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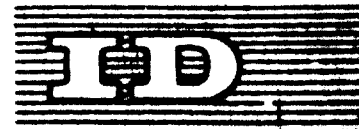
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THE STATUS OF RICE-BRAN OIL INDUSTRY
IN THE ECAFE REGION ✓

✓ Paper prepared by the UNIDO Regional Industrial Adviser, Agro and Light Industries assigned to the United Nations Economic Commission for Asia and the Far East (ECAFE), Bangkok, Thailand.

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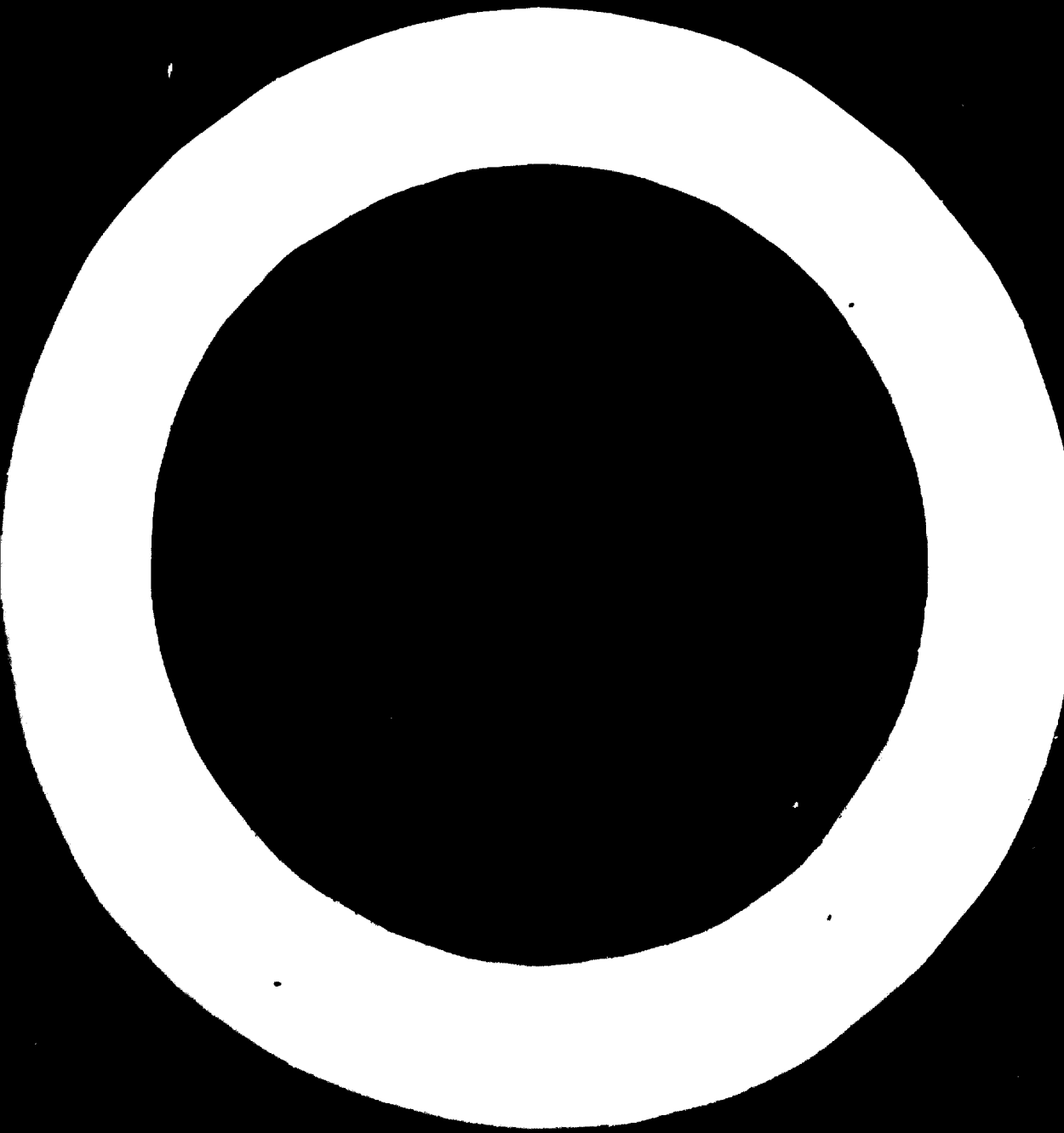
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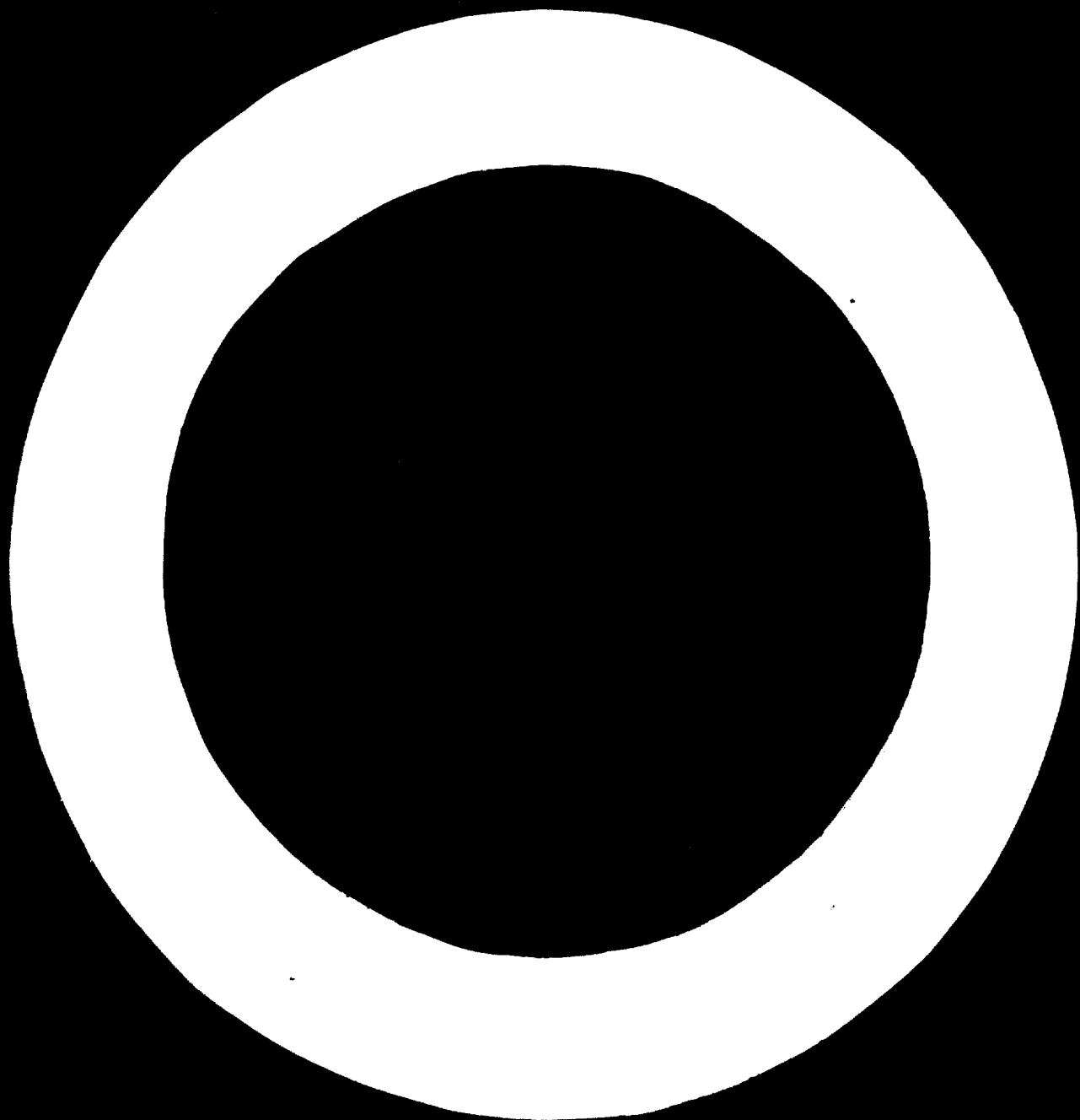
Cycle d'études interrégional
sur le traitement industriel du riz

