



**TOGETHER**  
*for a sustainable future*

## OCCASION

This publication has been made available to the public on the occasion of the 50<sup>th</sup> anniversary of the United Nations Industrial Development Organisation.



**TOGETHER**  
*for a sustainable future*

## DISCLAIMER

This document has been produced without formal United Nations editing. The designations employed and the presentation of the material in this document do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations Industrial Development Organization (UNIDO) concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries, or its economic system or degree of development. Designations such as “developed”, “industrialized” and “developing” are intended for statistical convenience and do not necessarily express a judgment about the stage reached by a particular country or area in the development process. Mention of firm names or commercial products does not constitute an endorsement by UNIDO.

## FAIR USE POLICY

Any part of this publication may be quoted and referenced for educational and research purposes without additional permission from UNIDO. However, those who make use of quoting and referencing this publication are requested to follow the Fair Use Policy of giving due credit to UNIDO.

## CONTACT

Please contact [publications@unido.org](mailto:publications@unido.org) for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at [www.unido.org](http://www.unido.org)

RESTRICTED

DP/ID/SER.B/17  
17 September 1975  
Original: English

06819

**PREPARATORY  
ASSISTANCE  
TO THE  
PLASTICS  
INDUSTRY**

IS/JAM/75/002

**JAMAICA**

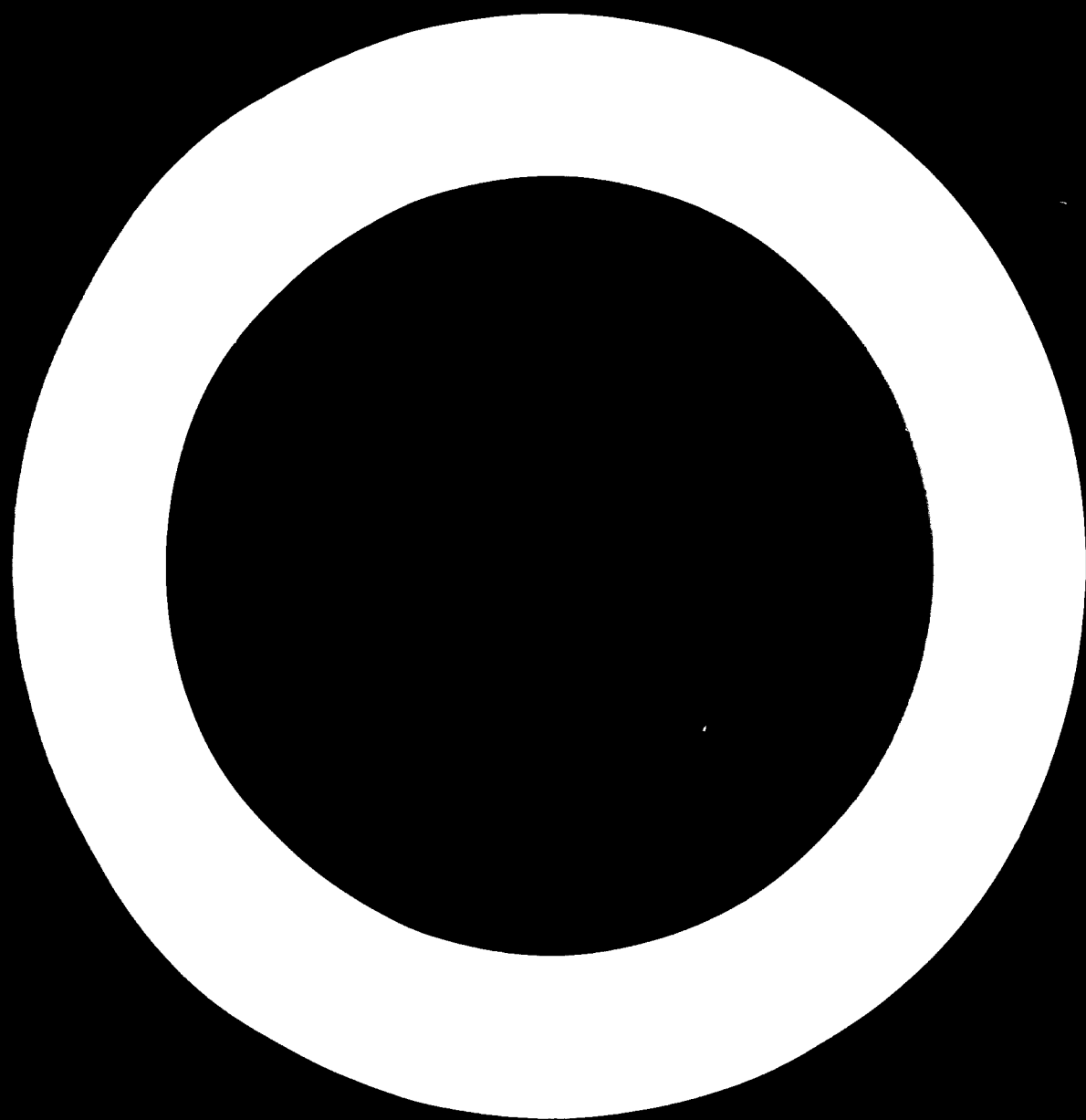
**TERMINAL REPORT**

Prepared for the Government of Jamaica by the  
United Nations Industrial Development Organization,  
executing agency for the  
United Nations Development Programme



**United Nations Industrial Development Organization**

We regret that some of the pages in the microfiche copy of this report may not be up to the proper legibility standards even though the best possible copy was used for preparing the master fiche



United Nations Development Programme

PREPARATORY ASSISTANCE TO THE  
PLASTICS INDUSTRY

JAMAICA

IS/JAM/75/002

Project findings and recommendations

Prepared for the Government of Jamaica  
by the United Nations Industrial Development Organization,  
executing agency for the United Nations Development Programme

Based on the work of C. A. Brighton, H. R. Spice and G. O. Thomas,  
consultants to the plastics industry

United Nations Industrial Development Organization

Vienna, 1975

### Explanatory notes

A comma (,) is used to distinguish thousands and millions.

Reference to "tons" indicates metric tons.

During the period of the project, the value of Jamaican dollar (\$J) in relation to the United States dollar (\$US) was \$US 1 = \$J 0.91.

