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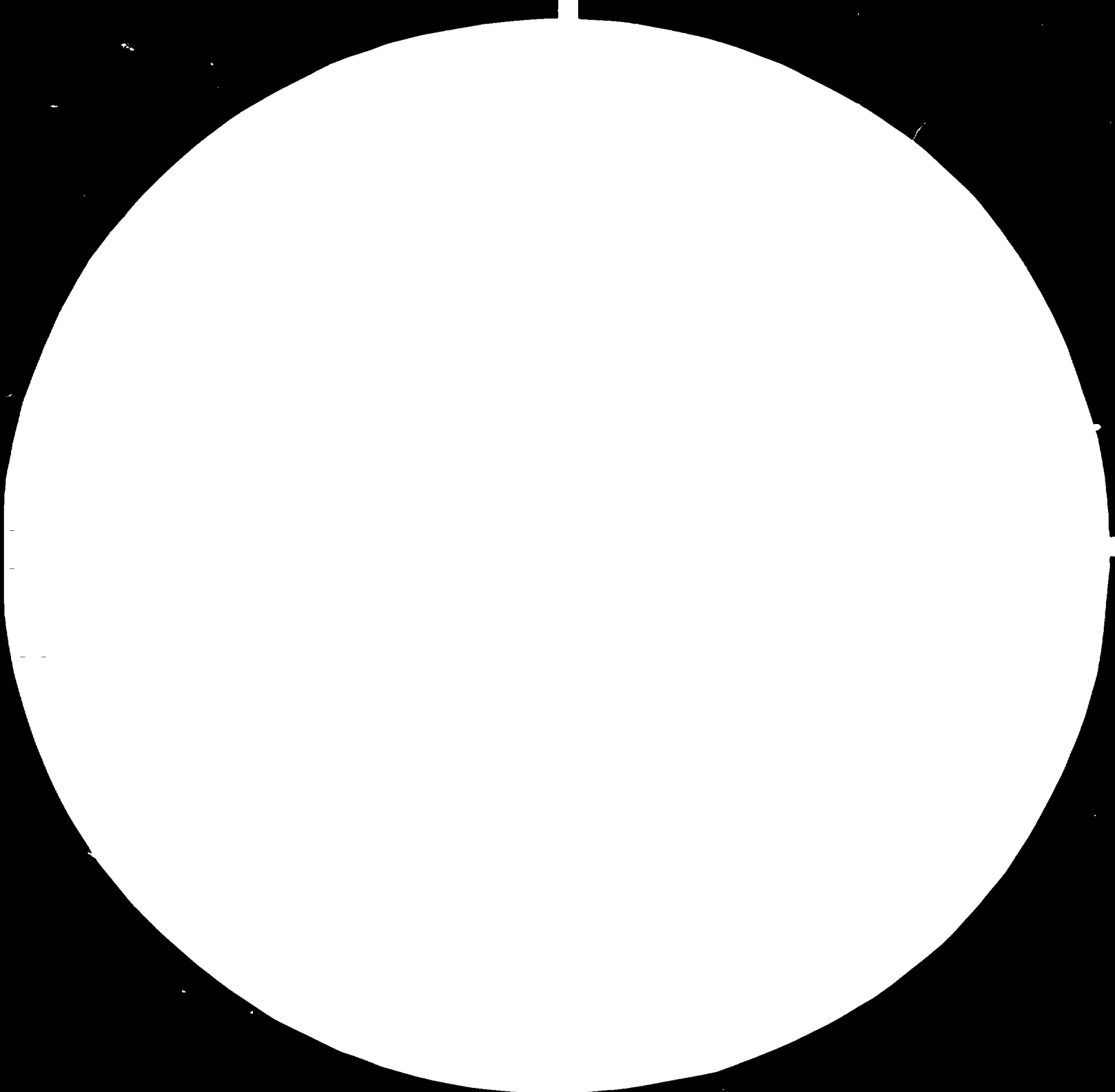

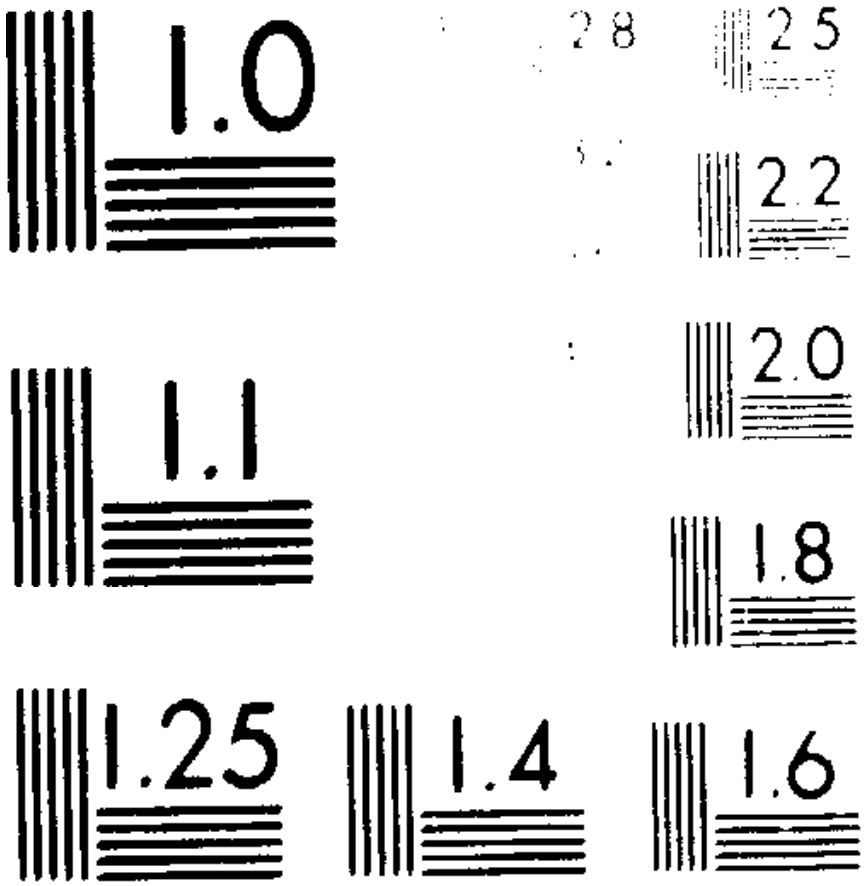
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Tropical Products Institute

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# A TECHNICAL AND ECONOMIC STUDY TO ASSESS AND EVALUATE THE PROSPECTS FOR PEPPER PROCESSING IN THE COUNTRIES OF THE PEPPER COMMUNITY

FINAL REPORT TO THE

# United Nations Industrial Development Organization

# A TECHNICAL AND ECONOMIC STUDY TO ASSESS AND EVALUATE THE PROSPECTS FOR PEPPER PROCESSING IN THE COUNTRIES OF THE PEPPER COMMUNITY

December, 1980

FINAL REPORT TO THE
UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

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Overseas Development Administration
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UNIDO Contract No. 80/48
Project No. SI/RAS/79/802
TPI Contract 52
TPI Report R941 (C)

In connection with the project entitled "Preparation of a Programme for Pepper Processing and Product Development in the Countries of the Pepper Community" (Project No. SI/RAS/79/802), the United Nations Industrial Development Organization (UNIDO) retained the services of the Tropical Products Institute (TPI) under UNIDO Contract No. 80/48 to carry out a technical and economic study to assess and evaluate the prospects for pepper processing in the countries of the Pepper Community (India, Indonesia and Malaysia). This document is TPI's Final Report presented to UNIDO on completion of the study.

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Exchange Rates

The following exchange rates for the United States dollar ($) have been used in this Report for current prices:

| | |
|---|---|
| United Kingdom | 0.42 Pounds |
| Canada | 1.15 Canadian Dollars |
| German Federal Republic | 1.76 Marks |
| Denmark | 5.46 Krone |
| Sweden | 4.15 Krona |
| India | 7.77 Rupees |
| Indonesia | 626 Rupiahs |
| Malaysia | 2.14 Malaysian Dollars |
| Singapore | 2.11 Singapore Dollars |

Historical exchange rates have been obtained from International Financial Statistics published by the International Monetary Fund.

Units

Metric units are used throughout this Report.
Figures in Tables do not necessarily add up due to rounding.

ACKNOWLEDGEMENTS

In the preparation of this Report, numerous enquiries were addressed to Governmental and private organisations, both by correspondence and through personal contact. These enquiries were greatly helped by those who organised itineraries in the countries surveyed. The authors wish to express their gratitude to all those who generously gave time both to assist and to discuss issues and supply information that contributed substantially to the production of this Report.

## EVALUATION SUMMARY

1. The pepper products covered in this Report are pepper oleoresin, pepper oil, the various forms of green pepper and ground and pre-packed pepper.

### Pepper Oleoresin

2. World consumption of pepper oleoresin has been estimated at 377 to 447 tonnes whilst production has been estimated at 365 to 400 tonnes per annum. In round figures therefore the world market size has been estimated at around 400 tonnes.

3. The major use of oleoresin is by the food manufacturing industry in North America, Europe and Japan. The USA is the major consumer, accounting for just less than half the total market. Other major consumers are the UK and the German Federal Republic. On average the world market is expected to grow at around 6% per annum over the next decade, rising to 720 tonnes in 1990. Since this forecast is subject to a considerable range of error, a likely variation in market size from 650 to 800 tonnes in 1990 has been suggested.

4. Oleoresin extraction industries were first established in North America and Europe in the 1960's. However, through the 1970's production facilities have been increasingly located in the pepper producing regions. There are now oleoresin extraction plants in India, Malaysia, Indonesia and Singapore. Current capacity in these four countries is estimated at 765 to 825 tonnes per annum, whilst production is estimated at 215 to 230 tonnes (26 to 30% of installed capacity). There is also thought to be at least sufficient capacity in North America and Western Europe to produce all the world's current needs. At present, therefore, very considerable excess world capacity for pepper oleoresin extraction exists. It would also appear that there is more than sufficient capacity to meet market needs in 1990.

5. Current price levels for pepper oleoresin (US $18 to US $22 per kg c and f in the consuming countries) are determined by the price of Indian supplies. At these price levels extraction in North America and Western Europe is only profitable when cheap

raw materials are available, the UK being the only country still extracting significant quantities. Similarly, in the pepper producing regions other than India, extractors are at best only able to cover their variable costs of production.
In view of the current over-capacity in India, it is unlikely that world prices will rise significantly in the foreseeable future. As a consequence, further investments in pepper oleoresin extraction facilities are unlikely to prove economic. Even if the market situation changes dramatically, present producers will quickly be able to increase their capacity to meet new demands.

6. If a decision is made to establish an oleoresin factory it is essential to ensure that adequate supplies of suitable raw material are available, that other spices besides pepper are available for extraction, eg capsicum, ginger, tumeric, celery and nutmeg, and that a market contract has been negotiated.

Pepper Oil

7. World consumption of pepper oil is estimated at 15 to 20 tonnes per annum. This is used by both the fragrance and flavour industries, the largest markets being the USA and the German Federal Republic. Prospects for market growth are poor: it seems unlikely that consumption will rise above 20 tonnes per annum by 1990, and it may even show a decline from present levels.

8. Most pepper oil is produced in the USA, the UK and in India. Supplies are more than adequate to meet demand in the foreseeable future. In both pepper producing countries and consuming countries there are a considerable number of small-scale distillation units which can be brought into production when the oil is needed.

9. In view of the very small market size, the setting up of facilities to produce pepper oil alone cannot be envisaged. The only possibilities would be to produce the oil as part of an oleoresin extraction process or in conjunction with other essential oils.

## Green Pepper Products

10. World consumption of the various forms of green pepper is estimated at 1,150 to 1,430 tonnes per annum, whilst production is estimated at 1,260 to 1,460 tonnes. The major part of this is preserved in brine or other liquid preservatives, with smaller quantities of dehydrated and freeze-dried green pepper being produced.

11. The major markets are the German Federal Republic and France, other significant markets existing in the Benelux countries, Switzerland and Sweden. An estimated 80-85% of consumption is accounted for by preserved green pepper, the remainder of the market being split between dehydrated and freeze-dried green pepper. Green pepper products are regarded as a luxury item, sales being made both directly at the retail level and to food manufacturers. The relatively rapid period of growth in demand which occurred in Europe as the markets were established now appears to have ended and in the future much slower growth can be expected. A growth rate of 4% to 5% per annum has been forecast, implying a demand for around 2,000 tonnes in 1990. Preserved green pepper will probably continue to hold about 80% of the market, whilst freeze-dried consumption will increase mainly at the expense of dehydrated green pepper.

12. The major producing countries are Madagascar, Brazil and India. About 90% is canned in liquid preservatives, the canning factories handling other commodities besides green pepper. Dehydrated green pepper is mainly produced in India, and freeze-dried green pepper mainly in the German Federal Republic from imported supplies of preserved green pepper. Considerable over-capacity of processing facilities was reported in India, whilst there is thought to be adequate capacity in the other producing countries. Major investments in new processing plants are therefore unlikely to be needed. If new facilities are established, it is considered essential that other products are available for processing, whether these are for canning, dehydrating or freeze-drying.

## Ground and Pre-packed Pepper

13. The prospects for the pepper producing countries to sell increased quantities of these products in the countries visited during the course of the study were ascertained.

The results indicate that in North America and Western Europe the chance of breaking into markets at present is extremely small. Fears of adulteration, the fact that after grinding pepper slowly loses its flavour strength and the need to compete with highly organised distribution networks are the main reasons for this. The only company to succeed in breaking into these markets did so because they were selling to a parent company whose distribution network was already well established.

14. Outside the above markets, there are thought to be possibilities for selling pre-packed pepper to the Middle East. Both the Australian and New Zealand markets are thought to be worth further investigation for both ground and pre-packed pepper. All these markets are relatively small and highly competitive.

15. In the pepper producing countries, only a few companies had the capability of breaking into export markets, most being geared to supplying their domestic markets. It is not felt that special emphasis should be placed on the development of these products in the pepper producing countries. Any significant market developments cannot be expected in the time span covered by this Report.

Other Issues

16. The possibilities for establishing joint-ventures for the purpose of processing pepper products were investigated. In general, little enthusiasm was expressed by flavour houses, dealers, grinders or packers in consuming countries for joint-ventures, this being mainly a reflection of the present situation with production over-capacity and market limitations. Potential developed country partners could see little point in further investments in these industries.

17. In oleoresins, several companies in consuming countries expressed willingness to provide technical advice to help meet market specifications. At the same time, manufacturers in pepper producing countries should try to obtain long-term marketing agreements. For green pepper one European company expressed considerable interest in establishing a joint-venture to freeze-dry in the producing countries, this being considered preferable to freeze-drying in Europe as is done at present.

Least enthusiasm was expressed for joint-ventures for the grinding and pre-packing of pepper, since this would involve duplication of facilities and would act against the interests of the companies so involved.

18. Research to develop new pepper-based products has so far proved largely negative. The potential for non-food applications are considered minimal. A new spice known as "pink pepper" has recently entered the market. This is not true pepper (Piper nigrum L), but has been tentatively identified as consisting predominantly of the dried fruits of Schinus molle, the "pepper tree", which originated in South and Central America.

