

Value Chains of Wild Edible Plants Used by Traditional Communities in Manipur, North East India

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ABSTRACT

Sustainable utilization of wild edible plants is significant for supplementation of food resources, bioresource management and uplifting the economy of the stakeholders. Native people in Manipur, North East India are collecting and using various wild edible plants. Traditional supply chain in the state has undergone a drastic change in the recent past giving way to modern system creating a complex scenario. The present paper aimed to highlight the commonly marketed wild edible plants in Manipur and to map the existing value chains of wild edible plants in order to find an improved system that would enhance the collector's livelihood means. The paper also analyzed the existing scenario of the market trends of wild edible plants which is complex of traditional and emerging modern system. Key issues and major interventions suggested for value chains in wild edible plants in Manipur are also suggested.

Key words : Value chain; NTFP; Wild Edible Plants; WEP; Manipur

INTRODUCTION

Since time immemorial, human beings are dependent on various plant resources to fulfil daily requirements. Throughout the world, people are collecting various wild plants including non-timber forest products for various purposes. Growing interest in the potentials of non-timber forest products have been inspired by desire to promote traditional values, use of natural products and acceptance of the importance of sustainability (Keèa et al. 2013). Studies on the potentials of non-timber forest products have now gone beyond the narrow rural focus of previous studies (Jensen 2009). It is now acknowledged that NTFP not only contributed significantly to the livelihood of rural residents, but its links extend beyond village boundaries. Non-timber Forest Products may belong to either edibles (specialty wood products, floral products) or medicinal and dietary supplements. Out of these different products, wild edible plants (WEPs) play significant role in the traditional community by providing food resources as well as sustenance to the local economy. According to the Food and Agriculture Organization (FAO), wild edible plants

are those plants that grow spontaneously in self-maintaining populations in natural or semi-natural ecosystems and can exist independently of direct human action (Heywood 1999). WEPs are neither cultivated nor domesticated but locally available as food resources with their usage based on traditional ecological knowledge (Kidane and Kejela 2021, Pardo-De-Santayana et al. 2005, Shumsky et al. 2014). Consumption of wild edible plants is uniform throughout the season and places. Use of the wild edible plants depend on the availability in a particularly area, their seasonality and culture specific (Berihun and Molla 2017, Feysa et al. 2011).

Identification and proper intervention in their harvesting and supply chains could contribute to the supplementation of food resources, nutritional security as well as the economy of the stakeholders (Ray et al. 2020). They provide low input low-cost option for increasing nutrition without spending limited cash resources. They could provide benefits to vulnerable and marginalized populations (Fentahun and Hager 2009) and also contribute to livelihood during unfavourable situations including famines (Strauch et al. 2008, Sachula et al. 2020).

As the WEPs are important for household food security and community at higher level, it is essential that socio-ecological systems for gathering and marketing these natural resources be appropriately managed, protected and prevented from overexploitation and degradation (Feyssa et al. 2011, Shumsky et al. 2014). It has been estimated at least one billion people are using wild foods as a means to supplement diets (Hickey et al. 2016). Despite its great potential, various factors impede the successful management of the wild edible plants. Accelerated deforestation during the last few decades has affected the availability of the wild edible plants. Increased population pressure and communication system also contributed to the increased harvesting of the plants from the wild. In many cases, harvesting of wild edible plants are poorly or not regulated resulting in unmitigated open access or poorly targeted restrictions excluding those populations depending on these plants for their economic sustenance.

A value chain is the series of value-creating activities which are not isolated from one another. Value chain in the context of wild edible plants describes the sequence of activities required to make a finished product from its initial starting material such as field crop or gathered wild material (Chopra et al. 2013). Value chain analysis is useful method for understanding how markets operate for a particular good (Kanji et al. 2005) and helps in conceptualizing the value-added services through which the product passes from the initial production stage to final delivery to the consumer. The Value Chain Analysis encompasses all those activities and services required to bring a particular product or service from its conception to destination either local, national, regional or global market (Kaplinsky and Morris 2001). These studies help in understanding socioeconomic and power relationship in the production chain from initial stage to final products (Booker et al. 2012). Development of value chain map enables identification of the key actors and their roles in the system (Shahidullah and Haque 2010). Determination of value chain maps can be used to improve the chain structure through exclusions, inclusions or building bridges in the wild edible plants flow from the source to the consumption levels. Identification of value chain actors and enhancing or modifying their roles is important for

increasing economic contribution of forest resources (Chapagain and Rai 2014).