The following abbreviations are used:

CARICOM	Caribbean Community Secretariat (formerly CARIFTA: Caribbean Free Trade Association)
CAST	College of Arts, Science and Technology
JIDC	Jamaica Industrial Development Corporation
JMA	Jamaica Manufacturers Association
NPA	National Planning Agency
UWI	University of West Indies

PE	Polyethylene
PE-LD	Polyethylene - low density
PE-HD	Polyethylene - high density
PP	Polypropylene
PS	Polystyrene
PVC	Polyvinyl chloride
UF	Urea-formaldehyde

---

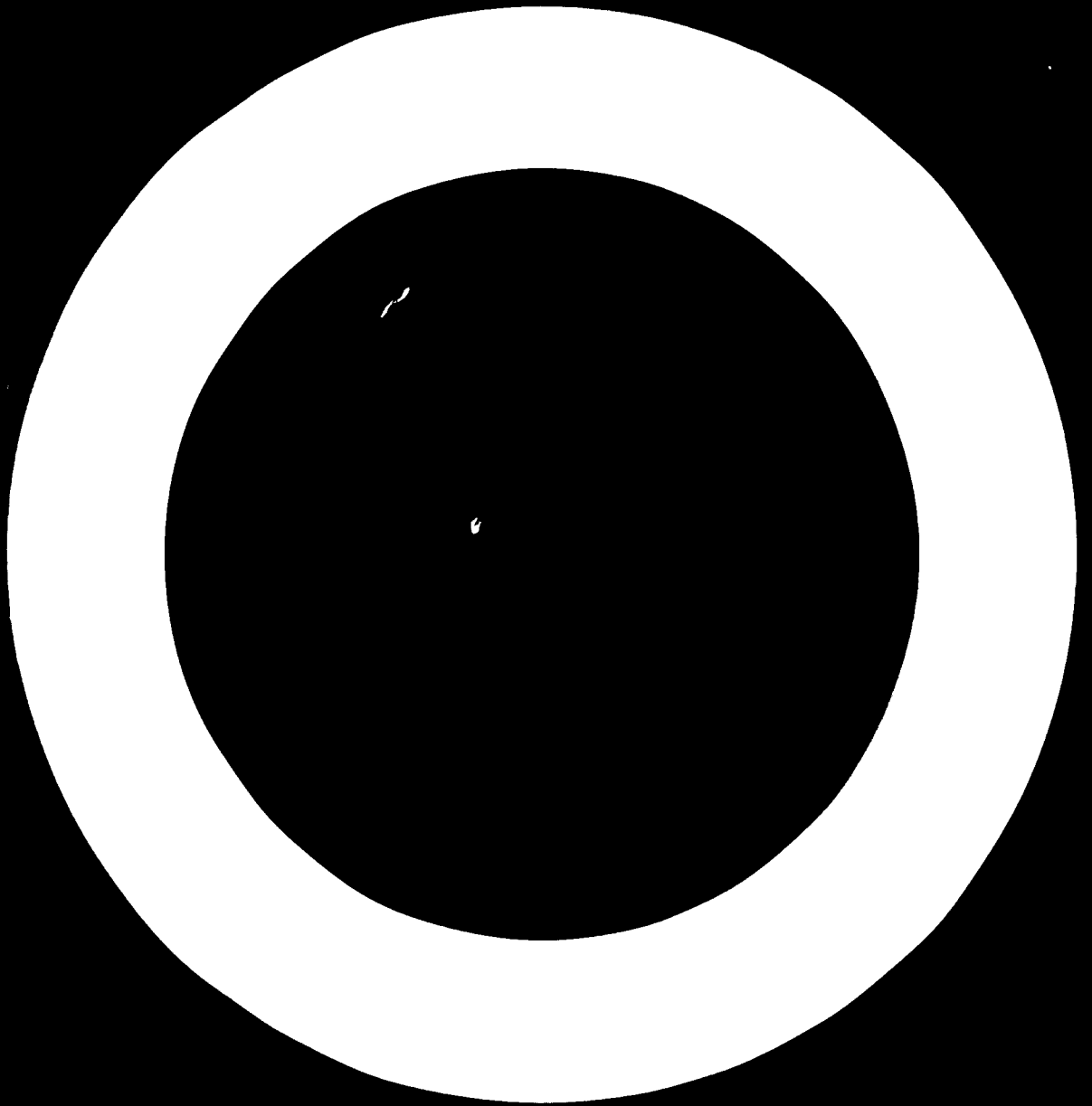
The designations employed and the presentation of the material in this document do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations concerning the legal status of any country, territory, city or area, or of its authorities, or concerning the delimitation of its frontiers or boundaries.

## CONTENTS

<u>Chapter</u>		<u>Page</u>
	INTRODUCTION.....	
I.	FINDINGS OF THE MISSION.....	
	A. Raw materials for the plastics industry.....	
	B. The structure of the plastics processing industry.....	
	C. Productivity and quality control.....	
	D. Technological development and engineering facilities.....	
	E. Training.....	
	F. Market development and export potential.....	
	G. Rationalization of the plastics industry.....	
	H. Official agencies.....	
II.	RECOMMENDATIONS.....	

### Annexes

I.	The Jamaica Industrial Development Corporation.....	21
II.	The Bureau of Standards.....	27
III.	Notes by the agricultural expert.....	29





## INTRODUCTION

The possibilities of a mission to examine the potential of the plastics industry was discussed by representatives of the United Nations Industrial Development Organization (UNIDO) and the Jamaican Bureau of Standards at the Sixth International Symposium on Plastics in Agriculture, which was held at Buenos Aires in September 1974. It was originally intended that the survey should be limited to agriculture, but at the request of the Government of Jamaica, it was extended to cover the entire industry.

The mission was carried out by the following consultants:

C. A. Brighton	Product and market development (29 July - 12 August 1975)
H. R. Spice	Application of plastics in agriculture (29 July - 15 August 1975)
G. O. Thomas	Application of polyolefins for films and fibres (29 July - 12 August 1975)

The objectives of the mission were to:

- (a) Conduct discussions on the application of plastics in agriculture to ensure maximum economic benefit to the agriculture industry,
- (b) Conduct consultations and discussions on ways to expand the market for various plastics applications and to examine the processing technology;
- (c) Advise on the use of polyolefins for films, fibres and tapes;
- (d) Make recommendations for a future programme of technical assistance by UNIDO, particularly in relation to expert advice, equipment for technical back-up of the processing industry and training at all levels.

