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There are two aspects to the problem :

- one of interpretation, demanding an objective assessment of the potential cost benefits of a country's economy;
- the other of implementation, demanding the know-how to plan integration of new technology in a specific production system.

This is where a country needs an objective assessment, plus the implementation know-how. This is a subject of international co-operation.

3. Substitutes and Alternative Technology

One of the consequences of the process of industrialization is the development of new techniques and the application of applied science to the technology of packaging for all types of food, consumer goods and products.

Replacement of traditional technology as jute, timber, paper and cardboard by new packaging material, such as flexible packaging, laminates, moulding material etc., could be possible and even necessary under the following conditions :

Techno-economic analysis should be prepared taking into account :

- available raw materials
- potential of existing packaging industry
- home and export market requirements

In this field the formulation of a long-range programme for packaging developed is necessary.

Packaging development should not be considered in isolation, but should be analyzed in connection with the product, its properties, price and destination.

Through such a complexity, packaging can maintain an appropriate place and importance in the national economy of developing countries.

The introduction of new packaging materials as substitutes for the traditional ones, requires as a matter of fact the previous preparation of both, industrial enterprises and goods turn-over units, especially those in trade and transport, to avoid difficulties in implementation.

For example in one developing country the new packaging material has been elaborated, but inadequate preparation by the receivers of this material for processing it into packages resulted in temporary difficulties in using it, and the country was compelled to import ready packages.

4. Packaging Systems

Access to technology and knowledge is a matter of increasing concern to the developing countries.

Modern packaging demands mechanised production of basic materials and containers and machines for filling, closing and handling these. New materials are being constantly sought to reduce costs. In the developed countries package manufacture is wholly mechanised, even wooden cases are machine-made. Open top food cans are produced on automatic equipment at speeds in excess of 1200 per minute and folded cartons in the region of 2000 per minute. High speeds are achieved by continuous motion, the replacement of sheet feeding by reel feeding and the combination of printing and manufacture on the same equipment.

Packaging machinery required in the developing countries is generally different from the type of machinery used in the developed countries, mainly due to the disparity in the volume of packaged goods.

The abundance of existing packaging technologies and processes, many of them based on most sophisticated materials and techniques, make the appropriate choice difficult and rather impossible without the proper knowledge and approach to this problem.

To introduce new methods of packing most effective for a given country, a determined packaging system must be chosen as an alternative, namely a comprehensive solution from the technical and economic point of view including the most suitable packaging materials, machines and installations for forming, filling and sealing packages, available manpower, marketing elements, production costs etc..

Such solution seriously affects the economical aspects of the entire venture and new investment possibilities.

IV - REQUIREMENTS FOR FURTHER EXTENSION ACCORDING TO INDUSTRIAL DEVELOPMENT

1. Requirements for Appropriate Technologies

Package is an integral compound of a product, and it is particularly true for food products and pharmaceuticals. For this reason the manner in which a new product is to be packed should be considered at an early stage of its development, so that any necessary package development should be conducted parallel to the development of a product. The manner in which a product is to be used often dictates the nature of the container. The migration of additives from packaging materials into foodstuff and other sensitive products need compatibility studies.

It is very important for pharmaceuticals because many of them, if not adequately protected, may deteriorate to the point of not only losing all efficacy but also of becoming toxic and dangerous to health and even life. New applications and modifications of traditional mediae are continually being developed and synthetic materials proliferate.

The cushioning systems cover a very wide variety of techniques and materials for protecting goods from the effects of handling in transit. They range from the traditional application of straw and woodwool for packaging, of glassware, pottery and ceramics, to the highly sophisticated shock-isolation systems, incorporating springs and hydraulic shock absorbers, used in packages for aero-engines, electronical and electrotechnical instruments and machinery. This is very important especially for the countries producing machines, electrotechnical and electronic products. In some developing countries this technology has been already successfully introduced.

The development of light textiles and leather industries needs modification and improvement of the packaging industry. In the first stage of development in some developing countries, packaging for domestic market and export should be distinguished.

The policy for home market sales should concentrate on the protection of goods and minimum packaging material cost per item.