19. Demand for pepper products at present accounts for about 4% of world pepper production and by 1990 this figure may have risen to 5%. In relation to total pepper production, pepper products are therefore likely to remain of relatively minor importance. In this situation, exports of whole black and white pepper will continue to be the most importance source of income for pepper-producing countries.

20. In terms of assistance to the Pepper Community, the services of a Pepper Processing and Product Development Technologist assigned to the Secretariat are not felt to be justified. However, it is felt that the assignment of a more broadly based technical advisor in the post-harvest sector, concentrating on the production and export of whole black and white pepper, is justified. The advisor would be attached to the Pepper Community in Jakarta.

## INTRODUCTION

UNIDO agreed to provide assistance to the Governments of the member Countries of the Pepper Community (India, Indonesia and Malaysia) in carrying out the project entitled "Preparation of a Programme for Pepper Processing and Product Development in the Countries of the Pepper Community" in India, Indonesia, Malaysia and selected user countries in North America and Europe (Project No. SI/RAS/79/802). In connection with this project UNIDO entered into a contract with TPI to undertake a technical and economic study to assess and evaluate the prospects for pepper processing in the countries of the Pepper Community. The contract (UNIDO Contract No. 80/48) was signed in March 1980.

The Terms of Reference for the Study were as follows:

(i) Based on information obtained from authoritative sources (end users, flavour houses, importers, spice trade associations and the International Trade Centre UNCTAD/GATT) assess and evaluate the prospects for selling increased quantities of processed pepper products on the world market;

(ii) Forecast, for a period of ten years starting January 1980, the prospects for selling increased quantities of processed pepper products on the world market, also the prices at which these products are likely to be sold;

(iii) Ascertain potential interest of small/medium-size flavour/packaging houses/importers in Western Europe and North America in establishing joint-ventures with local investors in countries comprising the Pepper Community for the purpose of processing pepper products within the Community and marketing them overseas; or alternatively establishing such joint-ventures in Western Europe or North America;

(iv) Ascertain the maximum production capacity of the pepper products processing factories already established in the Community, as well as their current rate of production;

(v) Based on the findings and conclusions resulting from the work done in items (i), (ii) and (iii) above, prepare an economic justification for either (a) expanding production capacity of existing factories, or (b) establishing new factories, or (c) a combination of both;

(vi) Draw attention to any known plans for establishing new factories for manufacturing processed pepper products in non-pepper producing countries;

(vii) Based on the work done above formulate guidelines for the establishment of new pepper products processing factories in member countries of the Community;

(viii) Formulate a programme of work for research and development of new pepper based products;

(ix) In connection with item (viii) above, determine whether the services of a Pepper Processing and Products Development Technologist to be assigned to the Secretariat of the Pepper Community would be justified and, if affirmative, formulate a specific programme of work for said technologist, and indicate the availability of the physical facilities which the technologist would need for his work; and

(x) In carrying out the work listed above, consult as appropriate with the Secretariat of the Pepper Community and members of the Permanent Panel on Pepper Techno-Economic Studies.

The personnel provided by TPI to undertake the Study were Mr P.R. Walters (Team Leader) and Dr A.E. Smith. In addition, inputs were provided by staff from TPI's Spices, Essential Oils and Other Plant Extractives Section and Statistics Section. In total 35½ man-weeks were allocated to the Study. The Team Leader visited the UNIDO Headquarters in Vienna for a briefing and exchange of views before work commenced.

In carrying out the work Mr Walters visited the USA,Canada, Indonesia, Singapore and Malaysia. Dr Smith visited Sweden, Denmark, the Federal Republic of Germany, the Netherlands, Switzerland (including a visit to the International Trade Centre UNCTAD/GATT), France and India. In these countries interviews were held with Government officials, Trade Associations and a representative sample of companies involved in the production,trade and utilisation of pepper products (see Appendix 1).

In Indonesia consultations were held with the Secretariat of the Pepper Community in Jakarta and Mr Walters attended the Third Meeting of the Pepper Community Permanent Panel on Techno-Economic Studies, 2-6 June, 1980 in Jakarta. A progress report on the Project was presented to the Sub-Panel on Processing and Product Development and the views of its members obtained.

This Report of the findings is introduced by a description of the various pepper products covered by the study. Chapter I contains detailed analyses of the markets for pepper oleoresin, pepper oil and green pepper products. For each of these products, present utilisation in the main markets is discussed and a forecast of future consumption made to 1990. From the main country studies, a summary of the world situation has been drawn up. This Chapter also contains a section on ground and pre-packed pepper which assesses the prospects for the pepper-producing countries to increase their export sales.

In Chapter II a review is made of the facilities for pepper processing. From the information obtained, an estimate has been made of the current world production of pepper products, as well as an assessment of production capacity.

Chapter III brings together the findings of the first two Chapters, comparing production and consumption estimates for pepper products. Recommendations are made concerning the establishment of further processing facilities, whilst the possibilities for setting up joint-ventures for pepper processing and new product development are discussed. Finally,the type of assistance which is required by the Pepper Community is considered.

## PRODUCT DESCRIPTIONS

The various pepper products and their relationship to each other are shown in the Diagram. Traditionally the main forms produced and exported by the pepper producing countries are whole black and white pepper. The former is obtained by drying the immature berries, whilst for the latter the mesocarp is removed by soaking and treading the mature berries before drying. This Report is concerned with the products obtained by the further processing of black and white pepper, i.e. pepper oleoresin, pepper oil and ground pepper, as well as the various forms of green pepper obtained by processing the immature berries.

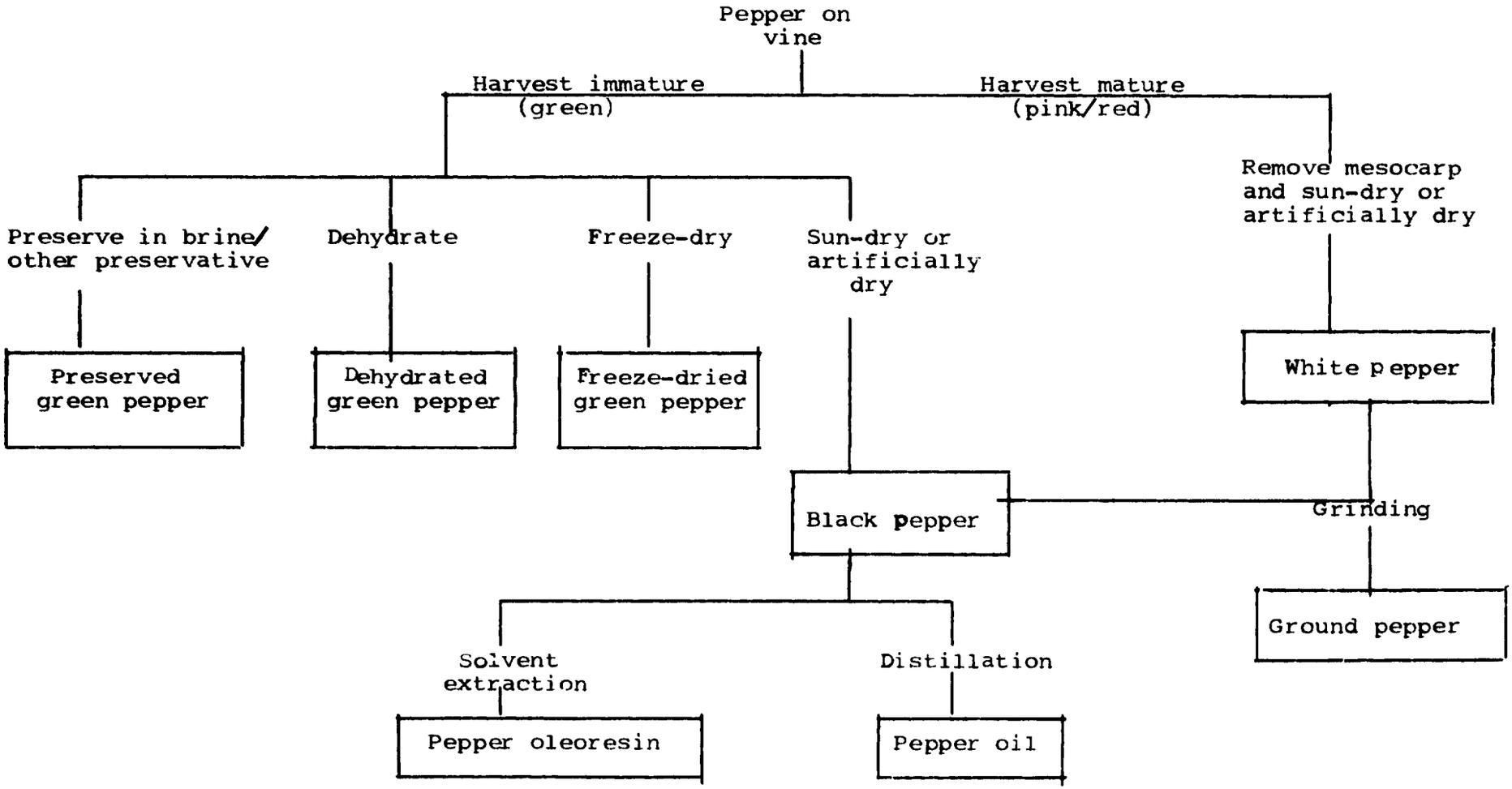
Pepper oleoresin is obtained by the extraction of black pepper with organic solvents, e.g. ethylene dichloride, acetone, etc. When freshly made, the oleoresin is a dark, viscous, heavy liquid containing the odour, flavour and pungent principles of pepper. The principal quality evaluation criteria for pepper oleoresin are the contents of volatile oil and piperine. Oleoresin yields vary between about 10 and 15%, a figure of 12.5% being assumed in this Report. The use of pepper oleoresin is almost exclusively in the food industry and before use it is normally dispersed on a suitable carrier to ensure a uniform consistency. The main advantages of use of the oleoresin over the natural spice are its freedom from bacterial contamination, standardisation of flavour strength and also storage space and duration benefits. One of the constraints on its use is in meeting national health and safety regulations for permissible residual solvent. The major constraint, however, is the traditional preference of some consumers for the ground spice.

Occasionally pepper oleoresin is marketed containing a high percentage of residual solvent (say 5% to 12%). This is referred to in this Report as "crude" oleoresin.

Pepper oil, the essential oil of pepper, is obtained by steam distillation of black pepper. It is a colourless to pale green liquid possessing the characteristic aroma and flavour of the spice but lacking in the pungency. Oil yields in commercial distillation are usually 1 to 2.6% (for calculation purposes 2% has been used in this Report). The main uses of the oil are in perfumery and in flavouring.

DIAGRAM

PEPPER PRODUCTS



Green pepper products have appeared on the market only in recent years. They are prepared from unripe but fully developed pepper berries. The whole berries are processed in one of three basic ways:

- preserved in brine or some other liquid preservative;

- dehydrated, after preliminary processing to deactivate the enzymes responsible for the normal browning reaction;

- freeze-dried.

These three products are mainly employed as a spice in gourmet cooking.

Ground pepper is obtained by grinding whole black or white pepper. This may be done on a small-scale, using a simple grinding machine, or on a large-scale, using highly sophisticated equipment capable of producing a large number of different grinds. The ground pepper may be marketed in bulk or packed in a range of small containers for sale in the retail market. Both ground and whole black and white pepper sold packaged in the retail market have been termed pre-packed pepper in this Report. In its industrial uses, ground black pepper is primarily used in meat products whilst ground white pepper is used in applications where dark particles are undesirable, e.g. light coloured sauces, mayonnaises and cream soups.

# CHAPTER 1
# MARKET ANALYSIS

The major markets for pepper products were investigated in Western Europe and North America. In addition desk research was undertaken on other markets in order to assess total present world demand and to project future world consumption levels.

Statistics of production and trade in pepper products are scarce. In view of this the majority of information was obtained through interviews, and the range of values for market size and growth given in this Report are subjective estimates based on interviewees' responses. Similarly, no satisfactory price series were obtained for pepper products, quotes being obtained where possible during interviews.

## A. Pepper Oleoresin

The major markets for pepper oleoresin are the USA, UK and the German Federal Republic. Smaller markets exist in other Western European countries, Canada and Japan. Limited quantities may also be consumed in the USSR and Eastern Europe, but information could not be obtained on these markets. The following sections discuss the present utilisation and future prospects in the main markets.

### 1. United States

#### (a) Present Consumption

Consumption of pepper oleoresin in the USA is estimated at 180 to 200 tonnes per annum, almost all of which is used by the food manufacturing industries. This market has maintained a good rate of growth through the 1970's as more users have changed over from using the ground spice to the oleoresin. The major consumer has always been the meat processing industry which is still estimated to account for over half of the total consumption. Other major uses are in soups, dressings and sauces, as well as in convenience foods. An important factor in the growth of oleoresin consumption has been the growth of the food service industry. In particular, there are an increasing number of fast food outlets which require a standardised product, whilst the trend towards ethnic foods has created a demand for highly spiced products.

Originally the major sources of supply of pepper oleoresins were 5 or 6 domestic extractors. However, over the last few years, cheaper imports (especially from India) have made domestic extraction uncompetitive with the result that the majority of supplies are now imported. One or two of the domestic extractors still produce small quantities of pepper oleoresin. They may also be responsible for refining, blending or marketing imported supplies.

Until 1980, US import statistics for pepper oleoresin were not separately recorded. However, besides India, imports come mainly from Singapore and in smaller quantities from Indonesia. In addition to the supplies consumed domestically, quantities are also exported/re-exported, mainly to Western Europe. A rough estimate would suggest that some 10 to 20% of total US supplies are produced domestically, the remainder being imported.

Prices in the first half of 1980 varied between US $18 and US $20 per kg c and f New York, depending on quantity and specifications. In the recent past, prices have remained relatively constant, but at a lower level than they were a few years ago. This fall in prices has been largely due to the presence in the market of cheaper imports from India. Indian exporters receive an export rebate, currently set at 12.5% of the fob value of the oleoresin, which enabled them to undercut US domestic producers. In 1979 the US International Trade Commission conducted an investigation under the US countervailing duty law into the Indian export rebate. However the Commission concluded that the US oleoresin extraction industry was not being injured by imports from India, largely due to the fact that domestic producers had been able to switch to the extraction of other spices.

(b) Future Prospects

Whilst consumption of pepper oleoresin in the USA increased steadily through the 1970's the indications are, now that the majority of potential users have converted to using the oleoresin, that there will be a slow down in the rate of market growth. Currently this trend is being aggravated by the economic recession in the USA.

Interviewees in the USA expressed widely differing opinions about the future growth of oleoresin consumption - at the lower end some estimated that demand would grow at around 3% per annum whilst others forecast growth rates of over 10% per annum. More than anything else, this would appear to be a reflection of the growth rates that can be expected in the different end-use sectors. For example, in the meat processing industry oleoresin usage appears to be more or less saturated, with growth rates in consumption therefore expected to be low. In contrast, the food service industry is growing at between 10 and 15% per annum. Already 40% of meals in the USA are eaten out of the home and by 1985 this figure is expected to have reached 50%. Use of pepper oleoresin can expect to benefit from this growth, in particular in the fast food sector. The constant development of new food products in the USA can also be expected to boost oleoresin consumption. Because of the many diverse trends which are affecting consumption, it is difficult to arrive at any one figure for the future growth rate. However, a range of 4-7% per annum would appear most likely and 6% per annum has been used as a basis for the forecast of 1990 demand presented in this Report.