The mission was briefed in Vienna on 28 July 1975. Upon arrival in Jamaica, a discussion was held with the Deputy Resident Representative of the United Nations Development Programme (UNDP) in order to formulate a programme of consultations and to establish contact with officials of the following bodies:

National Planning Agency (NPA)  
Ministry of Industry and Foreign Trade  
The Bureau of Standards  
The Ministry of Agriculture  
The Jamaica Manufacturers Association (JMA)  
Jamaica Industrial Development Corporation (JIDC)  
National Water Authority  
University of West Indies (UWI)

Subsequent discussions and consultations with industry and bodies such as the Banana Board were then arranged by the NPA and the JIDC.

## 1. FINDINGS OF THE MISSION

There was little background information on the plastics industry and no statistical figures were available on the present or past level of imports of plastics raw materials. The Jamaican Government is concerned about the general state of the economy, and all the official bodies are attempting to discourage the importation of manufactured goods. Because of its proximity to the United States of America, there is a large import of goods and the general approach to the plastics industry is to produce the same articles domestically.

It is possible for a manufacturer to obtain restrictions on the importation of goods if he can establish that he is able to produce the equivalent products locally. In certain instances, this has led to the introduction of inferior goods on the domestic scene while at the same time, giving the manufacturer the opportunity to increase his prices.

There has been a large import of machinery for the fabrication of plastics goods, and the present capacity is many times the present level of output. An application for a licence is required before permission to import is obtained and this is carefully studied by the JIDC in relation to the existing capacity and the potential growth of the market before authorization to purchase is granted.

The plastics industry, which is almost entirely in the private sector, is geared to meet domestic requirements, and there is only limited exportation of manufactured products, even to member countries of the Caribbean Community Secretariat (CARICOM).

### A. Raw materials for the plastics industry

At present, all the resins and polymers required for processing are imported. The Luana Corporation, a JIDC subsidiary, has been examining the feasibility of establishing a new oil refinery/petrochemical complex in Jamaica. The initial plans for a refining capacity of 250,000 barrels per day have been modified to a unit capable of handling 80,000 barrels per day. In the first stage, the unit will be concerned only with the supply of fuel requirements. An early announcement of the intention to begin is expected. The feed stock would be a heavy crude from Venezuela or Mexico. The second stage in the development would

be sulphur extraction and fertilizer production. The production of vinyl chloride and the manufacture of polymers would be considered as the third stage. It would appear that the third stage is in the distant future, particularly in view of the existing production in the Central American area and the intention to construct new plants in Mexico and Venezuela.

The current imports of plastics raw materials are about 10,000 tons per year as follows:

	<u>Tons</u>
Polyvinyl chloride (PVC), resin and compound	5,500
Polyethylene - high density (PE-HD)	600
Polyethylene - low density (PE-LD)	1,200
Polypropylene (PP)	600
Urea-formaldehyde (UF), phenolic and melamine resins	1,600
Polystyrene (PS)	100
Styrene-butadiene rubber	650

The greatest proportion is from the United States, imports are also received from the Federal Republic of Germany, Japan and the United Kingdom of Great Britain and Northern Ireland.

In addition to these raw materials, there is also some importation of PE-LD film, PP fibres, acrylic sheet, and the intermediates for polyurethane foam manufacture.

The present prices (in Jamaican dollars per pound) for polymers are in line with the general world prices:

PE-HD	0.26
PE-LD	0.25
PP	0.27
PVC	0.30 - 0.35

The processing industry will have to rely on imported raw materials for a very long time in the future, but this should not impose any restrictions on its growth, particularly if the full export potential of manufactured items is realized.

B. The structure of the plastics processing industry

The major development has taken place during the last 10 years. Almost 30 companies now process plastics. Only one company is above medium sized (using more than 5,000 tons of material per year), six are medium sized (250 tons per year) and the remainder are fairly small. The total quantity of raw materials used is about 10,000 tons, but this has to be set against a general manufacturing capacity of the order of 50,000 tons per year based on normal 24-hour shift production for a 5½ day work week. The types of production include:

- Extruded PVC pipe
- Moulded household items
- Shoe soling
- Blow-moulded containers
- Vacuum-formed egg boxes and containers
- Film and stretched tape extension
- Phonograph records
- Flexible polyurethane foam
- PVC coated fabric
- UF bonded and laminated board
- Carpets
- Crates
- Bags

With few exceptions, the development of the industry has not proceeded on a planned basis because the majority of the companies have been set up as associates of merchant organizations. Their production has been determined, on a short-term basis, by the immediate replacement of imported manufactured items without thought to export potential even within the CARICOM area.

The largest company is quite different in its outlook. It already exports 20 per cent of its output (PVC pipe and bottle crates) and aims to supply the entire demand for PVC pressure pipes in the Caribbean area. One of the other companies engaged in the manufacture of blow-moulded containers is in the process of setting up new equipment to saturate the existing markets and also to replace metal and glass containers for the packaging of products such as syrup and emulsion paint.

The industry is centered around Kingston so that port facilities are easily available for importation of raw materials and export of finished products. Most of the manufacturing concerns belong to the private sector. Some are joint ventures with foreign companies.

### C. Productivity and quality control

#### 1. Productivity

The productivity of the majority of processing plants is far below the generally accepted standards of similar operations in developed countries. Some of the many reasons for the low productivity are:

- Poor shop-floor supervision
- Inadequate technical back-up
- Poor maintenance facilities
- Difficulty in obtaining replacement parts
- Wrong choice of equipment
- Insufficient market demand

The supervision of the machine operation at the shop-floor level is a very important factor in maintaining both the output and quality of production. It is less important when the market demand justifies only a single day-shift and senior personnel are on hand. But if full productivity is to be achieved, it is essential to have good supervisors for the entire 24-hour period.

The lack of technical back-up impinges on the efficiency in many ways; at the present time most manufacturers rely on their raw-material suppliers for guidance in their plant operation. This reliance restricts development and does not ensure the most efficient use of the equipment. The development of the potential markets requires the availability of technical personnel who can understand the market requirements and can help with the design of products having the required performance characteristics for the job.

