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Nonwood and Livelihood: Sustainable Management of Non-wood Forest Products for Rural Livelihoods in South Asia

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SAARC Agriculture Centre

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SAARC Agriculture Centre, regional expert consultation meeting on Sustainable Management of Community-based Non-wood Forest Products and its Contribution towards Improvement of Rural Livelihoods in South Asia (virtual), 11-12 November, 2020.

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This book 'Nonwood and Livelihood: Sustainable Management of Non-wood Forest Products for Rural Livelihoods in South Asia' contains the papers and proceedings of the virtual regional expert consultation meeting on Sustainable Management of Community-based Non-wood Forest Products and its Contribution towards Improvement of Rural Livelihoods in South Asia organized by the SAARC Agriculture Centre (SAC), Dhaka, Bangladesh. The experts who presented country papers were the representative of their respective governments. Other expert invited for technical paper presentation spoke in his personal capacity. The opinions expressed in this publication are those of the authors and do not imply any opinion whatsoever on the part of SAC, especially concerning the legal status of any country, territory, city or area or its authorities, or concerning the delimitation of its frontiers or boundaries.

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FOREWORD



The Non-wood Forest Products (NWFPs) are important renewable natural resources for livelihoods and food security for the rural population in South Asia. NWFPs provide food for household, energy, herbal medicine, raw materials for building houses and animal enclosures, and agricultural tools and implements. In South Asia, 64% of the population lives in rural areas and these rural population depend heavily on NWFPs for their livelihoods in one way or another. NWFPs serves as 'food safety net' during seasonal food shortage brought by extreme climatic conditions, drought, floods, and economic crises. The contribution of NWFPs for improving rural livelihoods and alleviating poverty is increasingly recognized regionally as well as globally. It is estimated that rural households themselves consumed about 60% of NWFPs harvests, which indicates that it is an important source of food and other subsistence needs. Besides supporting livelihoods, the development of NWFPs results in emergence of local enterprises and small processing industries which generate millions of employments for rural populations.

Sustainable management of NWFPs species is crucial to ensure its future supply to rural households and to enhance the living standard of the rural communities. The current lack of comprehensive knowledge on the ecology and socio-economic value of NWFPs is hindering the effort to monitor, regulate and manage them. NWFPs are crucial for sustenance of rural livelihoods, but unsustainable harvesting techniques and over exploitation due to increasing market demand is threatening its sustainability and the livelihoods of forest-dependent rural communities. Given the importance of NWFPs in the region, SAARC Agriculture Centre organized the Virtual Regional Expert Consultation Meeting on "*Sustainable Management of Community-based Non-wood Forest Products and its Contribution towards Improvement of Rural Livelihoods in South Asia*" to assess the sustainable management practices of NWFPs and its contribution towards improvement of rural livelihoods. The country status papers and technical paper presented during the meeting are incorporated in this book.

This book '**Nonwood and Livelihood: Sustainable Management of Non-wood Forest Products for Rural Livelihoods in South Asia**' is published to share information on the status of sustainable management practices of NWFPs, its contribution to rural livelihoods, policies and institutional arrangements put in place for developing and promoting NWFPs in South Asia. This publication also contains the recommendation of the meeting, which highlights the need for reviewing national NWFPs policies and establishing adequate institutions, strengthening sustainable management approach, domestication, market information systems, value additions, marketing and trade, promotion of enterprises, research and extension support service and capacity development at various stages of NWFPs processing chain. Finally, I would like to thank Mr. Kinzang Gyeltshen Senior Program Specialist (NRM) and Dr. Sreekanth Attaluri, Senior Program Specialist (Crops) for their commitment and dedication in publishing this important book.

Dr. Md. Baktear Hossain
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Sustainable Management of Non-wood Forest Products for Improving Rural Livelihoods in South Asia

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Introduction

The Non-wood Forest Products (NWFPs) are important renewable natural resources for livelihoods and food security for the rural population in South Asia. There is a vast variety of species and products under NWFPs. FAO (1999) defines NWFPs as “goods of biological origin other than wood derived from forests and other wooded land and trees outside forests”. Globally, 1.5 billion people use NWFPs for household subsistence as well as for local and regional trade; however, such information is not available for researchers and policy-makers to help them with management and development of NWFPs (Thinyane & Maroyi, 2019). In South Asia, 64 percent of the population lives in rural areas (FAO, 2020a), and these rural population depend heavily on NWFPs for their livelihoods in one way or another. NWFPs, in South Asia, include medicinal and aromatic plants, leaves, fruits, seeds, resins, gums, mushroom, honey, lac, bamboos, canes etc. NWFPs form a vital component of people’s everyday livelihood, and provides food for households, energy, herbal medicine, raw materials for making houses and animal enclosures, and agricultural tools and implements. Rural communities also use NWFPs for social, cultural and religious purposes. NWFPs are harvested from surrounding environment, grazing lands, forests, woodlands, and natural habitats, and it serves as ‘food safety net’ during seasonal food shortage brought by extreme climatic conditions, drought, floods, and economic crises.

Sustainable management of NWFPs species is crucial to ensure its future supply to rural households and to enhance the living standards of rural communities. The current lack of comprehensive knowledge on the ecology and socio-economic value of NWFPs is hindering the effort to monitor, regulate and manage them. Undoubtedly, NWFPs are crucial for sustenance of rural livelihoods, but unsustainable harvesting techniques and over-exploitation due to increasing market demand is threatening its sustainability and the livelihoods of forest-dependent rural communities (Rasul *et al.*, 2008). Commercialization of NWFPs entails a large-scale collection and cultivation of commercial NWFPs species, which in turn develops local enterprises and creates employment for rural population at various stages of the processing chain. Research and development on highly valued and widely used NWFPs

species is important to understand its ecology and relationship with the forest ecosystem. It should be conducted in a participatory approach by considering local and traditional knowledge of rural communities.

The role of NWFPs in improving the rural livelihoods and alleviating poverty is globally accepted. In South Asia, rural households themselves consume about 60 percent of NWFPs harvests, which indicates that it is an important source of food and other subsistence needs. However, the quantity of NWFPs consumed goes unrecorded in any kind of studies to help assess its contributions to rural livelihoods. The NWFPs are of significant subsistence and socio-cultural importance with multi-faceted adaptive livelihood components. In a fast-changing globalized world, demand for natural products is growing, particularly for medicinal and aromatic plants, and organic mountain products. The sustainable harvesting and management of these products offers an immense opportunity to improve the livelihoods of rural communities (Rasul *et al.*, 2008). Besides supporting livelihoods, development of NWFPs results in emergence of local enterprises and small processing industries, which generate millions of employments for rural population. Majority of population in South Asia depend on NWFPs and it is important to manage NWFPs sustainably for sustenance and poverty alleviation in the region. To manage NWFPs sustainably, it is important to create enabling environments such as streamlining NWFPs policies with changing time, setting up appropriate institutions, establishing adequate infrastructures, and providing support and incentives for the stakeholders engaged in value chain of NWFPs. This chapter is prepared based on the country papers submitted by respective national focal experts of eight South Asian countries for virtual consultation meeting on “sustainable management of community-based non-wood forest products and its contribution towards improvement of rural livelihoods in South Asia”. It also drew on the discussions and recommendations of the consultation.

Policy and Institutional Framework

In South Asia, NWFPs have emerged as one of the most important renewable resources for rural population who depend directly on them for their livelihoods. National forest policies in the region have given increasing recognition to NWFPs as important component of forest management systems, as they serve multiple social, economic and environmental functions. Policy and governance of NWFPs resources subject rural communities to conditions, restrictions and prohibitions. With the emergence of concepts for managing the forests sustainably both at regional and global levels, forest management policies of South Asian countries have evolved from nationalization to participatory approach. All countries in the region have made clear significant policy change with the main objective of promoting

conservation and judicious use of NWFPs resources to support rural livelihoods and national economy. South Asian countries have seen a shift in its national forest policy according to changing environment to promote social, economic, and ecological development. To cite an example, the highest priority given by the Indian National Forest Policy 1988 to the livelihood needs of rural people and environmental functions of forests is a revolutionary shift from a regulatory to participatory approach of forest management (Bhattacharya, 2015). Similar successive forest policies like Panchayats (Extension to Scheduled Areas) Act 1996 provides NWFPs ownership to village assemblies and “Scheduled Tribes and Other Traditional Forest Dwellers Act 2006” provides forest rights and a primary role of managing forest to forest dependent communities (GOI, 2007). Similarly, forest policies of other countries in the region have also evolved to support rural livelihoods and to conserve and manage NWFPs resources sustainably. Therefore, forest and NWFPs governance systems in all countries is critical for sustainable management of NWFPs to ensure a constant supply of NWFPs resources to rural communities and for equitable sharing of benefits among the rural communities.

However, the South Asian experts’ consultation meeting on sustainable management of NWFPs and its contribution to improving rural livelihoods, held in November 2020, called for reviewing existing policies and developing national NWFPs policy. The meeting emphasized providing incentives and minimum support prices, developing marketing infrastructures, empowering local institutions and community groups, domesticating important NWFPs species, and developing regulatory framework to underpin sustainable management. Furthermore, the meeting revealed the need to develop appropriate institutional framework to support sustainable management of NWFPs for sustenance and improvement of rural livelihoods, and conserving biodiversity. There are well-established institutions at national and district levels for managing and developing core forests, and these same institutions are used for regulating and management of NWFPs. However, these institutions are inadequate to address a complex processing chain of the NWFPs from collections to consumers, involving multiple stakeholders. Existing policy and institutional setup are not helping to realize the full potential of NWFPs in improving livelihood and reducing poverty. The recommendations underscored the importance of establishing appropriate institutions responsible for management, development, processing, storage, value addition, and marketing of NWFPs to ensure better return to rural communities, and to contribute to national economy. Establishing institutions at various levels of NWFPs processing chain with clear and adequate delegated authority is crucial for sustainable management of NWFPs.

Role of NWFPs in Improving Rural Livelihoods

The contribution of NWFPs to improving rural livelihoods and alleviating poverty is increasingly recognized regionally as well as globally. A series of studies on NWFPs conducted in South Asian region revealed a pivotal role of NWFPs in improving rural livelihoods and contributing to biodiversity conservation. Rural livelihood systems vary considerably from one country to another depending on ecological, historical, cultural and other factors. But NWFPs contribute significantly to the livelihoods of rural communities in all countries of the region in terms of household food security and nutrition, additional employment and income, and opportunities for NWFPs-based enterprises. The NWFPs serve as important rural livelihood safety net during crop failure and untoward natural calamities. The contribution of NWFPs cannot be measured in monetary term alone since they serve subsistence and socio-cultural functions, with multi-faceted adaptive livelihood components. It is estimated that 275 million rural people in India, accounting for 27 percent of the total population, depend on NWFPs species for at least a part of subsistence and cash income (Pandey *et al.*, 2016). Similarly, a high proportion of population in other countries in the region also depend on NWFPs directly or indirectly. The dependency on NWFPs is particularly high among the rural population living within and in periphery of the forests, where some of the most disadvantaged section of the population characterised by widespread poverty live. NWFPs collection, a major source of income and employment for rural people, has a significant positive impact on local and national economy through downstream processing and trading activities. In India, 70 percent of the NWFPs collections take place in the tribal areas and 55 percent of employment in forestry sector is attributed to NWFPs. It also provides 50 percent of the household income for about one-third of India's rural population (Pandey *et al.*, 2016). However, data on percentage of rural population dependence on NWFPs in other countries are not available, but the status papers of all countries have explicitly shown high dependence of rural population on NWFPs.

The market for NWFPs is growing rapidly, particularly organic products and medicinal and aromatic plants. A sustainable harvesting and management of NWFPs provides a good opportunity to improve livelihoods of rural communities while conserving NWFPs resources at the same time. Besides livelihoods, the NWFPs provide employment for unskilled rural population. It is an alternative source of livelihoods during certain season where there is no regular work. The country status papers highlighted a number of success stories of NWFPs management, which contributed to improving rural people's livelihoods and even provided fund for rural development activities from community groups' account. In Afghanistan, Pistachio and pine nuts

generated more than 40 million USD per year in export earnings and rural communities greatly benefited from NWFPs. Bangladesh also generated significant income and revenue from an array of NWFPs species available in the country and rural communities benefited from sale of NWFPs and generated employment at various stages of NWFPs processing chain. In Bhutan, among the major NWFPs, a highly valued Cordyceps (*Ophiocordyceps sinensis*) generated USD 3.2 million in 2019. The money is used for improving living standards of rural communities and establishing a common revolving fund in the communities to provide soft loan to its members and also to fund development activities in the locality. NWFPs like tendu leaf, lac, gum, *amla*, *dona pattal* etc., generated significant income for rural communities and provided employment opportunities in India, thereby contributing to improving tribal and rural livelihoods. Nepal is rich in NWFPs and they play an important role in increasing rural income and alleviating poverty through promotion and domestication of NWFPs, developing proper policy framework for harvesting, better processing techniques of products, and improving marketing of NWFPs. In Pakistan, rural communities collect major NWFPs species like morel mushrooms, honey, pine nuts, medicinal plants etc. and earned substantial income which helped to improving rural livelihoods. Similarly, NWFPs play a major role in improving rural livelihoods in Maldives and Sri Lanka as revealed by the respective country papers.

Sustainable Management of Non-wood Forest Products

The sustainable management of NWFPs is crucial for the livelihoods of majority of rural population who depend heavily on NWFPs for food, shelter, medicines, fibres, energy, cultural artefacts, employment, and alternative income. The NWFPs management directly contributes to four Sustainable Development Goals (SDGs): (2) zero hunger, (3) good health and well-being, (12) responsible consumption and production, and (15) life on land. NWFPs are regarded as renewable resources, which encompass a wide range of wild and semi-domesticated biological resources harvested by rural households. However, globalization, interconnectedness, economic growth, demographic shifts, and competition are driving rural population living in and around forested areas to collect increasing quantity of NWFPs for commercial purposes, leading to the degradation of NWFPs resources. Increased commercial utilization of NWFPs resources make rural communities to over-harvest the products by ignoring more sustainable traditional harvesting practices (Sheppard *et al.*, 2020). If sustainable management interventions are not implemented through a participatory approach, unsustainable management of NWFPs will adversely affect the sustenance of rural livelihoods and local economy as the quantity of NWFPs available in the forest declines gradually. As transactions of NWFPs largely take place in

households and small-scale enterprises without established marketing systems in an informal manner, NWFPs are considered least important compared to the core timber production forest. This has led to the omission of NWFPs in the main forest management planning system and management plan. Thus, rural communities harvest NWFPs from the forests without any specific guidance and restrictions on harvesting. Forest managers need to understand the importance of NWFPs for the livelihood of rural communities and work closely with rural communities to promote sustainable management of NWFPs. To implement the sustainable management plan of NWFPs, forest managers should take the interests of the various NWFPs stakeholders like government, communities, private sector, traders and consumers into account, and involve the participations of these stakeholders, especially women, in decision-making. The indigenous knowledge and skills of rural communities should be documented and integrated in sustainable management plan of NWFPs, including the capacity development of rural communities.

The sustainable management of NWFPs entails the following main components:

NWFPs resource management planning

The NWFPs resource management planning should be guided by enabling policies and legislations. The planning process should involve all stakeholders. It must take their interests and tenure systems of NWFPs management into account so that the implementation of plan will be smooth and effective to achieve the plan objectives. As per the Management of NWFPs Module, economic, social and environmental criteria should guide management planners and stakeholders to set NWFPs management priorities in the planning process (FAO 2020b). Participation of rural communities in planning process is important for sustainable management of NWFPs for following reasons: to recognize the full extent of local demands on the forest resource; to fully consider the local knowledge of the NWFPs resource that has developed over time; to engage nearby communities as stakeholders in managing the resource and ensuring their commitment to long-term management goals; and to engage the energies of local people in their own economic change, which can include decisions on social and cultural priorities that forest managers do not realize (FAO, 1995).

The overall objectives of resource management planning are to sustain production of NWFPs, conserve biodiversity, prevent soil erosion, manage watershed, improve flora and fauna habitats, and to build climate resilient rural communities. A number of NWFPs species are found in the forests with different characteristics and ecology of the species, which require different

management approaches and interventions. Therefore, it is vital to select high valued and widely used NWFPs species for commercial development on the basis of their economic, social and environmental suitability. However, preference should be given to those species with established local and regional markets over those species with uncertain market. To the extent possible, a group of NWFPs species should be included in the sustainable management plan and other innovative approach, such as payment for environmental services to reduce the vulnerability of enterprises and communities from unexpected changes in demand and price of a single product. Forest managers should also consider seasonality of harvesting and the availability of labour, so that seasonally complementary harvests of diverse NWFPs can help to manage labour demand. The NWFPs species having high potential for improving rural livelihood, particularly disadvantaged groups, should be prioritized and incorporated in the management plan.

NWFPs resource assessment and mapping

The assessment of NWFPs resource can play a key role in their sustainable management. It should be the core component of NWFPs development and management planning process. It is carried out for selected NWFPs species to collect information about distribution, abundance, harvesting seasons, regeneration capacity, growth, site quality, and annual production capacity to forecast annual yield and determine an allowable harvesting level for management planning and monitoring. However, status papers of South Asian countries have not highlighted the existence of such a NWFPs resource assessment and sustainable management planning. Most of the NWFPs were harvested based on certain restrictions imposed by local or other relevant institutions without any resource assessment and sustainable management plan.

It is imperative to undertake an advance planning for resource assessment in order to reduce costs and labour, and to make the assessment more efficient. Before selecting the resource assessment method, it is essential to conduct field works like mapping of the desired NWFPs species distribution and abundance using the satellite images and through ground truthing data collection by involving rural communities who have local knowledge of the areas. Mapping of NWFPs species will help understand the extent of species occurrence, the forest types, species distribution, and the size classes. This advance mapping of NWFPs species is crucial for resource assessment, management, monitoring and future management interventions for sustainability. It is also useful to gather information on the past NWFPs harvest and utilization by the communities from the proposed area, and incorporate the information in the map.

There are large number of NWFPs species with different ecological and biological characteristics used by rural communities making it difficult to select appropriate resource assessment methods. FAO (2000c) revealed the four levels of quantitative assessment design of NWFPs: defining the population (area to be assessed and species to study); sampling design (random or systematic); plot configuration (sample plot size); and enumeration method (dependent on characteristics of NWFPs species). The methodologies can be adapted depending on the NWFPs species and the availability of time, money and human resources. The level of adaptation also depends on the importance of NWFPs in the assessment. The NWFPs resource assessment could be carried out for a single species, multiple species and multi-purpose assessment with timber management and watershed protection assessments. This NWFPs resource assessment should provide a reliable estimate of the NWFPs resource density in different forest types, which is the total number of trees for fruits and seeds species. For rattan, medicinal plants, and species that produce latex, assessment should also include small and juvenile plants. The assessment should also cover species regeneration potential and size classes. Diameter at breast height is used for all trees, and height measurements for herbaceous plants and under storey plants. The overall sampling intensity of the assessment depends on the trade-off between assessment precision versus cost, and the species that is being assessed. It is important to include knowledgeable local people who can help record each plant's local use and local harvesting techniques in the assessment. NWFPs is gaining importance, and resource assessment of NWFPs is vital. Therefore, it is essential to incorporate NWFPs component of resource assessment with the main timber assessment to save, wherever possible, cost and time given the diverse nature of NWFPs species.

NWFPs harvesting

The sustainable harvesting of NWFPs in natural forest closely follows the principle of nature where harvesting is dispersed to different compartments of forest areas at different times to avoid over-harvesting in one area and to give recovery and regeneration time after the harvest. This arrangement also provides time for NWFPs species to mature and disperse seeds for effective regenerations as well as for maintaining species diversity. The sustainability of NWFPs harvest depends on life cycle and the specific parts of species which are harvested. Best practices for collection and harvesting of NWFPs are developed for some of the widely used and highly marketed commercially important medicinal plants in the South Asian region. Rural communities should adopt sustainable harvesting practices by harvesting the products at right time to conserve resource, to improve socio-economic conditions, and to ensure a product quality and better economic returns. It is evident that the

timely harvesting of medicinal plants by following sustainable harvesting practices results in better quality in terms of active ingredients concentration while also inducing natural regeneration (Pandey, *et al.*, 2020). The sustainable harvesting techniques and standards for other important NWFPs species need to be developed in respective countries for sustainable management.

A knowledge of the productive capacity of a particular species producing NWFPs material is necessary to determine a sustainable harvest level at which a NWFPs resource can be harvested sustainably without any destruction. A major problem among the NWFPs stakeholders is the lack of this knowledge. The type of NWFPs harvested will help to decide the sustainable harvest levels: vegetative structures like roots and bark have to be frequently harvested; sustainable harvest level of fruits and seeds depend on the intensity of collection, the means of plant pollination and dispersal, regeneration, and growth capacity; harvest of plant exudates like latex, gums and resins do not destroy trees and remove its seeds (FAO, 1995). Since there is a wide range of NWFPs species with different biological and ecological characteristics, determining sustainable harvest level is complex, requiring a detailed knowledge of the species. Studies of yield and regeneration and harvest assessments are important tools for evaluating sustainable harvest levels of NWFPs species.

Most of the rural population are not aware of the rules and regulations pertaining to harvesting and management of NWFPs. The sustainable harvesting practices are not followed due to lack of knowledge and training in rural communities. There should be institutions responsible for monitoring and enforcing NWFPs harvesting in order to prevent harvesting of products beyond harvesting level of each species. Without a proper monitoring and enforcement mechanism, commercial demand for NWFPs will lead to over-harvesting. Thus, there has to be an effective and participatory monitoring mechanism involving rural communities. Based on the monitoring results, sustainable harvesting practices may be modified and fine-tuned to achieve sustainable management.

Domestication of key NWFPs species

The rural communities in South Asia mainly collect NWFPs for subsistence use, but when a subsistence product becomes commercially important, there are implications for resources management as a large volume of product is harvested. Increased commercialization presents significant challenges in terms of resource use conflicts, meeting market demands, and ensuring local capacity to enforce tenure rights. A shift from subsistence to commercialization of NWFPs resources has brought innovations in NWFPs

resource management regime, resulting in the formation of a community-based resource management, domestication and enterprise development systems. Market-driven unsustainable harvesting of NWFPs without much care for regeneration of stocks can have adverse impacts on the species and the forest ecosystem. Over-harvesting of NWFPs will have adverse impact on biodiversity and affect the wildlife population dynamics and maintenance of resource productivity. The increasing concern over large-scale harvesting of NWFPs triggered by market demand will lead to domestication and cultivation of commercially important species. Commercialization is not the only reason for species domestication in South Asia, it is also done for subsistence, culture and aesthetic values.

While domestication offers opportunity to increase the productivity of certain NWFPs species and reduce harvesting pressure on natural forests, domestication of important wild NWFPs species involves a considerable investment and money, which may be possible if the product has very high value and reasonable chance of getting better returns in a given environmental condition. To domesticate NWFPs species, it is essential to identify key species, collect germplasm, develop vegetative propagation techniques, and integrate the NWFPs in agroforestry or agricultural systems. Significant research and development support with extension services are required for the rural communities and relevant stakeholders to embark on cultivating key NWFPs species in private and community land. There are both advantages and disadvantages of NWFPs domestication. It reduces pressure on natural forest stocks, provide local income and resources for subsistence use, and sustain a steady and reliable production to meet market demands. But it also poses the risk of concentrating income generating potential in large corporate entities in the event of a large-scale cultivation and harvesting. This in turn will further undermine poor people living in rural and interior forest areas and ecological functions played by the species in the forest. The cultivated species will be prone to pests and diseases.

There is no reliable statistics on the number of species and the extent of NWFPs cultivation in South Asia. However, there are reports of cultivation of medicinal and aromatic plants in the region to improve the quality of raw herbs, ensure reliable supply, relieve the pressure on natural forests, and reduce the cost of collection. Most notable examples are high value and low volume medicinal plants like *Nardostachys jatamansi* in Nepal, *Saussurea costus* and *safed musli* in India and some of the mushroom species cultivated in the region. A number of NWFPs species may have been cultivated for local consumptions without reporting or appearing in the public domain. Integration of NWFPs species cultivation with the agroforestry system in farms and community land is imperative for sustainable supply of products

and reducing the pressure on forestry. Therefore, it is vital to carry out research to develop best agroforestry models, which integrate diverse NWFPs species in different agro-ecological zones. The adoption of these models by rural communities can result in improving their livelihoods. This approach will not only meet the local demand for products, but protects soil, improves soil fertility, and provides sustainable ecological functions in the forests.

Marketing and Trade of NWFPs

The contribution of NWFPs towards improving rural livelihoods primarily depends on strengthening marketing opportunities and resultant income, and creating employment opportunities (Rasul *et al.*, 2008). In the South Asian context, the market of NWFPs is highly unstructured and underdeveloped. Rural communities collect NWFPs and sell to middlemen and other intermediaries which in turn sell to the urban centre and finally reach consumers. In fact, the NWFPs value chain is complicated, which involve multiple actors at various stages from primary collector to consumer. The supply channel from a primary collector to an urban wholesaler consists of a few intermediaries who provide loans for NWFPs and make a quick payment of the products. The rural communities sell the products to intermediaries as they need money to buy daily essential supplies. Primary collectors depend on intermediaries to sell their products due to lack of direct access to credit and market, and as a result, intermediaries pay for the products prices far below the market rates. In some cases, intermediaries strongly influence rural communities to collect more and more products by providing advance money easily, which in turn leads to over-exploitation of NWFPs species and undermine sustainable management of NWFPs.

In order to protect primary collectors from exploitation by intermediaries, strong market information of NWFPs should be made easily accessible to rural communities so that they will have better bargaining power and receive good prices for their products. Dissemination of various types of information such as price, value addition options and sustainable harvesting techniques are crucial for the communities to prevent them from exploitation. A social networking forum must also be developed by the government agencies to exchange information among different community groups. Collective marketing approach as an NWFPs-based intervention can provide communities with knowledge, confidence and process to operate as a non-exploitative channel for marketing of products (Pandey *et al.*, 2016). Creating such an open and efficient market would generate higher revenue and offer a strong incentive for rural communities to assume the responsibility of managing the NWFPs sustainably and promoting efficient utilization. South Asian countries have a well-established agricultural market information

system, which is easily accessible to millions of farmers in different networking forums. This system is very useful to the farmers in getting correct information about the price of agricultural products to sell their products at a fair price. NWFPs market prices are not well incorporated in this agricultural information system in many countries. It is vital to incorporate NWFPs price in the system for wider dissemination to the remotest part of the communities so that they are not exploited by the intermediaries and that their NWFPs products fetch better price.

The Indian government, through its Minimum Support Price (MSP) which is an Agricultural Price Policy, purchases crops from farmers at MSP and it provides a fair and reasonable price to the farmers and food grains supply to buffer stocks and supports the food security programme (TRIFED, 2021). The MSP is the price fixed by the government to protect the farmers against unexpected fall in price and to guarantee price for their products. The Ministry of Tribal Affairs has included 23 NWFPs in MSP and it is applicable to all the states. It provides a revolving fund to the State Level Agency. If there is any loss, it is shared between Centre and State in the ratio of 75:25. This scheme provides a fair price to rural communities and protect them from exploitation by intermediaries and at a same time encourage rural communities to manage NWFPs resources sustainably for their sustainable rural livelihoods. Similar scheme of marketing NWFPs could be established in other countries in the region based on the national policies, relevant regulations, and by creating enabling environment for rural communities to get higher income from NWFPs for improvement of their livelihoods.

NWFPs help to develop the local economy and generate significant employment opportunities for rural communities and contribute to national economy. Processing and value addition of NWFPs is challenging as there is a wide variety of products collected by rural communities, and each product has different processing and value addition approaches. Selection of NWFPs species for value chain development is important, as it will enable relevant institutions to concentrate on developing value chain on these selected species and standardizing it for higher return. A value chain is a set of value adding activities through which products passes from initial production to final delivery to the consumer and it can be local, national, regional or international in scope and the worth of the products increase at each stage of processing, packaging and transportation (Hansda, 2009). NWFPs value chain can be broken down into several sub-sets of activities: production, collection, processing, storage, transport, marketing and sale. In rural setting, it is evident that simple processing and value addition like cleaning and drying can increase the price of products. The establishment and expansion of processing

and value addition enterprises largely depend on markets for such value-added products and investments in the skills and technology.

In South Asia, the enterprise development at the local, regional and national levels have contributed to local economy. The primary collectors collectively manage a number of community enterprises, especially small-scale processing and value addition enterprises. It leads to free access to market, get better returns from their products, generate employments, develop community bonding, and ultimately improve rural livelihoods. Some of the NWFPs required advance processing and value addition process like essential oils, which is complex and require a substantial investment for establishing the enterprises. These essential oils and other high end NWFPs are traded in international market quite substantially and earned significant foreign exchange reserve to the countries. Product development and branding is increasingly critical to obtaining a fair price for products and ensure that NWFPs commercialization makes a positive contribution to rural livelihoods. Community-based branding like “Village herbs” and “Vindhya Herbals” for medicinal herbs and “Leh Berry” for high grade beverage in India are gaining popularity. Similarly, many NWFPs brand names, which fetch fair price in the regional and international markets have emerged in the South Asian countries. Certification of NWFPs as market-based instrument for conservation and trade has influenced number of countries in the region to certify their products for sale in the international market as well as for conserving NWFPs resources in the forest. For example, certification of an organic product *pipla* by Kerala-based Indian Organic Certification Agency for brand Bio Bhutan in Bhutan and Forest Stewardship Council certification for essential oils and handmade paper in Nepal and certification of lemon grass oils are some of the certifications of NWFPs, which helped to enter the international market and manage NWFPs resources sustainably in the forests.

Sustainable Management of NWFPs for Improving Rural Livelihoods – The Way Forward

The country papers following this chapter indicate that NWFPs are vital component of everyday life of the rural people. NWFPs provide food, energy, herbal medicine, raw materials for building houses and animal enclosures, and agricultural tools and implements. Rural communities use NWFPs for their basic needs as well as for social, cultural and religious functions. NWFPs also provide supplementary income and employment opportunities for rural communities, and improve their livelihoods. But if the NWFPs resources are not managed sustainably, degradation of natural environment will lead to its decline and even some species may become extinct in the long run. In addition to the sustainable management of NWFPs, processing, value addition and

marketing of products are also crucial to increase the value of products and get better price for their products. The following points emerged from the country papers of the eight countries and the regional consultation meeting discussions:

- Experts of South Asian countries felt the need to review the existing policies and develop national NWFPs policies with an emphasis on developing legal frameworks, providing incentives, setting minimum support prices, providing market access, developing marketing infrastructures, promoting trade, domesticating species, and providing government support for primary collectors. In most countries in the region, regulatory frameworks are not clearly defined and fine-tuned to provide adequate access rights for rural communities. NWFPs laws and policies should promote ecological sustainability, equity in trade, and improve rural livelihoods through more information, close stakeholder consultations and strategic approaches in developing policy. Further, devolution and empowerment of local institutions and community groups in the collection, processing, marketing and trade is imperative for effective management and to reap higher return from the products. NWFPs policies and regulations should be reviewed and developed for creating enabling environment for sustainable management and development of NWFPs for improving rural livelihoods in the region;
- Sustainable management of NWFPs is important to guarantee a sustainable supply of products to rural communities for sustenance and improving their livelihoods as the products provide a wide array of uses and income for rural communities. Excessive harvesting of NWFPs beyond the productive capacity in response to market demands has led to the degradation of NWFPs resources and subsequent decline of resource availability. Therefore, it is important to devolve the management of NWFPs to the rural community where community-based regulations and decisions can set criteria for judicious harvesting as well as impose penalties for over-harvesting. In addition, empowering local institutions for promoting conservation and strengthening monitoring of NWFPs resources is also crucial for sustainability;
- Resource assessment is key to the sustainable management and development of NWFPs. The assessment is primarily conducted to collect information on distribution, availability, regeneration status, productive capacity, and other biological and ecological conditions of NWFPs resources. It is not possible to determine the sustainable harvesting level and prepare a sustainable management plan without conducting the resource assessment. In South Asia, NWFPs resource

assessment is neither carried out nor the sustainable management concept implemented to ensure sustainability of NWFPs. Therefore, it is essential to integrate NWFPs resource assessment with the main forest assessment systems and carry out management planning to incorporate NWFPs plan in the core forest management plan. As far as possible, effort should be made to mainstream resource assessment and management planning of NWFPs with the core forest management plan for effective implementation as well as to save cost. Without proper NWFPs management plan in place, there will be over-harvesting and degradation of NWFPs resources, which in turn will threaten the livelihoods of millions of rural people living both within and fringe of the forests.

- There is an opportunity to promote domestication of promising NWFPs species on private, community and government-owned land to increase the productivity of certain products and reduce the harvesting pressure on natural forests. Governments should develop an enabling policy to promote the domestication of NWFPs species by focusing on land tenure, incentive, research and development, technical and extension support, and financial support to promote the cultivation of important NWFPs species widely. In south Asia, few species of medicinal and aromatic plants are cultivated in small scale, and these cultivations were found to be successful in generating income and reducing pressure on forests. It is vital to carry out research on integration of NWFPs species with agroforestry or agricultural systems in different agro-ecological zones. The successful agroforestry models should be disseminated to rural communities for adoption in private and community land, and for promoting and developing cultivation of important NWFPs species for increasing production and generating income for their livelihoods;
- It is important to develop NWFPs market information system for rural communities so that they will have a better bargaining power for their products with intermediaries and small enterprises. In order to provide an effective market information to rural communities, NWFPs market prices should be incorporated in the agricultural market information system accessible by the farmers in different networking forums. As information is a powerful tool, relevant government agencies should develop social networking forums for exchanging information among different community groups. In addition, governments of the region should protect and support rural communities by establishing minimum support price scheme like the one established in India. This scheme guarantees minimum price to the primary collectors for their products even if the market price fall.

- Government should encourage and create a conducive environment to establish small and medium scale enterprises to processing and value addition of NWFPs. This will help the rural communities to sell their products at a fair price to these enterprises and get employment opportunities. Incentives and other necessary supports from the governments are essential to establish local level processing enterprises to bring immediate benefits to local communities in the forms of employment, better prices and reduced exploitation by intermediaries. To develop the value chain of important NWFPs species, it is crucial to understand the processes the particular product undergoes to reach to consumers. This will reveal the types of infrastructure required at different stages of processing chain and the level of investment and technology required in the value chain of the products. Product development and branding is also critical for marketing and selling the products in international markets and obtain a fair price for the products. Branding, certification and international coding of NWFPs should also be developed and promoted for highly valued and major NWFPs to reap the benefits through international marketing and trading.
- Strengthen research and development for the promotion and management of NWFPs in a sustainable way and contribute to improving the rural livelihoods. There is a strong need to conduct research to understand the biological and ecological characteristics of NWFPs species and develop resource assessment and harvesting guidelines based on the research findings. Research on NWFPs species is important to comprehend the productive and regenerative capacities of species and develop best management practices. Continuous research and development on processing, value addition, and marketing of product should also be conducted to develop the products and fulfil the actual needs of consumers to fetch higher price of products at primary collector's level.
- There should be a robust regional networking system for sharing knowledge, market information and disseminating guidelines and best practices of NWFPs management. South Asian countries should be able to share their NWFPs-related information on this networking system and information made accessible. It should be opened access and freely accessible even to rural communities who are heavily dependent on NWFPs resources and interact with the forests. Further, it will be effective for forestry extensions to disseminate sustainable harvesting techniques, market information, rules and regulations, policies, incentives etc. Documenting local and indigenous knowledge and

validating and disseminating NWFPs knowledge through this system is important for sustainable utilization and management of NWFPs.

