INDIGENOUS PRACTICE OF KHEJUR PALM (*PHOENIX SYLVESTRIS*) HUSBANDRY IN RURAL BANGLADESH

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KAMALUDDIN, M., NATH, T.K. & JASHIMUDDIN, M. 1998. Indigenous practice of khejur palm (*Phoenix sylvestris*) husbandry in rural Bangladesh. Distribution of khejur palms in the rural landscape of Bangladesh, their age-gradations, tree tenure pattern, borrowing practice of palms for tapping, juice yield according to age and site, marketing pattern and income were investigated by a rapid appraisal method. Data were collected from a village of Chittagong district by categorising farmers into two groups, owner and tapper, and interviewing 50 households, 25 from each group. The study revealed that most of the khejur palms growing in the study area were naturally regenerating and scattered over the landscape, ranging from homesteads to roadside, crop fields and canal banks. Palms of different age-classes were present. Income from sale of fresh juice and the products derived from juice were substantial for both owner and tapper households. Tapper households earned nearly the same as the owner households by borrowing trees for tapping. Marketing pattern, existing systems of tree tenure and the borrowing practice of trees for tapping seemed to be an effective mechanism for the fullest utilisation of khejur trees. Indigenous knowledge and experience of the farmers in managing and tapping the palms are discussed.

Key words: Tree tenure - agroforestry - palm tapping - marketing channels - household income

KAMALUDDIN, M., NATH, T.K. & JASHIMUDDIN, M. 1998. Amalan tradisi pertanian palma khejur (*Phoenix sylvestris*) di kawasan pedalaman Bangladesh. Taburan palma khejur di kawasan pedalaman Bangladesh, pemeringkatan umurnya, pola hak milik pokok, amalan meminjam pokok palma untuk torehan, hasil jus berdasarkan umur dan tapak, pola pemasaran dan pendapatan dikaji menggunakan kaedah penilaian cepat. Data diambil dari sebuah kampung di daerah Chittagong dengan mengkategorikan petani kepada dua kumpulan iaitu pemilik dan penoreh dan menemu ramah 50 isi rumah, iaitu 25 orang daripada setiap kumpulan. Kajian menunjukkan bahawa kebanyakan pokok palma khejur yang tumbuh di kawasan yang dikaji dipulihkan secara semula jadi dan tersebar di merata landskap, dari rumah ladang hinggalah ke tepi jalan, ladang tanaman dan tebing terusan. Pokok palma berbagai peringkat umur juga boleh didapati. Pendapatan daripada jualan jus segar dan produk daripada jus mencukupi bagi pemilik dan penoreh. Pendapatan isi rumah penoreh hampir sama dengan pendapatan isirumah pemilik yang meminjam pokok palma untuk ditoreh. Pola pemasaran, sistem hak milik pokok yang ada dan amalan meminjam pokok untuk ditoreh merupakan mekanisme yang berkesan bagi penggunaan sepenuhnya pokok khejur. Pengetahuan dan pengalaman petani tersebut dalam pengurusan dan penorehan pokok palma juga dibincangkan.

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Introduction

Khejur palm (*Phoenix sylvestris* Roxb.) is an important source of ungranulated sugar in India, Sri Lanka and Bangladesh. The tree is tapped for juice, which is used fresh or processed into different products for home consumption and/or sale. The palm is of considerable importance for household economy because of the extensive use of its juice in making sugar. Cultivation of khejur palm for tapping is an age-old practice. According to Sir George Watt, there were, in 1889, 68 122 ha of land under khejur palm cultivation for sugar supply, in Jessore and other districts of the then Bengal. Sir George Watt described the tapping technique of khejur palm in his report on Jessore in 1774 (Blatter 1978).

The palm is common throughout India, Sri Lanka and Bangladesh, wild or more often cultivated. The tree normally grows on farmland boundaries, homesteads and marginal land in rural districts. In certain areas, it is cultivated in orchards. The tree is raised by planting wildings and/or nursery-raised seedlings. Natural regeneration takes place freely by seeds. Birds act as dispersal agents and disperse seeds even up to 1 km away from the tree (Mishra & Singh 1989). Young plants are not attractive to animals and hence can perpetuate easily on sites that are open to browsing animals.