The lack of maintenance facilities is reflected in the over-capacity in many of the processing plants. The difficulty in obtaining spares and the excessive time which a machine can be out of action affect the production, which can be maintained only if an alternate unit is available. The lack of training and understanding is mainly responsible for the considerable variation in the quality of maintenance personnel.

In some instances, the most suitable equipment has not been chosen. Where the markets are limited, it is essential to have equipment which is versatile and which can be adapted to meet changing demands. This important consideration should be understood by technical staff who are knowledgeable in the processing of plastics.

The problems connected with productivity will only be fully appreciated as the market develops and the demand for high-quality products at a reasonable price becomes evident. A dramatic improvement in the present low level of productivity is necessary to be competitive in the export market.

It should be noted that there are a few companies which fully recognize these deficiencies and are taking steps to improve their performance.

### 3. Quality control

Quality control is a very important factor. Quality needs to be properly maintained at the production level to standards that are not only acceptable to the local market but are also in line with international standards. The majority of plants do not have the technical facilities essential for the assessment of product quality and consistency of manufacture because of a lack of trained personnel with an understanding of the need for such facilities. The present policy of imports restriction and market protection tends to encourage the production of goods of inferior quality that can only be sold on the home market and have no export potential.

There is a growing awareness of the need to compete and to establish standards which are internationally acceptable. The work of the Jamaica Bureau of Standards will stimulate this although, at the present time, the facilities and experience for the testing of plastics are very limited. The Bureau must be ahead of the industry in its understanding and use of testing methods. It must communicate to the plastics industry its intentions regarding the introduction of standards so that the industry can collaborate in the work which is an essential forerunner to such an introduction.

Where the industry has installed a process, the machine manufacturers normally help with the start-up to ensure correct operation and quality of product. Visits are maintained on a fairly regular basis. In some instances, personnel are sent on a training course to the manufacturer's plant. In many

cases, there are no further attempts at training when the original personnel have left the employment of the company. A probable decline in performance and quality can only be overcome by the introduction of fully recognized standards which will be used as a basis for acceptance in both the public and private sectors.

An awareness for quality of product and control must be inculcated during manufacture at all stages. It can be achieved only by giving due attention and publicity to this aspect.

The Bureau of Standards will have an important role to play in stimulating the awareness for improved and consistent quality. It should be encouraged by visible evidence of support.

#### D. Technological development and engineering facilities

##### 1. Technological development

Technological development is almost completely lacking in the plastics industry. As already indicated, it is essential for the efficient operation of equipment and the production of the right quality goods to meet all requirements. Although there is a great shortage of personnel with the right technological training, steps are not being taken to rectify this situation. The industry presents no attraction to students of higher education levels. It is the aim of most young people to find employment in organizations which offer planned advancement and the opportunity to work in an air-conditioned office.

The lack of technologists has impeded all the sectors of the plastics industry and has prevented it from taking its proper place in the economy of the country. Personnel are urgently needed for process development, improvement in productivity, quality control, product development and market development.

A few companies send men for training to the United States and Europe. If the trained men change employment, replacements are expected to learn on the job.

The wide range of literature on plastics is not accessible. Information is received only from the raw-material suppliers and the machinery manufacturers. An improvement in the availability of technologists would automatically correct this because they would demand such access as one of the tools for their trade.

The engineering staff are an essential part of the team needed for the proper development of manufacturing techniques. There is ample training for engineers. Good training in the basic disciplines can easily be adapted to meet the requirements for plastics fabrication.

#### D. Engineering facilities

The availability of first-class engineering facilities is a prerequisite for the industry, particularly for the supply of dies and moulds. These requirements have been recognized in view of the large importation (\$J 4.5 million) of such equipment for industry generally and the formation of the Toolmakers Institute. The plastics industry has been pressing the Institute for better toolmaking facilities, since at the moment these facilities are limited to a few of the major plastics manufacturers. It is hoped that the Institute will be able to meet these requirements within the next year or two. Although the Institute is limited in experience, the plastics industry is impatient and critical of its performance. The right facilities are being made available and it is only a matter of time before the Institute will be accepted as the major supplier to companies not having their own facilities.

The present situation is rather unsatisfactory, the only efficient tool-making facilities belong to one thermoplastics company who can charge what they like and have immediate knowledge of what their clients propose to do. Some problems and bad feelings have been created because many of the toolmakers were recruited from one of the other companies by offers of higher pay.

#### E. Training

An urgent need for training exists at two levels, i.e. supervisors at shop-floor level and technologists who have a sound knowledge of plastics materials and the conversion processes. The training of supervisors will need to cover basic management skills and give some background knowledge of plastics. The fuller understanding of the process they supervise will have to be gained through on-the-job training. A supervisor can only be effective if he has the respect of his operators. This can be achieved by giving training to the right calibre of men. The College of Arts, Science and Technology (CAST) runs a five-year course (based on one-day release) for engineering supervisors.



Such a course is probably too prolonged for supervisors for plastics manufacturing operations but some action is necessary. One major difficulty is the shortage of proper instructing staff. The top priority, therefore, should be the training of technologists who will subsequently help with the training of supervisors. At the moment, there is neither expertise nor courses which include plastics either at CAST or at UWI. Nothing is planned for the foreseeable future.

One company offers scholarships every year to members of its staff who have reached a sufficiently high standard of training and show the required potential. The scholarships cover full financial support with intensive training for one or two years in the United States or in the United Kingdom. There is no obligation to return to the company after training. Another manufacturer of PE film trains managers of the plastics operations by sending them to the parent company in the United Kingdom for some months.

CAST runs a chemical technology course over a two-year period. The first year covers basic chemistry and the second, a broad coverage of industrial chemical technology. Consideration has been given to adding a specialized third year course but, at the moment, sugar chemistry is regarded as being the most important subject. It would appear that the quickest way of training technologists would be to include a third year course on plastics. Admittedly, there are neither qualified instructors nor equipment at CAST, but under the guidance of an education-based plastics technologist from overseas, the course could start in October 1976. The lack of equipment could be overcome by reaching an agreement with the plastics companies for practical training in factories. There are some individuals in the industry who could be recruited to contribute on a part-time basis. It will not be possible to reach any recognised standards with the initial courses but it should be the aim to qualify for diplomas such as the LPRI (Licentiate of the Plastics and Rubber Institute).

