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D04695

Distr.
LIMITED

ID/WG.154/6
11 May 1973

ORIGINAL: ENGLISH

United Nations Industrial Development Organization

Workshop on Pesticides
Vienna, Austria, 28 May - 1 June 1973

PESTICIDES INDUSTRY IN INDIA
STATUS, GOALS AND PROGRAMS 1/

by

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id.73-3726

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INTRODUCTION

1. Agriculture plays a dominant role in the Indian economy and it is likely to be so in the foreseeable future. Great emphasis is therefore laid on agriculture in planning. It is the cherished goal of the society at large and the Government of India in particular to attain self sufficiency in food production, and to provide adequate food for all. The rate of growth of population underscores the paramount importance of immediate programmes for increasing the output of food grains.

2. Of no less importance is the requirement of increasing the output of cash crops and industrial crops which directly or indirectly provide the base for earning or saving foreign exchange needed for accelerating the pace of industrialization. Continuing imports of locally grown items like oil seeds and cotton to the tune of several crores of rupees annually illustrates this point. This causes an undesirable depletion of limited foreign exchange resources which could very well be reduced/ avoided by increased production resulting from timely protection of plants.

3. It is recognised that the pace of development of any country depends largely on the extent of application of science and technology in harnessing its natural resources. The policy makers in our country are consciously working towards this in a planned manner since our Republic was born in the year 1950. Each development plan period for the nation is spread over five years and we are currently in the last year of the Fourth Plan period and on the threshold of finalising the goals for the Fifth Plan commencing next year. Thanks to the foundation laid so far, a qualitative change is taking place fast in Indian agriculture due to ushering in of the new strategy of scientific farming through the introduction of high yielding varieties, improved seeds, chemical fertilisers and other modern farm management practices.

4. The crops plants in India are affected by over 250 pests and diseases of economic significance. The loss in crops due to pests' diseases and weeds which has been reckoned at 15-20% in traditional agriculture, is now known to be sometimes much more, particularly in rice, pulses, cotton and oil seeds under intensive agriculture. To make the problem more complex, the new high yielding varieties are often seen to be more susceptible to attack by pests. Also, greater use of fertilisers as envisaged will enhance the susceptibility of crops to plant diseases over and above enhancing the problems of weed control. It is estimated that in some cases up to 40% of the nutrient goes to sustain the growth of weeds. It is therefore clear that if effective plant protection measures are not adopted, our objective of increasing agricultural output will not be achieved in spite of the application of all the costly inputs.

5. Then there is the problem of loss of food grains in storage because of the attack of insect pests and rats. It is estimated that loss in storage averages about 6-8%. The damage caused by rats alone in the field in pre-harvesting period and in storage is very considerable. Although rat control programmes are at hand, the task is indeed great considering the vastness of our country. The loss in storage can be brought down to an insignificant level through the adoption of scientific storage methods and application of control chemicals has been demonstrated by large State Corporations engaged in trading and warehousing. Total prevention of loss in storage coupled with other measures may even provide the much needed marketable surplus in grains.

6. The role of pesticides in the field of public health in India is of no less importance. India's geographical position and climatic conditions has been, for long, favourable to the occurrence of many deadly diseases, particularly malaria. According to an estimate made in 1935, over 100 million people suffered from malaria every year. No aspect of life in India - social, agricultural and industrial - remained unaffected by the ravages of this disease. Thanks to DDT, malaria is now practically eradicated

with the rate incidence reduced from 10.8% in 1952 to .04% of population, and death practically Nil by 1970. Economic gains to the nation due to reduction in incidence of malaria and debility among working population and consequent saving in mandays have been estimated to be of the order of Rs. 7,500 million per year. But maintenance and consolidation phases must continue to ensure that the gains of the last two decades are not lost. Filaria, cholera, Kala-azar, black water fever, plague, etc., are some of the other insect borne diseases controlled through the application of pesticides amongst others. Plans for the control measures of other communicable diseases are afoot.

7. Thus, the important role of pesticides industry in the economy and development of India is obvious. The manufacture of basic pesticides in our country started with that of BHC in 1952-53. Today 42 different chemicals (21 insecticides, 13 fungicides, 3 rodenticides, 3 herbicides, 1 nematocide and 1 molluscicide) are being manufactured in the country. A number of other products have also been licenced for manufacture and are in various stages of establishment. Compared against the fact that about 900 different pesticidal chemicals are manufactured and sold in the world markets, our development, in qualitative terms, may not be too impressive. But perhaps the smaller number of pesticides manufactured in the country may be an advantage from the point of view of economy of manufacture, considering the developing state of the country and the growing awareness of problems associated with the continued use of pesticides.

