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09049

DP/ID/SER.A/202
28 June 1979
English/Spanish

PLASTICS IN AGRICULTURE*.

DP/MEX/78/017

MEXICO.

Technical report: Assistance in the preparation of this large-scale project

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

Based on the work of A. D. Clarke, expert of UNIDO

United Nations Industrial Development Organization

Vienna

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id. 79-5428

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1. Summary

A three day meeting for discussions was arranged by the Centro de Investigacion en Quimica Aplicada (CIQA) as the first activity in the implementation of their UNDP supported project on "Plastics in Agriculture". Four UNIDO experts made individual presentations. As a result of these discussions, the experts then advised CIQA on the detailed work programmes which should be implemented to enable the project to proceed effectively.

One recommendation has been made.

2. Recommendations

It is strongly recommended that the Mexican National Council for Science and Technology (CONACYT) be officially given the responsibility for implementing the necessary co-ordination between all parties with a common interest in the development and application of plastics in agriculture. Without such co-ordination, experience has shown that time, special skills and resources are needlessly wasted and the transfer of technology is limited.

3. Introduction

Four experts, Mr. A.D. Clarke, Dr. M. Guariento, Dr. G. Pruzan and Dr. B. Werminghausen, took part in a three day informal seminar organized by CIQA at which some nineteen papers were presented. These covered a wide range of subjects from the weather and conditions in the regional semi-arid area, social aspects, statistics of the current state of the plastics industry and details of current work programmes where plastics in agriculture are being used. Mr. M. Youssef, UNIDO staff member, gave a short introduction of UNIDO's participation in the CIQA project of which this meeting represented the first activity.

The experts then held detailed discussions at CIQA with six staff members to finalize the details necessary for the execution of the project. Each expert prepared a report and this report represents a summary of their observations.

A. Findings

There is much very skilled and competent work being undertaken in Mexico, both by the public and private sectors, which involve the use of plastics in agriculture, the items on rainwater harvesting and on advanced methods of irrigation were outstanding. However, the all familiar pattern that has been

observed in other countries was in evidence here, namely no centralised co-ordination of these activities. Thus scarce and valuable trained manpower resources are being wasted.

The Mexican Committee for Agriculture, although active, seems to have lost the support it had some two years ago when they organized the first National Meeting on Plastics in Agriculture. Efforts are being made to rectify this.

Much of the experimental work undertaken suffered through poor quality plastics being used, and these were produced in Mexico. There appears to be a lack of norms and of quality control. This situation has to be rectified and the determination of product parameters of performance for agricultural applications is one of the areas of CIQA's project. There is also a requirement for upgrading of plastics processing sector personnel through training programmes.

It is strongly recommended that the responsibility for implementing the necessary co-ordination between the Ministry of Agriculture experimental institutions, the extension service, the Ministry of Industry's interests, the polymer producers, the processing sector, farmers and growers' interests, CIQA and other interested organizations should be officially placed with CONACYT, the Science and Technology Council of Mexico.

Experience has shown that without such co-ordination, the whole research effort is dissipated and only a few people receive the benefits that can be obtained from such work. Through a co-ordinated effort, all work to a common goal to achieve higher agricultural outputs and thus more profit for the farmers and growers, particularly at the medium, small and peasant levels.

The experts were in agreeance that CIQA must get their growing programme started by October 1979 and full discussions took place regarding the layout of the agricultural plot, the type and range of experiments to be undertaken, as well as details on how the crops for these experiments/demonstrations should be selected. It was agreed that the project co-ordinator should be made available for the project in August 1979 and a plasticulture expert in September 1979, so that they would be available for the start of the practical work involved.

Copies of the individual expert summaries of papers presented and their observations are included as Annexures to this report, together with details of the agenda of the three day meeting. A summary of the sessions from 7-8 June 1979 is also included as an annex.

UNIDO MISSION TO CIQA AT SALTILLO, 4-8 JUNE 1979

1. Summary of an informal talk

An informal and illustrated talk reviewing agricultural applications of plastics in developing countries was given. This covered the use of greenhouses, tunnels, mulching, reservoirs, canal lining, water distribution, irrigation systems and some miscellaneous items as nets, wind screens, and plastics components for spray units.