The UWI realises the need to have experience in the various aspects of polymers and plastics but does not have staff with any fundamental knowledge of the subject. There is an interest in materials science, and it is felt that a start could be made by initiation of a research project in this field. The support of UNIDO is not recommended because this is a very long-term project. Furthermore, UWI is not only concerned with Jamaica, and the cost would be out of proportion to the immediate realisable benefits.

The matter of training was discussed with some of the Plastics Group members of the Jamaica Manufacturers Association (JMA). They proposed that a series of short specialized courses should be run under their auspices. This presents some difficulties because it is unlikely that trained instructors would be available, but if any subsequent missions include specialist experts, it would be logical to take advantage of their knowledge and include the presentation of brief lectures in their duties. The JMA was asked to discuss the subjects which would be of most use and submit their proposals in writing to UNDP.

#### F. Market development and export potential

##### 1. Market development

There has been practically no planned market development and the decision to manufacture specific products has been based largely on the replacement of imported goods. Market surveys have been carried out from time to time but these are usually done by consultants from the United States who appear to have little understanding of local market conditions. The surveys are not regarded as continuing exercises. Sales personnel in the various companies do not have the technical expertise to carry out any soundly based inquiries. Consequently, many opportunities in the various areas of application have not been realized.

Film, vacuum-formed and blow-moulded containers and crates are used in packaging. There is a realization of the need to look closely at this area of application because of difficulties which have arisen with the quality and supply of metal cans based on imported tin plate. (A separate mission on packaging will be making specific recommendations about this.) There has been relatively inadequate market development by the blow-moulding companies. There is an excess of capacity and still an annual import of about 3 million bottles. The processors complain that every client wants his own design of package. Production runs are, therefore, very short. Because of lack of technical expertise, there is difficulty in moulding some designs which are required by the multinational companies.

Market development and planning is very much needed. Two companies appear to be setting themselves up to operate more effectively. One company aims to supply a large share of the CARICOM market and recognises the need for the right expertise (plus a wide range of the latest blow-moulding machines).

Another company has indicated its intention to become the major supplier of vacuum-formed packs and is installing new equipment for this purpose. If these companies are to succeed in their declared purpose, then some measure of discipline must be introduced into the packaging industry by the wider adoption of standard packs and much higher prices for "specials".

The manufacturers of PE film for bags and shrink-wraps have not attempted to extend the range of applications. The quality is very poor. Even garbage bags have not proved satisfactory.

There appear to be limited opportunities for plastics in building and construction, except for pipes, in this sector. UF bonded bagasse board is not accepted as a construction material in the Kingston area because of the fire risk, although the Prime Minister has a country lodge built of this type of board. Vinyl flooring is available from a company that supplies terrazzo flooring. The manufacture of vinyl tiles is regarded only as a defensive measure (2,000 square yards per week).

Observations indicated that there should be large potential for this type of flooring, but the quality and design need to be improved, the finish of the substrate is not good enough, and the adhesive used seems to be unsatisfactory for local conditions. A "do-it-yourself" market could be established by proper sales promotion.

The major use is for pipes for water and drainage. One company is organizing to supply the entire CARICOM market. The introduction of a standard for pressure pipes has improved the opportunities, but there appears to be an extensive need for education among the water authorities in order to achieve general acceptance.

Agriculture appears to be one of the areas which could benefit most by a wider use of plastics for applications such as water storage, mulching, water distribution, crop cultivation and handling.<sup>1/</sup> It is surprising that so little is known of developments current in many parts of the world by the experts in the various organizations. The availability of the right types of PE film is a restrictive factor, but there is no reason why studies cannot be initiated using imported products. The agricultural economy is seriously affected by the shortage of water. The Ministry of Agriculture is studying means to alleviate the situation. It is opportune to consider positive support for an evaluation

---

<sup>1/</sup> See annex III.

...ing techniques using plastics and to ensure that the plastics industry and the Bureau of Standards collaborate so that there is a complete recognition of the types of products needed for home-based production.

Woven jute fibres are used for the manufacture of carpets and for sacks. Since the recent closure of one company, it is now necessary to import over 2 million bags at \$J 0.68 per year. In addition, woven PP backing cloth is imported from the United States (over 500,000 square yards per annum). Locally produced woven PP bags are used by the fertilizer industry but the sugar manufacturers still use jute bags, although the PP sacks are cheaper. One disadvantage of the PP sacks is that they are produced on a circular loom and this gives rise to a "pillow" effect when filled causing some stocking problems. This can be overcome fairly easily but would require technological expertise, which is lacking. There are many other possible applications for the fibres, e.g. furniture webbing, tarpaulins (PVC-coated), mail and bank bags and fishing gear that could be explored. It should be possible for this operation to reach its potential of 2-3 million sacks per year if it could supply most of the local requirements where technically feasible.

At present, it is not possible to produce the wide backing cloth for carpets. If plant extensions with new equipment were installed, this could be achieved while at the same time aiming to supply the whole CARICOM jute bag requirements of 7.5 million per year.

#### Export potential

The Commonwealth Fund for Technical Cooperation recently commissioned a firm of consultants to carry out export market development studies for the Jamaica furniture, apparel and plastics industries with particular reference to identifying opportunities for fabricated products in the United States. It was concluded that only limited possibilities existed, although wage rates were lower in Jamaica, because of the low labour-intensive industry, while local processors relied on imported resin and suffered from a lack of up-to-date market development and applicational know-how. They noted the lack of management and supervisory expertise in Jamaica and suggested that the following aspects should be improved: budgeting and cost control, inventory control, production planning and scheduling and costing. It is unfortunate that this survey did not investigate the opportunities which exist in the CARICOM area.

- 11 -

It has already been emphasized that export opportunities exist only if fabricated plastics products can be produced to the appropriate standard of quality and at a competitive price but there would still be a need for an intensive sales policy. The lower wage rates in Jamaica do present some advantages in the world but only when a reasonable degree of productivity is achieved. With regard to CARICOM, the Jamaican wage rates are higher by comparison. The very high freight rates present an additional restriction (despite the establishment of a national shipping line). In the short term, export opportunities, with one or two exceptions, are limited. The plastics industry must, however, aim to improve its performance to that of the major producing countries otherwise it will always be under pressure from superior quality and cheaper fabricated products.