India has a rich tradition of collecting and marketing wild edible plants by its various traditional communities and tribes. Around 50 million people in India are estimated to depend on forest products, particularly non-timber forest products for their subsistence living (Sundriyal and Sundriyal 2001). Manipur, one of the states in the North-East India, is endowed with various wild edible plants providing economic sustenance to various communities. The state is inhabited by different communities such as Meitei, Naga and Kuki, each of them having their own pattern of collection and consumption of WEPs. In the past, there was a unique system of cooperative marketing involving individuals or families from different communities in Manipur, which was called "*Ngaai Sanaba*", consisted of making trade-partners between the families (or individuals) of hills and valleys. Channel partners are usually formed between members of different communities residing in different geographical terrains both in hills and plains. Agricultural and forest items produced or harvested by one partner would be exclusively sold, given or bartered only with their corresponding partner called '*Ngaai*' in another village or community. The items would be handed over to the home or trading centre of the corresponding partner. The economic bond was extended even to the social fabric maintaining the harmony and cultural relationship between different communities. It was a taboo to disrespect the trade relationship among those people. However, this system gave way to the modern system and no longer existed. As the traditional system gave way to the new market economy, complex scenario is created by fusing remnants of the erstwhile practices and modern system. The transition produced an ambiguous role of the different actors involving in the wild edible plants in the new Value Chain System. Moreover, harvest and trade of wild edible plants are closely linked and dependent on sustained agricultural products. At present, the villagers of different communities will collect the plants from the nearby forests and consume them at village level or sold them to higher bidder in the village market or town market. Still there are no scientific studies on value chains of the wild edible plants in the perspective of

new market dynamics in the state of Manipur. As such, an attempt has been made to study the value chains of the forest edible plants collected and consumed by the traditional communities in the state. The objectives of the study are to (i) inventorize the commonly marketed wild edible plants in Manipur and (ii) map the existing value chains of wild edible plants in order to find an improved system that would enhance the collector's livelihood means.

METHODOLOGY

Study area

The present study was conducted in Manipur, one of the states in North East India. The state shares border with Myanmar on the east and is bounded on the north by Nagaland, on the west by Assam and south by Mizoram states of India (Fig. 1). Primary data were collected from villages in four districts of Kangpokpi, Ukhrul, Imphal East and Churachandpur (Table 1). Out of these, Kangpokpi, Ukhrul and Churachandpur are hill districts inhabited by various tribes belonging to Naga and Kuki-Chins. Imphal East district is valley districts inhabited by various

Table 1. Location of where primary data were collected

District	Villages
Churachandpur	Patlen, Ningthiching, Tuibong
Imphal East	Keibi
Kangpokpi	Motbung, Geljang, Koubru, Mongpijang, Songlung, Molnoi, Leikot, makhon, Nongmaijing
Ukhrul	Lambui, Tusar

communities out of which Meitei is the dominant community. Market surveys were conducted at the village markets viz. Motbung and Keithelmanbi (Kangpokpi), Lamlong (Imphal East), Sekmai (Imphal West), Lambui (Ukhrul) and Kangvai (Churachandpur) where WEPs are traded. Information was collected from the sellers, collectors, middlemen and consumers.

Interviews

Semi-structured questionnaires were administered to collect ethnobotanical data from the informants.

