 inhabitants and that each family consists of four persons, one has a market potential of 4 million homes, in which a superficial estimate indicates that 400,000 microwave ovens already exist in 1988. This means that only 10% of this population (the so called A and B classes) has microwave ovens, an excellent growth potential for Brazil and, consequently, growth in the utilization of containers

for packing food products. The same analysis should be done for other developing countries.

Aseptic containers

The climate in Brazil, together with its territorial extension and the absence of a "cold chain" for the preservation of food products, lead to the conclusion that aseptic packaging unquestionably has a bright future in Brazil. The problem today is the low purchasing power of the Brazilian population and the lack of information about the advantages and the quality of the food products packed in this type of container.

In Brazil, aseptic packaging was introduced by Tetra-Pak do Brasil Ltda., through carton containers.

A summary of this market is presented next:

- Consumption of "long-life milk" has been growing an average of 15 - 20% per year in the last 3 years. Between 1985 and 1988 growth was 48%.

- Flavored milk has shown significant growth because of both convenience and high nutritional valve. Between 1985 and 1988, growth was 30% per year.

- Fruit juices in Tetrabrik aseptic containers are pratically starting a new era in Brazil. Between 1985 and 1988 this market grew 52%.

- Tomato products, a new product in this container, grew a significant 60% between 1985 and 1988. In the category of tomato pulp and juices, the (Tetrabrik) containers were the ones that showed the greatest innovation in the last two years in Brazil.

The same evaluation done for developing countries with large territories and hot weather shown the importance of this packaging system in these countries.

Packaging for heat-processed products

As mentioned previously, the CETEA of the ITAL, through a special OAS project, carried out a Research Project between 1980 and 1985 on Flexible Heat Processable Containers.

Since 1988 several contacts are being made with industries that manufacture packaging materials (plastic and aluminum), converters, packaging transformers and potential users of this technology.

Several problems have been identified as "delaging agents" with respect to the introduction of this new type of packaging in

Brazil and developing countries, such as:

- Lack of adequate material;

- Lack of equipment;

- Lack of deeper knowledge of this technology;

- Potential market not identified;

- Lack of knowledge about the cost of these containers.

CETEA believes that because of the developing countries market circuntances, this new technology will start being introduced more substancially in the near future.

Modified/Controlled atmosphere container

This technology is practically non existent in developing countries for a numer of reasons. The main ones are the purchasing power of the consumer, the lack of adequate control of the "cold-chain" and the long distribution distances.

In the beginning, this seemed to be an excellent opportunity for the meat and fresh fruit (consumption container) markets, but it was realized that in fact the utilization of this new technology can in the short run be more interesting to the food exportation market and to the internal market in the medium and long run.

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ANNEX 3

SYMPOSIUM ON PACKAGING PROBLEMS OF FOOD INDUSTRIES IN HOT COUNTRIES

PROGRAM

PROGRAM

Date	Time	Activity
Saturday 18 th. Nov.	10.00 am	Opening ceremony
	11:00 am	Short break
	11:15 am	first session
		1. Food packaging in the Arab World (Dairy-soft drinks-confectionary). Dr. Falah S. Jabr Arab Federation for Food Industries.
		2. Food packaging in the Republic of Iraq. Mr. Suham Al-Adhami General state for vegetable oil, Iraq.
		3. Study for some contamination cases of food. Dr. François Chartellain Project Manager - Nestlé Switzerland.
	2.00 pm	closing of session

Date	Time	Second session
Sunday 19th. Nov.	9.00 am	1. Food Packaging: Food Safety - Shelf-life - Storage Problems Eng. Luis Madi - UNIDO Brazil
		2. How to save on packaging costs through better procurement technique. Neil Robson ITC - Switzerland
		3. Transmission of chemicals from the packaging material to food Dr. Isam M. Jawad Biological Research Center Iraq
	11.00 am	Break
	11.30 am	Third session
		1. General conditions for food packaging in developing countries Case study of the Arab World. Mr. Taher Bishr Moustafa Arab Federation for Food Industries Egypt
		2. New inventions in the field of food packaging. Mr. Johan Cavalli Regional Sales Manager Tetrapack Cyprus

		3A. Tecnicques of food packaging in hot countries in comparision to those in Europe.
		3B. Austrian experience in the food packaging (Meat, Dairy and fruit juices) Prof. Woidich, Austrian Food-stuff Health Authorities.
	2.00 pm	closing of day sessions
		Forth session
Monday 20th Nov.	9.00 am	1. Elecster equipment for aseptic processing and packaging of liquid products. Mr. Kyösti Peippo Elcster, Finland
		2. Properties and techniques of food packaging (Dairy-confectionary & soft drinks) Dr. Falah S. Jabr Arab federation for food industries.
		3. Industrial printing of food packages. Dr. Falah S. Jabr Arab Federation for Food Industries
		4. General discussion for the symposium topics
	11.30 am	Break
	1.00 pm	Closing session
		Announcement of the final report and recommendations