#### G. Rationalization of the plastics industry

It is difficult to indicate precisely where some rationalization may be put into effect without a detailed study of the various areas of application, the market needs and the manufacturing capability. It would appear as if this might be done in two areas: blow-moulded containers and PE film.

At the moment, there appear to be too many companies operating blow-moulding equipment. When new facilities are operating at one plant, there will be more than ample capacity to meet the market demands. Production programming and an efficient technical-sales network are essential for proper use of the manufacturing facilities. It would be logical to consider the blow-moulding manufacturers as one over-all unit, plan accordingly and probably move the equipment of the smaller companies into a new operation. In view of the new facilities which are being brought into operation, it would be wrong to suggest a detailed survey of blow-moulding at this stage. Within a year or so, some of the smaller operations perhaps will not be able to compete. The sector will then have only two or three of the largest, most efficient operators.

At the present time, the film manufacturers are producing material only for packaging applications. Planning should now begin to meet the possible demands of agriculture for heavy-gauge film with good ageing characteristics. The two reasonably efficient film manufacturers should be encouraged to meet the market requirements for all foreseeable grades and types of film. One

Company with a blown-film unit for making banana packing sleeves, should be discouraged from going ahead with this and helped in their objective to become the major supplier of vacuum formed containers. It would be useful if the existing manufacturers could be persuaded to look into the opportunities that exist for other types of film.

#### H. Official agencies

##### 1. The Jamaica Industrial Development Corporation (JIDC)

This body comes under the direction of the Ministry of Industry, Tourism and Foreign Trade and is responsible for the implementation of the Government's policy to "stimulate, facilitate and undertake the development of trade in this island". It has become concerned about the state of the plastics industry, particularly as it is called upon to give its approval to applications for the importation of equipment. The JIDC is not yet immediately involved in the direction of any of the companies concerned with plastics fabrication, but the Toolmakers Institute comes under its control. The Research and Development Department has been concerned with some investigations into various aspects of the plastics industry. The members are most co-operative, helpful and anxious to improve their background knowledge of plastics. The full range of activities of the JIDC are given in annex I.

##### 2. The Bureau of Standards

This organization is still in the formative stage.<sup>2/</sup> It has some good staff and is most anxious to become effective in all aspects of plastics, but at present this is limited to PVC pipe and paint. The Head of the Raw Materials Section will attend the Sixth Training Programme in Plastics Technology sponsored by UNIDO. It is essential that the Bureau extends its activities in pipe testing and starts to undertake development programmes to get a better appreciation of the performance of plastics pipe under local conditions. For example, the PVC pressure pipe being produced in Jamaica is white, whereas most countries use grey. The Bureau should start to investigate the ageing of such pipes when they are stock-piled in the sun prior to installation.

If it is confirmed that there are many applications for heavy gauge plastics films in agriculture, work should begin to establish if the standards adopted, for example, in France are relevant to the conditions in Jamaica.

<sup>2/</sup> See annex II.

The Bureau is very strong in its activities concerned with food technology, and in view of the probably rapid growth in the use of plastics in the area, it will be important for it to have a full understanding and test facilities for the evaluation of plastics containers for this application.

3. The Jamaica Manufacturers Association (JMA)

This represents the manufacturers of the country and is sub-divided according to the particular industries. The Plastics Group has a membership of 25. The mission held a meeting with the group, but only four members attended. The secretary is very efficient and hard-working, but members are only inclined to meet in the event of a crisis such as a shortage of raw-material supplies. The Government recognizes the association as representing the private sector of industry in the country and the President has just been appointed to the Governing Board of the JIDC. The Association must appreciate the need for training. It would be helpful if any future UNIDO experts in plastics technology could arrange to give at least one or two lectures to members and their staffs.

## II. RECOMMENDATIONS

The following recommendations are limited, at this stage, to those which are considered practical and achievable in the short term taking into account the present state of the plastics industry in Jamaica:

1. Run a short course (about one week) on the use of plastics in agriculture and for water conservation. Supply adequate quantities of various films and irrigation equipment for practical demonstrations immediately following the course;

2. Supply the Bureau of Standards with:

Complete range of pipe testing equipment

Equipment for measurement of basic plastics properties, e.g. melt flow index

Properly organized outdoor weathering equipment (the Bureau has already ordered a weathermeter)

Equipment for evaluation of films for agricultural use

An extension to the laboratory to accommodate the above

The services of a plastics physical testing expert for three months

3. Organize a third-year course on plastics technology at the end of the chemical technology course. This would need the services of a plastics educationalist for at least six months. Award six scholarships for training technologists overseas for a two-year period of work towards an academic goal;

4. Consider the proposals to be submitted by the JMA regarding special short courses on plastics.



Annex I

JAMAICA INDUSTRIAL DEVELOPMENT CORPORATION

The organisation has been the main instrument of the Government in its implementation of the policy of industrialisation over the last two decades. A statutory institution under the portfolio of the Ministry of Trade, Tourism and Foreign Trade, it is totally involved in all facets of industrial development:

Administers Government's industrial incentive laws

Advises Government on a wide range of industrial problems

Promotes the establishment of new industries

Owms and operates industrial establishments

Advises and negotiates with local and overseas investors on the setting up of industrial projects

Assists the expansion of existing industrial enterprises

Encourages and assists small businessmen to establish manufacturing concerns

Undertakes continuous training within industry

Provides factory space on long-term lease basis

It comprises some 17 departments which include the Toolmakers Institute, economic research, management and technical services, training, and food technology institute.

- 12 -

Annex II

THE BUREAU OF STANDARDS

The Bureau of Standards was established by the Government of Jamaica in 1969 under the Standards Act, 1968. The responsibilities of the Bureau are to promote and encourage the maintenance of standardization in relation to commodities, processes and practices and also to:

- (a) Make recommendations to the Minister in respect of the formulation of specifications and the promulgation and application of standard specifications and compulsory standard specifications;
- (b) Promote research in relation to specifications and to provide for the examination and testing of commodities, processes and practices;
- (c) Provide for the registration and use of standard marks;
- (d) Provide for the examination, testing and calibration of instruments, appliances and apparatus in relation to the accuracy thereof;
- (e) Encourage or undertake educational work in connexion with standardization;
- (f) Make arrangements for the inspection of any operation which is being carried out in or upon any premises in connexion with the manufacture, production, processing or treatment of any commodity, process or practice for which a standard specification or a compulsory standard specification has been declared;
- (g) Do such other things as may be expedient or necessary for the proper performance of its functions under this Act.

