

Minor and uncultivated fruits of Eastern India

Anupam Paul
Assistant Director of Agriculture
Government of West Bengal
Biodiversity Conservation Farm: Agricultural Training Centre
Fulia: Nadia:WB: India:PIN- 741402
anupampaul99@gmail.com

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Abstract:

Rapid urbanization process has alienated man from nature. Many wild and minor edible fruit plants are on the verge of extinction; these were supplementary fruit in addition to our elite table fruits like mango (*Mangifera indica* L), grapes(*Vitis vinifera* L) litchi(*Litchi chinensis*), apple (*Malus domestica*) etc. These fruit have tremendous health benefits and these were in use in *Ayurvedic* medicine. The wild edible fruits loaded with nutrients play an important role in maintaining livelihood security for many people in developing countries and it constitute significant portion of daily diet of the people of Sub-Himalayan, Himalayan and Lateritic zones of West Bengal, Jharkhand and Odisha. More emphasis is to be given on this less unexplored fruits in relation to conservation and utilization so that the tribal people can get their due share as they have been conserving them for centuries. Food processing and supply of raw material for preparation of *Ayurvedic* medicine would be the major thrust for popularizing these fruit crops in the Decade of Biodiversity Conservation 2011-2020.

Key words: Wild and minor fruits, domesticated, cultivated, nutritive value, sacred groves

Introduction:

Since time immemorial, edible wild fruits have played a very vital role in supplementing the diet of the people of Indian Sub-continent. Apart from customary use as food, wild edible fruits have various health advantages as it potentially give immunity to many diseases. Accordingly, *Ayurveda*, the Indian Folk medicine was developed from wild fruits and plants. Major fruit crops like Mango, Litchi, Guava etc. are commercially cultivated while the wild edible fruits refer to species that are neither cultivated nor domesticated, but it come from their wild natural habitat and used as one of the sources of food (Beluhan and Ranogajec 2010). There are another category of crops called minor fruit crops that have been domesticated but not cultivated in commercial scale like *Aegel marmelos*, *Dilleniasp*, *Cassiac aranda*, *Feronia limonea* etc. Some tribal people still depend on forest for different kind of food ranging from cereals to fruits. Some fruit crops are considered minor in some places while the same fruit crops are in commercial cultivation in some other regions; here the words minor and major are relative terms. The fruits like *Ananas comosus* Merr, *Anacardium occidentale* L, *Anonas quamosa*, *Artocarpus heterophyllus*, *Punica granatum* etc. are in cultivation in some states of India but those are also found in the wild. In addition to the role in closing food gaps during periods of drought or scarcity, wild edible fruits play an important role in maintaining livelihood and nutritional security for many people in developing countries (Afolayan and Jimoh, 2009). It has been revealed that wild fruits provide vitamins, minerals, fiber, antioxidants and compounds of nutritional, gastronomic and social importance such as alkaloids, essential oils and phenolics etc. Many workers suggested that wild edible plants play a very important role in the livelihoods of rural communities as an

integral part of the subsistence strategy of people in many developing countries.

East Indian states like West Bengal, Odisha, Bihar, Jharkhand, Assam, Tripura and other North eastern states have many wild uncultivated and minor fruits. The wild uncultivated fruits constitute significant portion of daily diet among the people of Sub Himalayan, Himalayan and Lateritic zones of West Bengal, Jharkhand and Odisha. There are several common fruits in eastern India.

Table: 1 Number of wild fruit sp

States/regions	No of Fruits	Authors
Assam	29	Shadeque (1989)
Eastern Ghat region	1532	Reddy et al (2006)
Meghalaya	125	Jasmine et al (2007)
Odisha	51	Sinha & Lakra (2005)
Sikkim	27	Sundriyal and Sundriyal 2011
Tripura	86	Mazumder & Dutta (2009)
Jharkhand	13	Kala (2009)

Table I states number of wild fruits found in the North Eastern states of India. Among the states, Meghalaya has the highest number of wild fruits. One study in the state revealed that indigenous fruits contribute a portion of family diet with an average annual consumption of 73 kg per household. Sale of wild fruits contributed 15 % of income for tribal households. However; there are some common fruits in those red lateritic zones like *Madhuca indica* and *Diospyros*

melanoxylon. Since traditional knowledge on wild edible fruits is on the wane, the research on wild edible fruits is crucial to safeguarding the traditional knowledge for future societies (Mazumder, 2004, Feyssa *et al* 2011, Jadhav *et al* 2011, Lulekal 2011). Erosion of traditional knowledge of wild crop plants and disappearance crop sps is synonymous to rapid modernization what is termed as GDP based development. Documentation, conservation and revalorizing indigenous knowledge on wild edible and minor fruits is urgently needed to promote nutritional health of the local inhabitants and urban people. It helps in restoring genetic and cultural diversity. People are to be made aware of the loss of crop diversity due to anthropogenic activities.