For textiles, fabrics, garments, knitwear, footwear and leather, the development of alternative packaging materials should be considered

as for example polyethylene shrink film, extruded PVC film, PVC shrink film as an alternative to polyethylene shrink film. The introducing to the packaging of glassprotected shrink films eliminates losses during the transport of above 30 to 50%.

2. Applied Research Key of the Development

In various developing countries the scientific aspects of packaging concerning the property of packaging materials, testing of packages and their protective function are not yet fully understood.

Technological development is seeded and sustained by research.

Knowledge can be gained in the form of "know-how" but applied research plays an important role in development to avoid waste of raw materials, for acquiring the maximum value and for research to improve productivity and profitability.

The second very important research problem is elaboration of standard test methods/unified testing methods/ for the country.

During the last decade, some developing countries have established packaging centres with varied functions. Most of them are engaged in promotional activities, without being largely involved in technological work such as testing, basic applied research, etc..

A few packaging institutes in developing countries have set up and, with the assistance of UNIDO, are expanding their laboratory facilities. They include the Korea Design and Packaging Centre, Republic of Korea; the Moroccan Institute of Packaging; the Mexican Packaging Institute, etc.. Because some facilities are available, they are in a position to undertake a variety of useful and practical programme of work to aid the industry. The example of the Indian Institute of Packaging also falls in this last category with difference that its laboratories already equipped to meet the vast and diversified needs of the country and functioning for over a decade now are being further expanded to strengthen its services to the fast developing trade and industry.

To ensure proper development of a national packaging industry, it is indispensable to establish in each developing country a national packaging body (centre).

A national packaging body/ laboratory, centre or institute should render the following services to the national packaging industry :

- (a) Testing and developing packages and packaging materials for home and export market;
- (b) Adjustment of local materials to the adequate packaging machines and systems;
- (c) Training of packaging producers and users including management;
- (d) Elaboration of development programmes for packaging industry.
Strategy for industrial development of a country;
- (e) Organization of necessary information systems for industry;
- (f) Enlistment of international corporations and all those concerned with packaging subjects.

3. Strategy and Policy in the Development of the Packaging Industry

One of the objectives in packaging is to minimize the costs and at the same time to maximize protection. It is very important to chose the most suitable packaging system, to apply the national raw materials and to introduce the substitutes.

The main elements of strategy and policy in packaging in developing countries are to lay down the right proportion and priorities of the development according to the general development of the country (specific industries):

- Formulation of a long-range programme for packaging development;
- export policy of a country;
- investment economic analysis;
- international co-operation, especially industrial co-operation to accelerate the development.

An integrated National Packaging Programme should take into account all technical, technological, organizational and health problems including environment. It is necessary to avoid mistakes and heavy losses.

V - INTERNATIONAL CO-OPERATION

1. Containerization Role in International Exchange and Co-operation

A technology closely connected with packaging which offers tremendous possibilities for developing countries is containerization.

Containerization is undergoing rapid development. However, it requires especially careful preparation in connexion with packaging modulus system for a country or region, transport packaging, terminals and transportation facilities. The establishment of such facilities requires the direct support and assistance of the government, especially for the sea-countries. The interested countries must decide themselves just where and how such facilities are to be introduced. This is the technology for present-day and for the future, taking into account container bridges; and developing countries should be the equal partners in the international chain of containerization and packaging. Unless the developing countries/especially sea-countries, begin now to make special arrangements for container ports and container terminals, they will run the danger of being unable to load or unload goods in accordance with international standards and conditions. The preparation of the plan of action including information services could be based on international co-operation.

2. Basic Elements of International Co-operation for the Acceleration of Progress

Over the past decades there has been a steady growth of industrial production in developing countries in various fields.

A substantial diversification of the industrial base of the economy is also scheduled with the capacity of meeting the requirements of not only the home market but also of the export market for several new items of capital goods.

Therefore, international co-operation in various forms on the bilateral, multilateral or regional or interregional basis is of considerable significance for fostering increased economy.

International co-operation in packaging spheres is not only desirable, but also imperative to bring about a rapid and orderly growth of the economy of developing countries.

