

7.1. Introduction

Human beings were very much dependent on plants for livelihood since their origin. Palms and cane is one such important group of plants used by people mainly for their sustenance since the beginning of civilization. In addition to their food, fodder, house building materials, hunting, fishing and war equipments, different parts of palms and canes have been used in a big way. They are also used for the prevention and cure of various ailments of both the human and the domestic animals. Even the pre-historic man felt the needs of plant medicines to get relief from their various bodily discomforts. With the advent of human civilization, many systems of therapy have been developed primarily based on plants. *Ayurveda*, *Homeopathy*, *Siddha*, *Unani* etc. are different traditional systems of medicines developed in India by different group of peoples. This plant based traditional medical system continued to provide the primary health care to more than three quarters of the world's population. In India, the uses of palms for medicinal treatment were started dates back to 5000 years B.C. Palms also forms the very source of processed food and commodities.

Along with the advancement of the civilization the society has been frequently facing the new diseases causing entities. It require many more formulations or medicines to tackle with such situations. Ethnobotanical studies plays lead role for new drugs development. Various authors (Kirtikar and Basu 1935, Chopra *et al.* 1956, Molla and Roy 1985, Das and Mandal 2003) had prepared lists of Indian medicinal plants used to treat various ailments by different communities in varied topographic locations of India. Now- a- days survey for the documentation of knowledge on traditional medicine in different parts of the world are given more importance. From West Bengal also numerous such works have been publishing regularly and compilation of such knowledge are found in various popular published literatures (Biswas and Chopra 1956; Hajra and Chakraborty 1981; Aditya *et al.* 1988; Jain 1991 and 1966; Asolkar *et al.* 1992; Pandey *et al.* 2002; Misra and Dash 2002; Dubey *et al.* 2002; Rai and Bhujel 2002; Sarkar 2011; Chowdhury 2009, 2012 2015; Chowdhury and Mukherjee 2010, 2012; Mondal and Chowdhury 2016; Basak *et al.* 2018).

The ethno botanical investigation relates the usage of the plants/ plant parts as medicine, food, divination, cosmetics, textiles, dyeing, building materials, tools, clothing, rituals, and music, hunting instruments and their management in their social life.

7.2. Definition of Ethno botany

The name Ethnobotany was coined by Harshberger in 1896 (*'ethnokos'* meaning *'the human race'* and *'botany'* means the *'Plant Science'*). Ethnobotany is the study of the relationship between people of primitive societies and their plant environment. Wickens (1991) distinguished ethno botany from economic botany by considering ethnobotany as *'the study of useful plants prior to their eventual domestication and commercial exploitation'*.

7.2.1. Ethno botany in India

India with its diverse flora coupled with the large numbers of aboriginal tribes (>550), inhabiting different remote and forested pockets in the country. These tribes provide immense scope to the ethno botanists to work with and to record their age old sustaining traditional knowledge. They include major tribes like *Santal, Munda, Gorkha, Mahato, Bando, Oraon, Chenchus, Naga, Momp, Saora, Karbis, Sarasias, Irulus, Kharia, Baigas*, etc. Along with some degenerating communities like *Great Andamanies, Ongae Birhore, Jarawa, Toda, Sentinelese, Shompen, Toto, Asur, Lodha* etc. These people can utilize the resources without disturbing the extremely delicate balance in the ecosystem.

7.2.2. Scope of Ethno botany in the Study Area

Vincent Smith (1976) called India as the ethonological museum of the world and some parts of West Bengal *i.e.*, Western plateau and North Bengal plains and Himalaya are very rich in ethnic communities. During tea plantations in the terai and duars areas by the Britishers, thousands of labourers were brought from Jharkhand, Bihar and Nepal and this influx of new people changed the demographic features and conditions of the area. There are not less than 36 different stocks of people in the study area of whom the most prominent tribes are *Toto, Rava, Mech, Dhimal, Santal, Munda, Malpahari, Oraon, Murmu, Mahato, Lepcha, Sherpa, Khas, Mangar, Sunar, Newar, Kami, Damai, Darji, Kirat, Dukpa, Tamang*, and *Malpahari* mostly residing at forested villages.

7.3. Result:

As per world's food source three most important plant families are grass family (Poaceae), the legume family (Fabaceae) and the palm family (Palmae/ Arecaceae). The utility of these three plant families are known to human kind since the ancient time. The indigenous people of the tropical world from the preindustrial period had an intimate relationship with the natural resources of their environment. Wild and cultivated plants and wild and domesticated animals both provided all the food and other needed for living. Palms occupy a very important position among all economic plants, as they are one of the major sources of man's food.

The life of man needs innumerable materials for their survival. All these materials were collected from nature in previous days. But with developments of science and technology today man started using artificially made synthetic or modified materials.

But, in tribal life even in present day the importance of naturally produced materials forms the main resources for their survival. During this dissertation a huge data were recorded and for easy understanding and description of all the recorded information were grouped under some categories like (i) Edible palms (ii) Fodder palms (iii) Medicinal palms (iv) Fencing and House Building palms, (v) Ornamental and Decorative palms, (vi) Multipurpose useful palms (Fig. 75).

A total 51 species covering 19 genera of the family Arecaceae of vascular plants have been recorded through the present ethno-botanical study on the ethnic and common uses of palms by tribal and other traditional people. The survey shows the importance and impact of the palms flora on the sustenance of their life. They use palm products not just to meet their daily basic needs but also as esthetic and to fulfil their religious sentiments.

