

TRADE IN AGARWOOD



A STUDY BY

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Trade In Agarwood

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WWF-India started life as a modest wildlife conservation organisation with a focus on protecting particular species of wild fauna. Over the years, the perspective broadened to encompass conservation of habitats, ecosystems and support to the management of the country's protected areas network. In 1989, WWF-India articulated its Mission as follows, to suit India's specific ecological and socio-cultural circumstances:

"The promotion of nature conservation and environmental protection as the basis for sustainable and equitable development."

In essence, the central goal is the conservation of India's biological diversity through a multi-pronged strategy which stresses community based approaches. Most WWF-India programmes are oriented to this.

WWF-India completes in 1994, twenty-five years of service to the cause of promoting harmony between humankind and nature.

Trade In Agarwood

Kalyan Chakrabarty
Ashok Kumar
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TRAFFIC INDIA



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FOREWORD

I am glad that TRAFFIC-India has brought out this study on the status of agarwood in India, its trade and future.

This report takes a close look at the distribution of the species in various states of India, its legal status, recorded quantities in trade, quantities exported to various countries, problem of conservation of the species and the control of the trade.

This publication also analyses the approach that our country should follow if judicious and sustainable utilisation of this species is to be carried out and the loopholes that are to be plugged if the extinction of the species in the wild is to be prevented.

I am sure that this will draw the interest of the conservationists and the users equally and lead to further feedbacks for evolving a rational policy for conservation and utilisation of this precious living resource for the benefit of mankind.

S.C.Dey

1st August, 1994
New Delhi.

Additional Inspector General Forests (WL)
and CITES Management Authority

PREFACE

WWF-India works for the conservation of biological diversity through field projects, policy work, education, communications and NGO networking. As part of its biodiversity conservation thrusts, TRAFFIC-India was established on January 1, 1992 to monitor trade in wildlife species and its derivatives.

Trade in Agarwood is the third wildlife trade monitoring report produced by TRAFFIC-India, since its inception and the first one dealing with a single species. The report also brings a special focus on the heavily endangered flora of our country of which only six are protected under the Wildlife (Protection) Act, 1972 and which almost always comes second to fauna in conservation priorities.

Aquilaria malaccensis or agarwood one of north-east India's most valued tree species, is not a CITES listed species despite its extensive trading and continuing decline in the wild. This publication is of special importance as it comes out in time for the 9th Conference of Parties of the CITES. The species needs to be put into the CITES Appendices for better protection and trade regulation.

This particular report will be of immense use to forestry personnel, CITES policy makers, trade specialists and enforcement agencies in the country.

30th July, 1994
New Delhi.

Samar Singh
Secretary General
WWF-India

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Steven Broad, Director TRAFFIC-South Asia contributed valuable data at short notice to fill gaps in information pertaining to that region which nevertheless requires more extensive researching.

CONTENTS

	Page No.
<i>Foreword</i>	
<i>Preface</i>	
<i>Acknowledgements</i>	
Introduction	1
Distribution and Status of Agarwood	4
Formation and Extraction of Agar	12
Utilisation of Agarwood and its Products	17
Trade in Agar	20
<i>History of Trade</i>	
<i>Trade in India</i>	
<i>The Middle-East Markets</i>	
<i>The South-East Asian Scenario</i>	
Conclusion and Recommendations	38
Bibliography	40
Appendices	42
<i>Agarwood in Traditional Ayurveda</i>	
<i>Agarwood in Traditional Tibetan Drugs</i>	
<i>Export of Agarwood from India</i>	

INTRODUCTION

This is the first market study of the valuable wood *Aquilaria malaccensis*, known in the trade as agarwood. The tree grows in the north-eastern states of India and in a number of countries of south-east Asia. The focus here is not on the timber that is yielded by the tree but on a brown, or very dark brown, pathological product formed by a fungal infestation of parts of the heartwood of certain trees of this species alone. It is this unique infested portion that contains a concentrated amount of oleoresin of high commercial value.

In literature, as in trade, the words "agarwood" and "agar" are used interchangeably, causing confusion. Strictly speaking, "agarwood" is the uninfested timber of the species or the tree itself, and "agar" is the infested part of the wood. Yet, since the trade commonly uses either of the words without distinction, some of this confusion has inevitably crept into our report; however, the context makes clear whether the reference is to agarwood or agar. What is important to note is that the uninfested timber of this species has a poor commercial value, whereas agar is greatly coveted in trade circles.

Here is a classic example of a natural resource, one that man has failed to duplicate so far, being extracted at unsustainable levels, thereby reducing the species to an endangered status—at least in India. The scarcity has led to a steady escalation in prices, but since the consumers can afford to pay the enhanced rate, unsustainable use continues recklessly. The efforts of state governments of north-eastern India to regulate the extraction have failed. Some state governments, therefore, decided to ban extraction altogether, but this step too has not succeeded in safeguarding the remaining trees against illegal felling. There is enough evidence to prove that the highly-prized Indian agarwood is, surreptitiously, still reaching consumers in the Middle East. Further, despite the ban on extraction, the distilleries in Assam are getting enough agar, partly from illegal extraction in India and partly by smuggling from Myanmar.

This, then, is the dilemma. If the government bans total utilisation of a product, the problem is merely swept under the carpet, forgotten,

and the regulation of its use abandoned. On the other hand, a limited and controlled utilisation can obtain the cooperation of legal traders and bring about a control of the illegal trade. Such a paradigm has not so far worked in India; certainly it has not worked in the trade in wild flora and fauna. There is altogether too much mistrust on all sides: the government is convinced of the malfeasance of the traders, and the traders know of innumerable ways of by-passing regulations. The government argues that when the import of African ivory was allowed with the purpose of reducing the pressure on Asian ivory, the traders continued to buy Indian ivory obtained from poached Asian elephants. Quite a number of legally-held 'African' ivory carvings in India are believed to be actually Indian ivory. The links between the people guilty of the killings, trapping, and extraction and the traders are so amorphous that, so far, no scheme of self-regulation seems workable.

The traders, driven quite naturally by personal profit, vie one with the other in gaining the last of the resource. The increasing scarcity of a precious resource is not a deterrent. In the short run, it could be an advantage: when the price soars, so does the profit margin per unit. Finally, when the resource runs out, the traders can easily switch to another resource or to a completely new business.

Drawing up a strategy on these battle lines has not helped the survival of agarwood in India. It may prove beneficial to give some of the leading traders in agarwood limited harvesting rights in return for their traditional knowledge and their cooperation in curbing unsustainable extraction and in enhancement of the species. The distressing alternative is the extinction of agarwood in India, to begin with, and later in other south-eastern countries. Mankind would lose not only a mere item of perfumery, but would be deprived of both the key to a mystery of nature and a host of other current and potential uses of agarwood. Above all, the trade in agarwood shows that traditional knowledge passed down from one generation to another still has a marketable niche — in this instance, worth more than \$40 million annually.

Several people have contributed to the study. Dr Kalyan Chakrabarti of the Indian Forest Service, a regular contributor to the *TRAFFIC*

DISTRIBUTION AND STATUS OF AGARWOOD

DISTRIBUTION

The genus *Aquilaria* is derived from the Latin *Aquila*, the eagle. While the king of birds holds dominion over the sky, *Aquilaria* thrives in the north-eastern region of India and south-east Asia. Its family *Thymeleaceae* numbers 50 genera comprising 500 species and is distributed mainly across South Africa and Australia. Of the 17 species of the genus *Aquilaria*, only two are found in India: *Aquilaria malaccensis* and *Aquilaria khasiana*. *A. khasiana* is a shrub or small tree (Bor, N.C., 1980) native to Bhutan and the Khasi hills of Meghalaya.

Whitmore T.C (1972) lists the distribution of *Aquilaria malaccensis* through Malaya, except Perlis and Kedah, India, Myanmar, Sumatra, Borneo and the Philippines. This would imply a geopolitical distribution of the genus including at least: India, Myanmar, Lao PDR, Thailand, Kampuchea, Vietnam, Southern China, Malaysia (Peninsular, Sabah and Sarawak), Indonesia (Possibly to Irian Jaya) and the Philippines. Burkill I.H (1966) mentions the occurrence of *Aquilaria* from north-eastern India and Hong Kong to New Guinea. In the text he also mentions Java and Hainan (southern China) as being historical sources of the product. There are also unconfirmed reports of the existence of *Aquilaria malaccensis* in Bangladesh although recent reports indicate that the species does not exist in the wild anymore (Khan 1993, pers. comm).

In India, *Aquilaria malaccensis* is native to Arunachal Pradesh, Assam, West Bengal, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, and Tripura. The species is generally found growing up to an elevation of 1000 m and is localised mainly in the foothills and undulating slopes of evergreen and semi-evergreen forests.

STATUS IN THE WILD

Commercial profitability has led to agarwood being felled indiscriminately throughout its range states. Its status in the wild, has therefore, been undergoing a steady transformation and in many places, the current status is unknown or indeterminate (see Table I).

Table I: Status of *Aquilaria malaccensis* in the wild

Country	Status	Country	Status
Bangladesh	E	Iran	?
Bhutan	R	Myanmar	V
Assam	R	Thailand (south-eastern and peninsular region)	?
Arunachal Pradesh*	?	Borneo	?
Manipur	R	Sumatra	E
Meghalaya	R	Peninsular, Malaysia	I
Nagaland*	?	Phillipines	?
Tripura	R		

*Adapted from WCMC Status report as of 24-5-94. *Not recorded in report.*

Key : E - Endangered I - Indeterminate
R - Rare ? - Unknown
V - Vulnerable

In the Indian context, however, more information was collected through a TRAFFIC-India field investigation. A statewise description of the status of agarwood and its extraction follows.

1. **Arunachal Pradesh:** The regular exploitation of agarwood since 1957-58 has depleted the once flourishing forests, and the bare truth can no longer be ignored. In 1982-83, the Forest Department finally banned all commercial exploitation of agarwood in the state, but this came after at least 26 years of regular extraction. Moreover, to augment the poor stock, the department has engaged in studies aimed at the regeneration of agarwood, and their efforts are expected to yield rewarding results.

The tropical evergreen and tropical semi-evergreen forests of the foothills of Kameng, Lower Subansiri, Siang, Changlang, Lohit and Tirap districts are the natural habitat for agarwood. The normal density of these forests are about 0.73-0.77% which diminishes in semi-evergreen forests. In terms of forest divisions, the Khellong Forest Division, Banderdewa Forest Division, Nampong Forest Division, and the Pasighat Forest Division are the major custodians of agarwood. There are no agarwood trees in Miao. With the aim of

augmenting wild stocks, the Silviculture Division of Arunachal Pradesh has made elementary attempts to artificially regenerate the species on an experimental basis. Beniwal (1987), too, has investigated the silvicultural aspects of agarwood in Arunachal Pradesh.

