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## Studies on the income-generating wild edible wetland plants traditionally consumed by the people of Bishnupur district, Manipur

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### Abstract

This paper focuses on the income-generating wild edible wetland plants found in the wetlands of the Bishnupur district, traditionally consumed by the people living in that area, and focuses to find out their mode of use and survey of local markets to study the marketability of the wetland plants found in the district during 2019 to 2022. A total of 21 wild edible wetlands plants were documented which have been sold in the market for generating income and serve as a source of livelihood for the people in that area. At present, the numbers of wild edible wetland plants are declining at a very fast rate, due to external agencies like environmental condition, climate change, rapid urbanization, mass exploitation, excessive, collection for selling purpose, fodder for animals, etc. Profit sharing of 10 selected wild edible wetland plants between the direct and indirect sellers has been calculated, the share of direct sellers earns more profit when compared to the indirect seller. Therefore, it is the need of the hour to document and do more research on these wetland plants to explore the socio-economic value of dwellers.

**Keywords:** Wetland, income generating, wild edible, local market, sellers, commercial value

### Introduction

Wetlands are “Wealth lands” or Biological Supermarkets, because of the extensive food chain and rich biodiversity that they support (Moirangleima, 2007). Out of the total geographical area of Manipur, wetlands cover nearly about 2.5 %. There are about 155 wetlands of which 153 (nearly 99 %) are located in the central valley while 2 are located in the hill districts (Wetland International South Asia, 2005, L.D.A. (1996) and ENVIS Centre). Wild edible plants are important in many indigenous communities around the world (Reyes-Gracia *et al.*, 2005; Tirunch and Herbert, 2008). Wetlands are important and one of the world’s most productive ecosystems. These areas play essential role for the health, welfare and safety of people living in or around it. Bishnupur is one of the four districts in the Central Valley of Manipur stretching between 93.53/E and 24.18/ N and 24.44/ N latitude approximately. It has a geographical area of 530 Km<sup>2</sup>. The Loktak Lake which is the only fresh water lake of north east India is situated in Bishnupur District. Due to its richness in biodiversity uniqueness of habitat, the Lake is included in the list of Wetland of International Importance, under the Ramsar convention. The lake is one of the most biologically productive ecosystems on earth and provides numerous services to the human civilization (Ghermandi *et al.*, 2011).

Wild edible plants also provide rural households with supplemented income opportunities through collections and sales in local markets (Moreno-Black and Price 1993). However, the magnitude of income derived from the wild plant resources is not well-known due lack of systematic data collection and analysis. Local economic survey of biological resources needs to be supplemented with an assessment of plant and animal products sold in the local market (Bennet, 1992). Although traditional leafy vegetables have the potential for income generation, a lack of awareness may not be allowed them to compete with exotic vegetable crops (Tansen Van Rensburg *et al.*, 2004; Maikhuri *et al.*, 2003; Maikhuri *et al.*, 2007).

Bishnupur is one of the four districts in the central valley of Manipur stretching between 93.53oE & 24.18oN longitude and 24.44oN latitude approximately. It has a geographical area of 530 Km<sup>2</sup>. The Loktak Lake, which is the only freshwater lake in northeast India, is situated in the Bishnupur district. Due to its richness in biodiversity and uniqueness of habitat, the Lake is included in the list of Wetlands of International Importance, under the Ramsar convention.

The lake is one of the most biologically productive ecosystems on earth and provides numerous services to human civilization (Ghermandi *et al.*, 2011). Loktak Lake is considered the lifeline of Manipur due to its importance in the socio-economic and cultural life of the people. A large number of people surrounding Loktak lake depend upon the lake resources, such as flora and fauna for their sustenance.