- There is a pressing need to build capacity at various levels of NWFPs value chain, starting from the NWFPs management and collection in the forests to the final product development. Rural communities have indigenous skills and knowledge of NWFPs management and use, but not the adequate knowledge to take advantage of domestic and international markets. Capacity development in conservation and management, sustainable harvesting techniques, domestication, processing and value addition, market information, and products development and branding should be strategically planned and implemented for sustainable management and development of NWFPs. It is also vital to build capacity of rural communities in NWFPs policies, rules and regulations, incentives and market information by creating awareness and providing adequate open access information. It is critically important to provide training, exposure visit and skill development programmes for forestry extensions, the key personnel responsible for imparting training to rural community on various aspects of NWFPs management. Further, capacity building of processors, traders, and entrepreneurs involved in the product development and branding is also vital for the development of NWFPs and consequently improve the rural livelihoods in the South Asian countries.

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Sustainable Management of Non-wood Forest Products for Rural Livelihoods in Afghanistan

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Introduction

Afghanistan's Non-wood Forest Products (NWFPs), particularly its dried fruit and nuts sector has played a major role in the export commodity and economy of the country. Afghanistan's weather and soil are suited well for the production of NWFPs and for the same reason many high value products are grown naturally in the wild. However, quantity has been low, prices high and poor on-site quality control have resulted in making low market investment for these products (MAIL & UNEP, 2020).

Most NWFPs are generally gathered from the wild such as cumin, licorice and ferula. The Government of Afghanistan has adopted the National Peace and Development Framework (ANPDF), which outlines the plan to achieve self-reliance and increase welfare of the nation. ANPDF sets agriculture and natural resources among the top priorities for the growth and jobs creation. Pistachio and Pine nut are clearly the priority Natural Resource Management (NRM) areas for the Ministry of Agriculture, Irrigation and Livestock that requires immediate action for restoration and proper management (MAIL, 2018), (MAIL, 2016).

The main difficulties arise largely in cases where NWFPs are freely collected under open access regimes to be used directly by the collectors or sold in informal markets. This is because these products are perceived to increase the share of poor people and make some livelihoods. However, a comparison of property rights regimes for NWFPs across Afghanistan is necessary as it forms the basis for understanding opportunities for improved NWFPs management and production in the future. There is a need to open green markets for these products to create niches for novelty items crafted by communities that are normally out of these materials.

Interest in NWFPs has grown recently due to consumer preference to these products that are considered natural, indigenous, better quality and healthy. Interest has grown to study the potential of non-wood forest products to meet the needs of the people and how their proper harvest and use could result in more benign in not negligible impact on the environment and livelihoods.

This paper covers various facets of Afghanistan non-wood forest products that have been gathered in recent years by experts and organizations working in the area. It provides basic information about various types of NWFPs that can be obtained from Afghanistan forest ecosystems, some success stories, their role in rural livelihoods, some barriers and challenges, and recommendation for the way forward. There is a clear need for more studies and research efforts to understand the depth and expansion of these products in Afghanistan and their contribution to the improvement of rural livelihoods and other environmental functions.

High Value NWFPs Species of Afghanistan

Pistachios

Historically, pistachios have occurred in the mountain areas in Afghanistan, Iran, and Central Asia in relatively arid climate and fine textured soils between 400 to 1,500 meter above sea level (masl) in open woodlots together with other species such as almond (Shovic, 2005) and (Harandi, O., Ghaffari, M., undated). Three species of pistachios are common in Afghanistan *Pistacia vera* L., *Pistacia Khinjuk* stocks and *Pistachio atlantica* subsp. *Cabulica* stocks, these plants are tolerant of cold and saline soils and require warm summers for proper ripening of the fruit (EOL, 2020). *Pistacia vera* L., that is mostly found in Takhar province along the Northern Pistachio Belt has been classified as Near Threatened (IUCN, 2007).

In Afghanistan, Pistachio woodlands have played an important role in soil conservation and ecosystem functioning, valued for its fruit and source of firewood and were a major export product in the region (MAIL & UNEP, 2020). However, illegal extraction, conversion of rangeland to agriculture, over harvesting for fuel and from drought have nearly deforested once dense pistachio forest in Takhar and Badghis provinces (Shovic, 2005). The Ministry of Agriculture, Irrigation and Livestock (MAIL) is planning to expand and restore the current Pistachio ecosystem through community-based interventions and encouraging public-private partnership (MAIL, 2017). Based on the Natural Resources Management Strategy, Pistachio restoration is one of the top strategic priorities of the government.

Case Study Takhar Pistachio Rehabilitation Project

Background

The Aga Khan Foundation, Afghanistan (AKF, A) with funding support from GIZ implemented a 9-month pistachio rehabilitation project in 4 districts of Takhar Province, involving 8 community development councils and a total of 18, 528 beneficiaries. The project coupled land rehabilitation of 45 hectares- involving the construction of soil and water harvesting structures such as bunds, pits and gully plugs- with direct seeding of Pistachio (*Pistacia vera* L.), a variety that is locally and traditionally grown in the area.

Approach: *Participatory Rangeland rehabilitation with communities.* Rangeland rehabilitation activities started with the *establishment of Pasture Management Committees* (PMCs). Working through the PMC, *livestock inventories* were undertaken, followed by a *participatory boundary demarcation* process involving all villages in the management area. This step created the basis for *planning and the preparation of animal grazing plans*. The grazing plans included the delineation of exclusion zones. Exclusion zones were implemented in order to demonstrate the effect of reduced grazing pressure on identified parts of the rangeland to allow for vegetative regeneration and to illustrate the importance of rotational grazing strategies.

Approach: Participatory Watershed management with communities

The approach adopted for watershed management under the project started with an assessment of the catchment, incorporating both the identification and prioritization of areas of degradation. This process was followed by the establishment of Natural Resource Management Committees (NRMCS). Training workshops were held with the NRMCS on conflict resolution, leadership management, and common property resource management. Through the NRMCS, social and resource mapping was undertaken. Once the mapping exercises were completed, specific criteria were developed and sites selected for rehabilitation measures- both biological and mechanical. These measures included terracing, contour trenches, the digging of pits, water harvesting ponds, check dams, gully plugs, nursery preparation, re-seeding and re-planting in the riparian zones. Local people, selected by the Community Development Councils (CDCs) were employed as labourers, ensuring direct, immediate financial benefit for community members. CDCs were brought together to form Cluster Level Development Committees in a process that integrated the NRMCS and allowed for valley/ watershed/ catchment level planning. Underpinning this process was the establishment of monitoring protocols and roles and responsibilities. This component was designed to ensure a continual learning, adaptation and impact assessment

process. NRMCS and CLDCs were trained on, and given the responsibility for this important element of the project.

Results

Communities assumed responsibility for the sites at the end of the project in 2008 and have continued managing them to date. Nine years after the start of the project, many of the trees have started producing fruits and the number of sites under protection and production of pistachio have increased- either on the initiative of individual farmers and Community Development Councils (CDC), NRMCS, or with the support of other NGOs. Most recent data indicate that over **45** hectares of eroded land was replanted with pistachio under, and in the period after, the project. In 2009, high value *ferula asafoetida* was introduced to 90 farmers. Currently more than **1000 farmers** are now cultivating and producing the crop in rain fed land. Since the start of the project, to date, **21** watershed and forestry demonstration sites on **327** hectares, along with **210** hectares of treated land have been established benefiting **73,000 people**.

Project Benefits/ Impact

Over 31,454 pistachio trees are still alive. Beyond the potential incomes earned from the sale of fruit, and together with improved skills and community knowledge, the project has brought a number of benefits including: reduced soil erosion, improved vegetation cover, improved biodiversity, increased fodder production and short-term employment.

Source: Aga Khan Foundation

Pine nuts

Pine-nut, locally known as Chilgoza grows naturally in the southern and eastern mountains and hilly areas of Afghanistan. The region is classified as Eastern Forest Complex and comes under Palearctic realm and Himalayan (CARD-F, 2017). Recently pine-nut has also been propagated artificially and is consider a high economic value plant. Pine-nut could be a long-term assurance of the socio-economic development of rural communities. It has been estimated that on average 23,000 MT of pine-nuts are produced annually, with an estimated value of USD 244 – 290 million (CARD-F, 2017). Afghanistan's climate is well suited for high quality pine-nut forestation. However, decades of conflict, illegal extraction, deforestation, and drought have destroyed much valuable forests. Also lack of skill and knowledge, poor investment strategies and processing and marketing practices are some of the other challenges that have restricted the pine-nut value chain development.

The full coverage and area of pine-nut in Afghanistan is unknown due to lack of proper survey and information. However, it is estimated that approximately 43,765 hectares of natural pine-forest exists (CARD-F, 2017). Pine nut are mostly harvested and process by local communities around the Eastern Forest Complex and its empty cones are used for fuelwood. The practices could be unsustainable and further degrade its natural ecosystems. The General Directorate of Natural Resources Management (GD-NRM) of MAIL therefore urges community-based forest restoration, particularly pine-nut restoration (MAIL, 2017). Forestation activities will only be successful if they are done in close collaboration with local communities. GD-NRM has established Forest Association comprising mainly of local communities and community leaders. Forest Association are supported technically by GD-NRM, with the aim to mainstream long-term conservation, sustainable management and utilization of forest resources, particularly high economic value species such as pistachios and chilgoza pine-nut.

Licorice

Glycyrrhiza glabra commonly known as licorice is found naturally in the wild in Afghanistan. This plant is frequently grown across various regions of Afghanistan. It has been used traditionally as a medicine and flavoring agent in confectionery applications for centuries. Afghanistan's licorice can compete with international standards due to its wilderness quality and uniqueness. However, many bottlenecks remain present such as unsustainable harvest, lack of direct access to international markets, political and socio-economic instability, infrastructure, production capacity, compliance with international product standards regarding uniformity, hygiene and traceability (Stanikzi, M.T., 2007). Afghanistan needs to overcome these challenges if it is to enter the global market place. One of the complications is low registration rate of licorice export. Based on records of the Ministry of Commerce, only 40% of total exports have been registered with the ministry and the other 60% is illegally traded (Stanikzi, M.T., 2007).

Licorice is considered as a high economic value product. The General Directorate of Natural Resources Management (GD-NRM) of Ministry of Agriculture, Irrigation and Livestock is planning to restore and expand licorice ecosystems by introducing environmentally friendly and green economic principles. The ministry is encouraging partnership between private investors and government in order to pave the way for a bigger market for the product. In 2016 alone, Afghanistan exported around 40,000 tons of licorice root, worth 54 million USD (MAIL, 2018b) . Currently, licorice is mostly collected from the wild, with only minimum scale cultivation. Due to low investment, lack of technology, machineries and extraction factories, most of

the value adding activities such as grinding, sorting, mixing, packing, labeling and certification of Afghan licorice take place in neighboring countries (Stanikzi, M.T., 2007). With the new scheme of the government, it is expected that investor would take interest in the Afghan licorice value chain and improve the quality and quantity of this product over the next five years.

Asafoetida

Asafoetida or commonly known as Hing is an aleo gum resin obtained from the rhizome and root of *ferula foetida* and other *ferula* family. Hing is an important medicinal plant of Afghanistan, which is mainly found in Samangan, Takhar, Balkh, Baghlan, Sar-e-Pul, Herat, Badakhshan, Jawzjan, Faryab and Kunduz provinces areas. Two types of hing could be found in Afghanistan; one known as white (Hing, Kabuli Sufaid) and the other is dark (Hing Lal) or red asafoetida. White asafoetida is water-soluble and the dark asafetida is fried in and converted into powdered form to use in cuisines (AKF, 2007). Hing plant is also grown natural in the wild in higher pasture areas. It is mostly collected by local communities and sold to local markets for some cash. From the local market, hing makes its way to the national and then regional market. Hing is only used for medicinal purposes, most of it is exported. Most Afghan asafetida production is exported to India, on its peak years in 1990/91, approximately 950 tonnes were exported to India (AKF, 2007). However, exports decreased tremendously in recent years. Main causes for this were unregulated and unsustainable harvest, natural disasters such as frequent drought, lack of value addition and many more. Hing requires a comprehensive study and analysis as well as proper governance mechanism, if the species is to compete at the global market.

Success story of blackcurrant cultivation in Shughnan 2015.

Blackcurrant is one the medicinal and forest bushes could be found in the mountain area above 2,500m altitude in Sheghnan. The height of the blackcurrant is 1.50 -2m and always grows in high altitude. This fruit has a black color and will be ripe in middle of summer and has a sour taste. This bush can be found in some villages of Sheghnan, Ishkashem and Yomgan District. The Blackcurrant fruit is very useful for blood pressure, fever and also strength of the heart; it's reducing the fat of the body. Blackcurrant has a good market locally where the price of one kg is about 1,500 Afghani in Badakhshan's center Faizaabad. Around 4,500 cuttings of the blackcurrant were cultivated in Sheghnan and Shukay district as trial in 2015. The grown blackcurrant plants now provide a good yield for the locals. According to the farmers, they earn around 3,000 Afghani from the collection of wild black currant and selling it in the local market.

Source: Aga Khan Foundation

NWFPs Contribution to Rural Livelihood and other Environmental Function

Rural livelihood

Afghanistan is a predominantly rural society that heavily depends on agriculture and natural resources. But due to poor soil conditions, lack of irrigated lands, disasters, on-going conflict and other factors, communities rely on other natural resources such as non-wood forest products. These include fruit nuts such as pistachio, pine nut, almond and medicinal plants such as liquorice, ferula and cumin. It is estimated that over 600 medicinal plants could be found in Afghanistan but only one-third of these are traded commercially (Younos., 2006). The plants play an important role in socio-economic development of rural communities.

Non-wood forest products such as Pistachio (*Pistacia vera*) nuts, Walnuts, Almonds, dried mulberry, and Chilgoza pine (*Pinus Geradiana*) nuts constitute a third of total export of the country and contribute positively to the nation Gross Domestic Product (GDP) (NEPA, 2019). Pistachio and pine-nuts have high Return of Interest (ROI), with an estimated account of more than 40 million USD per year in export (MAIL, 2017). Each hectare of fully-grown pistachio tree could generate approximately USD 24,500 income per year and each hectare of mature chilgoza pine on average could generate USD 18,375 income per year (MAIL, 2017). The Ministry of Agriculture, Irrigation and Livestock (MAIL) is planning to expand Pistachio and pine-nut forests by 23,000 each in the next 5 years (MAIL, 2017), which would result in an annual income of USD 986.5 (NEPA, 2019).

NWFPs play a major role in food security, and their livelihoods and economic opportunities for rural communities in Afghanistan are insignificant. Communities extract resources of their household consumption use as medicine and collect and sell in the market for cash. Sometime to avoid conflict, villagers harvest and process nuts in communities and then divide the revenue per household based on the contribution of members of the household (Shalizi, 2016). Local communities are the primary collectors of NWFPs for commercial purposes as well. In order to increase the global market share of Afghan NWFPs, proper expansion and improvement plans need to be developed and investors need to be encouraged to support local communities and the government. Cultural, social and institutional issues are important in determining the direct and indirect benefits of NWFPs commercialization for different social groups (Marshall et al., 2006). Therefore, before any intervention, the potential impact on institutions, communities, individual households, marginalized groups and individuals as well as men and women would need to be assessed (MAIL & UNEP, 2020).

By including communities and related organizations in the project, implementation ensures that project activities and actions are responsive to the needs and priorities of all marginalized and vulnerable groups. Efforts will need to be made to ensure a safe environment is created for all and any potential conflict and risks are completely resolved or mitigated.

Environmental Benefits

NWFPs are not only economic commodity, but they could generate substantial environmental, and social value for farming and rural communities through their protective functions. NWFPs provide medicine, pasture and shelter for livestock, habitat for wildlife, sequester carbon and other environmental services. NWFPs provide nature-based protection measures and are used for safeguarding precious agricultural lands, controlling erosion, and preventing damage to property. Nature-based infrastructure in the upstream portions of watersheds coupled with protection of land through vegetative green cover will help reduce the risks of flash floods, soil erosion, strengthen water conservation and regulate its discharge. (World Bank, 2018). To cope with the impact of climate change, Afghanistan's National Adaptation Plan (NAPA) proposed to conserve at least 10% of Afghanistan's land area and the habitat of selected species; and regenerate at least 40% of existing degraded forests and rangeland areas (UNEP and NEPA, 2009).

Success Story of Sea buck thorn afforestation in Sarcand village /Wakhan district.

Background:

Sarcand is a very small village in Wakhan district located 25 km from Khandood, the capital of Wakhan district and has 10 households, which belong to PAK and Panja Community Development Council (CDC). 95% of the people are engaged with animal keeping and agriculture, however agricultural land is sandy and not fertile in the area. Local communities survive 3-4 months with their agricultural productions. Every year, floods and stone slides threaten the village from two directions, but still the people are interested to save from harm and develop their village.

In 2015, the Sarcand CDC signed a Memorandum of Understanding with the Natural Resources Management unit of the Aga Khan Foundation to plant 2,000-2,500 sea buckthorn bushes in one hectare of land. Once the plantation started, it was expanded to 6 hectares of the area. With support from local communities, an estimated 21,000 cuttings of sea buckthorn were planted. The sea buckthorn bushes would protect the environment from degradation, used as fences for agricultural land, provide firewood for nearby communities as well as be used as fodder for livestock. However, sea

buckthorn has many medicinal purposes which are yet to be explored and market created for.

Head of CDC were asked about their contribution in this work and Mr. Juma Gul explained that 22 people from 10 household (HH) of this village have worked during one month to establish reforest there, every HH brought 40 donkey load sea buckthorn for fencing of this land and 30 donkey load for plantation which the total of cutting 21,000 in 6 hectare land which is a big treasure for the future. According to our calculation the contribution of AKF was 14% and the CDC contributed 86%, we had just USD 1,200 in total where we purchase 60 m 4-inch pipe by 9,000 Afghani to rehabilitate the Sarcand irrigation canal which damaged by stone slide. With this work we have protected the canal which irrigate the agriculture land and also established sea buckthorn jungle, which is unique in the area. At the end Mr. Juma Gul recommended the community to use the opportunity and contribute more and more when the international organization support them even with a small money, because we cannot find this assistant forever.

Source: Aga Khan Foundation

Women's Roles in NWFPs

Women make approximately 33 percent of the labour force in Afghanistan's agricultural sector but are mostly involved in lower level of agricultural value chains and small-scale production (CSO, 2016) and (World Bank , 2011) . Women tend to be more vulnerable to climate change as small-scale farmers because they limited options to diversify their income sources (Ochieng et al., 2016). Therefore, women's involvement throughout the planning and practical action for agricultural sector as well as NWFPs value chain is important (ARC, 2017).

The Ministry of Agriculture, Irrigation and Livestock (MAIL)'s General Direction of Natural Resources Management has committed to take practical and solid steps to increase women's participation and to ensure their meaningful involvement throughout the management, harvesting, processing, product development and marketing process of the natural resources management sector, particularly in NWFPs. For instance, women's membership is key while establishing Forest Management Association (FMAs), Rangeland Management Associations (RMAs) and Protected Area Associations (PAAs) that are the basis for future income generation from natural resources base (MAIL 2018). Women are mostly involved in nursery management and harvesting and processing of NWFPs, manage small orchards with fruits and nut trees and beehives. However, their involvements are still in the lower end of the commercial farming value chains such as day labour hand shelling/sorting almonds, apricots, peanuts, pine nuts, and

walnuts in their homes for contract farmers (Ganesh, 2017). The National Natural Resource Management Strategy (2017-2021) of Afghanistan points to these challenges and instructs for women inclusion in decision making process for natural resources management (MAIL, 2016).

Barriers and Challenges with NWFPs

A good overview of the potential of NWFPs and their conservation status in Afghanistan is still not available due to lack of fieldwork and studies. Currently no proper data, or data system on the exact distribution, availability and conservation status of any of the NWFPs, particularly wild-harvested medicinal plants could be found. How these species are being harvest, whether sustainable or unsustainable is not known. Lack of tools for law enforcement, low capacity within government and willingness among NGOs and international organizations working in the sector is one of the main challenges. Resource inventory, mapping and species management require capacity at the national and sub-national governance system. Expansion, conservation and harvesting plans for each NWFPs need to be developed, implemented and monitored to ensure sustainability of the products. No real success has been made in the value chain development of NWFPs. Also, there is a lack of capacity for quality analysis and quality control that seriously constrains the ability to develop the medicinal plant sector.

Laws and Regulations is another area that needs improvement. Existing laws and regulations are very general in scope and need updating. Also, a proper mechanism at the national and sub-national need to be put in place for their implementation. Without proper enforcement mechanism, over-harvesting and long-term drought would decrease the availability of many valuable species such as ferula. Being a party to CITES, control on trade needs to be stricken.

Although the Environment law requires a permit for the collection of species, there are also no proper grading system or national grading standards, even for the most important medicinal plant commodities. Lack of availability of laboratories certified to international standards that could carry quality analysis has doubled the challenge. Due to poor enabling infrastructure, establishing modern process centers could be challenging. Inconsistent and unaffordable power has made it impossible to establish industrial-scale dried fruit and nut processing facilities (MAIL & UNEP, 2020)

Research and Development Needs/Capacity Development of Stakeholders

Capacity building and skills development are a significant need for the value chain development of NWFPs. Capacity building would need to be embedded throughout the whole process of NWFPs value chain. One key area that requires capacity building is to work closely with organizations and individual on conducting research and studies on each specific NWFPs. Comprehensive research on distribution, availability and conservation status of wild-harvested medicinal plants and NWFPs in general, financial management system and developing business plan would tremendously help with the expansion and strengthening of their value chains. Also, both the government and communities require the necessary skill in order to increase the value of products, improve their quality and production and amplify their marketability and shelf-life. This may involve skills development related to: reduced storage and post-harvest losses, resource management planning and organisational management, reforestation, nursery establishment, pest management, water management, sustainable harvesting and landscape rehabilitation (MAIL & UNEP, 2020).

The Way Forward – for Enhancement of NWFPs Programs in the Country

NWFPs are important for rural and broader economic development of Afghanistan, yet realization of their full potential will require a more coordinated collective action, policy and institutional reforms, and increased investments. Supporting the commercial development of NWFPs will not only boost economic growth and support food security but will also improve the environmental condition for human, wildlife and biodiversity.

Completing development, enactment and operationalization of priority policies and rules, most importantly the National Natural Resources Management Policy and Medicinal Law. These would be major step in the sustainable management and harvesting of NWFPs in Afghanistan. A key next step would be to establish a centralized resources inventory that could be regularly updated with data from researches and remote sensing. Many organisations conduct studies and research but the data is not being shared for wider usage. The centralised resource inventory would act as a knowledge hub for data on NWFPs.

Trainings and workshops on improving product quality and processing on-site would need to be designed for farmers and other collectors. This could increase the price and provide access to niche markets (Schreckenberget al., 2006). If products are properly sorted out and processed on the site, this could

increase their shelf-life and also producers could earn more than only raw material (MAIL & UNEP, 2020). Also, encouraging entrepreneurship and supporting entrepreneurs could strengthen relations between producers and consumers, help with better business planning, advocate for improved infrastructure and support improved marketing strategies.

MAIL is adopting a pro-active value chain approach to public-private partnerships and is encouraging private sector investment as well as engage rural communities in markets and value chains (MAIL, 2018). This would drive for market-oriented benefit sharing arrangement, where Forest Management Association and Rangeland Management Associations groups would offer goods and services in return for money usually. MAIL is also encouraging the Payment for Ecosystem Services (PES) initiatives.

Participatory monitoring and evaluation and learning is key to sustainable management of NWFPs and scaling up of NWFPs associated enterprises for improvement of rural livelihoods. There should be a cyclic reviewing and adapting of NWFPs management plans through constant monitoring, learning, and where necessary adjustment of plans and processes (MAIL and UNEP, 2002)

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Sustainable Management of Non-wood Forest Products for Rural Livelihoods in Bangladesh

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Introduction

Forest provides many useful goods and services and Non-wood Forest Products (NWFPs) for subsistence and commercial values. NWFPs include fruits, seeds, nuts, barks, roots, fungi, resins, feathers, bush meat, fibres and leaves. It also includes bamboo, gam, canes, aromatic and medicinal plants. NWFPs are useful substances, materials and/or commodities obtained from forests which do not require harvesting (logging) trees. It is also known as “non-timber forest products (NTFPs)”, “minor forest produce”, “special forest produce”, “alternative forest produce”, “secondary forest produce”, “byproducts of forests”, “non-wood goods and benefits”, “non-wood goods and services”, and “other forest products”. NWFPs are grouped commonly into different categories like floral greens, decorative, medicinal plants, flavors and fragrances, and resins. NWFPs provide many vital resources such as food, medicine, honey, essential oil, spice, resin, gum, latex, fiber and floss, bamboo, and murta cane, rattan, broom-grass, sun-grass, mushroom, silk cocoon, lac, khoer (*catechu*), nypa leaves *etc.* These items are harvested for both subsistence and commercial use, either regularly, or as a fallback during times of need. They add to peoples’ livelihood security, especially for forest-dependent people (Posey 1999, Cocks *et al.* 2003). The contributions of NWFPs have a positive impact on rural livelihoods. It also creates new opportunities for entrepreneurial development. The fact that their use is less ecologically destructive than timber harvesting that encouraged the intensive management of forests. NWFPs strive to achieve both development and conservation objectives which led to initiatives to expand commercial use of NWFPs (Arnold and Ruiz Perez 2001). It is also widely believed that poor rural communities may be less inclined to engage in illegal logging if they are able to derive more material benefits from maintaining forests for various alternative goods and services (Oldfield 1988).

Millions of people throughout the world make extensive use of innumerable number of culturally important biological products from the nature (Koziell *et al.*, 2001 and Lawes *et al.*, 2004). Bangladesh is one of the most densely populated countries in the world comprising about 163 million people (BBS,

2016). The per capita land holding is less than 0.10 hectare, which is declining from 0.14 hectare in 1992 (FAO, 2015) and the country claimed to have the lowest per capita arable land of 0.02 ha (Iqbal *et al.*, 2002). According to Forestry Statistics in Bangladesh, the estimated forest area of the country is about 2.6 million ha and this is about 17.62% of the total land base of Bangladesh (BFD, 2016). Global Forest Resources Assessment (FRA) indicates that total forest area of Bangladesh is 1.429 million hectares, *i.e.*, 11% of the land area of the country (FAO, 2015; Rahman, 2016). This is much lower than the Government estimate. Out of 64 districts, 35 districts have no natural forest land (Bhuiyan, 1994). In the absence of effective institutional arrangements and governance, this high density of poor people in conjunction with their heavy dependence on natural resources has led to the over exploitation of forest and other natural resources, resulting in an accelerated rate of resource depletion (GOB, 2009; FAO, 2000).

There is wide scope and potential to ensure better rural livelihood and improvement of environmental condition through sustainable management of community based NWFPs. The objectives of this country paper are to review the sustainable management regimes of community based NWFPs, its contribution to rural livelihood improvement and the nexus between them. It also identifies the barriers, challenges and opportunity of NWFPs.

Methodology

This country paper focuses on data and findings obtained through a structured search of both published and unpublished secondary sources. Time and language constraints did not allow a detailed literature search. The literature search on this topic using on-line catalogues of Social Forestry, ISI Web of Knowledge, and CAB Directory were carried. Further, using combinations of the search terms like 'NWFPs', 'forest', 'livelihood', and 'Bangladesh' was also done to get enough information. Grey-literature from organizations whose work focuses on forests and livelihoods, such as the Bangladesh Forest Department (BFD), Bangladesh Forest Research Institute (BFRI), the United Nations Food and Agriculture Organization (FAO), and the International Union for the Conservation of Nature (IUCN), and different department related to forestry and agroforestry of various public university in Bangladesh were also searched. The literature search was kept deliberately wide, and included articles that, at first may have only appeared peripherally related to the topic, while keeping the review manageable by restricting the search to articles published over the past two decades. The majority of the literature drew mainly from sources on forest products in Bangladesh Forestry Master Plan 2017-2036, This article also focused on forest resources from

both natural forests and managed plantations. However, a paucity of data in this regard is acknowledged, and reasons for this are discussed.

Non-wood Forest Products Policy

A comprehensive and well-articulated policy and plan is vital for the development of NWFPs. Such a policy should specify the relative role of NWFPs in supporting ecosystem service, conservation and management, the level and nature of resource use and management, product development and promotion, entrepreneurship development, socio-economic development and poverty reduction.

National Forestry Policy 2016, emphasized the need to meet the demand of timber and NWFPs by assessing availability, expanding the area and increasing the throughput of plantations of NWFPs including medicinal and aromatic plants in both forest areas and outside. The policy has given priority to sustainable forest management which provide positive climate change and socioeconomic related benefits, resources for meeting local community requirements and essential ecosystem functions, and services to preserve and increase agricultural productivity to ensure national food security. It has also directed to provide technical assistance and extension services to women, youth and indigenous communities to support climate change adaptation and mitigation initiatives. These efforts will motivate individuals to grow more trees in and around homesteads and on unused marginal lands with appropriate emphasis on climate resilient shrub and tree species, indigenous non-wood forest products, fodder, and fruit-bearing tree species. The policy also guides to provide sustainably harvest, process, establish forest-based cottage and small-scale enterprises with investments in employment-enhancing NWFPs-based livelihood technologies that add product value and generate income to increased local employment opportunities. It also gives much emphasis on biodiversity conservation, which is also applicable for the conservation of NWFPs. Cultivation of cane and medicinal plants along with tree plantations is getting preference in the plantation programs. Further, cultivation of bamboo and murta (*Clinogynae dichotoma*) are also being emphasized. According to the Forestry Master Plan, NWFPs program development in Bangladesh will be promoted, facilitated and financed in view of their economic importance and its wide use by the rural communities. Small-scale enterprises based on NWFPs are given special consideration for providing off-farm income and employment to the rural communities. The National Forest Policy also includes the provisions for community participation, private forestry development, poverty alleviation and involvement of voluntary and non-government institutions in community/social forestry programs.

The clear-felling followed by artificial regeneration system in the hill forest management severely degraded the NWFPs resources. In addition, the monoculture of *Tectona grandis* made the forest unfavorable for the natural regeneration of NWFPs. The past forest policy and management strategies in Bangladesh were timber oriented. The timber dominated forest management did not give due attention to the sustainable management of NWFPs. There are harvesting rules for some products such as bamboo but is not strictly followed which led to resource depletion. The forest policy highlights the maintenance of efficient markets for forest products and non-wood forest products, developed supportive regulatory and legal framework to established market equilibriums for sustainable supply of raw materials to forest resource-dependent domestic industries. Bangladesh Forestry Master Plan 2017-2036 guides the government to enhance NWFPs program by increasing NWFPs plantations and developing regulatory framework to support NWFPs-related industries and create employment opportunities. It also emphasized to promote forest products-based industries, strengthening forestry research, livelihood support to forest dependent communities and climate change.

Institutional Set-up for Management of NWFPs

The forests of Bangladesh sustain the natural environment by providing supportive and regulatory ecosystem functions and services to the people of the country. Bangladesh Forest Department (BFD) under the Ministry of Environment, Forest and Climate Change is responsible for overall management of forest and NWFPs in the country. There are other government organizations like the Bangladesh Forest Research Institute (BFRI), the Bangladesh National Herbarium (BNH) and the Bangladesh Forest Industries Development Corporation (BFIDC) which are relevant to the management and marketing of NWFPs. The main responsibility of BFD is to assist the co-management committee and private sector with legal and policy level support for handling and optimizing collection of high quality NWFPs. The development of NWFPs for bamboo, cane and murta with a target area of 2,000 hectares have been implemented in 7th Five Year Plan (2016-20) by the Forestry Sub-Sector. To enhance forestry education, training and capacity building, BFD has established the different training institutes for training its staff, i.e., Bangladesh Forest Academy Chattogram, Forestry Science and Training Institutes (FSTIs) Chattogram, Rajshahi and Sylhet, and Forest Development and Training Centre (FDTC), Kaptai. Further, Bangladesh Agricultural Research Council (BARC) also initiated the training on forestry and agroforestry technologies for the professionals and organized different national workshop on research activities of forestry and agroforestry for different NARS scientists and related professionals.

BARC, BFRI, BNH and other institutions or universities were involved in forestry research. BFRI already took research initiatives for increased production, preservation, minimum wastage, increased service life, optimum utilization and multipurpose use of fibrous raw materials like wood, bamboo, cane, *etc.*, for small and cottage industries. On the other hand, BNH is involve for collection, identification, characterization, and *Ex-situ* conservation of different plants like NWFPs including medicinal plants. This organization also involved in the exploration, collection, identification, and preservation of the country's plant resources. During explorations, its scientists collect plant specimens, as well as associated information on locations, local names, collection dates, phenologies, diversity, abundance, distribution, local uses, and risks.

Forest Unit, Natural Resources Management Division of Bangladesh Agricultural Research Council (BARC) under Ministry of Agriculture also conducts research related to forestry, Agroforestry, NWFPs and climate change in coordination with National Agricultural Research Institute (NARI). BARC has coordinated project on “Improvement of agroforestry practices for better livelihood and environment” funded by World Bank, IFAD and GoB through Sponsored Public Goods Research (SPGR), National Agricultural Technology Project (NATP)-I and invented some improved agroforestry models for better livelihood and environment. In addition, Bangladesh Agricultural Research Council (BARC) coordinated two different forestry and agroforestry related sub-projects which is funded by Program Based Research Grant (PBRG), NATP-II viz. “Exploration, Identification, Characterization, Multiplication and *Ex-situ* Conservation of Endangered Forest Genetic Resources including Medicinal plants of Bangladesh” and “Germplasm conservation and farm productivity enhancement through the interaction of shade trees and tea based agroforestry system to mitigate the climate change”. The sub-projects are ongoing since 2018 and the technologies intendent to be generated from these sub-projects are as follows:

- Development of conservation technology and nursery techniques of 50 medicinal plants, 200 ethno-medicinal plants and 40 forest plants species;
- Development of fodder production through agroforestry system;
- Chui jhal (*Piper chaba*) and Black pepper (*Piper nigrum*) introduced Tea based agroforestry models;
- Development of homestead and cropland agroforestry system.

Furthermore, different educational institutes like Bangladesh Agricultural University (BAU), Mymensingh; Bangabandhu Sheikh Mujibur Rahman

Agricultural University (BSMRAU), Gazipur; Institute of Forestry and Environment Science, Chittagong University (IFESCU); Patuakhali Science and Technology University (PSTU); Hazi Mohammad Denesh Science and Technology University (HSTU); and Shar-e-Bangla Agricultural University (SAU), Dhaka; and Sylhet Agricultural University (SAU); Khulna University (KU); Shahjalal University of Science and Technology (SUST) and other different science and technology universities run different courses for graduate, postgraduate and doctoral degrees and research in forestry discipline in Bangladesh.