Materials and Method:

After visiting some of the states, primary information of minor and wild fruit was collected from different relevant literature, books, internet and secondary information pertaining to usage was taken from local people of West Bengal, Odisha, Jharkhand, Tripura and Assam. Basic information on the wild and minor fruit was collected giving less emphasis on different lime and lemon varieties. Popular Indian name (Hindi) of fruit crops has been used. One particular fruit crop may have several species and varieties but one particular widely available species has been considered. In order to accommodate vast array of information, a small representative list of wild and minor fruits has been prepared. Table III describes basic information on minor and wild fruits.

Results and Discussion:

1. The Vanishing Wealth:

The western mono culture mode of food production, known as Green Revolution in 1960s ushered a new era in the field of agriculture. It has not only pushed to extinction about 90% thousands of indigenous Indian rice varieties but also has led to expunge the mixed cropping, crop rotation and diverse crop cultivation (Deb, 2005). Farmers become accustomed to grow single fruit varieties like cereal crops for their convenience of interculture. Crops are grown on the basis of market demand not on the basis of traditional culture and agro-ecological condition. Conventional research aims at basically on fertilizer and pesticide management not on nutritive qualities, conservation and characterization of wild and minor crops. The traditional knowledge and wisdom of local people on agriculture are now pushed into oblivion through disuse (Paul 2002). Owing to rapid urbanization, the children of the nuclear families living in cities are denied of uncultivated but domestic minor fruits and wild fruits as they have no access to such fruits. School text books do not mention these minor fruits as the western mode of education do not recognize them worth reading. Various authors have mentioned that the wealth of traditional knowledge pertaining to these plants has also disappeared (Cleaveland *et al.*, 1994). Some fruits like *Flacortia indica*, *Lantana camera*, *Inga dulcis*, *Buchanania lanzan*, *Morus nigra* etc. were particularly eaten by the village children. But these are being lost from the villages due to rapid urbanization and felling of trees. Several mango and jackfruit varieties have already been vanished from the world. Several elite fruit crop varieties along with wild and minor fruits are under threat of extinction. The North Eastern states of India where so called western method of agriculture has not yet reached fully and rapid urbanization is not so rampant may boast of protecting the vast treasure of wild edible crops.

2. Nutritive Quality of Wild and Minor Fruits:

Analysis of nutritive qualities of wild and minor fruits has gained momentum. Nutritive quality may vary from species to species and it is also depended on soil and prevailing environmental condition. The table 2 shows the major nutritive value of some selected fruit crops. It reveals that minor and wild fruits are no less than so called elite commercial fruits like mango, apple and banana. Loquat contains substantial amount of beta carotene, potassium, calcium and phosphorus as compared to elite fruits like apple, mango etc. But the nutritional qualities are not projected towards the consumers. Moreover, these minor and wild fruit crops do not require special care and fertilization. Generally urban elite people consider them inferior fruit as those are eaten by poor people living in jungles.

Any wild edible crop can be elevated to the status of an elite *international* crop through state sponsored propaganda. For example, the Kiwi fruit was not known to New Zealand and other parts of the world until 1904 when a director of a New Zealand school (Ms Mary Isabel Fraser) visited China and took the vines of Chinese goose berry (*Actinidia chinensis*), a wild fruit of Yangtze Valley of China and planted it in her garden in New Zealand. It was named after the flightless Kiwi bird of New Zealand. Eventually, the fruit became so popular that commercial growers became interested. There were several research works on the nutritional aspect and health benefit of the fruit. Massive campaign in favour of the fruit went on through the media and people become attracted to this fruit. Thereby cultivation of the fruit has started in other

parts of the world and in India as well. Such exploration of wild and minor fruits is to be encouraged in the Indian Sub-continent as it is abound with several nutritious fruit crops. As per the USDA Nutrient Data base of KIWI fruits, many wild Indian fruits are no less than Kiwi fruit.