2. **Assam:** Illicit felling of agarwood was customary in Assam even as early as 1905-1906. At one time, the inhabitants of Dakhshinbagh, Sylhet (now in Bangladesh), had the monopoly of the trade in agarwood and agar oil. They used to lease the Assam Agar Mahal (*mahal* is a local demi-official term denoting area leased for extraction) on a three-year term, transporting the logs to their native district where they were crudely processed under close guard. After the partition of India, this industry suffered a setback. But it was not long before agar experts crossed over to India and settled at Nilbagan, near Hojai in Naogaon district, the new location for their trade operations. At one time, the Forest Department seriously contemplated establishing the agar industry in clearly defined divisions and researched the means for distillation.

Plantations of the species, which were raised as early as 1921 in and around Garampani, were completely erased by the early sixties by illicit operations. This suggests the formation of agar in these young trees. The subject of such agar formation was studied in Assam with the purpose of ensuring a steady supply of raw materials for the production of agar oil. Some agar dealers of upper Assam claim that an insect is instrumental in inducing agar formation. In captive plantations, which they raised on their homesteads, they introduced this insect through boreholes. Their claim is yet to be verified. The silviculturist of the Forest Department in Assam is currently undertaking an experiment on these lines.

A five-year plantation scheme was implemented in the state, and nursery and planting techniques perfected over the years. Though the species does grow in open areas, better results were obtained when it was planted under a broken canopy. But in Assam, as elsewhere, illicit felling has drastically reduced the growth of agarwood in the wild, bringing the legal production of agar oil almost to a halt. The industry around Nilbagan is struggling to keep alive on a negligible collection

of raw material from neighbouring states and Bhutan. The only worthwhile plantations within the state—those in Sibsagar—are still very young. Some wild trees are present in Naogaon, Sibsagar, Darrang and Cachar districts.

3. Mizoram: According to local people, agarwood grew in abundance, until a few years ago, on the hillocks (*Ram*) Mualkhang, Pukpui, Valam, Vanglawn, Hmarmual, Lunglei, Sihphir which today present a ravaged landscape. Only a few scattered seedlings dot these hillocks, (known collectively as *Sihfa Ram*), today. Avaricious merchants, obsessed with immediate personal gain, have stripped every corner of these luxuriant hillocks, trampling underfoot young seedlings. A measure of the outcome of their savage indulgence is apparent in the almost futile hope of the current regeneration efforts for this disturbed region. Even the few seedlings that live today are expected to perish in the not-too-distant future. According to local information, the catchment areas of river Tuivawl, especially the eastern embankments, used to be prime habitat for the agarwood tree. The wealth of agar in this area tempted people to indulge in indiscriminate collection, which entailed wanton destruction of the coveted timber. Today, the tree grows sporadically near the tributaries of river Tuivawl, namely, Saichal lui, Ser lui, Ralzawn lui, etc. Some areas where it is found today are as under:

Saicha Ram: Saichal lui flows from the eastern side of the catchment areas of river Tuivawl. Following the Saichal lui upstream from the starting point (i.e. Sawh Kawi), one can find, towards the left, a forest patch called Saicha Ram where a few, scattered seedlings survive across an area of approximately 0.5 ha. This precious patch is about one kilometre away from the bed of river Tuivawl.

Thingtlu buan Ngaw: Following Saichal lui upstream from the starting point on the right, one encounters a forest locally known as Thingtlu buan Ngaw (also called Thersawi Ngaw) where agarwood seedlings are scattered across an area of approximately 2 ha. This region is reputed to be the most conducive, in and around river Tuivawl, to the growth of agarwood. But indiscriminate felling over the past few years has stunted the growth of the seedlings.

Ser lui: Agarwood is scattered across two patches (measuring 0.5 ha each) of the catchment areas of the tributary Ser lui, which flows along the boundaries of the villages Dulte and Puilo.

Ralzaroh lui: Originating from the Ruallung side of river Tuivawl, this tributary once nurtured a plantation of agarwood in its catchment areas. Today, not even a seedling provides a link with the past.

Human lui: Flowing on the western side of river Tuivawl, this stream crosses the Seling/Champhai road 54 km from Seling and 21 km from Keifang. Following Human lui upstream, one arrives at a pocket of agarwood seedlings covering an area of approximately 0.25 ha.

People habitually collected agar in the areas adjoining the stream Tuisa, as well, which flows along the border of Mizoram and Myanmar, and its source stream, which traverses the boundaries of the villages Hnahlan and Khuangphah. Today, in this region there is hardly any agar worthy of mention.

4. Meghalaya: A long history of illicit felling and over-exploitation of agarwood has endangered the species in the natural forest areas. Today, only about 100 trees survive in the agarwood plantation of the Darugiri Reserve Forest. Not much information is available on the distribution and plans for regeneration of the species. Beyond the fact that no extraction of agarwood has so far been made by the Government of Meghalaya, there is no authentic report, not even on the export of the species from the government reserve forest.

5. Nagaland: The dense forests of agarwood, which once covered the Naga hills up to an elevation of 900 m, have been reduced to a few sporadic trees, mainly in Dimapur Range, Peren, Phek, Mon, Mokokchung, Tuensang, and Wokha Forest Division. Unskilled labour, hired to collect agar material, indiscriminately felled the trees and the tree is rare in the state today.

6. **Tripura and Manipur:** The wide distribution of agarwood up to an elevation of 1000 m in the hills of Tripura and Manipur provided the agar oil industries with a ready storehouse of raw materials. However, irresponsible use of these precious natural resources has depleted stocks to an all-time low, and distilleries in Manipur are making a desperate bid to survive on meagre raw material from neighbouring states.

7. **Non-government forests:** There is some agarwood under private ownership as also under the control of district councils, but no reliable record exists of the quantity and distribution. Their extents must be researched and the viability of these forests to supply agarwood to a legal trade determined.

LEGAL STATUS

Agarwood is not protected under the Indian Wildlife (Protection) Act, 1972. However, it is protected from extraction by state bans (under the Indian Forest Act) and by administrative orders of the state forest departments which vary throughout its range of occurrence. The current status of bans in various states of India and the neighbouring country of Bhutan are given in Table II.

Table II: Legal status of Agarwood in India and Bhutan

Arunachal Pradesh	Ban imposed during 1982-83. Currently banned.
Assam	Last extraction during the early eighties. Currently banned.
Meghalaya	No extraction from government forests has ever been allowed.
Mizoram	Extraction allowed/lease year 1990-93. (possibly renewed)
Nagaland	Extraction allowed/lease year 1991-92 (possibly renewed).
Tripura & Manipur	No official ban. Limited collection.
Bhutan	Ban imposed during 1991. Currently banned.

The status of exports of agarwood from India is, at the best, blurred. As per Chapter XVI, Part I, of the Export & Import Policy framed by the Ministry of Commerce, Government of India, for 1992-97, all wood and wood products in the form of logs, chips, powder, flakes, dust, timber, etc are prohibited for export. Hence, it appears that agarwood in the form of chips and dust is not allowed for export under the provisions of the present Export-Import Policy. But as per Sl. No. 34 & 44 of Part V of the same chapter of the Export-Import Policy, plants, plant portions, and derivatives obtained from wild and processed timber of all species, excluding sandalwood and red sanders wood, may be exported subject to specified terms and conditions. This provision therefore may permit the export of agarwood derivatives and timber in processed form. These two contradictory provisions clearly render the legal status of export of agarwood from India somewhat ambiguous.

FORMATION AND EXTRACTION OF AGAR

SYLVICULTURAL CHARACTERISTICS

Aquilaria malaccensis is a large, evergreen tree, over 15-30 m tall and 1.5-2.5 m wide, with a moderately straight and often fluted stem bearing thin, pointed leaves, 5-8 cm long and with several parallel veins. In the month of June, whitish blooms form clusters on the stalks. Fruits, which appear in August, are soft and 3-5 cm in length.

Neither the flowers nor the fruit, however, attract as much attention as the wood of the tree—not so much its normal, pale white, and unscented timber, or its thin, rough bark, but rather the irregular patches of dark wood which are the result of a fungal infection. It is the 'diseased', darkened parts of the agarwood that produce the highly-prized agar. Concentrated amounts of oleoresin are found where the branches fork out from the stem.

Several experiments have been conducted at plantations of agarwood in Assam, India and in south-east Asia. In Assam, plantations exist in Sibsagar and a few other pockets but the development of agar is not well researched in these stands of trees. In south-east Asia experiments have shown a germination of as much as 47 per cent. Seedlings, one year old (at 6 inches) can be transplanted into a secondary forest. The average height of seedlings at 2 years was 27 inches and they reached a maximum of 61 inches. The average height at 3 years was 29 inches and the maximum was 97 inches (Foxworthy in Whitmore T.C. [1972]). More importantly, 69% of the seedlings had survived at 3 years showing that the silviculture of this species could very easily be carried out after a few experimental trials in situ.

FORMATION OF AGAR

Agar is frequently found in young trees about 20 years old, but the infestation takes time to mature and trees about 50 years old have shown the highest concentration (yield approximately 2 to 3 kg per tree). Sometimes, all the tissue under the bark of the tree may be found converted into agar.

The first study of the growth and development of agar in *Aquilaria malaccensis* was undertaken in 1929 at the instance of the Assam government. Tunstall isolated three fungi belonging to the group *Fungi imperfecti* from agar, namely, (i) *Aspergillus* species (which is primarily responsible for the production of agar in *Aquilaria malaccensis* trees), (ii) *Penicillium* species, and (iii) *Fusarium* species. His experiment, which entailed inoculation of some healthy trees with *Aspergillus* sp. produced amazing results: agar-infected wood! This research was continued by S.R. Bose, who in 1939-40 and in 1941 inoculated about 36 trees with the same fungus. Agar formation was once again traced in several of the inoculated regions of the bark. Borings taken within 1 inch radius around the point of inoculation smelt strongly of agar, but agar formation was not observed beyond this limit.

Agar is regarded as a pathological product and usually, if not always, found where some former injury has been sustained. Inoculation trials with all the species of fungi on healthy *Aquilaria malaccensis* trees were conducted in Assam and in all the cases agar developed around the inoculated region but there was no spread, not even after a lapse of many years. It is interesting to note that in some trees that were inoculated with a fungus-free "control solution", infestation developed around the holes caused by the inoculation syringe. Fungal causation of agar in these trees was said to be via the inoculation holes which provided convenient entry points for the fungus.

