

Wild Date Palm (*Phoenix sylvestris* Roxb.) Husbandry in the Rural Southern Region of Bangladesh: Production, Marketing and Potential Contribution to Rural Economy

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ABSTRACT : An exploratory study was conducted in Gopalganj, a southern district of Bangladesh to explore the role of wild date palm (*Phoenix sylvestris* Roxb.) husbandry in the rural economy. A total of 36 households in the study area were interviewed using a semi-structured questionnaire. A multistage sampling method with 10% intensity and a semi-structured questionnaire were used for the study. Based on the land holding capacity of the households, the farmers were categorized into five groups as landless, marginal, small, medium, and large. The date palm was distributed over seven different habitats of which roadside support the highest value (31%) followed by agricultural field and orchard (25% each). Though the large category farmers own most of the palms (43%), a considerable portion (562 individuals out of 1980) of it is managed by the landless farmers, who earn a substantial livelihood from the palms. The farmers manage the palm mainly for juice production; juice is either used fresh as drink or after some sort of processing as molasses and/or alcoholic beverage. Date palm husbandry contributes 32,601 Tk., 21,107 Tk., 20,626 Tk., 29,574 Tk. and 35,335 Tk. respectively to the five group seasonally and 50,980 Tk., 77,556 Tk., 90,208 Tk., 112,560 Tk., 140,675 Tk. respectively annually (1 US\$ = 70 Tk.). Date palm trees contribute 65.48% of mean annual income to landless farmers followed by 27.21% to marginal farmers. However the poor marketing system result in decreasing the annual return from palm trees. Palm husbandry could be a promising source of rural incomes in Bangladesh if the farmers' traditional management knowledge was linked to more scientific management practices.

Keywords : Tapper, Juice, Tapping, Molasses, SWOT analysis, Bangladesh

INTRODUCTION

The palm (family Palmae or Arecaceae) is one of the important horticultural crops in many countries (James, 1980; Kamal, 1969). Dalibard (2007), enlisted 30 different palm species that are traditionally tapped in parts of tropical world. Situated in the tropical region, Bangladesh also houses a number of palms distributing from hilly topography through plain lands to the muddy mangrove forests (Hussain, 2007). There are about 230 genera and about 2,700 palm species distributed mostly in tropical and sub-tropical regions. In Bangladesh at least 20 species of palms grow naturally and at least 5 exotic species are planted as avenue or as garden plants (Pasha, 2006). The most common types of palm tree available in Bangladesh

are wild date palm (*Phoenix sylvestris*), *Palmyra* palm (*Borassus flabellifer*), Betel nut (*Areca catechu*) and Coconut (*Cocos nucifera*). Presently these trees are scattered grown all over Bangladesh. In Bangladesh very little attention is paid for the systematic cultivation of palm for better yield. A significant economic return is possible from the cultivation of palm (Dowson, 1982).

Wild date palm, *Phoenix sylvestris* Roxb., is one of the oldest fruit trees in the world, having originated most likely in Mesopotamia (modern Iraq) 5,000 to 10,000 years ago (Zohary and Hopf, 2000). Wild date palm is common through India, Sri Lanka, Pakistan and Bangladesh. It is a medium-sized plant, 7-20 m tall, growing singly or forming a clump with several stems from a single root system (Anonymous, 2003). Consequently date palm

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husbandry is a traditional land use practice through the world since ancient times (Blatter, 1978). Wild date palm is sometimes carelessly or erroneously called as *Khejur* palm. It has long been one of the most important plants of arid, desert areas of northern Africa, the Middle East and southern Asia (Hodel and Pittenger, 2003) providing food, ornament, material for shelter, fiber and fuel in a harsh environment where relatively few other plants are able to grow (Zaid, 1999).