ANNEX 4

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ANNEX 5

CONCLUSIONS AND RECOMMENDATIOS

CONCLUSIONS AND RECOMMENDATIONS

البيان الختامي للنـــــدوة

العربية العالمية للتعبئة والتغليف وسلامة المواد الغذائية

فـــي المناطـــق الحـــــارة

بدعوه مشتركة من الاتحاد العربي للصناعات الغذائية ومركز بحوث علوم الحياه فـــي الجمهورية العراقية وبحضور ودعم السيد وزيـــر الصناعة والتصنيع العسكري الاســـتاذ حسين كامـل عقدت فـــي بغداد خلال الفترة من ١٨ الى ١٩٨٩/١١/٢٠ النـــدوة العربيـة العالمية للتعبئـــة والتغليف وسلامـة المواد الغذائية في المناطق الحـــارة ومعرضهـــا النوعي المتخصص ٠

وتحدث في حفـل الافتتاح كلا مـــن :ـ

- الاستاذ حسين كامـــل راعـــي اعمال النـــدوة
- الدكتور فلاح سعيد جبـــر الامين العام للاتحـــاد العربي للصناعات الغذائيـــــة ٠
- الدكتور عصام مصطفى جواد من مركز بحوث علوم الحيـــــــاه

حيث اشارت الكلمات الى اهميـــة انعقـــاد الندوة والـدور الذى تطلـع بـه صناعة التعبئـــة والتغليف كقطـاع صناعـي حيـوى لكافـــة المواد الغذائية واطالـــة عمرها والحفاظ على قيمتهـــا التغذويـــة في ظروف الخـزن والتداول واهميتهـــا لتنشيـط قطاعات الصناعات البلاستيكية والورقيـة والزجاجيـــة والمعدنية ٠ كما اكـدت على اهميـــة مرفق العلم والتكنولوجيـــا في ديمومـــة وتطور هذه الصناعة وشـــكرت للعراق رئ - ! وحكومـــة وشعبا كريم ضيافتهم للندوة كما حيت جهـــود الاطـراف التي دعت لعقدها ٠

وقدمت في الندوة عديد الدراسات والابحاث وفق جلسات عمل متخصصة وعلـــى النحو التالي :ـ

جلسة العمل الاولى

رئيس الجلسة : الاستاذ احنف الناصرى

مقرر الجلسة : الدكتور مصطفى الغزالي

حيث تم عرض ومناقشة الدراسات التالية :-

١) تعبئة وتغليف المواد الغذائية في الوطن العربي (الالبان ، المشروبات الغازية والعصائر والمياه المعدنية - الحلويات) .

اعداد وتقديم : الدكتور فلاح سعيد جبر
الاتحاد العربي للصناعات الغذائية

٢) تعبئة وتغليف المواد الغذائية في الجمهورية العراقية

اعداد وتقديم : الاستاذ سهام الاعظمي
المنشأة العامة للزيوت النباتية / الجمهورية العراقية

٣) دراسة لبعض حالات التلوث للمواد الغذائية المعبأة

اعداد وتقديم : شركة نستله / سويسرا

جلسة العمل الثانية

رئيس الجلسة : الاستاذ ناصر البشر

نائب الرئيس : السيد محمد انور جانه

المقرر : السيد سمير فتح الله

حيث تم عرض ومناقشة الدراسات والابحاث التالية :-

٤) سلامة الاغذية والمشاكل التكنولوجية في التعبئة والحفظ

اعداد وتقديم : السيد لويس هادى
برنامج الامم المتحدة للتنمية

٥) كيف نحافظ على اقتصاديات التعبئة بأستخدام افضل تقنيات التصنيع

اعداد وتقديم : السيد جون ســـــيلن

منظمـة الانكتاد (الامم المتحده)

٦) اختزال المركبات الكيمياوية من مواد التعبئة والتغليـــــــــف

اعداد وتقديم : د . عصام مصطفـــى جواد واسماء عبدعلي

مركز بحوث علوم الحياة / العراق

جلسة العمل الثالثـــة

رئيس الجلسة : الاستاذ غسان ابراهيم

نائب الرئيس : د . محمـد سالم الدوسلي

المقـــــرر : السيد خالد شريف

حيث تم عرض ومناقشـــة الدراسات والابحاث التالية

٧) اضواء على صناعة التعبئة والتغليف وقضايا حماية البيـــئة

اعداد وتقديم : الاستاذ طاهر البشـــر

جمهورية مصر العربية

٨) الاتجاهات الحديثه في ميدان التعبئة والتغليف

اعداد وتقديم : شركة تترباك / السويد

٩) أ) طرق تعبئة الاغذية في البلدان الحارة مقارنة بطرق التعبئة في الدول الاوربيه

ب) تجربة النمسا في تعبئـــة وتغليف المواد الغذائية (اللحوم ، الالبان ، الصائر) .

