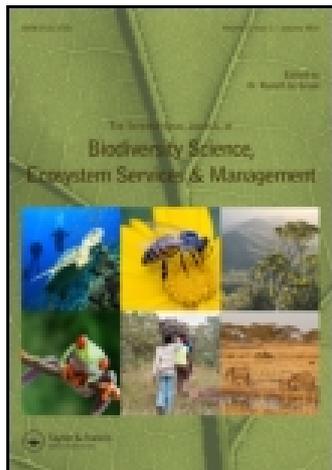


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Traditional practice of palm husbandry in the southeastern region of rural Bangladesh: status and potentials

Parvez Rana^a, Shawkat Sohel^a, Shariful Islam^b, Sayma Akhter^a, Mohammad Shaheed Chowdhury^c, Mohammed Alamgir^d and Masao Koike^{c*}

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An exploratory study was conducted in Feni, in southeast Bangladesh, to determine the status and potentials of palm husbandry in the rural economy. A total of 48 households in the study area were interviewed using a semi-structured questionnaire. The farmers were categorized into five groups based on their landholdings. Palms comprised the highest percentage (53%) of homegarden species. The most common palm was betel nut (*Areca catechu*). This species was distributed over five different geographical sites, of which roadsides were most common. Farmers with medium landholdings had the greatest number of palms. Farmers typically received considerably less compensation than distributors higher in the marketing chain who handled their product. Juice or sap from the wild date palm (*Phoenix sylvestris*) gave the highest net average profit per liter and annual income per tree. Landless farmers gain the highest proportion of their mean annual income from palm husbandry.

Keywords: palm husbandry; traditional management; rural livelihood; Bangladesh

Introduction

Palms are monocot perennials included in the Angiosperms and characterized by bearing a single leaf type and woody stems. The palm family (Arecaceae, Palmae), with some 2400 species, is distributed throughout the tropics and subtropics (Dransfield et al. 2008) and represents an integral and important part of tropical forests (Johnson 1995). Situated in the tropics, Bangladesh has a number of palm species distributed from the hills to the plains and even in mangrove forests (Blatter 1978; Hussain 2001). Palms are important horticultural crops in many countries (McCurrach 1960; Kamal 1969; Johnson 1996). In Bangladesh, at least 20 species of palm grow naturally (Pasha sine datum). The most common species are wild date palm (*Phoenix sylvestris*), palmyra palm (*Borassus flabellifer*), betel nut (*Areca catechu*) and coconut (*Cocos nucifera*), which are distributed throughout the country. In Bangladesh, few modern, research-based cultural practices for palms to produce higher yields are employed, although a significant economic return is possible from palm cultivation (Naik 1963; Dowson 1982). Coconut is the most economically important palm in Bangladesh (Pasha sine datum) and has the greatest number of uses (Dissanayake 1977; Rahman 2005). Palmyra palm, locally known as *tal daab*, also has multiple uses (Islam 2006). Betel nut is commonly produced along pond and canal banks, roadsides in village areas and around homes. It can be chewed alone, but the usual practice is to wrap small slices or pieces of the nut in a leaf of betel pepper, to which lime is added. It is used after meals and on special occasions (Islam sine datum). The wild date palm, known locally as

khejur, is produced as a homestead crop; however, it grows naturally or is cultivated in fallow lands, around homes, along farmland boundaries, and even in marginal lands along roads and canals (Anonyms 2000). In crop fields, the wild date palm is found on the *ails* (slightly raised embankments used as a border between crop fields) and also within fields along with other crops (Abedin and Quddus 1991). Sap from wild date palm has been used from time immemorial to produce traditional sweeteners, a mainstay of Bangalee cuisine (Ahmed et al. 2007). Because of the extensive use of its sap in making sugar, it is of considerable importance for the household economy in Bangladesh, where cultivation for tapping is an age-old practice (Kamaluddin et al. 1996).