Seal (2012) has studied different wild edible plants of Meghalaya state of India and found that a mature fruits of *Elaeagnus latifolia* L is widely used in Assam, Meghalaya, Manipur. It contains 14.8g protein, 13.6gK, 172mg Fe, 5860 mg Ca per 100g of fresh fruit and a nutritive value of 3702.73 (kcal/kg). *Elaeagnus pyriform* is also relished by the local people. It has a great nutritive value of 3827 kcal/ kg and contains 6260 mg Ca, 23 g protein per 100 g fruit pulp. But these findings are not widely known and the fresh fruits and its product are not made available in other parts of India like Kiwi. Acetone extract of a Meghalaya fruit *Myrica esculenta* has the highest amount of phenolic compounds (antioxidants) exhibited the greatest reducing power and radical scavenging activity. The acetone extract of *Elaeagnus latifolia* L contains the highest amount of flavonoids and flavonols (antioxidants also showed strong radical scavenging activities (Seal, 2011). Different surveys showed that 40% of total fruits sold in the market of Meghalaya belong to wild fruits. Bhoumick (2012) showed brighter prospect of *B sapida* in N E states of India, it contains more Vit C than Orange. Tribal people have been conserving it since millennia being aware of forest conservation and it is prior to enactment of Forest Protection Act. Kala (2011), Mahapatra *et al* (2012) and Mazumder *et al* (2009) have showed the significance of wild fruit diversity for indigenous people.

3. Conservation Effort:

Owing to rapid urbanization and encroachment on forest land, uncared village jungles and sacred groves many wild and minor fruit trees and shrubs are disappearing rapidly and become threatened species. It is to note that sacred groves is a forest patch in a jungle or near a village considered sacred, villagers are not allowed to take any leaf or fruit, dry leaf and branches except in case of emergency, it serves as a repository of biodiversity and it is means of conservation. Prior to enactment of Forest Protection Act etc, different tribal people in India have been conserving our rich biodiversity for centuries. Aggressive advertisements in media for western food, "cold drinks" (containing no fruit pulp) and health drinks have made even the village people to ignore and forget these fruit crops which were easily and locally available. During the Islamic rule in India and in Bengal in particular, the kings used to admire fruit trees specially mango. In Indian state of West Bengal, the kings maintained big orchards and conserved several varieties of mango. After about 40 years of independence, Government institutions and universities have realized the importance of crop conservation. Meanwhile, several varieties of indigenous fruits have become extinct. However, Botanical Survey of India has documented various wild and minor fruit crops (Roy *et al.* 1998). National Bureau of Plant Genetic Resources (NBPGR), a wing of Indian Council of Agricultural research was established in 1976 with 10 regional stations. Government of India has enacted Biodiversity Act in 2002 for documenting and protecting the crop biodiversity from bio-piracy. Germplasm collection of underutilized fruit crops has received less priority in comparison to the field crops. A report of NBPGR (edited by Malik *et al.* 2010) stated that germplasm of these fruits species have been collected at various horticultural organizations to identify promising genotypes for high yield and good fruits quality. Overall 2552 accessions of 16 underutilized fruits being discussed in this publication have

been collected by various organizations in India and national identity (IC Numbers) have been obtained from the NBPGR since 1976. These include *Aegle marmelos* (57), *Buchanania lanzan* (187), *Capparis decidua* (118), *Carissa* species (50), *Cordia* species (134), *Diospyros melanoxylon* (24), *Emblica officinalis* (159), *Garcinia* species (541), *Grewia* species (36), *Madhuca indica* (153), *Manilkara hexandra* (74), *Pithecellobium dulce* (24), *Salvadora* species (207), *Syzygium cumini* (198), *Tamarindus indica* (248) and *Ziziphus* species (342). Several farmers group, individual farmers are aware of the erosion of genetic loss along with local food security. They are trying to promote those fruits in their respective habitat. Table 3 showed a list of those minor and wild fruit crops. There are several fruit trees having multifarious use. *Madhuca latifolia* is an important multiple-use tree of all red lateritic belts of WB, Odisha, Jharkhand, Bihar etc. Its fallen flowers collected during the month of March-April are mostly used by the tribal people for making alcoholic beverages and refreshing drink. The light green thick peel of immature fruits is used as vegetable. Ripe fruit is not used widely but used mostly by the children. Edible oil is extracted from the seed and the oil cake is used in agricultural field and in fishing ponds. It thrives in hot weather and provides a good shade for the villagers. Leaves and trunk of the fruit trees of Arecaceae family (*N. fructicans* and *Borassus flabellifer*) are used for house making. Gopalan *et al* (2004) has mentioned the nutritive value of different Indian foods and public awareness is to be generated along with this line.