اعداد وتقديم : البروفيسور غوبتر

هيئة الرقابة الصحيه النمساوية

جلسة العمل الرابعة

رئيس الجلسة : الدكتور عدنان عبود ابراهيم

نائب الرئيس : السيد قائد احمد حسن حيدر

المقرر : السيد علي احمد كافود

حيث تم عرض ومناقشة الابحاث والدراسات التالية :ـ

١٠) التقنيات الحديثة المستخدمة في شركة الستر لتعبئة المواد الغذائية السائلة .

اعداد وتقديم : شركة الستر ـ فنلندا

١١) خواص وتقنيات تعبئة المواد الغذائية (الالبان ـ الحلويات ـ المشروبات) .

اعداد وتقديم : السيد عامر فاضل فليح

الاتحاد العربي للصناعات الغذائية

جلسة العمل الختامية

رئيس الجلسة : الدكتور فلاح سعيد جبر

نائب الرئيس : الدكتور عصام مصطفى جواد

تم عرض ومناقشة التقرير الختامي للندوة وتكريم المشاركين في اعمال المؤتمر المتخصص .

واقيم على هامش الندوة معرضا نوعيا متخصصا اسهمت فيه عديد الشركات العربية .

وقد نظم المعهد لكافة محاور عمل الندوة والتي اسهم فيه ممثلوا وزارات الصناعة والتجارة والصحة العربية اضافة لممثلوا البلديات وهيئات البحث العلمي والجامعات وغرف التجارة والصناعة العربية واعضاء الاتحاد العربي للصناعات الغذائية واجهزة الامم المتحدة وعديد الشركات العالمية من الاقطار العربية والعالمية التالية (مرفق رقم ١ - خاصة باسماء المشاركين) .

- الجمهورية العراقية
- دولة الكويت
- دولة الامارات العربية المتحدة
- المملكة العربية السعودية
- دولة قطر
- جمهورية مصر العربية
- جمهورية اليمن العربية
- جمهورية اليمن الديمقراطية
- الجماهيرية العربية الليبية الشعبية الاشتراكية العظمى
- المملكة الاردنية الهاشمية

اضافة الى وفود من :-

- برنامج الامم المتحدة للتنمية
- المركز الدولي للتجارة التابع للامم المتحدة
- فرنسا
- السويد
- النمسا
- تشيكوسلوفاكيا
- سويسرا
- المانيا الاتحادية
- الولايات المتحدة الامريكية

ولقد اثر المجتمعون تبني البيان الختامي التالي للندوة :

ادراكا لاهميـــة قطاع التعبئـــة والتغليف كعامـل اساسي مهم في نمـو القطاعات الصناعية والزراعية والاقتصادية ودوره الحيـوى في حفـظ المواد الغذائية بأفضل صـــورة صحيـة تغذوية مستطاعـة ولاطول فترة زمنيـــة ممكنـه وبأقل تكلفـه مستطاعة ودور قطـــاع التعبئـة والتغليف في تكامـل الهيكـل الصناعي كحلقـــه لاغنـى عنها بين القطاعـــات الانتاجيـــة والاستهلاكيـة وفي نمـو الصناعات البلاستيكية والورقيـة والزجاجية والمعدنيـة الى حد ما ، وكما ان ميـدان التعبئـــة والتغليف هو احد الانعكاسات لمعظيم الانجازات العلميـــه والتقنيـــه العالميـــه ولمرفق العلم والتكنولوجيا دور حاسم في هـذا المجـال فأن الجديد المستحدث في عالم تقنيات التعبئـــة والتغليف هو عالم التغيـر المتســارع ذى الانعكاس الكبير على اقتصاديات عديد الصناعات الغذائية العربية .

وعبـر دراســـة واقـــع هذا القطاع عربيا من النواحـــي التقنيـة والاقتصاديـــة وطبيعـــة القائـم من صناعات عربية غذائية وما تحتاجـه تلـك الصناعات من مواد تعبئـــة وتغليف مستقبلا وبهدف الارتقاء بهـا وفاء بالاحتياجات العربية ولمجمـل القطـاع الصناعي العربـــي يوصـي بالتالي ولكافـة المسؤوليـن عن القطاع الصناعي والتخطيطـــــي والاقتصادي والبحث العلمي والتطوير التكنولوجـــي في القطاعين العام والخاص وعلـــى امتداد وطننا العربي الكبير .