RESUME

LA SITUATION DE L'INDUSTRIE DE L'HUILE DE SON DE RIZ
DANS LA REGION DE LA CEABO^{1/}

1/ Document rédigé par le Conseiller industriel régional de l'ONU (agro-industrie et industries légères) détaché auprès de la Commission économique des Nations Unies pour l'Asie et l'Extrême-Orient (CEABO), Bangkok, Thaïlande.





Résumé

1. Les problèmes que pose la création de l'industrie de l'huile de son de riz sont bien connus. Ils sont à la fois techniques et économiques, et ils ont été suffisamment exposés dans les documents préparés pour le Cycle d'études interrégional, sous les rubriques appropriées. Il faut se rappeler que le son de riz est un sous-produit de l'usinage du riz et que l'huile de son de riz peut être considérée comme le sous-produit d'un sous-produit, le principal produit (35 %) de l'extraction de l'huile étant le son dégraissé.
2. L'auteur du présent document s'est efforcé d'analyser les facteurs pouvant contribuer à la création de l'industrie de l'huile de son de riz, ou l'absence de ces facteurs, dans 11 pays d'Asie et d'Extrême-Orient. On considère souvent à tort que l'existence d'un potentiel théorique suffit pour créer une nouvelle source d'huile. Il suffit pourtant de faire une étude approfondie des problèmes pour se rendre compte des difficultés auxquelles se heurte la création de cette industrie dans les pays en voie de développement.
3. L'analyse des facteurs favorables au développement de cette industrie montre qu'une pénurie aiguë d'huiles et de graisses dans un pays donné oblige à exploiter d'urgence toutes les ressources disponibles; mais faut-il encore que les conditions climatiques et l'infrastructure du pays favorisent, dans une certaine mesure, ce développement. Parmi les 11 pays de la région dont il est fait mention dans le présent document, seuls la Birmanie, la République de Corée, le Japon, l'Inde et la Thaïlande peuvent être considérés comme des producteurs d'huile de son de riz. La Birmanie et la Thaïlande bénéficient d'un avantage supplémentaire : l'exportation du riz est leur plus importante source de devises et, de ce fait, l'usinage du riz y est relativement mieux organisé, ce qui facilite, dans une certaine mesure, la collecte et l'extraction du son.
4. Il est intéressant d'indiquer que la Chine (Taïwan), où la production d'huile de son de riz a été organisée il y a quelques années, est passée progressivement à la production d'huile de graines de soja, évolution provoquée par l'importation de graines de soja provenant des Etats-Unis. En Thaïlande, les derniers renseignements