8. In quantitative terms, installed capacity exists for the production of 41,258 tonnes of basic pesticides, which is done mostly in the medium/large scale sector. Currently 18 units are engaged in the manufacture of these basic chemicals. Pesticides formulation industry has, however, developed faster in India. There are 37 units in the medium/large scale sector and 110 units in the small scale sector engaged in formulations of diverse nature.

Barring granular formulations, which is still a developing field in India, most of the other commonly used types of formulations like dusting powders, wettable powders, emulsion concentrates, etc , are being formulated by large number of units. For almost all types of these formulations, more than adequate installed capacities exist.

9. Demand analysis of pesticides has been made by various authorities in India from time to time. These demand analyses are mostly based on the target for the area to be covered under plant protection measures. Cropwise targeted breakdown is arrived at keeping the overall need and achievability in view. The requirement of pesticides is computed from the area to be covered and the recommended dosages of pesticides. The demand forecast for 1973-74 (closing year of Fourth Plan) is of the order of 45,000 tonnes, which is estimated to increase steadily during the Fifth Plan to a figure of the order of 74,420 tonnes by 1978-79, comprising mainly of 51,500 tonnes of insecticides, 14,915 tonnes of fungicides, 5,450 tonnes of weedicides and herbicides and 1,800 tonnes of fumigants.

I. TREND OF THE PESTICIDES INDUSTRY IN INDIA

10. A large domestic market coupled with the keenness of the Government in promoting the pesticides industry and favourable response from the farmers - the ultimate consumers - promise a fast growing trend for the pesticides industry in India. In this chapter the trend of pesticides production, application and use will be discussed, as visualised by the policy makers, the industry and the farmers, along with the trends in development of formulation and application techniques.

11. From the policy makers' angle, rapid increase of food grain production and other cash and industrial crops has been taken as an imperative need in planning. Intensive irrigation, multiple cropping, land reclamation, improved seeds, use of chemical fertilisers, agricultural extension service, etc., have therefore featured prominently in the country's agriculture planning. It is well recognised that the full benefit of all these measures cannot be obtained until and

unless effective measures are taken to use good treated seeds, save the crops in the field and avoid loss in storage due to attack of insects, pests and rats. Intensive programmes for seed dressing, plant protection measures, use of growth regulants along with other control measures, scientific storage, etc., are therefore afoot. The keenness on the part of the Government to adopt plant protection measures is also reflected in the inclusion of pesticides industry in the "core sector" of development of the nation's economy in the plans.

12. From the industry's angle, more sophisticated pesticides are bound to get prominence. Although, considering the developing state of the country and the economic state of the consumers, conventional wide spectrum pesticides will be continued to be used for some time more, sophisticated and selective pesticides are already gaining acceptance. At present 42 different basic pesticidal chemicals are being manufactured in the country. The number is likely to rise to about 100 by the end of the Fifth Plan, i.e. by 1978-79. In this, growth regulants, specific and systemic pesticides will feature largely. Organo-phosphorous compounds, carbamates, specific low toxicity organo-chlorine compounds and other more modern pesticidal chemicals are planned to be manufactured in the country in larger quantities, and supplemented by imports wherever essential for achieving targets laid down.

13. From the angle of the cultivators (the ultimate major users of pesticides, there is a growing awareness about the importance of pesticides in increasing farm output. Although the trend is favourable, the present state of acceptance of pesticides is not as good as it should be. The reason is obvious. India is a vast country. It is a tremendous task to make the message of pesticides reach all the farmers scattered in several lakhs of villages. Agricultural extension service and other Government and private agencies engaged in this task are realising this and organising themselves to meet

this need. But the task is of huge dimensions, and continued vigorous efforts to overcome tradition and educate the farmers is needed.

