



**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)



05026



Distribution  
LIMITED  
ID/WG.164/21  
18 September 1973  
Original: ENGLISH

United Nations Industrial Development Organization

---

Expert Group Meeting on the Manufacture of  
Proteins from Hydrocarbons

Vienna, Austria, 8 - 12 October 1973

**THE ROLE OF DEVELOPING COUNTRIES IN THE  
DEVELOPMENT OF THE HYDROCARBON FERMENTATION PROCESS 1/**

I. Al-Karawi\*

\* Head, Industrial Research Department, Industrial Studies and Development  
Centre, Riyadh, Saudi Arabia

1/ The views and opinions expressed in this paper are those of the author and do  
not necessarily reflect the views of the secretariat of UNIDO. This document  
has been reproduced without formal editing.

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.

I. Introduction

As a representative from an oil producing country with an ambitious program of industrial development I should like to express my appreciation to the United Nations Industrial Development Organization for arranging a working group meeting on manufacture of food protein from petroleum at a time where this project is still very much in the stage of development. We hope that this effort is a step in promoting an efficient cooperation between the industrialized nations and the developing countries on process technology and its utilization. Thereby, developing countries may be able to participate in new technological development from its early phases. This may greatly facilitate the successful implementation of the project later on.

II. The Development of the Petrochemical Industry in Saudi Arabia.

Saudi Arabia is known to be one of the major producers and exporters of crude oil. However, during the last ten years great efforts have been made by the Government to diversify and broaden the base of industry. In the long run it is considered more profitable and beneficial to the development of the country to export semi-finished and

finished goods rather than to rely entirely on the export of raw materials. The development of a Saudi Arabian petrochemical industry has been emphasized because of the presence of considerable reserves of petroleum and natural gas in the country. With the rise in oil production increasing quantities of natural gas are obtained as a by-product.

It is the policy of the Kingdom to leave investment in industry to the private sector to the largest possible extent. However, the large funds required for establishing a competitive petrochemical industry and for obtaining the necessary know-how in technology and international marketing by far exceeded the investment capital available from the private sector. In order to promote the establishment of such industries the General Petroleum and Mineral Organization - PETROMIN - was established with the objective of initiating and implementing large scale investments in various sectors of industry with the participation of private investors.

In addition to the establishment of refineries to meet local demand of petroleum products, efforts were concentrated on utilizing the large quantities of natural

gas not only as a supply of energy for local power stations and industry but also as a process raw material in chemical plants. The construction and operation of a 1100 tons per day urea fertilizer plant on the basis of natural gas is by far the largest venture in this field. A sulfuric acid plant attached to the urea fertilizer establishment utilizes the sulfur obtained from the purification of natural gas.

The production of various types of protein through fermentation of straight chain hydrocarbons may be in line with these developments and could be considered when the processes become technically feasible and the protein produced competitive with established sources. As a large percentage of natural gas is still flared off the utilization of short chain hydrocarbons present in natural gas would be of particular interest for Saudi Arabia. We understand that both Shell and ICI are exploring a process for fermenting methane with bacteria.

In the foreseeable future we expect that the use of protein produced from hydrocarbons will be confined to animal feed. A number of plants have been established in various parts of Saudi Arabia for the production of animal

- 3 -

feed on the basis of imported raw material. When available locally produced protein may be compounded in these plants into animal feed in support of the efforts undertaken by the Ministry of Agriculture to improve animal breeding and the supply of meat and dairy products in the Kingdom.

The pre-requisites of such a development will be that the protein produced is competitive with alternate products such as fish and milk-based proteins, soybeans and other natural proteins. Due to the free enterprise system in Saudi Arabia government subsidies would be contrary to established policies. Therefore, it is suggested that the economic consequences are considered at an early stage in the development programme.

### Future Activities

We understand that the processes involved in conversion of hydrocarbons to protein are still in the experimental stage although pilot plants have been established for production on a semi-commercial scale. Considerable efforts will be required before large scale production can be contemplated. We feel that a close cooperation between researchers, technologists and economists will be necessary. Existing technologies will have to be perfected and new

