The ethnobotany of benzoin (*Styrax* spp.)[1]

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ABSTRACT

This article deals with the observations made in a field research in a Batak Toba, North Tapanuli, North Sumatra, concerning the traditional agricultural system and the ethnobotany of benzoin.

The society of North Tapanuli classify three kinds of benzoin tree according to the quality of the resin, i.e., *hamijon toba, hamijon durame* and *hamijon bulu. Hamijon toba* is identified as *Styrax parallelo neurum* Perk., which is cultivated at locations above 1000 m contour and produce the best quality resin. *Hamijon durame* which is cultivated at lower elevation site 500-1000 m., produces a lower quality material. It can be identified as *Styrax benzoin* Dryand. And for the *hamijon bulu* has not been exactly identified, but concerning the morphology and habitat of the tree and the characters of its resin seem to suggest that it may be a kind of natural hybrid of the two species referred to above. The resin can be obtained from the trees of 6-70 years of age. The quality of the resin is primarily determined by the species of benzoin tree. The older the trees, however, the lesser the amount of high grade resins. The commercial blend-benzoins are manufactured by blending different quality resins in various proportions. Even the dammar, a non benzoin material, is mixed to fairly high percentages.

Key words : Ethnobotany of benzoin, traditional benzoin garden, benzoin species diversity, North Tapanuli, North Sumatra

INTRODUCTION

Of all the botanical wonders discovered in the New World by the first European explorers, few can compare with the benzoin plant for its fascinating history, its remarkable that benzoin is used all the world as incense, perfume and medicine. And the traditional benzoin garden continuing economic and ecological importance. For the native people in North Sumatra, Palembang and Java, benzoin not only furnishes an economic reason, but also serves as a universal and effectivehousehold remedy for wide range of medical

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problems. It has a few other uses such as flavoring agent in cigarettes and food, it is used in some varnishes, etc. The traditional use of benzoin also plays a crucial symbolic and religious role in Java society.

In Sumatra, benzoin trees (*Styrax spp.*) grow spontaneously all over the island in primary and secondary forests (Putz & Ng., 1978 : Van Steenis, 1949). In many parts of the island, local people tap benzoin trees to collect the resin for their own consumption : people use it as medicine and above all burn it as incense in rituals, especially duration rituals. The existence of origin myths of benzoin tree proves benzoin cultural importance and ancient use by Batak people (Katz, 2000). But only in the provinces of North Sumatra and South Sumatra (Palembang), the benzoin tree has been cultivated and the resin has been traded since at least the 9th century (Wheatly, 1959). We do not know when exactly and where it started to be cultivated in North Sumatra and in South Sumatra (Palembang).

This paper would present the ethnobotanical aspect and the evolution of benzoin garden management. We discuss about how were the benzoin garden established ?, what kind of type garden establishment ? Why the forest gardens took in the primary forest, took over the logging and took over the fallow gardens ? How did the local society evolve and manage this garden ?, how did it harvest (season, method, production, etc.), using (benzoin prospect as medicinal, aromatic and Cinnamic Acid as its isolation product, cosmetic and perfume, food additive, and varnish, etc.), and marketing (benzoin trade) by local people and industry ? We will try here to reconstitute the processes that led to this evolution.

SITE LOCATION

This study was conducted at Pusuk, Dolok Sanggul, Lembah Sarula, North Tapanuli, in the province of North Sumatra, where rapid economic growth has been accompanied by an increase in the rate and extend of forest cutting, the intensity of forest exploitation, and by other ecological as well as social changes.

The data were gathered during several periods of research in the research site (Figure 1), carried out between the year 1998-2000. The most detailed data were gathered during an extended stay with Batak Toba speaking tribe of North Sumatra.

METHODOLOGY

In this research, there are two approaches used i.e., :

1. **Ethnobotanical approach** : In this study, the approach used is as it is in the ethnoscience which the implementation is as follows :

Collecting ethnobotanical data of benzoin and traditional management system of benzoin garden was obtained by using direct participatory technique in daily life by direct interview to the people (key informants) including practice and perception. The interviews

were unstructured, open-ended discussion of the management system of benzoin garden, benzoin use, social-economic aspects and environmental local knowledge. Key informants were interview to get a general views concerning traditional knowledge of benzoin garden management, ethnobotany of benzoin, and local knowledge of environment. The key-informants were generally highly respected and of high status within local communities, as well as knowledgeable of custom or tradition of the Batak Toba people. The information obtained from the key informants was then confirmed by Batak Toba people and the location site where the research activities took place was identified. Based on the information obtained which combined with literature study, ethnobotany of benzoin, local knowledge of environment and benzoin garden management were described.

On the same opportunity, it was recorded all information of social aspect from the informants ; furthermore it was confirmed with the field condition. In this case, it was needed a direct participation in all daily life processes of Batak Toba community. In the field, we would work with the experts (key people) who had a broad knowledge on the benzoin gardens and the planting technique of benzoin traditionally.