On the other hand, chemical studies conducted in the Forest Research Institute, Dehradun laboratory on the role of hydrolytic changes possible from any action on glucoside bodies present in green and dry agarwood reveal that it is not possible to develop any agar oil or aroma by hydrolysis, and that inoculation of fungus is the only possible way of developing agar oil in otherwise uninfected wood. This research concludes that no fluid resin exudes naturally or on tapping the tree.

The mysterious agarwood has some more 'dark' secrets: agar formation, according to some professional agarwood collectors, is not confined only to standing trees but can also occur in felled trees that did not originally contain agar. This indicates that agar formation may take place in non-living materials also but in such cases it may be

that the felled trees were infected when standing and the fungal infection was not detected by the naked eye at the time of felling. Obviously, agar formation needs more detailed study for a successful growth of agarwood trees on a commercial basis.

EXTRACTION OF AGAR

Certain external features of agarwood indicate whether or not the tree harbours precious agar deposits. These include:

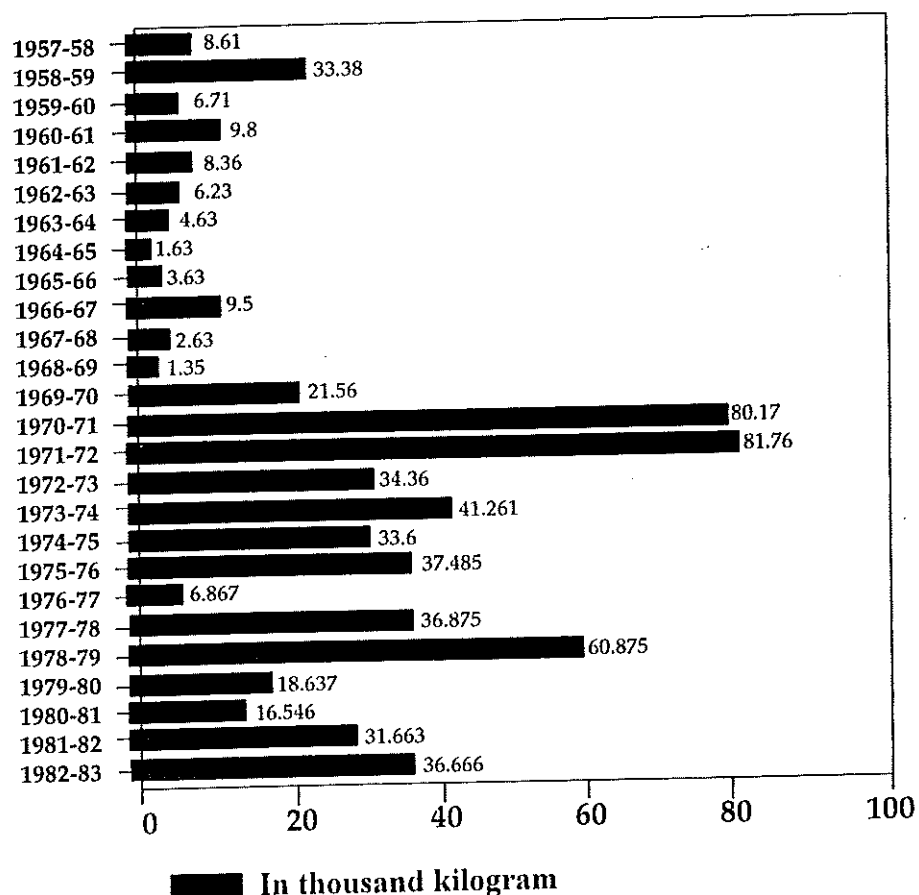
- (a) a poor crown, decayed branches, and uneven bole;
- (b) swelling or depressions and cankers on the bole;
- (c) the appearance of hordes of ants in the fissures; and
- (d) a distinctly yellowish tinge in the wood under the outer bark.

These apparent signs of agar formation are perceptible only to the practised agar collector. The Garos, a hill tribe of Assam and Meghalaya who are professionals in spotting agar-bearing trees are skilled in agar collection too. Unprofessional labour cannot detect the tell-tale discolouration without felling trees erroneously and chopping them into pieces indiscriminately. In Vietnam, as well, indiscriminate felling of trees is reported, a graduation from professional agar-collection to a greed-based harvesting (Broad 1994). This unconscionable loss of full-grown trees, which may have developed agar-bearing patches in later life, merits censure and immediate remedial action.

Once the agar tree is spotted and felled, the soft wood is chipped away in the hunt for the harder, darker, more odorous and dead heart wood. Often harvesters leave the fallen tree to rot as this would expose and clean the hard pieces. It seems that the diseased hard wood mostly appear in spike-like patches descending in the soft wood but other shapes and forms are also reported. The wood is cut into rough blocks and transported to the nearest storage and processing centre where the precious agar is extracted and then graded for consumption by the trade.

The commercial profitability of agar has led to reckless felling and over-exploitation of agarwood, thereby reducing the natural population drastically. There are records of exploitation going back to the turn of the century e.g. between 1918-1922 a total of 670 mds or 491 CWT (hundred weights) of agarwood was extracted from Cachar in Assam (Pearson and Brown, 1981). As a result, the species has become rare in its natural zone of occurrence. In Arunachal Pradesh, agarwood extraction from 1957-58 to 1982-83 is shown in Fig. II. Even as late as 1991-92 one range in Nagaland, Dimapur, was providing nearly 5000 kilos of agarwood annually (see Table III).

FIG. II: QUANTITY OF AGARWOOD EXTRACTED IN ARUNACHAL PRADESH



In Sarawak (Malaysia) gharu collection became very popular in the seventies when Chin in 1975 observed that "all adult males in.... all longhouses throughout Sarawak, began to organize gharu-collection. Chin interviewed 13 heads of households in 1977. While five earned

Table III: Agarwood extraction - Dimapur Range (Nagaland)

Year	Qty. (Kg)	Value (Rs)
84-85	—	97,331
85-86	—	66,500
87-87	—	18,634
87-88	6250	29,129
88-89	5393	—
89-90	4790	—
90-91	5685	—
91-92	4718	—

between US \$ 300-1000 annually from the sale of gharu, only five earned less than US \$ 300. One got nothing! Extraction of agarwood still continues unabated in south-east Asia where it is reported that helicopters are used to identify trees for agarwood harvesting (Broad S. 1994).

UTILISATION OF AGARWOOD AND ITS PRODUCTS

The aura of agarwood has permeated the world from remote times when agar oil, extracted from the aromatic wood, was used to produce incense in Egypt, Arabia and throughout the Far East. Today, its multifarious uses make it a widely coveted trade item, threatening its future in the wild. During this study, a list of uses of agarwood and its products were documented which are listed below :

Use as incense

As previously described in the text, agarwood often contains patches of fragrant, resinous wood which enters into the trade under the name agar. True agar burns with a bright flame or smoulders, producing a pleasant smell. Agar is found in the market in the form of chips and splinters (fine quality) and also as blocks weighing upto half a kilo. Although Arabs have traditionally used it to burn in incense holders in their baths and otherwise, the use of agar as an incense for Mohammedan prayers is recorded in Malaya as well. Both the Chinese and the Indians used to have it as an essential ingredient of joss sticks (or *agarbatti* in India). Today, joss sticks in India no longer contain the prized ingredient although it is reported that high-quality joss-sticks meant for export might have a drop of agar-oil as part of the mixture.

Use as perfume

Historically "agar attar" or a water based perfume was highly prized as the "otto of roses" in India. According to Trotter(1940) agar oil is valued for its capacity to retain perfume and is therefore highly prized by European perfumes for mixing with their best grade scents. "Zeenat" the Paris based perfume is reputed to be using agar in their formulation.

Medicinal use

The use of Agar in various oriental medicines has continued over the ages. The Malayans used agar mixed with coconut oil as a liniment and also in a boiled concoction form for rheumatism and body pain. Bull(1930) states its use in a complex ointment for small pox and for various abdominal complaints. It is used as a prescription for dropsy,

as a carminative, a stimulant, a tonic (especially drunk during pregnancy, after childbirth and for diseases of the female generative organs) and for palpitations of the heart. The discarded soft wood is used as *Kayu gaharu lemppong* by the Malaysians for the treatment of jaundice and body pains and is also used by the Chinese.

Agarwood has also traditionally been used in Ayurvedic (Appendix I) and Tibetan medicines (Appendix II). Some of its formulations such as Agar 31 is marketed under the trade name of Nirvana incense sticks by well known pharmaceuticals companies.

Use as writing material

The use of agarwood bark as a writing material has been documented extensively. Traditionally royalty used the parchment of agarwood as writing paper referring to it as *Sach pat*. Young trees which are well grown are selected, debarked from the ground upto 18 feet in a long strip and rolled into cylinders with the green outer part inside and the inner white part outside. This is then sun dried, unrolled and the green outer parts scraped and peeled. After treatment (colouring, soaking, filling with a paste made from the seeds of *Phaseolus aconitifolius* etc), the strips are cut to size and used as paper. Religious prejudices maintain the use for chronicles of important and sacred books, paper substitution is also known from the mountaineers of Annam and the Chinese.

Ceremonial uses

The use of agar in ceremonial and occult uses is also documented. It may be a part of a libation poured out at grave-sides by the Malays. It may also be put into funeral pyres by the Siamese. Some Malay tribe, fumigate their paddy fields with agar smoke to appease local spirits.

Use as timber

Indian foresters have suggested the use of agarwood for tea boxes, although as there is an enormous price difference between healthy and unhealthy (agar-infested) wood, healthy wood is often destroyed in the search for the other. Cabinet makers and inlayers use it in furniture work and for making ornamental boxes.

Use as bark cloth

The bark of agarwood is fibrous and can be beaten into bark cloth but is seldom used as such. Some Malayan tribes such as the Sakai make coverings of the head from it. The Dyaks of Borneo use it similarly and for lining baskets. It is recorded by Peal (1922) that Assamese use it as jungle mattresses although this does not seem likely as a rule and may have been an exception.

Other uses

Agar powder is known to be sprinkled on clothes and skin as a preservative against fleas and lice. An important element of several sweet smelling substances, it is used in the making of fumigators and pastilles. It is used as a cosmetic in Malaya and been used to make beads and rosaries. In Malacca, twine is reported to be made from it while in Malaysia it is documented that thieves while trying to stupefy their victims with *Datura* fumes may endeavour to cover-up by mixing *gaharu*. In Arabia, chips placed over live charcoals by the host signifies the end of a party - a subtle, yet sweet-smelling indication to his guests that it is time to bid adieu.