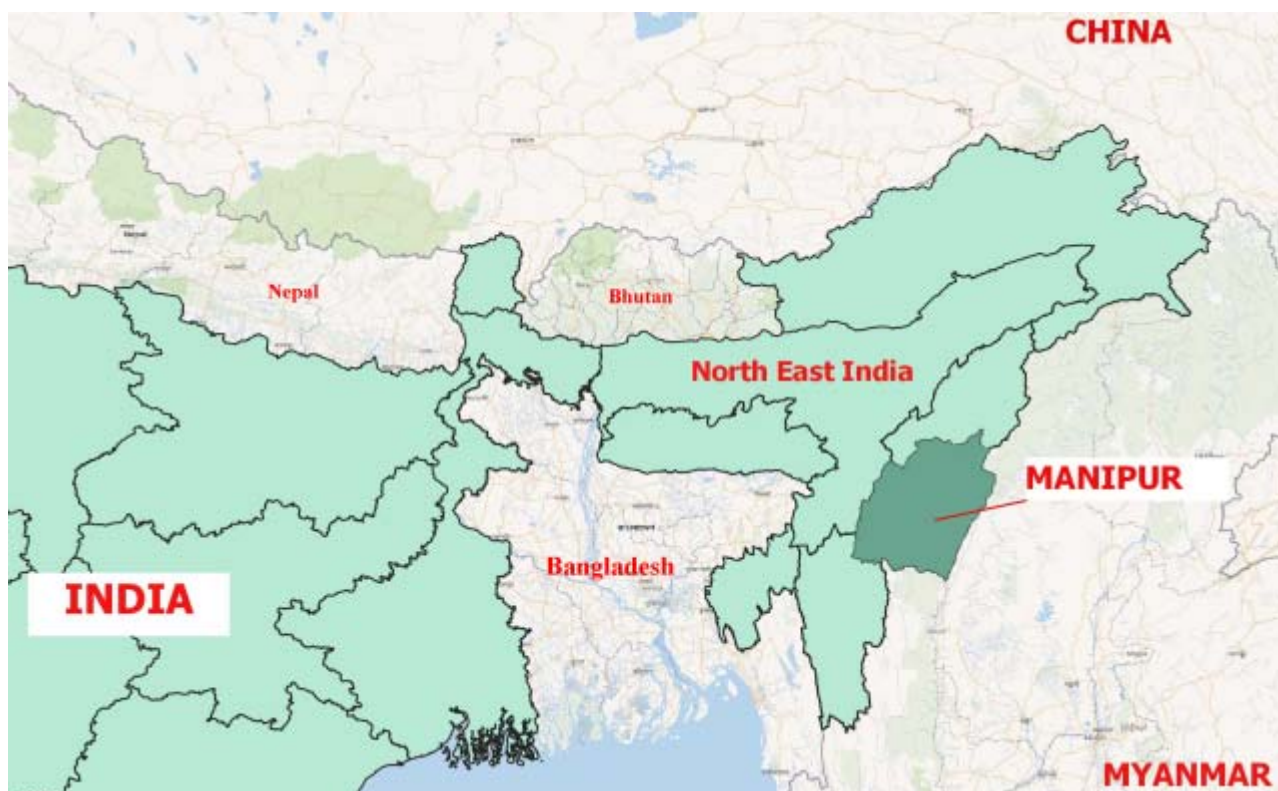


Figure 1. Map showing location of Manipur in Northeast India

Prior informed consent was obtained before collecting the information. Only those plants which were considered as wild are considered. The study followed the Heywood's definition of non-cultivated plant as those "plants that grow spontaneously in self-maintaining populations in natural or semi-natural ecosystems and can exist independently of direct human action" (Heywood 1999). Market surveys were done by visiting the markets from September 2018 to February 2021. Data were gathered for availability, collection, seasonality, and supply-chains. To supplement the market data, several WEPs collectors were also interviewed to understand the source, availability and demand.

Data Analysis

Value Chain Analysis was initiated by understanding the scope of supply chain structure (Taylor 2005). In the initial stage, a supply chain structure map was developed by identifying the stakeholders and processes along the chain and their main linkages between processes. The stakeholders and processes along the chain were analyzed to identify and quantify the value adding or non-value adding steps in the process. In this analysis, the chain of activities that originate from conception to end-use customers into strategically relevant segments including final disposal after use were considered.

RESULTS

The present studies have compiled data on wild edible plants and develop the value chain as observed in various districts of Manipur, North East India. The value chain of WEPs was broken down into individual activities, such as collection, processing, storage, transport and marketing. Some of the items are collected for self-consumption. Some chains, especially for products targeted to one community, are short and simple. On the other hand, chains of those plants which are consumed by different communities are longer. Details are provided in

Wild edible plants

Districts of Manipur have various resource potential for wild edible plant production. Though literature survey listed several plants consumed by the communities in the area, only a few plants are

dominant in the current study. Their presence in the market scenario is driven demand of the consumer and supply potentials. During interview, it was disclosed by the informants that many wild plants were collected as non-timber forest products by the villagers from the forest area and wastelands. Out of these items, some are simply collected and consumed at household level and did not reach market level. Some important food items available in the local market in the current season are provided in Table 2. Interestingly, marketing of wild edible plants is done only at suburban pockets of Manipur. Well organized marketing systems are absent in the village levels.

One unique observation is the reduced role of middlemen in the value chain process and presence of linkage with other activities and products (Fig. 2). At present, collection and sale of wild edible plants are mainly at subsistence level with rarely for large scale commercial purpose. Wild edible plants are closely interlinked with other agricultural products.