7.3.1 Edible palms: Plants are eaten mainly in two ways, cooked or uncooked (raw). While plants are eaten cooked then those are generally referred as 'shak' or 'saag' (leafy vegetable), (Chowdhury 2014). However, for all the recorded palms edible parts are not leafy twigs or leaves. The cooking method is also different for different plants and taken in different sections of a meal taking period. On the other hand, there is no such overall terminology for those which are eaten uncooked.

Most of the areas of Darjeeling Himalaya, Terai, Duars and Gangetic delta regions are basically remote. The peoples of these areas are mostly tribal who are really very poor

and needy and depend upon the various wild natural edible botanicals in their nearby wilderness. Different parts of palms and canes are used as edible.

7.3.1. a. Tender shoots: The terminal bud or ‘cabbage’ of *Phoenix sylvestris*, *Cocos nucifera*, *Borassus flabellifer*, *Arenga micrantha* are edible as salad and very young etiolated leaves, petiole and the pith of the young stem, are occasionally taken as soup. However, the removal of bud terminates the life of the palm. They are said to be relished as a pickle preserve by the rural tribes of the Himalayan region of the Darjeeling district. Tender shoots of *Caryota urens* and *Caryota obtusa* are edible and consumed as vegetable. Soft tissues of upper part of the stem (vascular region) of *Phoenix sylvestris*, *Phoenix dactylifera*, *Cocos nucifera* and *Borassus flabellifer* are used as cabbage for vegetable by the local people of Gangetic delta, Western plateau, North and South Bengal plains. The species of *Calamus*, *Daemonorops* and *Plectocomia* are the most interesting palms that are not growing abundantly, but now-a-days some of the species are being cultivated almost throughout the North Bengal, starting from Malda to Alipurduar. *Calamus tenuis*, *Calamus guruba*, *Calamus floribundas* and *Daemonorops jenkinsiana* are mostly valuable rattans for their use as vegetables in this region. The highly nutritious tender shoots of *Plectocomia himalayana*, *P. assamica*, *Daemonorops jenkinsiana*, *D. teraiensis*, *Calamus erectus* *C. acanthospathus* are eaten as raw vegetable at remote areas of Darjeeling and Kalimpong districts.

7.3.1.b. Starchy sap: The fresh sap of *Arenga pinnata*, *Phoenix sylvestris*, *Borassus flabellifer*, *Caryota urens*, *Nypa fruticans* are very popular drink as fresh sweet and /or as fermented form in Bengal plains. One litre of sap under proper oxidation may yield as much as one litre of four percent vinegar. *Caryota urens* is locally known as *kittul* palm, when it starts flowering by the emergence of inflorescence, the peduncle is severed and from the cut end of the peduncle yields plentiful supply of sweet sap until the peduncle gets dried up. A tree produces huge quantity of sweet sap from the subsequently developed inflorescences for a period of 4–7 years until the tree dies. The fermented sap contains enough vitamins and protein. *Phoenix sylvestris* is one of the most useful semi wild or wild palms in most of the drier parts of India. Freshly obtained sap of this semi wild date palm is clear as water having 12–15% sugar

and is delicious drink rich in vitamins. Application of lime in the collecting pot delays the fermentation of the sap. When sweet sap is boiled and gradually become condensed to form a semi-solid product which is consumed in various ways. After sufficient boiling, sweet sap condensed into palm sugar blocks known in local language as *Patali* (Fig. 76). This *patali* is at the present market rate is about Rs 200.00 per kg, more expensive than refined cane sugar. On an average a full grown *Phoenix sylvestris* tree in one season from November to February yields sufficient quantity of sap, which after boiling, produces about 40 kg of *patali* at present rate valued about Rupees 8000/- depending on flavours (Basu 2012). For collection and processing of sugary sap and for marketing the end product, several village level artisans and traders are involved to run their livelihood solely by the utilization of this very common semi wild palm. The tappers of *Phoenix* palms are locally called as 'Sewli'. Sap tapping from a date palm is a risky job, now a day's young villagers are not get tempted to work as Sewli as a result sap collection is getting reduced during tapping season. In West Bengal, Basirhat and Taki of North 24 Paraganas are well known for production of best quality patali. *Borassus flabellifer* is particularly associated with the Tamils of South India, who have found extensive uses of it since ancient times. The main use of this palm is in making jaggery or fermented into toddy and Patali/sugar cake (Fig. 76). Many village level artisans are thriving on this jaggery making industry. In Palmyra palm sweet sap is collected by cutting off the upper part of the peduncle, therefore the tapping season commences with the flowering season from February to July. *Nypa fruticans* is a useful mangrove species in West Bengal particularly in coastal region of Sundarbans. A lot of palm species including *Nypa* have been tapped throughout the coastal region for the production of fresh juice, syrup, fermented drinks, raw and refined sugar. *Nypa fruticans* is also most valuable for its sweet sap that tapped from the young stalks of the inflorescence. During observation the rural tribe of Sundarban reported that the tapping normally starts from the *Nypa fruticans* shoots after 3–5 years and continues up to 14–16 years. The highest yielding of sweet sap was reported from 9–12 years of mature shoots. 1 kg molasses of *Nypa* was produced from 6–9 liters of sap. However, it was observed that 8–12 % of the poor farmers or tribal peoples tapped the stems for wine.