2. Ecological approach

The target of this analysis is to present the traditional farming system of the Batak Toba community, including the strategy in benzoin gardening and swidden agriculture performed by each family, and to find out the reasoning behind such activities.

To elucidate the matter, data collection was conducted from two sources. The first source was the people of the society themselves. The environmental knowledge was shown in their activities utilizing their environment as livelihood, such as benzoin gardening, swidden agriculture and the establishment of permanent rice fields. Data of second source were obtained from scientific and objective measurements (anthropology, ecology and agronomy). The data from the two sources were used to analyze and subsequently to explain society behavior, changes in environmental units, species richness, vegetation dynamics and their utilization.

RESULT AND DISCUSSION

A. Benzoin diversity :

North Sumatra has been well known as the major producing area for benzoin for quite a long time. The other producing area is South Sumatra. Actually, benzoin trees are also found in Java and Kalimantan, but production in the two islands is negligible. Benzoin produce of Sumatra has been well known all over the world and identified in the trade as "*Sumatra benzoin*" or "*gum benzoin*" since the 14th century. Benzoin is a kind of <<*balsamic resin*>> obtained from wounding of the trunk of *Styrax benzoin* Dryland. The practice of wounding is known in the local term as *manugi*. Other species that also produce benzoin are *Styrax parallelloneurum* Perkins, *Styrax tonkinensis* Pierre plus maybe also several other

species. *Styrax tonkinensis* Pierre is known in the trade as <<*Siam benzoin*>> (Trease, 1949 and Clause, 1961 *in* Widyastuti, 1995 and Siregar, 1995). *Styrax benzoin* Dryland generally grows in lowlands such as in Musi swamps, Palembang (North Sumatra), Dairi, Central Tapanuli and Sarula valley, Pahae area, Naipospos and Pakkat, North Tapanuli (North Sumatra) whereas *Styrax parallelloneurum* Perkins has a characteristic of taller and slender bole with branches at 60 degrees angle from the trunk. This species generally grow in higher altitudes (800 to 1500 in above sea level). However when growing in a swampy area, the trees will not produce resin. This species is widespread in Northern Tapanuli, which has rugged and hilly topography, and yields very good quality resin. This species dominates in Northern Tapanuli and is known as *Toba benzoin*.

Toba Batak society classifies three kinds of benzoin tree according to the quality of the resin, i, e., *hamijon toba, hamijon durame* and *hamijon bulu. Hamijon toba* is identified as *Styrax parallelloneurum* Perk., which is cultivated at locations above 1000 m contour and produces the best quality resin. *Hamijon durame*, which is cultivated at lower elevation site (ex. 500-1000 m), produces a lower quality material. It can be identified as *Styrax benzoin* Dryand. *Hamijon bulu* has not been exactly identified, but the morphology and habitat of natural hybrid of the two species referred to above. Table 1. Showed the characteristics of *hamijon toba, hamijon bulu* and *hamijon durame.*

Table 1. Comparison of *hamijon toba, hamijon bulu* and *hamijon durame*

Characters	Hamijon toba (*Styrax parallelloneurum*)	Hamijon bulu	Hamijon durame (*Styrax benzoin*)
Hair of leef	Thin, pressed stellate hair	Relatively thick, pressed and appressed stellate hair	Rather thick wolly, appressed stellate hair
Fruit	Ovate globose, 2.5 x 2 cm	Depressed globose, 2.5 x 3 cm	Depressed globose, 2 x 2.5 cm
Seed	Brimmed hilum, ovate globose, 18 x 15 mm hilum 3 – 7 mm	Edge of hilum is smooth, subglobose, ca. 17 x 22 mm hilum 6-10 mm	Edge of hilum is smooth, sub-globose, ca. 15 x 19 mm hilum 3 – 6 mm
Color of bark	Ashy dark-brown	Rebbish dark-brown	Wine-reddish brown
Gall	Spirally twisted sack-gall	-	Spatule sack-gall
Habitat	1,600 – 1,000 m alt.	Ca. 1,000 m alt.	1.000 – 500 m alt.
Characteristic of resin	Milk-white, lose mucosity	Lustrous white, lose mucosity	Limpid white but change to reddish dark-brown, coontinue mucosity
Chemical analysis of resin	Cinnamic acid : 30.58 % ; Benzoic acid : 11.48 %	Cinnamic acid : 5.92 % ; Benzoic acid : 30.29 %	Cinnamic acid : 0 % ; benzoic acid : 27.60 %

Source : Yoshida (1971)

The number of benzoin species in the world is about 214 species (Index Kuiensis), in South East Asia is 29 species (Backer, 1965 ; Craib, 1932-1939 ; Hooker, 1882) and in Sumatra is 7 species (Backer, 1965). The 7 species of benzoin in Sumatra are : *Styrax benzoin* Dryand., *S. benzoin* Dryand. *var. hiliferum* Steen, *S. oligathes* Steen., *S. paralleloneurum* Perk (= *S. sumatranus* J.J. Smith.), *S. paralleloneurum* Perk. *f. inutilis* STEEN., *S. ridleyanus* Perk., and *S. serrulatum* Roxb. *var. mollissimum* Steen. (= *S. subpaniculatum* Jungh. & De Vr.).