Information regarding quality of plastics and the need to make to performance standards to guarantee the farmer/grower an effective material was stressed. Methods of utilizing re-cycled material in other countries was outlined and some of the agricultural applications where this has been used, was discussed.

The need to co-ordinate activities in the development of plastics in agriculture through National Plastics in Agriculture Committees was stressed. The prime need to develop a bridge between the Ministry of Agriculture and the Ministry of Industries through their representation on a National Plastics in Agriculture Committee was made as experience has shown that without this bridging and inter-ministry co-operation, the transfer of the technology to the farmer does not effectively proceed. It was pointed out that plastics are being used as a tool in increasing agricultural productivity and each and every application has to be tested in each country's conditions to establish both its suitability and its economic effectiveness. The problems that can arise if this is not done, were also illustrated.

2. Observations

a) The comments made by various speakers indicated that the plastics processing industry does not produce to standards or operate quality control procedures for materials used in agricultural applications. There appears to be a need for training within the plastics processing sector if the industry is to effectively develop its products to meet the agricultural requirements. It can also therefore, be suggested that these deficiencies will also reflect in other application areas where product performance is of prime importance.

b) Although there is a Mexican Plastics in Agriculture Committee which effectively organized a national congress two years ago, it has recently lacked industry support to organize a second congress which was scheduled for this year. There is no representative from the Ministry of Agriculture or the Ministry of Industry on this committee. Such representation is required through the appropriate national research institution and extension service.

c) The papers presented show that there are intelligent skills currently being effectively utilized in carrying out various research and development programmes in selected areas of the application of plastics in agriculture. Both the public and private sectors are involved in these developments but it is very clear that these scientific efforts are not co-ordinated into a national development operation, thus losing the maximum benefits which could be gained.

The work that has been undertaken is in the main objectively oriented and well performed. To maximize these development efforts, it is recommended that CONACYT, the Central Organization for Science and Technology would be the most appropriate body to whom responsibility for achieving the necessary co-ordination should be given.

d) The need to involve the Agricultural Extension Service at an early stage in these types of developments, does not appear to have been appreciated. It is necessary that a link be established between these research and development programmes and the agricultural extension service since they need to be trained in the nature of plastics materials and their specific properties while on the other hand, they can normally make valuable contributions of a practical nature to the programmes being undertaken. Additionally, closer links with plastics processors also appears to be desirable to avoid some of the quality problems that have been currently experienced.

e) CIQA's project will provide a centralised centre for information on plastics properties as well as being able to develop formulations to meet specific needs. Its programme of demonstrations will enable it to develop first-hand information on the physical performance of plastics, as well as a first-hand knowledge of the agricultural problems. Thus CIQA should eventually be able to act as the technical bridge between the plastics processors and the agricultural research institutions as well as with the ultimate user - the farmer.

PLASTICOS EN LA AGRICULTURA

by Gregorio Pruzan

A) RESUMEN DEL TRABAJO PRESENTADO EN LA REUNION DE SALTILLO

Luego de compliar conceptos con respecto a las diversas posibilidades de aplicación de los plásticos en la agricultura, variedad de materias primas, utilizadas y productos obtenidos, se consideraron aspectos que hacen al éxito o fracaso de diches aplicaciones.

Se suminestraron ejemplos como los de pelinelas y tuberias plásticas, teniendo en cuenta las etapas para su producción y utilización: materias primas, proceso de transformación, control de producción y calidad, oportunidades y tecnologias de aplicación.

Para cuda una de las etapas se mencionó la responzabilidad que le cabe a sector que participa del proceso, y la necesidad de aunar esfuerzos.

Se enfatizó en la necesidad de contar con normas que asejuren al usuario disponer de los productos que le permitan aplicarlos con éxito, además de la necesidad de disponer de instrucciones adecuadas para aplicarlos.

Con respecto a la industria plástica destacaron los principales problemas conque la misma cuenta para asejucar su eficiente desarrollo. Trazando un breve panorama de las necesidades comunes a muchos paises en vias de desarrollo como en el caso de los de Latinoamérica.

La capacitación de los mireles medio y superior se consideró como factor indispensable para la solución de una gran parte de los mencinados problemas.