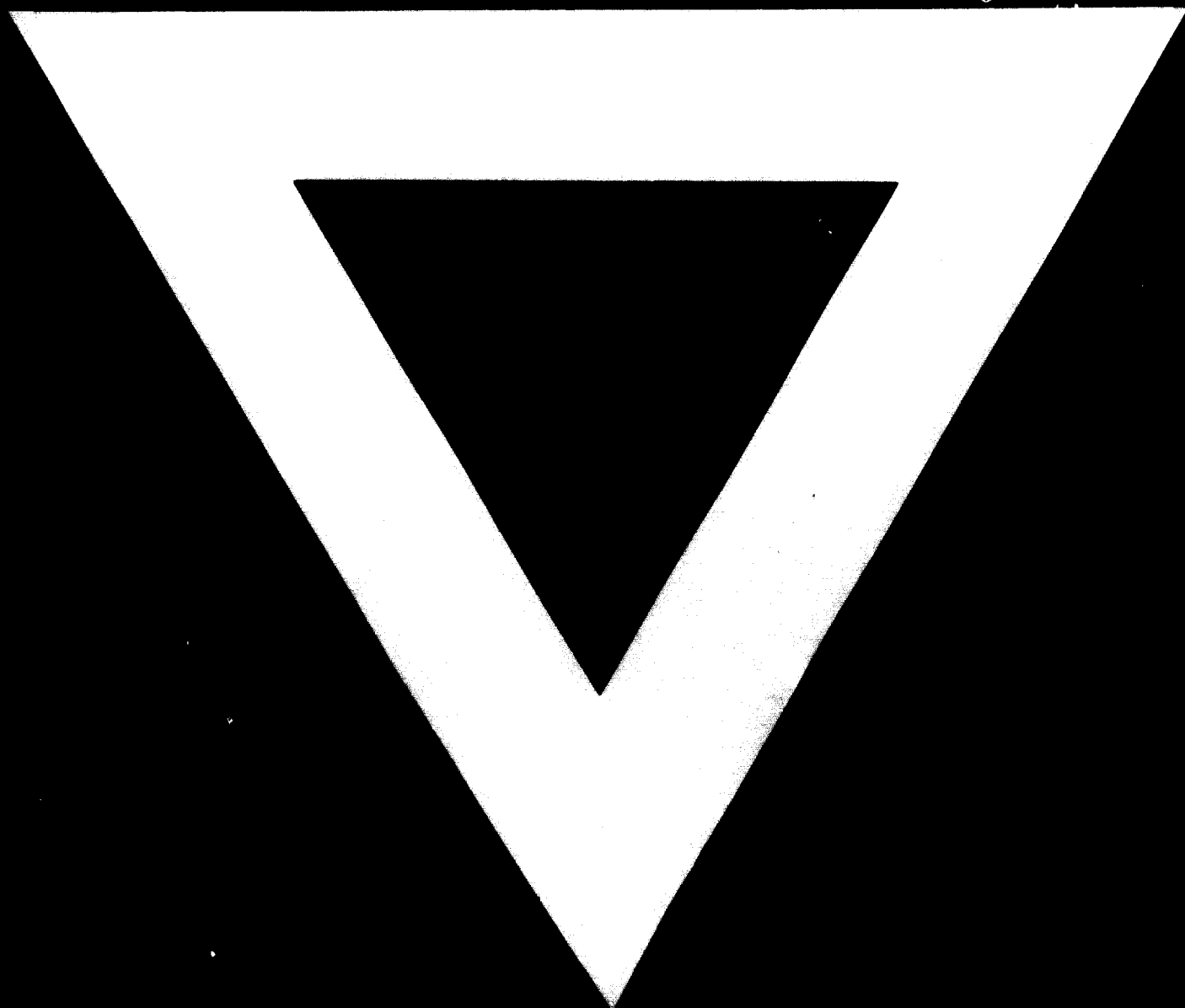
processes developed. It will be essential to investigate the supply of protein from traditional sources in the immediate and more distant future and to predict the long range development of food prices on a world-wide basis. Only then will it be possible to select the proper time for the successful commercial introduction of these processes.

As mentioned in the introduction, a close cooperation between the companies engaged in research and development work on hydrocarbon fermentation and public and private institutions in developing countries may be in the mutual interest. Saudi Arabian universities in Jeddah, Riyadh and Dammam have well equipped laboratories to participate in certain phases of this project. In addition, various ministries and government agencies have established research organizations which could make contributions in this field. The argument that developing nations are not able to supply the trained manpower required for high level research and development work is only partially true. Many times, the problem is that lack of suitable research assignments is the cause why institutions in these countries are unable to attract and maintain a staff of high calibre scientists and technologists.



In our opinion UNIDO should play a major role in organizing and coordinating this joint effort and arrange for the proper flow of information between the participating institutions and establishments. It is realized that legal questions such as patent rights and commercial interests may pose a problem. But, we feel that these obstacles can be overcome if the problem is approached in a spirit of cooperation.





**12. 8. 74**