P. sylvestris along with all other domesticated palms provides a wide array of commercial products for human kind (Johnson 1995) and is often the main subsistence resource for the poorest people (Dalibard, 2007). In Bangladesh, *P. sylvestris* is produced as a homestead crop; however, it grows naturally or is cultivated in fallow lands, around homesteads, farm-land boundary and even in the marginal lands along the roads and canals (Anonymous, 2000). In the crop fields, the palm is found on the *Ails* (slightly raised embankments used as border of crop fields) and also within the fields along with other crops (Abedin and Quddus, 1991). Juice from *P. sylvestris* has been used from time immemorial to produce traditional sweeteners, a mainstay of Bengali cuisine (Ahmed, 2007). Because of the extensive use of its juice in making sugar, it is of considerable importance for household economy in Bangladesh, where cultivation of the palm for tapping is an age-old practice (Kamaluddin *et al.*, 1996). Other than sugar production, this palm is also widely used for some other purposes as mat making, fencing, animal feed, shade and soil amendment (FAO, 2007)

Palm tapping for beverage purposes is a pan tropical practice, but has its greatest historical depth in Asia and Africa. In Asia, several palm species are traditional sources of palm wine; among them are the coconut (*Cocos nucifera*), the *palmyra* (*Borassus flabellifer*), the wild date (*Phoenix sylvestris*) and nipa (*Nypa fruticans*). The date palm can be tapped regularly and year after year for long time with a small amount of investment for maintenance (Blatter, 1978). Some species of *Phoenix* are able to produce juice all the year round but *P. sylvestris* produce only seasonally.

The juice of date palm oozing out as juice is a good source of vitamins of the B group and contains, in addition, an appreciable amount of ascorbic acid, which may be consumed fresh, or after being fermented, or even distilled into spirit, or evaporated down to the crude sugar (molasses) very largely eaten in Bengal (Anonymous, 2000). The rural poor households particularly depend on tree or other plant-based economic activities for their subsistence (GOB 1995). Dalibard (2007), identified various types of palm-crop associations in Bangladesh, which in the words of Islam and Miah (2003), is a strong evidence of multiple land uses to meet the growing needs for the growing people. The rural farmers of southern Bangladesh depend upon *P. sylvestris* husbandry for their seasonal livelihoods. The present study explores its traditional utilization pattern and socio-economic contribution to rural economy in a *P. sylvestris* abundant region of Bangladesh.

MATERIALS AND METHODS

The Study Site

The study was conducted in Gopalganj district with an area of 1490 sq km. It consists of five upazilas (sub-districts) namely Gopalganj Sadar, Tungipara, Kutalipara, Kashiani and Muksudpur. Muksudpur Upazila (Fig. 1) was purposively selected for the study and supports an area of 309.63 sq km. Lying between 23°19' N latitude and 89°52' E longitude, it is bounded by Nagarkanda and Bhanga upazilas on the north, Gopalganj Sadar and Kashiani upazilas on the south, Bhanga and Rajoir upazilas on the east and Kashiani and Boalmari upazilas on the west. Annual average maximum temperature is 35.8°C and minimum is 12.6°C with an annual average rainfall of 2105 mm. The soil is alluvium, sandy to loamy fertile. The Upazila supports a population of 269,489 with a literacy rate of 34.3%. Among the peasants 18.6% are landless, 55.6% small, 23.3% intermediate and 2.5% rich; cultivable land per head is 0.11 hectare (BBS, 2005; Halder, 2006).