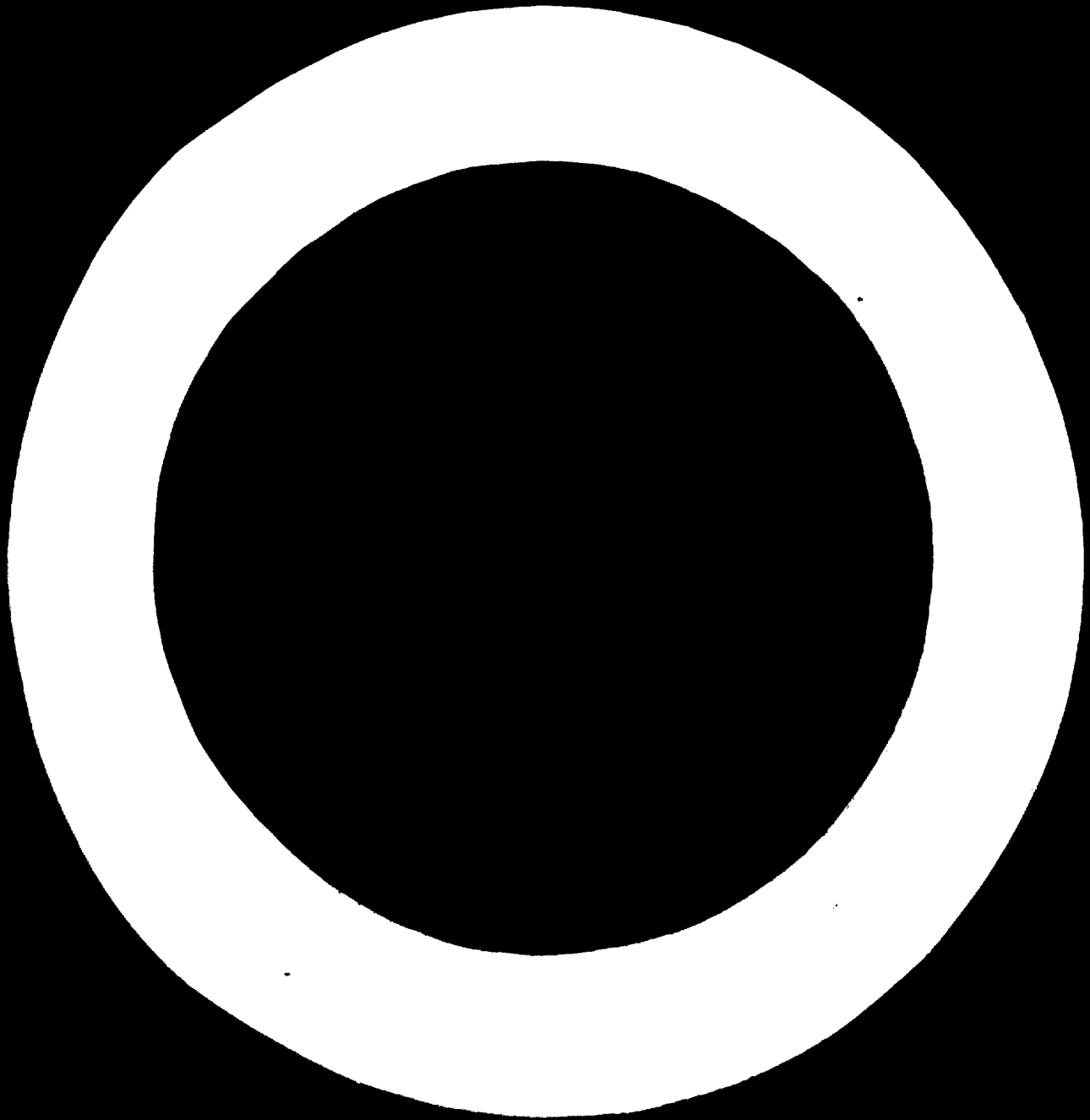
font état d'un fléchissement de la production d'huile de son de riz, qui n'est sans doute pas dans ce pays une opération rentable. Pour la Birmanie, qui s'était engagée il y a longtemps déjà dans la production d'huile de son de riz, les renseignements disponibles montrent que la production a fortement baissé et que la majeure partie de l'huile est utilisée pour fabriquer du savon.

5. Au Japon et en Inde, la production d'huile de son de riz s'accroît constamment. Tandis que le premier de ces pays fabrique des huiles comestibles et industrielles, le second se cantonne presque exclusivement dans la production d'huiles industrielles. Il suffit de rappeler que le Japon importe de grandes quantités d'huiles et de graines oléagineuses pour pallier l'insuffisance de ses ressources propres et que la demande de graisses et d'huiles, en Inde, est supérieure à l'offre, comme l'indique le grave déséquilibre des prix dans ce pays, pour comprendre dans quelles conditions la production d'huile de son de riz est possible et rentable.

6. Cette question suscite beaucoup d'intérêt dans un grand nombre de pays producteurs et exportateurs d'huile de copra ou de coco, et notamment à Ceylan, en Indonésie, en Malaisie et aux Philippines, mais il est très douteux que la production d'huile de son de riz puisse être rentable dans les circonstances actuelles. Il suffit pour s'en convaincre de savoir que, dans un de ces pays, une usine d'extraction par solvants a été obligée de mettre un terme à cette production et qu'elle envisage, paraît-il, d'utiliser ses installations pour extraire de l'huile de coco à partir de tourteaux de copra. Des résultats identiques auraient été obtenus dans un autre pays au cours d'opérations expérimentales. Ces faits démontrent qu'il faut apporter une solution aux problèmes qui entravent la création de l'industrie de l'huile de son de riz.

7. Peut-être y a-t-il lieu d'envisager sérieusement l'analyse systématique des problèmes posés, en passant de la production des matières premières à l'extraction et au traitement de l'huile. Il ne faudrait pourtant pas perdre de vue l'adoption éventuelle d'une nouvelle technologie. C'est pourquoi la conclusion recommande de résoudre le problème des matières premières, ce qui revient à réorganiser de fond en comble les diverses opérations d'usinage et de traitement du riz, sans oublier qu'il est difficile de modifier les méthodes traditionnelles que les pays en voie

de développement utilisent pour le traitement des matières premières agricoles. Point n'est besoin d'insister sur cet aspect de la question, car la production de paddy deviendra de plus en plus excédentaire au fur et à mesure de l'essor de la révolution verte; en outre, si l'on veut tirer parti de cette révolution, il est urgent de prévoir l'application de méthodes modernes au traitement industriel de cette céréale particulièrement importante.



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Summary

The problems encountered in the development of rice bran oil industry are well known. These are both technical and economic and are deemed to have been adequately covered in the papers to be presented at the Inter-regional seminar under appropriate headings. It is to be remembered that the rice bran is a byproduct of the rice milling industry and the rice bran oil would be a byproduct of a byproduct, considering that the major product (85 per cent) in oil extraction is defatted bran.

In this particular paper, an attempt has been made to present a point of view offering an analysis of the contributing factors for the development of the rice bran oil industry or the lack of it, in eleven countries in Asia and the Far East. Often the theoretical potential is confused, for a possible development of a new source of oil. One has only to examine the problems in depth to realize the impediments in the development of this industry in the developing countries.