B. Traditional Benzoin Garden

Basically, benzoin trees are cultivated as a monoculture, but later on when the garden also contains other useful vegetation, they are also kept and utilized in the farmer's daily life. Therefore the garden slowly becomes a mixed garden with benzoin and many other forest plants. Various kinds of forest plants growing in benzoin gardens are for example, edible fruit trees such as *handis* (*Garcinia* sp.), *Ubar* (*Eugenia* sp.), *haraka* (*Castanea* sp.) and vegetables like *handis* (*Garcinia* sp.) leaves, *sisahor* (*Baccaurea bracteata*), *bulu* (*Bambusa* sp.) shoots, plus plants utilized as construction materials and fire wood, such as *mayang* (*Palaquium obovatum*), *dauri* (*Cratoxylon aborescens*), *bitangur* (*Calophyllum* sp.), *simartolu* (*Schima noronhae*), *tingkaran* (*Carallia lucida*), *haudolok* (*Eugenia* sp.), *sapinur* (*Dacrydium junghuhnii*), etc. Consequently, it is very rare to find a truly monoculture benzoin garden. The emergence of other species in between benzoin trees is due to the fact that the garden upkeep is still very simple. The farmers only clean their gardens at the time they start tapping (*manugi*) by cleaning shrubs around the benzoin trees to be explored.

Planting distance in the traditional benzoin gardens are irregular, the benzoin is planted in between large trees of the forest. Where the young benzoin plants grow taller, the other big trees are eliminated by peeling the bark on the circumference of the trunk. When the tree dries out, it is then cut down. The height of benzoin trees is between 10 to 20 m from ground level, with layered canopies. The trunk diameters of the trees are also highly variable. This fact actually indicates that the benzoin trees in one garden consist of several age groups. This condition exists as naturally growing trees are kept. Due to the lack of up keeps, benzoin seeds from large trees germinate into seedlings underneath these trees and grow into young benzoin plants. Sometimes these young plants are deliberately maintained as an effort to replant old trees. Occasionally the farmer replants these young trees in empty spaces between large trees. The Batak Toba society very seldom establishes nurseries for their garden replanting or new planting.

Benzoin seedlings are collected from underneath mother trees considered to produce good quality resin in the hope that these seedlings will inherit the good characteristics or their parent trees. These naturally growing young plants are then transplanted to a new benzoin garden. Although having large variation, generally the planting density ranges from 200 to 500 trees per hectares, depending on the soil condition.

Benzoin trees begin to be exploited 6 years after planting or having reached a trunk diameter (dbh) of 10 cm. Harvesting is generally done in two steps. The first tapping (first *manugi*) occurs in January - February and collection is done in May - June. The first harvest

is usually only 25 % of the total. The second tapping (second *manugi*) is done in March - May with harvest undertaken in September - December. The second harvest covers 75 % of the number of benzoin trees in the garden and called *panen raya* (major harvest). Trees that are ready to be tapped can be characterized by change in their leaves color which appear more greenish and which show indications to flower *malos*), followed by wilting of the flowers and formation of fruit: Flowering periods are generally just before the dry season until the dry season (May to September)

The tapping processes of benzoin resin (*manugi*) practiced by the people of Pusuk are as follows:

1. *Dirambas bonana*: clearing of weeds in the benzoin garden, particularly wild shrubs around the benzoin trees.
2. *Agat pasitahir*: using a kind of tool to clean the benzoin trunk that has been tapped before, this time the resin collected is of a lesser quality called <<*tahir*>>.
3. Bark scraping: virgin bark on the benzoin tree is cleaned with a tool called *guris*, made of iron with circular sharpened end. This tool is used to scrape the bark of the trees to be tapped (*manugi*), until a reddish skin appears. People believe that this practice is necessary to induce the trunk to produce more resin.
4. *Manugi*: after bark cleaning, tapping is carried out by drilling a hole or making a cut called <<*agat panuktuk*>>, measuring around 5 cm on each side of the tree. The depth of the cut is such that the wood is visible, but the bark is still kept attached. Each side of the tree has generally 5 cuts at a distance of 30 - 35 cm. Afterwards the wound on the bark is reclosed by hitting the spot with the handle of the <<*agat panuktuk*>> until it is bruised. Tapping is usually done in cascades (generally 3 trees) such that each tree has around 30 cuts. The tapping system on the upper part is similar to the one beneath.
5. Harvest: Resin will appear from the cuts and coagulates in cuts. After 3 to 4 months the benzoin resin (*sidukkapi*) dries out and is ready to be harvested when the cut appears swollen. Collection of the resin is done by spooning out the gum. The released gum is then cleaned from adhering bark fibers, then dried and ready for sale. A harvest is considered good if one tree yields around 300 to 400 grams, however older trees produce only around 200 grams as they are bigger trees, hence more difficult to tap.
6. Marketing: The benzoin crop is usually sold to a middleman or collector (*tauke*) who comes from Tarutung, the capital of North Tapanuli district. During the investigation period, the price of *sidukkapi* is around Rp. 15,000 – 30.000 per kilogram, whereas *tahir* resin costs between Rp. 5,000 to 7,000 per kilogram depending on the quality.