In the packaging field there are two fundamental areas for international co-operation :

- Exchange of experience
- Industrial co-operation (joint ventures)

3. Exchange of Experience could be provided in various Fields of Industrial Activity

● Information constitutes an important element of every industrial activity. The following information is needed :

- Current information about existing technologies;
- New technologies in packaging, especially in new packaging materials;
- Information about patents;
- New inventions in this field, especially new packaging systems;
- Specific information needed for the development of packaging industry (new trends in development);
- Market requirements;
- International and national health regulations.

The abundance of existing packaging technologies and processes in packaging, many of them based on most sophisticated materials and techniques, make an appropriate choice difficult and rather impossible, without the proper knowledge and approach to this problem.

No company or group, however large, can be self-sufficient in assessing and meeting information needs. The problem is not primarily one of availability. The task is rather how to ensure information quality. This means optimizing the selection, timing, presentation and costs. Therefore, it is suggested, for consideration, to establish an

- International Packaging Information Bank for Developing Countries.-

Through such a bank every country (or company) can use a worldwide communication-network and, above all, can achieve this cost effectively.

- Training as a tool for upgrading the most important industrial resources : manpower : As a means to upgrade knowledge of packaging in the developing countries, it is indispensable to hold training programmes, seminars, group training meetings, exhibitions and contests.

The training programme should be made suitable to various levels of management including producers, users, consumers and others. It should also help in the promotion of trade, proper and economic use of packaging materials and methods.

Training covers a wide range - from indication of apprentices to preparing experienced men for technical change. Several developing countries have already introduced successfully in-plant training, for example India. Their experience in this field could be used in international co-operation. The packaging centres in developed countries (for example PIRA (UK); TNO (Netherlands) and others) have also a long-term experience in intensive training with minimum disruption of production, and new training facilities (visual training).

Regional seminars organized on the basis of international co-operation, contests and exhibitions, would further assist in the improvement of packaging status, not only in the respective countries, but also in the region as a whole.

- One of the objectives in packaging is to minimize costs and at the same time to maximize protection through applied research

Basic research costs a lot of money and time. To avoid overlapping and duplication and especially to accelerate the development of packaging industry, basic research could be obtained by international (bilateral or regional) co-operation. This is also very important for testing methods (unified testing methods).

Basic research laboratory work (applied research) could be available by international co-operation, on selected packaging problems like climatic and mechanical hazards, machine ability, shelf-life, compatibility, for example : migration of additives from packaging materials into product and vice-versa etc..

There is a gap between an original research concept and its successful implementation in industrial production. This gap is one that management cannot easily bridge. There are two aspects

of the problem: one of interpretation and objective assessment of potential cost benefits to the industry; the other of implementation, requiring "know-how" to integrate new technology in a specific production system. This is where the packaging industries need the objective assessment, skills and help. This can be the basis for international co-operation.

- Consultancy facilities available in developing and developed countries to promote greater utilization of technological services in packaging.

In the industry, management makes decisions on many different questions: how to implement new technology, how to boost productivity by effective use of resources, how to plan capital investment, how to exploit new markets and so on. The consultation services can help associated countries or companies to find the answer. The idea is to ensure packaging industry - if needed - through international co-operation necessary services on specific subjects.

The consultancy services in developed countries have by now been fully equipped to offer a wide range of consultancy services to developing countries for implementing industrial schemes including general diagnostics and demand surveys, feasibility studies, techno-economic evaluation and even for setting up complete industrial plants. In some developing countries specialized centres in packaging have been established suitably equipped with package testing facilities and which can offer consultation services in specific fields in packaging: for example India: consultation of specific commodities including food, documentation, training, testing and research; Korea: management training; Egypt: in paper, corrugated board industry; Singapore: in printing technology; and Hong Kong: testing methods.

4. Industrial Co-operation in Packaging Key Problems of Rapid Industrialization

Over the past decades there has been a steady growth of industrial production and diversification of the industrial production. Industrialization of developing countries will play an important role in the establishment of the New International Economic Order.