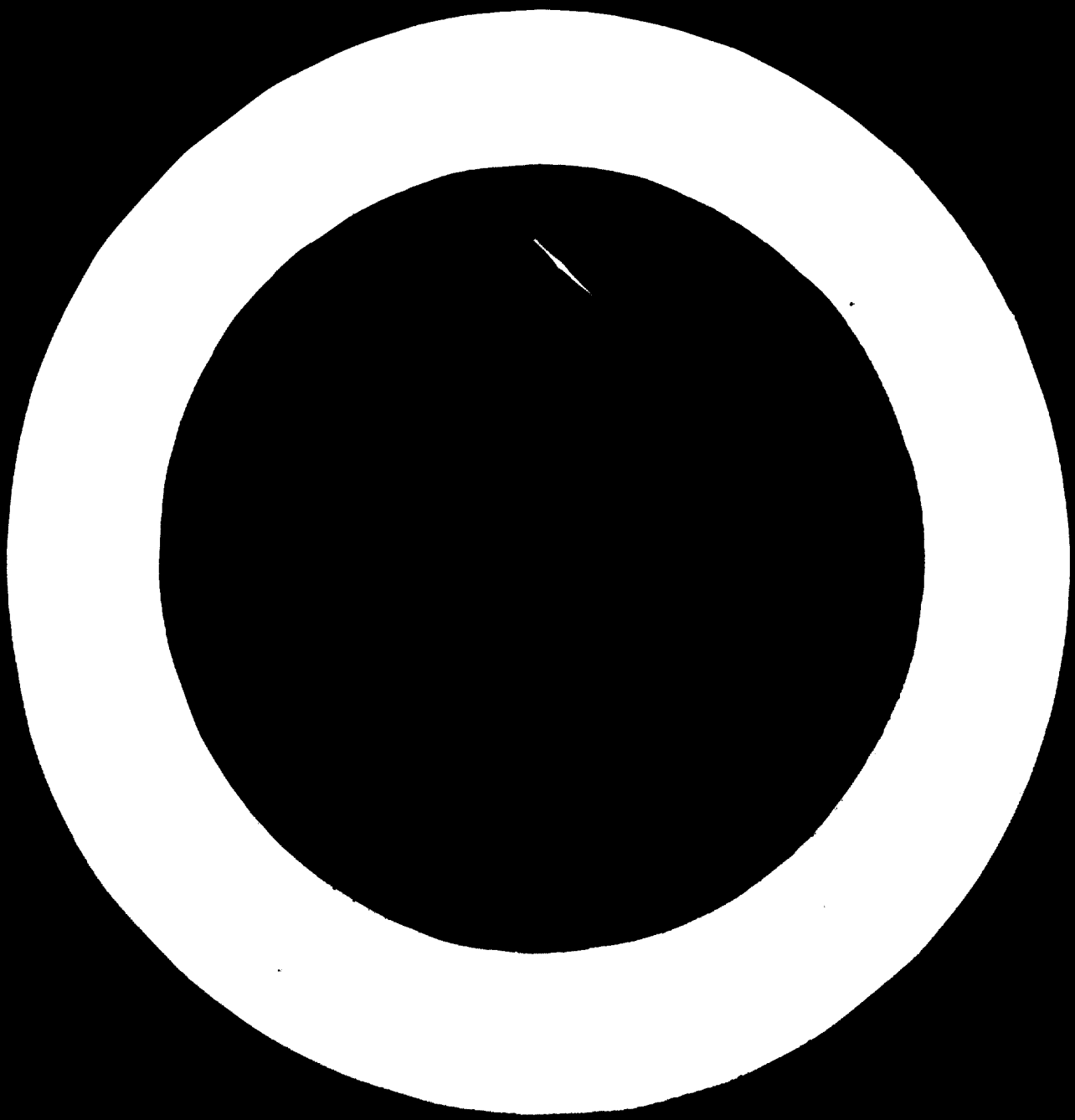
An analysis of the factors favourable for development of the industry indicates an acute shortage of oils and fats within a country, and a consequent urge to tap all available resources; and also that, to a certain extent, climate and infrastructural facilities act as incentives for its development. Among the eleven countries in the region to which reference is made in this paper only Burma, Japan, India, the Republic of Korea and Thailand can be considered rice-bran oil producing countries. The additional advantages in Burma and Thailand are that the export of rice is the most important source of foreign exchange earning and that, in consequence, comparatively better organized rice milling operation, which makes the collection and extraction of bran feasible to some extent, exists in these two countries.

It is interesting to mention that China (Taiwan), where rice-bran oil was in production a few years ago is reported to have gradually switched over to soybean oil production under the stimulus of imports of soybeans from the United States. In Thailand, recent reports indicate a decline in the production of rice-bran oil which is apparently not a profitable operation. Though Burma had an early start in the production of rice-bran oil, reports indicate that there has been a steep decline in production and that the bulk of the oil produced is utilized for the manufacture of soap.

Japan and India continue to increase their production of rice-bran oil, the former both as an edible and industrial oil, and the latter almost exclusively as an industrial oil. The predominant dependence on imports of oils and oilseeds owing to the scarcity of domestic resources in Japan and to the demand for fats and oils outstripping the supply in India, which is seen in a serious distortion of prices within that country, seems to explain the conditions under which production of rice-bran oil is feasible and profitable.

In a large number of copra or coconut oil producing and exporting countries such as Ceylon, Indonesia, Malaysia and the Philippines, though the interest in the subject is very keen, it is very doubtful if rice-bran oil production could be a profitable operation under the prevailing conditions. This has been proved in one of these countries where a solvent extraction plant originally intended for rice-bran oil extraction has discontinued this operation and the installed capacity is reported to be utilized for extraction of coconut oil from copra cake. Similar results have been reported on the basis of experimental operations in another country. These facts emphasize the need to eliminate the problems that impede the oil's development.

It would seem that a systems approach to analysing the problems from the point of raw material production to extraction and processing of oil has to be examined in depth. In considering such a step, the feasibility of adoption of new technology should not be lost sight of. The conclusion to be drawn therefore is that the problem of raw material must be solved, which means a thorough re-organization of the rice milling and processing operations, realizing that traditional practices in processing agricultural raw materials are hard to change in the developing countries. It is needless to emphasize this aspect, in view of the surplus production of paddy that will become available as the green revolution gains momentum; and planning for modern industrial processing of this most important grain is urgently called for in order to reap the benefits of the revolution.