According to Rashid (1991), there were a total of 14.3 million khejur trees over an area of 10 810 ha in Bangladesh. Annual production of juice is estimated at 1 210 000 t, of which three-fourths are made into 90 750 t of ungranulated brown sugar, locally called *gur* (Rashid 1991). Fresh juice and the products processed from juice are nutritious and favoured by people of all ages.

Leaves are widely used for thatching and making mats, hand fans, house brooms and fence. The tree yields a light brown durable wood consisting of a hard and rough outer cylinder and soft inner portion. It is used for construction of bridges and piers and for tent pegs. Since the trunk is chipped for tapping every year, its value for structural uses is degraded.

There have been a few studies on different aspects of khejur palm husbandry. Artificial regeneration of the palm is reported by Nanayya (1974). Davis (1977) described tapping techniques along with a brief account of the morphology and distribution of the tree. Mishra and Singh (1989) studied the dispersal ecology of the khejur palm. A brief account of tapping techniques and processed products along with the localities of khejur cultivation in Bangladesh is given by Rashid (1991). In the present paper, however, indigenous knowledge, tree tenure and distribution of khejur trees in rural agroforests, age-gradations of the existing trees, borrowing practice, juice yield, marketing pattern of juice, and processed products are discussed based on data collected from a village of Chittagong, Bangladesh by means of a rapid appraisal method.

Materials and methods

The study was conducted at Sayedpur village (Figure 1) in Sitakundu sub-district of Chittagong district. Sitakundu is bounded by the Bay of Bengal on the west and

Hathazari-Fatikchari hill tract on the east. Data and information were gathered through both direct observation and interviews with households. There were 300 households in the study village. For the study, households were categorised into two groups, owner and tapper. Households of the owner group tap their own trees or lend their trees to tappers for tapping on a contractual basis. Households of the tapper group tap their own trees and trees borrowed from other households. Owners lend trees to tappers on a 50%-share basis; the owner receives juice of alternate tapping nights, leaving the rest for the tapper.

Fifty households, 25 from each group, were interviewed. A semi-structured questionnaire was used to gather field data on age and distribution of khejur trees, yield of juice, marketing of products and income from the palm products.

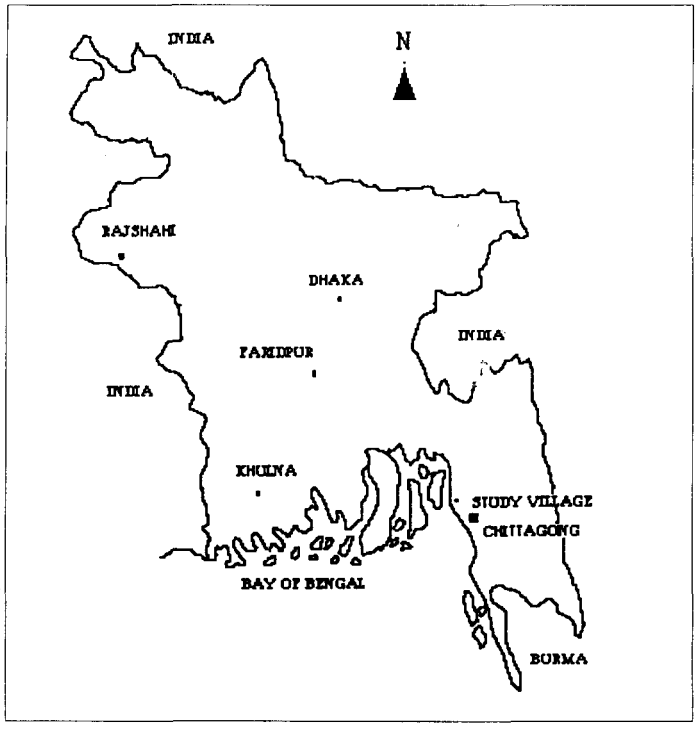

Figure 1. Map of Bangladesh showing location of the study village

Results and discussion

Distribution of khejur trees in the landscape

Khejur trees were found growing over the entire study area. The landscape is characterised by crop fields, homesteads and marginal lands along roads, canals and ponds. Crop fields are mostly utilised for growing rice. Pulses, grams, beans, peas and other vegetables are grown on crop fields, particularly as winter crops.

