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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org

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PROBLEMS AND PROSPECTS IN THE OILSEED AND VEGETABLE OIL PROCESSING INDUSTRY IN INDIA 1/

by

S.Z. Varcie
Director
Tata Oil Mills Co. Ltd.
Bombay, India

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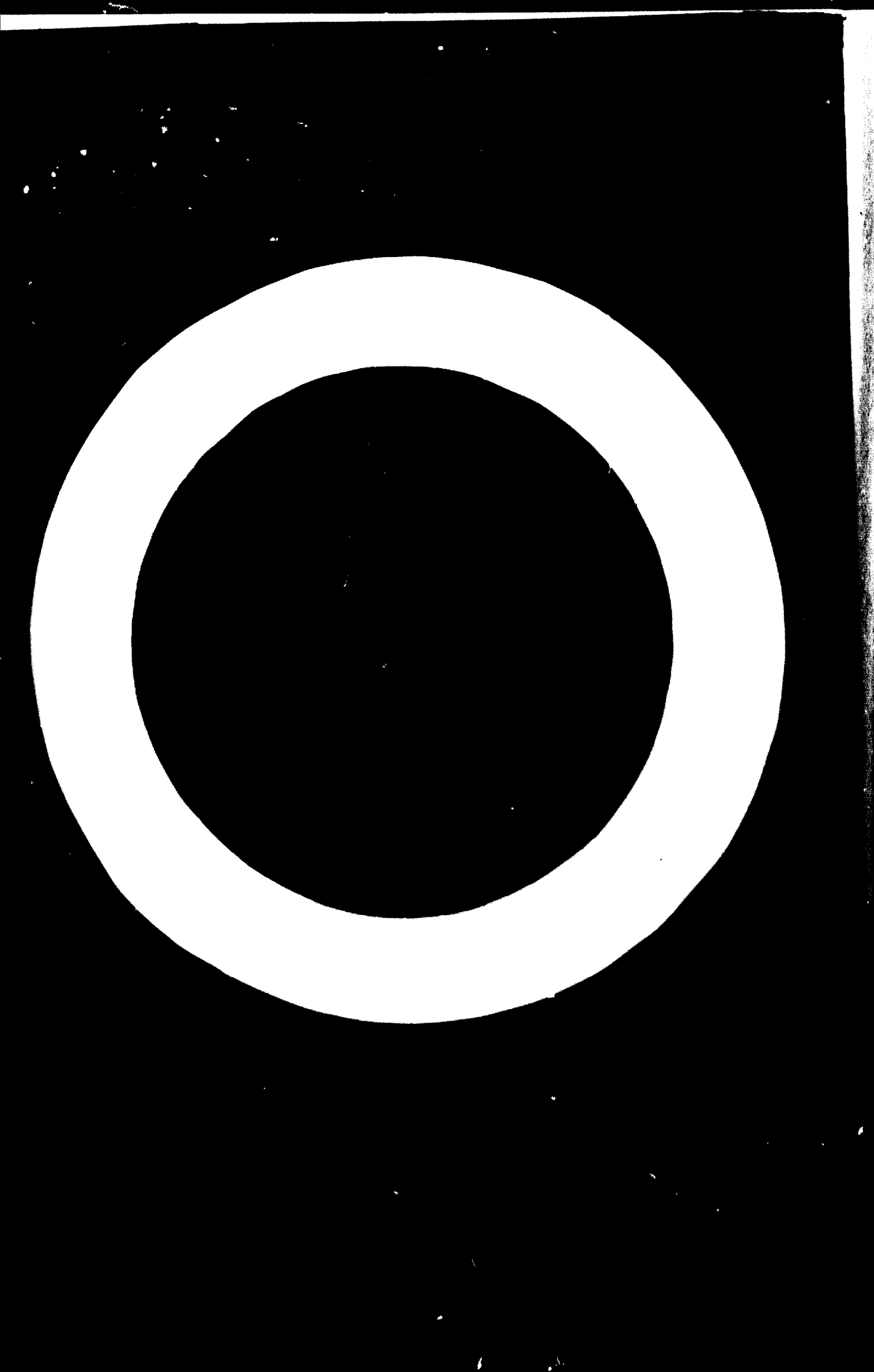