Introduction

1. In this paper, it is intended to provide factual and statistical information on the subject of rice-bran oil industry in the countries of the ECAFE region. It must be mentioned at the outset that the report (document AIDC(5)/24) of an expert study group set up by the ECAFE secretariat in collaboration with international agencies was submitted to the fifth session of Asian Industrial Development Council (AIDC) in January 1970 and is being circulated to the present Seminar. This report deals with the technical problems impeding the development of the industry in detail and makes recommendations for its proper development. In view of a large number of technical papers commissioned on this subject, in this particular paper an attempt has been made to provide some information on the individual countries and analyse the peculiar reasons for development of the industry or the lack of it in individual countries of the region. It is expected that this study will help to focus attention on the intricacies of the problems of the industry and the positive steps that have to be taken as remedial measures if its development is to be meaningful. Admittedly such measures would be of a long-term nature. There are no quick and easy solutions for age-old problems.

2. In the following table, data are furnished on the production of paddy and the potential for rice-bran oil in a number of countries in the region.

Table

Production of paddy, potential of rice-bran oil and actual production in some of the countries in the ECAFE region

Country	In 1,000 M.T. Production <u>a/</u> of Paddy	Potential of <u>b/</u> crude oil in Metric tons	in 1,000 M.T. Production of rice-bran Oil 1968/69 <u>c/</u>		
			Total Crude oil	Edible	Industrial
Burma	7,714	64,000	10,360 ^{d/}	940	9,420
Ceylon	1,147	6,900	-	-	-
China (Taiwan)	3,162	33,150	887	388	499
India	56,787	340,650	18,000	-	18,000
Indonesia	14,800	88,800	-	-	-
Japan	18,770	197,100	91,000	59,100	31,900
Korea, Rep. of	4,869	51,150	5,700	2,900	2,800
Malaysia	1,100	9,000	-	-	-
Pakistan	19,005	114,000	-	-	-
Philippines	4,363	45,750	-	-	-
Thailand	9,595	100,800	8,400	7,000	1,400

a/ Source: Asian Economic Statistics, vol. XIX, No.4, March 1969, reprint from the Economic Bulletin for Asia and the Far East.

b/ Calculated on certain assumptions of the rice milling conditions, and the probable potential of crude oil.

c/ Information available in the ECAFE secretariat.

d/ 1967 figures.

3. In the following paragraphs it is proposed to briefly review the situation in various ECAFE countries, based on the information available to the secretariat.

1. Burma

4. The production of paddy is around 8 million tons per annum. On theoretical calculations, the potential for rice-bran is about 430,000 tons/yr and the rice-bran oil 64,000 tons/yr, but the actual production of oil is less than 15 per cent of the potential.

5. Burma was one of the earliest among the developing countries in the region to attempt the extraction of oil from rice bran. Historically rice has been an important export commodity. Consequently large-scale rice milling units were set up which made it possible to collect the required quantities of bran for extraction of oil. Another significant point is the traditional deficiency of vegetable oils in the country that compelled the development of this industry.

6. On the basis of information available, there were ten solvent extraction plants of a combined installed capacity of 275 tons/day, until 1967 when six small plants were added. The current total installed capacity is reported to be 90,000 tons of bran/yr in the state sector. In all, the total number of solvent extraction plants are reported to be twenty-two, and the installed capacity 110,000 tons of bran/yr.

7. A review of the industry indicates that the number of solvent extraction plants increased from six to fifteen during the five-year period, 1961/62 - 1966/67. Despite this increase in the number of plants, the quantity of rice bran processed declined from a peak of 108,000 tons in 1964/65 to less than 78,000 tons in 1966/67. The figures for subsequent years are not available. The production of crude rice-bran oil in 1961-62, was 5,600 tons, whereas the refined edible oil was 3,360 tons, or a ratio of 1.7 to 1.0. During 1964/65, the year of maximum production, the ratio of crude to edible oil was 10,360 tons to 940 tons, or a ratio of 11 to 1.0, and the position does not seem to have improved at all in the following years. It is clear, therefore that the bulk of the rice-bran oil produced is used for the manufacture of soap, in view of its high percentage of free fatty acids. (FFA)

8. It is learnt that the twenty-two plants involve a total investment of about US\$ 8 million. As has been mentioned earlier the utilization of the installed capacity has been falling in recent years. The production of industrial crude oil is increasing at the expense of edible oil. Apart from any management problems, that these units may face, the cardinal factor is the inherent problems of the rice-bran oil industry which have been discussed in the AIDC report referred to earlier.

9. Details of the development action taken in recent years by the Government, if any, are not available. No information is available regarding the existence of any standards or quality control for the raw material bran or the oil produced and marketed.

11. Ceylon

11. The production of paddy in Ceylon was 1.14 million tons during the year 1968-69. On theoretical calculations, the potential of rice-bran oil is around 7,000 tons/yr. There is no production of rice-bran oil in the country on a commercial scale. In regard to extraction techniques, there are already solvent extraction plants in operation for the extraction of oil from copra cake. Rice-bran oil has been produced on an experimental basis. Based on the experimental work and the survey carried out, it has been concluded that, at the present stage of the rice milling industry with all the attendant problems, it is not economical to extract oil from rice bran. It has also been mentioned that the availability of an inexpensive source of edible oil in the country, namely coconut oil, which, being traditionally the only source of edible oil, acts as a deterrent to the production and marketing of rice-bran oil. This is a problem common to other coconut and coconut-oil producing and exporting countries in the region. It would appear, therefore, that the post-harvest processing of paddy needs re-organization so that modernization of drying, handling, storage and milling will receive prior attention. If the rice milling operations are re-organized by setting up units of large capacities, it may be possible to extract rice-bran oil and to process it either as an edible or industrial oil, as an integrated operation.

12. It is learnt that the Government is keen on developing this source of oil through the Ceylon Oils and Fats Corporation, but has apparently not been able to do so. Nevertheless, the Corporation could serve as the technical centre for watching the developments and for advising the Government on appropriate steps.