A study was investigated with high potential income generating plants growing in Keibul Lamjao National Park, Loktak Lake and enumerated 22 species of income generating plants belonging to 20 genera and 11 families (Poaceae 7, Zingiberaceae 3, Apiaceae 2, Polygonaceae 2 and one species each of Asteraceae, Convolvulaceae, Cucurbitaceae, Fabaceae, Hydrocharitaceae, Nelumbonaceae and Nymphaeaceae (Devi *et al.*, 2014). Several workers have surveyed these area and recorded many species. Among them, Deb (1961) listed 125 species; Bhatia (1981) recorded 159 species from Loktak area and Sinha (1990a, b) recorded 157 wetland species. Singh (2002) investigated the management of *phumdis* in Loktak lake and also reported the ethnobotanical uses of 24 species. Shyamjai (2002) reported 145 macrophytes from *phumdis*, whereas, Trisal and Manihar (2004) reported 131 macrophytic species. Devi (2007, 2009) studied the *phumdi* plants of the lake and also the consumable parts of wild plants. Devi *et al.* (2013a) studied important food plants growing in Keibul Lamjao National Park both for brow- antlered deer and also for human. Devi *et al.* (2012a,

2012b, 2013b,) also studied the traditional medicine from the park, fodder plants and also recorded 19 species of macrophytes for the area. Marketing plays an important role in the socio-economic development of any area as it helps to serve the people and the region (Berry, 1967), although market surveys and listings of uses of wild edible plants have been reported by some workers from Manipur and elsewhere in the region (Devi *et al.*, 2010; Kayang, 2007; Samant and Dhar, 1997; Sarma *et al.*, 2010; Singh *et al.*, 1988; Singh and Singh, 1985; Sundriyal and Sundriyal, 2004.

**2. Materials and Methods**

The present studies were based on field research work. A field survey was conducted during 2019-2022 in the wetlands of Bishnupur district, Manipur. Detailed information was gathered from the wetland dwellers (both male and female of age groups between 13 and 55 years) by using formal, informal, and extensive interactions which are involved in the collection of information about the revenue generation from these wetland plants. A total of forty-five market vendors (key informants) of different age groups (20-60 years) were interviewed during the study period. Table 1. shows the number of sample vendors selected from each marketplace. The respondents were selected using stratified random sampling techniques and were interviewed regarding local names, plant parts, price, plants used as food, medicine, uses in religious culture, etc.

**Table 1:** Number of Vendors for three markets

SL NO	Types Vendors	Name of the market and number of Vendors		
		Nambol Market	Bishnupur Market	Moirang Market
1	Permanent	8	12	14
2	Temporary	5	3	3
3	Total	13	15	17

**2.1 Mean prices and profit shares calculation**

For finding the mean prices and profit shares, 10 common spices were selected. The seller was divided into two categories: - one was the direct seller i.e., the one who collected the wild edible wetlands plants and sold them directly to the consumers, and the indirect seller who bought the wild edible wetland plants from the middlemen and then sold them to the consumers. The mean value of the selling prices reported by direct and indirect sellers for particular wild edible wetland plants was calculated by using the formula,

$$\text{Mean value, } MV = \frac{\sum Afa + Bfb + Cfc + \dots + Zfz}{N}$$

Where, A, B, C.....Z, represents the different selling prices (rates) of a particular wild edible wetland plant (Rs/Kg); fa, fb,fc.....fz are the frequencies of particular prices of wild edible wetland plants and ‘N’ indicates the total number of direct sellers and indirect sellers interviewed for that particular item. Percent of profit sharing from the sale of wild edible wetland plants between the direct sellers and indirect sellers was calculated (Bisht *et al.*, 2005).

**3. Result and Discussion**

A thorough survey of income-generating wild edible wetland plants found in the wetlands of the Bishnupur district, traditionally consumed by the people living in that area was performed. During the survey we have find out, their mode of

use and detail information of local markets to study the marketability of the wetland plants found in the district. A total of 21 wild edible wetlands plants were documented which have been sold in the market for generating income and serve as a source of livelihood for the people in that area. It also worth to be mentioned that, the number of wild edible wetland plants are declining at a very fast rate, due to external agencies like environmental condition, climate change, rapid urbanization, mass exploitation, excessive, collection for selling purpose, fodder for animals, etc. (Table 2). Some commonly available income generating plant which was found selling in the three local markets are shown in Fig. 1. From the Nambol Market, 13 vendors were sampled, who sold wild edible wetland plants. Out of this, 8 vendors had permanent stoles and 5 vendors were temporary stoles. A total of 30 plant species were found to be sold in Nambol Market, of which 21 plant species were sold by permanent vendors and 9 plant species were sold by the temporary vendor. From Bishnupur Market, it was found that out of 15 vendors, 12 were permanent vendors and 3 were temporary vendors, and a total of 27 plant species were sold by both the vendor *i.e.*, 20 plants species were sold by permanent vendors and 7 plant species were sold by temporary vendors. Similarly, from the Moirang market, out of the 17 vendors, 14 vendors had permanent stole and 3 vendors had temporary stoles, out of the 28 plant species 20 were sold by permanent vendors, and 8 plant species were sold by temporary vendors respectively (Table 3).