7.3.1.c. Fruit: Fruit of various species of palms and canes are rich in nutrients and different parts of fruits like pulp, seeds, endosperms are mainly edible. Fruits of *Phoenix sylvestris*, *Brahea edulis*, *Phoenix dactylifera*, *Elaeis guineensis*, *Serenoa repens*, *Butia capitata*, *Areca catechu*, *Astrocaryum huicungo*, *Jubaea chilensi*, *Dypsis lutescens*, *Chamaerops humilis* and *Salacca secunda* are highly nutritious for birds as well as human beings. Immature harvested seeds of *Nypa fruticans* have a tasty creamy flavour. Seeds *Calamus erectus*, *Calamus flagellum*, *Calamus pseudoerectus*, *Calamus longisetus*, *Daemonorops jenkinsiana* and *D. teraiensis*, *Plectocomia assamica*, *P. himalayana*, *Areca catechu*, *A. triandra* are quite nutritious and sold by tribal people in nearby markets like Matigara haat, Bagdogra bazaar, Dudhia bazaar, Pokhariabong haat, Bichgalli bazaar etc. of Northern Bengal.

The dried endosperm of *Cocos nucifera* when it separate out of the hard endocarp or the shell is called copra. The copra is the raw material for extraction of coconut oil which is largely used as cooking medium, hair oil and for making good quality bath soap, shampoo, shaving creams etc. Coconut oil cake is an excellent animal feed. The hilly tribal peoples consume fermented endosperm of the nut along with betel leaf and lime for warming up of the body. The female Palmyra palm (*Borassus flabellifer*) is not tapped and allowed to bear fruits; the immature fruits possess a jelly like sweet delicacy known locally as *talsas* and have a large local market (Fig. 78 D). The white endosperms of *Nypa fruticans* immature seed are sweet and jelly-like, and highly valuable is consumed as a snack. The hilly tribal, old or young, consume fermented *Areca catechu* endosperm of the nut along with betel leaf and lime for warming up of the body.

7.3.2. Fodder for animal: Raw fruits of *Calamus erectus*, *C. logisetus*, *C. flagellum*, *C. floribundus*, *C. acanthospathus*, *C. guruba*, *C. viminalis*, *Daemonorops jenkinsiana*, *D. teraiensis* etc. are favourite food of wild Elephants in various conservatories of North Bengal. Fruit of *Phoenix sylvestris*, leaves of *Cocos nucifera*, are preferred by wild animals. Many aquatic species are good fodder for livestock like *Nypa fruticans*, *Phoenix paludosa* etc.

7.3.3. Medicinal palms: Palms are of great significance in Indian indigenous systems of medicine. *Calamus erectus* is recommended for the treatment of diabetes (Fig. 77

M). The seeds of *C. erectus* are chewed by the diabetic patient. *Areca catechu* is prescribed for piles and its paste is used to get rid of ring worm, also to treat leucoderma, leprosy, cough, fits, etc. *Borassus flabellifer* (Palmyra) toddy apart from other uses is considered beneficial for inflammatory ailments, and dropsy. It is diuretic and is prescribed for chronic gonorrhoea and amoebiasis. The sap of *Cocos nucifera* derived from incising the peduncle of the inflorescence is drunk as *neera* or fermented to produce toddy. The white endosperm of coconut is delicious and eaten raw as wholesome food contains proportionate amount of carbohydrate, protein and fat. The sweet sap extracted from the peduncle is made into brown sugar or jaggery or for brewing into wine or vinegar. Tender coconut water is a refreshing drink and 120 ml of tender coconut water contains 93.9 gm of water, 5.9 gm of carbohydrate, 10 mg of calcium, 0.1 mg of iron, 0.01 mg of vitamin B_{1,2} mg of vitamin C, 0.14% protein, 0.13% fat and very high percentage of potassium and sodium. Tender coconut water acts as diuretic and can be used in any type of fever. Root, bark, flowers and leaf charcoal of coconut also have medicinal properties. The soft downy substance from the lower surface of the leaf is used as hemostatic. The astringent roots are used for curing dysentery and other intestinal ailments. The roots of coconut palm are used as dye, a mouth wash, and a medicine for dysentery. The shredded piece of root is used by the village folks as a tooth brush. Green coconut water with good amount of salt and vitamins act as relieving agent against indigestion. In Ayurvedic medicine, the nut is used in the treatment of headache, fever, rheumatism and good remedy against bad breath. *Areca triandra* is very similar in appearance like *Areca* nut. It is also used as a purgative and in ointment, along with several other ingredients for treatment of nasal ulcers. *Borassus flabellifer* toddy apart from other uses is considered beneficial for inflammatory ailments, and dropsy. It is diuretic and is prescribed for chronic gonorrhoea and amoebiasis. A toddy poultice prepared from unfermented fresh toddy and rice flour is a stimulant application on ulcers. The potash from the ash of the flower with sugar cane molasses is given for enlarged spleen. The palm candy is a good relieving agent against cough and cold. To the poor people of rural area Palmyra palm is a source of cheap medicine. Fruits of *Phoenix sylvestris* are edible although the pulp is thinner than Arabian dates which are consumed by the locals that contain good quantity of protein, fatty acid, carbohydrate, enzymes, minerals, calcium and phosphorus. The fruit extract is rich in vitamin B and Vitamin C and contains about 85 % sugar. The root of this palm is a good analgesic due to its heavy properties. It is very

effective in nervous disorders due to its sweet taste. It is also a good aphrodisiac agent as it is cold in potency. The root bark is used for treatment of rheumatic swelling and snake bite poisoning. It is stated that the roots of *Calamus rotang* in combination with other herbs are useful against snake bite or sting of scorpion. The root is also useful for its anti-dysenteric, anti-bilious, tonic, febrifuge and depuration properties (Basu 1992). Fruits of *Calamus longisetus* and *Calamus tenuis* are edible, seeds are chewed as masticator.