About 85% of the people of Bangladesh live in villages and depend mainly on agriculture and tree-based products (Bhuiyan 1991). These products provide food, ornament and material for shelter, fibre and fuel in a harsh environment where relatively few other plants are able to grow (Zaid 1999). Dalibard (2007) identified various types of palm-crop association in Bangladesh, which provide strong evidence of multiple land uses to meet the growing needs of the Bangladesh people (Islam and Miah 2003). The IUCN's Palm Action Plan outlines guidelines for the conservation of palm biodiversity. Johnson (1995) emphasized the documentation of indigenous knowledge because private growers are a source of a vast amount of valuable technical information on the growth requirements and cultivation of palms. Measuring the biodiversity of a community or habitat is a central issue of ecology and conservation (Verghese and Menon 1997). To develop sustainable uses of biodiversity, it is critical to know the

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species present in the ecosystem (Verma et al. 1999). However, very little quantitative information is available on the composition, structure, distribution and traditional management practices for palms. Because rural household incomes depend mainly on agriculture, landholding determines the household economy. The rural poor households particularly depend on tree or other plant-based economic activities for their subsistence (GOB 1995) and, in south-east Bangladesh rural farmers depend on palm husbandry for their seasonal livelihoods. The present study was undertaken to explore the indigenous knowledge of farmers, highlighting their traditional management, utilization patterns and socioeconomic contributions to rural Bangladesh.

Study area

The study was conducted in Farhad Nagar Union (a rural administrative unit consisting of a number of villages) of Feni Sadar upazila (sub-district; administrative entity) of Feni district, southeast Bangladesh (Figure 1). Feni Sadar upazila occupies 197.33 km² and is bounded by Chaudhagram, Tripura (India), Parshuram and Chhagalnaiya upazilas in the north, Sonagazi and Mirsharai upazilas in the south, Chhagalnaiya upazila in the east, and Daganbhuiyan upazila in the west. Total cultivable land is 18122 ha; fallow land is 250 ha; single-crop systems occupy 6.9% of the land area, double crops 83.9% and treble crop 9.1%. The main fruits are date (*Phoenix sylvestris*), palmyra (*Borassus flabellifer*), coconut (*Cocos nucifera*), mango (*Mangifera indica*) and