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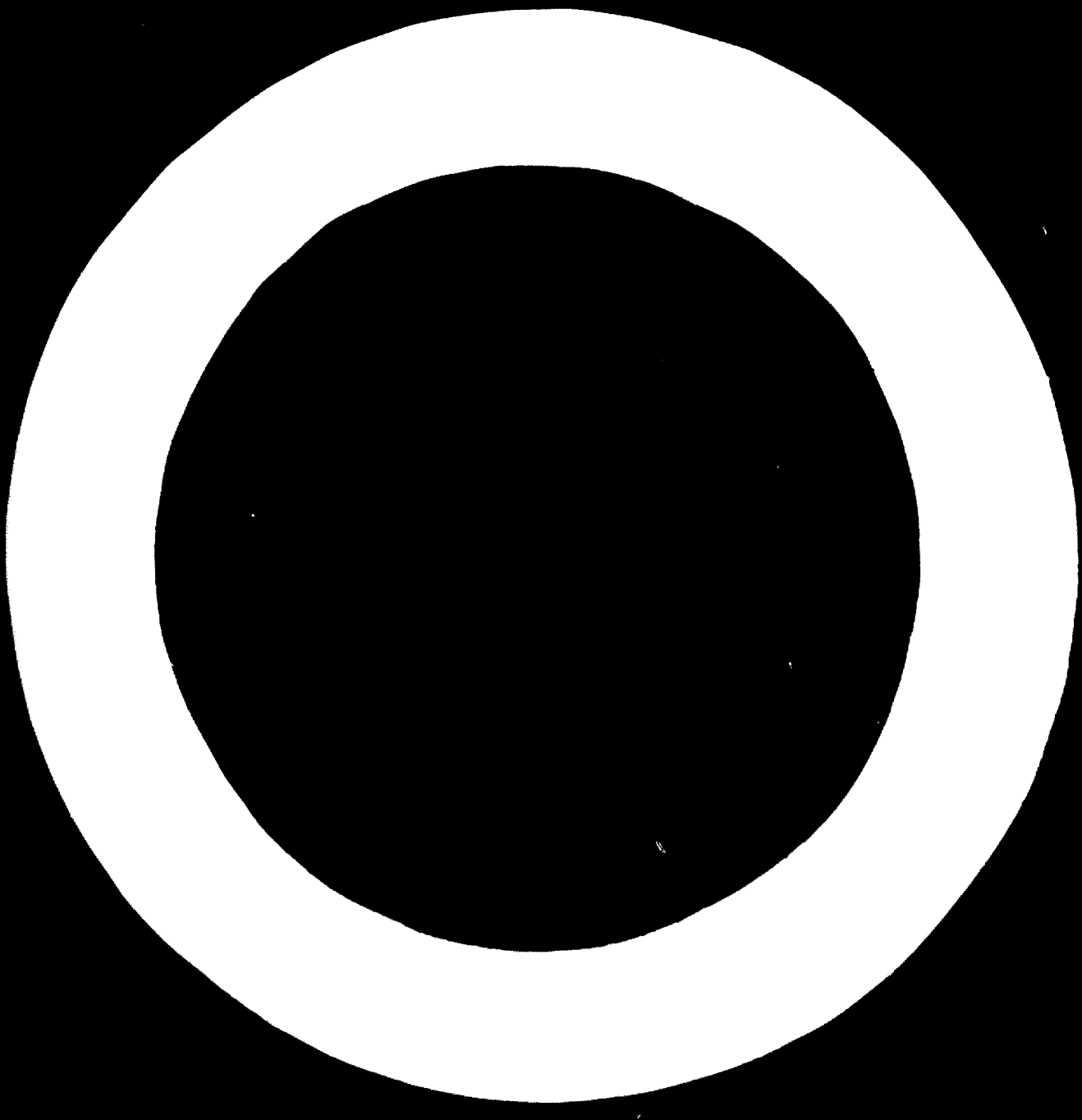

I. INTRODUCTION

I.1. India is one of the major oilseed producing countries in the world with roughly 11% of its cultivable land, namely about 37 million acres, devoted to the production of a variety of oilseed crops. On the other hand, paradoxically, India also has one of the lowest figures for average edible oil consumption at about thirteen grams per day and is facing almost an 'oil famine'. The primary cause of this has been a stagnation in oilseed production. In the last two decades of planning, the production of major oilseeds has increased at an average annual rate of only 2.2%. In the sixties, there has been a near stagnation in oilseed production with a growth rate of only 0.32%. Perhaps there is no other industry in India whose acute shortage of raw materials has been so persistent and inhibitory to development over the last decade, as has been the shortage of oilseeds for edible oil-based industries.

I.2. The main reason for the shortfall is low productivity of crops that results from absence of adequate inputs and an almost total dependency on rainfall. A recent research highlights the current yield per acre of groundnuts in India at almost half of what it was in 1921 and this has been in large part due to continuous utilisation of the poor lands for groundnut cultivation.

It is significant to note that while the production of groundnut rose at an annual rate of 3.5% from 1949/50 to 1968/69, this increase was mainly due to an increase in acreage and only .06% of this total annual increase of 3.51% was due to an increase in yields. Such dismal performance raises a number of questions about the future.

I.3. On the demand side, the inexorable rise in population increase of 2.5% a year cuts into a meagre per capita availability. Industrial demands are also rising as the production of soap, vanaspati and paints is increasing. With the self-sufficiency achieved in cereals, demand for fats can be expected to rise faster in the future. In the Indian economy, with such a massive population, even marginal shortages between demand and supply have been a major cause in fluctuating prices for oils and oilseeds.

I.4. It is not often realised that the 'fat famine' or in nutritional terms - the 'calorie gap' is as grim in India today as the 'protein gap' on which a lot of attention has recently been focused. In the "F-Spectrum" of Agriculture - Food, Fibre and Fat - it would be no exaggeration to say that the most critical area at the present time in India is concerning Fat. In the case

of food grains, we have the Green Revolution, brought about by high-yielding varieties and associated inputs, and in the case of fibres, synthetic fibres are making headway. In the case of fats, however, we have no such major technological breakthrough or substitutes which offer solutions to the current crisis.

I.5. It is estimated that the value of oilseeds represent about 9% of the total value of all agricultural commodities produced in India and about 4% of the Gross National Product. These figures highlight the significance of the edible oil industry to the total national economy. If one projects the welcome effects on the total national economy in terms of G.N.P., employment, etc., were the oilseed processing industry to develop in the next decades by 25% or 50% to move towards edible oil sufficiency comparable to standards of consumption in more advanced countries, it would dramatize the enormous significance of oilseed-based industry to the national economy.

II. VEGETABLE OIL RESOURCES AND NEEDS

II.1. The average Indian consumption per day of edible oils totals to about thirteen grams against seventy grams per day required for good nutrition. This small quantity is derived from 6.2 grams of vegetable oil, 2.0 grams of vanaspati or hydrogenated fat, 2.7 grams of

ghee (melted butter) and about 2.1 grams from "invisible" sources. India, which was at one time an exporter of vegetable oils, is now in a diametrically opposite situation of being an oil-hungry country in terms of its total oil requirements and not too adequate oil resources (Tables 1, 2, 2A & 3). In view of the rapid population growth, we need over fiftythousand tonnes of extra oil per year, even to maintain the very low per capita use of oil. For purposes of statistics five oilseeds, namely, groundnut, sesame, rape, mustard and castor are grouped together as major oilseeds (Table 4).