Table 2: Nutritional quality of some minor and wild fruit in comparison withMango, Banana and Apple

Fruit	Crude Protein g/ 100	Fat g /100	Crude fibre g/100	Carbo-hydrate g/100	Ca mg/100	K mg/100	Na mg/100	P mg/100	Fe mg/100	Vit C mg/100	Vit A (IU)
<i>Aegle marmelos</i> Correa	2.2	0.29	2.9	29	85			50	0.6	9.11	92
<i>Cordia myxa</i> L	1.9	1	2	16	20	26		26	5		
<i>Zizyphus mauritiana</i> Lam	2	1	2	93	60	589	154	585	7	88	
<i>Averrhoa bilimbi</i> L	1.04	0.33	2.8	6.73	4	133	2	12	0.08	34.4	61
<i>Syzygiu mcumini</i> Skeels	0.7	1.5	0.6	15	8			15	1.62		--
<i>Eriobotrya japonica</i> Lindl	0.43	0.2	1.7	12.14	16	266	1	27	0.28	1	1528
<i>Grewia asiatica</i> Mast	1.3	1.8	1.5	15	129	350	4	3.9	3.1	22	800
<i>Morus alba</i> L	1.44	0.39	1.7	9.8	39	194	10	1.85			
<i>Malus domestica</i>	0.26	0.17	2.4	13.81	6	107	1	11	0.12	4.6	98
<i>Musa paradisiaca</i> L	1.09	0.33	2.60	22.84	5	358	1	22	0.26	8.7	64
<i>Mangifer indica</i> L	0.5	0.27	1.8/	17	10	156	2	trace	0.13	27.7	765

Source: USDA National Nutrient data base (<http://www.nal.usda.gov/>) and Maliket *al* (1998), Mitra *et al* (2008)

Table 3: A representative list of minor and uncultivated fruits of Eastern India

Common Indian English name of the Fruits (A)	Scientific name and Family (B)	Description (C)	Yield Fruit/ tree (D)	Origin and Distribution (E)	Usage and Remark (F)
<i>Anola</i>	<i>Phyllanthus embelica</i> L Phyllanthaceae	Medium sized tree with small leaves, fruit matures in Jan – Feb.	1500-2000 nos	India Throughout India	Wild and domesticated, sour, rich in Vit C and Ca, fruits each weighs 30-50 g
<i>Ber/Kul</i> Indian Plum/ Jujube	<i>Zyzyphus mauritiana</i> Lamk	Thorny tree , matures in Jan - Feb	Eaten raw, 100kg fruits	India, S-E China MP, Jharkhand, Odisha, WB, Assam	Cultivated, minor, good nutritive value, eaten fresh, 15 varieties are there
<i>Bilimbi/Carambola</i> Tree Sorrel	<i>Averrhoa caribaea</i> L Oxalidaceae	Big tree, elongated cucumber like fruits are in cluster, yellowish green when ripe,	500 fruits,	Indo-China, Indo-Genetic plain, Assam	Wild and domesticated, sour in taste, used as <i>chutney</i> , high Vit C
<i>Golap Jamun</i> Rose Apple	<i>Syzygium jambos</i> L (Alstone) Myrtaceae	A big shrub, small-to-medium-sized tree, 15 m ht, with a tendency to low branching. Ripe fruit gives rattling sound on shaking. The skin is thin and waxy. The flowers are like guava and it matures in June-July.	400 nos	South East Asia WB, Assam, Bihar, Jharkhand, Meghalaya	The flowers are fragrant. The ripe fruit has a strong, pleasant rose flower like smell hence the name Rose apple. Finds good market.
<i>Anjir</i> Fig	<i>Ficus racemosa</i> L Moraceae	Big tree, reddish fruit bears on the trunk	100 kg	Asia minor Assam, WB, Tripura, Meghalaya	Domesticated and wild, apart from ripe fruit ,green fruits are eaten as vegetables not much in use as fruit
<i>Karonda</i>	<i>Cassia caranda</i> Linn Apocynaceae	Shrub, fruits ripe in July August	10kg fruits	Indo – Java, throughout India	Minor, domesticated ,sour in taste, rich in Vit C used as <i>chutney</i> ,
<i>Kokam</i> Mangostene	<i>Garcinia mangostene</i> L Guttiferae	Medium sized tree, dense canopy, fruit matures in April- May, fruits are berry, globose	500 fruits	Malaya WB, Assam	Minor, domesticated, used for dying and strengthening the cotton thread of fishing net , rich in antioxidants
<i>Lateku/ Latka</i> Burmese grape	<i>Baccarua sapida</i> MuellArg Euphorbiaceae	Matures in July-July, the fruit is used for ritual purpose during the Holy Chariot procession of Lord Jagannath.	70kg fruit	Burma region WB, Assam Meghalaya, Tripura	Minor and domesticated, also used as medicine and wine, edible seed with pulpy aril, eaten fresh
<i>Paniala</i> Governor Plum	<i>Flacortia indica</i> Merr <i>Flacortia jangomas</i>	Thorny shrubby hedge, 2mt height	2-3 kg	India Assam, West Bengal	Wild, Fruits are generally improved by rolling between the palms