7.3.4. Catastrophic: Coconut shell is used for making *Hookka* an improvised apparatus for smoking tobacco (Fig. 79 N). It was observed in some remote villages of South 24 Parganas and Bankura in West Bengal, the old village women were putting a kind of black powder called 'gul' inside their lower lip. Fermented *Areca catechu* endosperm along with betel leaf and lime is famous among the tribal people for warming up the body. It is also considered as weak narcotic. Dried immature nut is chewed by the local people in Darjeeling and Sandakphu hills to avoid the severe cold.

7.3.5. Recorded Plams for Building and Fencing Materials

Local poor ethnic communities use some wild palms for the construction of their houses and protect their courtyard through fencing. Several species of palms have been recorded during survey. Dried leaves of *Phoenix sylvestris*, *P. dactylifera*, *Borassus flabellifer*, *Cocos nucifera*, *Nypa fruticans*, *Trachycarous fortunei* and *Areca catechu* are used to prepare roof and wall along with bamboos in the construction of houses and the stem is used as pillar.

7.3.6. Ornamental and decorative palms

Some introduced palms like *Dypsis lutescens*, *Roystonea regia*, *Wodyetia bifurcata*, *Dypsis decaryi*, *Hyophorbe lagenicaulis*, *Raphis excelsa*, *R. humilis*, *Livistona chinensis*, *Latania loddigesii*, *Bismarckia nobilis*, *Sabal mauritiiformis* etc. are used for beautification purposes in different resorts, lawns, parks, road side or avenues, as ornamental plants. Apart from medicinal and several other uses, *Areca catechu* and *A. triandra* are also used as an interior landscape palm. While grown as indoor, it grows slowly and won't fruit or reach full size to become accommodative to its environment. The deep green pinnate leaves are very ornamental and easy to cultivate in any site around the garden where shade and water is available. *Phoenix*, on the other hand

means a person or thing of unsurpassed beauty or excellence. The genus *Phoenix* is one of the larger members in the Palm family and is easily one of the most popular in terms of its usefulness to humankind and of commercial and local importance. Some species of this genus are most popular for landscape use as they are hardy adaptable palms growing in many varied climates from extreme tropics, to the arid desert and even in the cooler subtropical and temperate climates throughout the world.

7.3.7. Religious palms: The fruit of *Cocos nucifera* are highly nutritious and are consumed by the Hindu community on special festive occasions (Fig. 78 F; 79 L). Hindus often initiate the beginning of any new activity by breaking a coconut to ensure the blessings of God and successful completion of the activity. According to Hindu mythology the cotyledons of *Borassus flabellifer*'s seed holds a high position and is used for the worship of goddess Lakshmi. Since it has high nutritive value, is sold in the market in huge quantity. The stem of *Phoenix paludosa* (hemtal stick) used in 'Manasa Mangal' ceremony. Flowers of *Cocos nucifera* always adorn auspicious occasion, in Hindu wedding. The areca nut (*Areca catechu*) represented as male and the betel leaf as female. It is also considered an auspicious ingredient in Hinduism therefore the nut is still used along with betel leaf in the religious ceremonies or in *puja*. The concept behind the shape of two copper utensils named *Kosha* and *kushi* used during *puja* has been derived from the shape of prophyll and bract of *Areca catechu* inflorescence. The fibrous coating of the seed in ripe fruits of *Borassus flabellifer* consist of sweet sticky material, which after collecting and straining, is made into a dough by combining it with grated coconut, wheat flour, rice flour and palm *gur*. The dough thus formed, is prepared to small ball which are either rolled or fried as pancake. This preparation is offered during the birth day of Lord Krishna by most of the Hindu families in the eastern part of India particularly in Bengal.

7.3.7.a. Canes in traditional life styles and religious practices

Now a day's ornaments made of split cane have become popular among young women in the rural areas especially in the Kalimpong and Darjeeling district. Some species of canes are used in tribal rituals and festivals too. To Bengali Hindus, a small specially designed container made of Pani Bet (*Calamus tenuis*) known as 'Kunke' when filled with newly harvested paddy symbolizes Lakshmi, the Goddess of prosperity. In Bengal during 'Nabanya'

a harvesting season, the Kunke filled with fresh paddy replacing the previous year's collection, wrapping with new cloth is worshipped.

During the marriage ceremonies of Hindus in West Bengal, the Bridegroom puts a little vermilion on the Kunke first then the vermilion attached to the side of the Kunke is put on the forehead of the bride to accomplish their marital bonding. Canes are also used for making the frame work clay images of Hindu God and Goddesses, but at present due to the high cost of canes, frame work are made with split bamboos as a substitute. Ethno botanical studies of Palms in India is yet to take shape and may probably get the foot hold on this rapidly expanding subject in future when ethno botanical uses of Indian palms will eventually become better known. According to our present estimate about 18 species of *Calamus*, two species of *Daemonorops* and 2 species of *Plectocomia* have different kinds of uses.