Value Chains of Wild Edible Plants

From the market survey and interactions with villagers, value chain of some significant wild edible plants is studied. Villagers collect the wild edible plants from the forest. There is no community or legal restrictions on the collection of wild edible plants at the village level. There is equitable access to all villagers in collection of forest resources. Forest lands belong to either to the Chief's or Village Authority in tribal areas in Kangpokpi, Senapati, Churachandpur and Ukhrul districts etc., villagers can collect resources in the community forests considered to belong to every villager. Sometimes, people from other villagers also come and collect the resources. Villagers can collect wild edible plants without paying any royalty to the village authority. Even while collecting plants from Reserve Forest Area under the jurisdiction of the Forest Department, Government of Manipur, most of the villagers are not paying tax to the concerned authority.

There is need for scientific resource managements while collecting wild edible plants. Villagers resorted to overharvesting of the forest resources and depend upon the natural regeneration for rejuvenating the depleted resources. When there is resource crunch, they just will shift to other products.

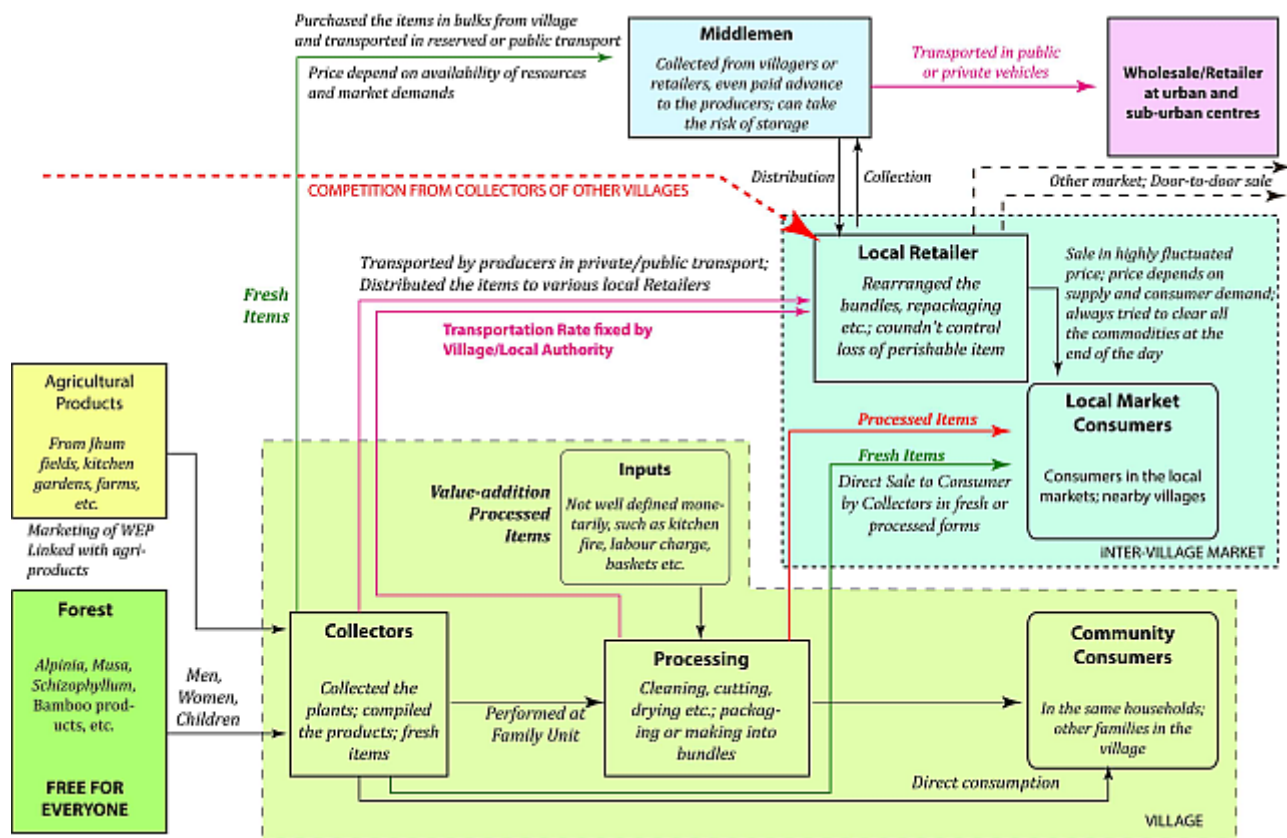


Figure 2. Value chain of integrated wild edible plants

Collection of wild edible plants from forests

There is gender discrimination in collection of wild edible plants in Manipur. Men were favorite as they can carry more items though both men and women are involved in the collection of wild edible plants from the forest. Most of the collectors need to go to long distance in the hills and mountains in search for the items. Some of the villagers started from 3 a.m. in the morning. Manual transportation is common means of transportation. Volume of wild edible plants collected is not determined by the market demand. It depends on how much a person can carry per trip as well as the availability of the Wild Edible Plants. When they could not get enough Wild Edible Plants, they would collect other NTFP. Households involved in the NTFP activities are not depend on income group. The activity is part of the traditional lifestyles. Even government employees with sustainable income might collect wild edible plants in their spare times. Practically all households may involve at one or any time. In normal times, families in BPL are frequently involved in these

activities.

Processing of wild edible plants