	Flacortiaceae				beforeeating, excess eating may give narcotic effect.
<i>Sitaphal</i> Custard apple	<i>Annona squamosa</i> L Annonaceae	Shrub like tree, with small leaves, fruits have gritty structure with grainy pulp, matures in Sept-Oct	100 fruits,	Tropical America WB, Odisha, Jharkhand ,MP etc.	Wild and domesticated, leaves have insecticidal properties, eaten raw, good taste,
Bread fruit	<i>Artocarpus altilis</i> (Park) Fosb Moraceae	Big tree, like jack fruit, large pinnate leaves, latex	50-80 fruits	Malayan Archipelago Lateritic zones on India	Wild and minor, rich in Ca, beta carotene
<i>Balatha</i> Lasura	<i>Cordia myxa</i> L Boraginaceae	Shrub, the fruit mature during July-August. Grow in different agro-climatic condition; It is a kind of a drupe, light pale to brown or even pink in colour. Used in <i>Ayurveda</i> . Tolerate arid weather	20 kg fruit	Asia/ Africa Different parts on India WB. Assam, AP,	Fully ripe fruit is quite sweet in taste having mucilaginous pulp and is fully enjoyed by children. The pulp in a half ripe fruit can even be used as an alternative to paper glue in office work.
<i>Latabel</i> Passion Fruit	<i>Passiflora edulis</i> Sims Passifloraceae	Vine, similarity with passion flower, fruit is juicy with seeds having a flavour. Trellising is needed, flowers throughout the year, three months crop	60-80 fruits/ vine	Brazil WB, Assam, Meghalaya	Minor, domesticated, good source of beta carotene, Vit C and iron. Lesser known. Gives fruiting after 10 months, live up to 6 years
Loquat Japanese Plum	<i>Eriobotrya japonica</i> Lindl Rosaceae	Medium sized ever green tree, with short trunk, 10 m ht, matures in early spring , small round shaped yellow fruit	50 kg	Central China, Japan WB, States of N-E, Assam, Tripura	Wild and domesticated, eaten fresh, good taste
Mulberry	<i>Morus alba</i> L Moraceae	Small sized tree, small cylindrical black-reddish fruit, leaves used for feeding the silk moth larva	3-4 kg	North China WB, Assam, N-E states,Odisha, Karnataka	Domesticated, small fruits, eaten by small children, good taste birds, used for jam fodder and green leaf manure.
<i>Ramphal</i> Custard apple	<i>Annona reticulata</i> L Annonaceae	Medium sized tree, bigger leaves, smooth fruit with hexagonal markings, grainy pulp, matures in Mar- April.	80-100	Tropical America WB, Odisha, Jharkhand ,MP etc.	Wild and domesticated, fruits are eaten raw, preferred by children
<i>Phalsa</i>	<i>Grewia asiatica</i> L Masters Tiliaceae	Medium tree, small fruits. mostly relished by small children, drought tolerant,	4-8 kg	India WB, Assam and Odisha,	Wild, domesticated, good market price, used as filler plants in Mango orchard
West Indian Cherry	<i>Malpighia puniceifolia</i> L Malpighiaceae	Medium sized shrub, 4 m ht, withstand drought	10-15 kg	South America WB, Assam ,Tripura	Wild and cultivated, richest sources of Vit C, lesser known