Se hezo referencia a la acción que desde hace 15 años está llerando a Cabo el Cometé Internacional de Plásticos en la Agricultura (CIPA), apoyando y difundiendo los propesos lopados en distintos paises en la utilizacción de los plásticos en el agro.

Tambien se señaló la cooperación que ha biendado ONUDI en diversos projectos relativos a la industria plástica, señalando algunos ejemplos de la labor que está llevando a cabo en Latinoamérica.

Teniendo en cuenta lo expuesto se señalo el importante papel que desempeñará CIQA para contribuir al desarrollo agricola con la participación de los materiales plásticos, en el campo de la investigación aplicada, cuyos positivos resultados serán beneficiosos para el pais desde el punto de vista social y económico, tomando como ejemplo lo lopado ya en muchos otros paises.

Se señaló por otra parte que siendo la mayor parte de los nosuncos de la industria plástica de origen petroquimico, el desarrollo que México ha previsto para este sector brindará mayores posibilidades para que los plásticcs cooperen con el desarrollo agricola e industrial des pais.

B) BREVES COMENTARIOS SOBRE LA REUNION ORGANIZADA POR CICA

Los trabajos presentados por los participantes y las posteriores discusiones pueden dividirse de la siguiente forma:

a) Caracteristicas de las zonas semiáridas y sus requerimientos;

b) Situacción actual de la petroquimica, de la industria plástica y de las aplicaciones en la agricultura mexicana;

c) Planteamiento accerca de la necesidad de controles, normas y respaldo técnico.

a) La información refenda a las zonas semiáridas de México, ha resultado de utilidad para la misión de CICA que se ha interconizado de los principales problemas que afectan a dichas regiones, de algunas de las soluciones que se hace empleado y de las necesidades prioritarias que se basan principalmente en el manejo de agua (reservas, transporte, distribución y riego) y en la protección de cultivos (invernaderos, túneles, redes antigranizo, etc.), en cuanto a la utilización de plásticos se refiere.

b) La actual situación de las industrias petroquimica y plástica, presenta favorables perspectivas para cooperar en la solución de los problemas señalados mediante las tecnolojias que emplean plásticos. Deberá para ello estar en condiciones de suministrar al sector agricola, productos con adecuados niveles de calidad para satisfacer las exigencias técnicas y económicas correspondientes a cada una de las aplicaciones.

c) Como requisito para complir con lo auterior, deberá disponerse de materias primas ademadas, procesos de transformación correctos, controles de producción y caledad, y normas para aseguras la constancia de la misma, además de los conocimientos necesarios para la eficiente aplicación de los productos plásticos en la agricultura.

Scugio de las reuniones, la necesidad primordial de contar con personal capacitado en sus distintos niveles, tanto de los que se desempenan a nivel de producción, como los que están afectados al desarrollo, divulgación y asistencia técnica de los plásticos en la agricultura para asesorar adecuadamente a los potenciales usuarios oficiales y privados.

Otro aspecto que ha sido planteado fué el relacionado con la receptividad de los productos plásticos por parte de los agricultores y campesinos, quienes segien se manifestó deberán contar el apoyo crediticio necesario para facilitar la adquisición de los productos e instalaciones.

C) Conclusiones

Se considera positivo el saldo de la reuniony buen punto de partida para la irriciación de las actividades del proyecto Plásticos en la Agricultura.

Evidentemente que para lograr resultados satisfactorios, CIQA tendrá que contar con la cooperación de los organismos oficiales y privados relacionados con el que hacer agropecuario y con la industria plástica.

Se estima que hubiera sido conviniento que las reuniones comentadas, participaran también pequeños y medianos agricultores para lograr un mejor complemento de la información intercambiada.

Lamentablemente el intenso programa desarrollado no posibilitó desponer de tiempo para efectuar visitas a las áreas de cultivo que ya emplean plásticos, y establecer contacto directo con actuales y potenciales usuarios.

Debe destacorse la calidad de lo mayor parte de los trabajos presentados por los profesionales mexicanos, como así también el nivel técnico de los mismos, aspecto que sin duda es favorable para lograr los objetivos del proyecto; llevando a cabo a través de CIQA y otros entidades que cooperen en el mismo, un programa consolidado en forma ordenada, coherente y continua.