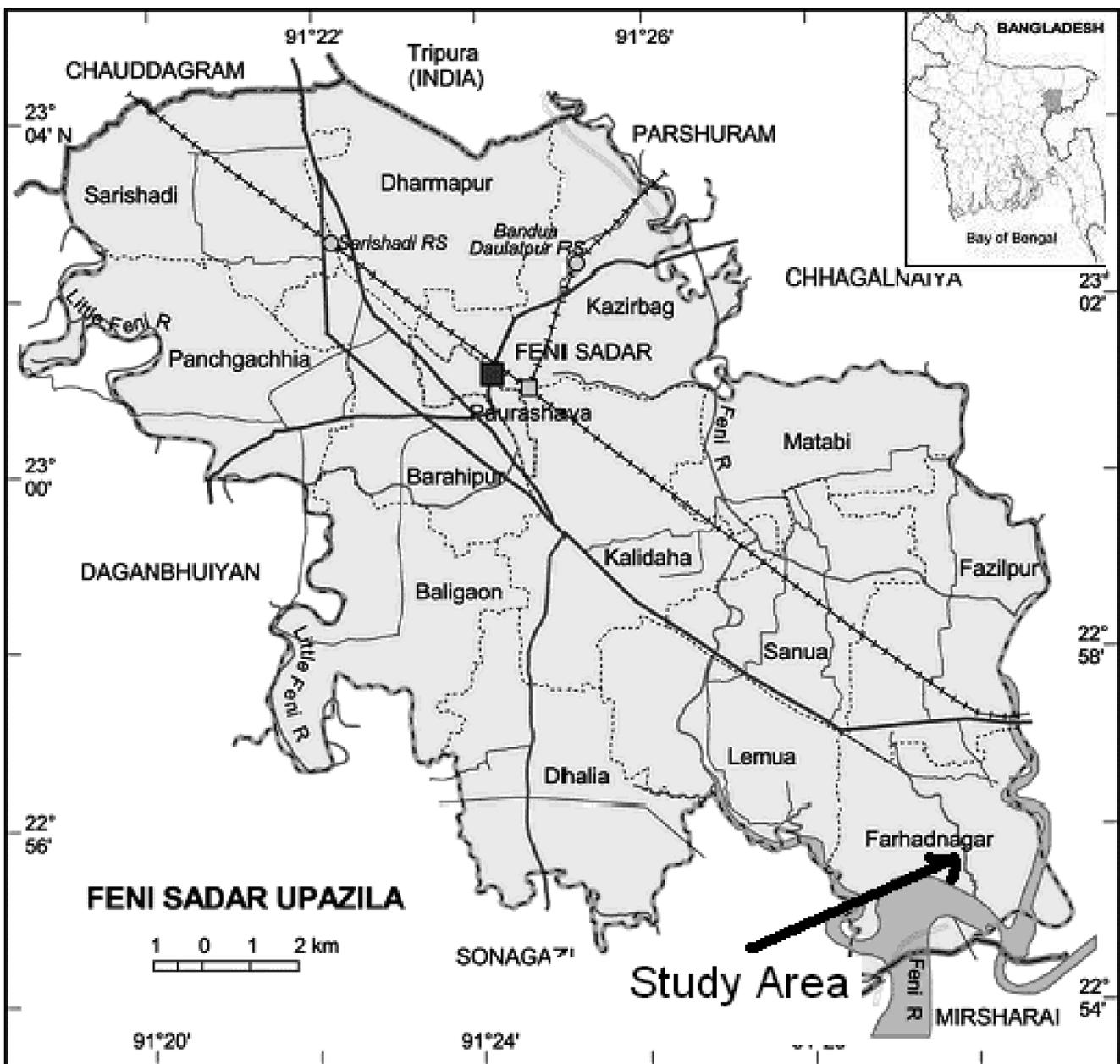


Figure 1. The study area in southeast Bangladesh.

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jackfruit (*Artocarpus heterophyllus*) (BBS 1997). Palms are one of the major plantation trees for fruits and sap in south-east Bangladesh (Pasha sine datum), particularly in Feni district. For this reason, the area receives substantial attention from local and regional buyers of palm products.

Methods

A deliberate sampling method was used to distinguish Feni district from the surrounding five districts in southeast Bangladesh. From a total of six upazilas, Feni Sadar upazila was selected because of the availability and accessibility of palms. A multistage random sampling method was applied to locate the villages and households for the study within the upazila as the primary and ultimate sampling units, respectively. From a total of 16 unions of Feni Sadar upazila, Farhad Nagar union was selected randomly and, from the union (a rural administrative unit consists of a number of villages), one village was selected using the same sampling technique. Then a list of palm tree cultivators was prepared from the village and 48 households (20% sampling frequency) were selected randomly for survey and interviewed using a semi-structured questionnaire. A preliminary socioeconomic survey was carried out to ascertain the important socioeconomic parameters of the study areas and to select the respondents for detailed study. A structured questionnaire pre-tested for intelligibility was used. After this preliminary survey, the socioeconomic parameters of potential value for the study were chosen and cross-checked. These included: landholdings, homegarden palm species diversity, distribution of palms, age class distribution, production system (planting material, traditional planting technique, cultural practices, harvesting age and harvesting techniques) and marketing systems for palm products. As palm husbandry is a function of landholding (including home and agricultural land), the farmers were categorized into five groups: landless, possessing less than 0.25 ha; marginal possessing, 0.26–0.50 ha; small, possessing 0.51–1.00 ha; medium, possessing 1.01–2.00 ha; and large, possessing more than 2.00 ha of land.

Results and discussion

Home garden palm diversity

In the study area, various species are traditionally planted around homes. Coconut, mango, palmyra palm, wild date palm, betel nut, koro (*Albizia procera*), papaya (*Carica papaya*), jackfruit, guava (*Psidium guajava*), sea apple (*Syzygium grande*) were the most frequently found species. Palm comprised the highest percentage (53%) of trees (Figure 2). The most frequently occurring palm was betel nut (48% of all palms) (Figure 3). Palms were popular because there was readily available propagative material (seeds) and they require little care. Farmers primarily cultivate palms for sale and personal consumption (Table 1).

Most of the palm trees were located along roadsides, ponds and canal banks, *ails* and/or generally scattered around the homegarden. Among the palms, coconut was

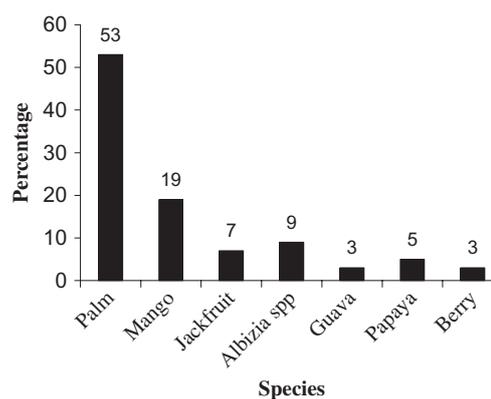


Figure 2. Home garden species diversity.