TRADE IN AGARWOOD AND ITS PRODUCTS

HISTORY OF TRADE IN AGARWOOD

Trade in agar, alternately known in international trade as aloes wood, eaglewood or Gaharu can be traced back with some veracity to at least 900 years before the birth of Christ. In India as far back as A.D. 600, *Susruta Samhita*, the Sanskrit medicine epic lists *agaru* for scenting purposes by fumigation and as an anodyne fumigation for surgical wounds. In the Bible, aloes wood is mentioned in connection with David and Solmon (B.C 900). Among the Hebrews *Ahaloth* or *Ahalim* was used for agarwood while Dioscorides used the word *Agallochon* in the first century in Asia Minor.

The Chinese who in the first century had ventured into Annam found gaharu in Malaysia and called it *Ch'en hsiang* or the incense that sinks in water. This could probably have been the first testing of agarwood for authenticity purposes. The first account of the trade in the species was compiled in the year 1200 by a Chinese custom official of the province of Kwangtung called Chan Ju-Kua. He documented that China got its supply of aloes wood from the Malay Peninsula, Palembang in Sumatra, Borneo, Java, Cambodia, Annam and Hainan. He wrote that the best wood came from Cambodia and the next best from Annam. Malacca is also named as a trade centre in *Ying-yai Sheng lan* in 1416. In 1564 Garcia da Orta wrote in *Colloquies* that the Chinese got aloes wood from Malacca and Sumatra and an inferior substitute from Ceylon that did not survive for long in the trade. The Portuguese, soon, took over the trade from the Chinese obtaining at least one cargo annually which they sent to Cochin-China and India (Malabar and Goa). Linschoten who was in Goa from 1583-89 mentions that precious rosaries, crucifixes and chaplets were made from it. It was traded from Malabar and Goa to Arabia and Persia, which are the first mentions of the middle-east connection of this trade. The Sanskrit *agaru* was distorted by the Portugese to *pao d' aguila*. The French further transformed it to *bois d' aigle* and the British to Eaglewood.

Although small trial shipments were made during this period from Calicut (Kerala) and Surat (Gujarat) to Europe and also from Siam

(Thailand) to France, there was no significant demand of agarwood in Europe. The trade in agar therefore remained to a large extent an eastern trade and currently can be geographically divided into trade in the Indian sub-continent, the middle-east and in south-east Asia.

Factors of Determination

Agar is graded according to the proportion and concentration of resinous deposits appearing in the black and brown patches of its wood. Good quality agar, when it reaches the market in the form of chips and splinters, as also blocks weighing up to half a kilo, is always black or brown, with a solution of catechu or other substances. Inferior quality agar, or even dhum, is often coloured to enhance its value. In India, agarwood is graded under the following classification:

- Grade I : Black agar
- Grade II : Bantang
- Grade III : Phutas, Kalaguchi
- Grade IV : Dhum

Grades I and II, which are exported as chips, fetch higher prices than Grades III and IV which are used for the extraction of agar oil.

Another Indian gradation is the historical one that distinguishes four kinds of agar: *Krishnagaru*, *Kasthagaru*, *Dehagaru*, and *Mangalyagaru*. *Krishnagaru* (called *Gharki* in Bangladesh) is considered the best, sinks in water, adheres to the teeth while crushing, tastes bitter, and smells brilliantly when burnt.

Historically, the Portuguese grade agar into two types *Kalambak* and *gaharu*. *Kalambak* (alternately called *calampat*, *calembuco*, *calambaa* and *calambaac*) was considered the superior of the two grades and it was suggested that it came from Cambodia. Bland (1886) lists the following grades of agarwood from Malacca.

- (i) *Chandan* (ii) *Tandok* (iii) *Menjulong-ulong* (iv) *Sikat* (v) *Sikat lampam*
- (vi) *bulu rusa* (vii) *kemandangan* (viii) *Wangkang*

The first three sink in water and the others float. *Chandan* is oily black

and glistens and *tandok* is similar. *Menjulong-ulong* is good in colour and the others are successively lighter.

Skeat (1900), adds five other grades namely (i) *garu isi yang tua* (ii) *garu tutor* (iii) *garu dedap* (iv) *garu kundur* and (v) *garu akar*. The last four are considered useless for the trade.

Although the names of the various grades varies from the middle-east to India to south-east Asia, there undoubtedly exists qualities of agar discernable to professional agar traders and extractors. It is also clear that these grades are based on the adequacy of infiltration of resin.

TRADE IN INDIA

Trade in agarwood and its products, including oil has for long been a monopoly of a few families in India. There is, however, a moderately large trade operating out of Assam where extraction, distillation and primary processing is carried out and in Bombay which is the export market for agar. In Jorhat and Sibsagar districts of Assam, for example, small-scale agar industries operate at a brisk pace, providing a livelihood for the local people, particularly the Muslim and Marwari communities. Several Assamese merchants regularly export consignments of the wood and valuable oil to the middle-east via Bombay, earning substantial foreign exchange.

Currently, the agar industry in India is the monopoly of a few inhabitants in and around Hojai and near Nilbagan in Naogaon district, where 200 agar oil factories operate. Margheritta, near Dibrugarh in Assam was a centre of agarwood trade prior to Hojai. The profits of this trade are concentrated in the hands of a restricted number of wealthy traders whose self-indulgent practices have endangered the valuable agarwood in its natural habitat. The local stock of raw material in Assam is now so negligible that the factories have to depend on supplies from neighbouring states and the Bhutan foothills and on imports, in the form of chips and dust, from abroad. The trade is also fed by illegal imports from Myanmar and Thailand.

Agar Mahal in Assam

In a bid to stabilise the agar industry, a cooperative society, called Naharani Agar Atar Cooperative Society, was formed at Naharani village, near the Golaghat sub-division of Jorhat in the early 70's. With a nominal share capital of Rs 500 from 50 shareholders in 1973, the society earned Rs 25,000 from the agar atar business during the reference period. The share capital rose, in the course of time, to Rs 4420, divided among 442 shareholders. Currently, three manufacturers are directly involved in the export of agar oil from Hojai. These are: Ms Frontier Trading Co., Ms Eastern Enterprises, and Ms. Oriental Enterprise. The main trade centre to which the exports are targetted is Dubai.

The industry's biggest handicap is the lack of raw material. The few plantations raised on private lands in Hojai, and those in Sibsagar district, are still very young. The recent ban on agar extraction in Bhutan has intensified the distress of the trade. Although smuggling from Myanmar is established as a source for the Indian industry, Thailand may be a possible country from which the wood is coming into India.

Agar Mahal in Mizoram

In 1984, Mizoram was demarcated into two circles, namely, Northern Circle and Southern Circle, for the purpose of agar collection. The Northern Circle comprised of the following forest divisions:

- (a) Aizwal East (b) Kolasib (c) Mamit (d) Kawrthah (e) Darlawn
- (f) Champhai (g) Thenzawl

The Southern Circle encompassed the following forest divisions:

- (a) Lunglei (b) North Valaiphai (c) Chhimtuipui (Lawngtlai)
- (d) Tlabung

The validity of the Mahal was fixed for three consecutive years. For the first three years, i.e. 1984-87, the forest revenue from agar from the

Mahal amounted to Rs 40,000 from the Northern Circle and Rs 10,000 from the Southern Circle. Due to unavoidable circumstances, no agar was extracted during the next three years, i.e. 1987-90. Then, when the extraction practice was revived in 1990, the revenue from agar for the three-year lease period ending 1993 totalled Rs 15,000 from the Northern Circle and Rs 35,000 from the Southern Circle. Prior to this system, there was sporadic extraction of agarwood in the state, and the recorded revenue from the Darlawn Forest Division was Rs 18,000 for 1981, Rs 11,000 for 1982, and Rs 11,000 for 1983.

The quantities of illegal agar seized have been officially documented as: 10 kg in 1984 and 20 kg in 1988 from Kolsib Forest Division, and 37 kg in 1984 from Darlawn Forest Division.

Distilling Facts on Agar Oil

Hojai, Nilbagan and Islamnagar in Naogaon district of Assam are the centres of distillation of agar oil. The towns were visited as part of a TRAFFIC-India investigation in April 1993. The air in all the three small towns throbs with sounds from approximately 200 distilleries in operation. The hub of attention is the *vakba* or the still in which the oil is distilled. It is interesting to note that these Assamese *vakbas*, essential for the distillation of agar oil, are manufactured many thousands of kilometres away in Delhi.

A major point of controversy during the survey was the amount of agar oil produced in the towns. Only an estimate could be made based on the various information collected and further surveys are required to establish the actual amount. One source placed the distillation capacity of each *vakba* at 4 tolas (46.48 grams) per month, which would restrict the total output to 800 tolas (9296 grams) per month. This was later contradicted by another source which claimed that Hojai alone could meet all the oil requirements of the middle-east market. The estimate of Hojai's monthly production capacity, namely, between 500 and 1000 tolas, differs from the findings stated elsewhere in the text. What is probably true is that the distillation of agar oil in Hojai registers between 500 and 1000 tolas per month, utilising a limited quantity of legally-acquired agarwood supplemented heavily by illegal extraction in India and Bhutan and agarwood smuggled from

Myanmar via the Indian state of Nagaland.

If the production of agar oil in and around Hojai is indeed 500 tolas (5.810 kg) per month (the lower figure), the annual production capability of the town would be around 69.72 kg per annum. Black agarwood is said to yield 0.09-2.5% of oil; but as this grade of wood is not used for distillation, the yield in Hojai would be below 0.09%. Were we to take 0.09% as the yield, the quantity of agar reaching Hojai would total to 77442 kilos annually. Further, if dhum, which has a lower yield, is being used, we tend to conclude that a sizeable quantity of the distillation-grade agarwood is reaching Hojai. This type of conjectural calculation, though not a satisfactory yardstick, establishes the substantial availability of agar at Hojai.

Although, during the survey, many new facts were gathered about the agar-oil trade, many more remain to be verified and authenticated. For instance, it is not clear whether the oil distilleries are licensed to operate by the state government or whether they at all need a licence. Some of the distillers interviewed admitted to operating illegally, but others claimed to have a licence. It was also not possible to establish the quantity of agar oil exported from India—a significant fact which needs to be clarified. TRAFFIC-India obtained samples of the two grades of agar oil sold in Hojai, though the basis of gradation could not be ascertained. In April 1993, Grade I was selling at Rs 1000 per tola, and Grade II at Rs 600 per tola. Interestingly, these prices were much lower than the retail prices quoted in the middle-east, if it is assumed that Hojai's Grade I corresponds to Dubai's grade priced at Dhs 600 per tola (Dhs 600 currently equals Rs 5400).