PLASTICOS EN LA AGRICULTURA

de Manlio Guariento

A) TRABAJO PRESENTADO - RESUMEN

El trabajo presentado se refería a la actividad del Centro de Tecnología Agraria de "Montedison Servizi Agricultura SPA", de Mantova y a las aplicaciones de los plásticos en los cultivos protegidos.

Todo lo expuesto ha sido relacionado con la creación del Centro de Plasticultura correspondiente al proyecto "Plasticos en la Agricultura" a cargo de CIQA, Saltillo.

Después de poner en evidencia las dificultades que este tipo de desarrollo puede presentar y de haber sugerido diversas soluciones para superarlas, se ha indicado con diversos diapositivos y explicaciones sobre cada uno, las tres direcciones que el desarrollo de las investigaciones debe seguir en cuanto a los cultivos protegidos.

1. Investigación sobre materiales plásticos utilizables en las diversas aplicaciones: cultivo en invernaderos, acolchado, irrigación y protección del viento, granizo y del exceso de luz;

2. Investigación sobre las estructuras portantes con el objeto de hacer posible el mejor uso del material plástico más adaptable al tipo de cultivo elegido;

3. Investigación sobre la tecnología del cultivo y por lo tanto sobre variedades y tipos más adaptables, sobre fertilizantes, sobre pesticidas, sobre estimulantes, y sobre las operaciones propias para cultivar.

B) IMPRESIONES RECOGIDAS DE LAS REUNIONES Y RECOMENDACIONES

Durante la exponición del trabajo presentado y las discusiones porteriores, se ha intentado crear la conciencia de las dificultades que, según las impresiones recogidas de los participantes mexicanos encontrarán, quienes llevena cabo tareas de investigación y est´en vinculados a este desarrollo.

Según lo que se ha manifestado en las conferencias, la propiedad de la tiena está muy fraccionada; los agricultores carecen de capital para inversiones; la subención ofcial se efectúa solo para obtener productos de primera necesidad con lo cual el campesino obtiene los recursos mínimos para su subsistencia; la asistencia tecnica practicamente no se lleva a cabo; se desconveen las asociaciones agricolas.

En estas condiciones, hacer investigaciones para divulgar la producción agricola de alto precio y rentabilidad que requiere altas inversiones, es una actividad que solo prestará utilidad por el momento para que los

organismos oficiales y empresas con disponibilidad de capital, puedan recibir información y orientación para realizar obras de importante valor social con intervención de aquellas entidades que quieran mejorar el nivel de vida del campesino.

Esto traerá como consecuencia detener la migración de la población rural a las ciudades, favoreciendo en cambio el regreso al campo y el desarrollo de actividades complementarios con efecto multiplicador.

Para lograr estos objectivos, es necesario que el trabajo de investigación sea apoyado e incentivado por: una vasta, aunque difícil de realizar, acción de propaganda social para promover la creación de asociaciones y cooperativas; una actividad promocional dirigido a los poderes públicos y financieros para sensibilizarlos sobre la necesidad de ayudar al desarrollo de la plasticultura en gran escala con los frues sociales mencionados anteriormente; una preparación de técnicos que pueden dar asistencia a los agricultures en la actividad de los cultivos protegidos.

Muchos de los participantes han hecho senter su intusiasmo y buena desposición para trabajar en este sentido. Tomando en consideración dicho entusiasmo, sobre todo en personas jóvenes, desarrollar los cultivos protegidos con plásticos en gran escala, aunque difícil no parece imposible.

PLASTICS IN AGRICULTURE

by Bernhard Werminghausen

In my paper I discussed the use of plastics in Agriculture in Germany, placing the emphasis on water conservation and irrigation, also that 90 of the work done at my station is aimed directly at the farmers.

With slides I demonstrated how greenhouses are constructed and talked about the different runnel systems also how to use the perforated "Flat-Film" 12 m wide, 0.05 mm thick, perforated with 500 holes per m² - for the protected cultivition of vegetables including potatoes.