Non-wood Forest Products Management

There are prescribed rules and management plan for collection of major NWFPs like bamboo, cane, murta, sungrass, golpata, honey, wax from government forests. Harvesting of some NWFPs are seasonal and some are year-round. Bamboo is harvested almost year-round at an interval of four years. There are clear prescriptions for sustainable harvesting of bamboo and also restriction imposed to avoid over-harvesting. Golpata is harvested every alternate year from a given site and there are rules prescribed for harvesting the golpata leaves. Honey is collected every year but only between mid-April to mid-June. There are guidelines as to what portion of the honeycomb can be cut and collected to extract honey (Zohora, 2011). Thus, all the major NWFPs are under some sort of management and some regulations. However, there is no management plan prescriptions for collection of NWFPs from USF land, private forest and village common forests. Villagers/professional collectors usually collect honey, wild vegetables, bamboo shoots, broom grass, medicinal plants, menda bark, sungrass, wild fruits and other NWFPs from surrounding forest areas for household uses and also for income. Among the NWFPs of the country; bamboo, cane and murta are considered as very important forest commodities for the products development. Forest department has completed 'Development of bamboo, cane and murta plantation project' during the period 1998-99 to 2005-2006 and another project of this kind was also implemented during the period 2009-2010 to 2013-2014.

Table 1: Non-wood Forest Products collected in Bangladesh (2018-2019)

Sl. No.	Type of NWFPs	Quantity
1.	Bamboo	49.87 million nos.
2.	Fish	7.7 million kg
3.	Honey	0.30 million kg
4.	Leaves (Golpata)	8.70 million kg
5.	Cane	0.53 million ft

Source: BFD, 2018-19

Table 2: Forest types, distributions, management regimes and diverse products in Bangladesh

Sl. No.	Forest types and Distributions	Management regimes	Key products (Non-wood)
1	<i>Hill forests (tropical wet evergreen and semi-evergreen)</i> Rangamati, Bandarban, Khagrachari, Chattogram and Cox's Bazar districts and Sylhet district	- Government ownership, - Co- Management programme with local community for protected area management, - Customary ownership	- Wood fuel, - Medicinal plants, - Wild vegetables and fruits - Bamboo - Grasses - Wild animals - Rattan - Betel leaves and nuts
2	<i>Sal forests (tropical moist deciduous)</i> Central (Dhaka, Tangail and Maymensingh districts) and North (Rangpur and Dinajpur districts) region	- Government ownership - Participatory plantation with local community	- Wood fuel - Wild vegetables and fruits
3	<i>Mangroves (natural and planted)</i> South-west (Khulna, Bagerhat and Satkhira districts)	- Government ownership	- Thatching plants (Goal pata- <i>Nypa fruticans</i>) - Honey, - Fishes
4	<i>Village forests (home gardens)</i> Broadly planted trees around home or with agriculture in rural areas across the country	- Individual	- Wood fuel - Fruits - Timbers - Bamboo - Rattan

Source: Ahammad *et al.*, 2015

Community-based production and marketing systems are not well-developed for NWFPs in Bangladesh. The development of NWFPs marketing depends on market intelligence and proper enforcement with relevant rules and regulations. Therefore, marketing resource is interlinked with costs and profitability. The export of NWFPs from Bangladesh is still very insignificant. Business Promotion Council (BPC) under the Ministry of Commerce has identified six specific potential sectors which include agro-products, fisheries, leather, medicinal and herbal plants, ICT, and light engineering; among the six sectors, medicinal and herbal plants were identified as the highest priority sector in Export Policy 2015-2018.

Important NWFPs and their Uses

The forest of Bangladesh provides a wide range of NWFPs for human use. The most important NWFP's are Bamboo, Golpata (*Nipa fruticans*), Sun-grasses, Honey, Wax, Cane (Rattan) and Murta (Patipata). Other NWFPs are Broom-grasses (*Thysanolaena maxima*), Nal (*Saccharum* spp.), Hogla (*Typha elephantina*) Hantal (*Phoenix paludosa*), medicinal plants (barks, fruits, leaves, etc. of plant), fodder, climbers (lota), Menda bark (*Litsea glutinosa*) (Khan, 1992; FAO, 2003). Rural people predominantly living in forested areas depend on NWFPs for various levels of uses. At the subsistence level, NWFPs are key sources for food, medicines, fodder, gums, fiber, and construction material. Arnold (2002) stated that "NWFP are particularly important in reducing the shortages suffered during the 'hunger periods' of the agricultural cycle as they help to even out seasonal fluctuations in the availability of food". Moreover, many of NWFPs are important traded commodities at local, national, regional and international levels, providing employment and income at each level.

Bamboo

Among the NWFPs, bamboo is the most important species. Bamboo (*Melocanna baccifera*, *Bambusa tulda*, etc) is often called as the poor man's timber. Although officially grouped as a Non-wood Forest Products, it plays a crucial role in the rural economy of Bangladesh. Roughly about 6% of the total revenue of Forest Department (FD) comes from bamboo. About 50 million bamboo culms are produced by the FD from government forests per year. It is an essential material for construction of housing for the rural people, especially for the hill communities. According to Banik (2000) there are more than 33 species of bamboo available in Bangladesh. Over 20 species of bamboo occur in Bangladesh's natural forests and village homesteads (Alam 1982; Alam and Basu 1988).

The flowering of bamboos is a natural process which takes place at a varying time range of 25 - 70 years. Besides, most of the bamboo species do not produce any seeds during their flowering time; as such, bamboos are propagated through vegetative methods. The conventional method through rhizome culture is not economically viable for large scale seedlings production. The offsets are bulky and heavy (4-30 kg per propagule); therefore, difficult to handle and transport. Availability of propagules per clump is also limited and costly and this method has limitation for large-scale bamboo plantations. Bangladesh Forest Research Institute has developed the easiest way of bamboo cultivation technology through branch cutting and this technology was disseminated in 1980.

Bamboo branch cutting technique

Among the different vegetative methods bamboo branch cutting technique is more suitable for mass production of bamboo seedlings. This method is suitable for *Bambusa balcooa*, *B. vulgaris*, *B. bambos*, *B. cacharensis*, *B. tulda*, *B. jaintiana*, *B. ventricosa*, *B. polymorpha*, *B. salarkhanii*, *Dendrocalamus giganteus*, *D. longispathus*, *D. brandisii*, and *Thyrsospachys oliveri*. Because most of the thick-walled cultivated bamboo species in Bangladesh have stout branches. Collection and caring of the branches from the clump are very easy and cost effective due to its availability. The collected branch cuttings from the culms are placed on the sand media under mist for rooting. Then the rooted cuttings are transferred in polybag filled with soil and harden for plantation.

Preparation of propagation bed

According to Banik (1995) and Rahman *et al.*, (2017b), preparation of a 3 layered sand rooting media propagation bed is the first step of branch cutting method. Each layer is 7-10 cm deep and made up of gravel and large size sand at the bottom, medium size in the middle, and fine sand at the top. In each layer, clean sands are placed so that bed remains well drained. The bed is 1.2 m wide and 12 m long, situated on level ground in the nursery. Such beds are also constructed on cement platforms with low brick walls at the sides and edges.

Collection of cuttings insertion in the propagation bed and root induction

The branches of selected bamboo species were collected from different parts of the country. The collected branch cuttings are placed on the sand media 2-3 cm apart and based at the 7-10 cm depth (Figure 1). The cuttings should be fixed firmly in the medium by pressing sand around the cutting bases with fingers. Immediately after firmly putting the branches, misting should be operated. Care should be taken so that the cuttings and the bed remain moist. The cuttings start sprouting leaves and branches within 7-10 days and produce profuse active roots in the propagation bed (Figure 2) depending on the season and species with 4-10 weeks (for cuttings taken during February-November).

Transferred of rooted cuttings in polybag and hardening in soil

Once the cutting is rooted from the bed, it is transferred to polyethylene hags (15 x 23 cm) containing sandy loam soil and cow dung 3:1. Transplanted cuttings are hardened under shade for 3-5 days and then kept in the nursery. Regular weeding and watering of the cuttings are practiced.

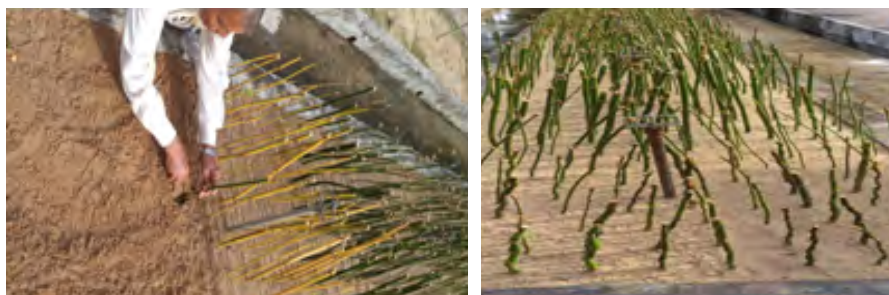


Figure 1. Branch cuttings are placed in the sand media



Figure 2. Produce profuse active roots in the propagation bed

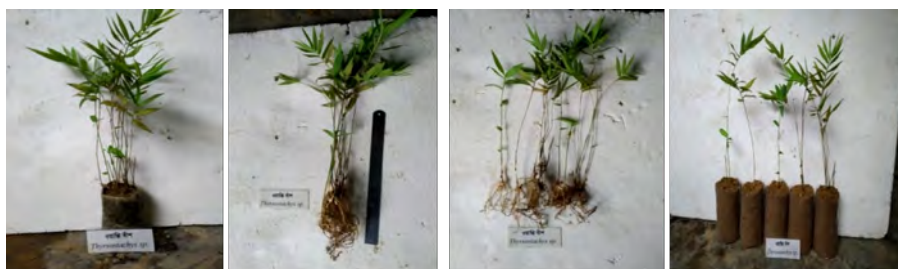


Figure 3. Seedling proliferation of Wappi bamboo in nursery (Rahman, 2020)

Research Findings

During the study period maximum 14 bamboo species were considered for bamboo branch cutting technique. The different factors affecting the rooting and survival of different species were identified.

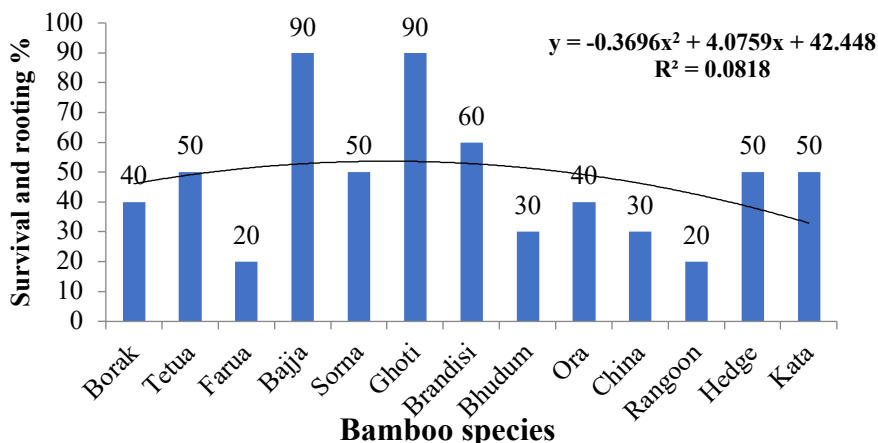


Figure 4. Rooting and survival percent of different bamboo species (Source: Rahman, 2020)

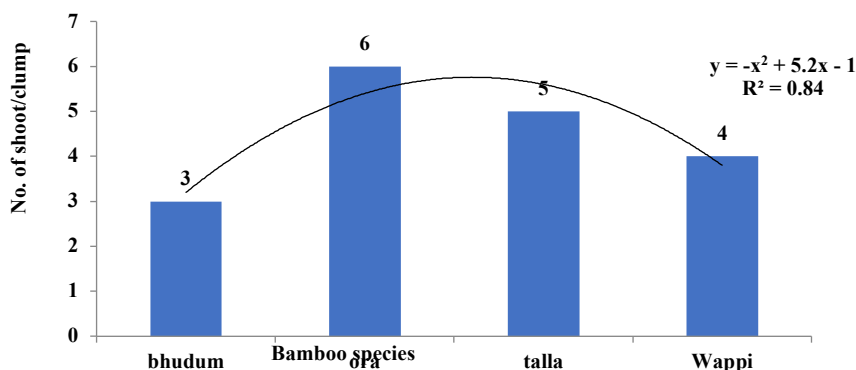


Figure 5. Seedling proliferation of different bamboo species (Source: Rahman, 2020)

The rooting and survival percentage of the species were evaluated. A clear variation was found among the different species.

Bamboo branch cutting technique is a successful technique of BFRI. Based on the demand of the stakeholders, distribution of bamboo propagules of different species was carried out every year. It has created an opportunity for wider interaction and linkage between BFRI and its stakeholders. Capacity building in bamboo branch and cutting technique were enhanced through dissemination of technology to extensions and rural farmers. During the 2019-2020 fiscal year, about thirty thousand seedlings were distributed among the different stakeholders. Rural communities were aware of bamboo cultivation through planting branch cuttings propagules. Every year different farmers are producing bamboo seedlings at their nursery in all over the country and improve their socio-economic conditions. This Technology was also disseminated in West Bengal, India in 2018.

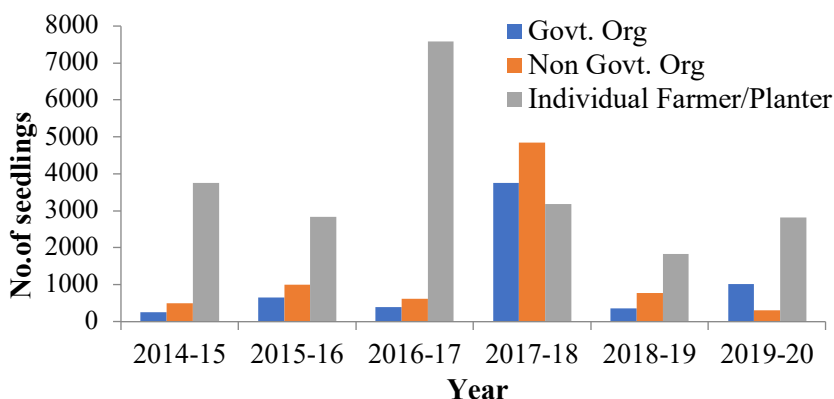


Figure 6. Bamboo Seedling distribution pattern in different years

(Source: Rahman, 2020)

Medicinal Plants

The leaves, bark, roots, stem and fruit of many plants are commonly used as medicines in Bangladesh. Among them most common are: kuruspata (*Holarrhena antidysenterica*), horitaka (*Terminalia chebula*), amlaki (*Phyllanthus emblica*) and bohera (*Terminalia belerica*), etc. (Khan, 1992). Most of the Medicinal and Aromatic Plants (MAPs) species in Bangladesh are extensively used in the preparation of Unani, Ayurvedic and Homoeopathic medicines. MAPs are also important raw material for allopathic medicines. Most of the aromatic plant species have special chemicals which act as preservatives.

According to IUCN, 5,000 species of angiosperm are found in Bangladesh. National Herbarium prepared a revised listed of medicinal and aromatic plants that exceeds 500 species. Bangladesh Council of Scientific and Industrial Research (BCSIR) identified 747 medicinal plants (Yusuf *et al.*, 1994). IUCN made a comprehensive survey on selected medicinal plants of Chittagong Hill tracts and listed 31 species that are being regularly used by tribal people (Motaleb, 2011). The Bangladeshi herbal medicine market is valued approximately US \$60 million at trade prices (Dixie 2003). The turnover figure for the Ayurvedic sector is around Tk. 1,000 million; Unani around Tk.1,800 million and homeopathy around Tk. 500 million (Sharmin, 2004).

Cultivation Practices

BFRI initiated standardization of cultural practices of five important medicinal plants in hilly area through agroforestry system by promoting good cultural practices and developing good linkage between producers and

commercial users. This venture will create an avenue of extending cultivation of Medicinal and Aromatic Plants (MAPs) in greater hill districts as cash crop for alleviating poverty of tribal people.

In Bangladesh, 18 priority medicinal plants in Shyamnagar Upazila of Satkhira District and 7 priority medicinal plant species in Natore District are being commercially grown. It is found that six species, *viz.*, amloki (*Embelica officinalis* Gaertn); ashok (*Saraca indica*); aswagandha (*Withania somnifera* Linn); bael (*Aegle mermelos* Linn), gulancha (*Tinospora cordifolia*), shatomuli (*Asparagus racemosus* wild) are common in both the Task Force Priority list and the herbal physicians priority list, and two species, *i.e.*, aswagandha (*Withania somnifera* Linn) and shatomuli (*Asparagus racemosus*) are found to be common under commercial cultivation in Natore and in Task Force priority list, one species aswagandha (*Withania somnifera* Linn.), is found to be common in all the three cases (Rahman, 2007). Therefore, these six medicinal plant species are recommended for large scale cultivation in the country. There is a growing demand for natural product-based medicines, health products, pharmaceuticals, food supplements, cosmetics, etc. in the national and international markets. To meet the existing demand, cultivated medicinal plants material is more appropriate for various medicinal uses. Systematic cultivation of medicinal and aromatic plants needs research and development support for:

- Good silviculture practices including selection, identification, propagation methods, seed preservation, nursery techniques, cultivation techniques, harvesting, step-wise quality control of raw materials up to processing stage and also post-harvest treatment, storage and safety;
- Development of protocols for producing planting materials with desirable agronomic and therapeutic chemical derivatives;
- Organic farming of medicinal plants as per pharmaceuticals requirement;
- Herbal pharmaceutical companies to initiate farming of selected MAPs through contract farming. This activity is expanding faster, but there is no organized data based information about the area brought under cultivation of medicinal and aromatic plants in the country. Most of the data are sporadic in nature. Recently, extensive MAPs cultivation started in northern and hilly areas keeping in view the quality production.

Aktar *et al.*, (2019) found that, cultivation of five commercially important medicinal plants namely Bashak (*Adhatoda zeylanica*), Kalomegh (*Andrographis paniculata*), Tulsi (*Ocimum tenuiflorum*), Satamuli (*Asparagus racemosus*) and Aswagandha (*Withania somnifera*) through agroforestry

systems as non-wood forest plants in Chattogram Hill Tract (Rangamati, Khagrachari, and Bandarban) were planted in association with Mango and Litchi based, and Guava and Banana based agroforestry systems. Growth, survival performances and yield of the products of the selected medicinal plants in the three districts were analysed. The findings revealed that among the five medicinal plants Kalomegh, Bashak, Tulsi and Satamuli were suitable for commercial plantation through agroforestry system. However, Aswagandha showed poor performance in all the three sites and need more trial to recommend for commercial plantation.

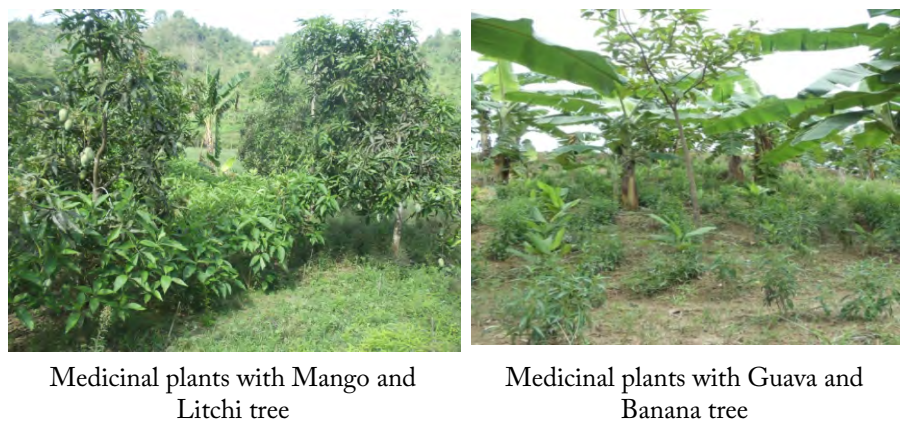


Fig. 7. Medicinal plant with different agroforestry systems

Table 3: Growth performance of 5 selected medicinal plants in plantation site and conservation plot

Name of the medicinal plant	Family	Performance at plantation site	Performance at conservation plot	Standard height (cm)	Height attained at plantation site (cm)	Height attained at conservation plot (cm)
Basak* (<i>Adhatoda zeylanica</i>)	Acanthaceae	Very good (90%-95%)	Very good (95%)	100-150	130-152	100-110
Kalomegh** (<i>Andrographis paniculata</i>)	Acanthaceae	Very good (90%-95%)	Very good (90%)	60-90	45-114	52-100
Tulsi** (<i>Ocimum tenuiflorum</i>)	Lamiaceae	Very good (90%-95%)	Very good (100%)	30-60	50-100	72-100
Satamuli* (<i>Asparagus racemosus</i>)	Liliaceae	Medium (60%-65%)	Very good (95%)	100-150	120-140	145-160
Aswagandha** (<i>Withania somnifera</i>)	Solanaceae	Poor (30%-40%)	Good (80%)	75-100	65-139	70-85

*Data taken at one-year-old plants ** Data taken at six month old plants
(Source: Aktar *et al.*, 2019)

According to Aktar, *et al.*, 2019, survival percentages of the five medicinal plants were recorded from three sites. *Adhatoda zeylanica* (Survival: 90-95%), *Andrographis paniculata* (Survival: 90-95%) and *Ocimum tenuiflorum* (Survival: 90-95%) showed the highest growth performance in each site among the five plants. *Asparagus racemosus* showed slower growth than that of 3 mentioned species and exhibited better performance at Khagrachari site among the three sites. However, *Withania somnifera* showed poor performance in all three sites. After six months of plantation, farmers started harvesting the bashak leaves and whole plants of kalomegh and tulsi are sold. The leaves of bashak plant can be harvested after every three months interval and continued up to 15-20 years age of trees (Merry, *et al.* 2012). In case of Satamuli, partial roots can be harvested after 18-24 months after plantation without damaging the whole plant. Harvesting can be done in six months interval and continued up to 20 years without incurring the extra management (Merry, *et al.* 2012).

Golpata

Golpata (*Nypa fruticans*) is one of the most abundant NWFPs in the country, growing naturally throughout the Sundarban forest and in other coastal areas. Made from the leaves of *nypa*, golpata thatching and roofing is very common in Khulna, Bagerhat, and Satkhira districts. It provides considerable revenue for the Forest Department. The demand of golpata varies directly with the price of Corrugated Iron (C.I.) Sheet in the market. With the fall of the price of C.I. Sheet, the demand for golpata declined and accordingly the harvest also declined (Khan 1992; Zohora 2011). Based on the prevailing demand, golpata is collected from the Sundarban by individuals through permit. The demand for golpata widely fluctuates and the overall trend is declining.



Figure 8. Golpata (*Nypa fruticans*) with flowering and fruiting

Honey and wax

Honey and wax are mostly extracted from the Sundarban. Roughly 300 to 500 metric tons of honey and 50 metric tons of wax are extracted every year (Siddiqi 2001). Honey occupies an important position as a foreign exchange earner. It is internationally known and is used as food, drink, and medicine in many parts of the world. Honey and wax are produced naturally in the beehives of the Sundarban. The main bee species in the Sundarban is *Apis dorsata* but sometimes *Apis cerena* are also found (Zohora 2011). Honey is also grown in the forest regions of Chattogram, Sylhet, Cox's Bazar, and Mymensingh. Recently, apiculture (bee-keeping) has been introduced in some areas of North Bengal and Mymensingh district with considerable success. Honey is probably the most promising NWFPs in Bangladesh in terms of export potential, provided its production can be better organized (Khan 1992).



Figure 9. Bee hive at Mangrove Forest in Sundarban and Pure Honey

Cane

Cane (*Calamus spp.*) is a climbing plant, mostly grown in homesteads and as under growth in the low-lying areas of tropical rain forests of Sylhet, Chattogram and Chattogram Hill Tracts. Canes are used for domestic purposes by the rural people and for making baskets, mats and sophisticated furniture and luxury souvenirs. It helps in developing cottage industries in rural areas. This is one of the major export items of cottage industries.



Figure 10. Cane plant and fruit

Murta

Patipata or Murta (*Clinogynae dichotoma*) grows naturally in the low-lying areas of Sylhet and also in rural areas of Tangail and Dhaka districts. It can be grown artificially in other areas of the country using suitable planting material. Patipata is an excellent material for floor mats, and is extensively used by rich and poor alike. In preparing ‘Sheetal Pati’, People are using Murta. These ‘Sheetal Pati’ have both home and foreign markets (Khan, 1992; FAO 1994).



Figure 11. Murta



Figure 12. Murta product

Sungrass

Sungrass (*Imperata* spp.) is the most common roofing and thatching material for temporary low-cost housing in the villages and forests of Bangladesh. Sungrass grows naturally, especially in the forests of low-lying areas, or around the denuded and barren hills unfit for growing high-quality timber trees (Khan 1992; FAO 1995).

Wild Orchid

The Orchidaceae belongs to the Lillioideae of flowering plants, is characterized for its perennial nature of herbs, inconspicuous perianth, 2-ranked leaves, zygomorphic and trimerous flowers, presence of labellum, pollinia, gynostegium, inferior ovary and nonendospermic seeds (Rahman et al., 2017a). In Bangladesh, the family is represented by 72 genera and 188 species, whereas the world represented by 880 genera and about 26,567 species mostly in the tropical and subtropical parts of the world (Cai et al. 2015). Of these, 117 species (62.23%) belonging to 41 genera are epiphytic in nature and 71 species (37.77%) belonging to 33 genera are terrestrial.

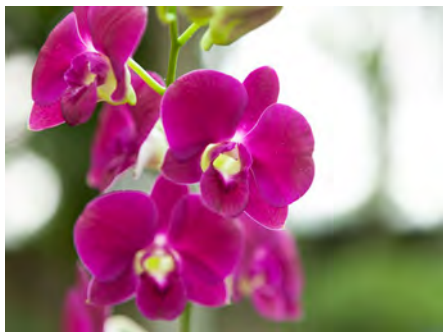


Figure 13. *Dendrobium parishii*



Figure 14. Orchid in forest

The study also revealed that the most species rich genera are Denrobium Sw., Bulbophyllum Thou., Habenaria Willd., Eulophia R. Br. ex Lindl. and Oberonia Lindl. represented by 27, 12, 9, 9 and 7 species respectively and most species rich areas are the forests of greater Sylhet, Chittagong, Cox's Bazar and Rangamati represented by 74, 70, 65 and 32 species respectively. About 15 species have been recorded from Sundarban mangrove forest of which four are restricted to the mangrove ecosystem only. These are: Bulbophyllum roxburghii (Lindl.) Reichb. f., Oberonia gammiei King & Pantl, Trias oblonga Lindl. and Vandopsis gigantea (Lindl.) Pftiz. Similarly, about 15 species also occur in Madhupur Sal forest of which Eulophia spectabilis (Dennst.) Suresh is restricted to Sal forest only. Rahman et al., 2017a, revealed that 45.74% species are economically important for their potential medicinal and cosmetic values and 37.77% for their ornamental values in Bangladesh.

Agar

Agarwood or eaglewood (Aguru in Bengali) is the most expensive wood in the world, Agar is the product of Agarwood sp. (*Aquilaria malaccensis*). Agar is highly valued by luxury perfume, fragrance and soap manufacturers. Both

agarwood smoke and oil are customarily used as perfume in the Middle East (Chakrabarty et al., 1994).

Bangladesh has suitable weather and huge abandon hilly land for agar cultivation. The Bangladesh Forest Research Institution (BFRI) has established 2.3 ha of experimental agar plantations at Charaljani and Keochia research stations in Chattogram. BFD has established several hectares of agar plantations sporadically in denuded and encroached forest areas throughout the country, especially in Borduara (Satkania, Chattogram), Rangamati, Khagrachari, Bandarban hill tracks, Harbang and Fasiakhali (Chakaria, Cox'sBazar) including 785 ha in Sylhet Forest Division (Hossen and Hossain 2016). In 2004 Karnafuli tea estate planted agar covering 1.56 acres with 426 plants. Later, in collaboration with Research and Evaluation Division, BRAC (Bangladesh Rehabilitation Assistance Committee) started an agar plantation project at Kaiyachara Tea Estate, Fatikchari in July 2007. They established two gardens for growing and nurturing agar (*Aquilaria malaccensis*) seedlings and one for plantation. BRAC Tea Estate Kaiyachara division has planted 83,400 agar seedlings covering 17 acres of land between August and October 2007 (Akter and Neelim 2008). Besides about 700,000 agar seedlings have been planted in two nurseries, namely 'Kaiya' and 'Sirgasia', at Kaiyachara tea estate. Furthermore, there are some privately-owned agar plantations in Modhupur (Mymensingh), Birisiri, Haluaghat (Netrokona), Sylhet, Habiganj and particularly in Maulvibazar district where many families have been engaged in production and marketing of agar and agar-based secondary products for several decades (Alam 2004, Uddin *et al.*, 2008, Islam 2013 and Chowdhury *et al.* 2016). Initially, BRAC Tea Estate plans to plant 50 acres of land with agar plant, after 12 years of which agar harvesting would take place. Assuming 90% survival rate and 2 kg premium quality agarwood production per plant, the estimated investment related to plantation would be \$1.82 million and total return would be \$761.34 million with the rate of return 41.9% (Akter and Neelim 2008).

According to Rahman *et al.* 2015, the total expenditure for agar cultivation up to the rotation period (12 years) is BDT 1.2 million per ha and the total return is Tk.6.1 million per ha. So net profit is BDT 4.9 million. On an average, every enterprise uses 600 kg to 4 metric tons agarwood for producing 0.74-5.75 kg agar oil where production cost and total returns are BDT 0.5 million and BDT 1.3 million, respectively with a net profit of BDT 0.8 million (Chowdhury 2020).



Insects attack



Physical cuts/ Drilling



Iron Nailing



Chemical stimulation



Fungal and Bacterial infection



Chemical injury

Figure 15. Agar Formation Techniques

Agar Plantation Management

In Bangladesh, *Aquilaria malaccensis* (Alam 2004 and Chowdhury *et al.* 2016), *Aquilaria agallocha* (Bhuiyan *et al.*, 2009 and Rahman *et al.*, 2015) are commonly cultivated. Agar trees were planted in monoculture and block plantations. About 75% of the plantations have been established on degraded land as well as denuded hills and rest 25% were established at the homesteads of farmers (Rahman *et al.*, 2015). Most of the farmers have an own nursery for raising agar seedlings and others obtained from outside. Before planting seedlings, sites were cleaned, standard-size pits were dug at a spacing of 2 m×2 m and after placing 1.5-2.0 kg of cowdung, each pit was left abandoned for at least 15 days. Few farmers use inorganic fertilizers during plantation establishment. One-year-old seedling usually planted in April or May and

weeding is intensively carried out in the first 3 years. Some farmers give stakes for supporting but mostly considered that staking would hamper the natural strength of the seedlings. To reduce water loss, mulch was frequently applied at the bottom of agar plants. Organic, inorganic fertilizers and pesticides were applied to promote growth and protect agar trees from leaf sucker insects, respectively. Pruning was usually done only once a year preferably in the end of May, from the third to fifth or sixth year after planting. Sometimes fencing was used to protect seedlings from cattle and other disturbances.

Rubber

According to Bangladesh Forestry Master Plan 2017-2036, approximately 40,000 hectares of rubber plantations owned by Bangladesh Forest Industries Development Corporation (BFIDC). The corporation also owns 14,834 ha of forest land and established 16 rubber gardens in 13,207 hectares of land by using Malaysian clones. There are seven Rubber Gardens in Chattogram, 4 in Sylhet and 5 in Tangail and Sherpur areas. About two million rubber trees in BFIDC's plantations are now under production. Many of the plantations are old and underproductive and are continuously being replaced with new plantations. The production figure reflect an annual average production of 5,448.00 MT. BFIDC has been promoting rubber cultivation in the private sector. A total of 13,172 ha of hilly land have been allotted to 1,302 individuals (10 ha/person) for raising rubber gardens in the private sector. Out of this, 5,261 ha of rubber plantation are under Chattogram Hill Tract Development Board. Tea gardens and other organizations have also raised about 8,418 ha of rubber plantation. Private sector produces about 5,500 MT of rubber annually. The production level at both BFIDC and the private sector plantations are quite low compared to the levels in countries like Thailand, Indonesia and Malaysia. Less than 10 hectares allocated to private sector entrepreneurs in Chattogram Hill tracts is too small to be a viable unit of management.

NWFPs Contribute to Improvement of Rural Livelihoods

Interest in NWFPs management has increased over the last few decades along with emerging global concern about rural poverty, deforestation, and later by adopting the concept of sustainable development (Belcher *et al.*, 2005; Chamberlain and Predny, 2004). NWFPs play an important role in the daily lives and welfare of people. They act as sources of food, income, medicine, construction material and fuelwood, as well as resources of spiritual and cultural significance (Aiyeloja and Ajewole, 2006; Hoare, 2007). NWFPs provide nutrients which are usually absent in daily diets such as proteins, vitamins, starch, minerals and other compounds, thus preventing

malnutrition (Shanley *et al.*, 2015). NWFPs are also important for food security, making a major contribution to food intake of most rural dwellers (Termote *et al.*, 2010; Olaniyi *et al.*, 2013). However, the sustainable management of community forests is important to sustain a stable livelihood for the rural communities.

The NWFPs contribute to the enhancement of rural livelihoods as rural people heavily depend on it for their daily living. NWFPs used by rural communities are less ecologically destructive than timber harvesting. This encouraged government and rural communities to sustainably manage NWFPs for development, conservation and commercial use of NWFPs for betterment of rural livelihoods. It is also widely believed that rural communities may be less inclined to engage in illegal logging, if they are able to derive more material benefits from maintaining forests for various alternative goods and services (Oldfield 1988). Moreover, in many cases, development of non-wood forest resources has assisted stakeholders in obtaining opportunities to merge forest conservation with economic development at the community and national levels (CBD, 2003).

Home gardens have a long tradition in many tropical countries. They consist of an assemblage of plants and may include trees, shrubs, vines, and herbaceous plants, growing in or adjacent to a homestead or home compound (Nair 1993). Home gardens represent a well-established traditional land-use system in Bangladesh and about eighty percent of the population lives in villages having small home gardens (Zashimuddin 2004). Such gardens play an important role in the livelihoods of rural poor, and in the rural economy of the country (Chowdhury and Mahat 1993). Moreover, trees and tree products from home gardens play an important role in household food security, as it is a sustainable source of food, fruits and vegetables. Home gardens also play a significant role in forest conservation by providing subsistence needs for local populations, which they may otherwise have derived from the forest.

Sustainable management of NWFPs ensure forest goods and services to meet present needs while ensuring their continued availability to meet long-term needs. According to Caspa *et al.* (2014; 2015), there has been an increased awareness of NWFPs contribution to household and national economies. The latter authors equally point out the contribution of NWFPs to some environmental objectives such as biodiversity conservation.

Natural forests and agroforestry systems provide food in rural areas. Bamboo shoots, different fruits, nuts and vegetables are major plant-based foods (Miah *et al.* 2012; Zohora 2011). Wild vegetables are widely recognized source of regular foods in remote locations of indigenous people in their forest lands and shifting cultivation farms. Bamboo shoots are used as important source

of foods to cope with dietary shortfalls during the pre-harvest seasons of rice in southeast hill forests of Chattogram Region (Rahman 2011) and Central Sal forest areas (Begum 2011). Rural people access to wide range of fruits trees used as seasonal foods from their traditional home garden or agroforestry systems. The availability of wild vegetables and fruits provide diversity of foods and easy accessibility to nutrition sources of poor households in rural areas. In home garden or agroforestry systems, tree fruits are increasingly cultivated for securing food and nutrition sources during crisis period of a year when adequate access to food is not possible (Rahman *et al.* 2012). Natural mangroves have a plenty of NWFPs sources, especially honey production enriched with nutrition provides seasonal and supplementary dietary needs of people (Abdullah 2014). Forest ecosystems also harbor wetland habitats and generate environmental services for biodiversity to sustain on these (Iftekhar and Takama 2008). Mangroves and swamp forests cover 40 percent of total natural forests that protect fish habitat. This also generates additional food sources, particularly fish protein to local communities. The actual contribution of forests to foods and nutrition values will be much larger with diversity of tree management outside forests in home garden or agroforestry systems (Salam *et al.* 2000; Rahman *et al.* 2012).