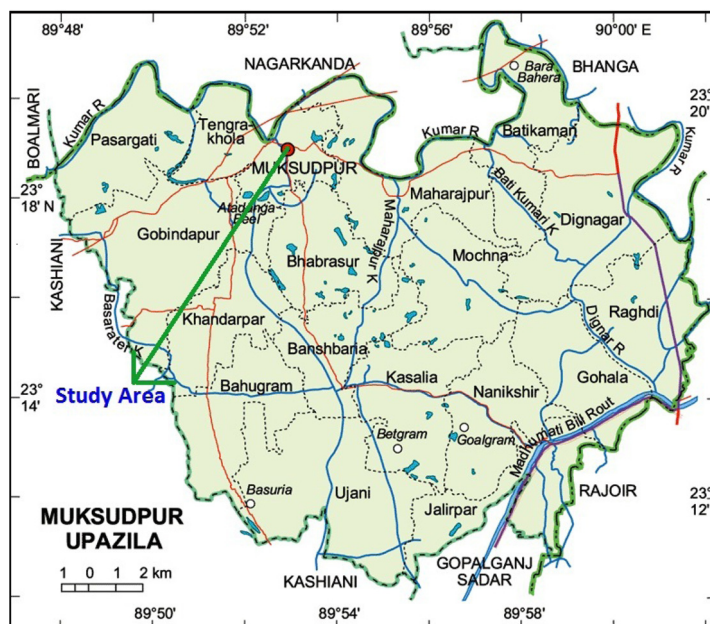


Fig. 1. Map of Muksudpur upazila, the study area in Bangladesh.

Survey Method

A deliberate sampling method was used to locate the Gopalganj district of southern region of Bangladesh during the time period of September 2010 to From a total of five upazilas, Muksudpur upazila was selected purposively. The rationale behind the selection of this site because was of the availability of *P. sylvestris* trees and palm husbandry. A multistage random sampling method was applied to locate the villages and households for the study within the upazila as the primary sampling unit and ultimate sampling unit respectively. From the upazila, three villages producing *P. sylvestris* abundantly were selected in random: one from northeastern, one from southwestern and the other from the middle of the upazila so that the findings represent the whole upazila. Then a list of *P. sylvestris* tree cultivators was prepared from the village and 36 households (20% sampling frequency) were selected randomly for survey. A preliminary socio-economic survey was carried out to ascertain important socio-economic parameters of the study areas to select the respondents for detailed study and interviewed using a semi-structured questionnaire (e.g., cross-checking the land holdings, occupations, date palm possession, contributions

of date palm in economy, land for homesteads and other operations like agriculture or fallow). As date palm husbandry is the function of land holding capacity of the households, the farmers were categorized into five groups accordingly viz., landless, marginal, small, medium, and large who possess less than 0.21 ha, 0.21-0.50 ha, 0.51-1.00 ha, 1.01-2.00 ha, and more than 2.00 ha of land, respectively. Then repeatedly a 10% sampling intensity was applied to select the respondents from each category. This was also a random selection. The same procedure was followed for all the 3 villages. All the sample members agreed to be interviewed because the interviews were conducted in the afternoons, during the farmers' leisure time, when they were most available and receptive to questions. On each topic the respondents were free to express their views.

STUDY FINDINGS

Basic Socio-Economic and Demographic Features of the Farmers

The average size of respondent families was 8, and the percentage of literacy rate of 13.67%. Average family

size was maximum i.e.10.20 in large group followed by 8.2 in marginal group. Besides this, the average earning member of family was also maximum, i.e., 4.46 in large group followed by medium (4.4) and small (4.2) group. The primary occupation in our study area is agriculture for all the classes among these large and medium group possess 75% followed by small group 65%. Landless (55%) and marginal (20%) farmer possess date palm as their primary occupation. In case of secondary occupation, large, medium (50% each) and small (30%) group are involved in date palm husbandry (Table 1). The average annual household income of the respondents was Tk. 94,396, and the contribution of income from primary occupation was 73%. Of the total 1980 palms studied, farmers of large category possessed 43% which is the highest followed by medium category possessed 31% and the landless farmers possessed only 1%, which is the

lowest value (Fig. 2). But the truth that the most palms are managed by the landless farmers (562 individuals) followed by marginal farmers (470 individuals). This is because most of the landless farmers are palm tappers and in most of the cases their main income source is date palm husbandry, while the large farmers managed the least palms (150 individuals) because of their having other important income sources.