I mentioned the importance of mulching especially in semi-desert regions and showed how mulching can be used on corn, beans, cucumbers and strawberries also how this same technique can be used in nurseries, vineyards and forestry.

I talked about the production of winter fodder (silage) using a white coloured u.v. stabilized pe film and showed how film tubes (pipes) (2,10 m) can be easily used for the storage of grain, fertilizers and other produce. I also mentioned the method and use of the silo-press.

On the subject of films far pond and reservoir lining I showed how the water can be transported and distributed with the help of pipes made from PVC and PC. I also showed that the installation of these pipes can be done by unskilled labour, thus reducing the cost of irrigation.

On the topic of drip-irrigation, I showed the results of the work carried out at Limburgerhof, and explained the different types of trickle-drip-irrigation systems, and under-lined the importance of good filters to obtain clear water.

The shredded waste of expanded polystyrene, "Styromull", can be used as a drainage filter. By using Styromull in slit-drainage and the water retaining "Hygromull", the structure and fertility of the soil can be improved.

I also showed how flexible drain-pipes can be installed by pulling them through the ground thus eliminating the digging of ditches.

A) Discussion

The participants showed a great deal of interest in the use of plastics in agriculture, particularly in the part that plastics can play in a more economical use of water.

It was stressed that the quality of the plastics materials made in Mexico must be improved particularly in pipe and film.

It was strongly recommended that the farmers should be sold a complete package and taught how to use it so that unskilled labour may be employed in installing the system.

B) Recommendations

Research on all applications must go on and experiments should be carried out not only in Experimental Stations but on the farms.

Agricultural Advisers must be trained in the use of plastics and the information must be published either by Newsletters or better still transmitted by T.V. or radio. This way the farmer will learn that by the use of plastics in agriculture he can increase his crop yield thereby improving his income and standard of living.

In my opinion it was a very good idea to hold this Conference, it is necessary to bring together the various interested sections of people i.e. the Plastics Industry, the Extension Service, Research workers, farmers and growers. Unfortunately no farmers were present.

A lot of good work is done in Mexico but it is not transmitted to the people working on the land.

There must be established some form of communication and co-operation between all interested partners and I feel that the further help of UNIDO is vital to accomplish all that is necessary in bringing this about.

I also feel that assistance from UNIDO is necessary to upgrade the farmers and thereby the whole population of Mexico will benefit.

CONFERENCIA PLÁSTICOS

Junio 4 de 1979

9:00-10:00 A.M.	Ceremonia de Inauguración Palabras Dr. Enrique Campos López Mr. M. Youssef Lic Sergio Piñas Ing Ricardo Medina	 CIQA ONUDI SRE CONAZA
10:00-11:00	Plenaria Dr. D. Clarke	
11:00-11:15	Receso	
11:15-12:15	Plenaria Dr. Gregorio Pruzan	
12:15-12:45	ANIPAC	La Industria de Transformación de Plásticos. Ing. Joaquín García M.
	COMIDA	
15:00-15:30	ANIQ	La Industria de Polímeros Ing. Sergio Barranca
15:30-16:00	IMP	Ing. Celestinos
16:00-16:30	CIQA	Análisis de Plásticos M.C. José Luis Angulo
	RECESO	
17:00-17:30	ITESM	Aspecto Social de la Utilización de los Plásticos en las Zonas Marginadas del Desierto. Dr. Hugo Velazco Molina (ITESM)
COKTAIL		

5 de Junio

9:00-10:00	Plenaria Manlio Guanciento
10:00-11:00	Plenaria Dr. Bernard Wermingshausen (BASF)
11:00-11:30	Receso
11:30-12:00	PLASTICULTURA EN MEXICO Ing. Gato Carretero (COMEPA)
12:00-12:30	EL PLASTICO EN LA GANADERIA Ing. José Luis García (PROMAFOR)
12:30-15:00	USO DE PLASTICOS EN FRUTICULTURA Ing. Francisco Carvahlo Contreras (CONAFRUT)
	COMIDA
15:00-16:00	DESCRIPCION DEL DESIERTO CHIHUA- HUENSE Ing. José Luis Escalante (DETENAL)
16:00-16:30	DIAGNOSTICO AGROPECUARIO COAHUILA Dr. Herminio Montelengo (SARH)
16:30-17:30	CENAMAR Ing. Efraín Peña
17:30-18:00	Dr. Jaime Leal (ETERNOMATIC) Compañía de Sistemas de Riego Para la Agricultura
20:00	C E N A