It is also worthwhile to note that top-grade agar chips could be priced higher than agar oil. This may be attributed to the demand for top quality incense among the wealthier families of the middle-east. The oil, unlike the incense, can be extracted even from Grade III and Grade IV (dhum) qualities. Like many other commodities, agarwood and agar oil are sold through brokers whose margin of profit is Rs 40-50 per tola of oil. A part of the well-known Ajmal family of Dubai is based in Assam thus securing for their kin, both ends of the agar trade.

Apart from Assam, other north-eastern states also play a crucial role in the trade. In Manipur, the town of Thambu Bazar is reported to be a centre of the timber trade between Myanmar and India. Apart from agarwood, teak and mahogany too are regularly smuggled through this town. Cash transactions in this region are negligible; commerce still relies largely on barter. For example, medicines such as Corex and Menstrogen are despatched to Myanmar alongwith salt, chillies and other condiments in return for timber and other forest produce.

One source, which conceded that illegal extraction of agarwood is a common malpractice in Manipur, disclosed that the consignments from Myanmar were much larger than from the other states in India. Another major centre of agarwood smuggling from Myanmar is Tuensang in Nagaland. Agarwood is brought in by traders from Myanmar and stocked with Naga middlemen-cum-translators. Assamese traders barter salt, dry chillies, medicines, and other goods for agar and other timbers.

Another interesting revelation was the practice of packing oil-cake (i.e. the waste material left over after distillation of agar oil) into tins and then smuggling these to Myanmar, the final destination being the middle-east. The route could be via Bangkok, but Singapore is a more likely entrepot.

The Agar Oil Process

The first task in the process of agar oil distillation entails classifying the agarwood on the basis of quality. The inferior chips and blocks are chopped out and discarded, leaving only the layers charged with oleoresin for skilful extraction, using a knife and a tool called a *batali*. Next, the chips and layers extracted are stored in a water drum and left to rot for 4-5 days. They are then lifted out of the drum and powdered with a large, indigenous grinding tool called *dhenki*, which is operated manually. The powdered agarwood is kept in a vessel called *deg* in a fixed proportion (8-12 kg of wood to 80 litres of water) such that continuous boiling, with the help of firewood, for three to four days is possible. A stainless steel pipeline is fitted to the upper portion of the *deg*, which then slopes through a water tank, finally

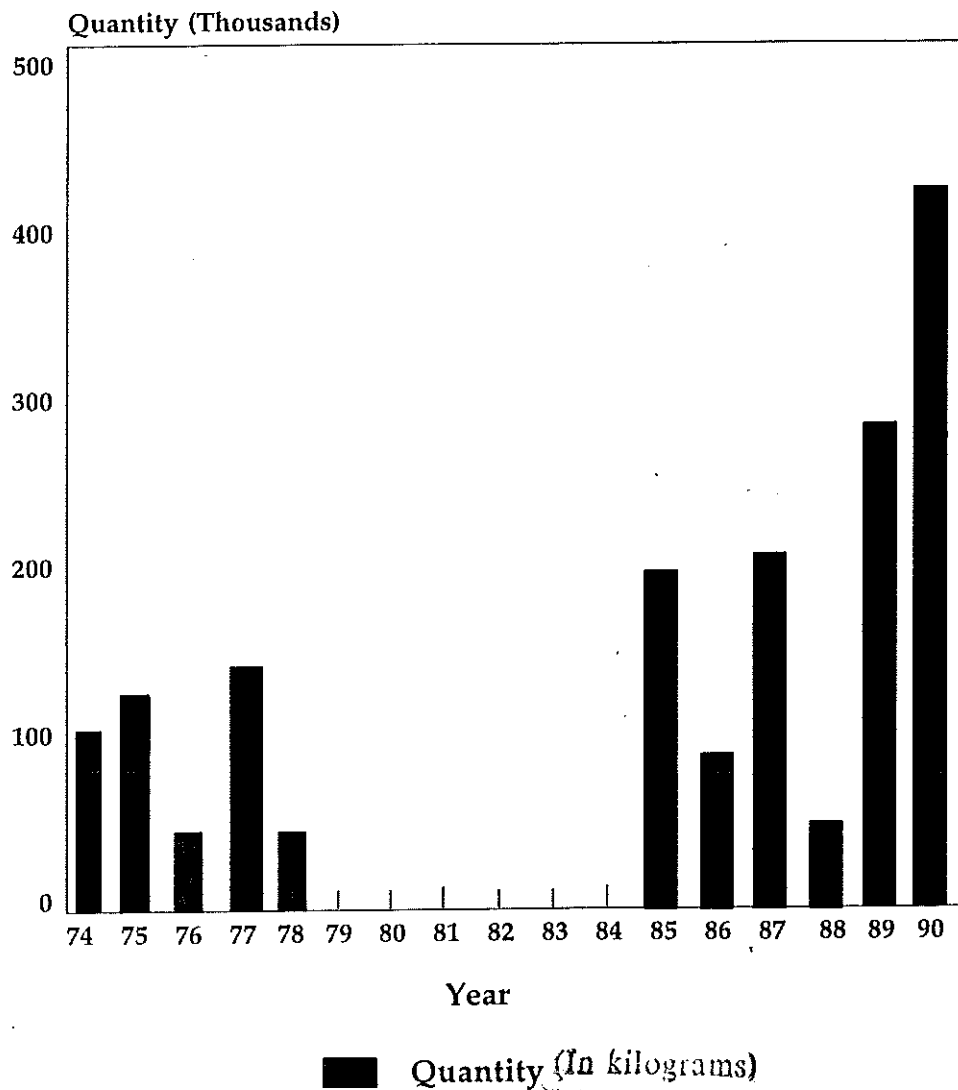
entering a container called *vakba*. When boiled, the rotten agarwood discharges oil, which passes along with water vapour, through the water tank where it condenses and falls into the *vakba*. The *vakba* is so designed that on one side of the outlet a pipe is fitted at its base to allow flow of the excess water through the open end. This excess water is withdrawn from time to time and returned to the *deg*, through a funnel fitted with a stopper valve at the top end of the *deg*, thereby maintaining the water level within. The entire distillation process takes three days.

At certain intervals, the *vakba* is detached from the pipeline, and the oil, floating above the water in the container, is skilfully extracted with the aid of a spoon-shaped tool, called *kafna*, or a syringe. The whole operation is conducted by one supervisor. The recovery of oil from black agarwood varies from 0.09-2.5%. The oil, thus extracted, is sucked into a bottle by a particular type of filter, made of cloth. It is finally dried in the sunshine to discharge all remnants of water and moisture to obtain unadulterated agar oil for marketing. A simple distillation method has been developed by the Regional Research Laboratory, Jorhat in Assam. Plant material is powdered in a way that avoids heat generation (as in grinding) and the wood is soaked in water for two to three days. The wood suspension is transferred to a stainless steel still which has a false bottom and a removable lid with a neck and a narrow tube which facilitates replenishment of water during distillation without removal of the lid. The oil-water ratio in the condenser is kept low on account of the high boiling point of the oil. The distillation process extends over 30-36 hours. The advantage of this improved method over the conventional method is that the vessel is safeguarded against corrosion, and the oil does not contain metallic impurities and is clear (Beniwal, 1987).

Export from India

The export figures from 1974-79 and 1985-91 are given in Appendix III. From the above data on export, it transpires that United Arab Emirates, Saudi Arabia, U.K., and Bahrain are the major importers of agarwood, including chips and dust. There is a general rising trend of export of agarwood, with recessions during 1986-87 and 1988-89 (see Fig. III.). The export price of agarwood per kilogram varies from Rs 14 to Rs 23 during the period 1985-86 to 1990-91, and the price rise seems to be uncorrelated over the period of time.

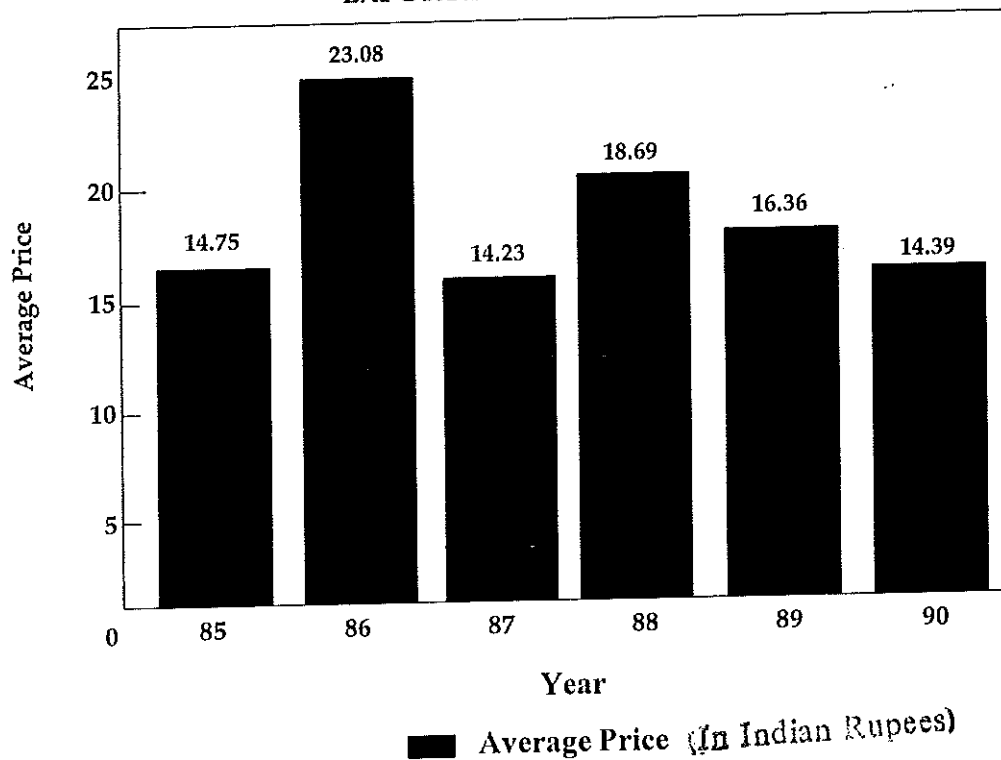
FIG. III: QUANTITY OF AGARWOOD EXPORTED FROM INDIA



Unprincipled Operations

How much agarwood still comes illegally from eastern India is anybody's guess, but a number of seizures over the past few years is concrete evidence of a profitable trade in this wild species. Some quantity of the banned timber has 'escaped' as a result of misdeclaration* and due to the negligence of the Indian customs officers in referring the questionable consignment to wildlife officials for inspection in the erroneous belief that only faunal products, and not wood, were required to be so referred. There are anecdotal accounts of agarwood being smuggled out via the Bombay airport in personal baggage, and this may well be true. Further, TRAFFIC-India has observed an indulgence in underinvoicing by Indian traders. The average export price from India, as shown in Customs statistics, has been of the following order (Fig. IV):

FIG. IV: AVERAGE PRICE OF AGARWOOD EXPORTED FROM INDIA



(Value as of March 1994: US \$1 = Rs 31.37 approx.)