Distribution of wild date palm species in different habitats

Seven different habitats namely canal banks, road sides, homesteads, *ails*, agricultural fields, pond banks and orchards were observed to be the habitat of *P. sylvestris* in the study area. It was found that the occurrence of palms in the roadside represented the highest value (31%) followed by agricultural field and orchard (25% each), ail

Table 1. Basic socio-economic and demographic features of the farmers.

Household category	No. of households	Percent of Literacy	Average family size	Average earning member	Primary Occupation (%)		Secondary occupation (%)		Mean annual income (Tk.)
					Agriculture	Date palm	Date palm	Others	
Landless	5	9.25	6.2	2	45	55	-	45	50980
Marginal	10	9.75	8.2	3.4	50	20	-	40	77556
Small	9	12.01	7.3	4.2	65	-	30	30	90208
Medium	8	19.23	8.10	4.4	75	-	50	25	112560
Large	4	18.08	10.20	4.6	75	-	50	25	140675
Total	36	13.67	8	3.72	-	-	-	-	-

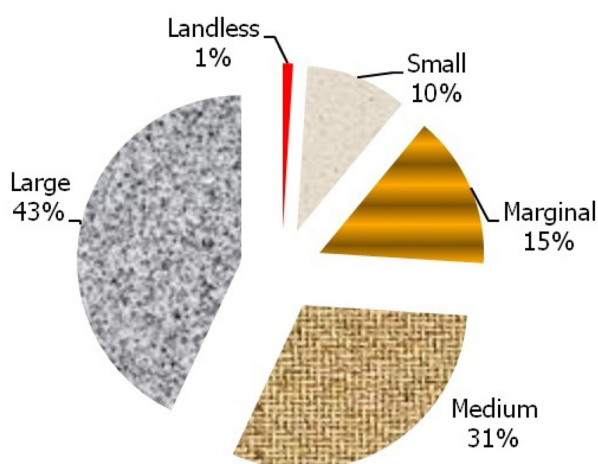


Fig. 2. Ownership and management pattern of wild date palm in the study area.

(15%), homestead (13%), pond bank (10%) and canal bank (6%). The similar trend was found by Kamaluddin *et al.*, (1996); Ahmed (1995), and Chowdhury *et al.*, (2008) for Sitakund of Chittagong, north Bengal regions and southwestern district of Bangladesh, respectively. But it contradicts with the results found for Mirsharai of Chittagong in Bangladesh by Islam and Miah (2003), where they revealed that canal bank occupied the maximum number of palms. In all the habitats, the dominating height classes were >20-25feet (30.15%) followed by >15-20 feet (27.14%) and >10-15 feet (23.64%) (Table 2). The palms that are located by the roadside are under the jurisdiction of the District Commissioner (DC) and those who want to harvest these palms are to take permission from DC. The tappers usually avoid sharing the palms on the roadside due to bureaucratic complexity.

Tapping and juice collection techniques of wild date palm

Tapping of the palms was reported to be the prerequisite for collecting juice. Tapping starts with a time consuming and technique worthy preparation. The farmers opined that unskilled tappers might sometimes cause the palm to death. Usually palms of more than 5 years are selected for tapping when woody stem attains a height of at least 2 feet. The instruments used for tapping observed in the study area were *dao* (a sharp iron made cutting device with larger and thinner blade), chisel, bamboo

made basket used for carrying the instruments, rope, earthen jars, etc.

Tapping operation was observed to be started at the onset of winter season by a series of pruning usually 3-4 times. A palm having at least 2 feet woody trunk was reported to be tapped leaving 1foot below. After 6 days of last pruning the palm is scratched with the dao and chisel during which thin scraps from the upper portion of the trunk are removed. On the 7th day, a tapping channel is cut and a bamboo made spout of 4 inches is inserted on the freshly cut trunk, another end of which is poured into the earthen jar placed and fastened just below the spout. The jar is placed at the evening on the palm leaving for the whole night and the juice-filled jar is collected very early in the next morning. The scratching of the trunk is done in every 7th day providing the palm a resting period of 3 days. They reported the possibility of reducing juice production, molasses quality and death of the palm if it is not given the resting period of 3 days.