An important factor in acceleration of this process of industrialization is industrial co-operation.

Joint ventures are an important and powerful instrument for the expansion of export and are of considerable significance for fostering increased economic co-operation among developing countries as well as in the developed world.

Industrial co-operation contributes not only to the accelerated expansion of the packaging industry, but also to the development co-operation in a wider perspective and aligned with the larger economic objectives. The importance of joint ventures was also emphasized at the Interregional Seminar held in Bombay in November 1974 and at the 2nd Interregional Seminar for Co-operation in Packaging among developing countries, in November 1975. Both seminars have been organized by UNIDO in co-operation with the Indian and the Korean Governments. The participants from Africa, Asia and Latin America have emphasized that with a view to upgrade the status of packaging in developing countries there could be co-operation, especially industrial co-operation, between the developed and developing countries which would accelerate the industrialization of the latter.

A good example of a country where such projects are being initiated is India. The mutual investment in the field of aluminium foils and flexible packaging is increasing with the diversification of Indian industries. Indian enterprises have reached a good position in industry and are equipped not only with machinery but also with technical know-how and consultancy expertise. Local talents are having their effective share in joint venture units and in the course of time these units are run by the local management class. They have also adequate provision in the scheme for training of local personnel.

5. Possibilities of International Co-operation among Developing Countries
(some practical examples)

The immediate problem which the developing countries are facing is to protect and preserve the industrial products. Packaging in these countries should aim at meeting their basic necessities. The experience achieved by some developing countries in this field could be a basis for international co-operation.

For example :

- Paper and board account for a large share in packaging the world over,

and a large variety of specialized papers are needed to meet specific requirements. The developing countries may have to take a look at the existing paper industry with a view to orient their production of paper appropriately to cater to the needs of the packaging industry.

Many countries are endowed with forest resources, but are unable to establish large paper mills as it is capital intensive. In this context, the examples of India and Egypt where small capacity mills specially for the production of speciality papers are worth considering to minimize imports. Significantly, Egypt has expertise in making paper pulp from rice straw inspite its high silica content. This experience may be helpful to others.

- In many developing countries, aluminium packaging industry is in the early stages both in manufacture and usage. The importance of aluminium foil, tubes or cans for the packaging of sensitive products need hardly any emphasis. The experience of India can serve to other developing countries.

Complete "know-how" for the production of aluminium collapsible tubes, container sheets and foil in different thicknesses are available in developing countries like India, Egypt, Korea etc..

- Since cellulose film has several inherent advantages, like moisture protection, clarity, heat sealability, etc., it is becoming very popular. However, in view of the heavy capital outlay and sophisticated technology involved in the production, many developing countries have to depend upon industrial co-operation. "Know-how" for the manufacture of cellulose films and their conversion are available in India, Egypt and Korea.

- Laminates which have a combined property of the substrates have largely replaced metal containers in packaging, in view of the economies they offer and at the same time meeting functional requirements. The techniques of lamination and coating are undergoing a phenomenal change in the developed countries, e.g. co-extrusion. Their application in some developing countries is not wide-spread owing to their non-availability and marketing consideration. In countries like Brazil, India and Korea considerable progress has been made and over the years have built up expertise which may be appropriate to other developing countries.

- In some developing countries, due to the non-availability of semi-chemical pulp, kraft paper is used as fluting media. It is necessary that

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Background Paper

the establishment of semi-chemical pulp mills should be encouraged based on the international co-operation among developing or developed countries.

- Cushioning materials, like paddy straw, wood wool, paper shavings, saw dust, etc. whose properties are not standard are still in use for cushioning in practically all the developing countries. This has led to increased packaging costs and other related problems. The newer development of air cushions as in Hong Kong, Singapore and India, rubberized coir and paper honey comb in India, seem to have great promise.

The other cushioning materials in use are those derived from plastics like polyurethane foam, expanded polystyrene, expanded polyethylene, etc.. These are light and are quite effective where a high degree of protection is required. Technology for some of these items is available in Korea, India and Hong Kong.

The above examples can give an idea about the needs and possibilities of co-operation among developing countries.