*'Misdeclaration', in customs terminology, is a distorted description of export cargo which enables the exporter to pay lower export tax or circumvent an export ban.

During 1993, the lowest grade of agarwood was quoted in Vietnam at \$100 (around Rs 3000) per kg f.o.b. Saigon. Even accounting for grade variation, the difference is too large. The retail price of the lowest grade of agarwood in Dubai in 1993 was Dhs 100 (around Rs 900) per kg. Indian exporters probably declare the entire cargo at the lowest possible price, irrespective of grade, and this will require to be investigated by revenue authorities. Agarwood is on sale in the Colaba market of Bombay where the buyers are Arabs. One of the grades was reported to be priced at Rs. 40,000 (\$ 1250) per Kg. The Mohammad Ali Road of Bombay is the main centre of agarwood trade in the city.

THE MIDDLE EAST MARKETS

The wheels of the agarwood industry turning in Assam, India, generates a powerful export drive to the flourishing middle-east market, the chief entrepot being Dubai, the commercial capital of United Arab Emirates. Here, the import, processing, and distribution of agarwood are concentrated in the hands of a small coterie of traders, although a wide network of shops retail agar products.

Traditionally, agar is used for burning as an incense, and as a perfume derived from its oil. For use as an incense, small agar chips are burnt over live charcoals, and it is customary for Arab women to direct the smoke towards their body and hair. The Arab men also use agarwood smoke and oil, but enquiries into this practice elicited only smirks.

Agarwood smoke is somewhat earthy and its aroma is totally unlike a perfume to non-users; the oil is even more concentrated. Though the younger generation of Arabs in the middle-east, who are influenced by Western customs, are increasingly partial to Western perfumes, they do not altogether neglect to use agarwood and its oil. In fact, the product range has been widened over the last few years by the introduction of agarwood essence, soap, and shampoo. These are marketed at about ten times the price of common brands of toilet soaps

and shampoos. The residual oil-cake, left after the extraction of oil, is mixed with other aromatic substances and made into small cakes, which, when burnt over coals, also produces aromatic smoke.

The use of agarwood as incense is culture specific, restricted to a few Arabic countries of the middle-east: Saudi Arabia, United Arab Emirates, Oman, Kuwait, Bahrain, and Qatar, which have formed the Arab Gulf Cooperation Council (AGCC). The reason could be the historic trade relations the lower Arab Gulf has had with India, the cradle of agarwood. Interestingly, the use of agarwood does not feature in neighbouring Arab countries such as Syria and Jordan, and there is only minimal use in Yemen. Egyptians too seems to find no need for agarwood. Despite close proximity to the UAE, agarwood is not used in Iran.

In most towns of AGCC countries, agarwood is sold in retail shops which specialise in Asian perfumery called *atar* (Ottoman in English) whose scent is somewhat overpowering by Western standards. Some of the *atars* are named after the flowers and herbs whose essences form part of their composition: Zafran (saffron), Amber, Motia, Kauser, Shabab, and Rose are a few of this sweet-smelling range of perfumes. One of the popular *atars* in the Gulf shops is Musk, a low-priced perfume (made in Bombay) whose exotic smell may not be welcome to those accustomed to the more subtle scent of Western perfumes. The low price of the perfume precludes the use of real musk:

The shops that stock these perfumes in a colourful array of glass and aluminium bottles also stock agarwood chips, graded by quality and price, in a row of glass-fronted display bins. The chips vary from a streaky light brown to a polished dark brown or chocolate colour, the darker pieces commanding higher prices. As the dark colouring can be obtained by polishing the chips with oil, the uninitiated could easily be misled. Only the cognoscenti can discern the difference in quality, which is ascertained by placing a sample chip over live charcoals; this is done in an incense burner which is typically shaped. Some shops had as many as 12 grades of agarwood chips on display, prices beginning at Dirhams (DHS) 100 (US \$27) per kg for the lowest grade though agarwood sawdust could be obtained for Dhs 70 (US

\$19) per kg. One of the retail shops was selling agarwood at prices, which register an increase (per kg) as the quality of the grade improves (see Table IV).

Table IV: Grades of agarwood in Dubai

Grade	Price in Dirhams	Price in US Dollars
VIII	400	110
VII	600	164
VI	700	192
V	1500	411
IV	2000	548
III	2500	685
II	3500	959
I	4500	1233

Enquiries at other shops revealed a similar scale in prices, the intermediate grades accounting for the bulk of the sales. The more expensive grades, which are not for the average buyer, are not put on display. The most expensive grade was priced at Dhs 35,000 (US \$9589)* per kg. Stored away in plastic bags, this special grade was brought out to satisfy TRAFFIC-India's curiosity. Its visual appearance did not differ much from the Dhs 4500 (US \$1233) per kg grade, but the users obviously discern the difference. In other shops, grades priced at one-half or a quarter of this price were not on display, though they were available. A small chip (weighing 5.8 gm) of the most expensive grade was purchased for Dhs 203 (US \$55) as a sample for TRAFFIC-India's study back home, though all the top grades are said to be of Indian origin. Later, an Arab national revealed that even more expensive grades were in stock, some soaring to the astronomic rate of Dhs 100,000 (\$27,400) per kg.

TRAFFIC-India's investigations in the middle-east found the oil priced at Dhs 50 to 800 per tola, the one priced around Dhs 600 per tola being the most popular. (A sample of this grade was later carried back to India.) Superior grades were priced up to Dhs 3000 per tola, but the

*The UAE dirham (Dh, or at times ADh) is related to the US dollar at approximately Dhs 3.65 to \$1. This rate of exchange has remained unchanged for many years.

salesman admitted that beyond the standard grade, the law of diminishing returns prevails. Grading is apparently based on the retentive power of agar scent on the skin, the aroma of expensive grades lasting several days. Agar oil is as expensive as pure gold. It is, therefore, no coincidence that the measure used to weigh gold biscuits (of 99.99 purity) in Switzerland, namely, tola, is also used for agar oil. One tola equals 11.62 gm, and the price of Dhs 600 per tola is equal to US \$ 14 per gm.

During the survey, the import of agarwood to Dubai from India was proven beyond doubt. There were also reports of agarwood consignments coming to Dubai from Myanmar and Bangladesh. However, a knowledgeable Bangladeshi who lives in Dubai claimed that agarwood was not native to his country and, therefore, the consignments in question could only have been smuggled from north-east India. Exports were also reported from Bhutan (which is not a CITES party) where this tree grows close to the Indian border.

The Ajmals of Assam

Whereas the salesmen in retail shops readily provided information, limited to retail operations and buyer preferences, the large importers were reluctant to divulge details on the processing operations, which are obviously closely-held trade secrets. Several attempts to meet the Ajmal brothers—Fakhruddin Ajmal and Aniruddin Ajmal—whose family, hailing from Assam, has been in the agar trade for generations drew a blank. Finally, Mr Ansari, Export Manager of Ajmal International Trading Company, which is reputed to control close to 70% of the trade in agarwood and its derivatives, slotted time for a meeting with TRAFFIC-India, and most of the information that follows was communicated by him.

Mr Ansari traced the history of agarwood: mentioned in Ayurveda (ancient Indian medicine) and *Ain-i-Akbari* (memoirs of Emperor Akbar who ruled India in the sixteenth century), the use of agarwood in India dates back more than two thousand years. In Egypt, its use was prevalent from antiquity up to a century ago. In Vietnam and Thailand, where it is known as 'Aloes wood', it is classified as a

medicinal plant and the oil is used for medicinal purposes. In Singapore, Malaysia, and Indonesia, it is called *Gahar Oud*, the Arabic word *Oud* meaning "wood". The value of agarwood is determined by the quality and quantity of *Dahn* (the oil) it contains. (Thus, *Dahn Al Oud* means "oil of wood".)

On the subject of extraction from the wild, Mr Ansari agreed that only that part of the heartwood infested by a fungus commands a price. As not every tree gets infested, and, further, as the infestation is not visible from the outside, the expertise of detecting the productive trees, i.e. those endowed with the fungal infestation, is vested only in a few families. Those well-versed in this art can detect infested trees merely by touching them! The heartwood infestation of the trunk was rated superior to that of the branches.

The annual import of agarwood by the Ajmals alone was estimated to be between US \$10 million and US \$15 million. The bulk of this import was said to be from Vietnam, which has itself recently ventured into oil extraction. Other exporters of agarwood are Thailand (where lately a ban has been imposed on exports), Kampuchea, Malaysia, and Indonesia. Traditionally, these countries sent consignments of agarwood to Singapore though some individual traders venture to approach the exporting source directly. However, TRAFFIC-India's enquiries at Singapore could not locate a trade in agarwood. Perhaps it is a transit trade, and, in that case, it would be difficult to locate in official records.

Currently, the total imports of agarwood in the middle-east are a matter of conjecture—as this figure is available neither with the Ajmals nor in Dubai's customs import statistics (agarwood not being listed under a separate import head). However, working on the premise that the Ajmals control up to 70% of the agarwood trade, the total import would be in the range of US \$13 million to \$19.5 million. Assuming, further, the usual mark up of 100% on retail prices, the agarwood trade in the middle-east alone would equal US \$40 million, or more, annually.

The buying of agarwood is a specialized technique, one at which the

Ajmals are adept. Only a practised hand can sift the superior grades of chips from among a mixed stock of top and inferior grades, a skill that should be appreciated in the light of the steep differences in prices that mark the variety of grades. The Ajmals, therefore, do not entrust the buying of agarwood to employees, but prefer to take personal charge of this crucial task. Such business acumen has earned them rich dividends. In the span of a few years, the number of Ajmal subsidiary companies has multiplied many times over; they have shifted their corporate headquarters from the traditional *souqs* to a sophisticated, downtown commercial area; they own a factory in Sharjah, 20 km from Dubai, have R&D facilities and retail outlets in all the principal towns of UAE, and their stocks are sizeable enough to permit export to other Arab countries.