It was revealed that tapping of the palms for juice production started from mid October and continued to mid March for approximately 152 days in winter season. From 152 days, palms are tapped in such manner as $(152-15)/6 = 23$ times approximately (3 days for juice production + 3 days for resting = 6 days, where the 15 days are required for the preparation of tapping). After tapping, the palms produce juice in the next 3 days, including the day of tapping, but in a diminishing manner.

Table 2. Distribution of wild date palm species according to height classes in different habitats of the study area.

Habitats	Height classes of species (Feet)					Total	Percentage
	5-10	>10-15	>15-20	>20-25	>25		
Canal Bank	49	100	104	102	30	385	19.44
Road Side	15	78	80	85	39	297	15
Homestead	31	63	60	89	29	272	13.74
Ails	29	79	67	83	36	294	14.85
Agri-field	12	31	34	38	10	125	6.31
Pond Bank	11	43	71	57	19	201	10.15
Orchard	16	74	138	143	35	406	20.51
Total	163	468	554	597	198	1980	100
Percentage	8.23	23.64	27.98	30.15	10	100	-

Usually in the day of tapping a palm produce the highest amount of juice. The study findings show that palms in the roadside and the orchard both produce equal amount of juice and within >14-21 years produce the highest amount of juice (7 L on average) followed by >7-14 years produce 5.5 to 6 L on average of every 3 nights and >28 years were reported to produce the least amount of juice while homestead and pond bank do the same. The study shows that most of the juice is produced by the landless farmers (29.34%) of total juice production followed by marginal farmers (24.61%) and most of the yielded juice (58.67%) is obtained from the leased palms + self-tapping by the tappers (Table 3).

Thereafter, the produced juice was reported to be distributed to the owners according to the agreements and in case of money contract the money is paid by the tappers to the owners at the beginning of the season [For the convenience of calculation, in case of molasses-sharing the molasses (crude sugar) is calculated as a conversion of juice where 6 liter juice = 1 Kg molasses (Thumb

rule), though in practice farmers manufacture molasses and pay the portion of it to the owners].

From the 1980 date palm trees about 1133 date palm trees has been leased according to different sharing agreement. Among these trees 602 (53.13%) palm trees were leased on the basis of juice sharing, 365 (32.21%) palm trees were leased on the basis of molasses sharing, and the least number of palms, 142 (12.53%) trees were leased on the basis of money contract. The landless farmers and tappers have the tendency to take lease palms in the juice sharing agreements (Table 4).

Wild date palm juice processing techniques

The juice was reported to be consumed fresh or after being fermented or even distilled into spirit or evaporated down to the viscous and molasses in the study area. Such concept was also supported by Griffith (1850); Blatter (1978) and Anonymous (2000). In the study area, molasses is prepared by cooking palm juice up to a desired degree.

Table 3. Total seasonal juice productions by different households.

Household Category	Seasonal juice production in Liter		
	Own palm + Self-tapping.	Leased palm + Self-tapping	Total
Landless	7384.2	68235	75619.2 (29.34%)
Marginal	22840.75	40575.4	63416.15 (24.61%)
Small	18012.13	28542.4	46554.53 (18.06%)
Medium	39127.25	13835	52962.25 (20.56%)
Large	19169.04	-	19169.04 (7.43%)
Total	106533.37 (41.33%)	151187 (58.67%)	257721.17 (100%)

Table 4. Sharing pattern of wild date palm among the households in the study area.