It is high time now to attempt recovery of benzoin gardens in Pusuk and its vicinity, as traditionally this has been the major crop in the traditional farming system of the local people. Other farming systems known are the cultivation of food crops and horticulture. Furthermore, benzoin resin is a potential export commodity of the area, which has a good prospect to be developed as the preferred farming system for the local farmers. Another positive factor is the condition of the society who has strong ties with this plant for generations. The traditional benzoin garden of the Pusuk people is relatively fine, but not yet maximized to perform better, there is a need for better planting system and more

integrated cultivation in order to improve production and marketing. The first step to realize this is to start with the provision of high yielding cultivars. This can be done through bud-grafting with high yielding and good quality plants such as *hamijon toba* (for upper parts) continued with rootstock that is fast growing and robust. Moreover, a good extension service should be provided in order to maintain highly productive benzoin gardens.

An interesting phenomenon to study further is the notion of farmers that they should not build a benzoin garden on the land that was formally used as upland crops garden. The belief that such practice will not produce a good benzoin garden. We believe that such a condition occurs due to the food crop farming system practiced by the local people, i.e. slash and burn or swidden agriculture resulting in diminished fertility of the soil. When this abandoned upland garden is then used to build a benzoin garden, the growth of benzoin trees will be hampered. Moreover, the abandoned land is usually dominated by *Imperata cylindrica*, which has an allopathic characteristic thus affecting the growth of benzoin plants. Another factor that affects the benzoin plant growth on abandoned upland rice field is the lack of shade trees. In order to enable benzoin gardening on abandoned upland rice fields, the following treatments are necessary:

(1). Planting of benzoin seedlings before the last paddy harvest to protect the seedling from harsh sunshine.
(2). Planting of fast growing shade trees (leguminous) in between young benzoin plants in the rice fields to provide shading after the paddy harvest.
(3). Planting of leguminous cover crops such as *Centrosema pubescens, Calopogonium muconoides* and others in the abandoned garden to suppress and prevent the emergence of "*lalang*" (*Imperata cylidrica*)

Through these efforts we can break the myth saying that abandoned dry land garden is not good for benzoin gardening. Through the above efforts we can utilize abandoned lands dominated by *Imperata cylindrica* to build benzoin gardens.

C. Benzoin quality

In marketing of benzoin, the factory divided benzoin quality in 6 grades, i.e. : (1) benzoin quality grade 1 is *special quality*, with their composition is benzoin special A, special B and special C = 3 : 5 : 12 ; (2) *benzoin matahari*, the composition are *mata kasar* and *mata halus* = 2 : 17 ; (3) *benzoin bintang tiga*, comparison of the composition are *mata kasar : mata halus : abu terbang : jurur : damar kasar : damar abu* = 2.5 : 9 : 6 : 6 : 2 : 4.5 ; (4) *benzoin bintang dua*, the composition are *mata kasar, mata halus, abu terbang, jurur, damar kasar*, and *damar abu*, with the comparison = 1 : 7 : 4 : 9 : 3 : 8 ; (5) *benzoin dewi sri*, this quality content *jarur* and *tahir* with the comparison of content are 1 : 1 ; and (6) *benzoin kulit.*

Table 2. Grade, the change of benzoin-name of each grade and these original plants

Grade	Village of Pusuk	Village of Lembah Sarula	Factory	S.P. or H .T.	H.B.	S.B. or H.D.
1st	Pertak Hamijon	Mata gadang (mata kasar)	Special A Special B Special C	*		
2nd	Sidukkapi	Sanpulang (kacang)	Mata kasar Mata halus	* *	* *	
3rd	Tahir Jurur	Jurur	Tahir Jurur	* *	* *	*
4th	Lecet	Lecet	Abu kasar Abu kasar	* *		
5th	-	Kulit	Kulit	*	*	*

Note : SP = *Styrax paralleloneurum* ; SB = *Styrax benzoin* ; HT = Hamijon toba ; HB = hamijon bulu ; HD = hamijon durame

Quality level known among traders in Tarutung are <<*mata, mata kucing, matahari* and *asalan*>>, whereas among exporters the known levels are: <<*tahir, jujur, mata kucing,* and *mata kasar*>>. In the world trade another grading is used namely <<*kemenyan putih, kemenyan sesetan* and *kemenyan hitam*>> (white benzoin, scraped benzoin, and black benzoin).