III. China (Taiwan)

13. Rice-bran oil production is reported to have been initiated in the country as early as 1953. The production of paddy is 2.5 million tons (1968-69), and the potential of rice-bran oil is estimated to be 33,000 tons per annum. The production of refined rice-bran oil is reported to have risen to a peak of 2,400 tons in 1963-64, and during the last three years the production has fallen steeply.

14. The stimulus for production of rice-bran oil on the island was the insufficiency of production of oilseeds such as soybean, sesame and rapeseed. There have been imports of soybean to supplement indigenous production. The sharp increase in imports in 1967 nearly doubled the quantity imported in previous years and continued imports in the following years probably explain the reduction in the output of rice-bran oil. It has to be appreciated that the general problems of the rice-bran oil industry are applicable to the conditions obtaining in the country; consequently the production of oil does not seem to be a profitable operation.

15. It must be mentioned that, in keeping with the general advances made in industrial development, the country has gained considerable experience in the solvent extraction process.

IV India

16. The production of paddy in India was 56.8 million tons in 1968/69 on an assumption of 4 per cent bran availability and 15 per cent yield of oil, the potential for rice-bran oil has been estimated at 340,000 tons per annum. The actual production in 1968/69 was reported to be 18,000 tons, all of which was used for industrial purposes, also on account of the high percentage of free fatty acids (FFA).

17. The traditional shortage of fats and oils in the country both for edible and industrial uses is reflected in the prices there, which are generally said to be 100 per cent higher than international prices. This has been one of the important factors responsible for the development of rice-bran oil industry in the country. Nevertheless the general problems of the industry as discussed in the report of the ECAFE expert study group, do apply to India. In the wake of the drought which occurred in 1964, leading to a severe shortage of food grains, attention was concentrated on modernizing the rice milling operations, basically with a view to obtaining higher yields of rice grain. The extensive re-organization programme undertaken by the Government makes it possible to develop the rice-bran

oil industry on a rational basis, if the present efforts are sustained over a considerably long period of time.

18. Another significant factor that has contributed to the development of the industry in the country is the general advances in technology of oil extraction, and the establishment of over 120 solvent extraction plants in different places. These plants operate on a variety of raw materials and the capacity is partly utilized for extraction of rice-bran oil. The internationally reported brands of solvent extraction plants are manufactured in the country. In addition both continuous and batch type plants of indigenous design are also being built, which has given an added stimulus to the development of the industry.

19. In the quality of bran that is produced, it is interesting to mention that more than 50 per cent of the paddy is parboiled and that this trend is on the increase. Admittedly rice bran from parboiled paddy has better keeping quality and is more suited to the extraction of oil.

20. The solvent extraction industry is controlled by the Government with special reference to the use of the use of the 'food grade solvent' where oils extracted are intended for edible consumption. National standards exist for raw and defatted bran and the rice-bran oil.

21. The defatted bran is reported to be exported to the extent of 70,000 tons (1968) and the export of raw rice bran has been banned. This is one of the incentives given for the development of the industry in the country.

22. As has been mentioned earlier, the crude rice-bran oil produced, in view of its high FFA content cannot be refined into edible oil, it is mostly used in the manufacture of soap and small quantities in the manufacture of fatty acids. It should, however, be mentioned that one unit is reported to be producing refined edible oil.

23. Recognizing the need for integrating rice milling with oil extraction, it is reported that the Food Corporation of India and a few co-operative societies have plans to set up oil extraction plants from rice bran in conjunction with the rice mills. This seems to be a positive step in the development of the industry.

24. The Government of India is reported to have taken long-term measures for a re-organization of the rice milling industry and, to this end, even modern sheller type rice milling plants are being manufactured within the country. The aggressive development policy followed by the authorities is likely to yield results in the long run.

V. Indonesia

25. The production of paddy is around 15 million tons and, on theoretical calculation, the potential of rice-bran oil is estimated to be 90,000 tons per annum. An attempt has been made to produce rice-bran oil in a newly established solvent extraction plant, but it is reported to have been given up for understandable reasons.
26. Unlike in some other countries in the region, there is no parboiling of paddy. Consequently the marginal advantage of bran from parboiled rice is also not available for extraction of oil in Indonesia.
27. In addition to the general problems listed in the ECAFE report, the internal transport problem is a further contributory factor. The solvent extraction process itself is new to the country.
28. A solvent extraction plant of 40 metric tons/day in Krawang where a large cluster of rice mills are operating within a reasonable distance from the plant is reported to have been set up. During the year 1969, the plant was run on an experimental basis for extraction of oil from rice bran. It is learnt that, owing to the extremely poor quality of the bran, it has not been possible to operate the plant successfully. The latest report indicates that it has ceased to extract oil from rice bran. Instead, attempts are being made to utilize the installed capacity for extraction of oil from copra cake. This is not the first instance of its kind. Similar instances are reported from other countries. This common experience strongly emphasizes the need to tackle the problems that impede the development of rice-bran oil industry at their very root.
29. An additional consideration is that, in the country, there is already an inexpensive source of edible oil in coconut oil. Any new oil that may be produced will have to compete with it. As in other coconut oil producing and exporting countries, there are few prospects of development of rice-bran oil industry under the conditions now prevailing.

VI. Japan

30. Pioneering work in the development of the industry has been done in Japan for over four decades. As a result of the research and development work carried out there, spectacular technological developments have been achieved

and the foundations of the industry have been laid broad and deep. On theoretical consideration of production of 19 million tons of paddy per annum, the potential of rice bran oil is estimated to be 197,000 tons per year, against which, the actual production is 91,000 tons or nearly 50 per cent utilization of the bran for oil extraction.

31. Some general considerations which have made it possible to develop the industry are that the paddy husking is carried out in the villages and that the brown rice is milled in urban areas. These, coupled with better organization of the rice milling system, help in the collection of large quantities of bran within a reasonable period. A comparatively cooler climate is also a contributory factor in keeping the acidity in the bran at a low level. The most important factor is that the country is traditionally an importer of oilseeds and oils; hence the necessity to utilize the domestic resources to the maximum extent.