The Bureau of Standards, in recognizing the lack of application of modern technology in industry in general, has been assuming a leadership role in expanding existing industry and assisting new industries to develop by the introduction of new manufacturing techniques and effective process controls through Jamaican standards. This leadership role has not been extended to the plastics industry because the expertise within the plastics industry, although limited, exceeds the expertise at the Bureau of Standards. The situation has arisen, not so much from the high level of expertise in industry, but from a lack of professional exposure and industrial experience, coupled with a lack of formal and specialized training in plastics technology and fabrication in Bureau personnel.

As yet there are no Jamaican standards for plastics or plastic commodities except in the case of PVC pipes, but international specifications are available for testing and reference. During the period January-July 1975, only 7.5 per cent of the products tested in the relevant laboratories of the Bureau were of

plastic. The products were PP rope, PE garbage disposal bags, PVC bottles, PP bottles, PVC water pipes and acrylic bathroom fixtures. In the past the laboratories have tested other plastics products such as PS egg containers, PVC uppers for shoes, handbags and shower curtains. Samples are tested to manufacturers specifications when requested or to international specifications.

The following equipment is used for testing plastics and plastic products as applicable:

- Avery universal tester to measure the tensile strength and percentage extension; and for carrying out compression tests
- Ballistic tear tester to measure the tear strength of plastic films
- Mullen bursting strength machines to measure bursting strength
- Hardness tester to measure hardness
- Torsional tester to measure the stiffness of non-rigid plastics at a given temperature
- Hydraulic pump to measure hydrostatic burst pressure of PVC pipe
- Compressive strength machine to determine resistance to flattening of PVC pipe
- Oven and deep freezer to determine reaction to thermal shock of plastic (acrylic) fixtures
- Clamp stand with  $\frac{1}{2}$  pound steel ball to determine impact resistance of plastic (acrylic) fixtures

The Bureau's potential for influencing the Jamaican plastics industry has not been realized because of a lack of expertise within the Bureau itself. This is best illustrated by the inability of the Bureau to fully satisfy the requests from the plastics industry for assistance in:

- Standardization of products
- Quality control systems
- Guidance in development of new products
- Methods of maximizing existing equipment and machinery
- Adapting plastics products for use, e.g. in agriculture and housing

The Bureau of Standards, in recognizing its inability to fulfil its role in the plastics industry and the unfavourable effect it will have on the future expansion, seeks to rectify the situation by the following means:

- Specialized training of Bureau personnel in plastics technology, fabrication, quality control and testing
- Acquisition of modern testing equipment

Industrial experience

Expansion of present building facilities

Expansion of staff

Unlike many other national standards institutions, the Jamaican Bureau of Standards is wholly financed by the Government and its activities are therefore seriously affected by the state of the annual budget and Government's policies. The current tight financial constraints on all government institutions will, undoubtedly, delay the achievement of our recommendations.

Annex III

NOTES BY THE AGRICULTURAL EXPERT

This short mission was effectively shortened because of inadequate pre-planning. Thus, not enough time was available for discussion with government bodies and a regrettably small amount of time was spent in the field. Contacts that were made suggested an alert interest in the potential of plastics materials in agriculture, and a willingness to try out new techniques. Some indications, both specific and general, of ways in which plastics can help to develop Jamaican agriculture are made below.

Many of the major uses of plastics in agriculture and horticulture involve the use of wide seamless PE sheeting in widths of up to 36 feet in 500 gauge (0.005") and 24 feet in 1,000 gauge (0.01"). At the present time, the maximum width of PE sheeting made in Jamaica is 6 feet, although one manufacturer is considering installing equipment to make film in widths of up to 12 feet.

The plastics pipe industry (HD-PE, LD-PE and PVC) should be capable of keeping pace with the expected demand for water supplies on farms, and for drip or trickle irrigation systems which are likely to proliferate in the near future. UNIDO can offer considerable practical assistance to the Jamaican plastics industry by advising on quality standards for plastics materials to be used in agriculture.

The production of bananas and sugar is of paramount importance to the economy. Bananas are grown on such a large number of farms that the initiation and supervision of any improved cultural techniques (even adequate fertilization) present difficult advisory problems. The technical staff of the Banana Board are fully aware of the potential for plastics and are currently investigating:

- (a) The use of PE sleeves over the stems (fruit) during the growing period, an established technique in the banana growing areas;
- (b) The use of foam plastics materials to protect fruit from the field to the packhouse;
- (c) The transport of bananas in rigid PP crates;
- (d) The encapsulation of measured amounts of fertiliser in micro-perforated PE bags which, when shallowly buried, provides nutrients in solution for a period of up to nine months and prevent wastage by leaching;
- (e) A drip irrigation system, using plastics tubing.

The accelerated growth which has occurred over the past two years has stimulated interest in irrigation (both overhead and drip or trickle) and in the storage of water on farms in both large and small reservoirs. Plastics materials can be very helpful in the catchment, storage and distribution of water. The expert was most impressed by the high cultural standards on the site used to grow anthuriums. The European and North American market for exotic blooms is growing and appears to be insatiable. Assistance in developing floricultural enterprises of this type could result in an improved balance of payments situation.

#### Specific applications of plastics in agriculture

With the current and proposed developments in agriculture, there is urgent need for low-cost water collection and storage facilities.

At Mandeville, one exposed-membrane, butyl rubber lined reservoir with a capacity of 160,000 imperial gallons has been in use since April 1973. On the same site, a catchment area lined with 800 gauge (0.08") PE film, covered with 1/2"-3/4" limestone aggregate has been in operation for the same period. As far as can be ascertained, this is the only large-scale water catchment and storage unit involving the use of plastics currently in operation in Jamaica.

No waterproof membrane of flexible plastics film has so far been used as a lined membrane. This proven technique should be demonstrated in Jamaica at the earliest possible opportunity.

It was understood from the JIDC that fish farming is practical on the island. It is likely that plastics-lined ponds could be useful to this industry, but time did not permit an investigation.