Extraction of canes from the forest is laborious process. Shorter length canes are pulled down by hand but for collecting longer canes these are to be separated from the supporting trees with the help of a tree climber to avoid damage to the middle and upper part of the cane as the lower most part of the cane is useless. The soft upper most part of the cane is also discarded because these are not suitable for making furniture frames. Canes are ready for extraction when the leaf sheath becomes detached from the stem. After harvesting leaf sheaths are removed and the entire cane is cut into 4 meter long billets which are tied together and kept in the erect position for drying.

The use of canes in India as well as West Bengal is spreading and there is no dearth of consumer demand in spite of several substitutes for cane products having come into the market.

7.3.8. Thatching: Leaves of *Cocos nucifera* and *Phoenix sylvestris*, *Trachycarpus fortune*, *T. martianus* provides roofing element for village people. Mature stem of *Borassus flabellifer* is hard and termite resistant and durable. Beams and pillars made from mature stem are in great demand in rural areas as roof support. Stem pieces are also used as fuel wood in brick kilns. leaves are used to make baskets, as thatching material, hand fans and packing materials for meat of wild boars during special occasion. Canes play an important role in the rural economy employing many people in

the remote areas, who earn their livelihood through extraction of canes, cleaning and processing. In Darjeeling Himalaya strong and long canes of *Plectocomia assamica* are used for hanging cane bridges over streams and rivers. The tribal people of North Bengal extensively use long canes like *Plectocomia* and *Daemonorops* for making cane bridges and as thatching material. The leaves of *Nypa fruticans* are also used for the same purpose. Thatching materials are prepared from the stripped leaflets. After having been thoroughly dried the thatches are secured to the framework of the roofs by lashings of *Pandanus* leaves (Fig. 79 J, K, O; 80 A,B,C).

7.3.9. Broom, ropes, mats and others: *Wallichia disticha* and *Borassus flabellifer* are very common palms in West Bengal but has much commercial and aesthetic value for making brooms. The leaf of *Phoenix sylvestris*, *P. dactylifera*, *Cocos nucifera*, *Borassus flabellifer* and *Nypa fruticans* are extensively used for making mats, toys, and various types of hand crafts (Fig. 79 D,E,F,G,H,I). These species are also used for making mats, baskets, trays, screen, fishing baskets and fancy materials. The thick canes are used for making furniture and frames, walking stick, police sticks, umbrella handles. Batons Coconut husk is now used as potting medium while the fibres have great demand in the manufacture of ropes, mats, rubberized mattress for cots and various other furnishing items of great commercial value. Coconut leaves are used for making brooms. Leaves are stripped off leaving the veins, and are tied together to make the broom. Leaf sheath fibre of *Caryota urens* and *Caryota obtusa* has multifarious uses for making ropes and brushes. Unopened leaves of *Borassus flabellifer* are soft therefore used for making baskets and various other fancy handicrafts. The leaf base of Palmyra palm yields high quality fibres for industrial purposes. About 80% of this raw fibre is exported to Japan and the western countries and serve as a good earning source for India (Davis 1985). The other parts of the tree are also useful as unopened leaves are collected from the semi wild palms from the village and leaf blade is separated from the midrib and are cut into two halves with the help of hatchets. The middle part is then separated from the midrib, boiled and softens which is then dyed, red, blue or pink then dried to make different fancy items. Mature leaves are cut and made into hand fans which have great demand as household item. Immature leaves of *Phoenix sylvestris* are used for making baskets, brooms and floor mats. At present, stems of felled sugar date palms are used as fuel to fire the earthen pots and tiles. Several tile manufacturing unit in eastern India use logs of *Phoenix sylvestris* in their furnaces as the cost of coal is

higher. *Phoenix acaulis* and *Phoenix loureirii* are useful for their leaves and stems. Leaves of both palms are used by the villagers for making baskets and brooms. The price of brooms made from leaves of *Phoenix loureirii* in local market in matigara and other places is about Rs 10 or more depending on the size. *Phoenix rupicola* or the cliff date palm grows in the mountainous forests of Darjeeling Himalaya is gradually losing its natural habitats. Leaves of *Licuala peltata* has great demand, the local people of North Bengal and in Bangladesh use the large leaves as rain hats, baskets, mats etc. Fresh nut of *Livistona jenkinsiana* is used by the Mikir tribes as masticator. Canes are recognized as one of the most useful forest product in India. From utility point of view, their position is next to timber and possibly equal to that of bamboo (Basu 1985). Split strings slender canes *Calamus longisetus*, *C. latifolius* are used as cordage and dragline for catching fishes. Strong but slender canes are used for making bows and arrows. A section of three meter long cane, when cut and held vertically, yields sap that trickles down the cut end. A two meter long piece of *Plectocomia himalayana* provides enough potable water to quench the thirst of four workers in dry season (Basu 1992). Urban people are employed in the small scale industries and cottage industries manufacturing cane furniture and other articles. The thick canes are used for making furniture frames, walking sticks, police sticks, umbrella handles and batons. Split canes are largely used for making seats and back of chairs, lamp shade and many other fancy items.