Besides the factors discussed above, two others may have a significant effect on oleoresin consumption. These are the possibilities;

(a) that ethylene dichloride (EDC) might be banned as an oleoresin solvent and;
(b) that ethylene oxide (ETO) may be banned as a sterilising agent for ground pepper.

Both these products are currently being investigated by the US authorities and although this topic is discussed in this Section, the effects of any such ban will be felt more widely than in just the US market.

EDC is the most commonly used oleoresin solvent, one of its major advantages being its ability to extract a wide range of spices. However, the effect of residual levels of EDC in foodstuffs is currently being investigated by the US Food and Drug Administration. Oleoresin extracted with EDC is already banned in Japan and, should it be similarly banned in the USA, would almost certainly limit market growth in the short-term. However, other satisfactory

solvents, e.g. acetone, exist and most of the production units can be converted to use them. In the longer-term, therefore, a ban on EDC should not seriously affect demand.

ETO is used as a sterilizing agent for pepper. However, recently the US Environmental Protection Agency proposed delisting it as a pesticide. This would mean that an alternative sterilizing agent would be needed for ground pepper and at present, although several possibilities are being investigated, none are competitive with ETO. The effect of a ban on ETO, therefore, might be to promote the maximum use of pepper oleoresin by the food manufacturing industry, at least in the short-term. Even in the longer-term such a ban is likely to be of benefit to oleoresin consumption - once users become accustomed to the oleoresin they are less likely to revert again to using the ground spice.

2. Canada

(a) Present Consumption

The annual consumption of pepper oleoresin in Canada is currently estimated at 15 to 20 tonnes. Although growth of oleoresin consumption in Canada over the past decade would appear to have been slower than in the USA, the pattern of demand is much the same, with the meat processing industry being the major user.

There is one oleoresin extractor based in Canada who used to supply the majority of domestic needs and to export. More recently cheaper imports have taken over the greater part of the market, with only small quantities now being manufactured in Canada. Imports originate mainly from India and Singapore and are normally bought through US importers.

(b) Future Prospects

In the future, the factors affecting market growth in Canada will be much the same as in the USA. However, with the more traditional patterns of food consumption in Canada, as well as the slower development of the food service industry, the growth rate of oleoresin consumption is likely to be slightly slower than in the USA - the figure of 5% per annum has been used in the projection to 1990.

3. United Kingdom

(a) Present Consumption

The UK is a major producer, importer and exporter of pepper oleoresin. Current production of the oleoresin is estimated at between 100 and 120 tonnes. If imports are included,the total availability in the UK rises to around 130 to 150 tonnes. An estimated 1/3 or slightly more is exported, giving the volume left for UK consumption at 80 to 100 tonnes per annum.

Imports have mainly originated in the USA, although more recently quantities have been coming in from India. Exports have been mainly to other Western European countries. Unlike North America, cheap imports from India have not yet caused a major reduction in domestic extraction. However, with rapidly escalating domestic production costs in the UK,it can be expected that over the next few years imports will increasingly take over from domestic production. In early 1980 prices for pepper oleoresin manufactured in the UK were around £10 per kg (US $24 per kg) whilst imports were under-cutting this level at around £9.60 per kg (US $22.7 per kg)

The UK was one of the first countries to use oleoresins in the early 1960's. As a result usage has spread to the majority of food processors, the meat industry being the major consumer with other uses being in pickles, sauces, dressings, gravies and soups.

(b) Future Prospects

Since oleoresins have been long-established in the UK, the majority of potential consumers are by now using them. Future growth in the market will therefore depend largely on growth of the food processing industry rather than on finding new customers. In view of these factors a relatively conservative growth rate in consumption can be expected in the UK, the general range quoted by those interviewed being between 2 and 5%. A rate of 4% per annum has been used for the forecast to 1990.

4. German Federal Republic

(a) Present Consumption

Consumption of pepper oleoresin in the German Federal Republic is estimated at 50 to 60 tonnes per annum. Nearly all is imported, although one domestic flavour house produces small quantities for its own requirements. The main sources are India and the USA with other supplies coming from the UK, Singapore and Indonesia. Quality is a major factor in the German market and, whilst buyers have been critical of Indian oleoresin in the past, the quality has now improved. The main usage is for flavouring meat products, but pepper oleoresin is also used in soups, sauces, salad dressings and snacks. Oleoresin prices have remained steady for some time.

(b) Future Prospects

It is generally accepted that there will be a growing market for pepper oleoresin but that this growth will be slow. One flavour house estimated growth at 3 to 5% per annum, perhaps rising in the best years to 7%. There may be advantages over the ground spice in surmounting health regulations, but German users of spices are conservative and do not like to change their methods or formulations. Unlike the USA, where most meat products are made by large, technologically sophisticated manufacturers, in the Federal Republic small butchers make the bulk of sausages and other meat preparations. They have traditionally measured their herbs and spices by the handful and it is hard to see them switching to oleoresins which require much more precise application. There is also a feeling that oleoresins will not produce the same taste as the ground spice. Moreover, as individual butchers only take small quantities of spices, the big flavour houses do not find it worthwhile selling to them. There has been only a slow loss of the small-butchers' market to large meat processors and so they can be expected to continue to dominate this trade.

5. The Netherlands

(a) Present Consumption

Consumption of pepper oleoresin in the Netherlands is in the order of 7 to 8 tonnes per annum. India is the main source of supplies, with smaller amounts coming from the USA.

The Dutch market is mainly divided between two large domestic flavour houses which incorporate the oleoresin into their formulations for the food industry. The main usage is in sausages and other meat products, other uses being in soups, sauces, frozen prepared foods and snacks. The Dutch meat industry uses comparatively little oleoresin compared with the meat industries in some other countries since the ground spice is preferred. Whilst the oleoresin has advantages in meeting health requirements more easily, ground pepper is regarded as a "natural" product and so is more acceptable. Lack of familiarity with oleoresins and their use is also seen as a factor deterring consumption.

(b) Future Prospects

In the Netherlands there appears to be a trend towards using "natural" products and, although the demand for oleoresin by food processors can be expected to grow, it will probably do so more slowly than the demand for ground spices. In this case, the proportion of the market taken by oleoresins will fall. With methods of cleaning and sterilising natural spices continually improving, cleanliness was not seen as a problem in the ground product. The prospects for oleoresins could perhaps be enhanced if they were promoted but processed food manufacturers have long-established formulations with which they are satisfied and it is expensive and risky to change these to incorporate oleoresins. There is also a subjective view that the oleoresin gives a different taste to that of the ground spice. A further factor advanced for the weak penetration of oleoresins into the Dutch market was that Dutch eating habits differ from those of the USA and UK. It was claimed that the foodstuffs where oleoresins are most suitable are not consumed as much in the Netherlands. A big expansion of demand for oleoresins would therefore require a change in eating habits such as the advent of the US style fast food chains. In view of these factors a relatively conservative growth rate in pepper oleoresin consumption of 5% per annum has been used for the forecast of consumption.

6. Sweden

(a) Present Consumption

The consumption of pepper oleoresins in Sweden is about 10 tonnes per annum, representing a doubling of consumption over the past 5 years. There is no longer any domestic production of oleoresin, although Swedish companies have manufactured small quantities in the past. The major source of imports is the USA, with lesser amounts coming from the UK and India. American imports are of dispersed oleoresin and have been favoured because of their consistent quality whilst Indian oleoresin is said to be of a more variable quality and visually less acceptable. The main user of pepper oleoresin is the Swedish meat processing industry.

(b) Future Prospects

It is estimated that oleoresins will continue to gain popularity in Sweden, a growth rate of 7% per annum being used in the forecast for 1990. However, the effect of any ban on ethylene oxide use was thought to be particularly significant for this market, as well as in the Danish market discussed below.

7. Denmark

(a) Present Consumption

It is estimated that 2-4 tonnes of oleoresin are consumed annually in Denmark. There is no domestic production. Imports are mainly obtained from the USA and India. Very small quantities are obtained from Indonesia. US oleoresin is preferred as it is of greater strength. On the other hand, the price of Indian oleoresin is on average 10 to 20% lower and this is a factor in making purchases. The principle uses of pepper oleoresin are in processed meat products.

(b) Future Prospects

It is thought that there could be a big expansion in demand for oleoresins in Denmark, but trade sources are reluctant to estimate a figure. The Danish meat industry, which is large by world standards, is at present a small user of oleoresin and so there could be some substance in this assertion.

For the purpose of this report demand has been assumed to increase to 10 tonnes per annum by 1990, implying an annual growth rate of 13%. Quality is important in the Danish market, regulations on permissible solvent levels being very stringent.

8. Other Markets

Japan is a relatively new market for pepper oleoresin, annual consumption currently being estimated at around 15 tonnes. This quantity is all imported, the USA being the major supplier. As in other countries, usage is primarily by the food manufacturers, the recent development of the meat processing industry being of particular importance for oleoresin consumption.

From available information, it would appear that there is still considerable potential for increased oleoresin usage. However, despite this potential, present market growth would not seem to be as rapid as sometimes claimed. One particular factor which has a bearing on this is that permissible residual solvent level regulations in Japan are particularly strict.

Future growth in consumption will be supplied through imports and, while extremely difficult to estimate, it has been assumed that demand will rise to around 40 tonnes annually by 1990, implying an annual growth rate of just over 10%.

In France consumption of pepper oleoresin is estimated at 8 to 10 tonnes per annum, this market having developed only slowly. The traditional attitudes in the French food industry seem to have been one of the major constraints to growth. However, as more users become familiar with oleoresins, this market can be expected to show a steady growth rate in the future. By 1990 it is estimated that it will have slightly more than doubled to 20 tonnes (i.e. a growth rate of about 8% per annum.)

Among other European countries, Italy might be considered as a potential market. However, so far pepper oleoresin consumption has been very low. Traders report strong resistance to oleoresins in the Italian market which cannot therefore be expected to show any significant growth over the next decade.

Similarly, in Switzerland usage was reported to be very small, with very little interest being shown in oleoresin consumption. Outside Europe, small quantities of oleoresins are consumed in Australia and New Zealand, and usage is also reported in South America. In total, consumption in these other markets is probably in the region of 10 to 20 tonnes.

Forecasts of future consumption in these latter markets can be little more than a guesstimate. Allowing for possible new market development a doubling of usage has been assumed implying a growth rate of 7% per annum, to give consumption of 30 tonnes per annum in 1990.

9. Summary of World Situation

The figures for present pepper oleoresin consumption and future growth rates for the markets discussed are summarised in Table 1.1. This shows current estimated world consumption of between 377 and 447 tonnes per annum, with the USA accounting for just less than half of this total.

TABLE 1.1 World Pepper Oleoresin Consumption; Estimate for 1980 and Forecast for 1990

(tonnes)

| Country | Estimated 1980 | Annual Growth Rate to 1990(1) | Forecast 1990 |
|---|---|---|---|
| USA | 180-200 | 6% | 340 |
| Canada | 15-20 | 5% | 29 |
| United Kingdom | 80-100 | 4% | 133 |
| German Fed. Republic | 50-60 | 5% | 90 |
| The Netherlands | 7-8 | 5% | 12 |
| Sweden | 10 | 7% | 20 |
| Denmark | 2-4 | 13% | 10 |
| Japan | 15 | 10% | 40 |
| France | 8-10 | 8% | 20 |
| Other Markets | 10-20 | 7% | 30 |
| Total | 377-447 | | 724 |

Notes:

1. This growth rate has been applied to the mid-point of the 1980 consumption range.

Using these figures, a forecast of market demand in 1990 has been made. This shows consumption rising to 724 tonnes over the 10 year period, i.e. at an average rate of around 6% per annum. Although the Table gives a single figure forecast it must be realised, in view of the uncertainty attached to the 1980 figures and the difficulties in estimating growth rates, that this will be subject to a considerable range of error - say plus or minus 10%, implying a likely consumption range between 650 and 800 tonnes in 1990.

In terms of individual countries, the USA will continue to account for just less than half the total consumption. In both Canada and the major Western European consuming countries, i.e. the UK and the German Federal Republic, growth rates will be slightly below that in the USA. Prospects for market growth appear best in Japan, Scandinavia and France. Overall, the forecast growth rate of 6% per annum indicates that there will not be a rapid expansion in demand for pepper oleoresin as has occasionally been forecast. In fact, some important manufacturers regard the ground spice as giving a superior, more natural product. Therefore, whilst over the last decade oleoresin consumption by industrial users has been gaining at the expense of ground pepper, in the future the differential between the growth rates of these two products can be expected to narrow.

In the above discussion, mention has not been made of the markets in the USSR and Eastern Europe. Although pepper oleoresin consumption in these countries is very limited at present, they must be viewed as future potential markets. It is known that some manufacturers and flavour houses are trying to open up these markets and that samples have been tested. However, in the absence of firm information it is considered unrealistic to include a figure for future consumption in these countries in the demand forecast.

B. Pepper Oil

The world market for pepper oil is small, the major consumers being the USA and the German Federal Republic. Pepper oil does not impart any "bite" because of the absence of piperine, but rather is used for its characteristic pepper aroma in both the fragrance and flavour industries. In the fragrance industry it is used especially in men's toiletries, e.g. aftershave preparations, but also in some high grade perfumes. As a flavour, it is used in foods which require extra pepper aroma and flavour without the bite. It is also used by the flavour industry for adding to oleoresins to give them the desired volatile oil content.

In view of the small volume consumed, information on the individual markets is necessarily sketchy. The following sections discuss the main markets and outline the future prospects.

1. United States

The US market for pepper oil is estimated at 4 to 5 tonnes per annum. The main sources of supply are imports from India and domestically distilled oil. Usage is in both the flavour and fragrance industries and, although opinions on the percentage use by each sector varied considerably, the market is probably divided equally between them.

At best the market would appear to be static at present, but it has probably declined in recent years, particularly in the food industry, where oleoresins have been able to replace the oil in some end-uses. For the future there would seem little prospect of any significant market growth and consumption is likely to remain around the present level.

The prices of pepper oil in the USA varied widely - c and f or ex-factory prices were quoted at between US $22 and US $110 per kg. As far as could be ascertained the cheaper oils were those which were imported, whilst the more expensive ones were domestically distilled.

2. German Federal Republic

The consumption of pepper oil in the German Federal Republic is perhaps 4 to 5 tonnes per annum. Nearly all the oil used is black pepper oil and India is the main source of supply. Malagasy black pepper oil (probably distilled in France) and Sarawak black pepper oil, probably also distilled in Europe are also available. There is a small domestic production in the Federal Republic, the volume of which depends partly on the relative prices of the raw material and the imported oil, and partly on quality factors. This domestically produced oil is all used by the producers for their own compounding purposes and is not offered on the open market. The main usage is in the flavouring of meat products. There is a smaller usage for fragrances, especially in after shave and men's Colognes but also in some high grade perfumes. Ex-store prices quoted in mid-1980 were:

| | |
|---|---|
| Madagascan black | 190 DM per kg (US $108 per kg) |
| Sarawak black | 140 DM per kg (US $80 per kg) |

However, black pepper oil (origin unstated) was being offered by another importer at 225 DM per kg (US $128 per kg).