32. The impact of the general industrial and technological developments in Japan as a developed country has played its own part in modernizing the rice milling, rice bran oil extraction, refining and other industrial processing activities.

33. The production of rice bran oil in the country during 1969 was 91,000 tons, and incidentally the single largest domestic source of vegetable oil. In the pattern of consumption, it is estimated that nearly 48,000 tons are consumed directly as cooking oil, and about 11,000 tons in the manufacture of margarine, shortening and other edible products, thereby accounting for a total edible consumption of 59,000 tons of rice bran oil. It is also reported that about 32,000 tons are used for industrial uses, such as the manufacture of fatty acids, soap, etc.

34. The extent of utilization of the bran for extraction of oil approaches 50 per cent of the total production and is on the increase year after year. This bears testimony to a remarkable degree of organization at different levels such as dehusking of paddy, milling, transport of bran, oil extraction, refining, etc., in order to make the production of 90-92,000 tons of rice bran oil profitable.

35. It is reported that there are some built-in advantages in the country to the farmers and that the bran becomes available at a steady price to the oil extraction plants. An assured supply of rice bran at a reasonably steady price is a further advantage.

36. The rice milling industry has undergone a reorganization and there has been an increasing tendency to build plants of large capacities. The country has also made significant progress in the technology of rice milling and the Japanese rice milling plants are in operation in a number of other rice producing and processing countries in the world. This is perhaps not the place to mention the development of the plant and equipment for extraction and refining of rice bran oil. At the initial stages of development in other Asian countries, Japanese machinery and technology were imported.

VII. Korea, Republic of

38. The country produces nearly 5 million tons of paddy per annum. Based on theoretical calculations, the potential for rice bran oil is estimated to be 51,000 tons per annum. However the actual production is 5,700 tons per annum or 10 per cent utilization of the bran.

39. Under the influence of the development of the rice bran oil industry in Japan, the production of rice bran oil in the Republic of Korea has been initiated in a number of plants of small capacity. In view of the known problems of the industry, the production has not been appreciable. In fact 50 per cent of the crude oil produced is used as an industrial oil, owing to the high percentage of FFA, and the remainder is refined and consumed as an edible oil.

40. In addition to the general problems of the industry, it must be stated that traditionally the per capita consumption of oils and fats in the country is one of the lowest in the region, and yet it does not seem to provide the necessary incentive for development. It is learnt that even the other oil seed resources such as soybean, rape and sesame seed are not fully utilized at present.

41. The conclusion to be drawn is that, with the continued existence of the present pattern of rice milling, collection and transport of rice bran, little or no improvement in the production of rice bran oil seems to be possible.

VIII. Malaysia

42. The production of rice bran has been estimated to be 50,000 tons during 1968 and it was forecast that, with the increase of paddy production, the availability of bran would increase substantially.

43. It is reported that the production of rice bran oil in the solvent extraction plants proposed to be set up, as partial utilization of the installed capacity, has been considered, but that no production has actually commenced. In the absence of any solvent extraction plant in the country, the rice bran produced continues to be used as a feed-stuff for the livestock. The Federal Industrial Development Authority however considers that this a wasteful use, and feels that rice bran oil should be extracted from the bran before it is used as a feed-stuff.

44. The problems of the rice milling and the quality of rice bran being no different in Malaysia than those of other rice producing countries in the region, there is little doubt that the development of the rice bran oil industry is not possible under the present conditions. It should also be stated that Malaysia falls into the category of oil exporting countries, being an important exporter of copra co-conconut and palm oils. For reasons discussed elsewhere, the domestic availability of inexpensive oils and fats makes it unprofitable to develop a new source of oil, the costs of extraction of which are likely to be higher. This is not to say that the position could not be corrected in such a progressive country as Malaysia.

IX. Pakistan

45. The production of paddy is about 19 million tons per annum. On theoretical considerations, the potential for rice-bran oil is estimated at 114,000 tons per annum. There is no production of rice-bran oil on a commercial scale.

46. In East Pakistan, which produces 70 per cent of the paddy in the country, it is reported that 14 million tons or 80 per cent of it is husked by primitive devices so that no bran for oil extraction becomes available from this source.

47. It is learnt that, in West Pakistan, in one of the solvent extraction plants, rice-bran oil was extracted on an experimental basis and given up as it was not profitable.

48. The authorities concerned seem to be fully aware of the problems of the industry. Re-organization of the rice milling industry seems to be under active consideration. It has also been reported that financial assistance from the Asian Development Bank has been made available for this purpose.

49. Pakistan happens to be an importer of oils and fats. As in India, owing to shortage of supply, the domestic prices are reported to be much higher than international prices. With the setting up of modern large-scale rice milling units and the consequent availability of large quantities of bran, it might be possible to extract the oil, initially for industrial uses. It should be mentioned that the solvent extraction technique has been well developed as it is widely employed for extraction of oil, chiefly from cottonseed.

X. Philippines

50. The production of paddy is about 4-5 million tons per annum and the estimated potential of rice-bran oil is 45,000 tons. There is at present no production of rice-bran oil in the country.

51. In addition to the usual problems of the industry, Philippines happens to be the largest producer and exporter of copra and coconut oil in the world. Since an inexpensive source of vegetable oil is already available within the country, perhaps it would not be economical to produce rice-bran oil even for industrial uses.

52. The solvent extraction industry has not developed widely. It is reported that there is only one plant of a large capacity which processes copra cake.

53. The rice and corn administration and the Board of Investment in the country are reported to have examined the development of rice-bran oil industry but no concrete steps seem to have been taken.

54. It is learnt that a private enterprise has carried out a feasibility study to set up a batch type solvent extraction plant, but has not done so, apparently on the grounds that it is not a feasible proposition under the present conditions.

XI. Thailand

55. The production of paddy is 9.6 million tons per annum and the potential of rice bran oil is estimated to be 100,000 tons. The actual production is 8,400 tons which is about 8 per cent utilization of the bran.