II.2. Groundnut: Groundnut is by far the most important oilseed in Indian economy, the annual production running about twice that of the other four major oilseeds obtained. India accounts for nearly 50% of the world's groundnut acreage, though it only accounts for about 25% to 30% of the world crop. Obviously, there is much room for improvement of yields (Table 1). The average Indian yield is about 680 lbs. per acre compared with yield in the U.S. and Nigeria which are more than 1,500 lbs. per acre. The low yield in India is mainly due to substantial planting of groundnut on marginal soils or in areas where rainfall is scanty. In fact, on good land under

adequate irrigation, yields of 3,000 lbs. per acre have been obtained.

II.3. Cottonseed: In India, cottonseed was a much neglected oilseed resource till recent years. Normally, around two million tonnes are available annually, but, only about 30% is processed for oil and meal. It is widely used as cattle feed and there has been historically some prejudices against the oil for edible purposes. This problem has been overcome to a very large extent in recent years by several measures undertaken by the Government for its utilisation.

II.4. Coconuts and Copra: This crop flourishes in South India and along the Western Coast of India from Goa southwards, with major production in the States of Kerala and Tamil Nadu. Most of the coconut is used directly as a component of much of the cooking in South India and is also consumed as tender coconuts, small quantities being dried for copra and crushed for oil.

II.5. Rice Bran: Rice is one of the most important food grains in India and large tonnage of rice bran, with an oil content in the range of 20%, are available as a by-product of rice milling. Unfortunately, lipolytic enzymes are activated in the milling process and acidity develops very rapidly in storage, the extracted oil containing sometimes even 50% free fatty acids. Consequently,

much of the rice bran oil is not suitable for refining and the manufacture of edible products. Instead, it is marketed for industrial uses. The defatted bran normally has a protein content of 15%.

II.6. Minor Oils: India has an extraordinary range of less known oilseeds and nuts which have potential both as edible and inedible oilseeds (Table 5). Distinct efforts have been made to promote small scale industries for processing such oilseeds as sal, neem, mohua, kusum and many others. By channeling minor oils into industrial markets, particularly for the manufacture of soap, edible oils can be freed for human consumption.

III. UNCOMMON USES FOR EDIBLE OILS - NEED FOR SUBSTITUTES.

III.1. In India, conservation and channelisation of edible oils for human consumption should take place not only by avoiding losses in processing, etc. but, also by finding suitable substitutes for edible oils used for non-food purposes.

III.2. Use of oils and fats for purposes other than food have their origin in peculiarities of the local culture. For example, in almost every State in India, rubbing of edible oils on the body as part of bathing for health reasons and using perfumed oils as 'Hair Oils' is common practice. It is estimated that nearly 5% to 6%

of edible oil is consumed for these cosmetic purposes in India. Use of edible oils for illuminating lamps in places of worship of religious purposes is another example . In the South-Indian oookery, substantial quantities of tender oooconuts are used in everyday cooking as a garnish in a variety of dishes. Tender oocconuts are also oonsumed in great numbers in parts of India during summer months as a refreshment. Put together, divereion of edible oils and fats and their source material to many of these uees significantly reduces the availability of oils and fats for human oonsumption. Finding suitable subetitites for various functions described above, would eliminate this avoidable divereification of oils and fats.

IV. PROCESSING OF OILSEEDS

IV.1. Oileeeds have been proceesed in India from times immemorial and the ourrent processing technology ranges from the primitive ghani to modern solvent extraction (Table 5).

IV.2. Ghani: The ghani is a very ancient and traditional method of oileeed proceesing in which a peetle rotated in a mortar by bullock or oamel is used to crush seede. After eeveral hours of grinding, the oil ie separated by dipping rags into the crushed seeds

and then squeezing out the oil. Although the number of such crushing operations is decreasing, a very large number of ghanis are still in use, primarily as village operations, crushing mustard or rape seed and such minor oilseeds as kardi, mohua or kusum. This is an inefficient method of oilseed processing and the resultant meals are normally high in oil at around 13% and the primitive conditions of processing virtually eliminate the meal from ghani as a source of protein for human consumption. It is estimated that about 50,000 tonnes of oil are lost on account of such crushing technique.

IV.3. <u>Mechanical Screw Presses or 'Expellers'</u>: In India, there are numerous processors, small and big, the small ones with anywhere from one to four or more of mechanical screw presses. It is estimated, that currently, there are more than 10,000 oil mills, most having one small press operated on a single shift during only a portion of the year. The meals typically contain about 7% to 9% fat. Much of the expeller meal is marketed directly, but, considerable quantities are forwarded to solvent extraction plants for further extraction. The crushing capacity of screw presses, calculated on a twentyfour hours per day basis for threehundred days a year, is estimated to be in the range of seven to eight million tonnes, but, the annual output is probably well under four million tonnes. The excellence

of preconditioning or precooking of the raw material normally determines the quality of the meal and oil and the efficiency of the extraction. The best performance in these expellers could yield meals with as low as 3% of residual meal, but, under Indian conditions 6% of oil in the residual meal is normal. It is estimated that in crude, low power expellers, about 50,000-70,000 tonnes of oil are lost on account of the inefficiency inherent in the units.