For the future there is likely to be a steady but slow growth in the flavouring applications of pepper oil. However, the demand from the perfumery industry is expected to remain static.

3. Other Markets

Besides these two main markets, specific information was obtained on pepper oil consumption in a number of the other markets which were visited.

In Canada the market was thought to be less than 1 tonne per annum, the major user being the meat industry. The view was expressed that the oleoresin would probably displace pepper oil in a large proportion of end-uses. As in the US, prices quoted in Canada varied widely.

The United Kingdom is both an importer (mainly from India) and producer of small quantities of pepper oil. In addition supplies are exported, mainly to Western Europe. Total annual consumption is estimated at around 2 tonnes, and the market is expected to remain relatively static. No more growth in use is expected in men's toiletries, whilst the oil is too expensive for most food products. One price quote of £60-70 per kg (US $142-165 per kg) was obtained.

In the Netherlands consumption of pepper oil is 1 to 2 tonnes per annum, the majority originating in India, with a few hundred kilogrammes also being produced domestically. Usage is in the meat industry (especially in sausages) where demand is said to be static with no prospects for any sizeable increases in consumption foreseen.

Switzerland imports 1 to 2 tonnes annually for use as a fragrance in products such as after shave preparations and "spicy" lotions. The oil comes mainly from the UK (believed to be distilled from Sarawak black pepper) and France. The majority of the oil is re-exported after incorporation in end-products. The Swiss market has been static for some years and is expected to remain that way.

4. Summary of World Situation

Total consumption of pepper oil in the markets mentioned above is estimated at 13 to 17 tonnes per annum. Allowing for a small use in other markets, the total world market for pepper oil is probably in the order of 15 to 20 tonnes per annum. The prospects for expansion in demand appear poor. Use by the fragrance industry seems to be more or less static, whilst in the food industry use of oleoresin has restricted usage of oil. Although no specific forecast for future consumption has been made, it would appear unlikely that world consumption will rise much above 20 tonnes per annum by 1990, and it may even show a decline from present levels.

C. Green Pepper Products

The major markets for the various forms of green pepper are the German Federal Republic and France. Other significant markets studied were the Netherlands and Sweden, the latter being of particular interest since a specific promotion campaign was undertaken to develop this market. These and other markets are discussed below.

Preserved green pepper is the most popular type of green pepper consumed, accounting for an estimated 80-85% of the total market. Both this and dehydrated green pepper originate in the pepper producing countries. Freeze-dried green pepper is mainly produced in the German Federal Republic from imported preserved green pepper.

It was not possible in any of the individual markets studied to obtain a very accurate breakdown of consumption between the various green pepper products. Unless otherwise stated all weights are expressed in terms of the drained weight of preserved green pepper.

1. German Federal Republic

(a) Present Consumption

The consumption of green pepper products in the German Federal Republic varies from year to year but on average is in the order of 600 to 800 tonnes, making it the world's largest importer. The market expanded rapidly during the 1970's but this growth is now thought to have peaked. Madagascar is one of the major sources of preserved green pepper, although supplies are said to be erratic. Malagasy pepper is canned at origin but is often re-packed in the importing countries. Brazil is probably the largest supplier of preserved green pepper, quantities coming both in bulk for re-packing in Germany as well as in retail packs. Brazilian pepper was said to be much more variable in quality than that from Madagascar and also to be not readily packable in glass jars as it discolours in brine. Imports of preserved and dehydrated green pepper also come from India but again are regarded as inferior to that from Madagascar - Indian green pepper is said to be too hot and, in the past, inadequate packaging has caused quality problems.

Quality is of considerable importance for green pepper products in the German market. The berries should be of a standard size, neither too firm nor too soft, and of a good consistent green colour with no black berries. The stage of harvesting is critical in achieving the best quality. A proportion of German imports of preserved pepper are freeze-dried in the Federal Republic and, for this, green pepper sterilised and preserved in a non-salt medium such as acetic acid is required. If the green pepper is preserved in brine, the salt penetrates the peppercorns to give too high a salt content for freeze-drying.

The market distribution of green pepper products is estimated at 50% to the retail and catering sectors and 50% to the industrial sector. Industrial uses include in sausages, pates, cheeses and other dairy products, sauces and soup mixes. In the retail market (see Table 1.2) the main type sold is green pepper in brine, although one major spice company is learning to produce a green pepper in a salt-free preserving medium. This will enable the housewife to use the pepper straight from the container without the need for rinsing. Dehydrated pepper has only a small share of the retail market as housewives do not like to wait while peppercorns are soaking. The taste of the re-constituted dehydrated pepper is also said to be inferior to the green pepper in brine. Freeze-drying green pepper offers an alternative to the dehydrated with the advantage that it can be used immediately after opening. The demand for freeze-dried pepper has been growing in Germany even though it is nearly double the price of dehydrated. Freeze-dried green pepper was initially sold only through retail outlets and to caterers, where it is valued for its long storage properties. However, industrial uses for it have developed from nothing three years ago to nearly 50% of total consumption now. The freeze-drying is done in the Federal Republic from imported green pepper. Consumption is now estimated at about 10 tonnes per annum (equivalent to some 40 tonnes drained weight of green pepper in brine).

Prices for green pepper products have fallen a little over the past 4 years. Recent quotes for Malagasy green pepper in brine have been about DM6.50 to DM7.50 per kg (US $3.69-4.26 per kg) drained weight for 5 kg cans, delivered store in the Federal Republic.

Recent consignments from Madagascar cost DM12.00 per kg (US $6.82 per kg) in 50 gm glass bottles. Indian green pepper in brine has been offered at DM5.00 per kg (US $2.84 per kg) while Indian dehydrated was DM15.00 per kg (US $8.52 per kg). Wholesale prices of freeze-dried green pepper are DM1.72 (US $0.98) for a 110 ml (12 g) pack, DM2.41 (US $1.37) for 160 ml, DM3.78 (US $2.15) for 370 ml and DM9.90 (US $5.63) for 850 ml (75 g).
Retail prices of various types and sizes of green pepper are given in Table 1.2.

(b) Future Prospects

The prospects for increased green pepper consumption in Germany still appear reasonable, although the period of major growth has passed. If the forecast economic recession occurs in the Federal Republic, it is likely that consumption will fall back in the short-term, since green pepper products are a luxury item, used with expensive cuts of meat. At present manufacturers are trying to make the product more attractive in various ways. Packaging is being improved, the trend being towards using glass containers which the housewife prefers, since the pepper can be seen. One manufacturer is bringing out a "2 portion" 8 g plastic blister pack of green pepper in brine to avoid storage problems. Another has a resealable container with a ring-pull top for easy opening. The convenience of freeze-dried green pepper is being promoted and this will probably be the most dynamic growth area, although a large proportion of the extra sales will be at the expense of other forms of green pepper, particularly the dehydrated. Finally, new products containing green pepper, such as a green pepper spread, a green pepper mustard and a green pepper sauce, are being introduced.

2. France

Consumption of green pepper products in France is estimated at around 300 tonnes per annum. The main source is Madagascar with small quantities coming from India and Brazil. Uses are thought to be divided into 50% retail and catering, 50% industrial. Green pepper has an established place in French cuisine, although it is still an 'up-market' item and therefore not consumed by the bulk of the population. In the processed form it is readily available in a range of products such as green pepper pate and green pepper cheese.

Overall, the demand for green pepper products in France is said to have reached a plateau and in the future only a moderate growth rate in consumption can be expected.

Table 1.2 German Federal Republic: Retail Packs and Prices for Green Pepper

| Company or Brand Name | Type | Size[1] | Retail Price in DM US ¢ in brackets | How Packed |
|---|---|---|---|---|
| FUCHS | In brine | 100 gm | 4.98 (2.83) | Metal can, ring pull top and plastic cover |
| FUCHS | In brine | 50 gm | 2.50 (1.42) | Glass screwtop bottle |
| OSTMANN | In brine | 50 gm | 2.25 (1.28) | Conventional metal can - to be superseded by 30gm ring pull can |
| UBENA | In brine | 60 gm | 2.99 (1.70) | Glass screwtop bottle |
| ALBA | In brine | 8 gm | 1.00 (0.57) | 2 portion plastic blister pack |
| ASO | In brine | 50/100 gm (catering and industrial sizes: 500gm, 14Kg, 35Kg) | Not known | Glass screw top bottle |
| FUCHS | Dehydrated | 30 gm | 3.25 (1.85) | Fancy plastic box |
| OSTMANN | Dehydrated | Weight not stated on pack | 1.85 (1.05) | Metal drum, plastic screw top |
| UBENA | Dehydrated | 30 gm | 3.99 (2.27) | Glass screw top bottle |
| FEINKOST | Freeze dried | 110ml (12 gm) (Also in 160ml, 370ml & 850ml packs) | 2.50 (1.42) | Glass screw top bottle |
| FUCHS | Green pepper mustard (2) | 100 gm | 2.25 (1.28) | Glass screw top bottle |
| FUCHS | Gewurz Pastete - Green Pepper spread (2) | 100 gm | 2.45 (1.39) | Glass screw top bottle |
| McCORMICK | Green pepper sauce (2) | ¼ litre when reconstituted | 0.98 (0.56) | Plastic sachet |

Source: Trade interviews and surveys of supermarkets

1. Weights are net and, for green pepper in brine, net drained weight.

2. Pepper content not disclosed.

3. Netherlands

Consumption of green pepper products in the Netherlands is around 50-100 tonnes per annum. The main outlets are speciality shops and up-market stores rather than supermarkets. Preparations such as green pepper mustard may, however, be found in supermarkets. Green pepper products are regarded as a luxury item and green pepper steak is not as popular a dish as in the German Federal Republic. The catering usage is largely confined to expensive restaurants. The industrial uses are in such products as mustard, pates, mayonnaise and similar sauces. Overall, the market for green pepper products is said to be growing but it is difficult to gauge the prospects.

4. Sweden

Although preserved green pepper has been imported into Sweden since 1961, for long it was only a small item, being found at first only in luxury restaurants and then in speciality stores. By 1970, it is estimated that total consumption was about 3 tonnes. In 1972, a major Swedish spice packer launched a national advertising campaign in the Swedish Press with the aims of informing consumers about a little-known spice and promoting retail sales of the product. In conjunction with this, a decision was taken to re-pack into containers more suitable for the Swedish market and of a higher standard than hitherto. Previously, packaging was in various sized tins as imported from origin. The new packs were 75 ml glass jars containing 45 g net drained weight for the retail trade, and one litre plastic containers, net weight 665 g, for caterers. The retail glass jars were more acceptable to consumers, being more familiar and enabling the consumer to see what he was buying. Glass also gave a more stable storage medium once the pack was opened. The promotional campaign was very successful and retail sales increased rapidly. The campaign was directed mainly at the retail market but the catering and industrial sectors in due course expanded their usage too. By 1976 total consumption had reached almost 100 tonnes. Thereafter the product was not specially promoted. Sales in the retail sector fell off, although demand in the catering and industrial sectors held up.

At present consumption is estimated to be about 50 tonnes per annum. Dehydrated green pepper was introduced during the 1970's but only small quantities are sold.

Most green pepper is imported from Madagascar, other sources being Brazil and India, although little is taken from these. Retail and catering outlets currently account for about 30% each of the imports while industrial users take 40%. The main industrial usages are in meat products, sausages, cheese and sauces. Importers' buying prices in mid-1980 were 14 Swedish Kroner per kg (US $3.40 per kg) drained weight delivered factory. Prices are reported to have remained fairly stable.

The main feature of the Swedish market is that it is the only example of a market where a concentrated promotion campaign for green pepper has been carried out. This has shown that sales can be increased, but that promotion must be continued if this market is to be maintained.

5. Denmark

Total consumption of green pepper products is about 10 tonnes per annum, most of which is in brine. 80-90% of all imports are from Madagascar, most of which are imported directly, the remainder being obtained through Hamburg or Rotterdam dealers. Small quantities of green pepper in brine are also imported from India. Malagasy green pepper is preferred as it is said to look better (greener) and its colour lasts longer. The Indian green pepper in tins is said to be less desirable as the contents alledgedly turn black.

In the future the Danish spice trade foresees only a slow growth in demand for green pepper, mainly in brine.

6. United States

The market for green pepper products in the USA is estimated at 30 to 40 tonnes per annum. Supplies are imported from Madagascar in tins in bulk, preserved either in brine or wine vinegar. These are either sold as such or repacked in glass bottles for sale to the retail trade. Brazilian green pepper is imported through the German Federal Republic where it is freeze-dried. Supplies of green pepper products also come from India.

In view of the size of the US market, green pepper product consumption is at a very low level - a fact confirmed by the general lack of knowledge of it as a commodity. However, the popularity of green pepper was said to be growing, its main outlets being through gourmet restaurants and delicatessen shops.

Despite the small market size, distribution appears to be country-wide.

In the future, although the market may continue to grow steadily, there is unlikely to be any dramatic growth in demand. One of the main factors limiting market development in the retail sector is that sales are unlikely to become large enough to justify a major promotional campaign, which in the USA would necessarily have to include television coverage. In the industrial sector a number of firms have experimented with green pepper products but none have so far expressed interest in using it commercially.

7. Other Markets

Apart from those discussed above, Malagasy export statistics (see Table 2.6) would suggest that the only other significant markets for green pepper products are in Belgium and Switzerland. Between 1973 and 1975, Belgian imports from Madagascar averaged 80 tonnes per annum but were very erratic. Consumption is not thought to be as high as this in either of these countries suggesting that supplies are re-exported and are already accounted for in the consumption estimates of other countries. If per caput consumption in these two countries is assumed to be of the order of that found in France or the Netherlands, demand would be about half these imported quantities at around 80 to 100 tonnes per annum.

Other minor markets, e.g. U.K. at best only account for a few tonnes annually each. A nominal 30 tonnes have therefore been added to the above figures, giving an estimated total size of the other markets of 110 to 130 tonnes.

8. Summary of World Situation

Based on the figures given in the preceeding sections, the world market for green pepper products may be summarised as follows:

| | Tonnes |
|---|---|
| German Federal Republic | 600-800 |
| France | 300 |
| Netherlands | 50-100 |
| Sweden | 50 |
| Denmark | 10 |
| United States | 30-40 |
| Other | 110-130 |
| TOTAL | 1,150-1,430 |

Taking the mid-point of this range would give a total world market of 1,290 tonnes. It is estimated that 80-85% of this is accounted for by preserved green pepper, the remainder of the market being split between dehydrated and freeze-dried green pepper.

The period of relatively rapid growth in demand for green pepper products which occurred as the markets in Europe were established now appears to have ended and, in the future, a much slower growth in demand can be expected. It will remain a luxury item and therefore its markets will be limited accordingly. Processors are developing new forms of packaging and new green pepper products which should lead to a continuing interest in the product. However, with major promotion campaigns usually ruled out on economic grounds, no major expansion in either existing or new markets is expected. A global estimate based on interviewees' responses would suggest a future total market growth of 4-5% per annum, implying a demand for around 2,000 tonnes in 1990. In terms of the individual products within the market the prospects for preserved green pepper and for freeze-dried pepper would seem to be much better than for dehydrated pepper. The preserved product will probably continue to hold about 80% of the market, whilst freeze-dried consumption will increase mainly at the expense of dehydrated green pepper.