Natural regeneration of khejur palms occurs in crop fields (Figure 2), roadsides (Figure 3), homesteads, and canal and pond banks. Crop fields are traditionally divided into many small plots, a characteristic feature of all crop fields of Bangladesh. Plots are bordered by slightly raised embankments, locally called *ails*. *Ails* are usually 15-100 cm high and 15-45 cm broad. *Ails* act as limits between plots and contain rain water, much of which sinks into the ground and does not run off as surface flow. *Ails* are usually utilised for growing forage in the monsoonal months. The farmers of the study area cultivate beans on *ails* as a late rainy season crop; the practice is particularly popular in the study area and adjacent localities.

When distribution of the sampled trees in the study area was examined, 13% of the trees were found on *ails*, 37% in homesteads, 12% on pond-banks, 18% on roadsides and 20% on canal banks (Table 1). Owner households held a higher number of palms than tapper households.

Table 1. Distribution of sampled khejur palms at different sites in rural landscape

Household group	Site				
	Pond banks	Homesteads	Roadsides	*Ails*	Canal banks
Owner	22	82	30	22	44
Tapper	14	29	24	16	17
Total	36 (12%)	111 (37%)	54 (18%)	38 (13%)	61 (20%)

Figure 2. Rural scene showing natural regeneration of khejur palms in crop fields

Figure 3. Naturally regenerated khejur palms along rural roads

Tree and land tenure

There was no khejur orchard in the study area; most of the khejur trees developed naturally. Farmers raised a few khejur trees in their homesteads and on the banks of their ponds by planting wildings; other khejur trees in homesteads and on pond banks grew naturally. Farmers usually allow a naturally developed khejur tree to grow on their own lands, such as homesteads, pond banks and *ails*, or on government lands, such as canal banks and roadsides. Commonly, trees are owned by a farmer who owns the land. Generally, pond banks, homesteads and *ails* are owned by the villagers and the owners have the rights to both trees and land. As such, 62% of the khejur trees growing on homesteads, pond banks and *ails* were under the ownership of farmers. Farmers had the rights to the trees (38%) growing along roadsides and canal banks, though they did not have tenure on the lands since the lands were government properties. Access to trees growing on government land is regulated by customary law of the country. When a tree grows on government land, such as a roadside or canal bank, the owner of the parcel of land adjacent to the government land holds tenure of the tree. The same tenure rule is applicable for the use of other tree species growing on government lands in rural areas.

Tenure of trees on personal holdings such as homesteads, pond banks and *ails*, is alienated with the distribution of land property at the time of family separation or sale of the parcel of land. By custom, a tree growing on an *ail* is owned by the owner of that land parcel located on the upper terrain of the site. This rule also holds true for *ail* land which is particularly utilised for forage production during moist seasons.

Age-class frequency distribution of khejur trees

Presence of khejur trees of different age-gradations or age-classes is important for sustainable production. For instance, if the existing khejur trees in a particular area consist entirely of mature and over-mature trees, the trees will go out of production at one stage, and sustained annual production will not be possible because of the absence of trees of younger age-classes. Since individuals of younger age-classes replace over-mature trees over time, an appropriate proportion of individuals of younger age-classes is also required to make annual production sustainable.

Farmers in the study area had khejur trees of different age-classes (Table 2). When distribution of individuals of different age-classes was examined, the highest number of individuals was found for the 14-20 years age-class, 42% of the total individuals belonging to both owner and tapper groups. Frequency of over-mature trees was less than that of middle-aged trees, due to felling of over-mature trees. When trees become over-mature, usually at age of more than 21 years, farmers fell them for sale or use for domestic purposes.