IV.4. <u>Solvent Extraction;</u> In India, solvent extraction can be described as secondary processing, since virtually all solvent units are utlised for processing oilcake. There are about eighty solvent extraction plants in India, varying from older batch extractors with capacities as low as ten to fifteen tonnes of oilseed cake per day, to modern continuous units with capacities as high as onehundred tonnes per day. The type of continuous units manufactured in India is the DeSmet horizontal travelling-belt extractor. The solvent extraction plants operating in India are quite small by standards such as obtaining in countries like United States, where a typical solvent extraction plant has a capacity of twohundred tonnes per day at a minimum and about onethousand tonnes plus at a maximum. Obviously,

the economies of scale that is possible in a large installation is not possible under Indian conditions.

Iv.5. The primary problem that the solvent extraction units face is the low quality of oilcakes since there is a time gap between production and utilisation of meals and considerable deterioration occurs in the meals if one considers the end use for human consumption. Secondly, most of the solvent extraction units do not have expellers located on the same premises which also contributes to the lack of efficiency. Till October 1967, there was a Government ban on solvent extraction of oilcakes which has since been removed. Problems also arise because the same solvent extraction unit is used for several oilcakes, both edible and non-edible. The solvent used in these plants is hexane, which is obtained from refined petroleum cuts, unlike the solvent used in the plants in United States, which is derived from natural gas. Most of the Indian meals are marketed in Europe and Japan to gain valuable foreign exchange. Substantial portion of meals which remain in the country are also used as animal feed and manure.

IV.6. <u>Vanaspati:</u> Vanaspati is the popular name for hydrogenated edible fats in India. The product is about fifty years old in the market, the first batch of about

4,000 tonnes having been imported from Holland about fifty years ago. The product is very popular as vegetable ghee and the organised industry manufacturing this product came into being in 1930. The production and consumption of vanaspati has increased about threefold in the last twentynine years and at present nearly 600,000 tonnes are manufactured and marketed annually, against an installed capacity of 1.2 million tonnes and a licensed capacity of 1.8 million tonnes.

IV.7. There are constraints both in terms of the use of raw materials and prices for the finished product which govern the operation of vanaspati. Basically, the raw material mix, as determined by the Government, consists of a mixture of groundnut, cottonseed and imported soya oils. Addition of 7.5% and 2.5% respectively of sesame and kardi is mandatory. Appropriate levels of Vitamin A and D from nutritional considerations are also incorporated under law. The manufacturers are prevented from using a raw material mix of their choice for the manufacture of vanaspati. The Government operates a very rigid and constant system of price fixation for this product to assure the customer of reasonable prices. This constraint, coupled with the restrictions on the use of raw materials, limits very much the scope for newer

innovations in this product line. A single product has therefore to be manufactured according to law within a narrow physical, chemical - and more important - economic parameter. For example, manufacturing margarine with a high Poly Unsaturated Fatty Acid (PUFA) content with suitable additives is not possible under the present system of rules. Similarly, the scope for marketing a range of products with high PUFA content to meet customer preferences is also not feasible under the present conditions. Marketing and manufacturing of mixtures of edible oils after refining is not allowed according to the present regulations.

IV. 8. Refining: Basically, refining is done in India by batch process and there are four or five continuous plants in operation for refining purposes. One of the major problems in the refining process is the disposal of the soap stocks, particularly in the case of cottonseed oil refining. Nearly 30,000 to 40,000 tonnes of soap stocks available from the refining of cottonseed pose a major problem. The development of an efficient method for the recovery of the fatty acids from this is a problem which challenges local technical ingenuity. Since 1950, India has stopped imports of bleaching earth. Thanks to the work carried out at the Regional Research Laboratories at Hyderabad, one of the Government laboratories,

all the bleaching earths used in bleaching of oils today are made in India, about eight companies manufacturing the total needs. The situation in regard to active carbons is not as self-reliant. Still some quantities are imported which will ultimately be replaced by indigenous production. High quality active carbon from 'Himachal Pradesh Pine' is under development.

IV.9 **Soaps:** The soap industry in the organised sector is one of the few industries in India which is working at the maximum levels of installed capacity. At the end of December 1970, there were fortyone units engaged in soap manufacture with the total installed capacity of 2.12 lakh tonnes. The actual production was 2.32 lakh tonnes worth around Rs.700 million. Nearly 95% of soap manufacture is in the form of laundry soap and about 4% is toilet soap. Almost equal amounts of each of lathering oil such as coconut oil and hard oils (palm, Mohua, etc.) and soft oils (groundnut, linseed) are used. Two-thirds of soap is made by the large scale units and only one-third in the small scale units. With the serious shortage of vegetable oils available for soap manufacture, use of synthetic detergents is rapidly developing.

V. MARKETING.

V.1. The major portion of edible oils and fats in India are marketed and consumed in the unbranded non-packaged form. Regional food habits vary much and influence consumption of different oils in different regions of the country. For example, mustard oil is the preferred cooking medium in Eastern India, particularly Bengal and Coconut oil in Kerala and parts of Southern India. On account of the low per capita income and the consequent low purchasing power, majority of consumers buy oil from the small grocer in a 'loose' form. Normally, a few cents-worth is dished out of small measures across counters, to meet day to day requirements of consumers. In these circumstances, it becomes almost impossible to popularise branded packaged oils on a national scale. Even those edible oils marketed in the branded and packaged form are promoted as 'pure groundnut oil', 'pure coconut oil', etc., advertising very clearly the original sources of oil, since this assurance to consumers seems essential to forestall doubts about the origin of the cooking medium. To some extent this practice conforms to regional preferences for cooking mediums. In these circumstances, therefore, suitable blending of different oils and processing them by modern technology to provide the consumer an acceptable oil in packaged form at economic

prices poses some problems. For example, it may be possible, by incorporating the right type of flavours to various blends, to develop cooking oils from a mix of hitherto unacceptable oils. However, the barriers of consumer preferences and the limitations of marketing and legislative restraints are to be overcome.