Junio 6

9:00-10:00	Dr. Lawrence D'Silvest
10:00-10:30	
10:30-11:00	
11:00-11:15	Receso
11:15-12:15	Plenaria Dr. Frank Harris Controlled Release Society)
12:15-13:15	
	Comida
15:30-16:00	PROYECTO PLASTICOS EN LA AGRICUL TURA Dr. Salvador Fernández (CIQA)
16:00-18:00	Mesa Redonda.

LIST OF ABBREVIATIONS

ANIPAC	National Association of the Plastics Industry
ANIQ	National Association of Chemical Industries
CENAMAR	National Centre for Advanced Methods of Irrigation
CEPA	Plastics in Agriculture Experimental Centre
CIQA	Centre for Investigation in Chemical Applications
COMEPA	Plasticulture in Mexico
CONACYT	The Mexican National Council for Science and Technology
CONAFRUT	The National Fruiticulture Commission
CONAZA	National Commission for Arid Land Studies
DETENAL	Director for National Territorial Studies
DGEA	Department of Agriculture, Extension Service
IMP	The Mexican Plastics Institute
ITESM	Technical and Advanced Studies Institute Monterrey (Private University)
ONUDI	UNIDO
PEMEX	Mexican Petroleum
PRONAFOR	The National Fodder Programme
RAN	Arid Northern Region
SARH	Hydrological Resources and Agricultural Secretary
SRE	Foreign Office Relation Secretary
UNAM	Autonomous National University of Mexico

PLASTICS IN AGRICULTURE

WORKING SESSIONS

JUNE 7-8, 1979

After the working sessions for the analysis of the Plastics in Agriculture Project, held between ONUDI experts and CIQA personnel, the following conclusions were obtained:

- The Project should start immediately and will be considered in two operational stages:
  - . Implementation Stage I from June to December 1979.
  - . Development and Transfer Stage II from January to December 1981.
- Recommend the nomination of Dr. Gregorio Pruzan as the Project Coordinator.
- To postpone the study tour of CIQA's personnel for February (last week) to April (first two weeks).
- Recommend the nomination of Dr. Manlio Guariento as the plasticulture expert, for one month period starting at the end of August of 1979.
- Certain pieces of equipment will be ordered after specifications which will be sent by the experts in plasti culture. Rest of the equipment will be ordered immediately following review of specifications by CIQA and UNIDO.
- For the Implementation Stage, CIQA is to carry out the following activities, before the arrival of the experts:
  - . Economic analysis of local market crop, getting year around as well as several years.
  - . Prepare land and services for the establishment of the Experimental Station.
  - . Start acquisition of materials (films, pipes, accesories and other implements as frames, etc.), also start to prepare biological material (seed, etc.)
  - . To get designs of the structures that will be constructed.

It is highly recommended that all the activities be followed at the required time schedules. Coordinator and required expert must be available to CIQA on demand.

Additional information for equipment specifications

1. 32 mm. Multi-purpose extruder, variable speed control, fitted with bottom fed die, center mandrel for blow film processing. Should be part of a modular equipment universal extruder.

   a) Final diameter of the tube 30 cm.
   b) L/D, 20:1 or more.
   c) Single phase 220 volts, 60 c.p.s.
   d) Metric connections.
   e) To extrude low density PE and flexible PVC.

2. Adjustable slot cooling ring for item 1.

3. Film assembly unit with adjustable height nip-rolls, take-off unit for center and surface wind-up and equipped with air blower and attachment for items 1 & 2.

4. Granulator: for PE pipes and filsm PVC pipes and films.

   a) 220 volts single phase, 60 c.p.s. Output approx. 15-20 Kg/hour.

5. Extruder screw (spare): for polyethilene film.

6. 100 Ton hydraulic press, 25 x 35 cm. (used).

   a) 220 volts single phase, 60 c.p.s.
   b) Water cooling system.
   c) Electrical heating.