Table 2. Age-class frequency distribution of sampled khejur palms growing in the study area

Household group	Age-class in years				
	0 - 6	7 - 13	14 - 20	21- 27	>28
Owner	26	58	82	28	6
Tapper	12	23	45	17	3
Total	38 (13%)	81 (27%)	127 (42%)	45 (15%)	9 (03%)

Since middle-aged trees (14-20 years old) produce more juice annually, annual yield in the future will depend on the number of middle-aged trees in the area. Frequency of individuals at the youngest age-class (0-6 years) was very low, only 13%, indicating fewer younger individuals in the study area. The findings suggest that there is a need to increase younger individuals in the study area to sustain the current rates of juice production.

Yield of juice

Tapping of the palm normally begins at age six or seven years. Trees are normally tapped every year. The palm yields for twenty-five years, though some have remained productive for fifty years (Rashid 1991). Tapping season usually starts by mid-October and ends by mid-February. Chipping (Figure 4) is usually done just before sunset at 2- or 3-night intervals. Juice is collected in a tapping jar, which is a special type of earthenware jar with a fat belly. Tapping jars are made locally by potters.

Figure 4. A tapper chipping a khejur palm. He has fastened himself to the trunk using a rope; a bamboo-made holder of chipping tools and a tapping jar are affixed at his waist.

According to the farmers, yield of juice varies considerably with tree age, site quality, growth condition, tree sex, resting time and tapping skill. Average rate of juice production for the study area was 2.4 kg per tree per tapping-night (Table 3). Average production of juice per season was about 145 kg per tree. Younger trees produced 1.1 to 2.2 kg of juice per tree per tapping-night, while the trees aged 21 years or more produced 2.3 to 2.9 kg per tree per tapping-night. Middle-aged trees (14-20 years old) produced the highest amount of juice, 3.7 kg per tree per tapping-night.

Table 3. Juice yield (kg) per tree per tapping-night of khejur palms of different age growing on different sites

Age class (years)	Site					Average
	Pond	Homesteads	Roadsides	*Ails*	Canal banks	
0 - 6	1.6	0.7	1.2	1.4	0.5	1.1
7 - 13	3.4	1.4	1.8	2.8	1.4	2.2
14 - 20	5.6	2.6	2.8	4.6	2.7	3.7
21 - 27	4.5	2.1	2.4	3.1	2.6	2.9
> 28	3.7	1.8	1.7	2.0	2.1	2.3
Average	3.8	1.7	2.0	2.8	1.9	2.4

Site condition also influenced juice production. The highest rate of juice production (3.8 kg per tree per tapping-night) was found in trees growing on the banks of ponds, and the lowest rate (1.7 kg per tree per tapping-night) for trees growing on homesteads. The second highest rate of juice production (2.8 kg per tree per tapping-night) was recorded for trees growing on *ails* and road sides, about 2 kg of juice per tree per tapping-night.

Trees growing on canal banks produced 1.9 kg of juice per tree per tapping-night. According to the farmers, juice of the trees growing on canal banks is very sweet and considered very suitable for making *gur*. Trees growing on sites in proximity to bodies of water produce more juice than those growing on relatively drier sites. Farmers believe that male trees produce more juice before appearance of inflorescence while female trees give more juice after formation of inflorescence. It is also believed that juice collected after a 3-night resting period is quantitatively more and sweeter than that collected after a 2-night resting period. Farmers attribute the difference to the chipping area (notch), locally called *khola*, which dries up within a 3-night resting period, accelerating juice flow and resulting in a higher yield per tapping-night. Farmers emphasise the importance of a tapper's tapping skill and sharpness of chipping tool, locally called *batali*, to yield adequate juice. According to farmers, an increase in juice yield by 0.25 - 0.50 kg per tree per tapping-night is possible by using proper tapping techniques and an appropriate chipping tool. In cool and clear weather (usually during December-January), juice flow is high, resulting in a higher yield per tapping-night.