**Table 2:** List of the wild edible wetland plants, habits, market value, and their uses in the Bishnupur district, Manipur

SL NO	Plant Name and Family	Local Name	Plant Habit	Market Price Rs./Kg or bundle			Uses
1	<i>Alocasia cucullata</i> (Lour.) G. Don (Araceae)	Singju-Pan	Rooted herb	Nambol Market 25	Bishnupur Market 20	Moirang Market 30	Taken as a traditional salad called <i>singju</i> and also cooked with fermented Soya bean
2	<i>Alpinia nigra</i> (Gaertn.) Burt (Zingiberaceae)	Pullei	Rhizomatous Herb	30	28	30	Prepared chutney called <i>eromba</i> smashed with plants.
3	<i>Amomum aromaticum</i> Roxb. (Zingiberaceae)	Namra	Rhizomatous herb	40	35	40	Vegetables, medicinal uses.
4	<i>Chenopodium album</i> L. (Amaranthaceae)	Monsaobi	Herb	10	10	10	Vegetables, Medicinal uses.
5	<i>Centella asiatica</i> (L.) Urb. (Apiaceae)	Peruk	Herbaceous rhizome	15	20	25	Vegetables, medicinal uses.
6	<i>Curcuma angustifolia</i> Roxb. (Zingiberaceae)	Yaiple	Rhizomatous herb	10	15	15	Vegetables are also used in <i>Meitei Cheiraoba</i> a religious ceremony
7	<i>Euryale ferox</i> Salisb. (Nymphaeaceae)	Thangjing	Rooted Herb	50	45	50	Fruit cooked, eaten raw as <i>eromba</i> .
8	<i>Enhydra fluctuans</i> Lour. (Asteraceae)	Komprek-Tujombi	Herb	15	20	10	Vegetables
9	<i>Hedychium coronarium</i> J. König (Zingiberaceae)	Loklei	Rhizomatous herb	20	15	20	Vegetables, medicinal uses, religious ceremony
10	<i>Ipomoea aquatica</i> Forssk. (Convolvulaceae)	Kolamni	Herb	15	10	10	Vegetables
11	<i>Jussiaea repens</i> L. (Onagraceae)	Ising - Kundo	Floating Herb	10	15	15	Vegetables, Medicinal uses.
12	<i>Lysimachia obovata</i> Buch.-Ham. ex Wall. (Primulaceae)	Kengoi	Herb	10	15	15	Vegetables
13	<i>Nelumbo nucifera</i> Gaertn. (Nelumbonaceae)	Thambal	Rooted Hydrophyte	5 per fruit	5	5	Fruit, vegetables, medicinal uses. Socio-religious ceremony.
				15 per bundle of leaf	15	15	
				10-50 per bundle of flower	10-50	10-50	
				50 per bundle of root	50	50	
14	<i>Neptunia oleracea</i> Lour. (Leguminosae)	Ikaithabi	Floating	50	45	50	Vegetables, medicinal uses.
15	<i>Nymphaea alba</i> L. (Nymphaeaceae)	Tharo-Angouba	Rooted Hydrophyte	Flower 20 per bundle	Flower 10-20 per bundle	Flower 10-20 per bundle	Vegetables, also used in religious ceremonies.
				Petiole 10 per bundle	Petiole 10-15 per bundle	Petiole 10-20 per bundle flower	
16	<i>Nymphaea nouchali</i> Burm.f. (Nymphaeaceae)	Tharo-Angangba	Rooted Hydrophyte	Flower 10-20 per bundle petiole 10-15 per bundle	Flower 10-20 per bundle petiole 15 per bundle	Flower 20 petiole 20	Vegetables, religious ceremony.
17	<i>Plantago erosa</i> Wall. (Plantaginaceae)	Yempat	Herb	10	15	10	Vegetables, medicinal uses.
18	<i>Polygonum barbatum</i> L. (Polygonaceae)	Yelang	Herb	10	10	15	Vegetables
19	<i>Stellaria media</i> (L.) Vill. (Caryophyllaceae)	Yerum Keirum	Herb	10	13	10	Vegetables, Medicinal uses.
20	<i>Sagittaria sagittifolia</i> L. (Alismataceae)	Kaukha	Herb	50	55	50	Vegetables.
21	<i>Trapa natans</i> L. (Lythraceae)	Heikak	Rotted Hydrophyte	50	45	40	Vegetables, eaten as snacks, have medicinal value.