14. Fertilisers and pesticides are complementary inputs. But the use of pesticides in India has not picked up as fast as that of fertilisers. Various reasons can be attributed to this. One important reason perhaps is the fact that the farmers can visualise the benefit of fertilisers in the field easily, hence its easy and more rapid acceptance, and today nearly 14 kg. of fertiliser is used per hectare of land although even this is below the average in many other countries. But the benefit of use of pesticides in ordinary times is not so apparent and immediate. Only when large scale destruction in epidemic form occurs, its importance is readily recognisable. Use of pesticides, therefore, had been more on a "fire-fighting" basis in the past. But the trend is fast changing. Although the use of pesticides in India is much less (being only 3,361 gm/ha) compared to other developed countries (Japan uses 10,000 gm/ha, and USA and East European countries use around 2,000 gm/ha) where agricultural productivity is high, there is a distinct rising trend. This can be attributed to the growing awareness for improving economic gains from cultivation for reaching higher standards of living, as a result of successive economic development plans of the Government referred to earlier.

15. The environmental problem associated with the use of pesticides in countries where large quantities of pesticides are manufactured and used, has been taken note of by the policy makers in planning pesticides production, handling, storage and use in the country. Emphasis is therefore laid now, as the country is to embark on greater use of pesticides, on regulatory measures. The problem of pollution due to pesticides is, of course, in most cases due to wrong and irregular use and adoption of unsafe practices. It is fortunately still not a pressing one in India, as the use of pesticides has not been very

extensive. But the low level of acquaintance of our farmers and the multiplicity of users spread over a vast country as ours coupled with the pointers provided by the experiences of other developed countries call for adoption of regulatory measures to safeguard the interest of the society at large. Accordingly, our Government has promulgated Insecticides Act in India. Under this Act, any organisation or institution engaged in the manufacture, storage, handling and distribution of bulk pesticides and their formulations needs registration and licence. The licencing policy under the Act provides regulations for proper labeling, use, application, toxicity factors, etc., of the pesticides. The licencing policy is based on a realistic approach towards the problem of ensuring maximum safety, but due care has been simultaneously taken to ensure that this does not act as a deterrent to the active growth of the industry or deny the farmers availability of suitable pesticides for their use in order to reach the targets.

16. The trend of formulation of pesticides in India is indeed encouraging. Almost all types of formulation are done to cope with the pest problems affecting the large variety of crops in the country. Dusting powders being amongst the earliest types introduced, however, still occupy a prominent place. But it is increasingly being recognised that there is a lot of avoidable wastage in the use of dusting powders, hence granular formulations are preferred if available. Water dispersible powders have gained prominence because of high technical material contents and their extensive use in the public health programmes for over 20 years. Emulsion concentrates are also widely used for spray application. Low and ultra low volume formulations for aerial spraying are developing fast. Pesticides mix formulations for specific use are also being done but this field needs further development. Insecticides-fertiliser mix formulations, particularly as foliar applications, promise economy in use, application and transportation cost, and have been actually tried with success in some areas.

17 Application techniques are undergoing a revolution. While application by hand and small portable mechanised devices are still being used to a large measure, large scale application by tractor is receiving increasing acceptance. To cover vast areas, aerial spraying through aircraft is recognised to be of advantage but ecology consideration and rural land ownership structure sometimes pose a hurdle for rapid development of this technique. Nevertheless, when circumstances warrant, as in the case of epidemic conditions, the Government does not hesitate to resort to such application.

18. The changing pattern of pest diseases complex with changing pattern and intensification of cropping will necessitate the use of newer and more sophisticated pest control chemicals. In this connection the phenomenon of development of resistant species is being taken note of although the problem is not yet very acute in India due to low level of usage of pesticides. Safer pesticides from the angle of environmental pollution control, easily degradable ones and specific pesticides will be used more and more in the future, provided, of course, they are available at reasonable prices so as to offer a favourable cost-benefit ratio.

II. CONTEMPLATED DEVELOPMENT OF PESTICIDES INDUSTRY IN INDIA

19. Keeping in view the pressing need for attaining self sufficiency in food, a target of covering 100 million hectares of land under plant protection measures has been set for the Fifth Five Year Plan period. Of the targeted area to be covered under plant protection measures, intensive treatment on surface and soil pests accounts for over 60% and the balance consists of seed treatment, rat control and weed control programmes. Assessment has been made of the need of pesticides in the country. The total requirement of pesticides by 1978-79 is of the order of 77,000 tonnes, meaning thereby the necessity of more than doubling the present avilability of pesticides in the next 4-5 years.

20. The use of herbicides and plant growth regulants is not yet very significant in India. But substantial increase in use of these chemicals is contemplated in the Fifth Five Year Plan.