In the study area, there were about 2400 tappable khejur trees yielding about 348 tonnes of fresh juice during a tapping season. Most of the juice is used for making *gur*; it takes 5-7 kg of juice to produce 1 kg of *gur*. Boiled juice is usually consumed with home-made cakes.

Marketing of products

Fresh juice and *gur* are the principal products for market. Fresh juice in earthen jars is collected from trees early in the morning (between 0500 - 0600 h), filtered and then transported for sale or production of *gur* in earthenware jars or metal containers. Tappers make *gur* at their houses; female members usually do the task of making *gur*.

Marketing of fresh juice normally follows a short-cut channel, while marketing of *gur* is characterised by several intermediaries operating between producers (owners/tappers) and consumers in distant areas or cities. Fresh juice is sold directly to consumers in villages or in local market places in the early hours, normally before 0900 h. Tappers sometimes buy additional fresh juice from owners for production of *gur* or selling directly in city markets. Price of fresh juice in villages or in local markets varies from Tk. 2.00 to Tk. 3.00 per kg, whereas in city markets it varies from Tk. 5.00 to Tk. 7.00 per kg. On an average, 500 to 600 kg of fresh juice are sold daily in the study area during a tapping season.

Tappers sell *gur* either to middlemen, locally called *beparies* or to consumers directly on market days (normally twice a week) in local markets or transport it to

cities to sell directly to consumers. In the study area, on an average, 200-300 kg of *gur* are sold in each market day during a tapping season.

Beparies supply *gur* to wholesalers, called *arathdars* in city markets. *Arathdars* sell *gur* to small resident traders and local itinerant traders, called *farias*, who sell it to consumers. Price of *gur* varies from Tk. 16.00 to Tk. 18.00 per kg.

Income from khejur palm products

In the study season, tapper households tapped 68% of the trees; the remainder (32% of the trees) were tapped by the owner households. The tapper group owned 65% of the trees it tapped; the remaining 35% were borrowed trees tapped on a 50%-share basis. Average incomes from sale of products for the tapping season were Tk. 2566 and Tk. 2653 per household belonging to the owner and tapper groups respectively (Table 4). Though the tapper group owned fewer tappable trees than the owner group, its average income was nearly the same as that of the owner group because of borrowed trees. On average, one tapper household earned Tk. 913 for a single tapping season by borrowing trees. This amount was an additional income for the tapper households. Tappers also earned Tk.10 per tree for pruning and raking (Y-shaped cut to expose sap wood) of khejur trees belonging to non-tapper households. A huge number of tapping jars are used annually for tapping; hence, the practice of tapping has a positive impact on the local pottery industry and trade.

Table 4. Number of trees per household, juice yield per tapping-season and income per tapping-season from sale of fresh juice and *gur*

Household group	Number of palms owned	Number of palms tapped	Yield of juice (kg)	Income per season (*Tk.)
Owner	8.0	3.8	855	2566
Tapper	4.0	8.2	884	2653

* 40 Taka = 1 US$.

Conclusion

Khejur palms are mostly distributed naturally throughout homesteads, crop fields, roadsides and canal banks in rural areas. Rural farmers utilise trees growing on their own lands and those growing on government lands. Secured tenure of trees growing on government lands is an incentive for rural farmers. Requirement of special skills for tapping has evolved an excellent mechanism of benefit sharing between owners and tapper households. The indigenous practices of harvesting, borrowing trees and marketing of products are conducive to the fullest utilisation of tappable trees. The natural distribution of khejur palms in the rural landscape suggests that the tree has a wide ecological amplitude for growing on a

variety of sites and that it has a capacity to grow in biotically disturbed sites such as roadsides or canal banks that are normally used for grazing. Regeneration of khejur trees either by direct seeding or planting wildings or nursery-raised seedlings is nearly absent in the study area. Data on age-class distribution indicate that natural regeneration is not enough to sustain the current rates of juice production. Supplementary planting seems to be important for sustainable production of juice. The difference in yield due to different sites has a practical implication as it offers an opportunity to choose suitable sites for artificial regeneration. The information presented including that related to tree and land tenure will be of considerable importance in promoting khejur palm-related activities in rural areas.

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