(١) تحيـــة جهود المنظمـة العربية للتنميـة الصناعية على انجاز دراسة قطـــاع التعبئـــة والتغليف والتمنـي عليها تطوير تلـك الدراســة مع التركيز علـــى الجوانب التالية :ـ

أ ـ اجراء مسح شامـل للمصانـع العربية الكبيرة المتعاملة في انتاج المـــواد الاوليـــه للتعبئـة والتغليف وخاصة البلاستيكية والزجاجية والورقيـــــة لتحديد طاقاتها الانتاجيـــة ومواصفات الانتاج وكذلك المصانع العربيـــة المتعاملـة في انتاج مواد التعبئة والتغليف ماكانت قائمـة بذاتها او تلـك المرتبطـه بمراكز انتاج السلع الغذائية .

ب ـ استقـراء الجديد المستحدث والملائم للواقـع والبيئـة العربية من تقنيـات صناعـة التعبئـــة والتغليف وطبيعـــة ومواصفات مواد ها الاولية .

جـ) تحبيذ جهود المنظمة في التعامل مع الاتحادات النوعية العربية المتخصصة وتكريس هذا التعاون في تحديد احتياجات القطاعات الانتاجية العربية من مواد التعبئة والتغليف .

٢) دعم جهود الاتحاد العربي للصناعات الغذائية لدراسة افضل الوسائل والسبل لحفظ المواد الغذائية العربية شائعة الاستهلاك وفق الظروف البيئية العربية على اختلافها ولظروف الخزن المتداولة والتعاون مع معاهد بحوث الغذائية ومراكز الابحاث العلمية واجهزة المواصفات والمقاييس العربية .

٣) دعم الجهود العربية الرامية في انجاز اكثر من مركز عربي مرجعي لتطوير صناعة التعبئة والتغليف وتوفير كافة انواع الدعم المادي والمعنوي لها ومدها بالخبرات العالية والطلب منها التركيز كذلك على اعداد الكوادر الفنية التي تحتاجها هذه الصناعة عربيا وعلى كافة المستويات .

٤) دعم جهود الاتحاد العربي للصناعات الغذائية وكافة الاجهزة العربية القطرية والاقليمية والقومية لدراسة سبل الحد من الفاقد في مواد التعبئة والتغليف في مواقع الانتاج العربية وتقييم تلك الدراسات وتعميم توصياتها وعلى اوسع نطاق عربي ممكن .

٥) العمل على ايجاد نهج عربي منسق عند استيراد تقنيات التعبئة والتغليف وتعزيز الموقف التفاوضي العربي لايجاد نظام متكاملة ومعدات ذات تقنيات ملائمة وتوائمه مع الواقع الصناعي والاقتصادي العربي على ان تتضمن عقود شراء التقنيات توائم لقطع الغيار والادوات اللازمة لعمليات الصيانة والادامة وتجهز قطع الغيار لمدة لاتقل عن خمسة سنوات مع تقديم الرسومات الهندسية لبعض الاجزاء التي يمكن تصنيعها عربيا على ان تكون الوثائق الخاصة بالمعدات بكتيبات بلغة مفهومة ومبسطة عن تجميع المعدات وتركيبها وتشغيلها وصيانتها .

٦) تطوير اجهزة الرقابة على الجودة في قطاع صناعة التعبئة والتغليف العربية ومدها بالامكانيات المادية وتوفير كافة مستلزمات نجاحها على مستوى الاداء الفعلي .

٧) التمني على كافة الاجهزة العربية المعنية توفير الحماية والدعم لصانع التعبئة والتغليف العربية مع ضمان جودتها والارتقاء بنوعيتها والسعي لاستغلال كافة طاقاتها الانتاجية الهندسية .

٨) دعوة كافة الاجهزة العربية القطرية والقومية الى ايجاد وتوحيد مواصفات مواد التعبئة والتغليف والعمل على توصيف دقيق للاحتياجات من المواد الاولية او نصف المصنعة او المصنعة من مواد التعبئة والتغليف والتعاون بذلك مع اجهزة وزارات التجارة والاقتصاد والتموين وغرف التجارة العربية .

٩) تشجيع الانشطة العربية القطرية والاقليمية والقومية الهادفة تطوير شكل العبوات الغذائية وخاصة المعتمدة على مواد اولية مصنعة محليا واقامة معارض متخصصة ودورية لقطاع صناعة التعبئة والتغليف وتقديم جوائز تقديرية للمبدعين العرب في هذا الميدان .

١٠) دعوة المستثمرين العرب كافة الى توجيه مزيد من الاستثمارات لقطاع صناعة التعبئة والتغليف للمواد الغذائية خاصة المعتمدة على مواد اولية عربية المصدر والتمني على صناديق وبنوك التمويل العربية توفير اقصى قدر من التسهيلات الممكنة لهذه المشاريع .

١١) التمني على اتحاد الجامعات العربية والاتحاد العربي للتصليم التقني ادخال مادة التعبئة والتغليف وبأسلوب علمي عملي حديث ومتطور في الفصول الدراسية وتخصيص مقاعد للدراسات العليا لهذه النواحي .