Quite large areas of land are irrigated with conventional rotary sprinklers. Drip irrigation of crops such as bananas, coffee, and all-spice could prove profitable and more economical of water in some areas. Since many, if not all, components for drip irrigation systems can eventually be produced in the country, progress in this direction will benefit both the plastics industry and agriculture.

In the short-term future, it seems unlikely that a greenhouse industry like that existing in Europe or the United States will develop or should be encouraged. When erected, greenhouse structures are likely to provide simple rain protection rather than a more completely controlled environment. There would appear to be a need for plastics greenhouses for propagating plants.

Plastics sheeting can be used to provide shaded areas (comparable to that offered by glass houses) for the protection of plants, particularly when growing ornamental plants or nursery stock. Narrow width plastics sheeting, locally produced, could be used for this purpose. The bamboo structures in current use, however, appear to be effective and inexpensive.

The mild climate of Jamaica would probably limit the widespread use of low tunnels, row covers or continuous cloches. However, it is a technique which should be examined for the propagation of those plants grown from soft-wood cuttings and for the protection of newly-grafted plants.

Several million gusseted PE film bags, with a diameter of about 6" are used for the production of plants of coffee, cocoa, mangoes and avocado. All these "pots" are manufactured in Jamaica. Some are not made to a very high standard, e.g. the film does not contain sufficient carbon black to resist ultra-violet degradation when used outside. The possibility of introducing a standard for PE film pots was discussed with the Bureau of Standards.

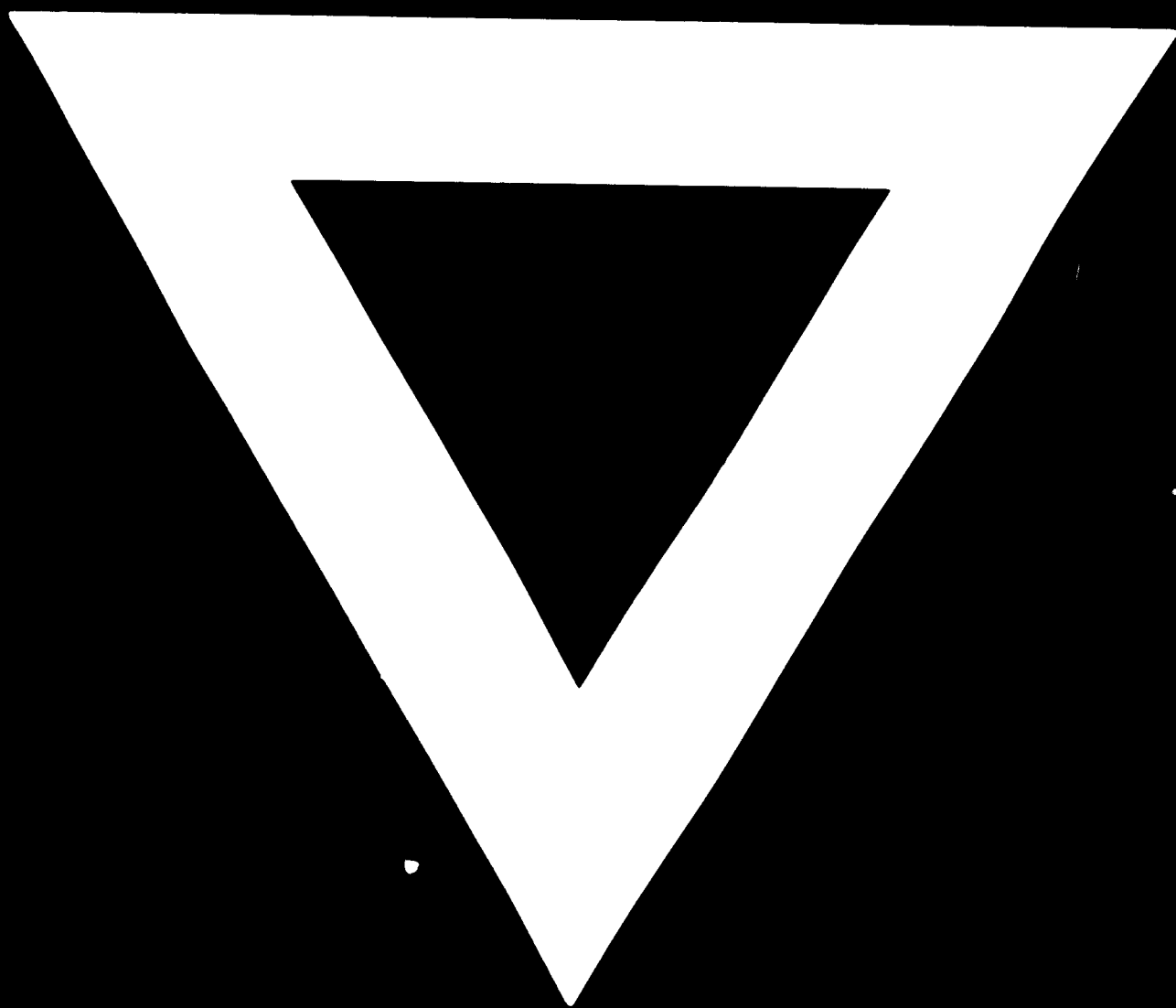
Plastics mulching could prove very rewarding in Jamaica for some crops by providing weed control and moisture conservation. It is a method of growing which complements drip irrigation systems, and PE films of suitable quality can be produced locally.

In the time available, it was impossible to assess the importance of soil fumigation or whether the fumigants used would justify the use of PE sheeting in either narrow or wide seamless widths in order to prevent waste and improve efficiency. Similarly, no investigation could be made into grain losses during storage or whether plastic fumigation sheets are used as a routine measure.

Time did not permit an examination of grain storage. It is possible on small farms that low density PE sacks could provide short or long-term storage for cereal grains.

Apparently, this technique of conserving green fodder crops has a long history in local agriculture, although its popularity has declined in recent years. The use of PE sheeting as an air-tight sealant during storage could be very beneficial and also permit the ensiling of small quantities of fodder, when it becomes available, at any time of year. Wide seamless PE sheeting, not currently available, is almost essential for efficient, low-cost, conservation.

In the course of two illustrated lectures, some interest was roused in the use of low-cost farm buildings, roofed with heavy (500-1,000 gauge) black PE sheeting. Locally made material could be used for this purpose.



**76. 01. 21**