The other classifications of the benzoin quality that we have founded in the North Tapanuli are :

1. Quality 1 or quality special A or B, the composition of this benzoin quality are mata kasar (25%), mata halus (30 %), abu + jurur (30%) and damar (15%).
2. Quality 2 : The compositions are mata kasar (20%), mata campur atau mata hitam (40%), and abu (40%).
3. Quality 3 : mata petih (10%), mata petih halus (10%), mata hitam (30%), abu + damar (50%).
4. Quality 4 : mata besar (20%), mata nomor 2 (30%), mata abu (30%), jurur (15%), and damar (15%).
5. Quality 5 : benzoin (20%), benzoin abu (40%), gum damar (30%) and damar batu (10%).
6. Quality 6 : damar 85 % and mata (15%)
7. Quality 7 : benzoin (10%), gum damar (40%), damar batu (30%), and damar hitam (20%).
8. Quality 8 : all of the composition are damar, damar batu (30%), gum damar (30%), damar (40%)

D. Marketing system

Benzoin has been the local community primary source of cash or tradable commodity used to obtain their subsistent needs (clothing, tobacco, kerosene, etc.).

Benzoin is a major source of household income for most household in this area. Some of this benzoin is produced in gardens of a hectare or so, using traditional technology. The ordinary farmers produce benzoin with their families, their workers consists of the male family members.

Approximately 80 to 90 percent of the benzoin produced in North Sumatra is traded within Indonesia. The remaining 10 to 20 percent is exported (Table 3). Its main uses are in the manufacture of cigarettes called "*rokok klembak menyan*" in which the benzoin is mixed with the tobacco and in articles used in ritual ceremonies. Exported benzoin is used as a base for cosmetics and various medicines. However, the use of benzoin is decreasing because of the changing tastes of smokers in favor of cigarettes mixed with cloves. Also ceremonies in which benzoin is used are becoming less and less frequent.

Table 3. Benzoin trade in North Sumatra, Indonesia, the domestic and export market in 1989-1993.

Year	Production	Export Market		Domestic Market	
		Ton	%	Ton	%
1989	4,460	938	21.03	3,522	78,97
1990	4,618	803	17.38	3,815	82,61
1991	4,692	374	7.97	4,318	92,02
1992	4,762	639	13.40	4,128	86,59
1993	4,970	767	15.43	4,203	84,56

Source: North Sumatran Regional Office's Trade Department, 1995

The price of benzoin from 1989-1998, has increased by approximately 30-40 % each year and in 2000 has increased 90-100 % (see table 4). The price at the time of this survey (1998-2000) was Rp 15,000 per kg (1998) and Rp. 25,000-35,000 per kg (2000). These prices were extremely low and far from those obtained in the 1970's and 1980's when 1 kg of benzoin would be worth the equivalent of two sacks of rice (32 kg) and currently 1 kg of benzoin can only buy one sack of rice (16 kg).

Table 4. The average price of benzoin (kg) paid to farmers in North Sumatra, 1989-2000

Year	1989	1990	1991	1992	1993	1997	1998*	1999*	2000*
Price (Rp)	5500	5525	6800	7800	7650	10000-12000	15000	15000-20000	25000-30000

Source: North Sumatran Regional Office's Trade Department, 1995 and * Based on field survey (1998-2000)

The price average of incense gum of benzoin is determined by quality and species. Base on the quality, the price of incense gum range between Rp. 10,000-35,000 in 1998-2000. Whereas base on the species, the price range between Rp. 5,000 – 10,000. Grade quality and price rate for farmer level of benzoin in North Sumatra see Table 5 and 6 below.

Table 5. Grade quality and price rate for farmer level of benzoin in North Sumatra

No	Grade	Price (Rp)	Remarks
1	1st quality	25,000-35,000	Dried incense gum but un sortated is called « *getah mentah tua* »
	2nd quality	20,000-22,000	Dried incense gum but un sortated is called « *getah mentah tua* »
	3rd quality	10,000-15,000	Dried incense gum but un sortated is called « *getah mentah tua* »
Incense gum quality by species			
2	- species of benzoin Toba (*Styrax sumatrana*)	8,000-10,000	Incense gum after harvest or tapping is called « *getah mentah muda* »
	- species of benzoin durame (*Styrax benzoin*)	6,500-7,500	Incense gum after harvest or tapping is called « *getah mentah muda* »
	- species of benzoin bulu (*Styrax* sp.)	5,000-5,500	Incense gum after harvest or tapping is called « *getah mentah muda* »