D. Ground and Pre-packed Pepper

The prospects for the pepper producing countries selling increased quantities of black and white ground and pre-packed pepper to the countries visited during the course of this study were ascertained. Since the views expressed were common in most of the countries visited, individual country reports have not been presented.

Only very small quantities of ground and pre-packed pepper are imported by North American and Western European countries. Import statistics are scarce and often difficult to interpret. However, ground pepper imports into the USA over the last 3 years are recorded as follows:

| | |
|---|---|
| 1977 | 16.8 tonnes |
| 1978 | 27.9 tonnes |
| 1979 | 10.2 tonnes |

Into the UK, the German Federal Republic, France and the Netherlands imports of ground pepper are estimated variously between 50 to 100 tonnes per annum each. In 1979, 79 tonnes of pre-packed ground pepper were imported into Denmark. Nearly all of these imports originate in other Western European countries or the USA.

The views expressed by interviewees in both North America and Western Europe show that, at present, there is very little prospect for the pepper producing countries supplying increased quantities of ground and pre-packed pepper to countries in these regions. A number of reasons were put forward in support of this view.

Fears of contamination and adulteration were widely expressed. This is particularly the case in the US market where great attention is paid to the cleanliness of products. There are often complaints in the USA that with imports of whole pepper, even on macro-analysis, consignments are not up to standard. The fact that standardised imported products are hard to obtain and are not usually of a sufficiently high quality were also put forward as reasons for not importing ground spices. Flavour deterioration by evaporation loss of volatile oil after grinding and during shipment is a further unavoidable problem.

In both North America and Western Europe the processing and distribution system for spices is highly developed and very competitive. The grinders have high technology facilities capable of manufacturing a wide range of grinds to meet individual customers' requirements. There is a high level of investment in the industry with new plant continually being commissioned. Very close links exist between the grinders and their industrial and retail outlets. In the long-term, there could be increasing opportunities for the pepper producing countries on grounds of cost advantages, either for selling direct to food manufacturers or, more feasibly, to the spice packers for resale to retail and catering outlets as well as industry. However, sellers would have to build up reputations of providing clean, good-quality materials and be able to convince buyers that it is worthwhile to buy ground spices from origin.

As far as imports of retail packs are concerned, the standard of packaging and labelling of many developing country producers is not yet acceptable to consumers. Other problems include damage in transit, extra freight/insurance costs because of greater weight or value, and the necessity for some developing countries to import some packaging materials such as tin plate or plastics, thus incurring costs. Guaranteeing regularity of supply is also difficult. Even if these problems are overcome, the domestic spice packers so control the market through their direct servicing of supermarkets that it is unlikely that developing country producers could make any significant inroads. For example, the spice companies themselves often provide and service the display racks in retail outlets. These racks need to contain a full range of spices. New suppliers do not have the resources to set up competing sales and servicing organisations, underwrite the necessary financial arrangements or offer as comprehensive a range of products. Some supermarket chains might conceivably take pepper on an own-label basis but this could lead to problems with their existing spice suppliers. The only prospect for a substantial intervention in the market by developing countries appears to be entering into some agreement with the domestic packers but the firms contacted have expressed no interest in this possibility.

These findings are in line with those in a recent ITC study (1) which described the markets for pre-packed spices in Western Europe and North America as "virtually impregnable." However, this same study investigated a number of other markets and concluded that in both Saudi Arabia and Kuwait there were good prospects for selling pre-packed spices. The other Middle East market covered by the study was Iran, where imports of ground spices are prohibited. However, besides these markets there are thought to be other possibilities for selling pre-packed spices in the Middle East region.

Whilst the ITC study did not cover pepper specifically, the experience of Singapore (discussed later in this Report) endorses the findings of the study. Several processors in Singapore have established markets in the Middle East for pre-packed ground spices, including pepper. However, it must be emphasised that these markets are highly competitive and relatively small.

Another market recently supplied from Singapore is Australia, to which small shipments of ground pepper, both in bulk and pre-packed, have been sent. Both the Australian and New Zealand markets are thought to be worth further investigation. The ITC study also mentions certain Latin American countries, e.g. Argentina, Brazil and Venezuela,as potential markets for ground spices. During the course of this study no further information was obtained on any of these markets.

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(1) International Trade Centre UNCTAD/GATT. Market Survey of Consumer Packed Spices in Selected Countries. ITC/DTC 21. June, 1978.

## CHAPTER II
## PROCESSING FACILITIES AND PRODUCTION

The major processing facilities for the manufacture of pepper products were examined in detail in India, Malaysia, Indonesia and Singapore. In addition, those facilities established in countries included in the market analyses were also covered. Based on the information obtained an estimate has been made in this Chapter of the current production of pepper products, as well as an assessment of production capacity.

### A. Pepper Oleoresin

Extraction and use of pepper oleoresin were first started on a large scale in the 1960's in the UK and the USA. Extraction capacity was later established in Canada and the German Federal Republic. Through the 1970's, however, production facilities have been increasingly located in the pepper producing regions and there are now extraction plants in India, Malaysia, Indonesia and Singapore.

#### 1. India

In mid-1980 in India there were some 12 spice oleoresin extraction plants with a total capacity of around 720-800 tonnes per annum, of which some 100 tonnes had been commissioned during the preceeding 12 months. Although pepper oleoresin accounts for the largest proportion of all spice oleoresin production (over 60% in 1979/80), it is produced by only 4 or 5 firms, located in or near the pepper-producing areas of South India. The 2 largest plants, which account for upwards of 75% of total output, are sited in the Cochin district of Kerala State. The total capacity which could be used for pepper is about 400-450 tonnes per annum, but current annual production levels of pepper oleoresin are 130-140 tonnes, ie 30-35% of capacity. The level of utilisation varies from one producer to another, with the larger producers reaching 60% of capacity while, in others, plant may remain idle for considerable lengths of time.

Nearly all pepper oleoresin is exported and it is unlikely that this situation will change rapidly since food processing

industries on North American or European lines are not expected to develop in the near future in India. Indian exports of pepper oleoresin are presented in Table 2.1. In 1979/80 these accounted for over two thirds of total spice oleoresin exports as shown in Table 2.2. The major Indian companies sell through well-established agents in New York. The agents charge a commission (around 5%) on sales but may also buy as principals. Many of the smaller companies do not have such arrangements which makes their selling efforts correspondingly more difficult. Other markets include the German Federal Republic and the UK, as well as other European countries and Australia. In mid-1980 the Indian fob price of pepper oleoresin was quoted at US$17.60-18.15 per kg. Indian exporters receive an export rebate equivalent to 12½% of the fob value of their exports.

Table 2.1 India: Exports of Pepper Oleoresin

| | Quantity (tonnes) | Value (US$'000) |
|---|---|---|
| 1975/76 | 44 | 570 |
| 1976/77 | 111 | 1519 |
| 1977/78 | 104 | 1744 |
| 1978/79 | 94 | 1617 |
| 1979/80 | 124 | 2148 |

Source: Spices Export Promotion Council, Cochin

Table 2.2 India: Exports of Spice Oleoresins 1979/80 (Provisional)

| Oleoresin | Quantity (tonnes) | Value (US$'000) |
|---|---|---|
| Pepper | 124 | 2148 |
| Capsicum | 7 | 185 |
| Ginger | 5 | 126 |
| Tumeric | 33 | 444 |
| Celery | 12 | 93 |
| Total | 182 | 2995 |

Source: Spices Export Promotion Council, Cochin

Production of spice oleoresin tends to be seasonal, but whole pepper is stored for out-of-season production. There are two basic production methods used in India - a distillation/solvent extraction process, developed by the Central Food Technological Research Institute (CFTRI), Mysore, and an extraction only process, based on American technology. The most used is the CFTRI method. This involves first the crushing of the raw material to an appropriate size, followed by distillation to obtain the volatile oil. The spice residue is next fed to extractor vessels and washed a number of times with a suitable solvent, usually ethylene dichloride for pepper oleoresin. Other solvents can be used and at least 2 plants in India are now using acetone in preference to ethylene dichloride. The extract is stripped of solvent to obtain a concentrate of the pungent principles to which the essential oil is then added to make up an oleoresin of standardised strength. To obtain the desired specification and to give a consistent product, the pepper oil is added back to the oleoresin. The alternative process used in India is the conventional proceedure of solvent extracting the spice without prior treatment.

The most commonly used packaging for Indian oleoresin is as follows:-
100 kg and 200 kg open topped mild steel drums with a food grade epoxy lacquer lining;
50 kg and 55 kg narrow and wide mouth metal drums;
25 kg mild steel containers, epoxy lacquer lined;
25 kg and 40 lb high density polyethylene containers.

Manufacturers use both Indian and US manufactured drums but the imported containers are preferred as they have wide mouths and suitable linings. However Indian packaging is now much improved and of an appropriate standard.

In the short-term there is clearly considerable pepper oleoresin over-capacity in India. Furthermore there are plans to commission perhaps a further 200-270 tonnes capacity, of which 75-125 tonnes could be used for pepper oleoresin. Even if the

available plant does become fully utilised, extra capacity can be created relatively quickly -producers claim that they could order and bring into use additional extractors within 4 months. The problem of plant underutilization could theoretically be overcome by manufacturing other oleoresins eg annatto, tumeric, capsicum and ginger. However, these products also face highly competitive markets. Therefore surplus capacity is likely to remain a problem.

2. Malaysia

One oleoresin plant has been established in Malaysia, based in Kedah Province in the north of Peninsula Malaysia. This uses the Indian CFTRI process, the technology for which was purchased through the Indian National Research and Development Corporation. The plant was manufactured in Malaysia and was completed in 1979. It has a capacity to produce 40 to 50 tonnes of oleoresin: space has been allowed to increase capacity in the future if required. To date, through lack of orders, the plant has only produced a few tonnes of pepper oleoresin.

In addition to the above factory, the possibility of establishing a further oleoresin extraction plant in Sarawak is also being investigated. Although no decision has been made on this, a feasibility study for a plant of around 220 tonnes capacity has been completed.

3. Indonesia

There are three plants in Indonesia capable of producing pepper oleoresin. In Jakarta a private company, with a US parent group, has been established primarily to obtain and market essential oils. It also has capacity for oleoresin extraction and over recent years was stated to produce around 25 to 30 tonnes of crude pepper oleoresin per annum. The level of residual solvent was variously reported to be between 5 and 12%. The product is marketed through the US parent company by whom it is refined.

The plant, which was said to be working at about 30% capacity, was experiencing mechanical problems. It was unclear how much re-investment in machinery will be required to overcome these

problems, but when fully operational the plant was assumed to have a capacity of about 100 tonnes per annum.

At Tawangmangu in Central Java an essential oil plant was established in 1967, using Bulgarian equipment. The factory, which is under Government control, has 9 distillation units, 3 of which have been modified subsequently to enable crude oleoresins to be extracted. It was said to be capable of producing a total of 30 tonnes of oleoresin per annum, although further modifications may be required to achieve this in practice. In 1978/79 a trial production run produced 7 tonnes of crude pepper oleoresin which was sold to the US. However, since this involved a considerable financial loss, further production has been stopped.

A third oleoresin extraction facility has recently been established by private enterprise at Telukbetung in Lampong Province, South Sumatra. This has been built and equipped under a turn-key agreement with a French company, who have also guaranteed a market for a proportion of the total production. The plant was stated to have a theoretical capacity of 120 tonnes per annum. A trial production run was due to take place in mid-1980.

From the above, the total installed pepper oleoresin extraction capacity in Indonesia amounts to 250 tonnes (130 of which is for crude oleoresin only). However, in view of the production problems being faced at 2 of the plants (Jakata and Tawangmangu), as well as the fact that the performance of the Telukbetung plant has yet to be tested, actual capacity may be well below this level.

4. Singapore

In Singapore, two US companies have jointly established an oleoresin extraction plant to produce to US specifications. The total capacity of this plant is estimated at around 220 tonnes per annum of which about one third (75 tonnes) is intended for pepper oleoresin. The factory was reported to be operating at about 70% capacity, producing on average around 60 tonnes of pepper oleoresin per annum, as well as oleoresins of tumeric, celery and other spices.

The majority of the pepper oleoresin produced is sold to the parent company in the USA, with small quantities also going to the German Federal Republic. Larger quantities of pepper oleoresin are not produced due to the lack of further markets.

5. Other countries

Besides the oleoresin production in the pepper-growing regions of Asia, some is still extracted in North America and Europe.

In the USA there were originally some 5 or 6 extractors. However, the position now is that only one or two still produce small quantities of pepper oleoresin when raw material prices are low. The capacity made redundant is either being used for the extraction of other spices or has been laid idle. Should it be required, there is still sufficient capacity in the USA to produce all its domestic and export requirements. Similarly in Canada the one pepper oleoresin extractor now only produces small quantities. In total it is estimated that US and Canadian production currently amounts to about 40 tonnes.

In the UK, production has so far been least affected by the competition from the pepper producing countries. The majority of extraction is undertaken by two companies. It is estimated that the UK production currently amounts to 100-120 tonnes annually. However, imports are expected to increase in the future with a consequent reduction in this level of output.

On the continent of Europe, production of pepper oleoresin is now minimal. The only country which is known to produce any is the German Federal Republic, where one large flavour house produces a few tonnes a year for its own requirements. However, enough oleoresin capacity is believed to exist in the Federal Republic to meet all current domestic needs. France has produced spice oleoresin in the past. It is not clear whether it is continuing to do so, but it is unlikely that there is any substantial production of pepper oleoresin. Sweden too formerly manufactured small amounts of spice oleoresin but this production has ceased. In the Netherlands there is no current production of spice oleoresins although the largest Dutch food processing company is said to possess the capability to produce

them if the need arises. The only two countries on the continent producing oleoresin to any degree are Spain and Hungary but production here is almost entirely of paprika oleoresin.

It is also believed that oleoresin extraction capacity may exist in the USSR and other Eastern European countries but no information was available on these.

6. World Situation

Based on the above, total world pepper oleoresin production is estimated as follows:-

| | Tonnes |
|---|---|
| India | 130-140 |
| Indonesia (Crude) | 25-30 |
| Singapore | 60 |
| US/Canada | 40 |
| United Kingdom | 100-120 |
| Other Western European | 10 |
| TOTAL: | 365-400 |

Production capacity is harder to estimate since the same equipment may be used to extract different spices, whilst figures for North America and Europe are not readily available. However, the available capacity reported in the pepper producing regions in Asia may be summarised as follows:

| | Tonnes |
|---|---|
| India | 400-450 |
| Malaysia | 40-50 |
| Indonesia | 250(130 crude only) |
| Singapore | 75 |
| TOTAL: | 765-825 |

Certain reservations on the Indonesian figures have already been discussed. Current production in the four countries is estimated at 215-230 tonnes - i.e. 26% to 30% of installed capacity.