<i>Amra</i> Hog Plum	<i>Spondius cythera</i> Sonn Anacardiaceae	Deciduous Tree, immature fruits are used in culinary art , July-Aug, immature fruits are eaten in culinary art, July Aug	30 quintal	Polynesia WB, Assam, Meghalaya, Tripura	Sour, used in Chutney, <i>Ayurvedic</i> properties,
<i>Anshfal</i> <i>Longan</i>	<i>Euphoria longan</i> Lamk Sapindaceae	Big tree, matures in June, like litchi smaller in size but the pulp is less.	30kg	Indo Burma Region Assam, WB, Tripura	Wild and domesticated There are 300 varieties in China, eaten fresh, good taste
<i>Bakul/ Maulsari</i> Spanish Cherry	<i>Mimusops elengi</i> L Sapotaceae	Tree with dense leaf canopy, used as shade tree in gardens. The orange-red fruit is hairy. Matures in April – May. Small fruits, each weighing 10-15 g.	10 kg	South Asia WB, Assam, Jharkhand, Tripura	Wild and domesticated, having <i>Ayurvedic</i> properties. It is eaten mostly by children.. The wood is extremely hard, strong and tough, and rich deep red in color.
<i>Batabi</i> Pumello	<i>Citrus grandis</i> Osbeck Rutaceae	Big sized fruit,500g- 1kg	50 fruits	S-E Asia WB, Assam, Odisha	Domesticated, sweet , eaten fresh
<i>Bon Am/</i> Wild Mango Himalayan Mango	<i>Mangifera sylvatica</i> Anacardiaceae/ Irvingiaceae	Evergreen trees, up to 25 meters, threatened species, fruit is very elongated	50 kg	India Nepal, Assam, Meghalaya, Tripura	Mainly used for jam , pickle
<i>Chalta/karambel</i> Dillenia	<i>Dillenia india</i> L Dilleniaceae	Big tree, fibrous calyx is eaten, matures in Jul- Aug	80-100	Assam, WB	Used for chutney
Durian	<i>Duraize bethinus</i> Bombaceae	Big tree, like jack fruit sweet aril with pulp but unpleasant odour	100-200 kg	Burma WB, Assam, Odisha, Meghalaya	Unpleasant smell,, eaten fresh, used as jam ,jelly, gives energy.
<i>Jalpai</i> Olive	<i>Elaeocarpus floribunda</i> Elaeocarpaceae	Medium sized tree, fruit matures during Sept –Oct, fruit is light green drupe, 2 to 5 cm long and 1.5-2.5 cm in girth. Both ends of fruit are pointed, outer surface smooth having a mesocarp fleshy	30-40 kg	Madagascar WB, Assam, Tripura, Meghalaya	Wild and domesticated, sour, used as chutney, rich in Fe
<i>Kayeth Bael/Kaitha</i> Elephant apple	<i>Feronia limonea</i> LSwingle Rutaceae	Big tree, fruits have a hard cover, matures Sept-Oct, succulent placenta and inner pericarp is eaten	1000 nos	India/ Sri Lanka WB, Assam, Jharkhand, Tripura	Wild and domesticated, sweet and sour, eaten fresh <i>Chutney</i> , bark has insecticidal properties.
<i>Putus</i> Spanish flag	<i>Lantana camera</i> Vervinaceae	Shrub with small thorns around the stem.	300g	Central America WB, Assam, Tripura,	Invasive alien sp, grown road side, small fruits are edible preferred by

				Jharkhand, Bihar	children, leaves have insecticidal properties.
<i>Bael</i> Stone apple	<i>Aegel marmelos</i> L Corr. Serr Rutaceae	Big deciduous tree, takes 11 months to mature in Mar- April, having hard shell, Numerous hairy seeds are encapsulated in a slimy mucilage, yellow pulp, one big fruit may weigh 1kg	500 nos	India WB, Odisha, Jharkhand, Assam, lateritic belts of India,	Widely used in <i>Ayurvedic</i> medicine, good laxative, mature and immature fruit is eaten, ripe fruit eaten fresh, Sacred tree for the Hindus. thrives well in extreme high and low temperature
<i>Bilati</i> Amra Hog Plum	<i>Spondius pinnata</i> Kurz Anacardiaceae	Deciduous Tree, immature fruits are used in culinary art , July-Aug , fruit is bigger than <i>S cythera</i> ,	40 quintal	Tropical Asia WB, Assam, Meghalaya, Tripura	Sweet and sour, eaten raw with salt, used in Chutney, immature fruits are eaten in culinary art, July-Aug
<i>Imli</i> Tamarind	<i>Tamarindus indica</i> L Leguminoseae	Big tree, 20-25 m ht, elongated ripe fruits matures in Mar-April, provides good shade	5-10 qtl	India Indo Gangetic plains, WB, Assam, Odisha	Sour taste, raw consumption is less, used in culinary art, chutney, rich in K, Ca, P and Vit C
<i>Jangli</i> <i>Badam</i> Wild Indian Nut	<i>Sterculia foetida</i> L Sterculiaceae	The branches are whorled and usually horizontal, with palm like leaves gracefully up-curved and crowded at the ends with large. Fruit is an aggregate of follicle of 1-5, scarlet, boat shaped, woody. The seeds are edible after toasting and taste like chestnuts ,	100 nos	East Africa/ Tropical Asia WB, Assam, Jharkhand	The seed contain oil used as medicine, the timber is used for making furniture and the bark for rope.
<i>Jilipfal</i> / <i>Ganga imli</i> Sweet Tamarind	<i>Inga dulcis</i> Roxb Fabeace	Big tree also known as Madras thorn, drought resistant, gives fruiting in April –May.	100kg	Mexico/ Central America WB, Bihar, , Assam Jharkhand, Tripura	Wild, fruits are like tamarind pod with reddish coating, pulp is spongy, eaten mostly by children
<i>Mahua</i>	<i>Madhuca latifolia</i> <i>Madhuca indica</i> Sapotaceae	Big tree, culturally associated with native people of lateritic belts, flowering starts from Feb-Mar, fallen flowers are collected by native people, fruits mature in Jun-July.	100 kg	India WB, Odisha, Jharkhand	Wild, ripe fruits are not popular, eaten by cattle. Seed is used for edible oil, flowers are used in various ways. Flowers used for alcoholic beverages.
<i>Tendu</i> / <i>Kendu</i>	<i>Diospyrus melanoxylon</i> Roxb.Ex.A Ebenaceae	Medium sized tree, round shaped yellow fruits mature in April-May	12-15kg	India WB, Odisha and lateritic belts	Wild, eaten fresh, sold in the local market, leaves are use in wrapping <i>BIDI</i> (a kind of local cigar)