Table 6. Grade quality and price rate of incense gum at village merchant level

No	Grade	Sub grade	Branch grade	Price average	Remark
1	1st quality, mata sam-sam	Kasar No 1		30,000-35,000	Granular > 3.75 cm dried gum with yellowish color
		Kasar No 2 Kacangan		25,000	Granular 2.25 – 3.75 cm dried gum with yellowish color
		Kasar No 3 mata jagung		20,000	Granular 1.2 – 2.24 cm dried gum with yellowish color
		Kasar No 4 bibit		15,000	Granular 0.5 – 1.24 cm dried gum with yellowish color
		Kasar No 5 abu	Drying dust	10,000	Granular 0.1 - 0.49 cm dried gum with yellowish color
			Flyng dust	7,000	dried gum with yellowish color
2	2nd quality, mata kucing	Mata kucing no 1 big granular		20,000-25,000	Granular > 2.25 cm, reddish gum, clotted gum
		Mata kucing no 2 medium granular		15,000	Granular 1.0-2.24 cm, reddish gum, clotted gum

		Mata kucing No 3 small granular		10,000-12,000	Granular < 1.0 cm, reddish gum, clotted gum
3	3rd quality, jurur	Jurur No 1		15,000	Clotted gum > 4 cm and mixed with barks, reddish-dark brown color
		Jurur No 2		12,000	Clotted gum 2.3-4 cm and mixed with barks, reddish-dark brown color
		Jurur No 3		10,000	Clotted gum 1.0-2.29 cm and mixed with barks, reddish-dark brown color
		Jurur No 4		7,000	Clotted gum < 1 cm and mixed with barks, reddish-dark brown color

The benzoin marketing chains involve a number of players. There are the farmer/producers at the lowest level, the middlemen, which include collectors at the village and district level as well as the larger traders, and exporters that deliver the product to the various markets and then there are the retailers and the consumers. There are four marketing patterns in benzoin marketing (Alwi *et al*., 1998) :

Pattern 1 : Farmer/Producer → Village collector → Local retailer → Consumer

Pattern 2 : Farmer/Producer → Village collector → District collector → Large trader/processor in North Sumatra → Large Trader/Processor in Java → Middleman → Retailer → Consumer

Pattern 3 : Farmer/Producer → Village collector → District collector→ Large Trader in North Sumatra → Cigarette manufacturer in Central Java → Middleman → Retailer → Consumer

Pattern 4 : Farmer/Producer → Village collector → District collector → Large Trader → Exporter.

The resume of the marketing chain of benzoin gum was presented in the figure 2.

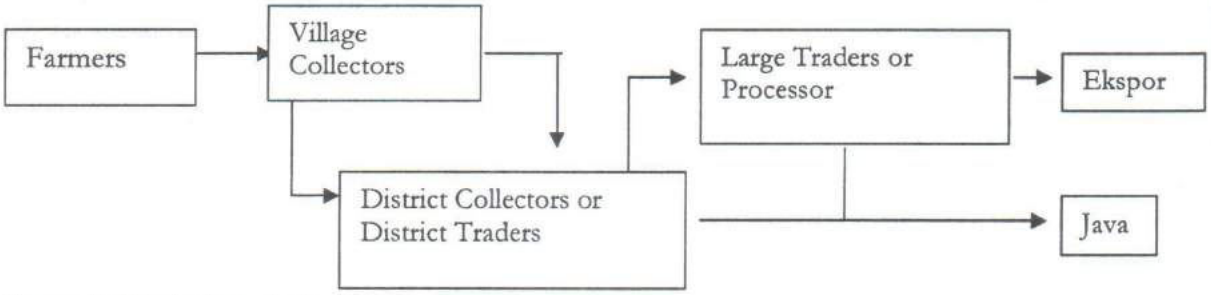

Figure 2. Marketing chain of benzoin gum

In looking at the characteristics of the benzoin market and analyzing the relationships between the low-level farmers, collectors, the big traders and exporters, it becomes apparent that the structure of the market is a type of oligopsony (See Table 7). This oligopsony tends to cause losses for producers because of the farmer's weak bargaining position and results in inefficiencies and market distortions (Alwi *et al.*, 1998).

Table 7. The Characteristics of benzoin market

Determination	Market Characteristics
Sellers	Many
Buyers	Several
Freedom to enter and exit to the market a. Big trader/exporter b. Farmer	 Difficult Easy
Status of the product	Homogenous
Price determination	Determined by buyer
Sources of information	Limited to and concentrated among big traders

Source : Alwi *et al.* (1998)

E. Benzoin Utilization

In general the use of benzoin can be distinguished into:

(1). Traditional Usage

Generally the traditional usage of benzoin is linked with religious and traditional rituals. For example, on the island of Java, benzoin is burnt in traditional ceremonies (as incense). Another usage of benzoin is as an ingredient of a mixture (with tobacco and other ingredients) of a typical cigarette known in Java as *rokok klembak menyan.*

(2). Modern Usage

The modern use of benzoin is in chemicals. Chemists have analyzed the contents of benzoin as follows: Cinnamic acid, Benzoate acid, Styrol, Vanillin, Styracin, Coniferil cinamat, and Benzoe resin. Consequently Benzoin has multiple benefits, viz.:

a). In Pharmaceutical laboratories

Benzoin has been used as an antiseptic agent, an expectorant (to relieve breathing problems), cataract medicine and an intermediate component in the synthesis of streptomycin antibiotics.