VI. PROFITABILITY.

VI.1. A profitability study of edible and hydrogenated oil industry made for the period covering 1960-1967, to determine the overall profitability as reflected by (i) profit margin (ii) return on capital employed and (iii) return on shareholders' capital, reveals that in comparison to the other manufacturing and processing industries the oil and oil-based industry has fared rather poorly in this period and the current position is not much different (Table 7). The gross profits as percent of sales for the edible vegetable hydrogenated oil industry was around 3.5% during this period, while it was nearly 10% for all other industries. The figures for gross profits as percent of capital employed are also substantially lower. The equity dividends as

percent of equity capital are in the region of about 7.0% as against 11% for all other industries. Such low profitability discourages new investment for large units which could be more efficient.

VI.2. On the basis of several criteria employed to determine profitability, therefore, the oil and oil-based industry, in its present technical and economic dimensions has a poor performance record. The heavy reliance of this industry on a widely fluctuating agricultural raw material base is one of the main reasons for lower profitability. The risks undertaken by the industry are quite high in proportion to the returns. In fact, raw material and other inputs account for more than 85% of total expenditure in this industry and therefore, under fluctuations of raw material price which are more the rule rather than the exception, operations are very vulnerable.

VI.3. One of the main causes of the fluctuation in prices of raw material is the short-term demand and supply which govern market prices and the not-too-infrequent disruption in communication and transport brought about by natural causes such as, monsoons, floods, etc. To some extent these are magnified by the traders out of proportion to the realities of the situation. Additionally, the

Government's policy of price control and restrictive import policy for raw materials and finished products, is another important factor which results in low profitability. Furthermore, the number of points in the chain of events from the field through the factories to the markets at which traders operate and exercise a hold over market events, are too numerous. A market system in which the oil industry (the user), and the farmer (the supplier), are linked more directly may help stabilize the prices of raw material to the advantage of both and finally to the consumer.

VII. OILSEEDS AS SOURCE OF FUTURE PROTEIN SUPPLY.

VII.1. An entirely new dimension to the oilseed processing industry is currently emerging, based upon the fact that oilseeds are sources of valuable protein of vegetable origin for human food. Viewed against the background of acute shortage of proteins in the developing countries, oilseeds can expect to play a major role in meeting human food requirements for protein from the extracted meals which are rich in this nutrient, in addition to providing calories through their oil, in the decades to come.

VII.2. **The Need:** Protein shortage in the average Indian diet has very rightly evoked the concern of scientists, food technologists, important sections of

the industry and the Government of India. The effect of protein malnutrition in terms of its disastrous consequences on the national life, are too tragic to be ignored. An indication of this concern was voiced by the Planning Minister, Mr. C. Subramanian, in his capacity as Member of the Special Panel to advise the Secretary General of the United Nations, in formulating strategiesto solve the protein malnutrition problem in developing countries. He said,

> "Progress itself consists in assembling programmes in different seemingly prosaic sectors, like nutrition and assigning the right proorities. What is needed is a recognition that the strategy to fight protein hunger is a prime developmental goal".

Large availability of oilseeds in India has led to an increasing realisation of the importance of these as sources of supplementary protein of high quality for the people. Of the total production of 5-6 million tonnes of groundnut in the shell, only 5% to 6% is used for edible purposes and over 80% for the recovery of oil. Approximately, 1.6 million tonnes of press cake and

extracted meal with 50% protein content are available every year and the commercial meal fetches only a fifth of the value of the oil per tonne. The resultant commercial meal is unfit for human consumption because of poor handling and processing.

VII.3. Groundnut Protein Concentrate and Protein Isolates: Technology:

Valuable work on groundnut processing to upgrade the quality of the meal for human consumption has been done in India and the relevant technology is fully developed indigenously. Tata Oil Mills have pioneered the development in this regard and have a production plant in Bombay. The flour has been successfully used to develop a variety of inexpensive nutritious foods suitable for different groups of the population.

VII.4. The status of technology in respect of Groundnut Protein Isolate has also reached the stage of large scale commercial manufacture. Briefly, the protein isolate process involves an alkaline extraction of the groundnut meal followed by acid precipitation leading to a fairly complete recovery of protein from the meal. A simultaneous chemical treatment which includes bleaching during the isolation sequence followed by spray drying, yields a highly soluble, odourless, bland protein isolate

with a protein content of around 90%. The purposeful association of Tata Oil Mills with the Central Food Technological Research Institute, a leading Government-sponsored institution, in developing this know-how, needs special mention. It is a noteworthy example of the utilisation of indigenous technology for national development.

VII.5. Groundnut protein isolate has certain distinct advantage over the parent raw material. Protein isolates from oilseeds sources can be three to four times as concentrated as the oilseeds from which they are derived and can be considered a very profitable by-product of groundnut processing. The isolate can be added to products to improve the nutritional value without affecting the characteristic taste and flavour of food products. In fact, protein isolates are ingredients of choice in a number of food products such as beverages, bakery products, etc., because of the superior functional characteristics they provide when used in these products.

VII.6. <u>Potentials for Food Uses of Groundnut Proteins:</u>

Use of edible groundnut protein and protein isolate in a variety of food products has begun. One of the large scale uses is the atta fortification programme of the Government of India. Here, 5% groundnut flour containing

50% protein will be added to 300,000 tonnes of wheat flour.