Besides this capacity, there is thought to be at least sufficient capacity in North America and Europe to service total current global demand. It must therefore be concluded that there is very considerable excess world capacity for pepper oleoresin extraction.

B. Pepper Oil

Pepper oil is produced by distillation either in its own right or as a by-product of oleoresin extraction. The main pepper-growing country manufacturing the oil is India, the other major world producers being the USA and the UK.

1. India

Pepper oil is a very minor item for most producers. Annual production is about 20 tonnes but most of the oil is used for blending with pepper oleoresin, and only about 30% of production is disposed of as oil.

Indian exports of pepper oil are given in Table 2.3. The main destinations are the USA and Europe. Nearly all of the exports are provided by one producer who distills pepper oil as an integrated part of his oleoresin process. This producer has the capacity to produce 40 tonnes of spice oils a year. There is no domestic market for pepper oil.

Table 2.3 India: Exports of pepper oil

| | Quantity (tonnes) | Value (US$'000) |
|---|---|---|
| 1975/76 | 1.0 | 24 |
| 1976/77 | 4.1 | 61 |
| 1977/78 | 6.2 | 123 |
| 1978/79 | 5.3 | 103 |
| 1979/80 | 6.7 | 104 |

Source: Spices Export Promotion Council, Cochin

No price quotations were obtained for Indian exports. However, the unit value of exports indicates a price of around US$19 per kg for 1979/80.

2. Malaysia

Besides oleoresin, the Kedah plant also has the capacity to produce 2 to 3 tonnes of pepper oil annually. At present, however, production is running at only about 100 kg per year, all of which is exported. In mid-1980 this was selling at a c and f price of US$28 per kg.

In Sarawak, a small oil distillation plant has been established at Kutching. This has a capacity of about 2 tonnes per annum and, over the last 2 to 3 years, annual production has been 100 to 200 kg. This has been sold to the German Federal Republic at a price of US$50 per kg fob.

3. Indonesia

Only very small quantities of pepper oil are currently being distilled in Indonesia, and are produced in small-scale village level units. Quality is not of a sufficiently high standard for the international market.

4. Other Countries

Amongst the pepper growing countries Madagascar, Brazil and Sri Lanka are reported to produce small quantities of oil. Outside the pepper growing countries a few tonnes of pepper oil are manufactured annually in the USA and very small quantities in Canada. Production of pepper oil in Western Europe mainly takes place in the UK and to a lesser extent in France. In other European countries, small quantities may be produced to meet producers' own requirements. This is the case in the German Federal Republic where one major flavour house distills its own pepper oil if a special quality is required or if raw material prices are so low as to make it cheaper to produce rather than import. In the Netherlands, one company distills about 200kg of oil a year as imported oil does not meet specifications.

Prices of pepper oil produced in various countries quoted in April/May 1980 were as follows:

| | |
|---|---|
| Black pepper oil English distilled ex store UK | US$315.00 per kg |
| Black pepper oil ex store Hamburg | $125.00 per kg |
| Black pepper oil Sarawak ex store Bremen | $ 80.00 per kg |
| Black pepper oil Madagascar ex store Bremen | $108.00 per kg |
| Black pepper oil Madagascar ex store Marseille | $ 92.00 per kg |

5. World Situation

No attempt has been made to estimate world capacity and production of pepper oil. Suffice it to say that world production is very small and that present capacity is more than adequate to meet needs in the foreseeable future.

C. Green Pepper Products

Green pepper may be produced in a number of forms:-

- preserved in brine or other liquid preservatives;
- dehydrated;
- freeze-dried.

The major producers of green pepper products are Madagascar, Brazil and India. Small quantities are also produced in Malaysia and, reportedly, in Sri Lanka. In these countries, the most important type produced is preserved green pepper, although dehydrated green pepper is also produced in India. The major part of freeze-dried green pepper is produced in the German Federal Republic from imported preserved pepper. A considerable proportion of green pepper is re-packed in the consuming countries.

1. India

Both preserved and dehydrated green pepper are produced commercially in India. Freeze-drying has been tried experimentally but is said to be uneconomic in the absence of supplementary products. There are currently 8 plants for dehydrating green pepper with a total annual capacity of 450 tonnes, 7 for canning green pepper in preservatives with a

total annual capacity of 680 tonnes. Production figures in recent years are given in Table 2.4. These show that in 1979 less than 10% of dehydrating capacity was being utilised. Many dehydration plants have gone out of business, mostly small-scale operations (one estimate put the number of idle plants at 6 or 7). Preserved green pepper has not been so badly affected but again capacity is greatly under-utilised.

Table 2.4 India: Production of Green Pepper

(tonnes)

| | Green pepper in brine | Dehydrated green pepper |
|---|---|---|
| 1977 | 119 | 69 |
| 1978 | 127 | 61 |
| 1979 | 243 | 42 |

Source: Processed Foods Export Promotion Council, New Delhi

Indian exports of green pepper over recent years are presented in Table 2.5. This shows the recent fall in dehydrated green pepper exports. By far the most important destinations are France and the German Federal Republic, but supplies are also going to other European countries and the USA.

Table 2.5 India: Exports of Green Pepper

| | Quantity (tonnes) | Value (US$'000) |
|---|---|---|
| Green pepper in brine | | |
| 1977/78 | 218 | 177 |
| 1978/79 | 131 | 174 |
| 1979/80 | 207 | 308 |
| Dehydrated green pepper | | |
| 1977/78 | 119 | 473 |
| 1978/79 | 35 | 280 |
| 1979/80 | 43 | 227 |

Source: Processed Foods Export Promotion Council, New Delhi

Dehydration and canning must be done in the pepper harvesting season (November to February) and it is essential that the producers know the volume of orders at least six months in advance in order to organise production at the appropriate level. To enable the dehydration equipment to be used throughout the year, experiments are being tried with dehydrating products such as chillies, coriander, onion and garlic. The basic dehydration unit was developed by CFTRI. Each unit has multiples of 48 drying trays, each tray taking 2kg of raw material. The drying time for green pepper is 7 hours.

Based on export unit values, the f.o.b. prices for Indian green pepper in 1979/80 were: dehydrated US$5.50 per kg, canned US$1.50 per kg.

2. Malaysia

One company is involved in the canning of green pepper in Malaysia. Their factory is located at Taiping, Perak Province, and was originally set up to can fish. Surplus processing capacity promoted diversification of the product range and, since 1978, they have been canning a few tonnes of green pepper in brine each year. The green berries are obtained from Johore Province, canned in units of 100 g net drained weight and exported to France. Prices were quoted at US$8.50 fob for cartons of 24 x 100 g cans (ie US$8.50 per 2.4 kg or US$3.5/kg net drained weight). The company undertaking the canning is a subsidiary of a French group, through which it has had the benefit of technical advice on production and the provision of a market outlet.

3. Madagascar

Madagascar was the first country to develop green pepper products in the mid-1960's. Malagasy export statistics for 1973-75 are given in Table 2.6, when exports were over 600 tonnes annually (thought to be almost all preserved). More recent statistics are not available, but Malagasy pepper production has been hit by outbreaks of foot rot disease and

by internal marketing problems. Although green pepper has been accounting for an increasing proportion of total pepper production, output is now estimated at 500-600 tonnes. It is reported that Malagasy production units are small-scale and that the canning of green pepper is carried out as an adjunct to other canning operations.

Total 2.6 Madagascar: Exports of Green Pepper

(Quantity, tonnes: value, US$'000)

| | 1973 | | 1974 | | 1975 | |
|---|---|---|---|---|---|---|
| | Quantity | Value | Quantity | Value | Quantity | Value |
| Total | 547 | 1212 | 657 | 1185 | 634 | 1358 |
| of which to | | | | | | |
| Netherlands | 18 | 40 | 64 | 141 | 25 | 51 |
| Belgium/Luxembourg | 100 | 175 | 106 | 166 | 106 | 210 |
| German Federal Republic | 145 | 265 | 266 | 445 | 286 | 569 |
| France | 107 | 225 | 153 | 283 | 103 | 233 |
| Sweden | - | - | 46 | 100 | 2 | 4 |
| Switzerland | 163 | 467 | 4 | 8 | 73 | 191 |
| United States | 5 | 9 | 7 | 16 | 21 | 42 |

Source: Malagasy export statistics

4. Brazil

Brazilian exports of preserved green pepper are estimated at about 400-500 tonnes per annum. Table 2.7 gives export statistics for "other" pepper and, although it has not been possible to confirm whether this refers to green pepper or not, both the quantities involved and the destinations suggest that this is the case. Only small quantities were recorded under this heading prior to 1977. The process in Brazil is reportedly more highly automated than in Madagascar, the green pepper being cleaned, blanched and machine-packed in one basic operation. Large companies are involved, owning large plantations and more able to exploit economies of scale. Brazilian packing is in various sizes and aimed at

the German market; labelling is in German.

Table 2.7 Brazil: Exports of "Other" Pepper

(Quantity, tonnes; Value, US$'000)

| | 1977 | | 1978 | |
|---|---|---|---|---|
| | Quantity | Value | Quantity | Value |
| Total | 611 | 884 | 453 | 631 |
| of which to | | | | |
| German Federal Republic | 559 | 772 | 396 | 507 |
| France | 44 | 99 | 56 | 123 |

Source: Brazilian export statistics

5. World Situation

Based on the above discussion, total world production of green pepper products are estimated as follows:

| | Tonnes |
|---|---|
| Madagascar | 500-600 |
| Brazil | 400-500 |
| India | 360 |
| TOTAL: | 1,260-1,460 |

The Indian figure of 360 tonnes is based on an average figure of 200 tonnes of preserved green pepper and 40 tonnes of dehydrated green pepper (equivalent to 160 tonnes drained weight).

About 90% of total production is canned in brine/preservative, the canning factories handling other commodities besides green pepper. Production of freeze-dried green pepper in the German Federal Republic is produced from these supplies.

D. Ground and Pre-packed Pepper

The processing of black and white ground and pre-packed pepper was examined in India, Malaysia, Indonesia and Singapore in order to see the present state of the industry in these countries and to assess their ability to enter export markets.

1. India

The production of ground pepper and pepper in retail packs is of minor importance in the Indian pepper trade and is likely to remain so. The typical domestic consumer is used to buying loose whole spices and doing his own grinding. As far as the export market is concerned exports of pepper powder have declined since 1977/78, when 46 tonnes were exported (40 tonnes of which went to Saudi Arabia), to just 11 tonnes in 1979/80. This compares with total exports of 21,000 tonnes of whole black pepper in 1979/80. In this situation Indian exporters see little scope for selling ground or powdered pepper.

Only one Indian company exports retail packs of spices in any quantity. This firm currently produces 16 lines in 35 gm glass bottles, together with a spice-rack as a promotional item. Among the spices sold are ground black and white pepper and whole black pepper. The main outlets are in the Middle East but the company also sells to France and Belgium, where its Belgian associates already have a dominant share of the domestic retail spice market. The company felt that prospects were poor in other European markets as it lacked a sales and distribution organisation. Nevertheless it is examining the idea of appointing agents, or perhaps maintaining its own office and keeping stocks in the consuming countries, but was not optimistic of any major market breakthrough.

The Indian market for retail packs of this type (up-market) is limited as the price is two to three times higher than the unpacked spice available in the bazaars. Nevertheless, there is a demand because the product can be sold on grounds of purity (through its brand name) and convenience (no need to grind). This firm's output of all spice retail packs is about 200 tonnes per annum.

2. Malaysia

Grinding of pepper in Malaysia is carried out only on a small

scale, to supply the domestic market. There is a large number of grinders and competition between them is strong. The ground pepper is either packed in polythene bags, bottles, etc., or sold in bulk. Few of the grinders have considered exporting their produce, although some express an interest in the Singapore market. In view of the small scale nature of the processing units, there would appear to be no possibility for the majority entering the export markets.

3. Indonesia

It was reported that there is no commercial grinding of pepper carried out in Indonesia. Pepper is nearly always sold whole and then, if so desired, ground in the home. In the larger towns, imported ground pepper is available for sale in super-markets. These supplies appear to originate mainly in the USA. Import statistics do not give a clear picture of the quantities involved, but it is thought that they amount to only a few tonnes each year.

4. Singapore

Quantities of pepper are ground in Singapore both for export and for domestic market. For the purpose of this Report it is the exports which are of interest. These go to two major markets, namely the Middle East and to Australia. It is estimated that several hundred tonnes are now sent annually to the various markets in the Middle East from Singapore. These supplies are mainly pre-packed. This market appears to be very competitive, with price being stated as the major factor in determining sales. To enable prices to be lowered, it is claimed that a considerable amount of adulteration of supplies to these markets takes place.

Smaller volumes are exported to the Australian market, these being estimated in 10's of tonnes. Supplies are sent both in bulk and pre-packed. This is a considerably more sophisticated market where quality is of importance.

# CHAPTER III
# DEVELOPMENT OPTIONS

This Chapter compares the consumption and production estimates for pepper products made in the previous two Chapters. In the light of current processing capacity, recommendations are then made concerning the establishment of further facilities. Other issues such as the possibilities for establishing joint-ventures for pepper processing and new product development are discussed. Finally the type of assistance which might be beneficial to the Pepper Community is considered.

## A. Pepper Oleoresin

### 1. Supply and Demand Balance

World production of pepper oleoresins has been estimated at 365 to 400 tonnes whilst consumption has been estimated at 377 to 447 tonnes. As mentioned earlier, these figures are subjective estimates based on interviews and, as such, no attempt has been made to reconcile the two sets of figures. However, if it is assumed that production is slightly under-estimated and consumption slightly over-estimated, in round figures the market size of 400 tonnes would seem reasonable. By 1990 it is expected that the market will have grown to between 650 and 800 tonnes.

At the same time present pepper oleoresin production capacity in the Asian pepper producing regions (ie India, Malaysia, Indonesia and Singapore) has been estimated at 765 to 825 tonnes. In addition, the establishment of further capacity is actively being considered in both India and Malaysia, whilst in North America and Western Europe there is sufficient capacity to supply at least the present total world needs.

Based on these figures there is currently therefore very considerable world over-capacity for pepper oleoresin extraction. It would also appear that there is more than sufficient capacity to meet market needs in 1990.

2. Economics of Production

The most important cost in oleoresin production is that of the raw material to be extracted. Depending on throughput, it is estimated that the cost of pepper would account for upwards of 75% of the oleoresin production costs. Fluctuations in pepper prices are not so important to oleoresin production, since the alternative to the oleoresin would be to use ground pepper, the price of which would be similarly effected. Of greater importance is the availability of sufficient quantities of cheap, extraction grade material ("light berries"). If only more expensive grades, or those with lower piperine content, are available this will increase oleoresin prices in relation to the ground spice.

The cost of solvents is also high, but a high proportion is recovered and recycled. This cost is, however, of importance when crude oleoresin is produced. The value of solvent lost, as well as the lower price obtained for the crude product, make this considerably less attractive than producing the refined product.

Prices for pepper oleoresin in mid - 1980 were quoted at around US $18 to US $22 per kg c and f in the consuming countries. These have been relatively constant over 1979/80 but are lower than price levels in the mid - 1970's. These present price levels are determined by the price of Indian pepper oleoresin, the Indian exporters benefiting from a 12½% export rebate. Since the Indians were able to lower their prices, extraction in the USA, Canada and most of Western Europe has been reduced considerably. It is only economic to extract pepper oleoresin now in these countries if very cheap raw materials are available. The only country nd seriously affected so far is the UK, but even here it would not be economic to establish a new extraction plant and, over the next few years, it would seem likely that oleoresin imports from the pepper producing countries will gradually erode domestic production.