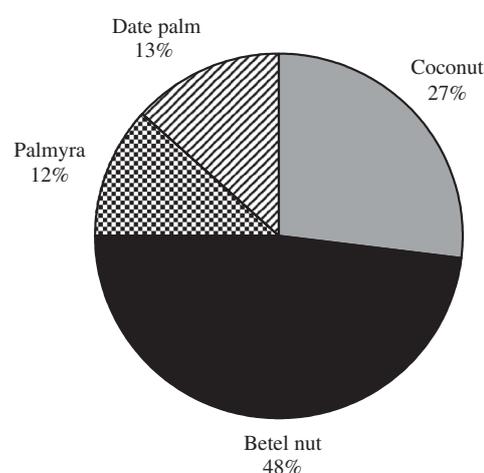


Figure 3. Status of palms in homegardens.

located along pond banks (27%) and scattered around homegarden sites (52%). Betel nut was located along pond banks, roadsides and around the home. Most of wild date palms were located along roadsides (29%) while some were grown in crop fields (28%), on *ails* and also within fields with other crops. Wild date palms also grow along pond banks (17%), canal banks (12%) and around the home (14%). Most of the palmyra palms were located along roadsides (47%). Among the total number of all palm trees (1237), the largest proportion (36%) was located on roadsides (Table 2). These results differ from those of Islam and Miah (2004) for Mirsharai, Chittagong in Bangladesh, where most palms were on canal banks. Halim et al. (2008) stated that the highest percentage of palms were in orchards. Palms along roadsides and on public land (i.e. canal banks) are under the legal jurisdiction of the District Commissioner (DC) and those who want to harvest these palms must receive permission from the DC to do so. However, these palms are usually not harvested or utilized because of the bureaucratic complexity of obtaining a permit.

Most palms (21%) were in the 21- to 25-year age class, with fewer in younger classes (Table 3). However, Islam and Miah (2004) found most palms (32.5%) were in the 7- to 14-year age class at Mirsharai upazila in Chittagong. Chowdhury et al. (2008) found similar results, with most

Table 1. Purpose of cultivating palms and consumption and utilization patterns.

Palm species	Purpose of raising palm	Consumption and utilization pattern
Coconut (<i>Cocos nucifera</i>)	Financial benefit Fuel	Two products for personal use; one for sale Beverage, copra, sugars
Betel nut (<i>Areca catechu</i>)	Financial benefit. Low maintenance cost	Farmers prefer to sell rather than harvest for personal consumption because of high local demand for betel nut The usual practice is to wrap small pieces of nut in a betel pepper leaf, to which lime is added
Wild date palm (<i>Phoenix sylvestris</i>)	Seedling availability from wild trees Sap collection	Beverage for personal consumption Tapping to produce sap that is modified into <i>Gur</i> (molasses) by boiling. A special variety is <i>Patali</i> , a hardened circular cake of molasses generally consumed with rice and milk
Palmyra palm (<i>Borassus flabellifer</i>)	Financial benefit Low maintenance cost Planting material is readily available from wild trees	Sweet sap (toddy) obtained by tapping the tip of the inflorescence is mainly sold In some cases, sap is distilled to produce alcohol called palm wine or <i>arrack</i> (any of various strong liquors distilled from the fermented sap of toddy palms or from fermented molasses)

Table 2. Habitat diversity of palm species.

Species	Site				
	Homegarden sites (%)	Pond bank (%)	Roadside (%)	Canal bank (%)	Ails (%)
Coconut	52	27	11	6	4
Betel nut	21	37	29	13	0
Wild date palm	14	17	29	12	28
Palmyra palm	9	33	47	5	6
Average (%)	20.2	27.6	36	8.6	7.6

Table 3. Age class distribution of palm species.

Species	Age class (Years)						
	≤5	6–10	11–15	16–20	21–25	26–30	>30
Coconut (%)	13	16	11	3	25	26	6
Betel nut (%)	24	12	10	25	19	2	8
Palmyra (%)	30	23	8	5	23	5	6
Wild date palm (%)	23	14	10	14	18	10	11
Average (%)	18	13	11	17	21	10	10

palms (30.5%) also in the same age class (21–25 year) at Jibannagar upazila of Chuadanga district.

Farmers with medium landholdings have the highest percentage of cultivated palms (35%) among the different groups, while those in the landless category possessed the lowest percentage of palms (6%) (Figure 4). Chowdhury et al. (2008) also found that farmers with medium landholdings possessed the highest percentage of palms.