Mr Ansari was aware that, owing to depreatory practices, the agarwood species in north-east India is under threat. Though he conceded that the Indian variety commanded the highest prices, he took pains to emphasize that, owing to the current paucity of this coveted tree, the Ajmals had shifted their import operations elsewhere. However, TRAFFIC-India's purchase of the US \$9589 grade from one of the Ajmal retail shops is proof to the contrary.

As a corollary to the survey the retail shop owned by the Ajmals in Bombay was visited and three grades of agarwood documented. While the TRAFFIC-India investigator could see grades costing Rs 18,000 and Rs 40,000 per kilogramme, Arab customers were inspecting a grade reported to be worth Rs 1,50,000 per kilogram in the adjacent chair.

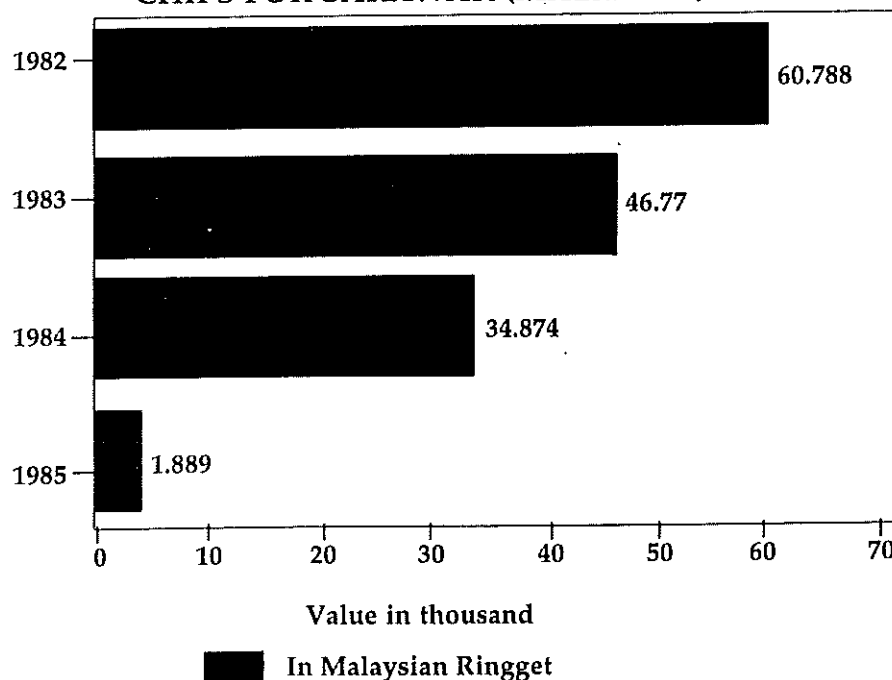
THE SOUTH-EAST ASIAN SCENARIO

There are reports of agarwood collection and trade from a number of south-east Asian countries including Malaysia, Indonesia, Lao PDR, Thailand, Kampuchea and Vietnam. The decline of supplies from India appears to have increased harvest pressures in south-east Asia. Although some of the countries allow limited harvest, several examples of illegal harvest and trade are reported.

In Lao PDR the wood has a value of 50,000 - 60,000 Baht (US & 2000 - 2,400) per kilogramme. There appears to be a substantial trade in this product from Sekong province of Lao PDR to Vietnam. In July 1993 about 30 Lao Theing tribe people were imprisoned at Dac Chung for trying to smuggle agarwood to Vietnam. Lao authorities are considering the smuggling of agar to be a serious conservation problem (Baird 1993). Known locally as *Mai baw heurang*, agarwood is common in Sekong and Attapeu provinces and the local Lao Theing villagers are encouraged by the Vietnamese to spot agar bearing trees. Over the last few years hundreds of Laotians and Vietnamese have been arrested for illegally harvesting and trading agarwood.

Substantial legal exports from Indonesia and Sarawak (Malaysia), in the 1980's is also documented. In December 1976, the best quality gharu could be sold for M \$ 80 per kati (626 gms) in the Baram. At the beginning of 1980, this same quality could be sold for between M \$ 200 and M \$ 250 per kati in the same place. It was in the 70's and the early 80's that a gharu boom took place in Malaysia with large number of people entering harvest and trade. The export of gharu chips from Sarawak during 1982 - 86 is shown in Figure V.

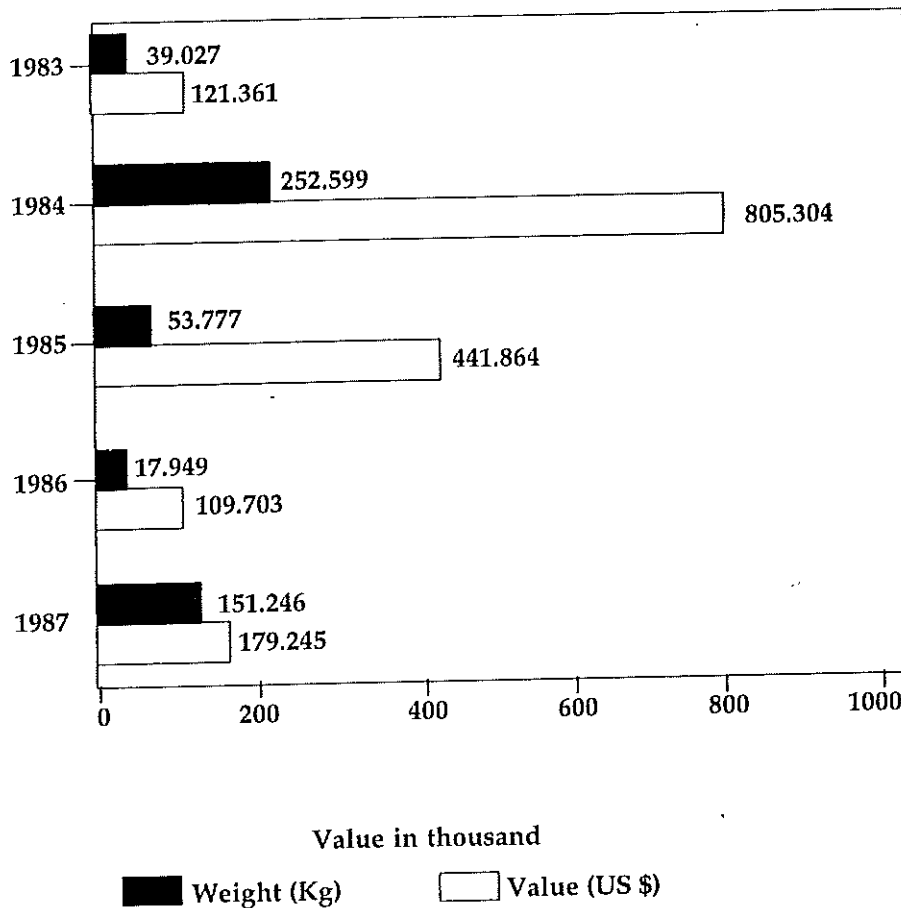
FIG. V: EXPORT OF GAHARU WOOD (AGARWOOD) CHIPS FOR SARAWAK (MALAYSIA)



(de Beer, J.H & Mcdermott, M.J, 1989)

De Beer and Mcdermott (1981) also provides figures for trade from Indonesia. The export of gharu wood during 1983-1987 is given in Figure VI.

**FIG. VI: EXPORT OF GHARU WOOD
(AGARWOOD) FOR INDONESIA**



(de Beer, J.H & Mcdermott, M.J, 1989)

As there is ample evidence from India of illegal imports from Myanmar as well, south-east Asia as a whole does seem to be a major agarwood extracting and trading block. Further studies are required to determine current harvest pressure and trade volumes in this region of the world.

CONCLUSIONS AND RECOMMENDATIONS

Agarwood (*Aquilaria malaccensis*) is under assault in the Indian wilds with unscrupulous traders exploiting the wood with catastrophic results in many states of the country. A flourishing trade, partly legal and partly illegal, exists however and has a definite impact on the status of the species. The following recommendations are intended to encourage a legal trade of the species while ensuring its continued survival in the wild state.

i) Since unscientific extraction and extensive exploitation of the species by unskilled labourers is largely responsible for the paucity of agarwood, the Government of India and entrepreneurs must decisively plan to restore the balance by intensive and scientific regeneration of agarwood trees in select areas. Such corrective action must be coupled with strict conservation measures to preserve the remaining stands of agarwood in its natural habitat.

ii) Further, inclusion of *Aquilaria malaccensis* under Schedule VI of the Wildlife (Protection) Act, 1972, and recommendation for its inclusion under Appendix II of CITES would give the species official protection and ensure a monitoring of the trade. Other range countries should consider suitable domestic legislation to regulate harvesting and trade.

iii) For earning considerable revenue from the export of agarwood derivatives, which have ready international markets, and keeping in mind that local industries would generate employment and boost the local economy, the formation of cooperative agar industries has a bright scope. But to become a reality, the government would need to invite important agarwood and agar oil traders to formulate a system of sustainable extraction and legal export in return for their cooperation in curbing the illegal trade. The future of agarwood depends on such a commitment from both the traders and the government.

iv) To supplement, the information base with respect to agarwood data must be collected on agar growth in private land and land under hill councils.

v) Currently, the Directorate of Commercial Intelligence records only the export of agar chips and dust and maintains no record of agar oil. This loophole must be plugged by ensuring updated, separate records of the export and the import of agarwood and all its derivatives. Further, a classification of agar chips and dust according to their value will help to control the indulgence in underinvoicing which is yet another blemish in the trade. Agarwood must not be treated as a timber but as a precious wood produce needing constant trade monitoring.

vi) The smuggling of agarwood from Myanmar, Thailand and Bhutan should be investigated and the borders made less porous.

vii) While encouraging legal and sustainable trade in agar products, suitable improvements to the industry is essential such as the possibilities of introduction of mechanical devices for grinding the wood and development of ancillary industries such as the *dhup* industry.

viii) Lastly, an ongoing research programme is essential to investigate scientifically the techniques for agar production in agarwood and trees and also as a R&D component for the industries.

It is only with such positive steps that the agar trade can hope to be a sustainable, legal and profitable one.

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AGARWOOD IN TRADITIONAL AYURVEDA MEDICINE SYSTEM

Medicinal names

Sanskrit	Lohah, Krmijah, Krimijagdhah, Anaryaka, Vishvadhupakam, Gandha-dhumajam, Sudhumyah.
Arabic	Kalambak, Ud-el-juj.
English	Aloewood tree, Eaglewood tree
Hindi	Agar
Malayalam	Akil
Kannada	Agaru, Agilu-gandha

Etymological explanation

Agaru	Aromatic wood
Lohah	Literal translation is iron. Its wood is alike Krishnavarnan (dark) and aromatic
Krimijagdhah or Krimijah	This is also called insectborn or Krimijah because it is produced by infestation believed to be caused by a special type of insect.