21. Although the Government is keen to meet the demand of pesticides and other agricultural chemicals by maximising domestic production facilities, it will still be necessary to meet a part of the requirements through imports. The import policy of the Government in the field of pesticidal chemicals is based on the appreciation of this fact on a pragmatic basis. Particularly those compounds for whose manufacture raw materials are not indigenously available, imports will be inevitable at least until the situation changes. Import is also permitted for sophisticated and newly developed compounds of specific application, for establishment of formulation techniques, application methods and establishment of market. But the stress by and large, is on the early switch over to domestic production wherever feasible.

22. For the growth of pesticides industry in any country the growth of basic chemical industry is a prerequisite, since it is from this mother industry that the pesticides industry is to draw its essential raw material requirements. The chemical industry in India is a fairly developed one and many of the basic raw materials needed for pesticides manufacture are already available indigenously. Plans are afoot for developing the manufacture of many others which are not at present available. Petrochemical industries which provide the basic building blocks for the synthesis of organic chemicals are planned to be established in a big way. The first state owned big petrochemical complex has started recently and the production of its various units are coming up in stages.

23. Fairly developed infrastructure and other engineering facilities exist in the country to give adequate support to the sustenance and growth of the industry. Facilities exist for undertaking all types of civil construction and equipment fabrication jobs in the country. Expert design and consultancy services are available

through numerous organisations equipped to render such services for translation of technology with the help of the collaborators. These are going to be further improved during the Fifth Plan period.

24. Hindustan Insecticides Ltd. is one of the fully Government owned enterprises in India and the only state owned company engaged solely in the manufacture and formulation of pesticides. The company was set up in 1954 to manufacture and formulate DDT for supplying to the National Malaria Eradication Programme. Through subsequent stages of expansion the company has increased its DDT production capacity to about six times its original capacity and is catering to the needs of public health and agriculture in India. Since 1971 the company is also manufacturing BHC in addition to DDT.

25. Through years of successful operation of its plants and through its R+D activities, Hindustan Insecticides has developed considerable technical expertise in the setting up of DDT, BHC and related plants. In fact, the last expansion project of the company of doubling the capacity of DDT manufacture at its Delhi plant was fully engineered by the company's own technical personnel. Keeping in view the contemplated growth in the field of pesticides industry in India and based on the confidence gained in successful operation of its current activities, the company is envisaging substantial diversification in pesticides manufacture. The company is in a position to absorb new technologies for manufacture from various sources, in order to play its role in the development of pesticides in India.

III. PROBLEMS

26. Many unanswered questions surround the use, manufacture and distribution of chemical pesticides in any developing country. Questions and choices abound concerning market composition, selection of pesticides, demand levels, demand elasticity, alternate technologies, financing, site selection, purchase of new plants and renovation of old facilities, transportation cost, pricing, etc.

Answers to these questions are difficult to find because of limitation of time and resources, and many times impossible because of lack of ready information on all the relevant factors. Some of the major problems faced by HIL and similarly placed other pesticides industries in India in sustaining a steady rate of growth and diversification are listed below

27. Data on the evaluation of pesticides with particular reference to their bio-efficacy, toxicity, degradability and residue tolerance level under the local climatic conditions are often not available, making the selection of right type of pesticides and their formulation for manufacture difficult. Adequate sophisticated and elaborate facilities for these studies do not exist.

28. Exhaustive market surveys for effective and created demand of specific pesticides are essential for formulating schemes for creation of manufacturing facilities, plant sizing, and future expansion programmes. The very vastness of the country coupled with the multiplicity of crops and pests makes the task conduct of such studies a stupendous expensive task.

29. Information about availability of technology with guarantees and relative advantages disadvantages of alternate technologies which are best suited for the raw materials available locally is not easy to come by.

30. The technical know-how in respect of new sophisticated chemicals is often available only in certain advanced countries. Developing countries like India whose resources are meagre, have to purchase the same at stipulated licence fees and capital costs which can be very high from our point of view. Due to very tight foreign exchange availability position, this factor acts as a severe constraint in bringing in new or modern technologies.

31. The minimum economic size of plants operating in the countries where technology has been developed in many cases is too big compared to the requirement of the particular pesticide in a

developing country like ours. The problems of scaling down often increases the cost and this comes in the way of transfer of technology.

32. In cases where technology is imported, the foreign supplier may not always find it convenient, from his point of view, to make maximum use of indigenous facilities that may be available, particularly when guarantees are sought. Maximum possible use of indigenous facilities, on the other hand, not only reduces the foreign exchange expenditure, but also acts as a promoter of development of indigenous industrial base, which is very essential for sustained growth in developing countries.