Management patterns of palm species

Planting material and techniques for palm species

Most palms in home gardens and along roadsides were planted and cultivated, while the remainder grew naturally,

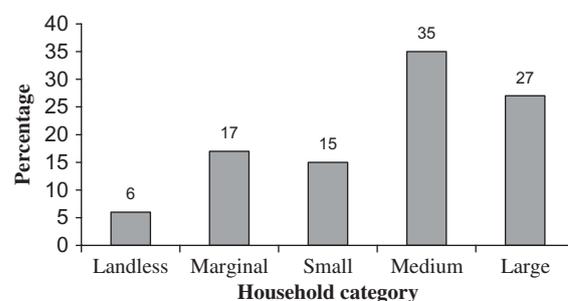


Figure 4. Proportion of palm trees owned by different household categories.

requiring no scheduled maintenance or care. Farmers stated that propagative material for the wild date palm and palmyra palm came from wild trees cared for 'by God himself', while those raised from cultivated trees were cared for 'by man'. These findings are comparable to previous findings: palm husbandry in Bangladesh is based on sporadically planted palms and/or naturally grown palms (Islam and Miah 2004), with natural regeneration occurring freely by seeds (FAO 2007), and birds acting as the main dispersal agent (Mishra and Singh 1989). Local farmers use their traditional knowledge for planting palms. Coconut palm seeds are planted in a propagation bed, and when the young shoot emerges, they are transplanted to the final planting site. Sometimes seeds are planted directly into the field. Similar techniques were also used to plant betel nut and palmyra palm (Islam 2006). Wild date palm management in Bangladesh is based on cultivated and/or naturally grown palms (Islam and Miah 2004). These palms are raised from seed as well as from volunteer seedlings from cultivated and wild trees. Because wild date palm seeds rapidly lose viability, farmers collect *khejur* seeds and plant them immediately into polybags in their own nurseries. Islam and Miah (2004) also documented this practice in Chittagong. Wild date palms produce fruit in winter. After fruit ripening, a large number

of seeds are dispersed around the palms, where they germinate during the rainy season. Farmers collect wild date palm seedlings when they are mostly 1 to 2 years old and 15- to 40-cm tall, from crop fields or marginal lands. These are replanted immediately after collection.

Cultural practices

Farmers typically do not use cultural practices on their own. They often employ a *Gachhi*, a specialist in palm cultural and management practices. *Gachhis* comprise an occupational group engaged in the extraction of palm sap, palm planting, and cleaning and removal of epiphytes and unwanted palm leaves and flower stalks from coconut, wild date and palmyra palms. *Gachhis* frequently collect juice from *khejur gachh* (wild date palm trees), or climb *tal gachh* (palmyra palm trees) for collection of sap or fruit. However, there are now very few *Gachhis* and their work, especially the collection of sap from the wild date palms and palmyra palms or cleaning epiphytes from coconut palms, is now done by any rural dweller who has gained the skill. However, the lack of skilled professionals has decreased the yield of palm products. In the case of coconut palm, *Gachhis* removed unwanted material from the tree once a year to increase flowering. Similar practices were employed on palmyra palm (Rahman 2005). In the case of betel nut palm, however, no cultural operations were practiced in the study area.

Harvest age and harvesting techniques for palms

Coconut palms reach maturity at 7 to 10 years old and can be tapped for sap from this time onwards, which requires climbing the palm. Coconut milk from young, tender fruits is collected by cutting any end of the coconut fruit surface while, from older coconuts, the milk is collected by removing the husk and breaking the hard portion of the shell. CRI (1967) found the same technique in Sri Lanka. Betel nut palms mature at 5 to 7 years old and palmyra palms at 7 to 8 years old. The fruits of both species are harvested by climbing the tree. Young immature fruits are used for juice. Tapping for sap from a palmyra palm is not

done by cutting the surface of the tree but by cutting the outer end of panicles of inflorescence among the leaves at the top of the tree. Hussain (2001) found a similar method of sap collection in Dinajpur, Khulna, Joydebpur and Mymensingh districts of Bangladesh. Wild date palms are tapped for the first time at 5 to 7 years old, and can be tapped for more than 20 years. The oldest leaves are removed at the end of October on one side of the tree. The bases of the petiole and leaf sheath are carefully removed using a *Dao* (cutting tool). A triangular piece of pseudo-bark is cut with great care to expose the sap-supplying inner zone. A spout is then inserted into the tree trunk at this point and a pot hung at its end to collect and store the sap. Tapping is done during the winter. After 5 to 6 months of tapping, flowering occurs and mature *khejur* can be collected by climbing the tree. Dalibard (2007) found a similar tapping technique in other regions. Farmers claim that unskilled tappers sometimes cause the death of a palm, and this is corroborated by the FAO (2007) – that the skill of the tapper can determine the palm's survival.