Fig 1: Some of the wetland plants commonly sold in the markets under study.

Table 3: The number of vendors, species, range of age group, and literacy rate.

SL NO	Market	No of vendors		No. of wetland plant species	Range of age group	Literacy rate (%)
		Permanent	Temporary			
1	Nambol Market	8	5	30	35-55	40%
2	Bishnupur Market	12	3	27	30-60	60%
3	Moirang Market	14	3	28	45-70	70%

Table 4: Showing the mean price (Rs./Kg.) and the percentage sharing.

SL NO	Edible Plant Species	*	Direct Sellers						Mean Value		Indirect Sellers						Mean Value	Share %	
			Selling Rates								Selling Rates							Direct Sellers	Indirect Sellers
			Values (Rs. /Kg)			Frequency					Value (Rs. /Kg)			Frequency					
A	B	C	fa	fb	fc	A	B	C	fa	fb	fc								
1.	<i>Alocasia cucullata</i> (Lour.) G.Don	4	25	20	0	1	2	0	22	2	30	25	0	3	1	0	28	62	38
2.	<i>Alpinia nigra</i> (Gaertn.) Burt Burt	3	30	28	0	1	1	0	19	2	35	30	0	1	1	0	32	83	17
3.	<i>Amomum aromaticum</i> Roxb.	2	40	35	30	1	3	1	36	3	45	40	40	1	2	1	41	92	8
4.	<i>Curcuma angustifolia</i> Roxb.	4	30	35	0	1	2	0	33	3	40	40	0	2	2	0	40	71	29
5.	<i>Euryale ferox</i> Salisb.	4	50	45	40	1	1	1	45	2	55	50	45	1	1	1	50	80	20
6.	<i>Hedychium coronarium</i> J. König	3	30	35	20	1	1	1	28	5	35	40	30	2	1	1	35	85	15
7.	<i>Ipomoea aquatica</i> Forssk.	3	15	10	15	1	1	1	13	3	20	15	20	3	2	1	18	51	49
8.	<i>Neptunia oleracea</i> Lour.	4	35	40	0	1	2	0	38	2	40	45	0	2	1	0	42	78	22
9.	<i>Sagittaria sagittifolia</i> L.	3	50	55	50	2	1	2	51	2	56	62	55	2	2	1	58	84	16
10.	<i>Trapa natans</i> L.	4	50	45	40	3	1	1	47	2	55	50	50	2	1	1	53	83	17

Profit sharing of 10 selected wild edible wetland plants between the direct and indirect sellers has been calculated Table 4, represents the different prices of the same species sold by them and their profit-sharing percentage. The profit sharing between the direct and indirect sellers revealed that the. It is because the direct sellers sold the plant species without the involvement of the middlemen. However, the indirect sellers sold plants by involving middlemen and earned less profit.

### Conclusion

The inhabitants of the Bishnupur district and surrounding Loktak Lake dwellers of Bishnupur District, used a wide variety of wetland plants for food, medicine, and socio-cultural purposes. They depend highly on wetland plants for their survival. The wetland of Manipur provides high-income generating plants and the local inhabitants living near the wetland area get these opportunities. However, nowadays wetland plants become decreased in number due to climate change, environmental factors, and human interferences. Therefore, to conserve it, we need to do more on the commercial values, so that it can improve the socio-economic values of dwellers and the most plants can be domesticated in the field after developing a new agro-based technique for future.

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