Women's Roles in NWFPs Management

In Bangladesh, there are forest dependent women including indigenous women who are often displaced due to deforestation and forest degradation. Socio-economic inequalities still persist which limit women and indigenous groups to have equitable access to resources and from participation in benefit sharing in Reducing Emissions from Deforestation and Forest Degradation programme (REDD+). Given these underlying dynamics, the UN-REDD Programme aims to contribute to gender equality by ensuring full participation and empowerment of women in forest management. The programme also views women and men as key agents of change and recognized their unique knowledge, skills and experiences as vital for successful REDD+ action.

Gender issues in forest use and management are much more pronounced, where men generally tend to focus on timber and profitable non-wood forest products, while women are likely to focus on firewood and fodder (Habtezion 2016). In addition, women tend to rely more on natural resources for their livelihoods and often they are the primary users of forests. Women are involved in agroforestry practices, gathering wild plants for food and medicinal purposes, and even in general management of forest. Women are directly involved in cultivation, harvesting and processing of NWFPs especially medicinal plants, which contribute to the improvement of socio-economic condition of women.

Challenges

- Inadequate legal framework for management and marketing of NWFPs.
- Lack of proper management plans and awareness of NWFPs regulations made access to NWFPs resources difficult and unsustainable.
- Limited facilities at BFRI for research on current and emerging subjects like climate change, genetic engineering, social forestry, remote sensing and GIS, biotechnology, monitoring and evaluation or capacity building and technology transfer.
- Lack of coordination and linkage between BFRI and extensions for development of NWFPs products and marketing.

Opportunities

- Incorporation of agroforestry in the agricultural policy will open the window for developing synergy with the forestry sector for sustainable management of NWFPs.
- With the NWFPs development “Maximum utilization of land will be ensured through promotion of inter-cropping with the main crops” linking with the forestry sector.
- Harmonizing Forestry and Agriculture Policies for development of NWFPs and utilize fallow and degraded land for NWFPs species cultivation.
- Incorporate NWFPs component in graduate, postgraduate and doctoral degrees courses in forestry discipline in Universities of Bangladesh i.e. Chittagong University, Khulna University, and Shahjalal University of Science and Technology.
- Develop capacity and implement awareness raising strategies for adaptation and mitigation measures of climate change.

Policy Recommendations

- National NWFPs policy should be developed.
- National NWFPs Working Group should be created for research and development related policy and research priority setting.
- NWFPs cultivation should be assured using agroforestry system in the periphery for the reserved forest through the co-management committee.

- Capacity development of stakeholders through proper training and demonstration of NWFPs collection, cultivation, conservation, preservation, marketing and management.
- Create enabling environment, where women's participation could be ensured to play leadership and decision-making roles in NWFPs management regime.
- NWFPs policy should mainly focus on sustainable management of NWFPs and improvement of the rural livelihoods for overall socio-economic development.

The Way Forward

- The rural population represents the largest group and they use these NWFPs for livelihood and social and cultural purposes. During critical periods of droughts and famine some of NWFPs are the only available foodstuffs for rural inhabitants.
- Urban consumers grow rapidly resulting in an increased demand for NWFPs. Furthermore, traders and vendors of these products are increasing as urban markets grow.
- Bangladesh Forest Department should plan to plant trees and shrubs through community participatory approach in appropriate land use areas to produce non-wood forest products for rural livelihood enhancement.
- Integrated research on NWFPs should be coordinated by BARC involving BFRI, BFIDC and BFD.
- Develop research methods on commercialization of NWFPs for sustainable management and to reap maximum benefits out of NWFPs.
- Determining harvesting limit for collection of NWFPs are crucial for sustainable supply of NWFPs for rural population and also for future generations.

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Sustainable Management of Non-wood Forest Products (NWFPs) for Rural Livelihoods in Bhutan

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Introduction

Non-wood Forest Products (NWFPs) play an important role in supporting the livelihood of rural people. Globally, about 1.2 billion people living in poverty are said to depend on NWFPs as a source of food, medicine, construction materials and income. The rural poor rely on it for poverty mitigation and reduction. They gather edible NWFPs and consume them as food supplements to tide over food insecurity. Besides subsistence use, it is an important export commodity in the region and generates export earning ranging from US\$ 7 million in Nepal to US\$ 561 million in India. Pakistan and Sri Lanka exports NWFPs worth US\$ 45 million and 78 million respectively (Gurung, 2017).

Bhutan has a land area of 38,394 km² and more than 80 percent of it is under forest cover. Also 51.32% of the land area set aside as National Parks, Wildlife Sanctuaries, Strict nature reserves and Biological Corridors to meet the conservation goals. The country is divided into three (Himalaya, temperate and subtropical) altitudinal regions. The Himalayan region is a distinct bio-geographic zone lying above 4,500 meters altitude. The temperate region is between 500 or 1,000 m and 4,500 m altitude. The subtropical region consists of southern foothills below 1,000 m and river valleys below 500 m altitude. The elevation varies from 100 meters above mean sea level (msl) in the south to 7,500 m in the north. Within these altitudinal ranges, it is further classified into eight bio-geographic ecological zones.

With 66 % (PHCB, 2017) of population living in rural areas, the NWFPs play an important role in the daily lives and overall well-being of the Bhutanese people; for instance, they are a major source for off farm income, food, medicinal and aromatic products, fodder, fiber, and also used for local construction materials. These are collected either for household consumption or for trade. Several case studies have demonstrated contribution of NWFPs to income generation of the rural communities and unemployed people living in urban centers. However, the potentials need further consolidation and realization to provide local people with a stepping stone out of poverty.

The contribution from the forest resources especially NWFPs to peoples' livelihoods and the potential for commercialization have been widely acknowledged in Bhutan. NWFPs are employed as poverty mitigation and reduction means. These often are a safety net for poor people during lean season and collect whenever needed. They also support home remedies, traditional medicines, indigenous crafts and commercial enterprises. The poor segments of the communities rely on the NWFPs for their livelihood and income generation.

The Forest Policy of Bhutan permits collection and use of NWFPs. As per the Forest Act 1995 and Forest Rules and Regulation of Bhutan 2017, the people have the right to collect NWFPs from state reserved forest for domestic use without payment of royalties. However, royalty is levied if NWFPs are collected for commercial purposes except from community forests. Today around 63 plant species are listed for collection and trade by the communities upon formation of management group.

NWFPs have environmental, economic and social functions besides immediate benefit to individuals or households. They constitute greater portion of floristic diversity of forest ecosystems, NWFPs form the main source of feed for faunal community of forest ecosystems and occupy a vital place in the food chain and also plays a vital role in sustaining the forest ecosystems and associated services.

Non-wood Forest Products Development in Bhutan

There are many NWFPs in Bhutan ranging from medicinal and aromatic plants, wild vegetables, mushrooms, incense, dyes, gums, fruits, essential oils, fibres, ferns, rock exhaust, cane and bamboo. The rural communities collect these for direct consumption to tide over food insecurity and mitigate poverty and also sell for cash income. Between 2010 and 2020, about 160 community groups manages and market over 63 species inclusive of medicinal plants, incense raw materials, fibre, natural dye, essential oils, mushrooms, cane, bamboo, spices, adhesives and so on. The groups marketed worth about Nu.54.66 million between 2010 and 2018. The sale of Cordyceps and incense raw materials constitutes a sizeable portion of the annual income of some semi-nomadic pastoralists.

For the long-term sustainable management of NWFPs resources in the country, a National NWFPs Development Strategy and a Framework for the management & marketing of NWFPs have been developed and currently guide the NWFP management in the country. In addition to this NWFPs management and marketing plans are developed to respective group to ensure collection of resources on sustainable manner. Currently, there are 166

NWFPs management groups involving 6,430 households across the country for the sustainable management and marketing of the NWFPs resources as shown in Figure 1. Among the districts, Pemagatshel and Samdrup Jongkhar are the two districts in Eastern part of Bhutan which has the maximum number of NWFPs management groups.

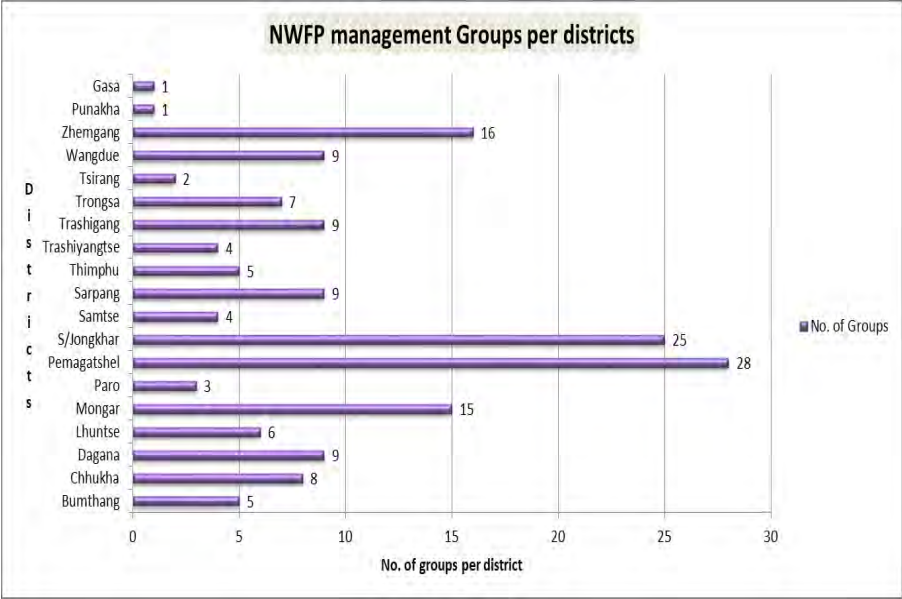


Figure 1: NWFP Management Group in different districts of Bhutan

Legal Frameworks for Management, Collection and Trade of NWFPs

The legal provision covering the collection and trade of NWFPs are included in the Forest and Nature Conservation Act, 1995 and the Forest and Nature Conservation Rules and Regulations of Bhutan, 2017. Further to facilitate smooth implementation of NWFPs related program, the following documents were developed:

National strategy for the development of NWFP in Bhutan (2020)

The vision of the national strategy is to enhance rural livelihoods and economic contribution through sustainable management of NWFPs. The objectives are to improve sustainable management of NWFPs, product development and improve efficiency & effectiveness in marketing.

Framework for the management and marketing of NWFPs (2013)

This framework is developed for the management and marketing of NWFPs from the State Reserved Forests Land (SRF), Community Forests and from Private Registered Land (PRL). The overall objective is to strengthen the sustainable management and marketing of NWFPs. While the specific objectives of the interim framework for NWFP management and marketing are i) to provide guidance to the field offices for NWFP management and marketing ii) provide guidance to local communities interested in sustainable management and marketing of NWFPs in their locality iii) provide guidance to NWFPs end users, buyers, traders and exporters iv) provide clear roles and responsibilities of different stakeholders involved in NWFPs management, marketing, export, monitoring and evaluation.

As per the framework for management and marketing of NWFPs, about 63 NWFPs species are listed that can be collected, marketed and traded provided harvesting guidelines are strictly followed. The frame work gives clear insight on which NWFPs are allowed to trade and should be sold in domestic market.

Sustainable Community-based NWFPs Management and Marketing

Ophiocordyceps sinensis

The *Ophiocordyceps sinensis*, commonly called Cordyceps ('Yartsa guenbub' in Bhutan) is a valuable commodity intensively collected throughout the alpine grasslands of the Eastern Himalayas and the Tibetan Plateau. This component of traditional Chinese medicine consists of dried fruiting bodies of the fungus *Ophiocordyceps sinensis* emerging from the cadaver of its caterpillar host. It is found growing naturally in the high lands of seven districts and 18 blocks of Bhutan,



Figure 2: Image of *Ophiocordyceps sinensis* & collectors

*Status of *Ophiocordyceps sinensis* in Bhutan*

The Royal Government of Bhutan had put a ban on the collection/harvesting of *Ophiocordyceps sinensis* in Bhutan until the year 2003. The common perception of *Ophiocordyceps* spp. is that it is rare and endangered, thus requiring protection (Namgyel, 2005). In Bhutan, it is listed in the schedule I of the protected list under the provisions of the Forest and Nature Conservation Act of Bhutan, (1995). It is considered as one of the most significant high value and a source of major revenue earner amid the NWFPs sold commercially both in domestic and international markets.

*Legalization of *Ophiocordyceps* spp. in Bhutan*

The harvesting of fungus was legalized following a Royal Command issued by His Majesty the Fourth King in 2004, so that our local high land communities are benefited from it. Farmers are allowed to harvest and sell the *Ophiocordyceps* spp. on condition that they do it on a sustainable basis and long-term sustainability shall be the focus (Namgyel, 2005). From each house holds three persons are allowed collect for period of one month. In order to keep illegal collectors at bay forestry officials supported by local volunteers patrols the collection site.

The community-based natural resource management (CBNRM) model for *Ophiocordyceps* spp. was introduced in early 2000. This change in approach is important in remote rural areas of developing countries where biodiversity is concentrated, where poverty tends to be pervasive, and where the reach of development programs is often limited. This will lead to renewed emphasis on finding ways of deriving new economic opportunities from biological resources which do not lead to further losses of biodiversity.

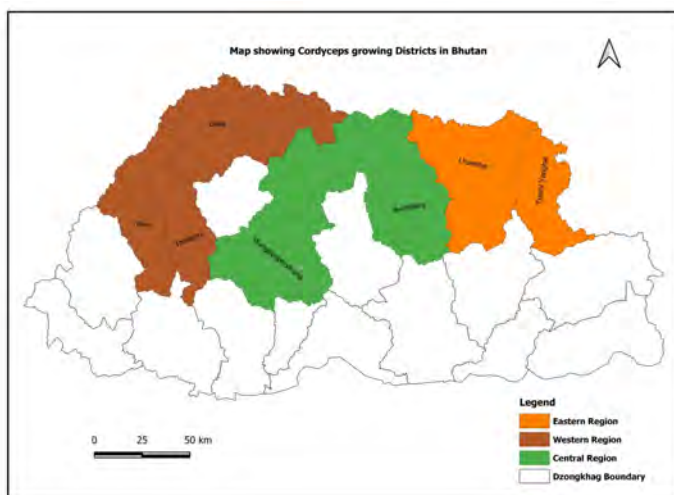


Figure 3: Map showing Cordyceps growing districts in Bhutan

Marketing

In Bhutan, Cordyceps is marketed through open auction facilitated by local government and various other agencies of the Ministry of Agriculture and Forests, basically to create transparent and conducive environment to both the buyers and sellers. However, the forestry department issues the certificate of origin to authenticate the collection sites and enable collector to take participate in the auction. Upon completion of auction, the ministry issues the phytosanitary certificate to traders. About an income of USD 3.2 million has been generated in 2019 alone through auction (Figure 4).

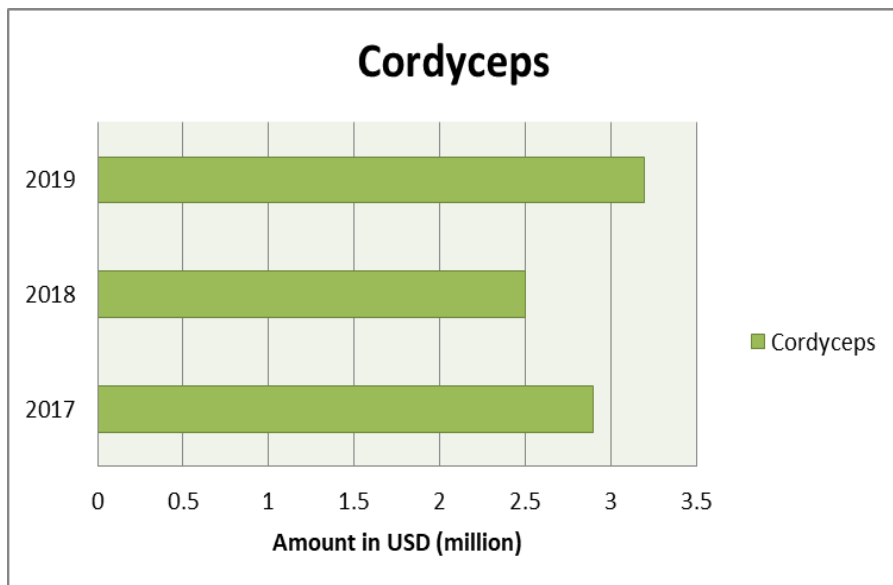


Figure 4: Income generated from Cordyceps (in million USD) from 2017 – 2019

Tricholoma matsutake

Community Forest for Matsutake mushroom management

In Bhutan, particularly for the small farmers given the terrain and the small landholdings, mushroom collection (both wild and cultivated) is not only their source of cash income but will also be their source of livelihood. Wild edible mushrooms have been collected and consumed from times immemorial. Some of the popular wild edible mushrooms are *Chanterelle* spp, Shiitake mushroom, *Armillaria* spp., *Bondarzewia* cf. *monticola*, *Cantharellus* cf. *cibarius*, *Catathelasma imperial*, *Clitopilus prunulus*, *Dacrymyces* cf. *palmatum*, *Lyophyllum shimeji*, *Lyophyllum aggregatum*.

Amongst this wild edible mushroom, *Tricholoma matsutake* commonly called Matsutake mushroom globally is mostly exported while the *Chanterelle* spp.,

are mostly preferred locally and mostly sold in the domestic market. The most commonly cultivated mushrooms are Shiitake mushroom and Oyster mushroom. Mushroom collection during the season has been one of the important activities generating both income and employment, as the market demand for mushrooms especially for Matsutake mushroom are growing every year. Collection of wild edible mushroom has been a common activity and it is gaining popularity across the country. Mostly women and children are involved in the collection of mushrooms, fern shoots and sale at the roadside and in the local markets. The mushrooms contribute to household food and nutrition security and also help to generate additional employment and income.

It is an important source of income for 123 households of Geneykha, Thimphu (CFMG, 2019) and 18 households of Ura, Bumthang. Though its trade is much developed in these two places, it is also found in the districts of Haa & Paro. The community forest has been formed for the management of Matsutake mushroom in Geneykha, Thimphu district and NWFPs management group in Ura, Bumthang district for the sustainable harvesting of Matsutake mushroom. The two important factors essential for sustainable harvesting practices are; the resource use rights and well-developed set of rules for collection by the groups.



Figure 5: Masutake mushroom

Marketing

The sale of Matsutake is marketed through open auction facilitated by local government and various other agencies of the Ministry of Agriculture and Forests. The stakeholders (buyers) and (sellers) agree on specification of mushroom (Grade A and Grade B) and decide on the price for each grade which are different. While grade A mushroom are for international trade and grade B are sold in the domestic markets and road-side shops. Almost half of the household annual income in Genekha comes from mushroom trade,

although mushroom is a seasonal based commodity. The Figure 6 gives the income generated from the sale of Matsutake mushrooms annually (2017-2020) from the community groups of Genekha village under Thimphu district and Bumthang district.

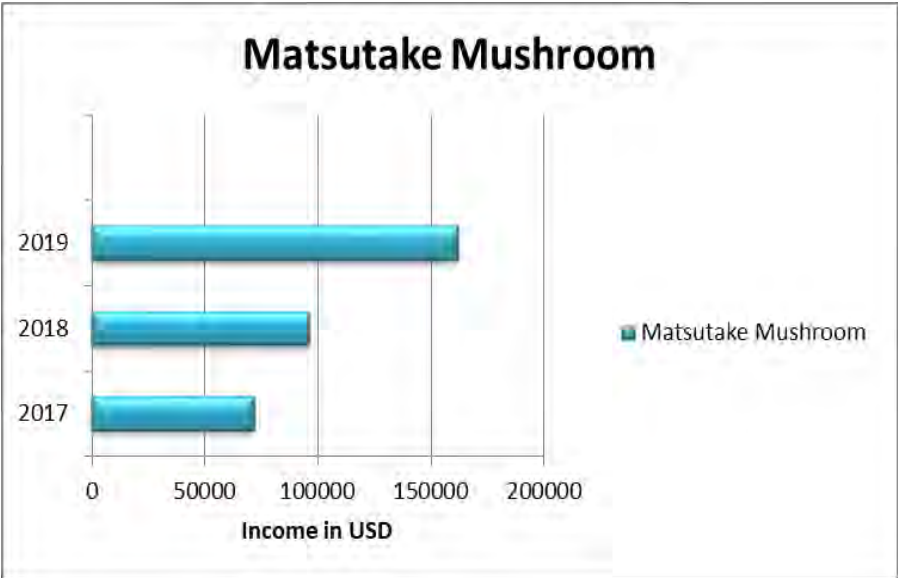


Figure 6: Income Generated from the sale of Matsutake mushroom (in USD) from 2017- 2020

Lemon grass (Cymbopogon flexuosus)

Status in Bhutan

Lemon grass grows naturally in the chirpine forests in four eastern districts of Bhutan. The distillation of lemongrass has become a major source of income for the rural communities in Eastern Bhutan. It is important to note that Bhutan is an exceptional case where lemongrass is collected from the wild for the production of essential oil, thus has an added advantage of being organic in nature. Moreover, lemon grass has been identified as prioritized NWFPs in the category of medicinal and aromatic plant species with great potential in the export market (Tobgay, 2008).

Lemon grass is distilled to obtain lemon grass oil which contains an essential oil known as “citral”. Citral is of primary commercial value and has a wide range of applications in cosmetic, toiletry, perfumery, pharmaceutical and food industry. Lemon grass oil is highly valued in the international market and therefore is in considerable demand and is a widely sought commodity (Chhetri and Tenzin, 2012).



Figure 7: Lemon grass oil extraction using a distillation drum & women loading lemon grass

The Dozam Community Forest in Eastern Bhutan was the first community forest approved and handed over to the community in 1997 for the sustainable management of the lemongrass resources. Later in 2011, the Lemongrass Cooperative was formed mainly to hand over resource management and oil trading responsibilities. The cooperatives have 70 members registered and few members of Dozam Community Forest are also cooperative members. A full-time distiller can make a profit of USD 6,000 and part time distiller can make around USD 400 annually.

Marketing

The market based organic certification scheme for lemongrass was introduced to improve the resource management, processing of lemongrass oil and opening access to export markets. Most of the lemon grass oil is sold directly to Bio-Bhutan, a private firm based in Thimphu. Bio-Bhutan pays USD 16 -18 per kg of lemon grass oil. However, the farmers also sell the lemon grass oil directly to commuters at the road site near their distillation unit. In the year 2019, the firm collected more than 5 tons of oil.

The figure below shows the income earned from lemongrass oil for the year 2017-2019.

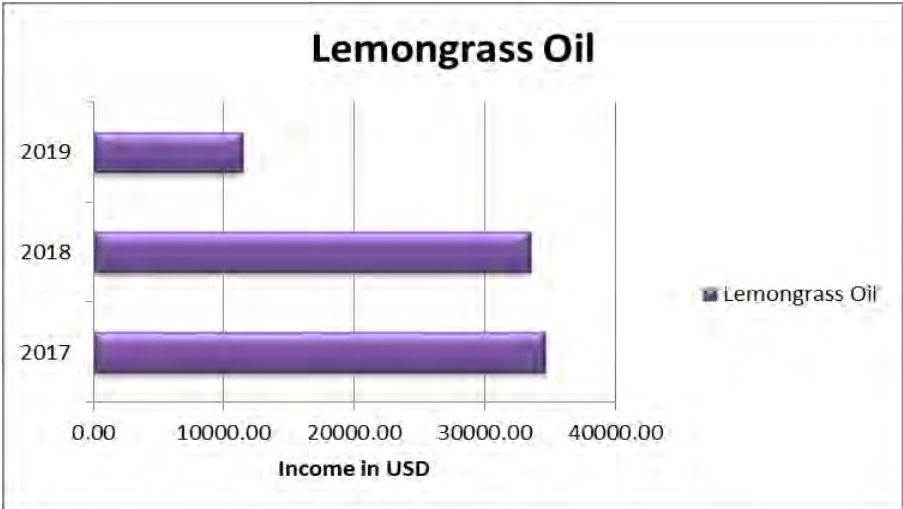


Figure 8: Income Generated from the Sale of Lemongrass oil (in USD) from 2017-2019

Community based management of Pipla spp.

Status in Bhutan

The most commonly harvested Pipla species and which has market value are namely, *Piper pedicellatum* (round pipla) and *Piper longum* (long pipla) in Eastern and southern Bhutan. This plant is commonly called as Pipla and has high medicinal values, highly recognized species in the Indian Ayurvedic system, Tibetan and Bhutanese Medical tradition. It is valued as a powerful stimulant for the digestive and respiratory systems, as a rejuvenating agent, longevity enhancer and tonic for the immune system.



Figure 9: Piper spp.

The Pipla Management group harvests Pipla from the State Reserve Forest Land (SRFL) in the surrounding area. Mostly *Piper pedicellatum* and *Piper longum* are harvested by the group members. More than 20 NWFPs management groups are involved in the management of pipla while the number of households benefitted through collection and trade of pipla is about 468. In the past people harvested the fruits before maturity but now with the groups formed, harvesting is done as per the prescription in the management plan. Prior to collection there is a meeting to decide on the starting date for the collection with group members.

Marketing

In the past, there was established market chain for pipla and its marketing followed either formal or informal trade routes/chain (Namgyel, *et al*, 2009). The collectors sold it informally to the local traders which then used to sell formally to the Food Corporation of Bhutan (FCB) through auction. It was also sold informally to national/district level Bhutanese traders and Indian traders which then sold the product further through formal auction system to the Indian traders. The major end market of Bhutanese Pipla is India, where Indian traders buy the products from Bhutan and sell either in raw or processed form.

Bio-Bhutan is a private Bhutanese firm which develops, manufacture and market natural & organic certified products. They have developed herbal tea mixing with Pipla but the present domestic demand is negligible. The private company like Bio-Bhutan should be self-sustained so that they can create local employment through different value addition activities within country.

Menjong Sorig Pharmaceuticals (MSP), a state-owned enterprise under the Ministry of Health (MoH) is also a potential buyer. However, their requirement is very minimal as few products are developed from it. Therefore, the current human resource strength should be capitalized and further opportunities should be explored. The traditional knowledge of herbal medicine can be used for new pipla product development and sell in international markets. Moreover, the demand for traditional medicines is relatively increasing where *Pipla* spp. can be one of the ingredients. Within country the demand is very low and product development and overseas marketing is not easy in the present capacity. With this constraint, it is sold to middlemen through open auction who further sell it to counterparts in India.

The figure below shows the income earned from marketing of Pipla spp. for the year 2016-2018 (Figure 10).

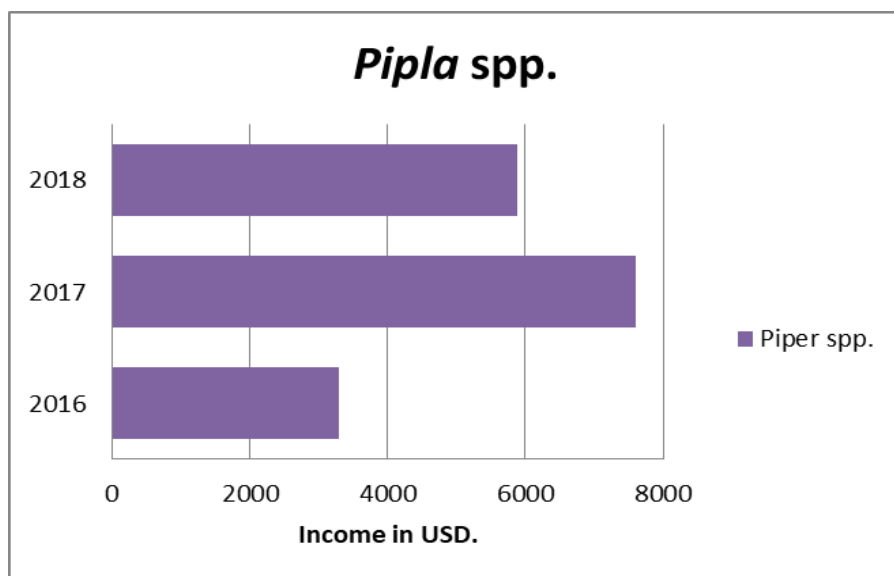


Figure 10: Income Generated from the sale of Piper spp. (in USD) from 2016-2018

Community-based management of Rubia cordifolia

Status

Rubia cordifolia is one of Bhutan's important NWFPs that have been marketed for a long time. It is a woody climber, which can be used as a medicinal plant as well as a dye, found abundant in parts of central and eastern Bhutan. It is mostly collected from the wild and because of its ecological adaptability and wide distribution area; it is widely available in Bhutan. *Rubia* is mostly used as a red dye and medicinal plant. Stems and roots are used for dyeing purposes, while medicinal properties are mainly found in its roots.

With the current growing interest in natural dyes the attention for this plant is returning. Roots of *Rubia* are an important ingredient of many Ayurvedic preparations and are considered very effective in purifying blood. Locally its leaves are used to cure pain through scrubbing the skin and its stems to color fabrics, eggs and wooden floors.

Marketing

The marketing of *Rubia* in most community groups are through auction coordinated by the Local Government and Department of Forests & Park Services. Dry and cut *Rubia* stems are also sold to Bhutanese middlemen who then market them to India which is the destination of most of the NWFPs collected in Bhutan.



Figure 11: *Rubia cordifolia*

The figure below shows the income earned from the sale of *Rubia* spp. for the year 2016–2018 (Figure 12).

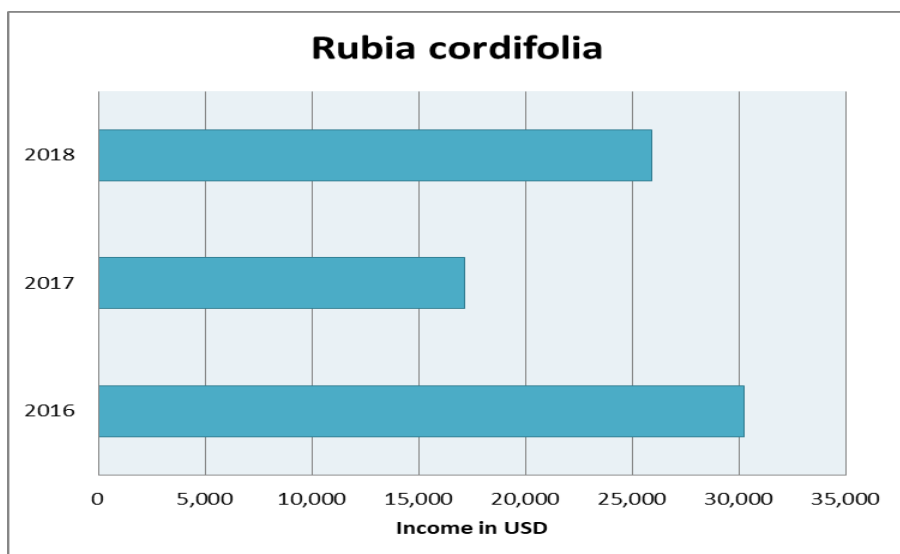


Figure 12: Income Generated from the sale of *Rubia cordifolia* (in USD) from 2016–2018

Medicinal and Aromatic Plants (MAPs)

Status in Bhutan

Bhutan is also known as *Menjong Gyalkhab*, meaning the land of medicinal plants. To date, more than 600 medicinal plants have been identified in Bhutan, and at least 300 medicinal plants are commonly used for preparing traditional medicines (Wangchuk and Tobgay, 2015). Average annual collection of high and low altitude in dry form is about 8,475.5kg (Tshering,

2020). It is collected and sold to traditional medicine unit by farmers groups established at community level.

The national list of essential medicines defines the traditional medicines used in Bhutan. Only traditional medicines that are in that list are produced and used in the traditional medicine system (MSPCL, 2018). Currently, the national list of essential medicines contains 114 traditional medicines. The raw materials for the production of these traditional medicines include around 300 raw materials (incl. medicinal plants, raw materials of mineral and animal origin). Presently, 85% of the raw materials are sourced in Bhutan, the rest from India (MSPCL, 2018).

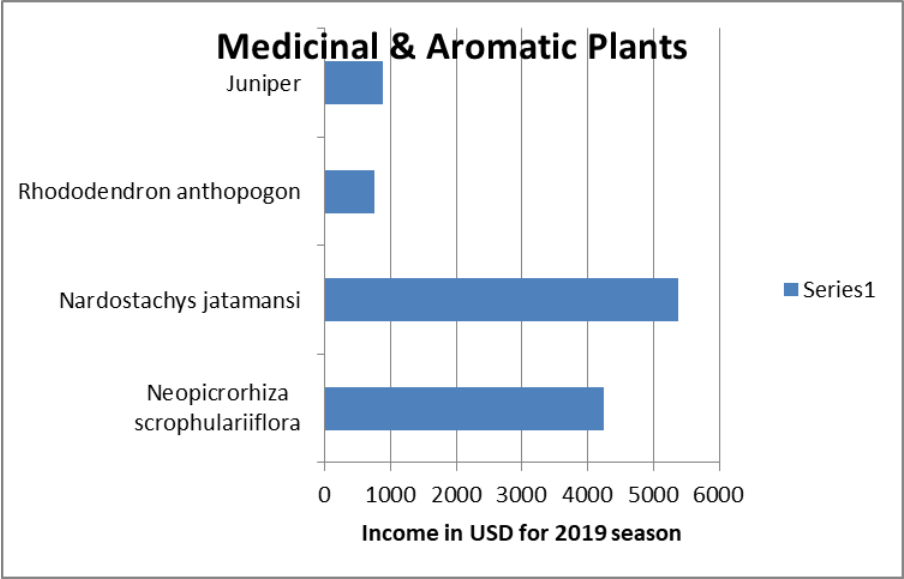


Figure 13: Income Generated from the sale of MAPs (in USD) for 2019 season

Marketing

Menjong Sorig Pharmaceutical Corporation Limited (MSPCL) sends list of high and low altitude medicinal plants to farmers group in written along with quantity required and price decided by board committee. Upon receipt of letter, the committee of the group decides on quantity of each plant species to be collected by an individual household. Post-harvest requirements are done in drying unit constructed in the community or at individual household level. When the required quantities of medicinal plants are harvested, dried and ready, the group inform to MSPCL. The MSPCL is the main buyer of medicinal plants and the demand is currently very limited. Besides medicinal plants the group also sells aromatic plants to incense factories and Bio-Bhutan.

Domestication and Cultivation Initiatives of Important NWFPs

Chirata

Chirata is a herb collected for commercial purposes by farmers of Shingkarh Lauri in the past. However, due to decrease in habitat areas over the year, the wild resources have declined drastically. In order to ensure sustainable harvesting of this herb, domestication program was initiated by the National Biodiversity Center in the year 2015 with technical backstopping from the Research and Development Centers of the Ministry of Agriculture and Forests. The initiative was successful and is being adopted by 68 households under Lauri Gewog, Samdrupjogkhar district.