7.3.10. Furniture industry: Palm producers, dealers and artisans are earning a lot by commercial exploitation of this fat growing forest resource. Depending on size, 24 species of palms and canes are extensively used in industries; thicker varieties for making walking sticks, alpenstocks, umbrella handles, chair, table, sofa and the thinner ones for making containers for paddy, rice, wheat etc. and baskets in the tea gardens. According to our present estimate about 14 species of *Calamus*, two species of *Daemonorops* and 2 species of *Plectocomia*, *Cocos nucifera*, *Borassus flabellifer*, *Phoenix sylvestris*, *Trachycarpus fortune*, *Areca catechu* and *Caryota obtusa* have different kind of uses in furniture industry (Fig. 77).

7.4. DISCUSSION

A total 50 species covering 19 genera of the family Arecaceae have been recorded through the present ethnobotanical survey for the use of palms among the tribal and other traditional people living nearby to such habitats. In addition to their use as food, fodder,

medicine, House building materials, Thatches etc. (Table 24) palms also provide suitable habitat for breeding and sheltering places of varied aquatic fauna. Maximum 33 edible palms are used by local people, similarly 12 palms used as fodder, 8 species are used as medicine, 7 palms are highly important for local tribes, and they use them as building and fencing materials. Some palm fruits and leaves used as religious purposes and another 11 palms are used as thatches (Fig. 75).

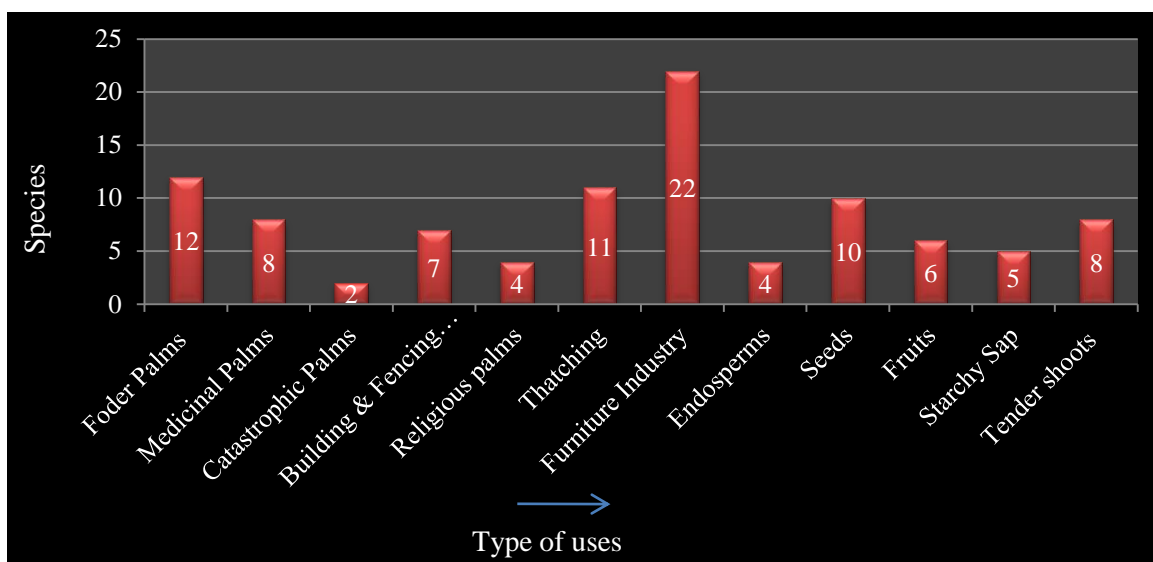


Fig. 75: Graphical representation of palms and their uses

All these characters of palm vegetation are related to the economy and survival of local people and their sustenance is, almost fully, dependent on palms as well as rattans.

Table 24: Palms and their local name, plant parts utilized, end use, extent of utilization status and cultivation status

Scientific name	Plant parts utilized	End use	Extent of utilization	Cultivation status
<i>Areca catechu</i> [Supary, Gua]	Seed	Masticatory, medicine	Local, commercial	Plantation and experimental
<i>Areca triandra</i> [Gua]	Seed	Masticatory	Limited, non-commercial	Experimental
<i>Arenga micrantha</i>	Seed	Masticatory	Limited	
<i>Borassus flabellifer</i> [Tal, Wine palm]	Seed, stem, Inflorescence	Sweet sap, stem as pillar	Widely used	Plantation and as semi wild
<i>Calamus acanthopathus</i> [Gouri bet]	Cane	Rough baskets, cane bridges	Limited	None