١٢) دعوة الاقطار العربية كافة الى انشاء هيئة او لجنة او مجموعة عمل متخصصة بقطاع التعبئة والتغليف وخاصة الموجه للمنتجات الغذائية تكون المرجع الاستشاري والتخطيطي في كافة الانشطة ذات العلاقة بهذا القطاع والمجالات مثلي القطاع العام والقطاع الخاص واجهزة البحث العلمي والمراكز والخبرات الجامعية العليا في اعمالها وتوفير كل سبل نجاح عملها والاستفادة من خبرة الاتحاد العربي للصناعات الغذائية في هذا المجال .

١٣) التعني على جامعة الدول العربية ومن خلال منظماتها وهيئاتها والاتحادات النوعية سرعة انجاز مركز المعلومات العلمية والاقتصادية معنى بقضايا التعبئة والتغليف يكون مع اللجان أو الهيئات القطرية ذات العلاقة شبكة تشمله من المعلومات وترتبط بعلاقات برنامج مع اجهزة الامم المتحدة وغيرها من الاجهزة الدولية للاطلاع على الجديد المستحدث في عالم تقنيات التعبئة ومواده الاولية .

١٤) مناشدة كافة الجهات القادرة المعنية العمل على حسن الاستفادة من مخلفات التعبئة والتغليف وخاصة البلاستيكية والورقية واعادة استعمالها لتعبئة مواد اخرى غير غذائية تعزيزا للاقتصاد القومي وحماية للبيئة العربية من التلوث .

١٥) الدعوة الى كافة المعنيين العرب لدراسة قضية حفظ الاغذية بواسطة الاشعاعات المؤينة الناسبة واستخدامها على نطاق تجاري في حالة ثبوت جدواها الصحية والاقتصادية .

١٦) التعني على الامم المتحدة مساعدة الجهات التي اعدت لهذه الندوة على تنظيم مؤتمر عربي دولي شامل ومتخصص يعقد في احد الاقطار العربية بهدف متابعة توصياتها وايجاد علاقات عمل برنامج في ميدان التعبئة والتغليف مع منظمات الامم المتحدة المتخصصة .

(١٧) يؤكد المشاركون على اهمية تشكيل لجنة متابعة لتوصيات الندوة من الجهات التي اعدت لها وتلمس الراغبة في الاسهام بأعمالها .

وفي الختام تقرر المشاركون في اعمال الندوة توجيه برقية شكر وتقدير لسيادة الرئيس صدام حسين رئيس الجمهورية العراقية لاحتضان بغداد للندوة ولدعم العراق الدائم لكل عمل عربي يعادل خير الامة العربية وتقدمها .

وكذا حيى المشاركون السيد وزير الصناعة والتصنيع العسكري الاستاذ حسين كامل حسن لتفضله بأستقبال اعمالها كما حيوا الامين العام لاتحاد العربي للصناعات الغذائية الدكتور تاج سعيد جبر وكافة العاملين به ورئيس واعضاء اللجنة التحضيرية للندوة من مركز بحوث علوم الحياة بمعهد الجمهورية العراقية .

ملحق رقم (١)

القائمة الختامية للمشاركين

ندوة التعبئة والتنمية وسلامة أموال المدخرين في المناطق المحتلة

المملكة الأردنية الهاشمية

السيد ...

ندوة الإطارات التربية الحديثة

السيد محمد عريقة

السيدة ... حشم الله

الجمهورية اليمنية الديمقراطية الشعبية

السيد ياسين سعيد

د. محمد سالم العمري

الجمهورية العربية اليمنية

السيد ... حسين حيدرة

دولة الكويت

عبد العزيز ... الرزاق

م. السيد محمد ... السيد

السيد ... الموباني التاجوري

السيد ... عبد الوهاب ...

السيد ... يوسف الشطاي

السيد ...

السيد محمد ... عيسى ...

الجمهورية العربية السورية

السيدة ... رمضان

الجمعية العربية السعودية

محمد ... الزواد ...

عبد العزيز عبد الله البواردي

عبد العزيز ... الزوين

دولة قطر

علي عبد الله ...

السيد ... يوسف كانو

الجماهيرية العربية الليبية الشعبية الاشتراكية ...

السيد ... عبد الله ... في التاوزي

عبد الباسط عبد الصمد ...