Saturwa

Although there was no market within Bhutan for *Paris polyphylla* but commercial interest for this plant started a few years ago with traders exploring marketing opportunities as there was a growing demand and increasing prices in export markets. Over the years the wild resources have declined significantly. In order to conserve this particular plant species, domestication was initiated in collaboration with community forest and Non-wood Forest Products Management Groups. As of today, there are four nurseries established in three Districts (Samdrupjongkhar, Lhuntse and Bumthang) to raise seedling for farming inside community and private forest.

Cane & Bamboo

Cane and bamboo play a pivotal role in sustaining livelihood of rural people and few enterprises. Amongst many crafts, *Bangchung* is a unique bamboo product made from bamboo species i.e *Neomicrocalamus andropogonifolius*. The weaving is mostly done by women and contributes 66% of household income (Mokten *et al*, 2003). The children as young as 8 years learn weaving and continue till their sixties. Having such a skill in weaving such products, enable the female member in a household to earn additional income and gain financial independence. To sustain this art through sustainable supply of raw materials, plantations of this particular bamboo species and cane are initiated by the Department of Forests and Park services. Moreover, similar programs are also being initiated by the Civil Society Organizations like Tarayana Foundation and APIC (Agency for the Promotion of Indigenous Crafts).



Figure 14: Cane and Bamboo products developed by the community group member

Sustainable NWFPs Management Practices in Bhutan

In order to ensure sustainable collection and marketing of Non-wood Forest Products the following measures are adopted:

- Collection based on issuance of permit to individuals;
- Management and collection of NWFPs in community forest are usually done by community groups based on the prescriptions of management plans. The tenure rights for such management regimes are given for the period of 10 years;
- Allotment of NWFPs management and collection area to rural communities are done through formation of NWFPs management and marketing groups. The groups are given tenure right for 3 years and extended based on their management practices.

The permit for individual collection is given to individuals for those NWFPs species which are not managed by the groups or if collection to be done is from areas which are not managed by groups. The permits are granted based on schedules under which it falls. For those NWFPs to be managed by the community group, it is mandatory to prepare management plan and get approved by the Forest Department. The rotation system, allowing collection within fixed time period and agreeing of frequency of collection/cutting in case of lemon grass are some of the sustainable management of NWFPs practiced in the country.

Challenges

In Bhutan, the NWFPs are mostly collected from the wild. The seasonal availability of the NWFPs produce and inter-annual fluctuation are the detrimental factor to achieve the economy of scale. Further, limited studies are carried to determine distribution and quantification to ascertain its potential to develop systematic business with stable market channel.

Modern forestry management is oriented more towards timber production and seldom give importance to NWFPs with a perception that these are

supplementary resources and has least contribution to gross domestic product by planners. Further, there is no market established for NWFPs unlike that of timber and under such scenario, most of the NWFPs are sold or traded illegally.

Although Bhutan is endowed with rich biodiversity including NWFPs resources, only few species are processed and marketed at national, regional and international market. Lack of professional capacity in addition to technology is a stumbling block in advancement of NWFPs based enterprises in the country. Few NWFPs are processed following primitive methods making product lesser competitive in market due to poorer quality and higher price tag.

Communities' residing in higher altitude has no other option but to depend on collection of NWFPs growing in their area for their livelihoods. In absence of NWFPs based enterprises at community level, the farmers collect more quantity of high value NWFPs like *Ophiocordyceps Sinensis*, *Picrorhiza kurrooa* and *Nardostachys grandiflora* to maximize profit from its sale. Such scenario has led to collection of high value NWFPs growing in the narrow belt of area in an exploitative manner.

The NWFP processing units are based mainly in the capital city and other urban centers. However, the NWFPs management and marketing groups are concentrated mostly in eastern- central Bhutan. Due to geographic isolation of groups and far-flung location of processing unit, the groups end up selling their produce to middlemen who later export it to India and other countries. Further, the communities have to depend on them to sell their collection as there is demand for limited products within country. Thus, leading to the major share of the profit to be taken by middlemen at the expense of hard work of rural communities.

Contribution of NWFPs towards Rural Livelihood

- Highlanders in Bhutan are enormously benefited with legalization of Cordyceps collection. The income earned from the sale of Cordyceps is used in the construction of better houses in the community as well to purchase land and construct new houses in lowland. In addition, it is often used to purchase horses and makes living through pottering to tourism companies.
- Besides benefit to individual household, the group could also generate common fund with sales proceeds collection during marketing. These enabled needy members could avail soft loan without any collateral for agriculture or to run small business. The fund is also used in community

work like minor repairing of irrigation, drinking water supply and also for annual rituals.

- Income earned from sale of NWFPs enhanced the living standard of communities. They purchase important household utilities and induction stove to have better sanitation and lesser health hazard.
- NWFPs are source of food and income for rural communities and the cash income generated from the sale of NWFPs is used to send their children to schools and invest in local small business.

The Way Forward

The Government regards agriculture as a priority for achieving the national objectives of diversifying the economy and creating more inclusive growth. Like many developing countries, Bhutan produces a wide variety of NWFP-based products, but the country is yet to maximize economic benefits that can be derived from marketing those products.

NWFPs have social, cultural and economic role to rural communities. Few NWFPs products traded have economic role to the national and international economies. With more than 70% of country under forest land, Bhutan has a potential to become a producer of wild NWFPs for trade in international market. Therefore, there is a need to develop a holistic approach to include NWFPs in forest management system as a priority. Currently, forest management system concentrated on timber production. These omission and anomalies need to be corrected since NWFPs can make significant contribution to household income of rural poor.

Although NWFPs resources are collected and used daily by local communities, its usage is grounded at subsistence level without value addition and sell in raw form. This is partly due to inadequate knowledge of appropriate value-adding technologies, coupled with poor infrastructural facilities. Thus, resulting in private sectors and entrepreneurs failing to spark an interest in innovative NWFP-based business. In order to help communities to earn cash income, interventions are required at different levels like processing, packaging and marketing. To achieve this, there is a need to build capacity of young professional to take interest in NWFP-based enterprises.

Globally, NWFPs are increasingly recognized as natural resources of high value. However, NWFPs developments are not explicitly addressed in management plans, actions or policies. Therefore, NWFPs should be promoted as species for collection from the forest as well as from cultivated areas within an agroforestry system.

Due to isolated location of producer and processing units, most of the NWFPs are sold to middlemen who often trade to India through informal market. There is a need to develop marketing linkages between groups and entrepreneurs based in urban centers to processing unit in order to increase return to the groups.

Basic marketing infrastructure is one of the key requirements for better marketing of NWFPs to help boost and diversify production. A strong agribusiness sector is a crucial catalyst in agriculture transformation, which will support to enter into global value chains and attract private investment for inclusive economic growth.

Bhutan is signatory to number of international conventions such as Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). To trade those plant species under appendix II, the species should be supported by non-detrimental finding documents. In order to generate this, resource assessment is a precursor and need to be initiated at the earliest.

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Sustainable Management of Non-wood Forest Products for Rural Livelihoods in India

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Introduction

Forest has been the source of livelihood of mankind since time immemorial as human race evolved with the wilderness of forest and meadows. They were collecting their food, medicines, minerals, resins etc. from the forest even before they learnt to cut wood and convert them into any utility products. Non-wood Forest Products (NWFPs) were abundantly available in the past and were almost exclusively used by the forest dwellers working as artisans. Earlier NWFPs were classified in various ways such as minor forest products, other economic products, non-timber forest products or other forest products due to less emphasis given to them by the State Forest Departments based on their marginal contribution in the revenues as timber was considered to be the major source of revenue and forests were managed solely for that purpose. As per the United Nations Food and Agriculture Organization (FAO) NWFPs are defined as “products of biological origin other than wood derived from forests, other wooded land and trees outside forests”. Under Forest Rights Act, 2006, "minor forest produce" includes all non-timber forest produce of plant origin including bamboo, brush wood, stumps, cane, tussar, cocoons, honey, wax, lac, tendu or kendu leaves, medicinal plants and herbs, roots, tubers and the like. The country has approximately 45,000 species of plants spreading in 16 Agro-climatic zones. Nearly 3,000 species have been identified to yield NWFPs but only 126 have good marketability (Maithani 1994) due to their better economic returns. The important tradeable NWFPs include medicinal and aromatic plants, edible plants, starches, gums and mucilage, honey, oils & fats, resins & oleo-resins, essential oils, spices, drugs, tannins, insecticides, natural dyes, bamboos & canes, fibres & flosses, grasses, tendu leaves, animal products and edible products.

With the onset of industrial revolution, the dependency on forests focused on timber production and supply of industrial raw materials like minerals and ores. The rights of the forest dwellers were replaced by the new rights created for the industries as long-term leases for continuous supply of raw materials. Therefore, the NWFPs management in the organized forest management

received largely secondary or tertiary importance relative to timber management although its relevance in informal economy is still significant. In medicinal herbs alone about 2.8 billion people in the globe still depend on the forests (World Health Organization, 2002). In the developing nations about one fifth of the populations depend on the forests for their livelihood (Sheppard *et al.*, 2020). In India, people living in the forest fringe villages are greater users of forest produce than those living away from the forests. As per Indian census 2011, there are 6,50,000 villages in India out of which 1,70,000 villages are located near the forest areas which are called as Forest Fringe Villages. About 550 million tribes live in India and about 300 million of them depend on forests for their subsistence and livelihood. Contribution of NWFP to household income in the Forest Fringe villages varies between 10 to 70 percent. About 25 to 50 percent forest dwellers depend on NWFPs for food requirement (TRIFED, 2020). Only after realizing the importance and value of the forests in the life and economy of people, approach towards forest had been reoriented towards conservation and sustainability rather than using it as a source of revenue. Gradually the share of NWFPs in the forest economy has been increasing. As per an estimate released by the Ministry of Tribal Affairs, Government of India, NWFPs sector has the potential to create about 10 million workdays annually in the country. Based on a survey conducted by Medicinal Plant Specialist Group of the Species Survival Commission, the International Union for Conservation of Nature (IUCN), it has been observed that about 72,000 species belonging to higher plants are medicinally used worldwide which constitutes approximately 17 percent of the world's total higher plant flora. However, out of these large number of medicinally important species, relatively very few Medicinal and Aromatic Plants (MAP) species are cultivated on large scale for commercial purposes. We are still depending upon the forests and collecting from the wild sources for most of the medicinal plants (Srivastava *et al.*, 1996). In spite of large-scale industrialization, employment opportunities, diversification and globalization of economy, millions of people residing in rural areas are still dependent upon NWFPs as their major source of income and livelihood (Poffenberger, 2006). As per one of the FAO estimates there is capacity to generate about four million man-years of employment per annum globally through NWFPs (FAO, 2002; FAO, 2008).

The collection of NWFPs by tribal community in India accounts about 70 percent of the NWFPs collection (Mitchell *et al.*, 2003) and creating nearly 55 percent of total employment opportunities in the forestry sector (Joshi, 2003). For example, in case of Gujarat, the NWFPs contribute to the tune of 20.1 to 34.1 percent in the total household's income and similarly in case of West Bengal, the contribution of NWFPs is as high as 55.5 percent. Namdeo and Pant (1994) reported that that tendu leaves collection and Beedi

manufacturing is providing four million man-days employment annually in rural areas. Commercially, NWFPs are major source of revenue generation and are estimated to generate annually about three billion Indian Rupees (US\$ 100 million) and exports a large number of NWFPs to different countries resulting in valuable foreign exchange revenue (FAO, 1995). India has a monopoly for some of the NWFPs in the world trade particularly for Karaya gum (*Sterculia urens*) and myrobalans (*Emblica officinalis*, *Terminalia chebula*).

Institutional setup and Policy framework for development of NWFPs in India

The Government of India initiated the process of people's involvement in the conservation, management and protection of forests with benefit sharing mechanism on the principle of Care and Share through Joint Forest Management (JFM) in 1990, generally known as "The JFM 1990 Resolution". Joint Forest Management is a concept of developing partnerships between fringe forest user-groups and the forest department based on mutual trust and jointly defined roles and responsibilities with regard to forest protection and development. In JFM, the user (local communities) and owner (Government) manage the resource and share the cost equally. Currently, more than 11,8213 Joint Forest Management Committees (JFMCs) are managing around 23 million hectares of forest in the country (FSI 2011). The JFMCs are largely involved in the plantation and other forestry activities.

Nationalisation of NWFPs

Historically, the NWFP collection was mainly done by the local people residing in the vicinity of the forests and collections were in low quantities, generally for their own consumption or selling in the local markets. However, as the economic value of these NWFPs increased the collection became destructive and unsustainable as well. To overcome this issue, some State Governments took over the control of these NWFPs through nationalisation of identified NWFPs. So, there is dual marketing structure for NWFPs i.e. nationalized NWFPs and Non nationalized NWFPs. The Nationalised NWFPs are aimed for restricted harvesting, assured minimum support price, quality control through identified state agencies. The Non-nationalized NWFPs is for domestic food and medicinal purpose and sold in local open market or through middle man. The nationalisation of selected NWFPs was done to check the large-scale unsustainable collection. Examples of successful nationalised NWFPs are in Madhya Pradesh for Tendu leaf collection (*Diospyros melanoxylon*), seeds of sal (*Shorea robusta*), harad seeds (*Terminalia*

chebula) and gum collection from trees etc In the States of Rajasthan and Odisha, the tendu leave collection is controlled by State Governments through Rajasthan Tendu Leaves Act, 1974 and Orissa Tendu Leaves Act, 1981. Similarly, the resin and resin produce are controlled by the state through Himachal Pradesh Resin and Resin Produce (Regulation of Trade) Act, 1981 in Himachal Pradesh. The major objective of nationalisation is to prevent the middle man in exploiting the actual collectors and ensure fair wages to the collectors and enhanced revenue to the State Governments.

Development of Community-based NWFPs Enterprise

The local communities residing in the fringe areas of forests and gathering NWFPs for their livelihood are most often poorly organized. In most of the cases they face lot of problems in selling the NWFPs collected by them even in the local markets. Majority of the NWFPs are generally in the form of seeds, fruits and leaves which are spoiled if not collected at an appropriate time and stage of development. Therefore, motivating the primary collectors to collect these NWFPs at proper stage will allow proper utilization of them on one hand and ensure economic return to the collectors on other.

The primary collectors form the base of the pyramid in the spectrum of relationship from collection to utilization of the NWFPs and consumers are the top of the pyramid and traders and industry in between these two groups. The major concern is at the level of primary collectors. Very little efforts have been made at the level of gatherers to educate them about systematic collection, conservation, cultivation and resource management of these NWFPs. In order to increase their returns, the primary collectors often mine the plants excessively. The collection of NWFPs depends upon huge investment in form of labour and time and the economic returns are not in the same proportion as investment for them. There was no clarity on the rights of the tribal population residing in the fringes of the forests on these resources. However, due to some changes in the late 2000 and as per Forests Right Act (2010), the Gramsabhas have been empowered to assign the forest resources to these dependent communities.

Another favourable move by the Central government was the constitution of Minimum Support Price Commission (MSP) for NWFPs to assure minimum fixed price to tribal population. This assurance of minimum price for primary collectors will help them at economic front and will improve the collection of NWFPs. There is also a need to form self-help groups, NGOs and cooperative societies for value addition and dispose of the collected NWFPs. There is also a need to promote village level cottage industries for processing of NWFPs at local level for production of non-edible oils, dye preparation etc. Many agencies and cooperatives have been formed and

supporting the organized NWFPs trade for economic upliftment of the tribal communities.

A few successful examples are available in India for State initiated NWFPs based benefit sharing models with the local communities. These initiatives have been started way back in 1970s and replicate by other state governments. For example, the most important States for the trade and collection of NWFPs such as Madhya Pradesh, Chhattisgarh, Andhra Pradesh, Odisha and Uttarakhand have developed some mechanisms for sustainable collection and protecting the rights of the primary collectors. These States have developed various micro-enterprise activities related to NWFPs. The changes brought about by these institutional innovations have been accepted and benefitted the different stakeholder group of NWFPs, ranging from primary collectors to traders and processing units. These regulations have changed the trading pattern towards a positive side and can be further improved based on the feedback from stakeholders. Separate organizations have been established by some State governments which are totally dedicated for the purpose of procurement, processing, storage and marketing of NWFPs and raw products from the NWFPs. Some of the innovative initiatives by these States are development of Jarie Bootee Mandi by Uttarakhand State under State Forest Development Corporation; establishment of specific societies for the purpose of socio economic upliftment of tribal communities such as Girijan Cooperative Society long back in 1956 by Andhra Pradesh Government; establishment of Chhattisgarh Minor Forest Products Federation (CGMFPF) in the Chhattisgarh State for providing leadership in NWFPs marketing and entrepreneurship; Odisha Forest Development Corporation (OFDC) and Tribal Development Cooperative Cooperation (TDCC) and two agencies marked by Odisha government for the procurement of NWFPs. These agencies have successfully transferred sixty-nine NWFPs to the local panchayats; thus, facilitating trade of these identified NWFPs through local governing bodies. Madhya Pradesh Minor Forest Produce Federation is one of the pioneer agencies involved in this sector and developed innovative and novel models for sharing the benefits from nationalized NWFPs trade with the primary collectors for supporting livelihoods and providing social security.

Dual role is played by NWFPs in the livelihoods of forest dwellers and local tribal communities by meeting their day to day and seasonal needs and meeting the demand in poor harvest years. On the same time, they also contribute towards cash economy of the household. Even as the collection of NWFPs is predominantly seasonal, the returns obtained from them are generally continuous for marginal tribal people particularly for children and women. The ecological survey showed that there is marked variability in

density and distribution for any specific NWFPs species. The collection period of some common NWFPs is presented in the following table-1.

Table 1: Calendar of NWFPs collection in India

NWFP	Months of Collection											
	J	F	M	A	M	J	J	A	S	O	N	D
Grasses												
Fibres												
<i>Madhuca latifolia</i> (Mahua)												
<i>Azadirctia Indica</i> (Neem)												
<i>Pongamia Pinnata</i> (Karanj)												
<i>Schleichera Oliosa</i> (Kusum)												
Sal seeds												
Khakan seeds												
Gums & resins												
Myrobalans												
<i>Diaspyros Melanoxylon</i> (Tendu Leaves)												
<i>Tamerindus Indica</i> (Imli)												
Lac												
<i>Cocoon</i> (Tasar)												
Wild Fruits												

(Source: Singhal, 1999)

There are few success stories based on community-based NWFPs entrepreneurship in the country through institutional interventions and innovations (Planning Commission 2011). In Odisha, a Non-governmental Organization (NGO) Sanjog registered and promoted small and marginal entrepreneurs with different NWFPs based industries to secure their livelihoods and assisting them to be benefitted through various social sector scheme and also linking them with other agencies to provide them stable and ensured market for their products. The NGO successfully connected about 200 tribal women NWFPs dwellers from Mohangiri hills of Kalahandi – Balangir area of Odisha with Tirupati temple for selling Siali leaf plates produced by them. This linkage provided about twenty percent extra income to these tribal women. This particular NGO is also promoting Lac

cultivation, a prominent and beneficial activity for local tribal community in the region and studies showed that lac cultivation from just three trees of the Kusum Tree in the region provides net income which is higher than that from one acre paddy cultivation.

In another case which exhibited encouraging results, minimum support price policy for hill broom and cashew drupe was adopted by women self-help cooperatives promoted through Regional Centre for Development Cooperation (RCDC) in Odisha in 2011. Similarly, a public sector undertaking named Girijan Cooperative (GCC) demonstrated successful business and welfare model in which they procure NWFPs from primary collectors belonging to tribal community in Andhra Pradesh and sell the products after value addition with their brand name. It turned out to be very challenging, encouraging and dynamic business model.

Bharatiya Agro Industries Foundation (BAIF), charitable and development research a voluntary organization in Maharashtra is working towards providing a sustainable livelihood for small, marginal farmers, resource poor rural locals including tribal communities. Majority of these tribal communities located near or inside the forests and collect NWFPs as prime source of their income and livelihood. The unsustainable harvesting and collection of these NWFPs have depleted these resources, thus affecting their livelihood and forcing them to move towards shifting cultivation in the fringe forest areas for their food security. Lack of knowledge about new scientific agricultural technologies and inadequate availability of latest seed varieties and other critical inputs lead to further deforestation and enhanced soil erosion resulting in unsustainable livelihood of these tribes. The BAIF took initiative to educate the tribal communities to sustain their livelihood with systematic harvest of NWFPs and linking them with market channels to ensure better returns. BAIF initiated NWFPs collection promotion in selected districts of Maharashtra (Thane, Nandurbar and Nashik districts) and Gujarat (Valsad and Navsari districts) located in the Western Ghat hill ranges. Some of these NWFPs such as *Emblica officinalis*, *Terminalia bellerica* and *Terminalia chebula* are available in plenty in these forests and have good demand in the local market for medicinal purposes. But local tribals have difficulty to fetch good price by selling them in local markets and the returns from NWFPs are not sufficient to sustain their livelihood. To overcome these challenges, BAIF provided them alternative sources of livelihood with the promotion of agroforestry systems on degraded lands of these tribals and collection of locally available NWFPs as a supplementary activity. The important NWFPs identified by BAIF for providing livelihood and food security for the local tribes in Maharashtra, Gujarat, Madhya Pradesh and Karnataka are presented in Table 2.

Table 2: NWFP Collection Promoted by BAIF

NWFP	Maharashtra	Gujarat	Madhya Pradesh	Karnataka
Medicinal	<i>T.bellerica</i> , <i>T.chebula</i> , <i>Emblica officinalis</i>			
Oilseeds	<i>Madhuca indica</i>		<i>Madhuca indica</i>	<i>Azadirachta indica</i> , <i>Derris indica</i> , <i>Madhuca latifolia</i>
Food	<i>Buchanania lanzan</i> , <i>Carissa carandus</i> , <i>Madhuca indica</i>	<i>Madhuca indica</i> , honey	<i>Tamarindus indica</i> , <i>Madhuca indica</i> , honey	
Gum, Wax and Resins	<i>Boswellia serrata</i> , <i>Anogeissus latifolia</i> , <i>Acacia catechu</i>	<i>Acacia sp.</i>		<i>Garcinia morella</i>
Tans and Dyes	<i>Acacia sp. bark</i> , <i>Terminalia nut</i>	<i>Acacia sp.</i>		
Bamboo	<i>Bambusa sp.</i> , <i>Dendrocalamus sp.</i> , <i>Ochlandra sp.</i>	<i>Dendrocalamus</i> , <i>Ochlandra sp.</i>		<i>Dendrocalamus</i> , <i>Ochlandra sp.</i>
Others	<i>Butea monosperma</i>	<i>Butea sp.</i>	<i>Butea sp.</i>	<i>Butea sp.</i>

(Source: Hegde, 2005)

To further enhance the knowledge and income of the local farmers and tribes through NWFPs, BAIF is scheduling regular capacity building programmes regarding scientific and sustainable harvesting, collection, storage techniques to increase shelf-life of these NWFPs through proper drying and providing direct market channels to ensure better returns.

Medicinal Plant Based NWFPs Resources - North East India

The Northeast region of India, comprising of the states of Arunachal Pradesh, Assam, Meghalaya, Manipur, Tripura, Mizoram, Nagaland and Sikkim, is a

unique ecosystem having enormous cultural, biological and climatic diversity. It is very rich in medicinal and aromatic plants diversity. A brief status of medicinal flora in Northeast states is given below:

Arunachal Pradesh: About 40% of the Indian flora and fauna are found in Arunachal Pradesh, many of which are endemic to the region. Over 500 medicinal plant species have been reported from Arunachal Pradesh. The locals use these plants for the treatment and cure of a large number of diseases. Some of the important plants at low altitudes are *Acorus calamus*, *Andrographis paniculata*, *Aquilaria agallocha*, *Dioscorea floribunda*, *Oroxylum indicum*, *Rauwolfia serpentina*, *Piper longum*, *Tinospora cordifolia*, and *Withania somnifera*. At the higher elevations *Aconitum ferox*, *Aconitum heterophyllum*, *Coptis teeta*, *Gymnadaenia archidis*, *Panax sikkimensis*, *Panax* spp, *Picrorrhiza kurroa*, *Rubia cordifolia*, *Artemisia* spp and *Taxus baccata* are most common. Some medicinal plants eg. *Curcuma caesia*, *Rubia Cordifolia*, *Acorus calamus*, *Piper brachystachyum* etc., are also under commercial cultivation. These plants not only cure a variety of ailments but also are a potential source of economy to the state.

Assam: Assam is home to a good number of plants having medicinal uses in Aurvedic, Unani, Homeopathic and even modern medical practices. Altogether, 952 medicinal plants species have been identified from the state. *Litsea cubeba* (Mejankuri), *Piper longum* (pipli), (Satmul), *Curcuma aromatica* (Ban-haldi), *Emblica officinalis* (aonla), *Zinziber officinalis* (Ada), *Terminalia chebula* (Hilikha), *Terminalia bellerica* (Bahera), *Eugenia jambolana* (Lohajam), *Garcina* spp (Thekera), *Holarrhina antidysentrica* (Dudhkuri), *Hydnocarpus kurzii* (Chalmugra), *Ocimum* species (Tulsi), *Phlogocanthus thyriflorus* (Titaphul), *Asparagus racemosa*, *Saraca indica* (Asoka), *Wedelia calandulacea* (Mahabhringraj), are some of the most commonly used plants in treatment of various ailments.

Manipur: Manipur has around 100 of Medicinal and aromatic plant species. Ethnobotanical studies carried out in the four sacred groves of Manipur revealed therapeutic applications of 120 plant species representing 106 genera and 57 families. Tree species contributed the maximum having 42% while herbs recorded 33% of the total medicinal plants. Most of the medicinal plants are harvested from the wild. It has been observed that the species that are scarce locally in the forest due to various developmental activities, deforestation, over-exploitation, etc. are abundant in the 'sacred groves'.

Tripura: The floral diversity of Tripura state is represented by 379 species of trees, 320 shrubs, 581 herbs, 165 climbers, 16 climbing shrubs, 35 ferns, 45 epiphytes and 4 parasites. *Angiopteris evecta*, a fern and *Gnetum montanum*, a giant climber belonging to Gymnosperm are two rare species that is found in

Trishna Sanctuary. Tree ferns (*Cyathea* spp.), which are also primitive and endangered, are found in South Tripura. There are 266 species of medicinal plants in the State (68 trees, 39 shrubs, 71 herbs and 88 climbers).

Meghalaya: Meghalaya is one of the richest states of India in terms of flora. As per the report of State Level Planning Committee, Meghalaya has 850 species of Medicinal Plants, 377 of which are used by 70% to 80% of the State's population for primary health care needs. Species like *Nepenthes khasiana* and *Piper peepuloides* endemic to Meghalaya are globally threatened as per IUCN Red Data Book. The people of Meghalaya, especially the tribals are well acquainted about the medicinal properties of the plants growing in their surroundings. Some of the important medicinal and aromatic plants found in Meghalaya are: *Acorus calamus*, *Artemisia nilagirica*, *Cinnamomum tomala*, *Costus speciosus*, *Dioscorea alata*, *Fagopyrum dibotrys*, *Piper longum*, *Piper nigrum*, *Solanum nigrum*, etc.

Sikkim: Sikkim Himalaya represents an extremely unique ecosystem rich in medicinal plant wealth associated with Ayurveda, Folk medicine, Homeopathy, Siddha, Amchi (Tibetan) and Unani system of medicines. It is reported to have more than 424 species of medicinal plants which have strong traditional system of medicines in Sikkim. The state has an enormous biodiversity of medicinal plants that occur right from the humid river valleys to the cold trans-Himalayan desert. The medicinal plants have traditionally occupied an important position in the sociocultural, spiritual and medicinal arena of the people in the State.

Nagaland: Some important medicinal plants of Nagaland are: *Panax pseudo-ginseng* (Gensing), *Taxus baccata* (Yew), *Aquilaria agallocha* (Agar), *Solanum khasianum*, *Ocimum sanctum* (Tulsi), *Aegle marmelos* (Bel), *Rauwolfia serpentina* (Sarpagandha), *Elaeocarpus ganitrus* (Rudraksha), *Dioscorea deltoidea* (Kath Aloo), *Emblia officinalis* (Amla), *Swertia chirata* (Chirata), *Rubia cordifolia*, *Oroxylum indicum*, *Clerodendrum colebrookianum*, *Passiflora edulis* etc.

Mizoram: The State has diverse flora with more than 400 ethno-medicinal plants. Some of the locally used medicinal plants are: *Eupatorium cannabinum* (Hlothar), *Curculigo grassifolia* (Phaiphek), *Callicarpa arborea* (Hnahkiah), *Mikania micrantha* (Japan-hlo), *Lasianthus hirsutus* (Changneithing), *Swertia angustifolia* (Khawsik damdawi), *Costus speciosus* (Sum-bul), *Picrasma javanica* (Thingdamdawi) etc.

Non-wood Forest Products Collectors in Bundelkhand

Bundelkhand is one of the drought prone areas of Central India, where dependency on agriculture for livelihood is very difficult due to limited irrigation facilities, uncertain rains, small land holdings and poor soil

conditions. The region has a large population of other backward castes (53%), scheduled castes (25%) and tribals (10%). Tribal population in many districts is negligible; however, in few districts they have good presence. Over the years, they have lost much of their land to powerful outsiders due to debt or their land is of very poor quality unfit for cultivation. Without access to good land, low educational attainment and far from development processes, tribal households are generally at the bottom of the social and economic ladder. It is in this context, they are mostly depending their livelihoods on NWFPs derived from trees, but they are being fully exploited by middlemen's marketing system. An attempt has been made by Chavan *et al.*, (2016) to record the different livelihoods earnings and their economic analysis as depicted in Table 3.

Table 3: Economics analysis of different NWFPs in Bundelkhand

Name of the species	Products	Period of collection	Stake holder	Production per tree/year	Rate per unit or Kg (Rs)	Income	
						per tree (Rs)	per Family/yr
<i>Butea monosperma</i>	Gum	Dec-Jan	Sahariya tribe	300 g	Rs 60-80/kg	25	6000-8000
	Lac	Oct-Nov	Farmer	1.5-2.0 kg	400-450	700-800	-
	Dona	Whole year	Farmer	1200-1500	Rs 1 for 4 dona	400-500	20000-22000
<i>Phoenix sylvestris</i>	Broom	Except rainy season	Landless/ Bargunda tribes	5-8 brooms	Rs 10/ broom	50-60	40000-50000
	Crown	Dec-March	Artisan	1	Rs 800-1000/ crown	800-1000	4000-4500
	Jaggery	Sept-Jan	Farmers	10-12 kg	Rs 30-40/Kg	350-400	8000-10000
	Basket	-	Bargunda tribes	1	Rs 30-40/piece	30-40	1500-2000
<i>Madhuca indica</i>	Flowers	Mar-Apr	Farmers & Tribal's	50-100	Rs 10-20/kg	800-1000	12000-15000
	Seed	May-June		70-100	Rs 4-5/kg	500	2500-3000
<i>Diospyrous melanoxylon</i>	Leaves	April-May		500 leaves (10 bundles)	Rs 1/ bundles	15-20	12000-15000
<i>Dendrocalamus strictus</i> (Bamboo Clump)	Bamboo stick	Year around		5-8 stick	Rs 60-70/stick	300-450	20000-22000

(Source: Chavan et al., 2016)

Successful Community-based NWFPs Collection

A multipurpose tree species Palash scientifically known as *Butea monosperma* Lam., of Fabaceae family, is a major source of many NWFPs such as a dye, gum, fodder, lac resin, use of leaves for making platters, etc. This species is commonly found in major parts of the India. There are about 359.7 million stems of this species in the country, as per the reports of Forest Survey of India and out of which 46.7% is outside forest areas including farmlands. The Central Agroforestry Research Institute, Jhansi of Indian Council of Agricultural Research developed suitable agroforestry systems for providing livelihood options to the small and marginal farmers and local tribes due to the potential of this species in securing better economic returns from production of Lac and Gum.

Gum from palash

During the months of November and December, the Saharia tribes of Bundelkhand region engaged themselves in searching densely populated palash trees in small groups in the farmer's field or along the roadsides for gum extraction. It is the season for gum oozing from palash trees. The bark of the tree is the source of extracting gum and it is readily sold in the market. They will identify the suitable areas preferably in a stretch of 5-6 km along the road or in farmer's field with good number of palash trees. They divide the plash trees into different groups and for initial two days, they will peel off the rough bark of trees from first batch. After that notching is performed with the help of iron sickles for oozing of the gum from the notches for next three to four days. Then, they collect the gum oozed out from the notches after a week in the bamboo baskets. About 300g of gum is collected from one tree on an average and overall about 100 kg gum is collected in a year by an average family comprising of 4-5 family members. They sold this gum to middle man at 80-90 Rs/kg, thus providing an annual income of Rs 8,000-9,000 to a family. However, middleman earns the maximum profit by cleaning and grading the gum and selling in the market at a higher rate of Rs 400-500/kg.

Dona pattal from palash

Dona pattal is traditionally used serving bowl made from leaves of palash in the rural areas of Bundelkhan region of central India. Some farming families meet their livelihood by collecting fresh leaves of palash for making bowls. In a case study of one farmer, who collects leaves from the region as well as from the fields of the neighbouring farmers on payable basis. His whole family members are engaged in collection and making dona pattal. The family used to make about 2,000 donas per day and earns about Rs 500 every fourth day

by selling the donas in the local market at a rate of Rs 12 for 50 donas. These dona pattal are eco-friendly in nature and replaces the plastic serving bowls.



Figure 1. Farmer making Dona Pattal

Lac from palash

Lac cultivation is one of the primary sources of income for the tribal and rural people. It is very common practice in the regions where other cash crops are not grown by tribal population. There are three main conventional lac host tree species in India used for about 90% lac production i.e. Butea (palash), Kusum (*Schleichera oleosa*) and Ber (*Ziziphus* spp.). Palash tree is generally used to grow rangeeni strain of Lac, as it is a good host for this strain. Newly emerged twigs and branches of palash are used to grow lac insect. The lac encrustation is produced within 4–5 months and after that they are harvested at maturity. Generally, the lac crop is harvested in October to November and small quantity of mature lac crop is left on the tree for brooding purpose for next season. A palash tree on an average produce about 1.5–2.5 kg of lac fetching an annual income up to Rs. 700–800. In the recent past, the average Rangeeni lac price is varying between Rs 200 and 500/kg. The palash based agroforestry systems have been developed for the central India conditions and this system can provide an additional return to the tune of Rs 1,200–1,500/tree. It can be further enhanced by practicing dye extraction from palash trees as another viable option.



Figure 2. Lac cultivation on Palash tree in Central India

Tendu leaf collection – a viable source of income for rural community

Tendu leaves (TL) are one of the most important sources of income for tribal communities and rural people living near forests in central India. It occupies a significant place among all NWFPs in the country. The tree is called Blackwood (Indian ebony), and is of less significance than its shrub, whose leaves are used for making beedis (an indigenous cigarette, which uses the tendu leaf instead of paper). The tendu leaf collection is one of the viable source of cash income for the tribes of central India. As per a study conducted by Ashoka Trust for Research in Ecology and the Environment, an institution dedicated towards biodiversity conservation and sustainable development, about Rs 1,900 crore were earned by the major tendu growing states such as Chhattisgarh, Madhya Pradesh, Maharashtra and Odisha in 2012.