The present low price levels have not only had a deleterious effect on production in developed countries - they are also affecting the profitability of the industries in the pepper

producing regions. For instance, discussions with producers in Malaysia, Indonesia and Singapore indicated that, at best, the majority were able only to cover their variable costs. Others, who were supplying their produce to their parent companies admitted that they could not compete with prices on the open market.

As far as could be ascertained, the major Indian producers were operating profitably although margins were said to be small and the industry reliant on the continued payment of the export rebate. In view of the current over-capacity in India it is unlikely that prices will be raised significantly in the foreseeable future. In real terms, therefore, world prices can be expected to be maintained at around their current levels. As a consequence of this, further investments in pepper oleoresin extraction facilities are unlikely to prove economic.

A further problem facing potential investors is that of minimum economic size of unit. Although no precise figures are available it is often claimed that a minimum capacity of 100 to 200 tonnes is required to justify an oleoresin plant. At these levels, if a reasonable percentage of capacity is to be utilised for pepper extraction, it would be necessary to take a considerable share of the world market. This is almost certainly not feasible and will therefore necessitate the plant extracting a variety of spices.

3. Requirements for Establishing an Oleoresin Industry

If it were decided to consider establishing an oleoresin factory, based on the comments made both above and earlier in this Report, the following requirements are considered to be of particular importance:

(a) Adequate supplies of raw material must be readily available. Prices should be similar to those paid by other oleoresin producers and the piperine content should be high (eg as in Lampong light berries).

(b) Other spices should be available for extraction, eg capsicum, ginger, tumeric, celery and nutmeg. Due to market constraints it is extremely unlikely that an extraction plant can be run at anywhere near full capacity for pepper alone.

(c) A market contract should be negotiated to ensure that at

least sufficient oleoresin can be sold to enable the plant to be economically viable.

It must also be appreciated that quite a considerable capital investment is required. Detailed quotes for establishing facilities within the pepper producing countries were not obtained. However, for plants with capacities varying from 50 to 120 tonnes per year, cost estimates to cover land, buildings and equipment, including construction and installation, varied from US $500,000 to US $850,000. This assumes locally manufactured equipment. However, if imported equipment is used, costs would be considerably above these levels.

4. Recommendations

Through the 1970's, pepper oleoresin production has increasingly been relocated in the pepper producing regions, especially in India and Singapore. It is important to realise that, in entering the market, new producers have relied primarily on taking a share of the market from developed country producers rather than significantly increasing the total market size. Pepper oleoresin is still produced in the developed countries, notably the UK. In the future, these industries will come under increasing pressure and ultimately the majority of pepper oleoresin extraction can be expected to be located in the pepper producing regions. However, in view of the relatively limited prospects which exist for future market development, the present considerable over-capacity which exists for pepper oleoresin production will remain, at least in the foreseeable future. In such a situation, further investment in pepper oleoresin extraction capacity cannot be recommended. Even if the market situation changes dramatically, present producers will quickly be able to increase their capacity to meet new demands. If a decision is made to invest, the points in (3) above are considered to be of particular importance.

B. Pepper Oil

World consumption of pepper oil has been estimated at 15-20 tonnes and, in the future, is notexpected to increase much above current levels. World production and capacity have not been estimated. However, plentiful supplies are always available to meet demand. In both the pepper producing countries and the consuming countries,there are a considerable numberof mainly small-scale distillation units which can be brought into production when the oil is needed.

As with oleoresin, the major production cost is that of the raw material. However, for the oil, price is not often the primary concern of buyers, users frequently only requiring very small amounts in their end-products. Of much greater importance is quality. This is illustrated by the fact that prices quoted earlier in this report varied from aroundUS$20per kg to over US $300 per kg.

In view of the very small market size, the setting up of processing facilities to produce pepper oil alone cannot be envisaged. The only possibilities would be production of oil either in conjunction with other essential oils or as part of an oleoresin extraction process - the constraints on the latter have already been discussed.

C. Green Pepper Products

1. Supply and Demand Balance

World production of green pepper products has been estimated at 1,260 - 1,460 tonnes, the majority of this being canned in brine/ preservative with smaller quantities of dehydrated green pepper and freeze-dried green pepper being produced. Consumption has been estimated at 1,150 - 1,430 tonnes.

These estimates for production and consumption are of very much the same order although, in view of the lack of recent export statistics and the absence of data on production and consumption, a degree of uncertainty must be attached to both. By 1990 it is estimated that the market for green pepper will have grown to around 2,000 tonnes.

No estimates of present processing capacity were made, although considerable over-capacity was reported in India. It is believed that the majority of canning in the main producing countries is undertaken in conjunction with other products and that there is adequate capacity for green pepper production.

## 2. Requirements for Establishing a Green Pepper Processing Industry

Since green pepper is likely to remain a luxury product, showing limited market growth, and adequate production capacity is available in the main producing countries, major investments in processing facilities are unlikely to be needed. If a plant were to be established, certain points should be kept in mind.

The harvesting season for green pepper is short and is unlikely to generate sufficient turnover to justify the establishment of a processing plant on its own. It is therefore considered essential that alternative raw materials are available for processing (whether for canning, dehydrating or freeze-drying) to obtain a higher plant utilization. The economics of processing will depend on the economics of running the plant as a whole, rather than just on the economics of green pepper production. However, in comparison to pepper oleoresin and oil, the material costs of raw pepper will be of less importance. Instead the cost of packaging, ie canning or bottling, will become of much greater significance, especially for products for the retail market.

Of the three processed forms of green pepper, market considerations suggest that preserving and freeze-drying are likely to be the sectors showing the best growth. Any developments should therefore take place in these sectors rather than in dehydrating. On the marketing side, in a small luxury market there will be only limited distribution outlets. It is therefore preferable to establish contacts within the major markets before production developments are undertaken.

D. Ground and Pre-Packed Pepper

The supply and demand situation for ground and pre-packed pepper was not quantified in the same way as for the other pepper products. Instead, in the countries visited in North America and Europe, the market situation was reviewed, whilst in the pepper producing regions processing developments were assessed.

The results indicate that in North America and Europe the chance of breaking into markets at present are extremely small. Fears of adulteration, the fact that, once ground, pepper looses pungency and the need to compete with highly organised distribution networks are the main reasons for this. The only company to succeed in breaking into these markets did so because they were selling to a parent company whose distribution networkwas already well established. Other markets may exist for the Pepper Community countries in the Middle East, Australia and New Zealand but these are relatively small and highly competitive.

On the production side only a few companies had the capability of breaking into export markets, the majority being geared to their domestic markets. In the future it is not felt that any special emphasis should be placed on developments of these products in pepper producing countries except to ensure supplies to the domestic market. Potential exporters might be able to sell small quantities in the more promising markets, but any significant market developments cannot be expected within the time span covered by this Report.

E. Joint-ventures

During the study, those interviewed in Western Europe and North America were asked for their views on establishing joint-ventures for the purpose of processing pepper products. Opinions varied for the different products, but for the most part there was little enthusiasm for joint-ventures. More than anything else, this was probably a reflection of the present situation of production over-capacity and market limitations. In such a

situation,potential partners in the developed countries could see little point in investing further in such industries.

As far as oleoresin is concerned this is certainly the case. In the past a number of North American companies have been involved in the establishment of pepper oleoresin plants in India, Indonesia and Singapore, whilst the plant in Malaysia is a joint-venture between Indian and Malaysian interests. However, although some companies expressed interest in being involved in future oleoresin developments, none appeared willing to put capital into such a venture.

With the gradual relocation of the pepper oleoresin industry from the consuming to the pepper producing countries,certain changes in the marketing system are necessarily taking place. The requirements of consumers are for oleoresins with guaranteed quality specifications, ie piperine and volatile oil contents, colour, residual solvent level. The producers for their part must be capable of meeting these specifications and, at the same time, of finding suitable market outlets. It is therefore in the fields of technology and marketing that there is the greatest need for collaboration. To this end, several companies in the consuming countries expressed a willingness to provide technical advice to help producers meet their specifications. At the same time manufacturers in the pepper producing countries should try to obtain long term marketing agreements. In view of the over-supply situation, this latter aspect is becoming increasingly difficult since many of the major consumers have already well established buying channels.

As far as green pepper is concerned the majority of production is canned and therefore requires the establishment of a canning factory. Since this would not beeconomic for green pepper alone, other products would need to be considered. In such a situation any possibility for a joint-venture would have to be considered on a case-by-case basis. For freeze-drying of green pepper one European company expressed considerable interest in establishing

a joint-venture to freeze-dry at origin. This is considered preferable to freeze-drying imported preserved green pepper in Europe as is done at present. A better quality product is obtained, with much greener berries, and it also avoids the need to undertake the initial preserving process before shipment to Europe. As with canning it would be necessary to freeze-dry other products in conjunction with green pepper to make the process viable.

Least enthusiasm was expressed for joint-ventures for grinding and pre-packing black and white pepper. Such facilities are already established in consuming countries to undertake these operations. Joint-ventures would in most cases be a duplication of facilities which would act against the interests of the companies involved.

F. New Pepper-based Products

The great majority of uses for pepper and its products are in the food sector. Developments are continually going on in this sector which, in the past, has accounted for the general increase in consumption of pepper. During the course of this study, enquiries were made to ascertain the possibilities for the use of pepper in non-food uses (other than in the fragrance industry which has already been discussed in relation to pepper oil). In general, it may be said that pepper and the compounds which may be extracted from it have been thoroughly researched by companies in North America and Europe who are continually searching for new products to develop. This research has proved largely negative with regard to pepper, although two uses - as an insecticide and in medicines - are worth further comment.

As an insecticide academic research has shown (1) that piperine is more toxic to house flies than pyrethrum. More recent research (2,3) has shown that ground black pepper and its 95% ethanol

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(1) Harvill, E.K., A. Hartzell and J.M. Arther. 1943. Toxicity of piperine solutions to house flies. Contribution to Boyce Thompson Institute. 13: 87-92.

(2) Su, H.C.F., 1977. Insecticidal properties of black pepper to rice weevils and cowpea weevils. Journal of Economic Entomology. 70: 18-21.

(3) Su, H.C.F., 1978. Laboratory study on toxic effect of black pepper varieties to three species of stored-product insects. Journal of the Georgia Entomological Society. 13 (3): 269-274.

extract when used to surface-treat wheat are highly toxic to the rice weevil and to the cowpea weevil. Although these studies indicate that there might be a potential use for pepper (or piperine) as an insecticide, when considered in relation to the price of pepper such a use must be regarded as uneconomic at the present time.

The medicinal use of pepper was discussed at the Third Meeting of the Pepper Community Permanent Panel on Techno-economic Studies (June 1980, Jakarta). It was pointed out that pepper is used in traditional medicines in certain regions and Pepper Community members were requested to prepare a status paper on the nature and amount of use in their countries for presentation at a future meeting. Preliminary discussion on this subject indicated that use was probably very small and it is extremely unlikely that these traditional uses can be transferred to modern medicinal uses.

In recent years a new spice known as "pink pepper" has entered the market. This, however, is not a product of true pepper (Piper nigrum L.) but has been tentatively identified to consist predominantly of the dried fruits of Schinus molle, the 'pepper tree' which originated in South and Central America. Pink pepper may in fact be a mixture of several species of berries.

The origin of pink pepper is believed to be Reunion and also possibly Mauritius and Madagascar. France is the main importing country, supplies being sent from there to other consuming countries.

The German Federal Republic is the largest market with demand in the order of 20-30 tonnes a year. Pink pepper is a high priced luxury product; the delivered cost is about US $55

per kilo and after it is repacked it is sold at about US $2.50 per 30g jar, which retails at US $3.40 to US $4. Despite the present high price level, some German firms feel that, given adequate promotion and a stable price, the demand for pink pepper could well increase in similar fashion to green pepper. However, other companies are sceptical. The taste might not be as widely acceptable as that of Piper nigrum and the high price is a deterrent to large sales. The only outlets at present are in the retail sector and expensive restaurants.

In France, consumption is probably no more than 15 to 20 tonnes per annum and the market is limited to exclusive stores and restaurants. Sweden is also a significant importer of pink pepper although its total annual consumption cannot be much above 10 tonnes. Prices are about US $75 per kilo c & f Sweden. Small volumes are also sold in a number of other countries.

In general, there would seem to be some prospects of an expanded market for pink pepper in Western Europe, although it is unlikely that it will parallel green pepper. Its cost is presently far too high for mass consumption and its distinctive flavour may not find universal acceptance.

G. Pepper Products in Relation to World Pepper Production

Total world pepper production is forecast at around 130,000 tonnes in 1980, having an estimated fob value approaching US $250 million. Figures in this report show pepper oleoresin consumption to be 400 tonnes (equivalent to 3,200 tonnes of pepper), pepper oil consumption at 15 to 20 tonnes (equivalent to 875 tonnes of pepper) and the consumption of the three forms of green pepper at 1,300 tonnes. In total, therefore, consumption of processed pepper products accounts for an estimated equivalent of 5,375 tonnes of pepper, ie 4.1% of world production. In value terms (fob) pepper products account for 4.4% of the value of world pepper production. This situation is summarised in Table 3.1.

Table 3.1 Pepper Products in Relation to World Pepper Production

(Tonnes)

| | 1980 | | | 1990 | | |
|---|---|---|---|---|---|---|
| | Product tonnage | Pepper equivalent | Value (US $'000 fob) | Product tonnage | Pepper equivalent | Value[4] (US $'000 fob) |
| Pepper oleoresin | 400 | 3200 | 7200[1] | 725 | 5800 | 13050 |
| Pepper oil | 17.5 | 875 | 1750[2] | 17.5 | 875 | 1750 |
| Green pepper products | 1300 | 1300 | 1950[3] | 2000 | 2000 | 3000 |
| Total pepper product consumption (1) | | 5375 | 10900 | | 8675 | 17800 |
| World pepper production (2) | | 130000 | 247000 | | 175000 | 332500 |
| (1) as % of (2) | | 4.1% | 4.4% | | 5.0% | 5.4% |

Notes:
1. At US $18 per kg oleoresin.
2. Prices vary widely. An average value of US $100 per kg of oil has been assumed.
3. Assuming a unit export value of US $1.5 per kg for preserved green pepper - see Tables 2.5 and 2.7.
4. At constant 1980 prices.

By 1990 the forecasts show that pepper oleoresin consumption will be in the region of 725 tonnes (equivalent to 5,800 tonnes of pepper), green pepper products in the region of 2,000 tonnes and pepper oil at around 1980 levels, ie a total of 8,675 tonnes in terms of raw pepper. If by 1990 pepper production is assumed to have increased at an average rate of 3% per annum, this will rise to 175,000 tonnes, with processed pepper products accounting for 5% of this total. When measured in value terms, pepper products will account for 5.4% of the value of world pepper production in 1990. In other words, in relation to total pepper production, pepper products are likely to remain of relatively minor importance.