سالم ... الشطاي العمري

السيد ... محمد ... زعبية

- ٥ -

[illegible] الخاصة [illegible]

الجمهورية العراقية

د. علي قاسم محمد حسين
م. احمد محي الدين الطاهر
عثمان ابراهيم
احمد خالد عبد الله
[illegible]
د. رعد السامرائي
د. ميسون محمد [illegible]
د. [illegible]
[illegible] محمد صالح الاعظمي
[illegible]
عبد الله [illegible] عبد الغني
احمد محمد [illegible]
نائل [illegible] عسكر
د. [illegible] احمد [illegible]
[illegible] توما
محمد [illegible] محمد باقر
[illegible]
سمير عبد [illegible] عبد [illegible]
[illegible] داود
[illegible] عبد الستار التميمي
عبد الامير عبد المحسن ابراهيم
[illegible]
[illegible] عبد الكريم [illegible]

بشير ياسر عودة
[illegible] سويلم [illegible]
طارق عزة [illegible]
د. فؤاد عبد الوهاب [illegible]
[illegible]
د. محمد سعيد هاشم احمد
د. هيثم عبد الرزاق [illegible]
د. محمد عبد [illegible]
د. [illegible] سلطان [illegible]
د. محمد فخري احمد
د. عدنان ابراهيم السامرائي
د. عصام [illegible]
د. مصطفى رشيد [illegible]
سمير فتح الله [illegible]
اسماء عبد [illegible]
د. [illegible] زكي سعيد
د. [illegible]
د. ابراهيم احمد [illegible]
د. محمد قاسم الجبوري
[illegible] عبد الكريم محسن
د. اياد احمد [illegible]
د. [illegible]
سناء داود يوسف

قائمة المشاركين

الدورة الثانية

[illegible]	د. عبد الرسول عبد الرزاق
د. نبيل عبد الامير [illegible]	د. عبد الاله محمود [illegible]
[illegible]	[illegible]
يوسف [illegible]	[illegible]
يسرى [illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
د. [illegible]	[illegible]
د. [illegible]	[illegible]
د. [illegible]	[illegible]
د. [illegible]	[illegible]
د. [illegible]	[illegible]
د. [illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
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[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

قائمة المشاركين

هاشم السيد الشيخ عمر

جورج اليامي كاكا

د. كامل [illegible] هاشم

محمد حسين محمد

وليم عبد الحسين الموزاني

محمد شاكر محمد

عبد الحسن حسن زامل

ذياب زاد الخاطي

ذياب زاد هاشم

[illegible]

عبد الواحد شمس الدين

نبيل نبيه عجران

ثائر عيسى الشابزني

د. نبيل السيد ياسم السيد

نوري جوهر حسن

نصير رسول سعيد الحلاني

عبد القادر حسين البدري

محمد حسين رضا عوان

ثائر سلطان الربيعي

سعيد ذيب سلطان

باسمة عبد النور

قائمة المشاركين

الاتحاد العربي للمنظمات ذاتية

د • [illegible]

[illegible]

د • [illegible]

د • [illegible]

د • [illegible]

[illegible]

[illegible]

الاتحاد النسائي العربي العام

[illegible]

المركز الدولي للتجارة التابع للامم المتحدة (الاونكتاد)

[illegible]

برنامج الامم المتحدة الانمائية

د • [illegible]

قائمة المشاركين

الشخصيات الشهيرة

الدكتور فلان سعيد [illegible]

الدكتور عصام عبدالله مراد

السيد احمد ابراهيم الوزير

الدكتور عبدالله رشيد الزاوي

سعيد عبدالله الوزير

عامر فاضل ذيب

وسيم مصطفى النمر

الشركات المشاركة بالمعرض

المؤسسة العامة لمنتوجات الالبان

المؤسسة العامة للزيوت النباتية

الشركة العراقية لتسويق التمور

شركة سلام للمواد الغذائية

شركة ميادين لتعبئة كربلاء للمواد الغذائية

شركة الفرات الاوسط للانتاج الحيواني

شركة منتوجات زهير المحدودة

شركة بغداد لتعبئة الاغذية وتعليب التمور المحدودة

مصنع سومر للانتاج الحيواني

شركة باز للصناعات الغذائية المحدودة

شركة المنصور للانتاج الحيواني المحدودة

بسكويت (غازي)

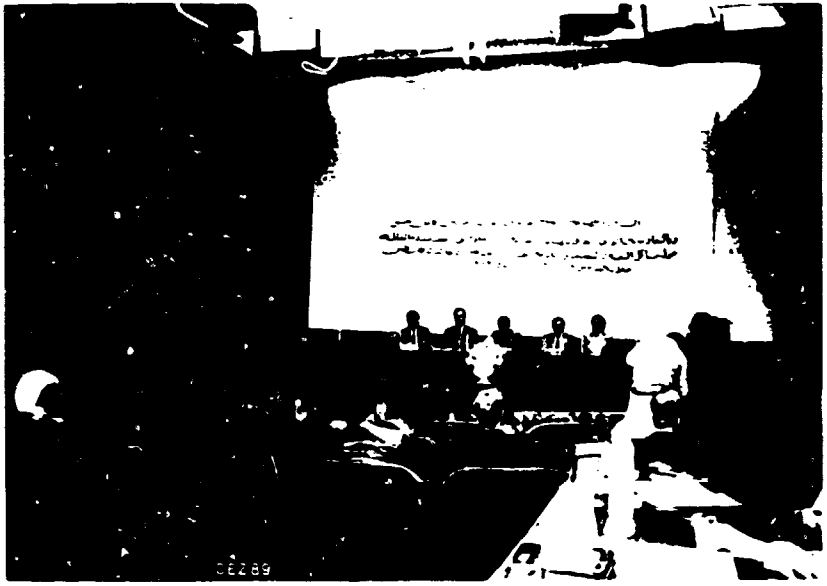
مطاعم [illegible]