Marketing of palm products

Most palm products are sold at local markets through middlemen, tappers or *Gachhis*. Some are directly sold in local markets, as sap from wild date palms used as a beverage. There are several problems in the marketing of palm products. Farmers do not receive the correct price for their product because middlemen and other distributors higher up the marketing chain take most of the revenue. The farmer's lack of marketing knowledge and available market information, as well as marketing facilities, is responsible for this problem. Middlemen typically conceal their selling and market prices, making it difficult for farmers to set an appropriate price for their product. Bakht (1984), Warner (1995), Halim et al. (2008) and Chowdhury et al. (2008) reported similar barriers in obtaining market price information from middlemen.

Prices of different palm products vary seasonally and in relation to production location. Prices also vary with yield, quality and local demand (Rashid et al. 1993). Table 4 shows the average annual per-tree production cost,

Table 4. Average production cost per unit, selling price per unit, net profit per unit, production (fruit) amount (unit) per tree per year and income (TK) per tree per year.

Palm product (fruit and juice)	Average production (fruit and sap) (unit/tree/year)	Average production cost (Tk) per tree/year ^a	Average selling price per unit (T.)	Net profit per unit (Tk) ^b	Income (Tk) per tree/year ^c
Coconut	80	50	10.00	9.37	750
Betel nut	120	20	1	0.83	100
Palmyra palm	110	25	5	4.77	525
Wild date palm	1000	30	0.25	0.22	220
Wild date palm juice	200 (liter)	600	15 TK/liter	12 TK	2400

Note: Tk 69.00 = US\$1.

^aIncludes production and transportation costs. Average production cost per unit (Tk) = average production cost (Tk) per tree per year/average production (fruit/sap) in unit per tree per year.

^bNet average profit per unit (Tk) = average selling price per unit (Tk) – average production cost per unit (Tk).

^cIncome (Tk) per tree per year = average production (fruit/sap) in units per tree per year × net average profit per unit.

Table 5. Contribution of palm husbandry to mean annual farmer income.

Category	Mean annual income (Tk)	Average income from palm	% of mean annual income
Landless	43,780	34,011	78
Marginal	65,650	20,645	31
Small	85,109	21,110	25
Medium	115,349	31,554	27
Large	151,255	37,145	25

selling cost, profit and expected income from different palm species. The formula used here is adapted from Vishwakarma et al. (1998), Ahmed et al. (2007) and Alamgir et al. (2005, 2006a,b, 2007). Wild date palm juice had the highest net average profit per unit (Tk. 12), followed by coconut (Tk. 9.37). Annual expected income per tree was also highest for wild date palm juice (Tk. 2400), followed by coconut (Tk. 750). Wild date palms had the highest value (1000 fruits) in number of units sold annually, followed by wild date palm juice (200 l), and betel nut (120). The least net profit per unit (Tk 0.22) was found for wild date palm fruit. Landless farmers were found to earn the highest proportion (78%) of their mean annual income from palm husbandry (Table 5), as found also by Halim et al. (2008). Employment and income from small-scale non-farm enterprises, particularly for poor people, are of growing importance in the rural economy of developing countries (Arnold 1995; Gunatilake et al. 1993; Liedholm and Mead 1993).

Conclusion

Palm husbandry is an important component of seasonal livelihoods in southeastern rural Bangladesh. It plays an active role in the economic contribution of the rural economy, and to the cultural heritage of local people. Other than sap production, palms are also widely used for other purposes, such as mat making, fencing, animal feed, shading and soil amendment. Considering these multipurpose uses, palms can contribute in many ways to the sustainability of integrated farming systems. Farmers apply their own traditional knowledge in the cultivation and management of palms, employing a sustainable manner of utilization. Over the past few decades, the importance of farmers' traditional knowledge in managing natural resources has gained increasing recognition from the scientific community (Ahmed et al. 2007; Chowdhury et al. 2007). More research documenting, exploring and correlating farmers' traditional knowledge with scientific technology could easily contribute to improving the husbandry as well as the conservation of these palms. It might be opportune for policy makers in Bangladesh to assess the potential of palms and to extend cooperation to support related research activities in order to contribute to the implementation of the IUCN Palm Specialist Group's Palm Action Plan.

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