The technology developed by some developing countries could be more suitable for developing countries involving more human labour and thus reducing unemployment which is the major problem in many of the developing countries.

6. Economic and Organizational Forms of Co-operation in the Field of Packaging

(i) There are two fundamental areas of co-operation in the field of packaging :

(a) The co-operation among developing countries : In view of the varying levels of packaging in developing countries in terms of quality and quantity, there appears to be an urgent need to exchange knowledge and experience among developing countries in the first instance.

(b) The co-operation among the developed world: Development needs of course capital investment. Large-scale capacities in selected segments of the packaging industry open the door for large industrial co-operation with the developed countries. Such a large venture could cover the needs of not only one developing country and could be based on multilateral co-operation.

(ii) Diversified forms of co-operation: Different forms of co-operation as bilateral, multilateral and regional, could contribute to the elastic policy in national economy of each country.

(iii) International mechanism for international co-operation in packaging : To promote and to facilitate the international co-operation, an efficient mechanism for co-operation should be established.

It is suggested to establish the Regional Centres with a view to organize co-operation between :

- Countries in the region
- Other regions
- Developed countries
- International non-governmental organizations, for example the World Packaging Organization, the European Packaging Federation, the European Organization for Quality Control and others.

The purpose of establishing Regional Packaging Centres should be to assist the countries, through international co-operation, in building up their own packaging infrastructure, to provide them with the information and services to programme packaging development on a broad scale and to assist in introducing international co-operation.

The organization of a Regional Centre should be adequate for the real requirements of the associated countries in the region, their level of development, need of export and home market and specific conditions of the countries and region.

The following group of activities should be developed :

- International co-operation in all forms indicated above, including industrial co-operation;
- Information (Information Bank in Packaging);
- Technology problems
- Marketing functions
- Standardization
- Training
- Consultancy services.

Taking the above into consideration, there are two possibilities to develop two main models of a Regional Packaging Centre (from the financing and organizational point of view) :

- A self-sustained centre existing as a separate institution, having its own administration, facilities and independent budget as well as full organization structure, financed by the associated countries or industries;
- A centre attached to a well established and functioning national packaging centre (institute) where general administration, financial and technical services could be carried out by that body. Such a possibility exists in India or Hong Kong for the Asian Region.

The substantive part of the activity of a Regional Packaging Centre could be financed by associated countries as a contribution.

(iv) The basic benefits of international co-operation in packaging :

All of these activities indicated in this paper, if developed individually and separately in each country, will cost a lot of money and time and can lead to overlapping and duplication.

Taking into account the lack of skilled people and knowledge, individual solutions in above fields of activity could hamper general development not only in the packaging industry but also in the country economy.

Based on existing experience, it is possible to emphasize the following basic benefits of international co-operation in packaging :

- To accelerate the development of the packaging industry according to the country needs;
- To avoid diversification of financial resources, especially by investment;
- To open the door, through joint ventures to joint participation in the mutual industrial growth;
- To extend and, at a wider scale, to participate in international exchange;
- To avoid duplication of work, especially research, testing methods etc..;
- To avoid mistakes made by some countries by learning from their positive and negative experience.

International co-operation among developing countries and the developed world is indispensable to avoid heavy losses of products or diversification of financial resources.

The concentration of the activity connected with international co-operation in a Regional Centre will contribute to optimization, utilization of available financial resources for this purpose.

VI - THE ROLE OF UNIDO IN THE INTERNATIONAL CO-OPERATION IN PACKAGING

The international co-operation in such a complex technology as packaging will be based on an integrated programme which should involve all technical, technological, economical, organizational and health problems, including environment.

By formulating such a programme, it is necessary to include UNIDO's role in co-operation and transfer of technology in packaging.

Such a programme would inter alia, include the following and UNIDO should:

- (i) Assist national packaging centres through the provision of expertise and provide necessary information and supporting services needed for extension.
- (ii) Advise on the formation of packaging centres in developing countries through consultation meetings, seminars, group discussions on a bilateral and multilateral basis.

Provide the developing countries with elements of the strategy for setting up such centres including model document concerning the structure, the objectives of packaging centres etc., to enable them to form such centres as soon as possible.