b). Mixing ingredient in the preparation of perfumes

Benzoin has been used as *fix-active*, the agent that holds the scent to stay longer. It is also used as a *fix-agent*, which acts as a catalyst in blends of several kinds of perfumes to obtain a better aroma. Through etherification process, the Cinnamic acid can form methyl and ethyl ester.

c). As an ingredient in the preparation of cosmetics

In the preparation of cosmetics, benzoin has for a long time been used in the form of Cinnamic acid. In France, benzoin has been in use in the manufacture of cosmetics for a long time, with a patented name known as "*lait virginal*" (*sustaining youth*). Actually benzoin functions as skin protection against sunburn and it has astringent properties to get rid of dirt imbedded in the skin. Benzoin component, which is very useful in cosmetics, is "*Isobutyl Salicylic Cinnamic*". which is a derivative of Cinnamic acid? This agent has been patented as "*sun screening agent*" with sunray resistance at 2800 - 3150 A° (Arythermal Range).

d). Preservative in food and beverages

According to FDA (Food and Drug Administration of America), the use of Cinnamic acid in the preservation of food and beverages is relatively small, namely 1.25 mg/kg/liter of food or beverage, compared to the use of Sodium Benzoate of 250 mg/kg/liter (Standard Industri Indonesia, SII).

e). Preparation of wood polish

Research outcome from the Balai Industri Kimia Medan (North Sumatra) indicates that the resinous residue from the isolation of Cinnamic acid from benzoin can be used as an ingredient in the preparation of good quality wood polish.

The chemical analysis of benzoins was presented in the Table 6 and 7.

Table 6. Chemical analysis of benzoins by Brans and van Hulssen

Product and origin	Insoluble component	Ash %	Moisture %	Cinnamic acid	Benzoic acid	Author B=Brans H=Hulssen
A.*Styrax benzoin*						
- Raw resin	7.23	0.29	1.42	-	42.87	B
- Almond	3.40	0.24	1.78	-	35.75	B
- Liquid type	2.40	0.22	1.82	-	34.75	B
- Brown resin	11.26	0.70	2.70	-	32.10	B
- Brown bark	42.85	1.40	3.50	-	33.38	B

- 1st quality at Singkel	26.60	1.00	4.30	-	32.52	B
- 1st quality at Barus	58.80	2.53	8.42	-	17.48	B
- Parung	1.19	0.09	3.32	-	27.94	H
- Longkap	2.78	0.17	3.49	-	26.95	H
- Djarir	23.78	0.75	6.77	-	24.39	H
B. *Styrax Paralleloneurum*						
- Big almond (mata kasar)	3.05	0.31	1.28	31.69	11.10	B
- Small almond (mata halus)	11.17	1.36	2.67	31.68	9.12	B
- Jarir	24.10	0.74	3.58	25.17	8.63	B
- Mata kasar	1.28	0.07	5.60	30.98	11.55	H
- Mata halus	2.59	0.03	5.04	28.68	12.69	H
- Jarir	3.70	0.05	3.90	25.42	13.40	H
C. Commercial Sample						
- First quality	24.75	2.60	3.72	14.03	15.46	B
- Good quality	34.95	1.80	5.50	16.00	19.17	B
- Export, best quality	17.58	0.82	5.98	16.70	16.63	H Damar (24.8%)
- Export, pure quality	23.95	0.99	5.84	14.10	16.40	H Damar (41.4%)
- For the east A	29.51	1.08	6.86	9.00	19.70	H Damar (24 .5%)
- For the east B	36.80	1.75	8.66	6.00	22.20	H Damar (11.1%)
- For the east, almond admixed with damar	27.51	1.17	6.84	0	13.28	H Damar (60 %)
D. Samples of USA						
- Sumatra benzoin	16.32	0.90	4.73	12.3	28.2	H Damar (26.7%)
- Siam-benzoin	1.57	0.06	4.94	0	41.3	H 0%
- Indochine benzoin	0.73	0.04	5 .56	1.2	43.6	H 0%

Source : Yoshida (1971).

Table 7. Chemical analysis of benzoin from Sumatra (based on weight of oven dry sample).

Variety	Insoluble matter in alcohol (%)	Ash content (%)	Moisture content (%)	Acid number	Saponification number	Ester number	Cinnamic acid content (%)	Benzoic acid content (%)
Kemenyan	1.28	0.07	5.60	96.2	184.1	87.9	30.58	11.48
toba								
Mata kasar	2.59	0.03	5.04	105.4	181.8	76.4	27.94	12.96
Mata halus	3.70	0.05	3.90	112.2	167.5	59.5	24.48	12.90
Kemenyan bulu	12.91	0.17	9.82	92.2	140.3	48.1	5.92	30.29
Kemenyan durame								
Parang	1.19	0.09	3.32	107.8	226.0	118.2	0	27.6
Longkap	2.78	0.17	3.49	105.7	237.9	132.2	0	26.2
Jarir	23.78	0.75	6.77	87.3	212.3	125.5	0	18.59
Samples collected by Lembaga Penelitian Hutan								
Sample 1	7.27	0.53	3.72	90.6	140.5	49.9	0	33.82
Sample 2	4.58	0.23	2.93	93.9	163.3	69.4	0	35.73
Sample 3	4.00	2.00	1.68	89.6	114.3	24.7	0	39.46
Sample 4	2.28	0.15	3.88	104.3	138.6	34.3	0	38.92
Sample 5	2.10	0.06	3.58	94.5	149.8	55.3	0	35.32

Source : *Lembaga Penelitian Hasil Hutan* (1970).