Household category	Juice Sharing (Tree leased by)				Molasses sharing (Tree leased by)				Money contract (Tree leased by)			
	La	Ma	Sm	Me	La	Ma	Sm	Me	La	Ma	Sm	Me
Landless	12	-	-	-	-	-	-	-	-	-	-	-
Marginal	48	30	-	-	18	17	-	-	-	-	-	-
Small	38	50	18	-	52	25	17	-	-	3	-	-
Medium	112	54	15	18	61	23	23	-	-	23	23	-
Large	105	21	56	25	40	25	37	27	14	21	23	32
Total	602 (53.13%)				365 (32.21%)				142 (12.53%)			

Note: La= Landless; Ma = Marginal; Sm= Small; Me= Medium.

Usually the tappers collect juice filled jar from the tree before sunrise and bring it to the place of cooking by a carrier made of bamboo. The farmers use a burner of square shape and a *Tala* (tin made pot) with a size of 3' × 2.5' or 4' × 3.5' possessing a capacity of containing 6 kg and 8 kg of molasses, respectively.

The burning place was reported to either be *ex-situ* at the homestead or *in-situ* in the field. The *in-situ* procedure was observed to be maintained by males providing some facilities of not carrying the juice to homesteads and of fuel wood availability. Usually the pruned branches, dried leaves and grasses are used as fuel wood in the field. On the other hand, the *ex-situ* procedure is usually maintained by females and extra cost for fuel wood has to be then incurred.

Before burning the juice is screened well to remove the dust and all other foreign matters. Thereafter the *Tala* is filled with juice and burning starts. After half an hour there produces a layer of white foam on the cooking juice which is collected by *Orong* (large wooden spoon) and cast. For a *Tala* of 3' × 2.5' size burning time is 2 hours and for a *Tala* of 4' × 3.5' size it is 2.5 hours. Next, a little amount of boiled juice is taken in an earthen pot and stirring it with an *Orong* with some pressure does crystallization. Usually it takes 4-5 minutes for crystallization. The crystal is mixed well with the hot boiled juice and cooked at low temperature for few minutes and thus molasses is formed. Crystallization process is locally called "*biz tola*" which is done for the condensation of the molasses. A thumb rule is continuing that 1.5 liters of juice produces 100 gm of molasses. After cooling the molasses, is poured in the earthen pot whose mouth is tied with polythene or plastic to make it air tight and stored in a cool and clean places for future uses.

A solid molasses locally called *Patali* also manufactured by the farmers in the study area. In its preparation, crystallization of hot juice is done for a longer time usually 10-15 minutes. Such long duration of crystallization impels the molasses to be condensed rapidly. Then the highly crystallized molasses is mixed with the hot molasses in *Tala* and stirred well for well mixing and

cooked for a while. After that molasses is poured into various shapes pot like square, rectangular, triangle, etc. according to the farmer's aspiration and this is called *Patali* and kept untouched for 30-45 minutes. During the study it was observed that square shape of the *Patali* was chosen by the farmers for carrying facilities.

Tari (alcoholic beverage), an indigenous hard beverage also prepared from the date palm juice by the farmers. The basic technique of manufacturing *Tari* is fermentation. Chemically it may be called the ester of molasses. The farmers estimated that 9 liters juice is required to prepare 4 liters of *Tari*, which can be stored for at best one to two days.

Marketing of wild date palm products

The farmers opined that while marketing the juice produces, sometimes juice is sold directly as drunk in the early morning by empty stomach, boiling palm juice a mixture was prepared, which has a strong demand for eating with cake, some juice used for manufacturing molasses; sometimes molasses are used for manufacturing *Patali*, and the rest others are used for manufacturing *Tari*. The farmers claimed that the manufacturing of *Tari* is the most profitable business, but the legal restriction limits the production of it, whereas in America and Africa, tapping of palms has been practiced exclusively or mainly for wine production (Dalibard, 2007). Other than fruit and juice production, *P. sylvestris* provide a multitude of useful products ranging from food, to materials for house construction, tools and handicrafts, fencing (Balslev and Barfod, 1987; Zaid, 1999; FAO, 2007). In the study area, multiple benefits such as fuelwood, fencing and thatching material, handicrafts and mats, timber, material for house construction are also obtained from *P. sylvestris* tree. The people of the study area were found to make a huge amount of product by using *P. sylvestris* materials and at a time sold in the local market.