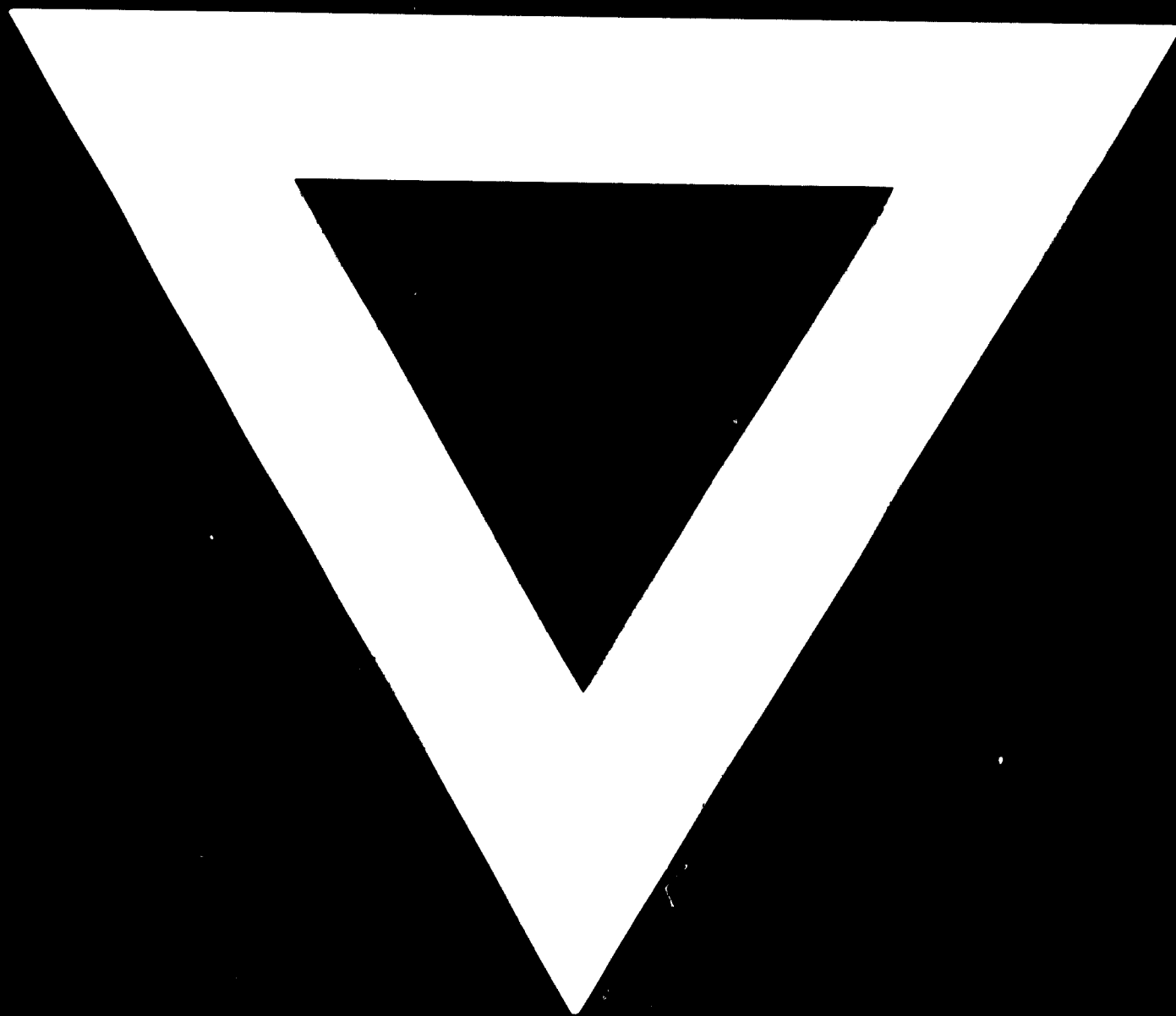
Expand assistance especially to the less developed countries by providing experts on the request of the government concerned.