CONCLUSSION

In Sumatra we found 7 species of benzoin, these species are : *Styrax benzoin* Dryand., *S. benzoin* Dryand. *var. hiliferum* Steen, *S. oligathes* Steen., *S. paralleloneurum* Perk (= *S. sumatranus* J.J. Smith.), *S. paralleloneurum* Perk. *f. inutilis* STEEN., *S. ridleyanus* Perk., and *S. serrulatum* Roxb. *var. mollissimum* Steen. (= *S. subpaniculatum* Jungh. & De Vr.). The society of North Tapanuli classify three kinds of benzoin tree according to the quality of the resin, i.e., *hamijon toba, hamijon durame* and *hamijon bulu. Hamijon toba* is identified as *Styrax paralleloneurum* Perk., which is cultivated at locations above 1000 m countur and produce the best quality resin. *Hamijon durame* which is cultivated at lower elevation site 500-1000 m above sea level. Produces a lower quality material. It can be identified as *Styrax benzoin* Dryand. And for the *hamijon bulu* has not been exactly identified, but concerning the morphology and habitat of the tree and the characters of its resin seem to suggest that it may be a kind of natural hybrid of the two species referred to above. The resin can be obtained from the trees of 6-70 years of age. The quality of the resin is primarily determined by the species of benzoin tree. The older the trees, however, the lesser the amount of high grade resins. The commercial blend-benzoins are manufactured by blending different quality resins in various proportions. Even the damar, a non benzoin material, is mixed to fairly high percentages.

The benzoin *hamijon toba* (*Styrax paralleloneurum* Perk.) cultivated by the society of North Tapanuli is considered the most suitable for North Tapanuli, which has an undulating topography with good drainage properties. Moreover, this species produces the best quality benzoin known as *sidukkapi.*

The benzoin plantation of the North Tapanuli, North Sumatra people is relatively still traditional and has been practiced for several generations. At the time of the investigation, the benzoin areas were dominated by old gardens of more than 20 years of age. Attempts to replant the old trees are still minimal. This is evidenced by the fact that it is very hard to find young benzoin gardens of less than 20 years of age. To develop benzoin plantation in this area, there is a definite need for replanting.

Observation of sampled transects in benzoin gardens shows that there is a large variation in each garden with regard to age and diameter of trees, due to the irregular management and replanting of the garden.

The close link between the Batak Toba society and benzoin garden provides a good opportunity for further development of the benzoin to become a prime commodity, through the provision of high yielding plant materials, efficient garden management system and improved marketing system. The versatile usage of benzoin brings good prospect of benzoin gardening, because Benzoin is a high value crop.

Traditional benzoin plantation is basically an agricultural system characterized by long periods of cropping, using traditional technology. The opening of benzoin gardens is carried out in forests after the timbers are exploited or old secondary forest or after paddy field abandoned. The benzoin seedlings are planted among the remaining forest trees. Planting under the big trees is done in order that the big trees become the shade of the young seedlings. The system results in irregular planting distance and sometimes the seedling are inhibited in their growth, due to the density of the canopies of the forest trees. Therefore when the seedlings start to grow bigger, the surrounding benzoin trees must be reduced by peeling the barks, and when the trees are dead and dry, they are felled. In the next development all the forest trees are cleared (disappeared).

Concerning of the benzoin utilization, it is remarkable that benzoin is used the entire world as incense, perfume and medicine. The traditional benzoin garden is continuing economic and ecological importance. For the native people in North Sumatra, Palembang and Java, benzoin not only furnishes an economic raison, but also serves as a universal and effective household remedy for wide range of medical problems. It has a few other uses such as flavoring agent in cigarettes and food; it is used in some varnishes, etc. The traditional use of benzoin also plays a crucial symbolic and religious role in Java society.

There price average of incense gum of benzoin is determined by quality and species. There are three important notes influence on the price of incense gum of benzoin thet should be take into account i.e. management of plantation (improve of the traditional agricultural system of benzoin), marketing of product and commercial system. In order to solve these problems we need to improve the traditional benzoin garden through breeding works specially using good quality of seedling and intensification practice (silviculture), and in the central production (village level) should be established to handle marketing system

and the local government should take part in determination of quality of incense gum of benzoin based on chemical properties.

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