33. The collaboration terms offered by parties in the advanced countries are often not in line with the Government policies of the receiving countries. This becomes a constraint in selecting the best technology.

34. As is well known, development of a pesticidal chemical from the laboratory stage to the stage of commercial exploitation necessitates huge financial outlay. The company which has developed the technology would naturally like to recover the development cost incurred by it within the shortest time, as the commercial life of any particular chemical is limited. The foreign companies, therefore, sometimes claim heavy licence fee, royalties and other profit sharing terms in collaboration agreements. This sometimes comes in the way of acquiring the technology by developing nations from financial considerations.

35. For the manufacture of those pesticides where the raw materials are to be imported, another problem comes up. There is generally a sizable lag between the stage of finalising the collaboration agreement and commercial production. Initial calculations made in pre-agreement periods on running cost, profitability, recurring foreign exchange requirement, etc., may not hold good when the plants come into actual production. This often affects the economic viability of the projects.

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36. Consumer servicing is another field where a vast country like India is facing problems. In the field of pesticides, consumer servicing includes consumer education. Intensive and extensive efforts in this field to educate the farmer on the safe practices, recommended pesticides and dosage, application techniques, timing, etc., are needed. All these need heavy financial outlay and backing, particularly in the pre-production stage.

37. Terms and conditions for transfer of technology from the various countries and various companies are quite different, making proper evaluation and comparison of offers difficult. Some form of standardization in this field is necessary to facilitate confident transfer of technology without undue pains.

38. Over and above all the above technical and commercial problems remains the problem of financing projects, particularly that relating to foreign exchange requirements for import of technology and plants as well as spares.

IV. CONCLUSION

39. The need for expanded domestic production of pesticides augmented wherever necessary by imports in a country like ours is apparent when one considers -

1) Continuing critical need for increased food production.

2) Important role of pesticides in agriculture as well as public health.

3) Likely deficits between domestic production and consumption, particularly when agriculture depends on natural endowments like monsoons, rain, etc.

4) Uncertainty of availability of foreign exchange while needed to rely on foreign sources for supply of technology remains.

40. Despite unprecedented efforts and growing success, the modernization of Indian agriculture is still short of its potential for meeting the nation's need for food, fibres and commercial crops. The per hectare use of pesticides averages to only about 336 gms. (targeted 1973-74) as against 2,000-10,000 gms. in other countries having high agricultural productivity. Significant increase in agricultural production is going to require a steady supply of relatively inexpensive but effective pesticides which are attuned to Indian agriculture and the realities of Indian farming practices.

41. The trend of growth of pesticides industry in India is really an encouraging one. India has the necessary base, infrastructure and favourable investment climate for the rapid development and diversification of pesticides industry. The Government policies in this regard are pragmatic and encouraging.

V. RECOMMENDATIONS

42. Based on the problems enumerated in the earlier chapter faced by the pesticides industry in India on the one hand and the pressing need for rapidly increasing the domestic pesticides production, it is recommended that UNIDO may specifically assist in the fields mentioned below

43. Establish regional Institutes for evaluation of pesticides with particular reference to bio-efficacy, toxicity, biodegradability, etc., under the various climatic conditions and serve as a data bank in this regard, for evaluating pesticides suited for application in the climatic and other conditions obtaining in various regions of the world.

44. Survey of alternative technologies available for specific products and help in selecting the technology best suited for regional conditions and regionally available raw materials so as to reduce costs of manufacture.

45. Provide expertise for countries that may need help in

1) assessing market conditions including survey of effective and created demand of the various pesticides,

2) defining alternative strategies for meeting domestic pesticides requirements in the most economic and safe manner,

3) projecting economics of plant installations, volume of production, scale of manufacture, etc., and

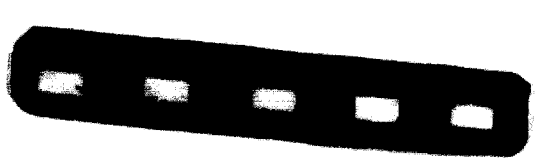
4) collecting information on export possibilities.