- (iii) UNIDO may consider the means of creating a general awareness in packaging among less developed countries through conference among all those concerned with the packaging in the respective country. In this endeavour the services of packaging experts may be enlisted particularly from more developed countries among the developing countries as far as practicable.

- (iv) Where a suitable degree of sophistication is not available in some developing countries, there appears to be a need to look for areas where intermediate technology is available. UNIDO may be of assistance in this regard.
- (v) The Third Interregional Seminar for Co-operation in Packaging among Developing Countries should be convened as soon as possible to discuss the programme for international co-operation and transfer of technology.
- (vi) UNIDO should organize the co-operation among developed and developing countries through the non-governmental organizations such as the World Packaging Organization, the European Packaging Federation, the Asian Packaging Organization, the EOQE and others.
- (vii) UNIDO should supply the developing countries with the activity and experience of other regional packaging centres, for example IDCAS Regional Packaging Centre, its organizational and financing model.
- (viii) UNIDO should organize the training course for the top people responsible in the country for the development of packaging industry, with the scope of mechanism and organization of international co-operation and transfer of technology.



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PACKAGING: AN INTEGRATED PART OF ECONOMIC DEVELOPMENT
IN DEVELOPING COUNTRIES

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I - INTRODUCTION

Packaging Role in the Process of Industrialization

(a) Rapidly growing demands of food, machines, electrotechnical and electronic products as well as pharmaceuticals, building materials, textiles and others were bringing about an increase of demand for packaging and also the necessity of modernization and improvement of quality.

(b) The status of packaging in many parts of the world is still insufficient and in some countries is in a stage of infancy. Practical in the majority of developing countries of Latin America, Africa, Asia and the Far East, the advantages of adequate functional packaging seem to have reached only the fringe of the populations.

However, in some countries a great progress has been achieved in the last years in the development of packaging industry, for example in India, Egypt, Morocco, South Korea, Mexico and others. The evaluation shows that in general the packaging industry in developing countries is at the first stage of development. The industrial revolution which greatly boosted the economy of the developed countries, did not have any significant impact on the present-day developing world. In fact, packaging used for daily necessities of life in the developing countries is still similar to what it was some 30 years ago in the developed countries. Dependence on agriculture, rapid increase in population, low level of technology, low productivity, lack of experienced experts as well as inadequate financial resources, are some of the factors impeding the establishment of packaging industry on a large scale, and in the right proportion, the general development of industry.

(c) In order to solve these problems, all possible efforts should be made for the development of raw materials, technologies, training and also for saving costs of production

The Lima Declaration and Plan of Action envisage that at least 25% of the world industrial production should originate from developing countries

by the year 2000.

One of the prime factors in the process of industrialization is packaging industry. In the broad sense there is no product, industrial or agricultural, that is not packed. Consequently, the parallel development of the packaging industry in accordance with the development of industries in other sectors, is essential, if industrial progress is to be made.

II - BACKGROUND

1. Function and Importance of Packaging in the National Economy

Packaging has a multi-disciplinary nature. Functions and importance of packaging in the national economy, increase simultaneously with the general economic development of each country.

The packaging industry has now been recognized as an integral link in the national economy. For example: paper and board are essential to most industries in a hundred ways - from business forms to packaging - from industrial tissues to building materials.

Packaging is a technique of using the most appropriate packaging media for the safe delivery of the contents from the point of production to the ultimate consumer. Packaging serves as a vital link in the long line of production, storage, transport, distribution and marketing. It is the package which has to protect the contents against several hazards, such as climate and transport especially by sea transport and different climatic areas/ingress of moisture and so on.. It is the package which must preserve the quality, functional and freshness performance of the product and make it possible for the product to reach the consumer or user, in prime condition.

2. Packaging as a Link of Industrial and Social Progress

The development of the packaging industry is closely linked with industrial and social progress in general.

Packaging is used by every industry and has played its part in enhancing the material quality of life in such diverse ways as ensuring

fresher food and safer medicines. Packaging means not only faster, more highly automatized machinery, but also harnessing new materials or new combinations of them and adapting to environmental constraints such as the needs for inoffensive disposability. The most important from the economic and social point of view, is fitness for purpose. Thus, for instance, we cannot merely look at what packaging is and how it is made, but we have to consider its functions too, its performance. Poor performance means high production costs in downtime and wastage.