<i>Calamus erectus</i> [Kadam bet]	Cane, leaves seed	Posts, pillars, furniture frames, leaves as thatch	Widely used	Experimental cultivation
<i>Calamus flagellum</i> [Putti bet, rabi bet]	Cane	Baskets, etc	Limited use by tribal peoples	None
<i>Calamus floribundus</i>	Fruit, cane	Fruits edible, making baskets	Limited use by tribal peoples	None
<i>Calamus gracilis</i> [Chuli bet]	Cane	Basketry, making chair, seats & suspension bridge	Limited used	None
<i>Calamus guruba</i> [Sundi bet, onabi bet]	Cane	Basketry, split canes for chair seats	Widely used	Experimental in West Bengal
<i>Calamus inermis</i> [Rong bet]	Cane	Chair frames, police sticks	Widely used	None
<i>Calamus khasianus</i>	Cane	Chair, bottoms and frame works	Widely used	None
<i>Calamus kingianus</i>	Fruit, cane	Furniture making	Widely used	Experimental
<i>Calamus latifolius</i> [Ruebee, korak bet]	Cane	Rough baskets	Widely used	Experimental
<i>Calamus leptospadix</i> [Dangri bet, rabi bet]	Cane	Rough baskets, split canes for chair seats	Widely used	Experimental
<i>Calamus nambariensis</i> [Hoka bet]	Cane	Furniture frames	Widely used,	None
<i>Calamus longisetus</i> [Jungli bet]	Fruit, cane	Rough baskets	Local, commercial	Experimental cultivation
<i>Calamus tenuis</i> [Pani bet, Jati bet]	Cane, young shoots	Rough baskets, young shoots edible	Widely used	Experimental
<i>Calamus pseudoerectus</i> [Otla bet]	Leaves and fruit	Thatch and seed eats for diabetes	Local	None
<i>Calamus viminalis</i> [Bara bet, hasali bet, kiring bet, baghi bet]	Cane fruit	Rafts; chair frames; split cane for chair seats; fruit edible	Widely used	Experimental cultivation
<i>Caryota mitis</i>	Starch from the stem, leaf sheath fibre	Brooms	Locally used	None commercial
<i>Caryota obtusa</i>	Stem starch	Used as brooms	Widely used	Non Commercial
<i>Caryota urens</i> [Bherli mad]	Sap, starch from stem, leaf sheath fibre	Brushes, brooms, etc	Widely used	Non- commercial
<i>Cocos nucifera</i> [Narel, narikel]	Fruits , leaf, stem, sap	Endosperm for oil, mesocarp for fibre, fuel, leaves for thatch, fibre, stem for wood	Widely used	Plantation and experimental
<i>Daemonorops jenkinsianus</i> [Golak bet, cheka bet]	Cane	Chair frames, baskets	Widely used	Experimental in North Bengal
<i>Daemonorops teraiensis</i> [Kara bet]	Cane	Posts, pillars, furniture frames, leaves as thatch	Widely used	None

<i>Licuala peltata</i> [Kurid, patti]	Stem leaves	Pillars; thatch for houses; leaves as umbrella in hilly regions	Widely used	Cultivated as ornamental plant
<i>Livistona jenkinsiana</i> [Toka pat, takau-araung]	Leaves	thatch , umbrella, hats	Widely used	Tribal people cultivate in Arunachal Pradesh
<i>Nypa fruticans</i> [Gulag, gol patta]	Leaves Sweet sap	Thatching Syrup	Widely used Limited	Experimental cultivation
<i>Phoenix acualis</i> [Khajur]	Fruit, pith, leaves	Fruit pulp edible, pith made into short of sago starch; thatching, rope, brooms	Widely used	None
<i>Phoenix loureirii</i>	Fruit, leaves	Thatching, brooms	Limited	None
<i>Phoenix paludosa</i> [Hetal]	Stem, leaves and fruit	Stem sued for religious purpose, fruit edible	-	-
<i>Phoenix rupicola</i> [Khajur]	Fruit, stem produce starch, leaves	Thatching and brooms	Limited	Ornamental cultivation
<i>Phoenix sylvestris</i> [Desi khajur]	Fruit, stem, Leaves	Fruit pulp edible, pith made into short of sago starch, thatching, rope, brooms	Widely, commercial	Widely cultivated
<i>Pinanga gracilis</i>	Seed	Masticatory, medicine	Limited	None
<i>Pinanga riffithii</i>	Local use unknown	-	-	None
<i>Plectocomia assamica</i>	Cane	Used in furniture making, hanging bridges	Widely used	Experimental
<i>Plectocomia bractealis</i>	Cane	-	-	None
<i>Plectocomia himalayana</i>	Cane	Furniture making, baskets	Limited	None
<i>Plectocomia khasiyana</i>	Cane	Crude baskets, furniture making	Limited	None
<i>Salacca secunda</i>	Leaves	Thatching	Limited	None
<i>Trachycarpus martianus</i>	Stem, leaves	Thatching	Limited	Cultivated as ornamental palm
<i>Trachycarpus fortunei</i>	Flowers, seeds, trunks	Stem as pillar, rough rain coats are made from leaf segments	Widely used	Experimental Cultivation exists
<i>Wallichia caryotoides</i> [Dieng, soh-syllah]	-	-	-	Now cultivated as ornamental palm
<i>Wallichia oblongifolia</i> [Jharu patti]	Leaves	Used as thatching, Brooms	Limited	Now cultivated as ornamental palm
<i>Wallichia disticha</i> [Tashe]	Stem	Young shoot edible	Local use	Experimental



Fig. 76: *Borassus flabellifer* L. A. Pitcher (vaar) coated with lime B. Female inflorescence is covered with pitcher C. Sap collector carrying the sweet sap D. Mixing of sweet sap E. Pitcher with sweet sap F. Preparing for boiling G. Concentrated sweet sap H. Spreading sweet sap I & J. Two types of patali K, L & M. Selling patali in local markets N. Female tree.