VII.7. Fortification of bread with groundnut protein isolate has been implemented by the chain of State-owned Bakeries, Modern Bread. Noteworthy also, is the introduction of cereal and oilseed protein-based high protein weaning foods like "Bal-Amul", developed and marketed by a large Dairy Cooperative, AMUL, in Gujarat in Western India. A number of units in the food industry have also started utilising oilseed protein as a raw material for high protein biscuits, beverages, etc. Tata Oil Mills in Bombay are currently marketing a high-protein beverage 'MILPRO' based on groundnut protein isolate.

NEW SOURCES OF OILSEEDS UNDER DEVELOPMENT.

VII.8. Cottonseed and Sesame: The present production of cottonseed in India is about 1.6 million tonnes, which can easily provide almost 0.5 million tonnes of edible quality flour containing 50% protein, if modern methods of processing techniques are adopted. A pilot plant established at the Regional Research Laboratory, Hyderabad, is doing valuable work for the future utilisation of this important source of protein foods.

The available supply of sesame seed in India is about 500,000, the second largest in the world. It is a rich source of some essential amino acids and could be advantageous when used with other materials such as groundnut

protein to prepare protein-rich foods. There are some inherent problems in the quality of the raw material. Recent work at the Central Food Technological Research Institute in India to find a solution is promising.

VII.9. Soyabean and Sunflower: In recent years, considerable interest has developed in regard to soyabean as a possible protein source in India. Work is being carried out by U.P. Agricultural University at Pant Nagar and Jawaharlal Nehru Agricultural University at Jabalpur, in introducing this crop in selected areas in the country. Technology for the use of soya as a protein source in various product formulations is available, and is developing rapidly in several parts of the world. If soyabean can become a profitable crop for the farmar in India, cultivation, processing, utilisation and marketing of soya protein may become feasible. Rigid fixation on the use of raw materials for protein products will be inhabitory to future development. There is scope for innovation to develop potentially successful products using a variety of raw materials. India, is as much short in edible oils as it is short in proteins. Current developments to introduce sunflower as a source of oil are also significant. Sunflower can provide larger yields of oil per acre and also provide proteins of fair quality which when blended with other suitable oilseeds can be used with great benefit.

VII.10. Oil Palm: Introduction of oil palm in certain areas of India to augment edible oil resources needs careful attention. Oil palm, compared to most oilseed crops is by far the most productive. Large uncultivated areas available in certain parts of India are quite suited for its cultivation. Large-scale cultivation of oil palms in Malaysia, Latin America and Africa are good examples of the economic advantages of this crop. The quality of oil from oil palm is considered to be quite high comparable to the best of other edible oils. Oil palm can be successfully grown in Kerala in Southern India and Andaman and Nicobar Islands in the Bay of Bengal.

VII.11. Even on a rough estimate, it is possible to envisage that in the near future one million tonnes of edible oilseed protein can be made available for human foods. During the current and next decades we can expect to witness a large scale manufacture and marketing of a very wide range of palatable high protein foods in the form of fortified flours, breads, high protein beverages, weaning foods, extended protein-based foods, as well as the enrichment of many existing cereal staple foods.

VII.12. In summary, just as the conversion of oilseeds to meals through processing brought about a revolution in animal feeding, processing of oilseed meals

to isolated protein and into myriad food forms containing isolated oilseed protein is a logical next revolution - this time in human feeding. The millions of tonnes of oilseeds throughout the world, the basic complex raw materials which nature synthesis are readily available as the etarting point for the new technology.

VIII. SCOPE FOR CO-OPERATION WITH DEVELOPING COUNTRIES.

It is clear from the above review that Indian technology for the processing of oileeds is self-reliant and dynamic not only for the conventional processing of these raw materials for oils, but, aleo for the manufacture of protein concentrates and isolates. Combined with the substantial marketing and distribution skills that are available in India, industrial growth in this area is expected to advance rapidly in the Seventies. Speaking on behalf of my own company, it may be appropriate to record here that Tata Oil Mills is one fo the few companies anywhere in the world in the oilseed bueiness which got deeply interested over the last decade in developing the technical and process know-how for protein isolate and related products. In keeping with the philosophy which has guided its progress over the last fiftyfive years, as a 100% Indian enterprise in oilseed processing, Tata Oil Mills would willingly offer the skills in technology and marketing to other developing nations of the world.

The problems and requirements of the developing world are too familiar to us, having achieved what we have solely drawing upon our own technology and resources, as in the pre and post-independent era. In addition to sharing technical and marketing know-how, facilities for training personnel from developing countries in these fields can be made available in the common task of industrial development of our sister nations.

IX. CONCLUSIONS.

Insufficient productivity of oilseeds to meet the growing demands of edible oil-based industries and consumers is an emergency in India in terms of goals to national development. The negative spiral of consumers having to pay higher prices, the edible oil-based industry to go on earning low profit margins and the producer himself not having an attractive incentive to maximise production will continue to frustrate all segments of the trade and industry unless there is a concerted action in promoting increased productivity of oilseeds, by

(a) a well-planned and massive action to improve yields on the present acreage;

(b) introduction of newer crops such as sunflower, soyabeans, oil palm, etc.

and

(c) edible oil-based industries in India taking an active part in developing the raw material sources on a master 'techno-economic' plan,

All sources of inefficient handling and wastes due to old and uneconomic methods of processing must be replaced by more efficient means of production to save substantial losses of the precious edible oils.

The movement away from edible oils such as groundnut oils to the minor oils must be made more rapidly in the soap industry. A vast potential of minor oils is still untapped. Similarly, readily available sources of oil such as rice bran (bran equivalent of 30,000 tonnes of oil) and cottonseed have not been fully exploited. If problems facing utilisation of these resources are resolved as of today, almost half million of oil will be readily available for consumption.