Processing of wild edible plants are performed using crude methods. Some of the items are cut, and cleaned at the collection site itself. Such practices are usually performed to reduce the load of the materials. Fermentation is rarely conducted to preserve the products. Some of the wild edible plants are not processed. As such, wild edible plants may belong to either (a) used as raw, (b) dried or (c) processed e.g. fermentation, etc. After processing, post processing treatment may also be conducted. Drying is the most common type of post processing. Common methods of drying are (i) sun drying and (ii) drying over kitchen stove. In the latter case, burning of fire wood is common for both cooking and drying. Minimum efforts are given during drying. Man-days during processing are very much reduced during drying. Duration of processing may depend from type of bioresources. Processing of wild edible plants usually take 3 – 7 days. Processing of bamboo shoots take around 2 – 3 man-days for cutting and

Table 2. Wild edible plants commonly marketed in the study area

Scientific Name	Vernacular Name	Type of Food	Target Consumer	Availability			Processing type	Collection Season	Future potentials
				Ukhrul	Kangpokpi	Imphal East Churachandpur			
<i>Acacia pennata</i> (L.) Willd.	Khangkhu (K)	vegetable	Local	Rare	Rare	Common	Fresh	Summer	subsistence
<i>Albizia procera</i> (Roxb.) Benth.	Khangkhu (K)	Vegetable	Specific community		Moderate		Fresh	Seasonal	Subsistence
<i>Alpinia nigra</i> (Gaertn.) Burret	Narison (T), Pullei (M), Aigidon (K)	vegetable	All communities	Moderate	Moderate		Cutting	Seasonal	Subsistence
<i>Amomum aromaticum</i> Roxb.	Namra (M), Ai (K)	vegetable	All communities	Abundant	Abundant	Abundant	Cutting	Summer	Have potential
<i>Antidesma acidum</i> Retz.	Tuiki (K), Ching Yensin (M)	vegetable	specific community	Common	Common	Common	Fresh	Usually after rainy season	subsistence
<i>Auricularia</i> sp.	Pachop (K)	vegetable	All communities	Limited	Limited	Limited	Drying	Sporadic	Subsistence
<i>Centella asiatica</i> (L.) Urb.	Kangvashan (T), Changkongche (K), Peruk (M)	vegetable	All communities	Plenty	Plenty	Plenty	Sorting,	Regular bundles	Subsistence
<i>Chimonobambusa callosa</i> (Munro) Nakai	Ngatha (T), Laiva (K), Laiwa (M)	vegetable	All communities	Rare	Confined to high altitude	Confined to high altitude	Fresh; fermented	Seasonal	Enterprise level can be induced
<i>Clerodendrum glandulosum</i> Lindl.	Anphui (K), Nareihan (T)	vegetable	specific community	Common	Common	Common	Fresh	Regular	Have potential
<i>Dioscorea alata</i> L.	Shirin (L), Haa (M), Hapai (T), Hakaisan (K), Thingtupi (K)	vegetable	All communities	Limited	Limited	Limited	Cutting	Seasonal	Subsistence
<i>Dysoxylum excelsum</i> Blume		vegetable	Kuki	Rare	Rare	Moderate	Fresh	Winter	subsistence
<i>Elsoltzia communis</i> (Collett & Hemsl.) Diels	Lomba (M), Lengmusei (K)	Spice	All communities	Rare	Rare	Rare	Drying	Summer	Have potential
<i>Eryngium foetidum</i> L.	Awa phadigom (M), Pathikhom (K)	Spice	All communities	Common	Common	Common	Fresh	All seasons	Have potential
<i>Eurya acuminata</i> DC.	Sizou (K), Dabab (L)	Spice	specific community	Plenty	Plenty	Plenty	Drying	Regular	Limited market value
<i>Ficus semicordata</i> Buch.-Ham. ex Sm.	Theipi (K), Thourathi (T), Heirit (M)	Fruit	All communities	Moderate	High	Moderate	Fresh; fermentation	Seasonal;	Subsistence as such; large scale beer production