<i>Vella/ Bhallatak</i> Marking nut	<i>Semeocarpus anacradium</i> Anacardiaceae	Big deciduous tree, like cashew nut, used in Ayurveda, sometimes it causes allergy.	20 kg	India WB, Odisha, Jharkhand	Wild, hypothalamus is eaten but it may be allergic to some people. Washer men use it to mark the clothes.
<i>Dampel/Asan Kandis</i> False Mangostene	<i>Garcinia xanthochymus</i> Hook Clusiaceae	Big tree, fruits, soft, light yellow, grows in axils of branches, edible arils, pointed at rear end.	30 kg	India, Burma WB, Assam, Odisha	Used as jams, and curries. The dried fruit sap is called gamboge and provides a dye that is used in water color paints. Medicinal value
<i>Jamun</i> Wild Jumun	<i>Syzygium cuminii</i> L Skeels Myrtaceae	Big tree with dense foliage proving shade along the road side, soft black fruit with skin and pulp not separable.	50 kg	India Indo Gangetic plains, WB, Assam, Odisha	Highly perishable, eaten fresh, rich in Iodine, seed is used to cure diabetes, leaves used as fodder, one of sacred fruits of the Hindus.
<i>Khejur</i> Wild Date	<i>Phonix sylvestris</i> L Roxb Arecaceae	Date palm tree, thrives well in drought condition, fruits matures in May- June, small brown clouded fruit having less flesh,	50 kg	India WB, Assam, Odisha, Jharkhand	Wild cultivated and domesticated. sweet xylem sap is collected during winter months for making molasses and alcoholic drink
<i>Nour/Hariphall</i> Star Gooseberry	<i>Phyllanthus acidus</i> L Skeels Phyllanthaceae	Medium sized tree, small pendulous ribbed fruits grow in clusters from branches, like grapes. Fruits appear simultaneously with the flowers and produce fruit twice a year.	15 -50 kg	Malay/ Madagascar India WB,, Tripura, Manipur, Meghalaya	Wild and domesticated, Eaten raw with salt, rich in vit C, used as pickles.
<i>Rambutan</i>	<i>Nephelium lappaceum</i> L Sapindaceae	Medium sized ever green tree, matures in July-Sept, ellipsoidal fruit in cluster, like <i>litchi</i> with small hairs over it aril,		Indonesia WB, Assam, Meghalaya	Threatened sp, Eaten fresh as dessert, high vit C used as syrup, Juicy pulp
<i>Rasbhari</i> Cape Gooseberry	<i>Physalis peruviana</i> L Solanaceae	Herb, small seedy berries with papery calyx, resembling a miniature spherical yellow tomato. it is about the size of a marble about 1-2 cm in diameter. Like a tomato, it is bright yellow to orange in color, good shelf life	1-2 kg	Peru/ Columbia WB, Assam, and other parts of India	Recently introduced and cultivated in small pockets, rich in Vit C, used in folk medicine, used as jam
<i>Taal</i> Asian Palmyra palm/ Toddy palm	<i>Borassus flabellifer</i> L Arecaceae	Branch less palm, matures in July-Aug, the ripened fibrous outer layer of the palm fruits can also be eaten raw, boiled, or roasted. Immature fruit is cut and three jelly like seeds are eaten after removing	200 fruits,	Indian subcontinent WB, Odisha, Assam	The inflorescence is cut and the xylem sap (juice) is collected by hanging earthen pot. The juice so collected early morning is a refreshing drink and light alcoholic drink is made from the juice. Ripened fruit has fibrous outer