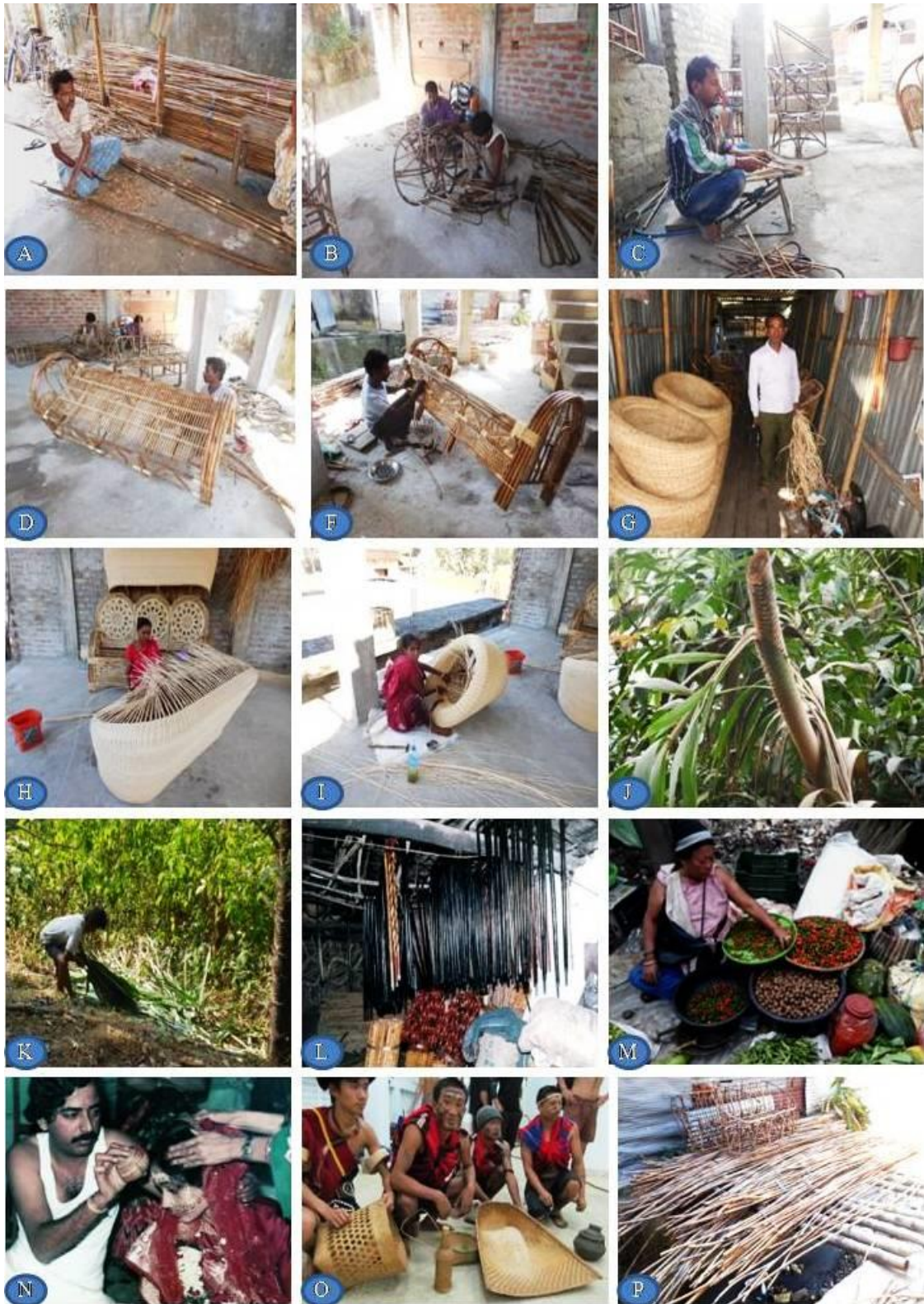


Fig. 77: A, B, C, D, F, G, H, I. Various Furniture like Chair, Sofa, Walking Sticks made form *Calamus* species J. Shoot tender of *Plectocomia himalaya* Griff. used for vegetable K. Palm leaves used for Brooms L. Walking Stick made from *Calamus* sp. M. Fruits of various *Calamus* species in a market for tribal medicine. N. *Calamus tenuis* Roxb. used during hindu wedding O. Various type of hand craft P. Cane dried by sunlight



Fig. 78: **A.** Palmyra palm (*Borassus flabellifer* L.), tapping of sap from the peduncle. **B.** Ripe fruit, Pulp, Tal furuli **C.** Hand fan made from leaf of palmyra palm. **D.** Talsas. **E.** Fancy items made from palmyra leaf. **F.** Kosha Kushi copper replica of *Areca* palms prophyll and bract. **G.** *Areca* nut in local market for sale. **H.** *Areca* nut tree.



Fig. 79: A, B. Sap Collector with date palm (*Phoenix sylvestris* Roxb.) C. Boiling of sap. D, E, F. Brooms from date palm leaves. G, H, I. Mat made by date palm leaves. J, K. Gagebo form by palms leaves L. Coconut uses in Hindu ritual M. Coconut oil. N. Hookah made of coconut shell O. Hut made by *Borassus flabellifer* L. leaves



Fig. 80: A. Gageboo of *Trachycarpus fortunei* (Hook.) Wendl. leaves B & C. Cattle houses thatch by *Borassus flabellifer* L. D. *Wallichia caryotoides* Roxb. leave used for brooms E. *Phoenix sylvestris* Roxb. leaves used as food storage bucket F, G & H. Various steps of Gutkha production from Seeds of *Areca catechu* L. I. *Nypa fruticans* Wurmb. leaves used for thatches