It is clear from the above review that edible oil-based industry in India is an excellent example of an industry in which the supply-demand imbalances are most acute. In fact, on the side of supply, to increase productivity per acre of oilseeds, the impact of the shifts in the pattern of income generation and income distribution

On the volume of demand that would be generated must be taken into account. The consequent supply-demand equilibrium has to be planned in an integrated manner. Therefore, both the industry and the planners in the Government should forge a specific 'industry plan' for the next decade in which concrete attempts could be made to solve these imbalances. The consequences of these imbalances have serious implications on economic growth and social welfare of India's millions. A Techno-Economic Plan, which clearly sets its targets to be realised in the edible oil-based industry should be able to answer some basic questions.

We have witnessed in India recently a near miracle in the production of cereals, thanks to the high-yielding varieties and the crash programmes undertaken by the Government on all aspects of this development including procurement. The phenomenon of Green Revolution, it should be noted, has occufred mainly in a few States in India like Punjab, Haryana and parts of Uttar Pradesh. If food deficit States are assured of increased food grain availability, it should be possible to undertake with greater confidence increased oilseeds production in these States.

The profit incentives that farmers might seek for releasing land for oilseeds or for improving yields on the present land, must be well-identified based on the lessons

learnt in cereal production in India in the last few years.

Immediate steps should be taken for faster development of synthetic detergents to relieve the pressure on edible oils. The impediments in the way of this programme ought to be well-identified and resolved.

Since scarcity of edible oilseeds is going to be unavoidable in India for some time, possibility of bilateral trade treaties with other oilseed producing countries in the developing world ought to be explored for mutual advantage.

The litany on what needs to be done in India to overcome the problems of 'Edible Oil shortage' may read formidable. But, India possesses the necessary resources of technology both in agriculture and processing and in marketing and management. Industry in India, if its past record is any indication, has kept abreast of developments and integrated them promptly into its operations in oilseed processing. In fact, the current activities on proteins for human food from oilseeds springs from such a forward looking dynamism. One can look forward with justifiable confidence that this industry in India will grow to bigger dimensions from its already sizable proportions, augmenting its raw material resources, finding

substitute products in which edible oils are used at present and exploiting fully the untapped resources available at present and to be developed rapidly in future, on well evaluated techno-economic foundations.

TABLE NO. 1

INDIA'S RANK AMONG VEGETABLE OIL PRODUCING COUNTRIES IN THE WORLD.

	CROP AREA (million hectare)			CROP PRODUCTION (million Tonnes)		
CROP	World	India	India's rank.	World	India	India's rank.
Groundnut	15.82	6.70	1st	14.25	4.93	1st
Sesame	5.06	2.36	1st	1.49	0.42	1st
Mustard	7.64	3.08	1st	3.88	1.18	1st
Linseed	7.92	1.94	1st	3.30	0.43	5th
Castor	-	0.45	-	0.56	0.10	2nd
Copra	-	-	-	3.32	0.26	4th
Cottonseed	32.00	8.00	1st	20.00	1.80	4th.

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Source: Proceedings of the Seminar on Oils & Fats - Measures to Augment Supplies - Oil Technologists Association, India - P-L, 1971.

TABLE NO. 8

DEMAND FOR OIL IN INDIA

Uses.	1965-66	(in '000 tonnes) 1970-71	1975-76
Edible purpose	1400	1800	2350
Vanaspati	440	600	825
Soaps and cosmetics	340	485	660
Paint and Varnish	65	150	250
Export	Very Small	-	-
Total (as oil)	2245	3035	4085

Source: Proceedings of the Seminar on Oils & Fats - Measures to Augment Supplies - Oil Technologists Association, India - P-LL, 1971.

TABLE NO. 2A

PRICES AND PRODUCTION OF SOAP AND VANASPATI.

	SOAP			VANASPATHI		
	Producgion	Production index	Price index	Production	Production index	Price index
	'000 Tons	1952-53 = 100		'000 Tons	1952-53 = 100	
1955-56	104	120	97	280	138	83
1960-61	145	167	117	340	167	138
1965-66	162	186	155	401	198	185
1969-70	227	261	173	478	235	258

(Source: Basic Statistic relating to Indian Economy: C.S.O. Monthly Statistics of Production & Eco. Adviser's Price index)

TABLE NO. 3

VALUE OF IMPORTED VEGETABLE OILS TO INDIA.

(in million rupees)

	Soyabean Oil 1	Mustard including rapeseed oil 2	Linseed oil	Palm oil 3	Tung oil	Cottonseed oil
1964-65	11.2	1.3	-	34.4	0.9	7.3
1967-68	142.4	1.0	-	11.5	0.4	-
1969-70	169.9	0.8	0.2	0.6	0.5	-

1 - Mostly from U.S.A.

2 - Mostly from Nepal.

3 - Mostly from Malaysia.

Source: Monthly Statistics of the Foreign Trade of India, Vol. 1, Exports & Re-Exports, March'70.

TABLE NO. 4

PRODUCTION OF MAJOR OILSEEDS IN 1971 IN INDIA

('000 Metric Tonnes)

Groundnut in shells	6065
Mustard and Rape	1963
Sesame	568
Linseed	455
Castor	136

(Target for the five major oilseeds in 1973-74 is 10.5 million tonnes)

TABLE NO. 5

POTENTIALITY OF OIL AVAILABLE FROM MINOR OILSEEDS.
(including those of forest origin)

(in '000 tonnes)

Seed	% oil in seed	Present Oil Production	Seed potential	Oil potential
Mohua	45	25.00	490.0	171.0
Neem	45	20.00	418.0	83.6
Karanjia	32	7.00	111.0	30.0
Kusum	40	3.00	90.0	30.0
Sal	14	3.12	5504.0	668.0
Watermelon	26	2.50	20.0	5.0
		60.62	6633.0	987.6

Source: Proceedings of the Seminar on Oils & Fats - Measures to Augment Supplies - Oil Technologists Association, India - P-LII, 1971.