In 2011, Mahadule and Vimmy conducted a case study in Madhya Pradesh (MP) to understand the role of NWFPs in addressing rural poverty. This study on the role of tendu leaves in addressing rural poverty found that throughout India, tendu leaves and beedis are estimated to provide 106 million person days of employment in collecting activities and 675 million person days in secondary processing. In the state of Madhya Pradesh, tendu leaf collection generates, at an average, more than 45 million person days of employment per year for six million poor tribal people and scheduled castes, especially women and children. Madhya Pradesh is one of the largest tendu producer State of India and accounts for about twenty percent of total tendu production in India. The State produces about 2.5 million Standard Bags (SB) each bag having approximately ten million tendu leaves. The tendu trees are generally pruned in the month of February to improve the quantity and quality of tendu leaves. The leaf collection process starts with this pruning and takes about 50 – 55 days for completion, thus provides sufficient time for tendu leaf collection to the local tribes.

The standardised procedure has been developed for tendu leaves collection and processing and it is followed throughout the country. The process of plucking involves four to five steps- walking to and fro from tendu growing area, plucking of leaves, sorting and tying in small bundles and delivery of the bundles to collection centres. After the collection of leaves at the collection centre, leaves are spread over the ground for drying. After two to three days of drying, the counted bundles are put into gunny bags and finally transported to city collection centre (brick walled sheds), by local transports like tractor. From city collection centre the bundles are sold by Madhya Pradesh Minor Forest Produce Federation (MPMFPPF), the Apex state level organization, to traders and manufacturers. The Primary Co-operative Societies are responsible for the collection of tendu leaves. There are over 15,000 collection centres in MP. To know the trends better and different phases of the tendu trade in MP, we must first see the detailed figures of production of tendu leaves since 1989 given in the table 4 as posted on MPMFPC website.

Table 4: Data of Tendu Leaves Trade in Madhya Pradesh

Year	Collection	Collection Rate per S.B	Collection Wages	Quantity Stored	Quantity disposed off	Sale Price	Expenditure	Net receipt
1989	43.61	150	65.42	43.58	43.58	405.15	114.70	290.45
1990	61.15	250	152.88	60.57	60.57	248.47	209.12	39.35
1991	46.16	250	115.40	45.79	45.79	298.07	180.00	118.07
1992	45.06	250	112.65	44.64	44.64	285.99	201.47	84.52
1993	41.31	300	123.93	40.98	40.98	252.77	198.29	54.48
1994	42.38	300	127.14	42.08	42.08	299.40	210.95	88.45
1995	39.56	300	118.68	39.36	39.36	289.39	197.80	91.59
1996	44.60	350	156.10	44.43	44.43	338.85	269.38	69.47
1997	40.14	350	140.49	39.95	39.95	338.69	244.05	94.64
1998	45.47	400	181.84	45.23	45.23	407.66	280.39	127.27
1999	49.37	400	194.20	49.12	49.12	402.20	283.87	118.33
2000	29.59	400	114.78	29.49	29.49	176.31	160.08	16.23
2001	21.28	400	83.09	21.22	21.22	111.05	136.07	-
2002	22.74	400	89.04	22.65	22.65	165.77	143.83	21.94
2003	22.25	400	87.56	22.21	22.21	152.95	140.71	12.24
2004	25.77	400	101.61	25.72	25.72	167.71	145.86	21.85
2005	16.83	400	66.37	16.82	16.82	131.41	106.90	24.51
2006	17.97	400	71.88	17.97	17.97	151.33	100.56	50.77
2007	24.21	450	108.95	24.21	24.21	373.64	136.89	236.75
2008	18.25	550	100.35	18.25	18.25	211.26	136.57	74.69
2009	20.49	550	112.67	20.49	20.49	265.49	149.86	115.63
2010	21.24	650	138.11	21.24	21.24	332.89	179.71	153.18
2011	17.06	650	110.85	17.06	17.06	310.06	154.10	155.96
2012	26.06	750	195.45	26.06	26.06	618.40	245.94	372.56
2013	19.92	950	189.28	19.92	19.92	394.81	247.04	147.77
2014	16.99	950	161.42	16.99	16.99	310.09	217.39	92.70

Source: MPMFPC website

Unit for Quantity: lakh Standard Bags (One Standard Bag contains about 50,000 leaves);
Unit for Amount: Rs. In Crores.

In order to address the exploitation of primary collectors, the government decided to promote cooperatives of leaf collectors and established the Madhya Pradesh Minor Forest Produce Cooperative Federation (MPMFPCF) in 1984. Three tier structure consisting of a Primary Cooperative Society (PCS) at the village level, District Union at district level and Federation at state level were developed. The federation became fully operational in 1989. Following a tiered structure, the federation, which is organized as a cooperative, is comprised of 1,947 primary cooperative societies in which all the Tendu leaves collecting families are members, formed into 58 district cooperative unions, and an apex federation at the state level (Mahadule & Vimmy, 2011).

The 73rd Amendment to the constitution has provided for the devolution of power to the Panchayati Raj Institutions. In landmark legislation, the parliament enacted the provisions of the Panchayats (Extension to Scheduled areas) Act (PESA) in 1996, which has provided for endowing Panchayats at the appropriate level with the ownership of NWFPs. Consequently, in 1998, an executive order was passed in MP to implement the PESA. Under this, the net profit of the tendu trade was to be returned as bonus to the collectors, the “owners” of NWFPs under PESA. Now, according to PESA, 60% of the net profit should go directly to the primary collectors as incentive wages, 20% to the primary cooperative societies for infrastructure development, and the remaining 20% is to be used for the purpose of regenerating forests and the development of NWFPs resources (Mahadule & Vimmy, 2011).

In Maharashtra, members of *gram sabhas*, empowered to manage forests under the Forest Rights Act, have also changed the way tendu leaves are collected. They have banned pruning and cutting of bushes, and burning of the forest floor—methods used by traders to advance the fresh flush of leaves. Around 440,000 families collected tendu leaves in Maharashtra in 2012, according to the Maharashtra State Forest Department. By August 2017, Maharashtra had allotted over 4.43 million acres of forest land under community forest rights that allow forest dwellers to not only use and sell minor forest produce on their own, but also manage and protect its natural resources. Around 104 villages earned Rs 9.8 crore by selling tendu leaves under community forest rights in 2017 (Moudgil, 2017).

In predominantly tribal areas, *gram sabhas* are also allowed to sell minor forest produce, such as tendu leaves, under the Panchayats (Extension to Scheduled Areas) Act (PESA). Although the Act was enacted by Parliament in 1996, it was in 2014 that Maharashtra notified the rules under which a *gram sabha* can either ask the forest department to carry on the sale of tendu or can manage the sale on its own with support from various government departments. Many villages, especially those in Gadchiroli district, are using PESA to auction tendu leaves.

In 2017, the 18 *gram sabhas* earned Rs 5.07 crore by selling 5,458 standard bags—each bag has 70,000 leaves of tendu. The villagers earned Rs 3,000 as collection wage and Rs 5,000 bonus (given after the sale of produce) per bag. Around 5 per cent of the revenue was kept aside for a village development fund to be spent by the *gram sabha*. Each gram sabha got about Rs 2–2.5 lakh in its development fund depending on the number of bags deposited. Dhamadi Tola village used this money to appoint two teachers in its primary school, while other villages organised cleanliness drives or local festivals. In Gadchiroli's Bhamragad and Dhanora taluka, villages repaired ponds and planted bamboo from the development fund (Moudgil, 2017).

Success of Amla value addition model – a testimony

Many NWFPs have less shelf-life and become difficult to market by transporting them to the markets from the remote localities. Primary processing and value addition to such products can substantially increase the marketability and profitability. Based on the case study conducted in Visakhapatnam District in Andhra Pradesh, value addition to wild Aonla increase income of villagers. Miss Baka Indramma, a 45 year old resident of Valasi Village of Ananthagiri Mandal, Visakhapatnam District in Andhra Pradesh used to sell Wild Aonla fruits in the nearby market transporting the raw Aonla to a distance of 4–5 km. The selling price was Rs 1.50 to 2.00 per kg. After collecting, transporting and selling 40 kg Aonla, she gets Rs 80.00. Many a times that income is also not earned if there is a glut in the local market. With the help of an NGO (Kovel Foundation: an organization of 250 Girijan Gum Pickers Associations) Aonla was steam boiled, de-seeded and sundried. This process reduced the weight to 1/5th, enhanced shelf-life and increased the price manifold. A small intervention could substantially improve the livelihood of the tribal NWFPs collectors.

Sustainable Management of NWFPs

In India, forest management is joint responsibility of National and State governments. In the National Forest Policy of 1988, a revolutionary change was brought in the forest management that emphasized on participatory forest management more popularly known as joint forest management. National legislation (e.g. “Panchayats (Extension to Scheduled Areas) Act 1996” provides ownership of NWFPs to Gram sabhas/panchayats. Forest dependent communities residing near the forests are given primary role in forest management by recognizing Forest Acts and this ownership also includes share in net revenue of the State Forest Department. It shows there is increased awareness for involvement of community and regulate the use and overexploitation of the NWFPs from the forest areas. Sheppard *et al* (2020)

proposed a conceptual framework for sustainable co-production management for timber and NWFPs. The status quo represents a generalised current state of affairs where the single goal of wood production is paramount. Each node within the proposed framework describes a factor that is significant for transitioning towards sustainable co-production management.

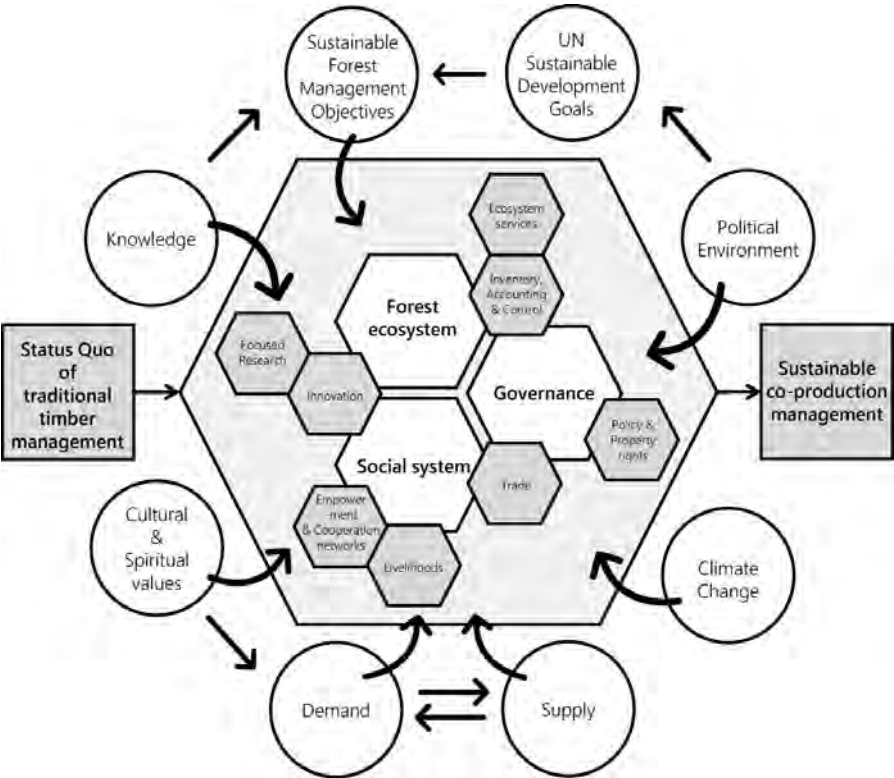


Figure 3. A conceptual framework for transitioning to sustainable co-production management for timber and NWFPs (Source: Sheppard et al., 2020)

The Way Forward for Sustainable Management of NWFPs

Augmenting livelihoods of the forest dependent communities requires some focused intervention on NWFPs. The facilities related to storage, grading, processing and value addition through convergence of existing schemes and programs in private and public sectors needs to be created and promoted. Communities should be empowered with information about the market, policy and products to enable them strategizing and accessing better returns from NWFPs. The NWFPs are the economic backbone of tribal communities and the major source for their livelihood option, and play an important role in poverty alleviation. NWFPs which are growing naturally in the forests needs to be promoted and sustainably managed. The market of

NWFPs is unorganized and mostly characterized by higher degree of exploitation at lower levels. Besides, there is also absence of aggregation, intermediate processing/storage and collective selling of NWFPs at village level. Improved processing techniques, market creation, training and awareness programme will help in popularizing these hidden treasures. Therefore, it is a collective responsibility of all stakeholders, including government agencies to support livelihood options of NWFPs collectors. As long as the bottom of the pyramid is supported, enriched and equipped, rest of the strata can sustain for a long time.

The following are the specific points for development and promotion of NWFPs:

- The State Departments should strengthen extension efforts and enhance traditional knowledge and skill of the tribal and rural communities in NWFPs;
- Research institutions needs to improve basic knowledge about cultivation practices and dimensions of NWFPs;
- Conservation agencies and NGOs should promote conservation of vulnerable NWFPs species at the grass-root level;
- Community organizations need to adopt sustainable collection and management practices of NWFPs on community lands;
- Profitable private enterprises for processing, transporting and marketing must be developed;
- Government institutions need to be strengthened to regulate important NWFPs resources and at the same time foster their sustainable development;
- Future initiatives should also link the management and conservation of NWFPs with the commercial development of these resources;
- Refining of the value addition and developing a comprehensive value chain analysis of key NWFPs;
- Decentralization of NWFPs collection and trade to community-based institutions and primary collectors to manage the trade and get benefits;
- Creating awareness, social mobilization and capacity building of the primary collectors;
- Develop a zone wise GIS based inventory of availability, cultivation status, demand and supply for NWFPs;
- Provide subsidy to NWFPs collectors and set premium pricing of NWFPs to get sustainable profit for the collectors;

- NWFP-based agroforestry models to be promoted in tribal dominated areas for sustainable livelihood;
- Empowerment and strengthening of local institutions such as gram sabha, JFMC, Cooperatives and Self-help groups.

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Sustainable Management of Non-wood Forest Products for Rural Livelihoods in Maldives

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Introduction

Maldives, an island state that consists of 1,192 coral islands of which 200 islands are inhabited with a local population of over 436,330 and expatriate's population of over 100,000. The country is very much depended on tourism sector. Coconut groves are the most evident and common woody vegetation in the country. The Global Forest Resources Assessment of 2005 estimated the forest area of Maldives at 1,000 hectares, and the Agricultural Development Master Plan (2006–2020) of Maldives quotes an estimate of 3,716 hectares of forests. Nevertheless, forests have always been playing a crucial role in the rural communities. Protection from natural calamities to source of food and place of communal activities, forests have been offering different services and products. In the past, wood from forest has been utilized for construction of houses, boats and other furniture. Thatch was used as roofing material and non-wood forest products such as nuts, fruits, gum, and medicinal plants were used in the country.

With the advancement and development of country's economic status, our dependency on forest and its resources have reduced, but at the same time how we manage and extract resources from forest has also changed. We have become environmentally more aware and the quantity and types of Non-wood Forest Products we extract have also differed.

Non-wood Forest Products – Current Scenario

One of the important roles that the forest plays in Maldives is cratering of Non-Wood Forest Products (NWFPs). In the past, the use of NWFPs was so abundant that communities relied solely on NWFPs for their daily consumptions. NWFPs have also been used for their medicinal and aesthetic values. *Cocos nucifera* (coconut) is the main tree species found in the Maldives. The communities of inhabited islands have the access to natural resources from the uninhabited islands, which have an abundance of coconut palms. Coconuts have played an important role in the economic development and remain the dominant feature of the agriculture sector of Maldives.

Coconut is grown both in coastal boundary zones and home gardens, support livelihood of islands population providing nuts for daily consumption and sales, timber and firewood, roof thatch and other value-added products such as coir rope, oils, toddy and processed sugar. Maldives is self-sufficient in fresh coconuts, however, import of processed coconut products are on the rise, due to low availability and high price. The current coconut production and management system are expected to decline the situation and increase dependency on imported coconut products for consumption and decrease the income earning potential of farmers.

Coconut palms are considered as a useful natural resource economically as well as medically and nutrition wise. Almost all parts of the coconut tree, from its roots to its tip, are of use to the Maldivians. Coconut is essentially one of the most nutritious foods one can find in the island nation of Maldives. The health benefits of coconut and its medical usefulness is greatly utilized by the Maldivians. Coconut water, traditionally, was used as a remedy for upset stomachs, nausea and vomiting.



Figure 1: Coconut

Table 1 shows the high amount of coconut used and traded in the country. With recent easing of transporting coconut within and between atolls without transporting it to Male before it is being sold to other markets has led to gradual reduction of coconut traded in Male’ market.

Table 1: Quantity of coconut traded in Malé Market

Year	Amount in Kg
2020	52462
2019	84899
2018	211262

Source: National Statistical Bureau (2020)

Young coconut has been source of food from the early days. A coconut drink that has been used for welcoming people, mostly sold at restaurant, café' around the country and resorts (Figure 2). It is a vital source of income for the islanders. The women would generally be engaged in these activities. They collect coconut leaves from the forest, dry them and weave into mats locally called “Fangi” (Figure 3). In the past, it was used to cover huts, but nowadays these are sold to the tourist resorts for their uses.



Figure 2: Tender Coconut



Figure 3: Thatch weaving (Fangi vinun)



Figure 4: Woven palm leaves- ready for market

Woven palm leaves fetch a good price as there is demand from the resorts. Coconut shells are also made into different types of souvenirs. Toddy tapping is a tradition that is slowly being neglected and now it is hard to find people having knowledge of this tapping. “Ruku Raa” which is the local name of the sweet drink tapped from coconut palm is a delicious traditional drink, which need to be revived.

[illegible]

Figure 5: Reed Mat



Figure 6: Breadfruit chips Figure



7: Terminali catappa (kanamdhu)

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Table 2: Commercial Non-wood Forest Products in Maldives

<i>Product</i>	<i>Scientific and local name</i>	<i>Uses</i>
Country almond	<i>Terminalia catappa</i> (kanamadhu)	Nuts used for eating and cooking, deserts.
Gum	-	Boat building (sealant)
Reed grass / Mat sedge	Thundukunaa	Mats, rugs, home use, souvenirs
Breadfruit	<i>Artocarpus altilis</i> (Bambukeyo)	Culinary use
Coconut	<i>Cocos nucifera</i> (Kaashi)	Culinary use, cosmetic
Betel leaves	<i>Piper bitle</i> (Bileh)	Recreational
Screw pine fruit and leaves	<i>Pandanus tectorius</i> <i>Parkinson</i> (maa kashikeyo)	Culinary use, thatch weaving
Coconut honey	Dhiyaa hakuru	Culinary use
Coconut fruit (young coconut)	Kurumbaa	Culinary use
<i>Launaeaa sarumentosa</i>	Kuhlha filaa faih	Source of dietary fibre

Source: Shimla, 2017

NWFPs Policies and Strategies

The government emphasis on the development of Forestry Sector has been heightened by the creation of Forest and Coconut Rehabilitation Section in the Agriculture Department. Forestry has always been under the Agriculture Department as its roles are mostly interlinked with agriculture. NWFPs is incorporated in the Agriculture Policy and Draft Forest Policy. There is no specific regulation meant for NWFPs, but the draft policies when finalized would give more emphasis on regulatory framework and strategy of NWFPs. New projects are in pipeline for the rehabilitation of coconut groves which plays the most important roles in management of NWFPs in Maldives.

National Coconut Rehabilitation Programme

Summary Description

The coconut rehabilitation program will look into replanting and improving the existing coconut population in the country. The program will support strengthening the necessary infrastructures and strengthened government services.

Project Overall Goal & Objectives

The project goal is to establish a coconut industry through rehabilitation of coconut cultivation to increase the avenues for income generation and support livelihood in rural sector. The main objectives of the project are: to develop

viable Coconut industry in Maldives; organization of large and small coconut growers; coconut product diversification and improving coconut plantations in Maldives (ADB, 2006). The project aims to increase the incomes of rural farmers by improving coconut yield gradually by promoting high yielding coconut varieties and by controlling major coconut pest.

Project Activities

Establishment of a National Certified Coconut Seeds /Seedlings

Coconut is perennial palm and economic lifetime is approximately 60 years. Hence, proper selection and production of coconut seeds/seedlings will assure the future national nut yield. Therefore, any coconut planting materials production programme should be under the close supervision of the government. Field activities of this programme are being carried out in Hanimaadhoo Agriculture Centre (HAC). Field activities include producing improved and disease-free coconut seedlings in an established nursery within HAC premises. Activities planned through this program are as follows:

- Improvement of coconut varieties and seeds nut production;
 - available local coconut varieties will be identified, and among all the varieties the best varieties will be selected for replantation;
- Commencement of a certified coconut seedlings production programme;
- Supply certified coconut seedlings to the growers and local islands.

Replanting and rehabilitation of low yielding palms and coconut

There is no systematic replanting programme of coconut in Maldives, however environment protection law emphasizes to plant 2 seedlings for each uprooted or felled tree. Replanting is a must and it is determined by the total extent of coconut in a particular area or island. Considering the economic life span of coconut as 60 years the rate of replanting should be minimum of 2% of the total extent. Through this project “Coconut Rehabilitation Programme” will be implemented by removing senile palms and aged plantation which are unproductive. Community involvement will be the high priority in the implementation process of this programme; community members will be trained for coconut management and for post-harvest activities. Under the Ministry of Fisheries, Marine Resources and Agriculture, a new section is established as ‘Forestry and Coconut Rehabilitation Section’ where its main function is to manage forestry sector and coconut production sector of the Maldives

Establishment of laboratories for treating Coconut Hispid Beetle

Coconut Hispid Beetle is considered as a severe pest in Maldives, which was introduced in the country in 1999. This pest occurred first near Male' atoll. Since then, government has taken prevention and control measures to minimize the effects of this pest. Hispid Beetle infestation has spread over the years throughout the country with exception to only three atolls of the south. However, these atoll's vegetations are also at risk, due to increasing demand for plant relocations. Releasing parasitoid *Asecodes hispinarum* was one of the successful control measures taken to manage further spreading of Hispid Beetle. Since the pilot project of releasing *Asecodes hispinarum* was in small-scale with one rearing facility, population decline was not observed in the country. More satellite laboratories in different areas would help to reduce the population significantly. Once the project is fully implemented, it will improve the coconut stand of the country thereby providing more income to the communities from coconut palms.

Small and Medium Enterprises Development Finance Cooperation

SDFC (Small and Medium Enterprise Development Finance Cooperation) was established as a specialized financial institution providing financial products and ancillary service to Micro-Small and Medium Enterprises (MSMEs) and entrepreneurial start-ups with the primary purpose of easing access to finance for MSMEs (MoED, 2019). This corporation provides opportunities for small NWFPs enterprises to avail financial support and downstream NWFPs product to fetch better return, which in turn will develop local economy and enhance living standard of communities.

Vision

The leading financial institution assisting and supporting the development of MSME's in the Maldives for achieving, broad-based and robust economic growth.

Mission

Support emergence and growth of MSMEs by providing solutions that cater to the financing needs of MSMEs and are widely accessible to MSMEs across the country.

Sectors

Key focus is to develop loan products and enable growth of businesses in the following sectors;

- Tourism (Local Tourism)
- Agriculture
- Manufacturing
- Information and Communication Technology
- Fisheries



Figure 8: SDFC Logo

With the establishment of SDFC, local communities have an easy access to finance their project and businesses. This has also increased loan availability to agriculture sector which in turn helps to develop and support value addition of NWFPs.

Business Center Cooperation Limited (BCC)

On March 23rd 2017 a new company was formed by a President Decree in order to provide support and assistance to small and medium businesses. The objective of BCC is to operate SME related business centers, and to promote and support SME's throughout the country (Corporate Maldives, 2017)



Figure 9: BCC Logo

Individuals, NGOs or cooperative which manufactures local produce including NWFPs products are able to sell the products at the Velaanaa International Airport and Hulhumale' shop run by the Cooperation. This provides opportunity for them to reach bigger market and also reduces the market cost.

Successful NWFPs Enterprise

Rise of Virgin Coconut Oil

Production of Virgin Coconut Oil (VCO) and value-added products started mid 1990's. But coconut oil had been used and is used for different purposes in the communities. In the past, many projects have been implemented by the Ministry of Fisheries, Marine Resources and Agriculture to develop VCO as an industry that would enhance growth in the communities. Many have taken up the training and knowledge provided by the Ministry to start their own businesses.

Role of Small and Medium Enterprise

Small and Medium Enterprise (SME) plays an intricate role in the development of communities and national economy. With the coherent atmosphere for the growth of SME, many have ventured into the production of VCO. The demand for VCO has been drastically grown with the development of tourism sector and the usage of locally grown and local cosmetics have gained popularity. Some have started to make other by-products from VCO and its residue. These products fetch a good price at the market as it is specially made for the hospitality industry.



Figure 10: Some of the VCO products available in the market

Handicraft training using wetland resources

Organized by the European Union-funded Climate Change Adaptation Project (CCAP) of the Ministry of Environment and Energy for the diversification of income generation from the wetland area in Fuvamullah Nature Park on Fuvamullah City. Under the project, participants were taught to make Reed Mats which fetches high price at the market. The programme empowers the local community economically by training them in the traditional Maldivian craft of *Thun'du Kunaa* weaving, which uses reed grass. Wild screw pines (*Pandanus spp.*) are also used in the weaving activities. Livelihood support programme participants learn how to splice and dry the leaves, which are later woven into mats, bags, pouches, storage boxes and other handicrafts.

Livelihood improvement and income generating initiatives have been incorporated in the Fuvahmulah Nature Park management scheme to help the local community understand the value of wetlands and the important services they provide. With the additional knowledge on sustainable use of wetland resources, Aminath a participant in the project and other beneficiaries from the livelihood improvement trainings became strong advocates for the conservation of important ecosystems such as wetlands. The participants were fully aware of the importance of sustainable management of wetland resources for their livelihood and also for ecosystem services.

Aminath lives close to a vast protected wetland area within the Fuvahmulah Nature Park on Fuvahmulah Atoll. Aminath goes to the wetland at least once a month to harvest taro from her allocated field (IUCN, 2019). Occasionally, she also takes a dip in the freshwater lake surrounding the wetland. When Aminath had the opportunity to participate in a handicraft training, she was thrilled as she was aware that such an activity could potentially provide an additional source of income for her household as well as to the communities.

“If the biodiversity in the park is not effectively protected and conserved, there would be no reed or pines for participants of the livelihood programme to make handicrafts from. We need to protect our natural resources and we can only do this together with the local communities,” added Aminath.

NWFPs and Local Communities

Local communities depend on surrounding forest and its NWFPs since the early days. Their dependency in the past has been from utilization of thatch for homes to food security. The environmental benefits have always been entrusted within the communities.

In the early 1970's with the development of tourism industries in Maldives, NWFPs was gradually more commercialized and its value rose with the steadily increased of tourists. Also, with the progression of the country, the dependency on NWFPs slowed as communities became more dependent on foreign products. The forest areas were cleared and transformed for housing or used for agriculture purpose. This led to decline in use of NWFPs and its importance gradually reduced. But still in certain islands and communities the usage was in progress as their dependency was crucial than others, especially in islands away from the capital city.

We as a nation currently are more focused on sustainable environment management and protection. Therefore, communities have started to utilize the NWFPs cautiously and respect for the products derived from the forests.



Figure 11: Island Forest

Constraints and Opportunities of NWFPs

Table 3. Constraints and opportunities

CONSTRAINTS	OPPORTUNITIES
Mainstreaming NWFPs into National Policies	Cataloging them within projects
Lack of knowledge on NWFPs and research	Creation of Forest Section
More effort needed for the sustainable production and harvesting of NWFP	Awareness creation
More studies, cataloging and research needs in NWFPs	Market expansion
Lack of financial resources	Opportunities for non-wood forest products commercialization
Revitalization of NWFPs generating plants	

The Way Forward

Non-Wood Forest Products play an important role in local communities as it provides subsistence needs for the communities. The commercialization of NWFPs is vital for the communities to fetch better price and market their products easily. The collection and processing of NWFPs can increase households' income by selling the products and at a same time generate employment. Sustainable management of NWFPs will lead to resource and biodiversity conservation and support ecosystem services. Therefore, we need to balance the harvesting of NWFPs with the productive capacity of forests, so that sustainable management of NWFPs is not compromised as local communities depend on it from generation to generation.

With the creation of Forestry Section and finalization of Forest Policy would be a leap forward in the forestry sector of Maldives. More emphasis needs to be given to NWFPs while formulating policies and strategies in the ministry and department, and also in the relevant agencies. This will create importance of NWFPs and provide direction for development and promotion of NWFPs in a sustainable manner. Cooperation and collaboration among the stakeholders would cement the development in NWFPs and ultimately enhance the livelihoods of rural communities. Further, government should support NWFPs enterprise development to realize the immense opportunity of NWFPs value addition and product development through financial support from BCC and SDPC.

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Sustainable Management of Non-wood Forest Products for Rural Livelihoods in Nepal

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Introduction

Forest occupies a total of 5.96 million ha which is 40.36% of the total area of the country. Other Wooded Land (OWL) covers 0.65 million ha (4.38%). Forest and OWL together represent 44.74% of the total area of the country. Out of the total area of forest, 82.68% (4.93 million ha) lies outside Protected Areas and 17.32% (1.03 million ha) inside Protected Areas. Within the Protected Areas, Core Areas and Buffer Zone contain 0.79 and 0.24 million ha of forest, respectively. Out of the total area of forest, 37.80% lies in middle mountains physiographic region, 32.25% in High Mountains and High Himal, 23.04% in Churia and 6.90% in Terai. In case of OWL, Terai, Churia, Middle Mountains, and High Mountains and High Himal physiographic regions share 1.47%, 3.50%, 9.61% and 85.42%, respectively.

The total carbon stock in Nepal's Forest has been estimated as 1,054.97 million tons (176.95 t/ha). Out of this total, tree component (live, dead standing, dead wood and below ground biomass), forest soils, and litter and debris constitute 61.53%, 37.80 %, and 0.67%, respectively. Among all physiographic regions, Churia was observed to have the highest occurrence of forest disturbance particularly grazing, forest fire, landslide and bush cutting. Nepal is rich in NWFPs species and it can be grouped into two categories: consumptive and non-consumptive. Consumptive NWFPs on one hand are utilized at the household level and the excess products are sold in the market; whereas non-consumptive NWFPs on the other hand are related to the indirect benefit of sound forest management and promoting ecotourism (Hammet, 2004). NWFPs include medicinal and aromatic plants (MAPs), bamboo and rattan, dyes, fibers, papers, wild foods, soap detergents, resin, and others. In Nepal 700 plant species are medicinal, 440 are wild foods, 30 are spices, and other 71 are fibers yielding (Subedi *et al.*, 2014). About 10,000-15,000 tons of NWFPs is marketed in India and overseas annually. The export of NWFPs is worth around US\$ 8.6 million, which is approximately six times the official value of timber exports to India (Edward, 1996). Further, the demand for NWFPs has grown in recent years.

The use of medicinal and aromatic plants (MAPs) as supplementary food and ethno medicine together with the potential cash income is an extremely important source of livelihoods for the rural people of Nepal. The MAPs have a huge potential to generate income as more than 75% of the people in Nepal use herbal drugs (Kalauni and Joshi, 2018). MAPs contributed quite substantially to the economy of Nepal with elevated prices than forestry goods (Acharya *et al.*, 2015; Kalauni and Joshi, 2018). It is estimated that Nepal export around 33,000 tons of MAP products generating an annual revenue of around US\$ 19-60 million (MoFSC, 2009). The export value increased from US\$ 27.49 million in 2005 to US\$ 60.09 million in 2014. Nepal on average exported 13,230 tons worth US\$ 39.34 million per year equivalent of MAP products during the last 10 years (Kalauni and Joshi, 2018) to more than 50 countries. Approximately 800 species of MAPs and other NWFPs species are used for subsistence livelihoods and over 160 species for commercial trade (Karki, 2004a; Karki, 2004b; DoF, 2008; GoN, 2009). Over 90% of the NWFPs exports are dispatched to India in crude forms, providing lesser benefits to the local and national economy compared to its potential benefits if value-adding processing was done within the country (ANSAB and EWW, 2000).

Government Policy and Institutional Framework

The Government of Nepal formulated and implemented specific NWFPs related policy in 2004. Master Plan for Forestry Product, 1988 stated a specific program to promote NWFPs focusing on medicinal plants. Forest Act, 1993 and Forest Regulations, 1995 stated several procedures to collect and utilize NWFPs, but lack motivating people to utilize the resources sustainably. In 2000, Forest Sector Policy was prepared and private sectors were recognized for efficient use and commercialization of NWFPs. It has also recognized NWFPs as a means to increase income and support livelihood of poor and landless people. But it has several restrictive provisions that hinder optimal use of the forest resources. The Biodiversity Strategy, 2002 and its Action Plan have listed forestry biodiversity including NWFPs and revealed strategies to promote NWFPs.

The NWFPs Development Policy, 2004 is a separate policy solely focused on promotion and utilization of NWFPs. The long-term vision of this policy is to develop national economy through conservation and sustainable management of high value NWFPs and make Nepal well-known worldwide as a source of medicinal herbs and NWFPs. It has the following six objectives: (i) Sustainable management of NWFPs in the wild so as to help in the regeneration of species and obtain maximum economic and environmental benefits (ii) Cultivation of important NWFPs for commerce so as to help in

ex-situ conservation of species as well as help in the national economy and employment (iii) Promote primary processing and value addition of NWFPs at the local level to increase employment and income in rural areas and increase participation of local private sectors to enhance local economies (iv) Aid in commercialization of NWFPs by providing capital, infrastructure, technical knowledge, skill and marketing management to help in poverty alleviation and improve livelihoods of local people (v) Ensure participation of disadvantaged, poor and women in communities in the collection, processing, production and marketing of NWFPs and help in natural resource management through gender and social perspectives (vi) Promote NWFPs sector to be competitive in the global market so as to help in the national economy.

The objectives of the policy are expected to be achieved through five main policy areas:

1. Conservation and management focusing on the concept of sustainable development;
2. Promotion of the participation of people;
3. Simplify the certification and taxation process;
4. Make research and development accessible to communities;
5. Facilitate skill development and commercialization process through awareness.

The 15th Five Year Plan of Nepal (2019/20 to 2023/24) prioritizes the following strategic interventions for promotion of NWFPs:

- a) Forest management plans will be improved and implemented effectively to increase the production of timber and non-wood forest products (including those useful in Ayurveda medical system) at sustainable capacity based on the condition of natural and planted forests;
- b) By determining pocket areas for herbs and non-wood forest products with commercial potential, farming technologies will be developed and expanded with the business plans, including the establishment of an herbal processing center;
- c) Essential oils produced from Nepal's plant resources and the formula used in this process will be utilized, marketed, commercialized, and exported. Quality of non-wood forest products will be standardized, and forest certification will be issued;
- d) At least one medium to large scale timber industry and one industry of the same size based on non-wood forest products or herbs will be

established in each province. For this, public-private community partnerships will be promoted as needed;

- e) Research and development will be carried out in useful herbs including Nepal's native plants;
- f) Fourteen large or 195 medium-sized timber or non-wood industries will have been established.

Management and Utilization of NWFPs

Four different types of NWFPs production areas are present: private home gardens and agricultural lands, community forests, state forests near villages, and remote state forests. The intensity of management was most intensive on private lands and less intensive in community forests; in the remote state forests there was virtually an open-access regime. The importance of NWFPs use is reflected in several management practices. Three main types of management practices were distinguished: (a) controlled utilization, (b) enhanced production, and (c) purposeful regeneration. The management practices are not primarily spatially oriented, but resource oriented. Consequently, within community forests certain species may be subject to an open access regime. This is often the case, if the district forest office has issued permits for NWFPs collection from certain species with high commercial value (WUR, 2020).