Furthermore, it must be realised that the development of processed pepper products is not necessarily to the advantage of pepper consumption as a whole. For example, pepper oleoresin is used as a replacement for ground pepper. Many manufacturers claim that, in terms of raw pepper, they are able to obtain the same flavour strength by using less oleoresin than ground pepper. Figures for the reduction in the quantity of pepper required vary greatly, 20% probably being an average figure with some estimating savings as high as 50%. Certainly if oleoresin consumption were to develop on a large scale this would exert a downward influence on total world pepper consumption.

The conclusion to be drawn from this is that, in the future, exports of whole black and white pepper will continue to be by far the most importance source of income for the pepper producing countries. The majority of their resources should therefore be devoted to ensuring that this trade is developed to their maximum advantage.

## H. Assistance to the Pepper Community

Under the Terms of Reference it is required to "determine whether the services of a Pepper Processing and Products Development Technologist assigned to the Secretariat of the Pepper Community would be justified". At present, the Pepper Community Secretariat has two professional officers - the Director and an economist. The findings of this Report have shown that pepper products are likely to play a relatively minor role in terms of total pepper consumption. At the same time, the development of new pepper-based products appears to offer few prospects. Exports of black

and white whole pepper will therefore continue to be of prime importance to the pepper producing countries.

In this situation, the services of a Pepper Processing and Product Development Technologist cannot be justified. However, it is felt that the assignment of a more broadly based Technical Advisor in the post-harvest sector, concentrating on the production and export of whole black and white pepper, may well be justified. The duties for such an advisor might include:

- provision of advice to Pepper Community members on the post-harvest aspects of black and white pepper production and export, particularly quality control and its maintenance;
- assistance to the pepper grinding industries, with the primary view of supplying domestic markets;
- keeping abreast of developments in the production and marketing of pepper products;
- reviewing of research into new pepper-based product development;
- assistance in collating all technical information received by the Secretariat, including that on pre-harvest aspects.

The person employed would require a thorough knowledge of the post-harvest aspects of pepper production. It is appreciated that no one person can be specialised in all of the fields listed above. However he should have sufficient experience to know the sources of information and thus to enable the Pepper Community Secretariat to provide advice to its members. The production and export of whole black and white pepper are regarded as particularly important in this respect. The Technical Advisor should be attached to the Pepper Community Secretariat in Jakarta but, in order to undertake the job satisfactorily, would need to be allocated sufficient funds to allow several months of travel each year. It will probably be necessary to spend about one month in each of the Pepper Community member countries with occasional visits to Europe and North America, as well as other potential markets. In such a way it should be possible to improve technical co-operation between the Pepper Community member countries and to promote the consumption of pepper.

## Appendix 1. Organisations Visited

During the course of this study interviews were held with Government officials, Trade Associations and a representative sample of companies involved in the production, trade and utilization of pepper products. These are listed below on a country basis, the majority of the visits being made between April and June, 1980. In addition, a large number of other organisations were contacted by letter or by telephone.

### (a) United States

#### (i) General

American Spice Trade Association
580 Sylvan Avenue
Englewood Cliffs
N J 07632

#### (ii) Oleoresin Manufacturers

Kalsec Inc.
P.O. Box 511
Kalamazoo
Michigan 49005

#### (iii) Traders

J. Mannheimer Inc.
47-22 Pearson Place
Long Island City
N Y 11101

L.A. Champon & Co. Inc.
70 Hudson Street
Hoboken
N J 07030

International Brokers Inc.
70 Hudson Street
Hoboken
N J 07030

George Uhe Co. Inc.
76 Ninth Avenue
New York
N Y 10011

Ludwig Mueller Co. Inc.
Two Park Avenue
New York
N Y 10016

(iv) Flavour Houses

Fritzsche Dodge and Olcott
76 Ninth Avenue
New York
N Y 10011

Stange Co.
342 Western Avenue North
Chicago
IL 60612

(v) Grinder/Packer

B. Heller & Co.
6363 West 73rd Street
Bedford Park
IL 60638

(vi) End-Users

Armour Food Co.
8849 South Greenwood Avenue
Chicago
IL 60619

Kraft Inc.
801 Waukegan Road
Glenview
IL 60025

(b) Canada

(i) Trader

Torma Trading Ltd.
75 The Donway West
Suite 906
Don Mills
Ontario M3C 2E9

(ii) Flavour Houses

Norda International Ltd.
833 King Street West
Toronto
Ontario M5V 1N9

Griffith Laboratories Ltd.
757 Pharmacy Avenue
Scarborough
Ontario M1L 3J8

Stange Canada Ltd.
3340 Orlando Drive
Mississauga
Ontario L4V 1C7

(iii) End-User

Foodpro National Inc.
2610 J.B. Deschamps Blvd.
Lachine H8T 1C9

(c) United Kingdom

(i) Spice Traders

Rucker & Slann Ltd.
62-63 Mark Lane
London EC3R 7DD

Clarke & Smith (Eastern) Ltd.
62-63 Mark Lane
London EC3R 7DD

(ii) Oleoresin Manufacturers

Bush Boake Allen
Blackhorse Lane
London E17 5QP

The British Pepper and Spice Co. Ltd.
86-90 Hermitage Wall
Wapping
London E1 9LW

(d) German Federal Republic

(i) General

Waren-Verein der Hamburger Borse e.V.
Plan 5
2000 Hamburg 1

(ii) Traders

E.H. Worlee & Co. mbH
P.O. Box 60 29 60
Bellevue 7-8
2000 Hamburg 60

Menke & Co. GmbH
Gr. Reichenstrasse 25/27
2000 Hamburg 11

Schwab GmbH
Deichstrasse 36
2000 Hamburg 11

Paul Kaders GmbH
Schauenburgerstrasse 21
2000 Hamburg 1

C. Melchers & Co.
Postfach 77 03 40
Steindamm 48A
2820 Bremen 77

(iii) Flavour Houses

Haarmann & Reimer GmbH
Postfach 1253
3450 Holzminden

Dragoco
Dragocostrasse
3450 Holzminden

(iv) Grinder/Packers

Gehring & Neiweiser GmbH
Postfach 3240
Sudbackstrasse 37a-43
4800 Bielefeld 1

Ostmann Gewurze
Postfach 143-145
Friedrich Hagemannstrasse 56
4800 Bielefeld 17

Avo-Werke August Beisse GmbH
Postfach 1167
4500 Osnabruck

Freeze-Dry Foods Trading Co. Ltd. (Freeze drying green/pink pepper)
Vertriebsgesellschaft fur Gefriergetrocknete Produkte mbH
Postfach 147
Otto-Hahn-Strasse 2
4404 Telgte

(e) The Netherlands

(i) General

Royal Tropical Institute
63 Mauritskade
1092 Ad Amsterdam

(ii) Importer

BV Handelmaatschappij UNIPRO
Rokin 95
Amsterdam C

(iii) Flavour House

Naarden International
28 Huizerstraatweg
1411 GP Naarden

(iv) End-Users

Unilever Inkoop Mij.B.V.
's-Gravelandseweg 555
Schiedam

UVG Nederland B.V. (UNOX)
Gasstraat 10
5349 AA Oss

(f) Sweden

Nordfalks AB (Importer. Grinder/packer)
Box 63
43121 Molndal

(g) Denmark

(i) General

Danish Meat Research Institute
Postbox 57
Maglegardsvej 2
4000 Roskilde

(ii) Importers/Grinders/Packers

K. Dirach ApS
Byageren 3-9
4000 Roskilde

Slagteriernes Faellesindkobsforening (SKF)
96-98 Avedoreholmen
2650 Hvidovre

(h) Switzerland

(i) General

International Trade Centre UNCTAD/GATT
4 route des Morillons
CH-1211 Geneva 22

(ii) Flavour Houses

Firmenich SA
Case Postale 239
1 route de l'Air
CH-1211 Geneva 8

Givaudan SA
CH-1214 Vernier

(i) France

Deltaco-France
(Compagnie Marseillaise de Madagascar) (Importer)
49 rue Grignan
13006 Marseille

(j) India

(i) General

The Spices Export Promotion Council
World Trade Centre
Mahatma Gandhi Road
Ernakulam
Cochin-682016

Central Food Technological Research Institute
Cheluvamba Mansion
Mysore-13

(ii) Traders

Kanji Moorarji
Kanmoor House
Narshi Natha Street
Bombay-400009

South India Produce Company
P.O. Box 344
Cochin-682002

(iii) Manufacturers

Bombay Oil Industries (P) Ltd. (Oleoresins)
Angamally South
Kerala

Synthite Industry Chemicals (P) Ltd. (Oleoresins/oils)
Synthite Valley
Kadayiruppu P.O.
Kolenchery-682311

Sonit Aromatic Chemicals (P) Ltd. (Oleoresins)
258 Peenya Industrial Area, Phase IV
Bangalore-560057

Brooke Bond India Ltd. (Oleoresins, Grinder/Packer)
Whitefield
Bangalore-560066

Flavours and Essences (P) Ltd. (Oleoresins)
P.O. Box 206
10th Km Hunsur Road
Belavadi
Mysore-570005

Spicex Chemicals (P) Ltd. (Green pepper)
C57 and C58 Industrial Estate
Yadavagiri
Mysore-570002

(k) Malaysia

(i) General

Pepper Marketing Board
Tanah Putih
P.O. Box 1653
Kutching
Sarawak

Ministry of Primary Industries
Jalan Gurney
Wisma Keramat
Kuala Lumpur

Ministry of Agriculture
Kuala Lumpur

Ministry of Agriculture and Community Development
Kutching
Sarawak

Sarawak Economic Development Corp.
Kutching
Sarawak

Malaysian Agricultural Research & Development Institute (MARDI)
Serdang
Selangor

(ii) Manufacturers

Sri Sai Oils and Oleoresins Sdn. Bhd. (Oleoresins and oils)
P.O. Box 55
Sungai Petani
Kedah

A. Clouet & Co. (K.L.) Sdn. Bhd. (Green pepper)
468-11 Jalan Ipoh
Kuala Lumpur

Terpenes Trading Co. (Oil distillation)
Kutching
Sarawak

Tay Hak Hak Co. (Sarawak) Sdn. Bhd. (Spice grinder)
Kutching
Sarawak

Hnmy's Manufacturing Industry (Spice grinder)
Kutching
Sarawak

(l) Indonesia

(i) General

Pepper Community
4th Floor Jaya Building
12 Jalan M.H. Thamrin
Jakarta

Department of Trade and Co-operatives
Directorate for External Trade Relations
Jalan Abdul Muis 87
Jakarta

Department of Industry
Directorate for Miscellaneous Industries
Jalan Kebon Binatang III/15
Jakarta

Chemical Research Institute
Bogor

(ii) Oleoresin Manufacturers

P.T. Essence Indonesia
International Flavours and Fragrances
74 Jalan Otto Iskandardinata
Jakarta

P.T. Polind
c/o P.T. Panca Bina Esa
10th Floor Arthaloka Building
2 Jalan Jendral Sudirman
Jakarta

(m) Singapore

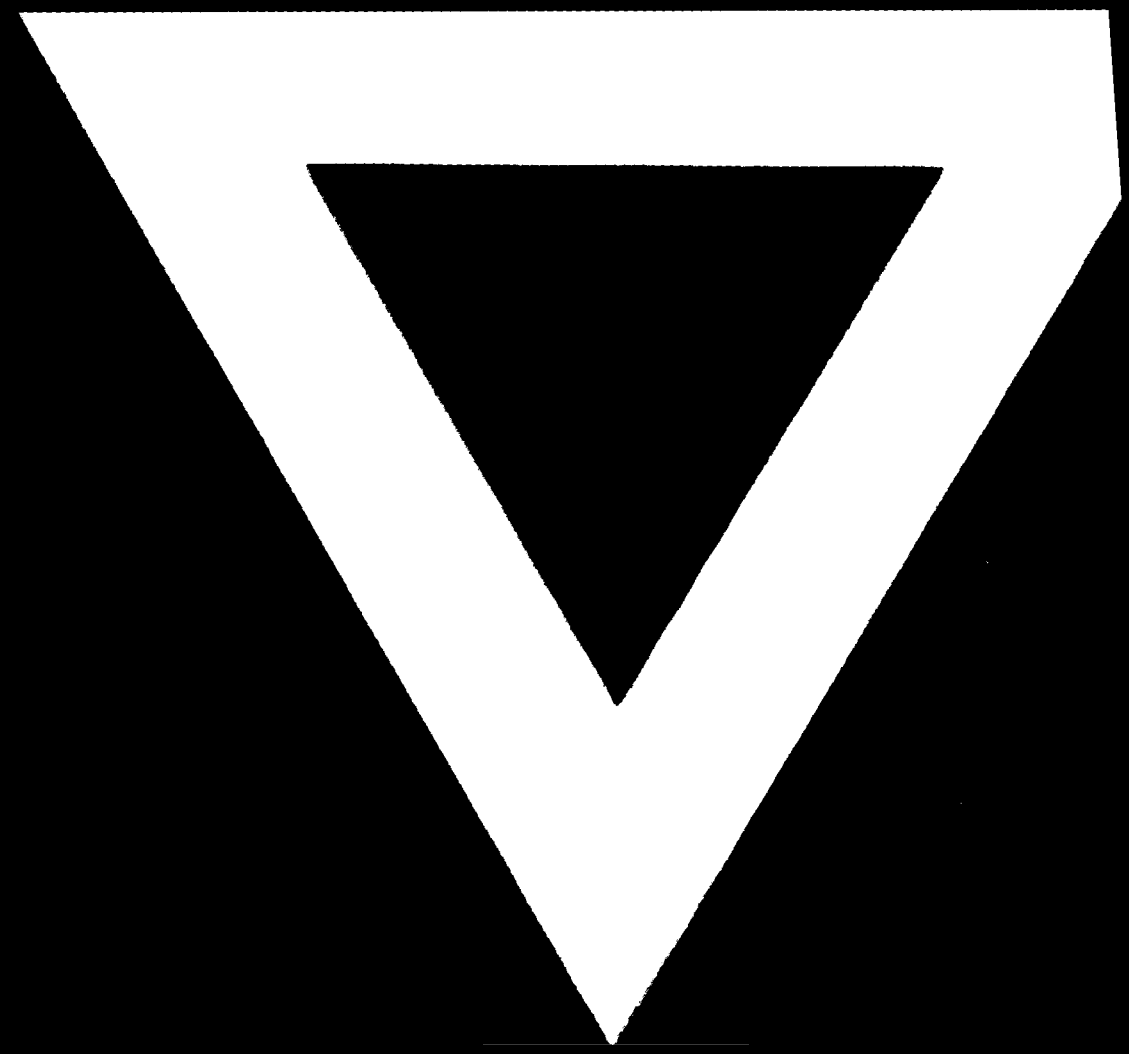
(i) Spice Traders

Spices of the Orient Pte. Ltd.
Block 3, 701 PSA Multistorey Complex
Pasir Panjang Road
Singapore 0511

Hiang Kie (Pte) Ltd.
302 LKN Building
135 Cecil Street
Singapore 1

(ii) Oleoresin Manufacturer

Botanicus Pte. Ltd.
Four Enterprise Road
Jurong
Singapore 22



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