7. 6" x 12" two roll mill with speed differential, 1:13 ration cooling and heating facilities for rolls.

   a) 220 volts single phase; 60 c.p.s.
   b) Steam heating, water cooling
      Up to 10 Kg/Cm^2 (for PVC and PE formulation).

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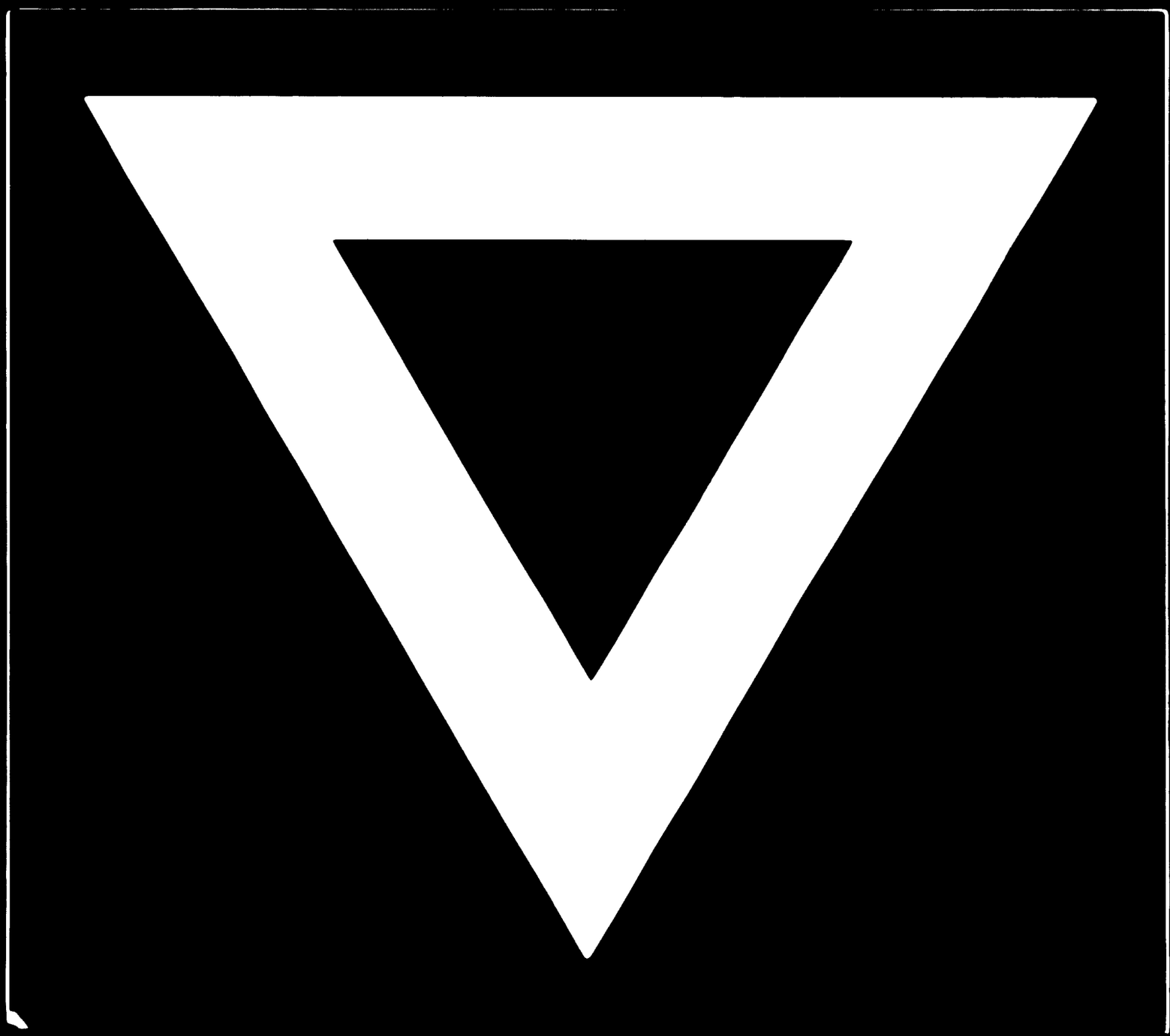

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