According to the farmers' opinion, majority of the palm products are sold to the local markets through middlemen or tapper. Some cases they directly sold it in

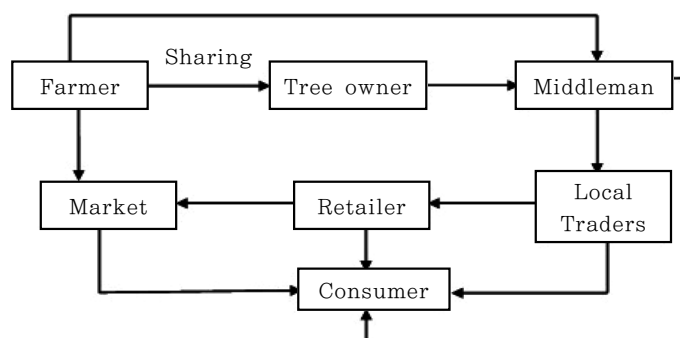


Fig. 3. Flowchart of marketing channel of wild date palm products in the study area.

the local market. After collecting the juice from the tree, sometimes it was reported to be shared with the tapers. The farmers opined that while marketing the wild date palm produces, sometimes raw juice is sold directly in the local market (Fig. 3). There are several problem arises in the marketing of palm products. The local farmer doesn't get the proper price of their product due to improper marketing system. Sometimes the middlemen get the maximum benefit from the farmer products. This is due to lack of marketing knowledge and available market information as well as marketing facilities. The price variation might be higher than the stated price, as the middlemen generally do not state the real price. Bakht (1984); Warner (1995); Halim *et al.*, (2008); Chowdhury *et al.*, (2008) and Rana and Islam (2010) reported the similar barriers of obtaining the information from the middlemen.

Contribution of wild date palm tree species in total annual income

P. sylvestris husbandry is one of the important means of livelihoods in rural southern Bangladesh. It plays an active role in the contribution to rural economy, to the

cultural heritage of the countrymen as well (FAO, 2007). A significant economic return is possible from the cultivation of palm (Dowson, 1982; Naik, 1963). Our study revealed that the total seasonal income was highest for large farmers (35,335 Tk.) [Tk.: Taka, Bangladesh currency; 1 US\$ = 70 Tk.] followed by landless farmers (32,601 Tk.) and medium farmers (29,574 Tk.). The study also stated that the highest mean annual income from *P. sylvestris* husbandry for large farmers (140,675 Tk.) followed by medium farmers (112,560 Tk.) respectively (Table 5). By selling of palm products the farmer can uplift their socio-economic condition. This finding also agrees with the findings of FAO (2007); Dowson (1982) and Naik (1963). It was observed that *P. sylvestris* husbandry contribute 65.48% of mean annual income to landless farmers followed by marginal (27.21%) and medium farmers (26.27%) (Table 5). Halim *et al.*, (2008) and Rana and Islam (2010) stated that the landless farmers were found to earn the highest mean annual income from the palm husbandry, which is the same result of our study. This reflects a global trend: for instance, Liedholm and Mead (1993) also found substantial contribution of such sector in the total income. Employment and income

Table 5. Contribution of income from wild date palm husbandry in income of the farmers.

Household category	Seasonal income (Tk.)	Mean annual income (Tk.)	Percent of mean annual income
Landless	32601	50980	65.48
Marginal	21107	77556	27.21
Small	20626	90208	22.87
Medium	29574	112560	26.27
Large	35335	140675	25.11

from small-scale non-farm enterprise activities, particularly for poor people, are of growing importance in the rural economy of developing countries (Arnold, 1995; Gunatilake *et al.*, 1993).