Scientific Name	Vernacular Name	Type of Food	Target Consumer	Availability			Processing type	Collection Season	Future potentials
				Ukhrul	Kangpokpi	Imphal East Churachandpur			
<i>Hedychium flavum</i> Roxb.	Loklei (M), Nanithei (T)	vegetable	All communities	Rare	Common	Moderate	Cutting	Seasonal	Limited production
<i>Meriandra dianthera</i> (Roth ex Roem. & Schult.) Briq.	Lengmasel (K), Kanghuman (M)	Spice	All communities	Rare	Moderate	Moderate	Fresh, Dried	All season	High demand
<i>Musa balbisiana</i> Colla	Naaga (T), Changlong (K)	vegetable	All communities	Common	Common	Rare	Cutting	Regular	Subsistence income
<i>Oenanthe javanica</i> (Blume) DC.	Komprek (M), Andum (K), Hanchamhan (T)	vegetable	All communities	Common	Common	Common	Fresh	All seasons	subistence
<i>Parkia timoriana</i> (DC.) Merr.	Jongtha, jonglha (K), Yongchhak (M)	vegetable	All communities	Moderate	Moderate	Moderate	Fresh; Drying	Seasonal	High demand; devastated from epidemic
<i>Rhynchosyche ellipticum</i> (Wall. ex D. Dietr.) A.DC.	Chehlep (K)	Vegetable	Thadou	Limited		Moderate	Fresh	All season	Subsistence
<i>Rotheca serrata</i> (L.) Steane & Mabb.	Moirang Khanam (M), Nunggangpak (K)	vegetable	All communities	Common	Common	Common	Fresh	Summer	subistence
<i>Schizoplyllum commune</i> Fries	Ansunglung (L), Pasi (K)	vegetable	All communities	Limited	Limited	Rare	Drying	Sporadic; after rainy season	Subsistence
<i>Schizostachyum fuchsiatum</i> (Gamble) R.B. Majumdar	Ngai (T); Gowa (K)	vegetable	All communities	Common	Common	Limited	Fresh; fermentation	Seasonal	Have potential
<i>Volvariella volvacea</i> (Bull.) Singer	Charuyen (M)	vegetable	All communities	Damp place	Rare	Rare	Drying	After rainy season	Have potential
<i>Zanthoxylum rhetsa</i> (Roxb.) DC.	Singjol (K), Naoseknam (M)	Spice	All communities	Abundant	Abundant	Abundant	Fresh, Drying	All season	have potential

Note: Seasonal items when processed, can be marketed throughout the season; M – Manipuri (Meitei); K – Thadou Kukui; T – Tangkhul

cleaning about 20 kg of fresh items.

Marketing Strategies

In most of the cases, producers/collectors themselves transport the items to the village markets and sell directly to customers. Producers have to sell the items directly to the consumers or sell in wholesale to Local Retailer. While selling to retailers, producers usually did not provide all products to a single retailer. Instead products are distributed to many retailers. It is because, it is too risky in the part of the retailer to stock many products. There is high fluctuation on the price. Profit margin at the retailers are also different. Change in selling units and prices between collectors and retailers for some selected wild edible plants are shown in Table 3 in the Motbung market (Kangpokpi district) as a case study.

Actors in Chain

Role of the actors in the supply/value chains are different. Middlemen may belong to two categories – (i) from outside the village, (ii) from the village itself. In many of the wild edible plants, role of the middlemen were reduced, as producer directly dealt with the retailer or consumers. Retailers may belong to two categories also - (i) Local Retailers who received the items directly from the producers, (ii) Urban Retailers who received the items from either middlemen or wholesalers. Retailers could not afford to procure all the items carried by a producer. Market demand at village market is too low. Retailers also go to door to door for sale of the items; or they settle at one place and sale the items. Most of the wild edible products are not undergone value addition by the retailer. In certain cases, retailer redistributed the packages to increase the number.

Relationship with other agri-products

Value chain of wild edible plants is closely interlinked with the agricultural products from jhum fields and kitchen gardens. These items are transported together and sold together in the village markets.

DISCUSSION

Identification of wild edible plants and analysis of value chains have been important for successful commercialization of these products. of value chain of wild edible plants When the value chain are improved, wild plants have enormous potential in poverty reduction particularly in developing

economy (Akankwasah et al. 2012).