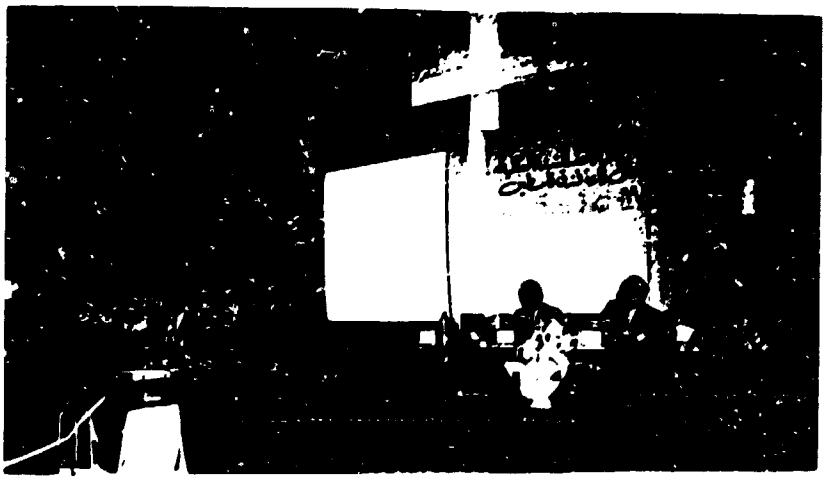
List of the Participation at the Symposium on Food Packaging

Name	Country
F. C. Robson	Switzerland
[illegible]	Sweden (UNCTAD)
[illegible]	[illegible]
[illegible]	W. Germany
[illegible]	Int. Fast Foods Co., U.S.A.
[illegible]	Finland
Heikki Lehmus	Finland
F. Feippo	Switzerland
Chantelle in [illegible]	UNDP
Dr. L. Modi	

ANNEX 6

PHOTOS OF THE SYMPOSIUM





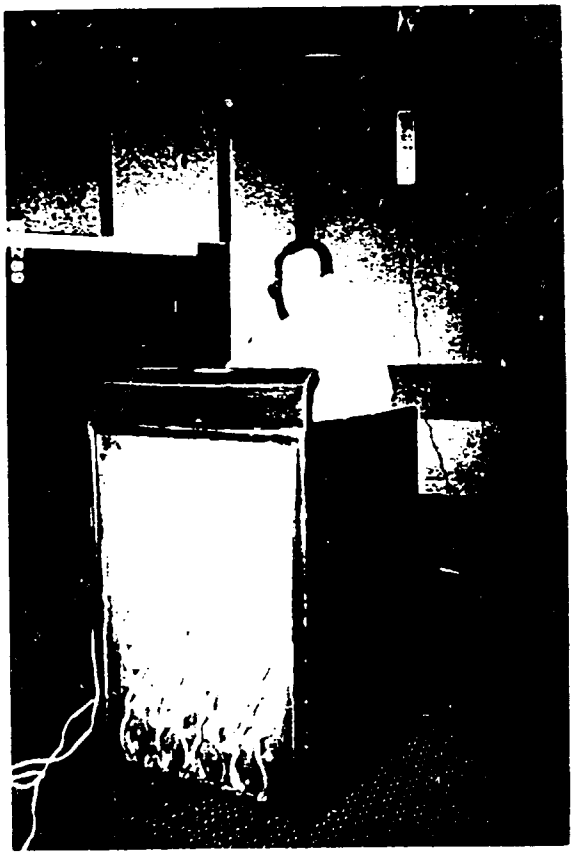

السيد وزير الصناعة والتصنيع
والتعاون بين الاتحاد العربي للصناعات الغذ
حول مشاكل التغذية والتغليف وسلامة الغ
خلال الفترة من ١٨ — ٢٠/
DEZ 89