Parts used Stem, Heartwood and Oil

Medicines used in Agurva oil, Chyavanprash, Conchflower oil, Erimadadi oil, Lawangadi powder

Medicinal action Juice is bitter, acidic in taste, potency is warm, quality is light and dry.

Actions/utilities

In oil form and as an ingredient of medicines Respiratory problems (asthma), eye, ear and mouth diseases, rheumatic ailments, leprosy, aphrodisiac (old oil taken with betel leaf), beneficial for skin and skin diseases, purifies septic wounds.

In powder form Fever, dysentery, digestive disorders, hiccupping (taken with honey)

As an ointment Throat and skin diseases, pain killer.

Appendix-II

AGARWOOD IN TRADITIONAL TIBETAN DRUGS

S. No.	Name	Use and Action	Dosage
1.	A-GAR8(AH-Ghar) -EAGLEWOOD8	Cardiac disorders	2-3gms daily
2.	A-GAR 12 -EAGLEWOOD 12	Body pain	2-3 gms daily
3.	A-GAR 15 -EAGLEWOOD 15	Body pain cough	2-3 gms daily
4.	A-GAR 17 -EAGLEWOOD 17	Urinary and kidney diseases	2-3 gms daily
5.	A-GAR 19 -EAGLEWOOD 19	Body pain and fever	2-3 gms daily
6.	A-GAR 20 -EAGLEWOOD 20	Nervous disorders	2-3 gms daily
7.	A-GAR 31 -EAGLEWOOD 31	Body pain mental irritability Insomnia	Sprinkle 3-4 gms over coal fire and inhale thorough mouth and nose whenever needed.
8.	A-GAR 35 -EAGLEWOOD 35	Body pain Fever and Inflammation	2-3 gms daily
9.	BI-MA-LA (Bee-ma- la)-BHIM MITRA	Cardiac diseases	2-3 gms twice daily
10.	BRONG-TZE A-GAR 8 (Drong-tze ah-ghar) -MYROBALAN8 OF 'BRONG-TZE'	Mental disorders	2-3 gms daily
11.	DA-LI 16 (Dha-lee)- RHODODENDRON	Digestive diuretic	2-3 gms thrice daily
12.	DA-LI 18- RHODODENDRON 18	Vasodilator disorder of the nerves	2-3 gms thrice daily
13.	DZA-TI 20 (Zah-thee) -NUTMEG20	Promotes mental well being	2-3 gms twice daily
14.	GA-BUR 25 (Gha-bhoor)-CAMPHOR25	Fever	2-3 gms once daily
15.	GLANG-CHEN 18 (1) (Lhung-chen)- ELEPHANT 18 (1)	Liver disorders	2-3 gms daily

TRADE IN AGARWOOD

S. No.	Name	Use and Action	Dosage
16.	KO-BYI13 (Kho-jhee) -NUXVOMICA 2113	Analgesic	2-3 gms daily
17.	MAN-NGAGbSIL- sBYOR (Mhen-ngag seel-jhor)-COOLING FORMULATION OF SECRET ORAL TRADITION	Poisoning enlargement of liver and spleen	2-3 gms daily
18.	OL-SE 27 (Wall-say) -PODOPHYLLUM 27	Menstrual disorders	2-3 gms thrice daily
19.	sPANG-KHRAG RIL-BU (Phung-tragh rheel- bhoo)-BLOOD GENTIAN PILL	Antipyretic	2-3 gms thrice daily
20.	sPANG-rGYAN 15 -GENTIANA 15	Anti-inflammatory bronchodialator expectorant	2-3 gms thrice daily
21.	SEMS-KY bDE- sKYID (Sim-key dhee-key)- HAPPINESS OF MIND	Mental disorders	2-3 gms daily
22.	SHING-KUN 25 (Shing-Kuen)- DEVIL'S DUNG 25	Muscular, skin, nervous and circulatory disorders	2-3 gms daily
23.	SROG-'DZIN 11 (Sogh-zhin)- ELEVEN HOLDERS OF LIFE	Mental disorders	2-3 gms daily
24.	bSAM-'PHEL NOR-BU (Sahm-phei nor-bhoo)- MIND- INCREASING JEWEL	Nervous disorders	2-3 gms twice daily
25.	gSER-THANG 18 (Sayr-thung)- GOLDEN DECOCTION 18	Analgesic	3-5 gms decoct to 1/3rd water level, thrice daily

**EXPORT OF AGARWOOD FROM INDIA
(INCLUDING CHIPS & DUST)**

April 1974 to March 1975

Country of destination	Quantity (kg)	Value (Rs)
Saudi Arabia	700	2030
Kenya	1110	3535
Bahrain	8160	17,050
UK	60	105
Qatar	25,287	65,175
Dubai	15,062	36,751
Others	60,503	160,658
Total	110,882	285,304

April 1975 to March 1976

Country of destination	Quantity (kg)	Value (Rs)
Saudi Arabia	8312	40,660
Kenya	3626	21,556
Bahrain	22,449	86,230
UK	25,401	385,108
Qatar	2190	8760
Kuwait	9915	34,830
Dubai	40,994	190,801
Others	14,599	77,620
Total	127,436	845,565

April 1976 to March 1977

Country of destination	Quantity (kg)	Value(Rs)
Saudi Arabia	14,350	73,075
Kenya	600	3600
Qatar	2425	9713
Kuwait	250	2080
Oman	8516	39,600
Dubai	26,375	130,427
Others	5358	40,533
Total	57,874	299,028

April 1977 to March 1978

Country of destination	Quantity (kg)	Value (Rs)
Saudi Arabia	2800	13,100
Kenya	5395	31,680
Bahrain	2500	13,050
UK	9840	34,365
Qatar	7035	38,975
Kuwait	5550	23,875
Oman	16,216	74,828
UAE	24,000	121,000
Others	75,410	482,939
Total	148,746	833,812

April 1978 to March 1979

Country of destination	Quantity (kg)	Value (Rs)
Saudi Arabia	8000	35,961
Kenya	3260	20,731
Bahrain	4250	17,700
UK	1072	9800
Qatar	600	2925
Kuwait	308	1110
Oman	12,450	121,311
UAE	28,558	142,007
Others	6399	39,555
Total	62,897	391,100

April 1985 to March 1986

Country of destination	Quantity(kg)	Value (Rs)
Bahrain	7000	1,03,572
Belgium	938	25,878
Ethiopia	250	4000
German F. Republic	32,506	5,37,501
Netherlands	24,998	4,99,299
Oman	1850	47,975
Saudi Arabia	48,465	7590
Singapore	8000	36,476
UAE	58,360	6,40,523
USA	4500	1,50,143
Yemen Arab Rep.	12,000	1,25,812
Total	1,98,867	29,30,185
	(Average Rs 14.75 per kg)	

April 1986 to March 1987

Country of destination	Quantity(kg)	Value (Rs)
Bahrain	17,953	2,27,414
Fiji	36	675
Djibouti	500	7650
Japan	2080	49,369
Kuwait	1000	25,000
Mauritius	153	4700
Oman	10,470	1,63,910
Saudi Arabia	4236	8,07,016
Singapore	2000	83,000
Somalia	1000	31,000
Tanzania	700	7550
UAE	52,503	7,30,826
Total	92,631	21,38,110
		(Rs 23.08 per kg)

April 1987 to March 1988

Country of destination	Quantity(kg)	Value (Rs)
Bahrain	6051	86,006
Japan	245	1565
Kuwait	1000	14,600
Oman	1000	17,200
Saudi Arabia	29,270	4,72,450
UAE	1,64,333	22,90,624
USA	3500	43,000
Yemen P.D.R.	700	7,646
Total	2,06,099	29,33,091
		(Rs 14.23 per kg)

April 1988 to March 1989

Country of destination	Quantity(kg)	Value (Rs)
Bahrain	19,114	2,80,756
Chad	100	6952
Djibouti	300	9683
Kenya	1000	15,000
Kuwait	1180	91,525
Nepal	1105	25,437
Oman	2020	29,350
Qatar	80	1300
Saudi Arabia	20760	3,99,084
Somalia	5000	88,917
Sri Lanka	1000	17,576
Total	51659	9,65,580

(Rs 18.69 per kg)

April 1989 to March 1990

Country of destination	Quantity(kg)	Value (Rs)
Australia	2083	98,853
Bahrain	4600	1,03,523
China Rep.	40000	1,99,516
France	9000	2,08,667
German Federal Rep.	2000	48,801
Italy	2000	17,963
Japan	43227	5,55,537
Kuwait	422	96,372
Oman	14500	1,92,000
Pakistan	4172	56,544
Qatar	2	4900
Saudi Arabia	18653	4,99,827
Singapore	275	16,035
Somalia	3000	44,484
Sweden	30	30
Tunisia	4500	1,50,099
UAE	98631	11,71,774
UK	11510	3,53,859
USA	20000	7,40,429
Yemen Arab Rep.	5000	80,775
Total	283605	46,39,988
		(Rs 16.36 per kg)

April 1990 to March 1991

Country of destination	Quantity(kg)	Value (Rs)
Australia	1000	35,616
Bahrain	4501	99,160
Chinese Taipei	86000	3,90,265
France	4500	1,14,039
German Federal Rep.	7505	1,74,956
Japan	42,878	10,01,539
Kuwait	1000	32,700
Oman	501	6000
Saudi Arabia	20,850	3,86,58
Singapore	26,351	5,81,994
UAE	97,687	10,00,000
UK	1,00,025	15,36,958
USA	12,500	3,86,951
Yemen Rep.	28,072	3,76,690
Total	4,32,370	62,23,447
		(Rs 14.39 per kg)

- Source: 1. 1974-79 from *Wealth of India, 1985*.
2. *Monthly statistics of the Foreign Trade of India*, Annual nos. for 1985-86, 1986-87, 1987-88, 1988-89, 1989-90, and 1990-91 vol. I, Export & Re-export. Published by the Directorate General of Commercial Intelligence and Statistics, Ministry of Commerce, Govt. of India.



The TRAFFIC Network is the world's largest wildlife trade monitoring programme with offices covering most parts of the world. TRAFFIC is a programme of WWF (World Wide Fund for Nature) and IUCN (The World Conservation Union) to monitor trade in wild plants and animals. It works in close co-operation with the Secretariat of the Convention on International Trade in Endangered Species (CITES).

TRAFFIC-International which co-ordinates the network is located at Cambridge, United Kingdom. TRAFFIC-India is a division of WWF-India and is based at the WWF-India Secretariat at New Delhi.

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