Human population throughout the world have collected the wild edible plants and also changed the landscape by intervening the populations of wild species (Cruz-Garcia 2017, Thakur et al. 2017). Variation in preference over wild edible plants was observed among different communities, for instance, preference of *Eurya acuminata* among the Kuki tribes. Cultural services and values associated with the wild edible plants are significant factors for divergent consumption pattern for plant species (Reyes-García et al. 2015). Existing value chain in the Manipur, Northeast India is very complex with ambiguous role of actors. Role of stakeholders overlapped in all three stages – at the producer level, processing level and marketing level. In the context of Manipur, roles of actors are not equally significant with higher roles for producer, harvester, processor and retail traders while role of middlemen is highly reduced. When some producer acts as part-time middlemen, the chain became more complex. Increasing role of middlemen who serve the bridge between primary producer and retailer or end user may create complex value chains, as observed in Asian countries particularly in wild medicinal plants (Booker et al. 2012). The wild edible plant market is characterized by non-standardized measurement units, high price fluctuation and minimum value addition. Marketing for wild edible plants trade is closely interlinked with other agricultural items. Trade of wild edible plants are highly volatile with retailers or producers changing to other species including farm products according to availability (Termote et al. 2012).

Generalization can be made on the characteristic features of the supply chain in the state. Whole villagers have equitable access to the resources. As all the villagers have access to the resources making chance of overharvesting is very high. Harvesting of wild edible plants cannot continue indefinitely without proper management practices to sustain their yield (Ros-Tonen 2000). Only those plants that can be harvested without killing the whole plants and have the capability to regenerate easily offer good prospects of sustainable harvesting and management (Peters 1996, Ros-Tonen 2000).

Households or individuals involved in the activity fluctuate from time to time and not specifically confined only to lower income groups. In other

Table 3. Change in price across various actors in the value chain of some wild edible plants in the markets of Kangpokpi district

Wild edible plant	Roles of stakeholder	Selling unit	Collector price	Middlemen price	Retailer price & volume	Volume at the retailer	Approx. profit by the retailer
<i>Eurya acuminata</i>	<ul style="list-style-type: none"> Collectors - Collection; assembled into bundles; sell directly to the retailers Retailers – sell directly to urban traders; sometimes processed for storage. 	1 bundle of about 20 twigs with leaves	INR 20 for 3 bundles	No Middlemen	INR 10 per bundle	4 – 5 bundles	50% of the cost
<i>Melocana baccifera</i>	<ul style="list-style-type: none"> Collectors - collection of shoots, crude processing, sell to retailers Retailers (sell direct to the consumers) 	Single piece with approximate length of 15 cm each.	INR 25 per piece	No Middlemen	INR 40 per piece	4 – 5 pieces	60% of the cost
<i>Musa paradisiaca</i>	<ul style="list-style-type: none"> Collector - pluck, sell to retailer without disturbing Retailer - store, sell to the consumer 	Bunch of banana.	INR 100 per bunch with odd banana; INR 50 per bunch with even items; (value differs)	INR 120 per odd bunch, INR 60 per even bunch	INR 120 per odd bunch, INR 60 per even bunch	4 – 10 bunches	20% of the cost
<i>Parkia timoriana</i>	<ul style="list-style-type: none"> Owner - sold the right to middlemen Middlemen - reserved the tree, collect; sell to the retailer Retailer – sell the fresh pods; dried the seeds when could not finish selling 	1 tree with about 30 – 50 bunches	INR 1000 – 2000 per tree /season got by the owner	INR 40 – 80 per bunch	INR 50 - 100 per bunch	4 – 10 bunches	50 - 400% of the producer's price
<i>Schizophyllum commune</i>	<ul style="list-style-type: none"> Collector - collect, dried, direct sale to retailer) Retailers - sell directly to consumer 	1 can of approx 1.4 kg.	INR 160 – 170 per can	NIL	INR 200 per can	About 5 – 6 kg.	18 - 25% of the cost

studies in Nepal and central Africa, there was no relation between wealth status and subsistence collection in the wild edible mushroom (Badimo et al. 2015, Christensen et al. 2008). There are minimal community regulations on harvesting and processing but transportation rates are regulated through several mechanisms.