The type of management is also dependent on the type of collectors involved in NWFPs. Different categories of collectors are present depending on the number of species collected, and location and amount of time spent on NWFPs collection: (a) single species collectors, (b) multiple species collectors, (c) day-to-day collectors, and (d) night halter. These categories differ in respect to whether NWFPs are used for household or commercial purposes and whether NWFPs use involves a partial versus livelihood activity or specialized activity. The type of collection has great influence on decision making arrangements regarding NWFPs use and management (WUR, 2020).

Conservation and Management Initiatives

Recently, some farmers have started to cultivate medicinal plants, which could be replicated elsewhere in the country (Chettri & Sharma, 2006, ICIMOD, 2004; Malla *et al.*, 1999). Development of this opportunity could be a great economic incentive for farmers while at the same time reducing exploitation of non-wood resources in government forests. Specifically, in eastern Nepal, where there is a high demand for *chiraito* (*Swertia chirayita*), an herb widely used for its medicinal properties in 28 traditional medicine, some progressive

farmers have started to cultivate the species on their land using indigenous technologies and to sell to international traders (Sharma *et al.*, 2004). Local harvesters know seasons and how to select plants that are ready for harvesting, how to harvest species without harming other plants and without injuring the plant itself. However, policy hurdles requiring certification of products that are cultivated on private forestry are a great disincentive for people (Ojha, 2000).

In Humla, a remote district in western Nepal, user group enterprises growing *jatamansi* (*Nardostachys grandiflora*), an herb with essential oil extracts in its rhizome that is used in perfumery, enhance the restoration and conservation of forests and increase incomes in the area, that in turn generated an interest in conservation (Sharma *et al.*, 2004). In 1995, the Biodiversity Conservation Network supported a community-managed *jatamansi* essential oil processing enterprise, Humla Oil Pvt Limited. The local communities and their institutions do processing, management, and marketing of the enterprise with support from ANSAB and its partners.

Another example in Bajhang, Nepal, relates to the Kailash Forest User Group (KFUG). KFUG formed a company called Malika Handmade Paper Pvt Ltd. The company was supported by ANSAB in 1999 to produce handmade paper using *lokta* (*Daphne bholua*), a shrub whose bark contains high quality fiber that is used for making paper. Forest user group members conserve *lokta* in natural habitats and harvest it sustainably for resource conservation, as well as conducting research on regeneration methods for on-site and off-site conservation. Records are maintained and periodic meetings are organized to review progress, develop strategies, and obtain feedbacks. The annual turnover of the factory is NRs 294,000 (US\$ 4200) and profits during 2003 were NRs 105,000 (US\$ 1500). In another study, Olsen and Hells (1997) found that in the northern and middle parts of the Gorkha district in central Nepal, 25% to 100% of households in a given village participated in collection and that the average daily income is competitive with other income-generating activities in the area.

All these examples, where local communities are involved in private cultivation and enterprise development help in conserving resources in government managed forests that are usually open access forests due to the absence of regulatory bodies in remote areas. People are dependent on such open-access areas to meet subsistence needs. However, if they are able to make extra income by getting involved in these small-scale enterprises, they would not go to open access government forests. This arrangement and indigenous protection systems of forest management are in place in many parts of the country which have been indirectly benefiting the conservation of NWFPs (Subedi, 1999). In many parts of the country sizable chunks of forests

are set aside, managed and protected by local communities for religious value which are usually linked to protection of watershed areas. In such areas, communities have their own rules and usually follow them. Further, communities, especially older generations have indigenous knowledge about NWFPs, but it differs in various social groups and categories. Usually, groups who are most dependent on NWFPs have the most knowledge (Ojha and Bhattarai, 2003). There is heterogeneity of knowledge and practices within any area and this is important to consider in designing sustainable management practices (Ghimire *et al.*, 2004).

Success Stories of NWFPs Management and Development

Nepal is rich in NWFPs resources. There are several instances that many communities are exploiting it as per their own knowledge, traditional technologies and some market information. It is evident that to develop this sector as a prominent means of income generation and transfer it into lucrative business, external interventions and market access is necessary. It is justified with the following two success stories:

Case 1

Resin collection has been practiced quite long before. But it became an attractive practice after establishment of Laxmi Rosin and Turpentine Industry in 1986. By 2010, the number of resin industries and resin tapping process has grown significantly. Statistics showed that 40,438 metric tons resin extraction agreement was made between 15 different rosin and turpentine companies and government until 2007 and 35 different districts have practiced resin collection (GRTL, 2007; Subedi, 2010). The management of forest through community forest (CF) management concept helped the community forest user groups (CFUGs) to use forest resources efficiently. One of the financially beneficial work for rural communities is pine resin collection through CFUGs.

Kanel (2004) states that among the NWFPs, resin has second most contribution to the revenue of CFUGs. The intervention by government with promulgating government rosin collection guidelines 2007 triggered growing quantity of resin tapping. Further, after getting the right to use CF resources by CFUGs, the quantity of resin collection increased. According to the Trade and Export Promotion Centre data, resin worth of 580.21 million Nepalese rupees in 2008/09 are exported to India.

Case 2

The Churia area is rich in NWFPs products, but poor people of these area are not utilizing effectively and efficiently. A study shows that 93% of people lack awareness and 41% of users had no idea about future planning with regards to NWFPs. Therefore, market analysis and development training along with elimination and mapping of products based on continuous supply on a large scale and business planning activities etc. will add to the value of such groups/cooperatives. CARE Nepal carried out some of the interventions under the Churia portfolio programme to promote NWFPs/MAPs for poorer groups in the community and larger society to improve the livelihood security of the poor and vulnerable people in the Churia/Siwalik and Bhabor foothills regions of Sarlahi and Mahottari districts.

Based on this study, 138 species (both aromatic and medicinal) were found within the project area. Traditionally, all domestic materials have been made of bamboos, rattans, and other NWFPs, which are widely available in the Churia area. Accordingly, the local economy has increased through the selling of these products in the local markets. The sustainable use and management of NWFPs resources is a crucial to sustain local economy and enhance rural livelihoods. Increased demand for handicrafts has attracted small-scale cooperatives which are affiliated to poorer groups in rural areas. The scaling-up scheme and support are required to convert small-scale to enterprise through capacity development and marketing networks. There were several interventions made to the targeted area. The intervention program builds the capacity of users' groups through training, and workshops. It also established a demonstration plot for extension and supported for nursery beds (technical and financial). Market analysis and sharing market information among producers, traders, and other concerned stakeholders showed the potential market places and price status. Most importantly, program helped to strengthening the NWFPs network.

Due to above mentioned interventions, 145 users gained knowledge and skills in NWFPs management. Four nursery beds have been established by communities and are producing seedlings. A total of 114 hectares area has been cultivated and/or covered with NWFPs (especially MAPs) in CF, leasehold forestry, and private sector, where 314 poor, vulnerable and socially excluded (PVSE) households were involved and reduce benefits. Out of them, 35% are from ethnic castes and nine are from Dalits (so-called untouchables). Two district level NWFPs networks have been established and are functioning well, especially focusing on NWFPs cultivation (production, harvesting, processing, and storage), marketing promotion and ensuring rights of users. Two selling centers for NWFPs established in Sarlahi and Mahottari districts to ensure that the local market is doing well. NWFPs

network of Sarlahi district has developed meaningful coordination with the local government (DDC) and DDC allocated US\$75,00 for promoting the NWFPs, targeting the PVSE. (IUCN, 2007)

Contribution of Non-wood Forest Products

In Nepal, there are more than 700 plant species that have medicinal value, of which 238 are in active use and 100 are traded. The Government of Nepal has kept 30 species in priority, of which 12 are for commercial cultivation and market promotion (AEC/FNCCI 2004, Luintel *et al.*, 2004, Subedi, 2006). NWFPs are increasingly growing popular in national and international markets as they are important ingredients of several herbal cosmetics, herbal tea, food, medicine, construction materials. About 80% of the rural population depend on the NWFPs for their livelihoods in Nepal. NWFPs have commercial, socioeconomic and environmental values in rural communities. Sustainable exploitation, use, and commercialization of NWFPs are important for socioeconomic development, poverty reduction, and livelihood enhancement of rural people in Nepal. NWFPs play an essential role in foreign exchange earnings and make a substantial contribution to poor people's health care by their medicinal and food values. The harvest of NWFPs and trading it to Indian and overseas markets are almost in a raw form. NWFPs enterprises employ thousands of collectors and village investors including traders in Nepal for at least a few seasons in the year. The demand for NWFPs has grown in recent years as it provides nutrients, medicines, fodder, wood, thatch, and building equipment for rural households, including mulch and non-farm profits. These products have a potential for contributing to the local economy, subsistence needs (medicine, food, etc.) and improved natural resource management leading to the conservation of ecosystem and biodiversity of the areas. Moreover, NWFPs also provides non-consumptive uses and ecosystem services for rural communities and the country.

In terms of employment, ANSAB (Asia Network for Sustainable Agriculture and Bio-resources) estimated that around 189,000 people work in the NWFPs sub-sector and they draw between 15% and 50% of their household income from the sub-sector (Edwards, 1996). A proper investment environment can create employment opportunities for local people reducing the heavy flow of youth migration to cities and foreign countries for jobs. This will also reduce poverty by providing income raising opportunities locally. A 1995 survey of producers, traders and processors of NWFPs operating from the eastern border of the country to the mid-western town of Nepalgunj shows that a total of 100 entrepreneurs handled 42 thousand tons of over 100 different NWFPs items, equivalent to US\$26 million (Subedi 1997). It is

estimated that about 10,000 to 15,000 tons of plant products of more than 100 species are exported to India annually, i.e., 90% of total NWFPs trade (Edwards 1996). Devkota (2006) analyzed the royalty contribution of various forest products during fiscal year 2002-04 and found that the contribution of medicinal and aromatic plants was only 3.5% that of the rest of the non-wood forest products such as sand and gravel was 16.5% and that of timber and fuelwood was over 80%.

Table 1: Total Collection and Royalty to Government from NWFPs in FY 2002/03-2004/05

Fiscal year	Medicinal and aromatic plants		Other NWFPs		Total quantity (M Tons)	Total royalty (Million NRs)
	Quantity Collected (MT)	Royalty (Million NRs)	Quantity (Mt)	Royalty (Million NRs)		
2002/03	4863	30.37	29245	39.47	34113	69.84
2002/03	2857	15.99	27165	28.32	30022	44.31
2002/03	2985	13.55	29746	64.29	32731	77.84
Total	10710	59.90	86156	133.09	96866	191.99

Source: Devkota, 2006

World Bank (1994) estimated that under an intensive forest management regime, community forests show promising potential through timber and NWFPs. It shows significantly higher level of incremental benefits from NWFPs than from timber when managed intensively for seventy years (see Box 1). This shows that there is almost thirteen-fold incremental income through medicinal plants than through timber; for rattan and bamboo it is more than four times. These figures provide adequate rationale to the advocates and agencies who argue that NWFPs are a remedy to enhance livelihoods, alleviate poverty and contribute to the national economy.

Box 1 Projected Yields and Returns of Community Forests (CFs)

CFs that could total about 1.8 million ha after 70 years could be yielding products valued at NRs 12.5 billion per year, taking into account only woody forest products. The incremental benefits were estimated at NRs 2390/ha/yr for timber, NRs 9500/ha/yr for bamboo and rattan, NRs 30,700/ha/yr for medicinal plants and NRs 660/ha/yr for fuelwood and fodder.

Issues and Challenges

Policy and legislation:

Although there is a specific policy to develop herbs and NWFPs with several supportive policy, plans and guidelines, its implementation part is relatively weak. Policy is not sufficiently supported by required institutions, expert human resources, production and mobilization, and effective legal provisions. Policy statement focuses on promotion of the sector with facilitating the process, but stakeholders perceive the current legislations create many hassles and demotivate producers, collectors and traders. On ground support mechanism is almost negligible.

Research and Knowledge Management:

Although several researchers have conducted research on NWFPs issues, but these research findings are scattered. There is lack of complete inventory protocol of NWFPs resources. The national information about species, their habitats, and amount of production, collection and trade are still incomplete. Information related to current marketing channels, amount of each products that passes through market chain, price variation as well as projected future supply and demand of the products are systematically generated and extended to related stakeholders.

Value Addition and Enterprise Development

The NWFPs are mostly marketed in India and only few are exported to other countries. Therefore, producers or collectors solely depend on these markets. Several uncertainties of these markets hinder the enterprise development. The uncertainties are related to quantity and quality of demand, price and inconsistent conditions posed by middlemen and traders. Further, there are many hassles to collect and get permission to transport it. Edwards 1996, studied existing NWFPs trade, which show that the trade is largely informal; corruption and bribery is rampant; interventions that encourage NWFPs trade and enterprise development are limited; international market is non-transparent, keeping the traders and entrepreneurs always at risk; quality control is always a question; many hassles are there in collection, trade and enterprise development etc. Most of these NWFPs-based enterprises established by individuals or communities in different districts are of small scale, having low scale of production with poor yield rate and poor-quality products. They have not been able to compete with Indian products due to weakness in business approach, support policies and marketing. A competitive market environment and quality conscious buyers and sellers are surprisingly

missing in the trade, which probably has constrained the market expansion of the products in the third countries.

Challenges in Management and Development of NWFPs

Several reports have suggested that the diversity, quality, and availability of some NWFPs species are being depleted due to several reasons. (Edward 1994, 1996a, 1996b; Malla *et al.*, 1995). It might be due to lack of knowledge on sustainable harvesting techniques that is triggered by high demand, extreme poverty, and lack of technologies. Practically there is no supervision or control in collection and also no rationale for allotting plots and unscientific tax system. NWFPs harvest, production, processing operations and management practices are not well developed and therefore they use own traditional methods that pose threat to sustainability. In Nepal, processing industries are at a preliminary stage and the access to processing technologies and market is uncertain (Subedi 1997). There are long distance and geographic gaps between resource and market area.

The challenges faced in processing and marketing are:

- Lack of marketing infrastructures;
- Imperfect wholesale market for NWFPs created because of limited number of wholesalers,
- controlled price information, and government being the major buyers for some products;
- Less developed market for many products and high price fluctuations;
- Many producers with small quantities of products - receive only a small portion of the total income;
- Roles and services of brokers and middlemen - myths and reality (exploitation by middlemen versus their services: cash advances, transport, storage, risk-taking, etc.);
- Lack of market information like current marketing channels, amount of each products, price variation as well as future supply and demand of the products, processed product, development and future price projection;
- Most of the traders with an inadequate marketing knowledge and skills;
- Limited access to availability of information and technology for product development;
- Difficulties in matching market requirements by suppliers due to several uncertainties such as production fluctuation, decreased collection due

to early snow fall, inconsistent quality of products coming from many sources, and guaranty of collection permits.

Government Forest Sector Development Plan stated NWFPs as potential area to develop for national economic growth and improvement of rural livelihood. But it has given lower priority compared to timber and forest conservation sector in terms of program, budget and institutional set-up. Government's rules and actions are more restrictive than facilitation and promotion creating illegal and informal activities in this field. NWFPs comes from two areas; natural forest and private land cultivation. But identification of the source of products and granting permission to transport and trade the products from private land have not been streamlined.

The Way Forward

Policy, legislation and institutions

- The existing policy has to be revised based on an extensive study and information gathered from different stakeholders;
- Develop regulations and strategies for management and development of NWFPs covering institutional set-up, market infrastructures, human resource and capacity development at local, district, and at national levels;
- Simplify and streamline administrative procedures of collection, transportation, trade and royalty payment etc. to avoid bureaucratic re-tape and strengthen surveillance and monitoring system.

Research needs and knowledge management

- National inventory of NWFPs resources has to be developed on priority basis;
- An effective data collection and management system need to be established that includes the data of NWFPs collected from the forest, production on private land, processing facilities available, demand of market and types of markets (domestic and international), quality of products, price, actors, their roles and their capacity etc;
- There should be a separate research institute on NWFPs to assess the quality of NWFPs, to find out the key steps for sustainable management of NWFPs, to develop suitable technologies, to prescribe best practices to private cultivators, to support the processors with efficient tools and techniques, to explore value addition opportunities and business promotion interventions etc.

Capacity building and advocacy

- Professional development in NWFPs is crucial to deal with the emerging challenges and for sustainable management and development of NWFPs programs;
- Continuous advocacy among policy makers, planners and other stakeholders of NWFPs is required to prioritize NWFPs plans and programs;
- NWFPs extension service agency should be established at center and province levels. These institutions support the community groups, cultivators, collectors, processors and traders with knowledge, skills and enhance their awareness level;
- Business service centers conduct training on cultivation, collection, storage, processing and marketing. Disseminate information, technologies and best practices related to NWFPs to all stakeholders involved from production to final product development.

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Sustainable Management of Non-wood Forest Products for Rural Livelihoods in Pakistan

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Introduction

Pakistan is blessed with natural forest resources diversity with nine ecological zones. Presently, forest in Pakistan covered an area of 4.5 million hectares in which 3.44 million hectares exist on state-owned lands and 1.06 million hectares on communal and private lands (GOP, 2020). There is 31 % area of the globe under forest cover; however, it is not equally distributed among the countries around the world. In comparison with world forest coverage, Pakistan remained a forest deficient country with only 5.01 % area under forest cover. Pakistan forestry has contributed 2.1% share in agriculture Gross Domestic Products (GDP) and the available forest resources provide life line for the country by regulating climate and water resource and serves as habitat for flora and fauna (GOP, 2020).

Forestry falls in the provincial domain in Pakistan. However, the key role of planning and economic coordination is mandated to Federal Government of Pakistan. The federal government also deals with the matters of import and export of wood and non-wood forest products. Furthermore, the inter-provincial matters including trade of forest products is also look after by the federal Government. According to the constitution, implementation of forest related international conventions and agreements is the sole mandate of the federal government in Pakistan. Forest in Pakistan spread all over the country; however, Khyber Pakhtunkhwa (KP), province covered 40 percent forest area of Pakistan, followed by Gilgit Baltistan with 15.7 and rest of forests area is across the other parts of the country (Suleri, 2002).

According to FAO 2009, Non-wood Forest Products (NWFPs) are goods of biological origin derived from forest and outside forests. NWFPs are a broad category of products that encompass all flora and fauna, forest resources excluding timber. NWFPs such as nuts, wild mushrooms, herbs, spices, medicinal and aromatic plants, resins, gums and dyes have been used for food, health and industrial purposes for centuries (Sorrenti, 2017). Globally, it is well established fact that millions of rural poor of forest proximate communities derived their livelihoods from wood and non-wood forests products. Due to the diverse ecosystem, Pakistan has diverse forest products i.e wood, fodder and non-wood forest products. The main NWFPs can be

divided into food and non-food medicinal plant and herbs category like natural honey, wild mushrooms/morels, wild fruits, nuts, resin and gums, mazri leaves and silk (GOP,2020).

Geographical location of Pakistan is blessed with many biodiversity hotspots, holding dense understory flora. The Himalayan and Hindukush mountain ranges of Pakistan support a range of valuable NWFPs. Forest Proximate Communities (FPCs) of this area have the-board knowledge of the local forest resources and their usages (Zubair *et al.*, 2019). The role of NWFPs in sustaining livelihood is documented for forest dwellers and it is a major economic activity in the FPCs. Latif *et al.*, 2005 revealed that Pakistan has many NWFPs species, some of the important food NWFPs provide are wild mushrooms i.e morels, natural honey, nuts, wild fruit and vegetable, spices, mazri palm, silk cocoon. Tree plantation is an age-old land use system and NWFPs role in rural livelihood and rural development has been new age phenomena presently gaining popularity. Per capita forest area in Pakistan is merely 0.033 hectare far below the world average of 1 hectare. Pakistan is forest poor country with 5.01 percent area under forest as compared to other countries of South Asia. The primary reason for meager forest area in Pakistan is too low precipitation which leaves about 75 percent of the area to falls in arid or semi-arid zones.

Table 1. Forest areas by types of vegetation in Pakistan

<i>Category</i>	<i>Total Area</i>	<i>Percent share</i>
Coniferous	1666	28.1
Irrigated Plantation	283	4.8
Riverain	352	5.9
Scrub	1001	16.9
Coastal	330	5.6
Linear Plantation	17	0.3
Range Lands	1424	24.0
Mazri	24	0.4
Miscellaneous	834	14.1
Total	5931	100.0

Source: GOP, 2020

Forest Policy in Pakistan

Forest policy in Pakistan has long history. The major legal instrument for rangeland ecosystem and forest conservation is the Forest Act, 1927. This act has become outdated and revised number of times. The current forest policy goal of Pakistan is “Expansion, protection and sustainable use of national forests, protected areas, natural habitats and watersheds for restoring ecological functions, improving livelihoods and human health in line with the national priorities and international agreements”. The primary objective of National Forest Policy is to promote sustainable use of wood and non-wood forest products by enabling and matching inter-provincial trade of wood and non-wood forest products through the Federal Forestry Board. Past forest policies were mainly focused on production and sale of woods and NWFPs did not receive proper attention. Since Khyber Pakhtunkhwa (KP) province has given an adequate attention to NWFPs promotion in Forest Policy 1999. Forest Department of Sindh province also took initiative for conservation of biodiversity including non-wood forest products.

Deforestation and forest degradation remained a major challenge in Pakistan. The direct drivers of deforestation and forest degradation are forest land conversion to agriculture, rural infrastructure expansion, overharvesting of forest products, increasing demand of fuelwood, poor harvesting practices of forest products, overgrazing, and forest fires. It is well established fact at global level that forests provide viable solution to the global issues of climate change, desertification and loss of biodiversity. To address the challenges face by the country, Government of Pakistan has launched a mega project for expansion of forest cover in the country. The project known as “Billion Tree Afforestation Project (BTAP)” is contributing to mitigate the effects of global warming. The project is implemented by Government of Khyber Pakhtunkhwa. The initiatives of increasing forest cover through this project are subservient in raising awareness among general public and policy makers.

The Ministry of Climate Change holds inherent mandate to meet national and international obligations regarding climate change issues. The Ministry is mandated to formulate national policy, plans, programs and strategies regarding to environmental protection, preservation of ecology, forestry, wildlife, biodiversity, prevention of pollution including disaster management etc. Pakistan Forest Institute (PFI) is conducting research and capacity building in the specialized field of forestry and allied disciplines for the improvement of environment and conservation of natural resources of the country. As part of on-going research activities, PFI is coordinating with national and international agencies related to research and development in forestry sectors. The organization has capacity to coordinate and conduct research on forest products in the country and give guidelines to the industry

working in forestry sector. PFI is managing various projects for the improvement of environment and poverty alleviation in Pakistan.

Methodology

The country paper is based on review of literature and secondary data from different sources of Government of Pakistan. Consultation with different stakeholders working in the fields of Natural Resource Management (NRM), WWF Pakistan, Forestry Ranges, Research Institute and Honeybee Research Institute (HBRI) at National Agricultural Research Centre (PARC), Islamabad were conducted.

NWFPs Contribution to Rural Livelihoods

Globally, NWFPs are increasingly considered as a basis for sustainable management of forests and become integral part of the household livelihood system (Gurung, 2017). In the globalized world the role of NWFPs is reflected as business opportunities after the declining role of NWFPs in industrialized economies (Weiss *et al.*, 2020). FAO 1995 revealed that NWFPs are playing a vital role in livelihood support to rural communities by providing food, medicine to human being and fodder to livestock and other related domestic requirements to rural communities and urban consumers of NWFPs (Chikamai *et al.*, 2009). Various food and non-food NWFPs have ability to support livelihoods and growth in the socio-economic status (Negi *et al.*, 2010). This situation argues for importance in formulating development and conservation strategies for forest resource including NWFPs (Kar and Jacobson, 2012). NWFPs provide food security by off-setting seasonality of other food sources (Shackleton and Pandey, 2014).

NWFPs play a major role in many developing countries due to the high concentration of population relying directly on the forests. This is due to very small land holding characterized by marginal productivity, poor accessibility of mountain areas and comparative disadvantage in the production of agricultural crops, compare to much lower costs and higher volumes in the plain areas (Choudhary *et al.*, 2014). Therefore, the rural communities living in fragile ecosystems need to look for alternative options of high-value, low-volume of crop production and non-perishable commodities from forest such as NWFPs for their livelihoods. Pakistan is blessed with diverse flora of almost 5,700 species of which around 2,000 are reported to be medicinally important (Ullah, 2017). NWFPs are important for rural communities living proximity of forests in Pakistan for their livelihood (Zubair *et al.*, 2019). Lack of employment opportunities often push the FPCs to collect an array of NWFPs species for their livelihoods. In Pakistan NWFPs are used for daily

subsistence and also as a source of cash income in number of forest dependent communities.

Globally, morels mushrooms (*Morchella* spp.) are highly prized and easily identifiable forest resources. In Pakistan collecting, processing and marketing of morels mushrooms is an important socioeconomic activity in mountainous regions. Thousands of families are involved in morel collection, processing and marketing (Sher and Shah, 2015). The forest proximate people used to collect NWFPs for their domestic and economic needs without considering the importance of conservation and sustainability while harvesting or collecting from forest (Latif *et al.*, 2005). Mazri planthas is important for the livelihood support of the local communities in dry areas of the western borders of Pakistan (Abdullah *et al.*, 2020). It is a source of fibers, leaves are used for makings hand fans, baskets, brooms, trays, prayer mats, grain bins, hot pots, hats, and sandals etc.

There is lack of awareness among the rural communities regarding income generation from NWFPs and its contribution to food security and welfare of the people. NWFPs collection and marketing is growing, but far below its potential. The potential of NWFPs is still underestimated and not appreciated in Pakistan. Data regarding collection and marketing of most NWFPs species are not available in Pakistan. Wahlén, 2017 also revealed that there exist no data on the home consumption of NWFPs at the international level but its value is estimated to be two to three times higher than the value of marketed NWFPs. Even in the Europe, there is a data gap and the available information on the economic significance of NWFPs is mostly incomplete, scattered or not comparable among countries (Vantomme, 2003). Due to this factor, NWFPs could not secure proper place in forest management planning. Departure from the traditional practices to professional forestry sector is needed by placing NWFPs at proper place in development agenda. Traditional practices of collection/harvesting and processing is very common among the communities. There are no established marketing channels for NWFPs in Pakistan. The communities are not organized and dealings largely at household or small-scale enterprise level.

Women's Roles in NWFPs Management

The women play an important role in collection and processing of NWFPs in forest proximate communities in Pakistan. Iqbal, 1991 pointed out that about 0.289 million forest dwellers of Khyber Pakhtunkhwa (KP) province of Pakistan, mainly women and children are involved in collection and processing of morels mushrooms. A recent study also reported women's role in NWFPs collection and processing in the country (Zubair *et al.*, 2019). Another study revealed that collectors of morel mushrooms include 40

percent children, 33 percent men and 27 percent women in the study areas (Ahmed, 2007; Hamayun *et al.*, 2006). Iqbal, 1991 reported that in Swat District of Khyber Pakhtunkhwa, rural people are involved in collection of morels mushrooms including 54 percent children, 24 percent women and 22 percent men from the forest. Shah, 1991 also highlighted the role of women in collection, cleaning and drying of morels. The author further revealed that morels collector are poor locals of Swat District and they collect morels in spring season as part time activity to support the livelihood.

Mazri palm (*Nannorrhops ritchiana* (Griff) Aitch.) is important NWFPs species found in different parts of Pakistan and it is important material for making traditional handicrafts items like hand fans, mats, baskets, hats, cages, hot pots, salt pots, and brooms. Women played an active role in Mazri collection, harvesting, and manufacturing finished products to support their livelihoods.

Non-wood Forest Products Management

Morels Mushrooms

Wild Edible Fungi collection remained a vital source of food and income generation in more than 80 countries of the world. Sultan *et al.*, 2007 reported that fifty-six edible species of mushrooms are reported from Pakistan and among these species, some species are being commercially exploited. Morels mushrooms are important NWFPs found in different forests of Khyber Pakhtunkhwa and other parts of Pakistan. It was reported that more than 70 percent of mushrooms are produced in Khyber Pakhtunkhwa (Iqbal, 1991). The forest proximate communities have own indigenous knowledge for identification and collection of wild Morels Mushrooms. The collectors are poor villagers and collect for marketing for livelihood support. Morels mushroom collection is part time activity in Kalash Valley in Khyber Pakhtunkhwa. Due to over harvesting, deforestation and urbanization, some of species are threatened of extinction (Sultana *et al.*, 2007). Lack of information and exposure of the rural communities collecting the morels mushrooms led to unsustainable harvesting practices and marketable surplus mushroom is declining. The analysis in Table 2 revealed that fluctuation in export quantity, value and export unit value of the mushrooms during the last five years.

Table 2. Export of Mushrooms from Pakistan

Year	Mushrooms (fresh or chilled)			Mushrooms (of Genus <i>Agaricus</i>)		
	Quantity (tons)	Value (US\$)	Export unit value (US\$/Ton)	Quantity (tons)	Value (US\$)	Export unit value (US\$/Ton)
2015-16	14.5	2354461	162376.6	6.6	992489	150377.0
2016-17	35.7	4755826	133216.4	21.7	2903066	133781.8
2017-18	35.8	5620239	156989.9	6.2	1059896	170951.0
2018-19	19.0	2718832	143096.4	7.7	902940	117264.9
2019-20	9.4	1133472	120582.1	8.0	1039376	129922.0

Source: Pakistan Bureau of Statistics, 2020

Natural Honey

Honey production is considered environmentally friendly practice. Honey hunting and beekeeping as non-farming business activities of rural peoples having the potential to provide economic contributions to household involved in honey business. Plants pollination and conservation of flora is associated with additional benefits from bee keeping. Khan *et al.*, 2014 concluded that bee flora present in Pakistan can support up to 3.5 million bee colonies. An estimate showed that presently there are only 10,000 beekeepers in Pakistan and they are managing almost 0.6 million colonies producing about 12,000 tons of honey annually. Natural honey and beeswax are two important NWFPs that have a strong relationship with plants. In the natural environment, forests and bush lands are major sources of nectar and pollen, and also an important source of materials used by beekeepers (Chikamai *et al.*, 2009).

Wild honey harvesting is traditionally practiced in Khyber Pakhtunkhwa, Sindh, and Punjab provinces. There are limited studies available on honeybee biodiversity. Collection of natural honey from traditional bee hives remained significant source of sustenance and income for habitant of forest communities of Khyber Pakhtunkhwa province of Pakistan (Ahmed, 2007). Local people used traditional methods for extraction of honey from hives. There is need for capacity building of the collectors to increase the honey yield. Honey hunting activity as a supplemental livelihood activity is done part-time during the peak harvest season. To promote and domesticate the honey industry in Pakistan, number of stakeholders are playing their roles. Pakistan Agricultural Research Council (PARC) is an apex agricultural organization working under Ministry of National Food security & Research has played a leading role in Pakistan for up scaling of beekeeping industry in

Pakistan. Honeybee Research Institute (HBRI) at National Agricultural Research Centre, Islamabad has established a honey-testing and quality laboratory to promote the value of bee products. This facility provide assistance to beekeepers to develop their export market by addressing issues like potential antibiotic and pesticide residues. Domestication and the promotion activities includes honeybees colony management, queen breeding, honey extraction technology/techniques, honey testing facility. Capacity building of beekeepers, agricultural extension staff and other stakeholders in the promotion activities of honey/bee products is important. There is increase demand of honey in international, national and local markets. PARC Agro Tech Company (PATCO), also contributed in the technology dissemination and commercialization of honey and honey products to domestic consumers in country.

Pakistan was importer of honey due to demand and supply gap (Iqbal, 1991) and now Pakistan is exporter of honey. Honey produced in Pakistan enjoys a good reputation in the Middle East due to its unique taste and quality. Pakistan exports about 1,372 tons of honey mainly to Middle East. The analysis in Table 3 revealed that honey export quantity is in increasing trend since 2016-17 however export unit value has been in declining trend.

Table 3. Export of Natural honey from Pakistan

<i>Year</i>	<i>Quantity (Tons)</i>	<i>Value (US\$)</i>	<i>Export Unit Value (US\$/Ton)</i>
2015-16	776	7770923	10015
2016-17	729	7277039	9988
2017-18	824	6398798	7764
2018-19	1020	7305154	7160
2019-20	1372	8186595	5966

Source: Pakistan Bureau of Statistics, 2020

Pine nuts

The world's largest pine nuts (*Pinus gerardiana*) forests are mainly located in the dry temperate zone of Pakistan. Nearly 20 percent of the Pakistani forests are comprised of *Chilgoza* trees. Pine nut is established in western Himalayan forests of Pakistan. These forests are found in Khyber Pakhtunkhwa, Baluchistan and Punjab and in northern areas of the country. The native communities living in the proximity of these pine forests are greatly dependent on pine forest for livelihood support and handsome earning. Despite its value at global level, the pine nut forest ecosystem is degraded by illegal harvesting for fuel wood. Its natural regeneration is hampered by uncontrolled grazing and overexploitation of the medicinal plants for economic gains. Pakistan is the second largest producer of Pine nuts in world

after China. Due to its peculiar taste and fragrance, Pakistani pine nuts have great demand in local, national and international markets. Pakistan exports pine nuts to the world market. The analysis in Table 4 showed that there is a decreasing trend in quantity of export from Pakistan. However, the export unit value showed significant increase since 2015-16 to 2019-20.

Table 4. Export of Pine nuts from Pakistan

<i>Year/variable</i>	<i>Quantity (Tons)</i>	<i>Value (US\$)</i>	<i>Export Unit Value (US\$/Ton)</i>
2015-16	4005.2	59804096	14931.6
2016-17	2363.2	29048854	12292.2
2017-18	2627.4	33470193	12738.9
2018-19	1509	17405222	11534.3
2019-20	526.7	9299962	17657.0

Source: Pakistan Bureau of Statistics, 2020

Medicinal plants

The rural people living in fragile ecosystems earn their livelihood or add to their income by collection and sale of medicinal herbs. Forest remained major source of traditional herbs and medicines which fulfill need of about 2.8 billion people (World Health Organization, 2002). Medicinal plants are also important component of NWFPs in Pakistan and it has immense potential for improvement of livelihood for communities involved in collection and marketing. There are about 636 local and multi-national herbal companies registered in the country. Unfortunately, the domestic trade of the medicinal plants has not been documented and standardized. There is need to document the production, processing, consumption and domestic marketing of medicinal plants.

Sher *et al.*, 2014 observed that wild collection of medicinal plants is only source of raw material in the country with virtually no cultivation. Collection of medicinal plants is mostly done by women and children as part time activity for supplementary income in Swat District of KP province. Marketing of the medicinal plants is not organized. Collected material is mostly sold through local middlemen and collectors are not able to get good prices. It was observed that the value chain of material is complex involving many actors (Sher *et al.*, 2014). Awareness regarding sustainable use of this natural resource and capacity building of communities involved in medicinal plants collection, processing and marketing need to be organized for all FPCs in the country.