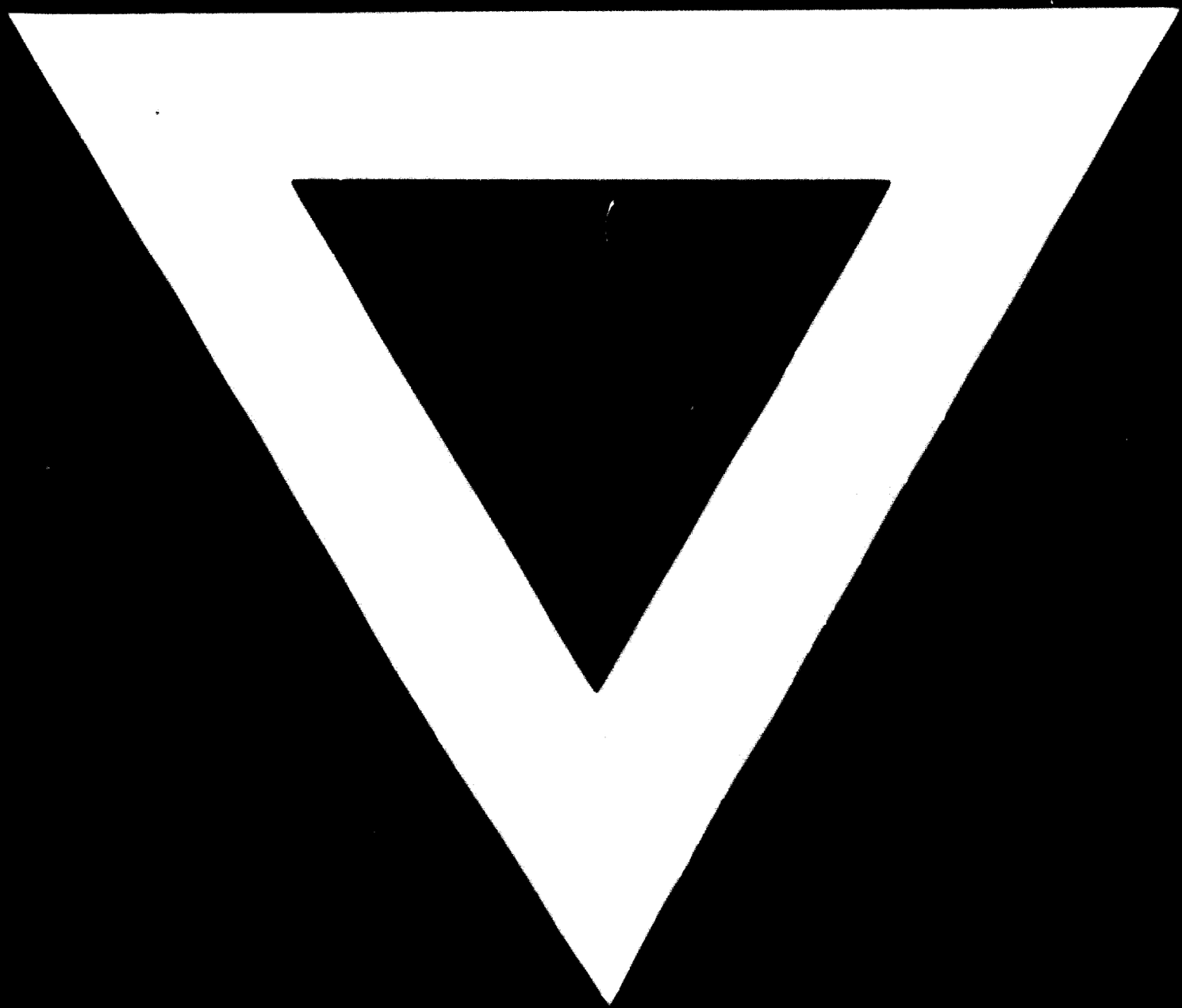
46. Facilitate transfer of technology between developed and developing countries by drawing up model terms and conditions for technical collaboration supply of plants on the lines of the one framed by the United Nations Economic Commission for Europe in Geneva in March 1957 for the supply of plant and machinery for import and export. This can be used whenever required by the member countries of UNIDO for entering into technical collaboration agreements. This would also provide guidelines for negotiations on important aspects like guarantees, payment terms and liabilities of the parties involved.

47. Bring into existence a general fund for reducing the burden of the receiving countries and compensating the company which has developed the technology to overcome the problem elaborated under paragraph 34 regarding receiving countries having to bear indirectly through licence fee, royalties and other financial terms, a portion of the development cost incurred by the developed countries.

48. Suggest methods of getting financial assistance for developing countries for specific projects from international agencies, particularly for the foreign exchange expenditure.

49. Arrange for training for managerial and technical manpower development in other developed countries on easy subsidised terms.





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