56. The production of rice bran oil in the country has been made possible, for more reasons than one. In common with Burma the country is one of the traditional exporters of rice. The milling industry is comparatively better organized to permit the collection of bran and extraction of oil, before hydrolysis sets in. Parboiling is practised and the bran obtained from parboiled paddy has better keeping qualities. This is an additional advantage.

57. There are reported to be a few solvent extraction plants engaged in the extraction of oil from the bran. Attempts have been made to popularize refined rice bran oil as an edible oil in the country.

58. At one time it was reported that lack of adequate market for the defatted bran was a disincentive for the development of the industry. However the compound feed manufacturing units which have come up in recent years utilize defatted bran as one of the ingredients in the manufacture of balanced rations.

59. Recent reports indicate that there has been a decline in production of rice bran oil in the country, suggesting again that the operation are not very profitable.

XII. Other countries

59. In the preceding paragraphs, discussion has been confined to the eleven countries on which information was available in the secretariat. In the remaining rice producing and processing countries in the ECAFE region, there appears to be no production of rice-bran oil for the same reasons and problems that have been illustrated above.

Conclusions

60. The statistical data and information discussed in the preceding paragraphs with reference to individual countries bring into sharp focus the

problems of the industry. Most important is the problem of the raw material bran. Modernization of rice milling and pre-processing techniques need to be tackled to make available large quantities of bran of good quality for extraction of oil on an industrial scale.

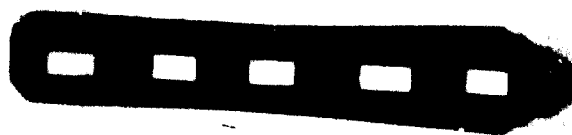
61. The scarcity of domestic sources of oils and fats and traditional dependence on imports is undoubtedly an incentive for development, provided bran of good quality is made available. This presupposes the existence of a well developed solvent extraction industry and refining of oil and of the required skills.

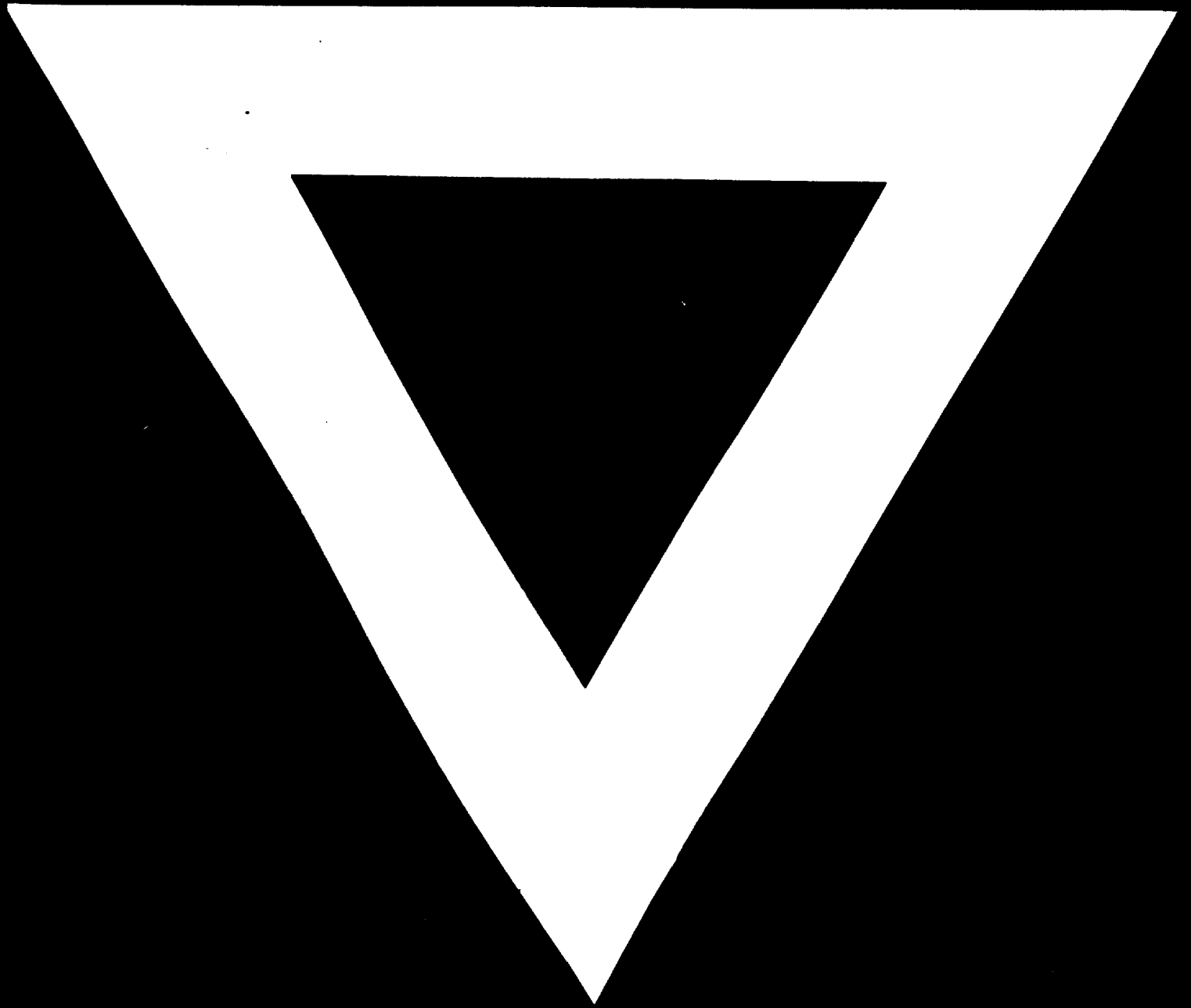
62. The economic factors operating in oil exporting countries with abundant and inexpensive traditional sources of oil, namely coconut oil, are likely to deter the development of rice-bran oil for as long as its cost of production is higher.

63. Aggressive government policies and positive incentive measures for development of the industry are of crucial importance.

64. The adoption of new technology in both rice milling and oil extraction should receive consideration of the governments in examining the overall development of industrial processing of rice and by-product utilization, particularly in view of the green revolution sweeping the region.

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