		thethinlayerThe white kernel of the germinated seed is also eaten..			layer,tolerate drought, eaten fresh by tribal people, the yellow pulp is processed.
<i>BilatiGaab</i> Indian Persimmon/ Velvet apple	<i>Diospyros blancoi</i> A.DC Ebenaceae	Dioecious tropical tree, grows well from the sea level to the 2,400 feet above the sea level, Sapota like fruits with reddish velvety layer, medium sized	80-100 nos	Philippines WB, Assam, Jharkhand	Wild and domesticated ,eaten fresh, timer is very hard called <i>iron wood</i>
<i>Deoa</i> Monkey Jack	<i>Artocarpus lakoocha</i> Roxb Moraceae	Big tree. The orange-yellow male flowers and reddish female flowers grow separately on the same trees. Velvety, dull yellow syncarp fruits are nearly round or irregular	70 kg / 250 fruits	India WB, Assam, Tripura	Sweet sour pulp, like jack fruit, generally eaten fresh. Used as chutney. Each fruit contains 20–30 seeds that are fleshy with thin seed coat, leaves used as fodder
<i>Gaab</i> India Persimmon	<i>Diospyros peregrina /</i> <i>Diospyros malabarica</i> (Desr.) Kostel Ebenaceae	Big tree with elongated leaves, berry fruit is yellow in colour on maturity,matures in April - May	80-100 nos	India WB,	Minor, domesticated, Eaten raw, it is used for dyeing and strengthening the cotton thread of fishing net
<i>Golpata</i> Nipa palm	<i>Nipa fruticans</i> (Thumb.)Wurmb Arecaceae	Branch less mangrove palm, small fruits are eaten like Asian Palmyra.	200 nos Used for thatching and basketry	Sundarban area of WB.	Juice is collected like Asian Palmyra. Immature and mature fruit is eaten like <i>Taal</i>
<i>Jamrul/Jaman</i> Star Apple/ Wax apple	<i>Syzygium samarengense</i> (Blume) Merrill & Perry Myrtaceae	Evergreen tree with big leaves, berry bell shaped fruit matures in June-July (rainy)and in Jan – Feb(winter) for second flush , winter fruits are sweeter than rainy season size varies	40 kg, one big fruit weigh 60 g	Malay, Andaman Island WB, Assam, Tripura	Fruits are bell shaped, different colours-purple, reddish, white . It does not taste like apple, finds a good market
<i>Keora</i> Mangrove apple	<i>Sonneratia acida</i> Buch-Ham Sonneratiaceae	Mangrove tree, green fruit available during April-Aug	40 kg	Sundarban area of WB	Sour fruit, used as chutney,
<i>Panifal</i> Water chestnut	<i>Trapa bispinosa</i> Cyperaceae	A floating aquatic plant having nutlike fruit and grown in low-lying water bodies, matures in Sept-Oct	24 t/ ha	Africa WB, Assam	Edible corms, rich in dietary fibre and minerals

Source: Roy *et al*(1998), Chadha, K. L, (2001), Peter K.V (2007), Malik *et al*(2010), and Personal communication with local people
Index- ht- Height in meter, WB- West Bengal state of India, AP- Andhra Pradesh state, MP- Madhya Pradesh state



Mimusops elengi



Ziziphus oenoplia



Diospyros melanoxylon



Grewia asiatica



Spondius cythera



Borassus flabellifer (immature seed)



Borassus flabellifer (mature seed)



Cassia caranda



Elaeagnus latifolia



Diospyros blancoi



Inga dulcis



Sterculia foetida

Conclusion:

Table fruits like mango, litchi, pine apple etc. are generally preferred because of convenience of eating and for good taste. People do not give preferences on fruits having unpleasant tannins and glycosides which are available in many wild fruits. Fruits with too many seeds are not preferred also. Most of these fruits are highly perishable and difficult to store in the fresh form. Some of them are not easy to eat out of hand. A few are not acceptable as a fresh fruit, because of high acidity and/or strong astringent taste. However, considering the nutritive quality, minor fruits have tremendous potentialities in ameliorating food crisis and common ailments of tribal people. These unexplored fruits are to be explored in such manner so that tribal people can get its due share as they conserved it over the centuries. Food processing and supply of raw material for preparation of *ayurvedic* medicine would be the major thrust for popularizing the minor fruit crops. Eastern part of India is still abound with various wild and domesticated fruit crops. However, mere institutional effort is not enough to conserve those vulnerable crops. Local people are the custodian of those crops. Sacred groves have been a good reservoir of various plant and animal species and this are the natural means of conservation.

In the decade of UN sponsored Decade of Biodiversity 2011-2020, officials of local govt, political parties, bureaucrats, agriculture and forest officials need to be sensitized to the importance of conservation of wild and underutilized crops for future food security.

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