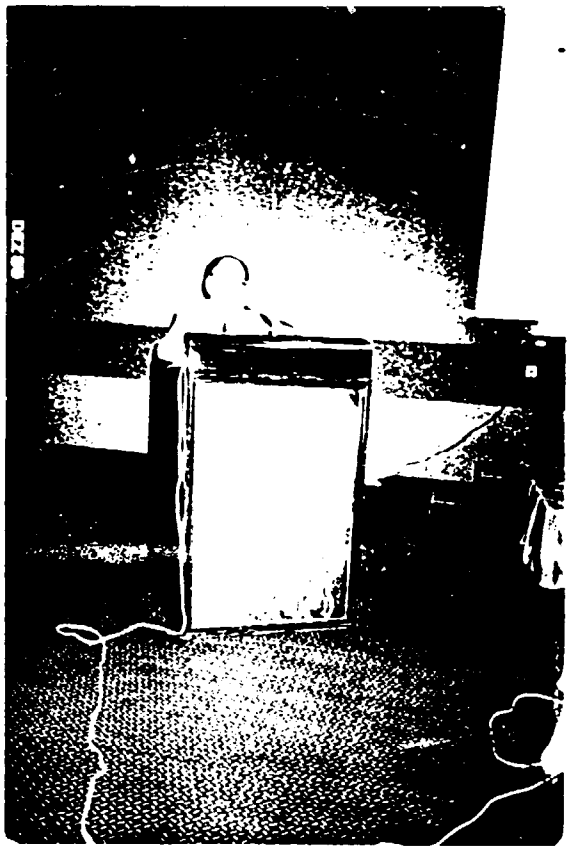

حضور السيد وزير الصناعة والتصنيع العسكري الاستاذ مصطفى كامل مصطفى
التعاون بين الاتحاد العربي للصناعات الغذائية ومركز علوم الحياة لفقد الندوة العالمية
حول مشاكل التغذية والتغليف وسلامة الغذاء

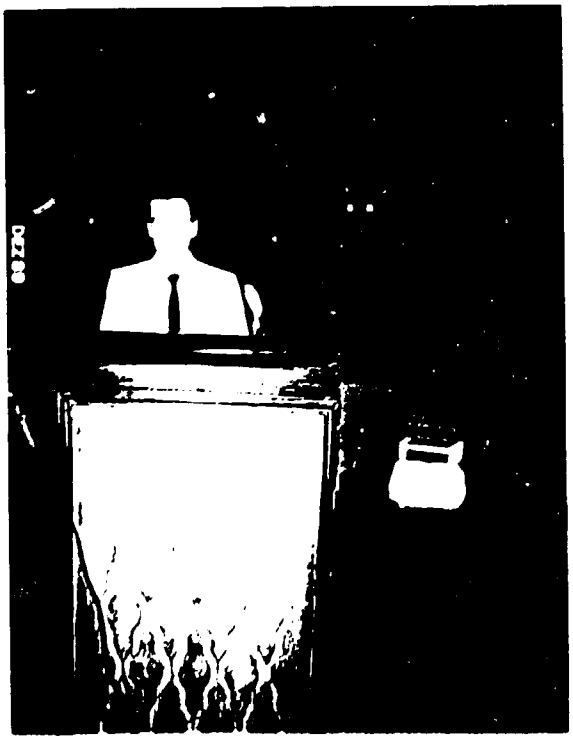

الصناعات الغذائية ومراكز
وسلامة الغذاء وذلك على
١٨ـ ٢٠ / تشرين الثاني ١٩٨٩

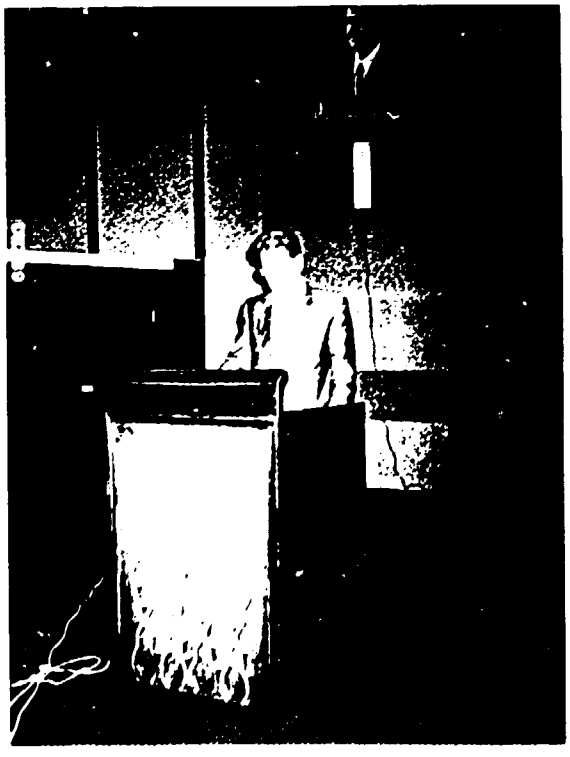

وذلك على قاعة فندق
الثاني ١٩٨٩
DEZ89


٢٠ / تشرين الثاني ١٩٨٩









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