Gender role in wild date palm husbandry

Gender played a key role in the palm husbandry in Bangladesh. The rural women in Bangladesh are usually illiterate and palm husbandry can be utilized as a potential sector for their employment. In the study area it was observed that in the selecting of planting materials, maintenance and in the processing of the products male and female members participate simultaneously, on the other hand harvesting and marketing were only done by the male. It was observed that in the selection of planting materials and planting of trees for the cultivation of wild date palm, male members was 80% and female 20%, in the maintenance of palm trees female contribute 60% where male was 40%. In case of processing of wild date palm products, female members contribute 70% (Table 6).

SWOT ANALYSIS

SWOT analysis of wild date palm husbandry sector

Table 6. Gender role in wild date palm production operation in the study area.

Planting		Maintenance		Harvesting		Processing		Marketing	
Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
80%	20%	40%	60%	100%	-	30%	70%	100%	-

Table 7. SWOT analysis of wild date palm husbandry in southern Bangladesh.

Strength	Weakness	Opportunity	Threat
Low labor cost	Lack of institutional support	Trained farmers	Substitute products
Low processing cost	Improper marketing facility	Market development	Increased cost in production and processing
Multipurpose use	Absence modern technology	Improved technology	Market insecurity (seasonal demand fluctuation)
Increased household income		Research	Unwillingness of future generations to enter this profession
Environment friendly			

(Table 7) in the study area shows that the highest level of strength is low labor cost. Considering the present unemployment situation of the country it is easily understood why labor cost is low. Next is the low processing cost of the products and multipurpose uses. This is environment friendly and increases the total household income. Weakness remains in the lack of institutional support and absence of modern technology in processing of products. Moreover, there is always addition of technologies in different stages of production of palm products in the world. But the palm farmers are not exposed to state-of-the-art technologies required to improve their production. Lack of proper marketing facility is also an impediment to expansion of this husbandry. Availability of substitutes is top-level threat to wild date palm products. Substitutes like sugarcane, *palmyra* palm and coconut products are sold comparatively in lower cost and all the year round; as a result, many customers move towards those products. Other threats include market insecurity and unwillingness of future generations to enter this profession.

CONCLUDING COMMENTS

P. sylvestris husbandry has great potential to contribute to the rural livelihoods and economy of Bangladesh. The

survey clearly revealed that the *P. sylvestris* husbandry makes a great contribution to and has further potential for socio-economic upliftment in the rural areas through providing work opportunities for poor and landless peoples. In Bangladesh, *P. sylvestris* farmers do not have any improved technology and employ their own indigenous knowledge in every aspect of its cultivation and processing. However, the net return from *P. sylvestris* products sale is satisfactory from the landless farmer level to large farmer level and contributes a large share to annual household income. But the farmers face some problems in farming palm originated from the neglect on behalf of the governments. This study has revealed that farmers generally possess the effective management techniques for *P. sylvestris* husbandry. However, it is necessary to conduct research to develop improved methods of tapping and processing of juice, to achieve higher production. The sustainable management of the palm on the other hand can upgrade the micro-climatic condition, enriching the vegetation resources of the country. The IUCN Palm Specialist Group has already declared the Palm Action Plan (PAP) with a view to conserve the palms and to explore their utilization worldwide (Johnson, 1995). It might be the time for the policy makers in Bangladesh to pay their attention to assess the potentials of palm and to extend cooperation to support related research activities. Recently, in setting research priorities in forestry, research on various facts of palm species has been given high impetus by the Bangladesh Agricultural University. Non-government organizations (NGOs) may come forward to assist in market development. It could thus be a promising small-scale enterprise in Bangladesh with a capacity of fulfilling both domestic and international demands.

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