3. Optimum Utilization of Manpower, Raw Materials and Finance

The successful evolution of a package calls for an interplay of a number of disciplines like physics, chemistry, biology, engineering, transport, economics and marketing techniques. It is the problem of development activities and services in the production, handling, storage, transportation and sale techniques. For the developing countries it means employment for a large range of people and increasing the knowledge in various fields of activity.

Adequate and functional packaging of products, be they food, pharmaceuticals, textiles, leather, and machines, electrical and electronic instruments, handicrafts, etc., materially contribute to the industrial prosperity of a country by the optimum utilization of manpower, raw materials and finance.

The world-wide oil crisis lead to the need of a nation-wide saving campaign of resources and as consequence the subject of optimum packaging pattern should be considered. It is the problem of national policy and strategy to establish the right priorities and proportions according to available raw materials, export and home market needs and financial resources.

Naturally, in the advanced industrial countries like Japan, the USA and the European countries great emphasis is laid upon optimum packaging campaigns in order to overcome pollution from scrapped materials of packaging.

In developing countries emphasis should be laid more on the saving of resources.

A survey of the packaging situation in the developing countries of the world reveals some common features: packaging is considered as an additional cost, governments of the countries do not provide for priority treatment for packaging industries and other subjects of industrialization. The support from the governments is the prime and essential factor of development.

It is necessary to organize group exercises for the management personnel in the industries, to indicate the role of packaging in national economy and to promote the right concept that packaging is an investment and not an item of cost.

4. Packaging as a Vital Economic Problem

Materials are an important and costly resource, along with men and machines. Therefore, the study is necessary from both the economic and technical point of view. For packaging much of the efforts are on how best to use materials to minimize packaging and transport costs. From their point of view it is also necessary to study the stress on packaging during distribution, looking for instance at the characteristics of cushioning materials as for example foamed plastics and assessing their effective use.

A very important economical problem should be recognized by investment. Development needs of course capital investment. The packaging industry, especially plastics, metal, paper and board, are capital-intensive. The industrial management might have to decide between modification of existing machinery or investment in new plants. It is not always a question of hardware alone : The requirements could be for a whole new factory. The economic factors have an influence on the decision. In some developing countries for example, there is a tendency to build a low production capacity in order to meet the small local demands.

But low capacity means high costs of production.

By the new investment the energy expenditures on different types of packaging should be taken into account before decision is made. For example, the relative costs, in terms of energy, for different packaging branches are :

- Glass	5,5 %	of total costs
- Metal cans	4,8 %	" "
- Cartons	3,8 %	" "
- Pouches	3,5 %	" "

The other economic aspect of new transport packages : Certain countries, especially the developed ones, refuse to accept goods packed in wooden crates. The economic calculation showed that, if all expenses are calculated, the costs of transport and handling included, the replacement of wooden packages by cardboard containers or unit loads packed in shrink film is economical, even if other advantages are disregarded. Techno-economic analyses are necessary if we like to avoid mistakes made in the past by some developing countries.

III - TECHNOLOGY AND PERFORMANCE OF ALTERNATIVE RAW MATERIALS

1. Losses of the Country's Economy

An evaluation has shown that approximately 25 to 50 per cent of the supply of food and other products is damaged because of lack or insufficient packaging. Developing countries are estimated to be losing about 30% of their exports due to inadequate packaging. It is of little value to produce goods which are damaged in handling, ^{during} transport or storage because of insufficient packaging. In technology-based industries, such as packaging profitability is closely linked with the ability to keep pace with technological change. The problem is how to do this cost-effectively.

The key to the solution of these vital problems lies in the development of modern packaging industry, in the right proportion with the general industrialization of the country or region.

2. Implementing New Technology

Operating in a general world climate of rapid technology change, it is necessary to have a techno-economic analysis about the suitability of new technology to the local conditions. The most important is to use the local raw materials.