TABLE NO. 6

VEGETABLE OIL EXTRACTION CAPACITY IN INDIA
(Crushing and Solvent Extraction)

(Figures given in terms of seeds, 000,000 tons)

	1963-64	1970-71
Ghannies	9	8
Power operated expellers.	65	70
On cottonseed.	5	17
Solvent extraction (cake/seed)	12	30
Total:	91	125

Source: Proceedings of the Seminar on Oils & Fats - Measures to Augment Supplies - Oil Technologists Association, India - P-L, 1971.

TABLE I.C. 7

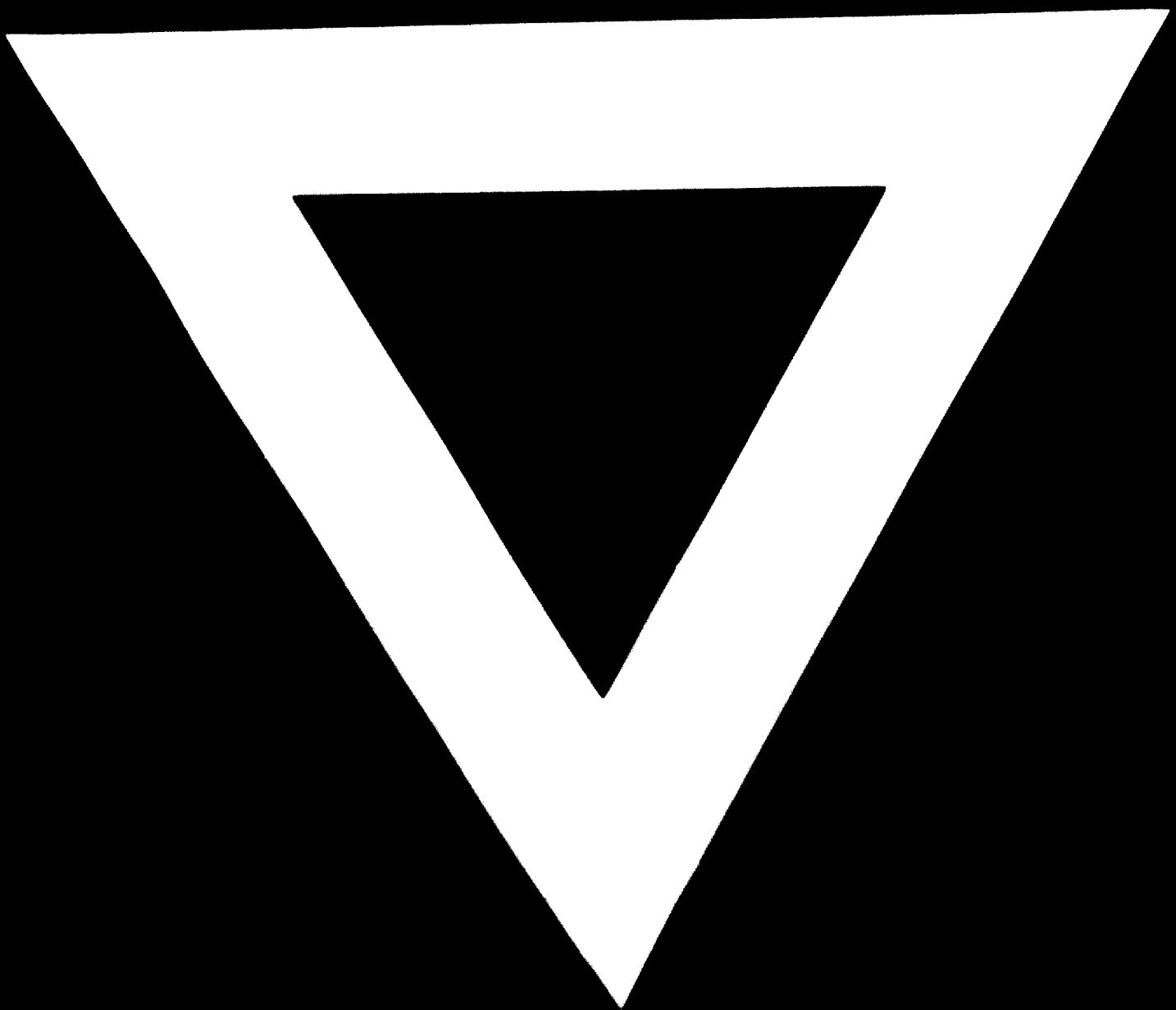
A STUDY OF PROFITABILITY OF EDIBLE AND HYDROGENATED OIL INDUSTRY IN INDIA.

(Average figures for 1960-1967)

	Edible and hydrogenated oil industry.	Processing * and Manufacture	All Industries
Gross Profits as % of sales	3.1	7.6	10.1
Gross Profits as % of capital employed	9	10.1	10.1
Net Profits as % of net worth.	7.8	8.5	9.5
Dividends as % of net worth.	4.7	5.5	5.9
Equity dividends as % of equity capital	7.2	11.3	11
Taxation as % of profits before tax.	52.0	51.3	47.6

* Foodstuffs, Textiles, Tobacco, Leather and Products thereof

Source: Tata Industries Private Limited, Dept. of Economics & Statistics October 28, 1970.



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