Value Chain Development for NWFPs

For establishing value chains for potential NWFPs in Pakistan, there is need to start research program for basic data collection, awareness creation, identification, preservation traceability, quality assurance, food safety labeling, market linkages and documentation of domestic and international trade. Developing value chain for NWFPs is not straightforward as compared to the typical value chain of agricultural produce. It is bit complex to develop and promote value chains of NWFPs which are naturally grown in forests. For development of NWFPs value chains, the sustainable natural resource management approach should be applied based on protection of natural resources by economical use of NWFPs and bringing the value chain actors under one umbrella. The NWFPs value chains may be influenced by mountain forest characterization including fragility, diversity, marginality and inaccessibility. Therefore, these preconditions of the forest need to be considered in order develop a NWFPs value chain that will favour rural communities and enable them to enter in the national and global markets.

Challenges in Sustainable Management of NWFPs

- Rapid growth of population putting more pressure on NWFPs resources.
- Continued degradation and deforestation due to climate change and heavy dependence of local community on forest and natural resources.
- Inadequate regulatory framework for management of NWFPs.
- Lack of data on harvesting, processing and marketing of potential NWFPs resources.
- Lack of awareness and training of rural communities on NWFPs resources management.
- Depletion of traditional knowledge about NWFPs among new generations.
- NWFPs harvesting is community/village based without considering sustainable management concept, quality assurance and hygienic conditions.
- Informal and unorganized supply chain in NWFPs resulting in lack of information flow to FPCs/collectors.

The Way Forward for Management of NWFPs

Pakistan is blessed with natural forest resources diversity with nine ecological zones. However, country remains forest deficit in global context. Deforestation and forest degradation is a major challenge in the country.

NWFPs play a vital role in enhancement of rural livelihood and large number of rural communities depend on NWFPs. Collection and marketing of NWFPs are growing, but far below its potential without taking sustainability measures. Basic data on production, collection, domestic use and domestic marketing is not available. It is challenging to assess the real contribution of NWFPs to Pakistan economy as there is a lack of data to find out the combined value of so many products that make up NWFPs. To ensure the sustainable management of NWFPs, availability of basic data is paramount importance for informed decision making. The collection, processing, use and marketing of NWFPs are often confined to the informal sector, thus making it very difficult to capture from formal statistics system. The awareness about NWFPs in Pakistan is limited, even the communities who are involved in collection, processing and marketing are not fully aware of NWFPs management. There is avenue for creating NWFPs demand locally at large scale and also have high potential in international markets.

The following points highlighted below are important for sustainable management of NWFPs:

- Formulation of enabling policies, frameworks and strategies that provide supportive role in the promotion of sustainable use of NWFPs and conservation of indigenous knowledge;
- There is need to study existing supply chains of NWFPs in the country. Baseline studies on all NWFPs are needed to ensure proper planning and informed decision making for sustainable use of NWFPs;
- Development of adequate infrastructure for storage, quality control, certification, branding of NWFPs;
- Assessment of value of marketed and non-marketed (home consumption) of NWFPs;
- Rural communities engaged in NWFPs needs training and capacity building on collection, processing and marketing to ensure the sustainable management;
- There is need to promote proper harvesting system of NWFPs to avoid both over and under harvesting and maintain the sustainability of the NWFPs resources;
- Development of value chain for NWFPs will ensure the inclusiveness of rural communities engaged in NWFPs.

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Sustainable Management of Non-wood Forest Products for Rural Livelihoods in Sri Lanka

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Introduction

Non-wood Forest Products (NWFPs) have an important role in rural economy and also provide considerable importance at national level. NWFPs are defined as goods derived from forests that are tangible and physical objects of biological origin other than wood (FAO, 2015). NWFPs include products used as food and food additives (edible nuts, mushrooms, fruits, herbs, spices and condiments, aromatic plants, game), fibers (used in construction, furniture, clothing or utensils), resins, gums, and plant and animal products used for medicinal, cosmetic or cultural purposes. Forest Conservation Act has not defined the Non-wood Forest Products as such but defined Forest Products and Timber separately. There is a legal provision to issue permits to collect forest products from forests and the National Forestry Policy supports for production of Non-wood Forest Products. The forest cover of Sri Lanka extends over 19 million hectares equal to 29.2% of the total land area and around 60% of these forests have the potential to develop and collect NWFPs while rest of the forest area is highly protected without human interventions. In addition, Sri has around 900,000 hectares of home gardens where domestication of NWFPs is possible.

National Forestry Policy on Non-wood Forest Products

The National Forestry Policy aims at sustainable utilization of NWFPs and development of the same outside the forests. The current National Forestry Policy was formulated in 1995 and consists of three main objectives as follow:

- To conserve forests for posterity, with particular regard to biodiversity, soils, water, and historical, cultural, religious and aesthetic values;
- To increase the tree cover and productivity of the forests to meet the needs of present and future generations for forest products and services;
- To enhance the contribution of forestry for the welfare of the rural population and to strengthen the national economy, with special attention being paid to equity in economic development.

Policy objectives are concern about the forest product development and community livelihood development. The Policy on wood and non-wood forest products, industries and marketing includes following:

- Greater responsibility will be given to the local people, organized groups, cooperatives, industries and other private bodies in commercial forest production, industrial manufacturing and marketing;
- Efficient forest products utilization, development of competitive forest industries based on sustainable wood sources, and manufacture of value-added forest products will be promoted;
- Effective measures to protect the forests and prevent illegal trade in wood, NWFPs and endangered species of flora and fauna will be instituted.

In order to implement these policies, strategies have been developed. Development of public market information system for wood and non-wood forest-based industries, provide tax and financial incentives, credit facilities and technical assistance on forest products and NWFPs are main strategies identified under this policy. In addition, sustainable utilization and development of Non-wood Forest Products both in forests and outside forests is identified as another strategy.

Legislations on Non-wood Forest Products

Forest Conservation Act has defined forests products and provide provisions to collect, transport and develop the same. According to the same Act, forest products are defined as:

- Trees, leaves, meat, fruits, seeds, roots, juices, timber , charcoal, un treated rubber, oil, natural varnish, barks, lac, gums, resins, caoutchouc, catechu and myrobalans;
- Plants which are not trees, including grasses, creepers, reed, mosses and all parts or produce of such plants;
- Tusks, horns, shed horns, edible birds' nests, skins and other parts of the animals and honey;
- Limestone, soil, rocks and gems, including limestone, coral, laterite, bitumen, asphalt, bituminous shale, mineral oils and all products of mines and quarries;
- Water from natural sources.

Even though Forest Conservation Act has the provisions to issue permits to collect Non-wood Forest Products, Flora and Fauna Protection ordinance doesn't have the same provisions. Around 40% of the forest lands of Sri Lanka are declared as protected areas under Flora and Fauna Protection Ordinance,

so that these forests are not potential forests for NWFPs development and utilization. Rest of the forest which are declared and control under the Forest Conservation Act are potential forests for NWFPs development and utilization in sustainable manner. Local communities are encouraged to participate in managing NWFPs. The Forest Management Plans are prepared by the Conservator General of Forests for declared forest under Forest Conservation Act. Sustainable utilization and development of NWFPs components are incorporated in the Forest Management Plan. The Act has mandated the Forest Department to implement management plan and develop mechanism for sharing benefits with the local communities. Based on the provision in the Act, local communities can actively involve in development of Non-wood Forest Products in the forests and collect NWFPs in a sustainable manner under the supervision of the Forest Department.

Economic Contribution of NWFPs

Majority of the people in rural area, especially those living in the peripheral villages of natural forests use various NWFPs for different proposes. Most of the NWFPs are collected for household consumptions, but many of them have high demand in rural and urban markets. The contribution of NWFPs to the national economy is significant and it is undervalued in national income accounts due to unavailability of the reliable data.

Present Scenario of main Non-wood Forest Products

There are seven main NWFPs in Sri Lanka which are medicinal plants, rattan, kithul products, wildlife products, edible forest products, gum and resin products and other miscellaneous NWFPs.

Medicinal Plants

Medicinal plants are mainly found in forests and non-forest lands. The quantity and number of medicinal plants collected from the forest lands are unknown, but more than 50% of the plants collected are used as indigenous medicine. Some of the plants that are most extensively used in indigenous medicine are sudu handun (*Santalum album*), Aralu (*Terminalia arjuna*), bulu (*Terminalia bellarica*), mee (*Madhuca longifolia*), rasakinda (*Tinospora cardifolia*), kihomba (*Azadirachta indica*), weniwal (*Consinum fenestratum*) etc. Some of these species have become scarce so they are imported to fulfil the local demand.

Rattan

Rattan is spiny, climbing plant belonging to the palm sub-family Calamoidea, six species of rattan are used commercially and eight species are endemic to Sri Lanka (De Zoyza *et al.*, 1991). Other species are also used mainly for subsistence purposes. Rattan is one of the most important forest products that provide valuable raw material for rural industries. Its main uses are furniture and ornamentals, housing and construction materials, house and kitchen utensils and binding materials.

All rattans found in the country belong to genus *Calamus*. Three out of ten rattan species are of large diameter and rest are smaller diameter species. Commercially and widely used species in Sri Lanka are thambotu wewel (*Calamus zeylanicus*), sudu wewel (*Calamus ovoideus*), heen wewel (*Calamus pseudotenueis*), ma wewel (*Calamus thwaitesii*), kaha wewel (*Calamus rivalis*), narswel (*Calamus delicatulus*), wewel (*Calamus rotang*) and kukuluwel (*Calamus pachystemonus*).

Except for *Calamus rotang* and *C. thwaitesii*, other rattan resources are greatly depleted now and they are confined to wet zone forests. *Calamus rotang* is abundant in dry zone especially in Polonnaruwa and Ampara districts until recent past. However due to exploitation, availability of these species has become scarce at present.

Collecting rattan from wet zone forests has been banned due to scarcity of the resources. However, large diameter rattan is collected illegally from forest. As a result two high diameter of rattan species, *C. ovoideus* and *C. zeylanicus* are near to exhaustion.

Kithul products

Kithul (*Caryota urens*) produce variety of products such as sap tapped from the flowering shoot, pith used for food and medicine, fodder and wood. The sap is processed to produce toddy, treacle, and jaggery (FAO, 2002). The fermentation of the sap produce toddy that can be distilled into arrack. Treacle is made by boiling the sap and further boiling down the sap produce jaggery. Treacle is sweet liquid which can be used to produce traditional Sri Lankan sweets and used to consume as a sweetener with curd. Jaggery is in a solid form and it is perishable. The demand for these products is high so this is a good rural industry to be promoted for improvement of rural livelihood.

Kithul is an understory species, found in the wet and intermediate zones in lowland and mid elevation rain forests. The resources are declining because of forest degradation and low natural regeneration of kithul. High concentration of kithul trees can be found in lowland rain forests and Knuckles Forests.

Kithul trees can be found also in cultivated lands as well. Propagation techniques and other agronomic aspects are not fully explored so kithul cultivation is not widely practiced. Most of the kithul trees available in forests, home gardens and other agricultural lands are naturally regenerated.

Wildlife products

These products are illegal because hunting of wild animals except wild boar is prohibited under Flora and Fauna Protection Ordinance. However, people do hunting to protect their agricultural lands and to obtain meat. Most common species hunted are wild boar, spotted deer, sambar, monkeys, porcupine, mouse deer, bandicoot, rabbit and iguana. Many people who are living around forest fulfill their protein requirement from wild meat even today. Because hunting is illegal, no information is available to assess the contribution to rural food security.

Edible forest products

Fruits, seeds, roots, stems, rhizomes, mushrooms and barks collected from forests are used as food by rural communities (Epitawatte, 1993). These are most important for rural communities living in the fringe of the forests. Rural people collect these products mainly for consumption but little amount is sold. There are large number of edible plant species and the consumption of edible species vary with the locality. Yams, mushrooms, madu (*Cycas circinalis*), beraliya (*Doona cordifolia*), and hal (*Vatica copalifera*) are some of the common NWFPs species. The most important edible plants are green vegetables and fruits. Other important uses are preparation of porridge and beverages.

Gum and resins

There are several tree species from which gum and resins are collected. Cashew (*Anacardium occidentale*), kohomba (*Azadirachta indica*), maliththa (*Woodfordia fruticosa*), divul (*Feronia elephantum*) are main gum producing species found in forests. There is no commercial extraction of gum from the above species in Sri Lanka. Oleo resin extraction is done commercially in *Pinus caribaea* plantations.

Honey, spices and other miscellaneous NWFPs

Honey from wild bees is commonly used as a food item and for medicinal purposes. Many rural households, especially in the dry zone, consume honey. Most of the honey collected is marketed as an ingredient in indigenous medicine. Wild cinnamon (*Cinnamomum zeylanicum*) and wild cardamom (*Elettaria ensal*) are spices of considerable economic importance.

Recommendations for Development of NWFPs

The over exploitation of some NWFPs species have been identified as one of the main issues. Some of the species have become scarce as a result of over exploitation. Therefore, it is important to assess existing stocks of NWFPs and develop sustainable harvesting levels. In addition, time of harvesting of different NWFPs species are also an issue as there is lack of standard guidelines and best practices.

Domestication of NWFPs is important to increase the NWFPs production and generate income for rural communities. Production of planting material, motivation of people for planting should be done through training of rural communities and also by building capacity of local institutions.

Nursery technique of some NWFPs producing species is not known. Therefore, it is important to carry out research to develop nursery techniques and propagation methods of different NWFPs species. The nursery techniques should be documented and disseminated for promotion and development of NWFPs.

Forest degradation resulted in low availability of NWFPs resources, it is recommended to introduce NWFPs producing species for reforestation programmes of Sri Lanka. Plantation strategy should be developed to plant important NWFPs species in natural forest as well as in forest plantations for continuous supply of products for rural communities.

There is no proper market for some of the NWFPs. Therefore, it is recommended to develop marketing infrastructures and market information system of NWFPs.

Value addition to NWFPs is not done with exception to the kithul products. As such, value addition of NWFPs should be done to fetch better price of products and at a same to generate employment and develop local economy.

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Community-based Non-wood Forest Products Management is Key in Building Climate Resilient Communities

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Introduction

Non-wood Forest Products (NWFPs) are the products that are derived from forests other than timber. NWFPs have ecological, economic, social and cultural functions. They constitute greater portion of floristic diversity of forest ecosystems and support livelihoods of people. NWFPs support the livelihoods of huge numbers of rural people in the world particularly in the South Asia. NWFPs are used as food, medicines, fibers, fuelwood, resins and other materials for consumption as well as for barter and income. Globally, about 1.4 billion people living in poverty are said to be dependent on NWFPs. The rural poor rely on it for reduction of poverty and improvement of their living standard. The sustainable management of NWFPs is fundamental for sustaining large portion of ecosystems and providing livelihoods, but it is increasingly difficult to manage NWFPs sustainably because of persistent poverty, a growing international demand for NWFPs, and climate change impacts. Moreover, at the local level, decision-making power on management of forests and forest products, and the sharing of related costs and benefits are often inequitably distributed across groups, marginalizing people based on gender, caste, ethnicity, socio-economic status, and other factors of social differentiation (Michillette & Elias, 2018).

About 80% of the rural population depend on the NWFPs for their livelihood in Nepal. NWFPs have commercial, socio-economic and environmental values in rural communities (Shrestha *et al.*, 2020). There are over 800 types of NWFPs that are harvested in India and it is estimated that between 100 to 275 million people in India depend on NWFPs for *inter alia* food, medicines, shelter and cash income (USAID, 2017). In Bangladesh, about 300,000 rural people are directly involved in collection, processing and selling of NWFPs and about 1.3 billion of *Taka* is contributed to the national economy. Besides subsistence consumption of NWFPs, substantial quantity of NWFPs is traded either locally or globally in increasing trend.

In the management and utilization of NWFPs, it is paramount to comprehend that really constitutes sustainable management of the NWFPs

resources and benefits the livelihoods of the people in the era of constant climate change. One of the main facts is the involvement of local communities, which is indispensable in sustainable management of NWFPs resources and gain benefits out it. Most of the NWFPs resources are 'open access' resulting in collection of NWFPs either by private contractors or government corporations for commercialization. These entities often resort to over-extraction unlike local communities, who plan for sustainable resource management.

Climate change is not new and it is a real. Climate change, predominantly temperature and rainfall have direct and indirect impacts on forests and its ecosystem, in which NWFPs is a part of it. Climate change also upshot social structure of the communities thereby hampering the governance of the communities, hence push people into more vulnerable position. Climate change impacts are becoming increasingly evident in the Himalayan region, which has profound implications for communities (Chitale *et al.*, 2018). NWFPs will be impacted even under a moderate climate scenario with both ecological range expansion and reduction (Chitale *et al.*, 2018). Hence, people who are dependent fully or partially on NWFPs for their livelihood will be hit severely. Decreasing availability of NWFPs seem to deprive the rural poor from a supplementary source of income, food and healthcare. Thus, concentrated efforts to understand and assess how NWFPs can contribute to mitigation and adaption of climate change and how NWFPs are impacted by changing climates (IGSSS, 2016). These supplementary and alternative sources of food, often referred to as NWFPs are especially crucial in years of crop-failure, usually as a result of extreme climatic events (droughts and floods), disease and pest outbreaks and other natural disasters (Shackleton, 2014).

Many countries in south Asia have adopted community-based approaches to manage forest resources including NWFPs sustainably. It is increasingly reckoned to be more effective and efficient in sustainable management of NWFPs. Yet, there is also a complex challenge with deep-seated causes and effects, including poor governance, corruption, and lack of tangible and equal distribution of benefits, all of which hinder sound NWFPs management. Community-based sustainable management of NWFPs can only be possible if the critical elements of economic, social and environmental components is reckoned carefully.

Sustainable Management of NWFPs – Critical Elements

Sustainable management of any forest resources is inevitable in the era of Climate Change. Climate Change is happening and its impacts are discernably on human and natural resources. Sustainable management of

NWFPs is critical at this juncture owing to many of rural people fully or partially dependent on it; besides many of the high value NWFPs are exploited for commercial purpose. With the increasing rate of NWFPs consumption, sustainable management of NWFPs resources become the greatest global concern. Sustainable has three critical pillars: economy, social and environment. Sustainable development is often illustrated by a simple diagram showing three overlapping circles representing social, economic and environmental progress, implying the need for balancing and managing the trade-offs between them.

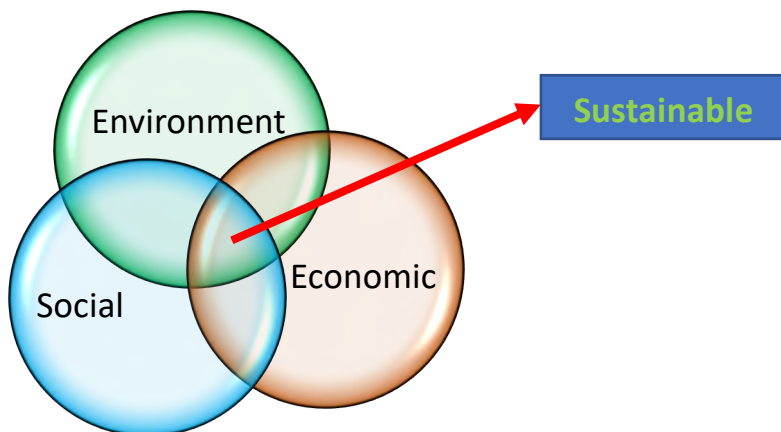


Diagram 1. Three Spheres of Sustainability

The diagram 1 is mainly to illustrate the three spheres of sustainability and it is important to apply for sustainable management of NWFPs resources. Managing the NWFP resources just for environment purpose may not be enough for economic and social benefits. Maximum social benefits can only be achieved through community-based NWFPs management and not just collection of NWFPs by individuals. Sustainable management of NWFPs requires members of community to trust one another, commit themselves and take the ownership and responsibility for any activities that is being carried out related to NWFPs resources. NWFPs play huge roles in contributing socio-economic growth, biodiversity conservation and building social capital.

Community-based NWFPs management is more resilient to climate change

Climate change and climate variability are threatening the range of crucial goods particularly NWFPs and environmental services from forests on which an estimated of 1.6 billion people are fully or partly dependent. Therefore, it is imperative to build climate resilient community through sustainable management of community-based NWFPs. The resilience means the ability

to cope with stress (also called “resistance”), the capacity to recover from the effects of disturbance and the capability to adapt to stress and change (Braatz, 2012).

Building resilience in the context of the community-based sustainable management of NWFPs includes adjusting its management practices and building resource capital for communities to be resilience to negative impacts of climate change, more importantly to increase the resilience of vulnerable people in the communities. Community-based sustainable management of NWFPs requires efforts to ensure that adequate local, indigenous and technical knowledge are taken into considerations, an enabling policy and legal framework are put in place, responsive and effective institutions and governance mechanisms that can support timely, appropriate and equitable decision-making at local level are well established, which will ultimately contribute in building community resilience (Braatz, 2012).

Community-based sustainable management of NWFPs will build economic, social and environmental resilience, which is illustrate in diagram 2 below:

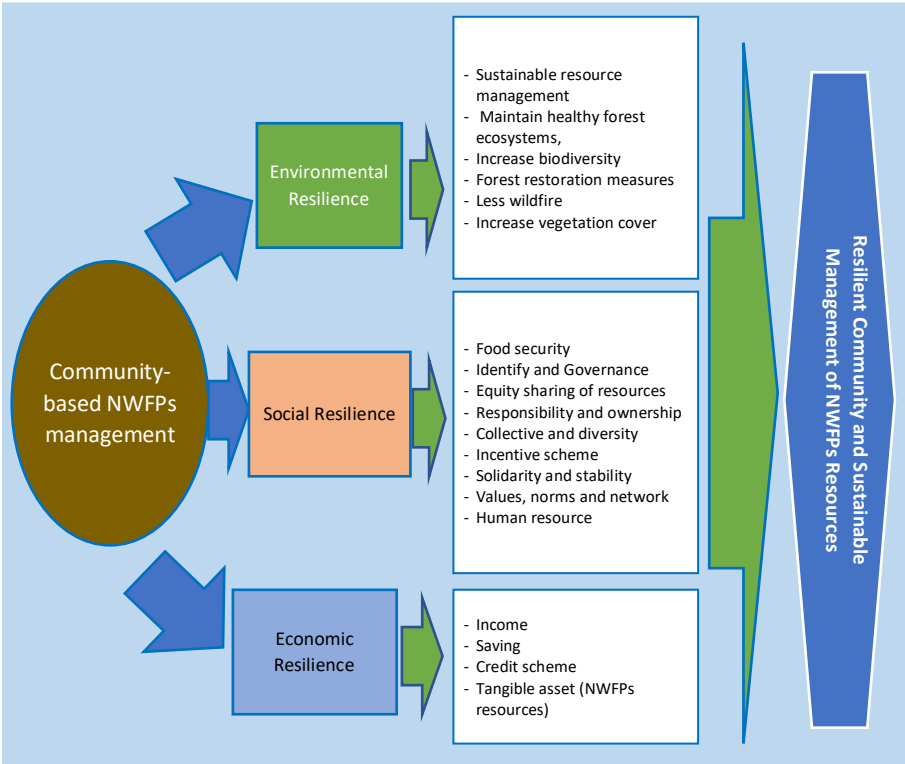


Diagram 2: Community-based NWFPs resource management builds community resilience

Community or Group is always better than individual to absorb shocks. It becomes resilient to food security shocks and stresses. As a group, it becomes more stable and shared responsibilities to take up the tasks. Traditional, indigenous and local ecological knowledge have all been used to understand the species, ecosystems, or practices held by people who lives are closely linked to their natural environment including forest and its resources (Braatz, 2012). Many communities living in and around the forest possess considerable knowledge of the natural resource. Having local and indigenous knowledge on resource management will put communities in better position to withstand any shocks. Community-based sustainable management of NWFPs will build local institutions that can support participatory and responsive decision-making processes leading to equitable outcomes. This management regime of NWFPs can build resilient community in the time of climate change.

Roles of Non-Wood Forest Products in time of Climate Change

NWFPs have huge role to play in the era of climate change. Involvement of people in sustainable management of NWFPs is supreme and unnegotiable in the time of climate change. Community-based forest resource management is an old fashion and is a traditional way of managing the NWFPs resources very effectively and sustainably. NWFP can play huge roles to make the communities more resilient to climate change through economic, social, cultural and environmental benefits. But significant benefits can only be derived, if the communities are fully involved in resource management and utilization, more importantly in the decision-making process.

Based on the current and future climate change scenario, decline of agricultural and livestock productions have been projected. NWFPs can be looked as potential future strategy to deal with challenges of food, nutritional and income security of the population (IGSSSs, 2016). The use of NWFPs as a 'safety-net' is reported as a common feature of rural livelihood and at the same time some of the rural households are vulnerable to a range of risks associated with the climate change (Paumgarten, 2007).

Economic roles of NWFPs

Long term economic benefits of NWFPs can only be realized through sustainable management of NWFPs resources by communities with support from the government by creating enabling policies and legal frameworks, and establishing adequate institutions to support and promote sustainable NWFPs management.

NWFPs are the main source of livelihoods of forest-dwelling communities. The poor segment of the farming communities relies on the NWFPs for

improvement of their living standard and reduction of poverty. They use fern, cane and bamboo shoots, lichens, wild mushrooms, wild asparagus, orchids etc. for direct consumption to tide over food insecurity and mitigate poverty. NWFPs plays important roles in building resilient communities in the face of climate change by providing communities as food safety-nets in times of emergency; as sources of products for generation of income and diversification of livelihood options other than farming; as sources of employment, particularly where farming and other rural livelihoods are no longer viable (Braatz, 2012). NWFPs is the main source of income for people living in the remote area. The welfare of rural people is at risk if NWFP resources remains unsustainable.

There are growing interest in NWFPs for their enormous economic value. NWFPs contribute to the creation of economic benefits and cash income at the local and community levels. NWFPs also generate local, national and international trade revenues worth billions of dollars annually (Tiwari, *et al.*, 2007). In household economies of rural societies residing in or close to the forest, NWFPs have three primary functions. First, it supports the needs of households for their subsistence and consumption for energy, nutrition, medicine, and construction, etc. Second, in periods of depression through losses of crop production, they are seen as a food safety-net. Thirdly, NWFPs can generate cash and employment for the people. The importance of NWFPs may also be significantly greater than timber production; as there is growing evidence that local and wider-scale commercialization of NWFPs is increasing in many regions, providing cash income to numerous households (Shresthra *et al.*, 2020). NWFPs helps household in achieving self-sufficiency, food security, income generation, accumulation of savings and risk minimization (Kabir & Mamun, 2015).

In Bhutan, between 2010 and 2018, about 148 community groups comprising of 5,378 households have been established for NWFPs management and marketing. These groups marketed NWFPs worth about USD 1 million between 2010 and 2018. The sale of Codyceps and incense raw materials constitutes a sizeable portion of the annual income of some semi-nomadic pastoralists in Bhutan (DoFPS, 2018).

Social and cultural roles of NWFPs

NWFPs have a huge potential to contribute to livelihoods of forest-fringe communities. The primary collectors of NWFPs have a direct stake in sustainable management of these resources to protect their livelihoods. Unfortunately, they are rarely involved in decision-making related to sustainable management of these vital resources. Community-based

management of NWFPs will encourage people to participate and take the ownership of the resources as well as be responsible for sustainable utilization.

Community based management of NWFPs means preservation and keeping the local culture alive. Suppose, NWFPs support health service of a large number of rural people through home remedies. A range of NWFPs support rural-based traditional healers in dispensing home remedies for many health problems. They also support traditional medicine and indigenous crafts across many cultures. The traditional medicine, indigenous crafts and home remedies constitute a system of indigenous knowledge and culture of incalculable social value. In the contemporary context too, NWFPs hold educational, academic and research values for the societies' endeavor to manage them sustainably (DoFPS, 2018).

Community-based NWFPs resource management means having a group formed with clear responsibilities to manage NWFPs sustainably. Community groups for sustainable management of NWFPs will have series of benefits to group members. Community-based NWFPs resource management encourages and promote the good governance through rule of law, opportunity of participation, consensus points, accountability, transparency, responsiveness, efficiency and effectiveness, and equity and inclusiveness (Parajuli & Lamichhane, 2014).

Community based management of NWFPs becomes an autonomous and well-recognized community-based institution with trusted social capital (trust, connectedness, norms and network) for collective action together with its scope and mandate to democratically manage and mobilize its physical, financial, natural and human assets. Community Forest User Groups have become the most effective institution to provide immediate support to disaster affected communities (Gentle *et al.*, 2020). Community-based disaster preparedness is determined by a number of community characteristics such as the presence of strong social and economic infrastructure, strong social cohesion, and shared values (Gentle *et al.*, 2020). Similarly, community-based management of NWFPs will secure property rights and ensure that management benefits are obtained by rural communities who are dependent on the NWFPs resources.

Environmental/Ecosystems roles of NWFPs

The more diverse an ecosystem the less vulnerable it is. At the same time, NWFPs form the main source of feed for faunal community of forest ecosystems and occupy a vital place in the food chain. In summary, NWFPs have a vital role in sustaining the forest ecosystems and the associated services. It is important to involve local communities to retain and use their traditional

or indigenous knowledge for ecological conservation and at the same time benefit them from these ecological resources. Maintaining forest ecosystems in a healthy state is the most straight-forward action to retain their resilience. Healthy forests are better able to cope with stress, recover from damage. Healthy ecosystems are more resilient to negative biotic and abiotic influences than are ecosystems under stress whose ecological processes are impaired.

It has been increasingly reckoned that sustainable harvesting and management of NWFPs is ecologically less destructive than timber harvesting (Kabir & Mamun, 2015). In northeast India, large tracts of forest areas are managed by communities and they maintain records of day-to-day NWFPs requirements and harvestings, thereby helps to conserve natural resources like soil, water and biodiversity and thus ensure ecological security (Tiwari, *et al.*, 2007). Tiwari (2005) found that medicinal herbs and aromatic plants contribute towards the conservation of biodiversity and save a fragile ecosystem from degradation. Hence, sustainable management of NWFPs is critical to meet the complex demands of both conservation and development. On contrary, over utilization and exploitation without any scientific management may have detrimental effect on environment and ecosystems, which may alternately affect the livelihood of communities.

Conclusion

There are amply NWFPs resources in the forests and it plays huge roles in contributing to environmental conservation, building social and economic capital through community involvement. Cautious sustainable management of NWFPs is key for making community and resources resilient to Climate change. Climate change is real and its impacts are becoming increasingly evident in the Himalayan region affecting rural communities. Community-based sustainable NWFPs management practice can build resilience of vulnerable communities from adverse impacts of climate change. This management practice builds national and local institutions to support participatory and responsive decision-making processes leading to equitable outcomes.

Community-based sustainable management of NWFPs faces few pertinent challenges related to harvesting techniques, value addition, markets and poor governance. Poor harvesting practices and over-exploitation in the face of increasing market demand are threatening the sustainability of those resources, and the livelihoods of forest-dependent communities. Unless NWFPs are harvested as per the harvesting guidelines developed based on scientific or indigenous knowledge of NWFPs species, it will become genetically impoverished or depleted more rapidly.

In order to manage NWFPs sustainably by communities and make environmentally, ecologically, socially and economically resilient to climate change, it is exceedingly important to have tenure rights and access to resources. Besides managing the NWFPs resources sustainably, it paramount to add value on products so that resources are used efficiently. Capacity building of communities and domestication of those commercially viable NWFPs species are critical for future sustainability.

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Report of the SAARC Regional Expert Consultation Meeting on ‘Sustainable Management of Community-based Non-wood Forest Products and its Contribution towards Improvement of Rural Livelihoods in South Asia’ (virtual) organized by the SAARC Agriculture Centre (SAC), Dhaka, Bangladesh

(11-12 November, 2020)

Opening of the consultation meeting

The SAARC Agriculture Centre (SAC), Dhaka, Bangladesh organized the Virtual Regional Expert Consultation Meeting on ‘Sustainable Management of Community-based Non-wood Forest Products and its Contribution towards Improvement of Rural Livelihoods in South Asia’ during 11-12 November, 2020. Mr. Kinzang Gyeltshen, Senior Program Specialist (NRM) was the Program Coordinator and led the SAARC regional expert consultation meeting. The meeting was attended by the National Focal Experts of 8 SAARC Member States; Director, Senior Program Specialists, Senior Technical Officer and Senior Program Officer of SAC and Expert from Department of Forest and Park Services, Bhutan. Welcome address was delivered by Dr. Mian Sayeed Hassan, Director, SAC and special remarks of the meeting were delivered by Chief Guest, Dr. S.M. Bokhtiar, Executive Chairman, Bangladesh Agricultural Research Council; Special Guest, Mr. Jamal Uddin Ahmed, Director (SAARC), Ministry of Foreign Affairs, Bangladesh; Special Guest, Dr. Md. Nazirul Islam, Director General, Bangladesh Agricultural Research Institute and Mr. Kinzang Gyeltshen, Senior Program Specialist (NRM) SAARC Agriculture Centre, Dhaka Bangladesh.

Objectives

- Assess sustainable management practices of NWFPs in the region;
- Evaluate the contribution of NWFPs to the improvement of rural livelihoods;
- Understand the nexus between NWFPs and rural livelihoods;
- Identify barriers, challenges and opportunities of NWFPs management.

Paper Presented

A total of eight country papers on 'Sustainable Management of Community-based Non-wood Forest Products and its Contribution towards Improvement of Rural Livelihoods in South Asia' were presented at the regional consultation meeting covering Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka. One technical paper covering crucial aspects of community-based non-wood forest products management and climate change was presented by expert from SAARC region.

Recommendations

The following recommendations emerged during the virtual regional expert consultation meeting 11-12 November, 2020:

Policy

- Develop/ review national NWFPs policy with emphasis on incentives, minimum support prices and marketing infrastructures;
- Decentralization and empowerment of local institutions and community groups in collections, processing and trade;
- Develop NWFPs regulatory framework to underpin sustainable management;
- Formulate enabling policy to domesticating and marketing important NWFPs species.

Strategy

- Develop national strategy for sustainable management of NWFPs covering development of institutional and management capacity;
- Establish adequate infrastructures for processing and marketing;
- Validate and document traditional knowledge of NWFPs for dissemination to younger generations to support sustainable management;
- Establish revolving fund for community groups for sustenance;
- Build strong linkages among researchers, enterprises, regulators and collectors;
- Develop value-chain of major NWFPs species and establish market information system accessible by rural communities;
- Develop regional NWFPs project to enhance NWFPs programs in the region. The information generated from the regional expert

consultation meetings should be taken into consideration while developing project;

- Establish network among the experts of SAARC Member States for continuous sharing of technologies and knowledge for sustainable management of NWFPs.

Management

- Develop NWFPs resource assessment protocols to prepare NWFPs management plans for high valued and important NWFPs species for sustainability;
- Develop monitoring and evaluation mechanism to control over-harvesting and manage NWFPs resources sustainably;
- Support value addition and product development of NWFPs and conduct timely market study to facilitate marketing of products.
- Carry out zone-wise/species-wise GIS mapping showing NWFPs species distribution, abundance, regenerative capacity, annual harvesting level, demand and supply of NWFPs;
- Promote successful NWFP-based agroforestry models in rural areas for sustainable livelihoods.

Capacity development

- Carry out joint NWFPs research by academia / universities in the region to reduce the knowledge gap and establish a common platform for online sharing of knowledge;
- Conduct training on collection techniques, storage, processing, value addition, product development and access to market information for forestry extensions and community groups;
- Create awareness on rules and regulations and sustainable management of NWFPs for sustenance of rural livelihoods;
- Capacity building on strengthening community groups and establish network among groups for sharing knowledge and information.

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Photo of Virtual Regional Expert Consultation Meeting



Banner of Virtual Regional Expert Consultation Meeting





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