Seasonal variability of the wild edible plants is rampant as observed in various studies in other countries and cultures (Feyssa et al. 2011). This variability also affects the volume of collection. Variability of the volume is also determined by the load that can be carried by the collector. In most of the cases, collector would spend one day in the wild collecting and carrying the items in traditional carriers or makeshift carriers. Market for wild edible plants is not well established with various price fluctuation at different routes. Presence of different routes of wild edible plants was observed in various countries of Africa (Feyssa et al. 2011), Asia and Latin America. Fluctuation may depend on quality variation such as quality of storage, appearance of blemishes, wilting, etc. Selling prices were initially determined by the producers but fluctuated when there is decrease in buyer's demand. In most of the cases, the retailer and producers like to dispose their products in a single day. As such, there is decrease in selling price towards evening, ultimately in the late evening the producers would sell the products in throwaway prices. Lack of storage facilities for WEP, enforce the producers or retailers to trade the products in smaller quantities in a day or few days (Senyolo et al. 2018). Unsold products are sometimes processed for future use or intentionally fed to animals. Edible material diverted away from human food and fed to animals can be considered as part of food waste (Stuart 2009). Main methods of processing remain drying (either sun dry or smoke), fermentation and slicing. These processing processes are also linked with mechanism to reduce food spoilage, which is very common. Food waste or loss refer here means the decrease in food quantity or quality, which makes them unfit for human consumption (Grolleaud 2002). These losses depend on the technology available in the country as well as the extent of market dedicated for agricultural produce (Parfitt et al. 2010). Keys issues encountered in the value chain of the wild edible plants in

Manipur, North East India are summarised in the Table 4.

Inclusion of wild edible plants in the nutritional security of a country may have larger implications in the environmental sustainability (Ray et al. 2020). Overharvesting of wild edible plants under unregulated scenario may create an unfavourable condition for biodiversity conservation. On the other hand, increasing use of wild edible plants could lessen the footprints of agriculture and allow the traditional community to shift toward more sustainable food systems.

CONCLUSIONS

Local trade of wild edible plants in Manipur, Northeast India is mainly 'supply driven chain' with significant role of producer and village-level middlemen. Some of the products have long gap between production and consumption level influencing social and cultural proximity between the two levels. The Northeast India has large potential of wild edible plants. These natural resources have great economic potential not only in the local level but in the larger contexts. Mitigating the challenges encountered in the traditional supply chain in this region will help in boosting the food resources, nutritional quality and economy of the local people. Channelising these resource potentials and value addition to these products in scientific process can contribute to the economic development of the local population as well as increase food potentials. Harvesting and collection of wild edible plants should be prioritized for sustainable economy. A long-term plan for wild edible plants involving stakeholders will contribute in providing food security and economic sustainability of the people at local level.

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Table 4. Key issues encountered in value chain of wild edible plants in Manipur

Criteria	Issues/Challenges	Suggested management approaches
Resource Management	There is no systematic resource management in collection of wild edible plants from their natural habitats. Overharvesting is very frequent in many areas as there is absence of regulatory mechanism of harvesting at community level.	Replenishment of wild edible plants depend on natural regeneration. Aided natural regeneration with capacity building and skill transfer for resource management to stakeholders might be necessary. Increasing the bioresource options will reduce the pressure from overharvesting.
Available Habitat	Forest area available for collection of wild edible plants is limited. Existing area cannot support the pressure from increasing population. Habitat loss from deforestation and other anthropogenic factors are major threats to wild edible plants (Duguma, 2020).	Special emphasis to cultivate wild edible plants in protected forests might offset the harvesting from natural condition. Coordination and strengthening of collectors and user group will be relevant in the management of the forest area. Plantation of selective crops in shifting cultivated areas and forest areas will help in stabilizing revenue generation of the villagers.
Stakeholders	Role of actors involved in the collection, marketing and supply of wild edible plants overlapped in various stages. The situation is compounded with irregularities in marketing scenario.	Encouragement of enterprise development through increased production and management can offset these issues.
Marketing scenario	Marketing of wild edible plants are usually linked with agricultural products. Despite mass production of wild edible plants, there is limited marketing facility with high chance of spoilage.	Greater production of agro-products can reduce pressure on forest-based seasonal products.
Processing methods	Both pre and post harvesting processes are mainly based on traditional methods. Sometimes, preservation techniques are applied to offset the food spoilage.	Transfer of new technology and blending traditional methods with modern methods will enhance the value addition of the wild edible plants.
Monetary return	In many instances, there are disproportionate profit margin at the level of retailers.	Supporting and encouraging federated groups that focus on marketing challenges can help in removing transportation bottlenecks. Balancing the role of actors by supporting product supply chain can streamline the production and marketing of WEPs

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