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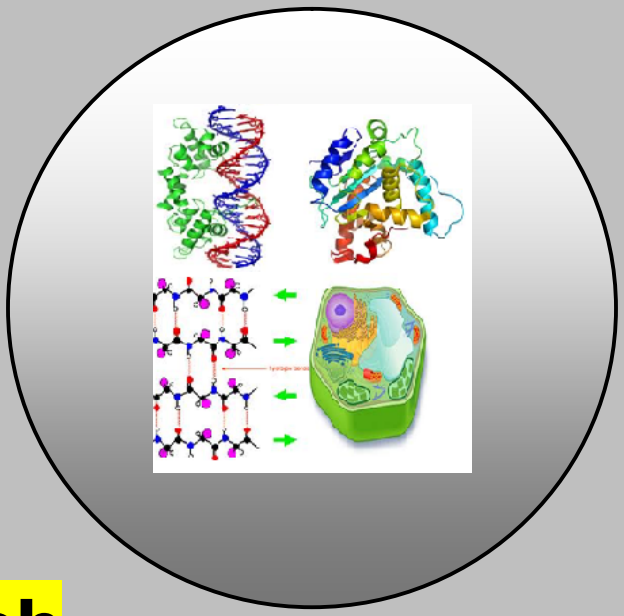

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REVIEW ARCTICLE

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Economic Valuation of Some Forest Floristic Resources Related to Tribal Utilization – A Review

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ABSTRACT

Human civilization had been integrated with diverse life forms starting from the ancient period to modern dates, using the biological resources for their daily life support. The production and marketing of wild floristic resources and services gained importance in forest management, as demand for, these increased considerably day by day. However, due to lack of relevant information on the level of output of non-timber products, its economic significance was seldom accounted. This review highlights the world wide approaches on economic valuation of NTFPs (non timber forest products) especially wild edible mushrooms, minor fruits and wild underground crops in different parts of the world on which the aboriginal communities depend, as they serve as the key source of food security as well as nutritional supplement for them.

Keywords: Forest Floristic Resources, NTFPs, Economic Valuations, Tribal Utilizations and Wild Edible Mushroom.

INTRODUCTION

Forest ecosystems provide a range of products and services for human use, primarily due to the biodiversity inherent in them (Chopra and Kumar 2005). The floristic resources of forests are major natural resources in the form of food, fodder, medicine, clothes, house building materials

etc. and were the potential place for early human colonization especially in the fringe areas (Gadgil and Guha 1992). It is noteworthy to mention that in different parts of world most of tribal villages are in the vicinity of the forests. The people of the traditional society of developing world extensively use their natural environment to supply themselves with fuel, wood, vegetables, fruits, meat, medicine, rope, string etc. (Myers 1983; Balick and Cox 1996). Besides the tangible benefit of forest goods, there are a number of intangible services of forests like carbon sequestration, maintaining hydrological regime, bio-geochemical cycling, pollination, purification, origin and recharge of water bodies, nitrogen fixation, cycling of nutrients and many more.

Wild floristic resources and food security

Wild floristic resources constitute a critical component of food security and an important source of income for the poor in many developing countries. Since early dates, forest fringe people are to depend on forest resources as their essential life support due to non accessibility of modern commodities. Besides, during food scarcity these forest plant products are also the staple food for the locals. The proportion of non timber forest products (NTFPs) utilized for food varies dramatically by country and community 88% of Cameroonian pygmies in Centre Province and 15% to 80% of households in the Cameroonian Southwest province, and 80% of households in Equateur and Bandundu in Democratic Republic of Congo indicate everyday use (Ambrose-Oji 2003; Ndoye and Awono 2006; Tieguhong and Ndoye 2008). Tiwari (1994) estimated 80% of forest dwellers in Bihar, Orissa, Madhya Pradesh, West Bengal and Himachal Pradesh of India depend on forest for 25 to 50% of their annual food requirement. The tribals constitute an Important segment of the population of India (about 8% of the total population) and majority of them lives in forest ecosystem with their own socio-cultural pattern, tradition and typical food practices (Sinha and Lakra 2004). But most of the tribal people of India have small or marginal land holdings to grow food grains. The productivity for 8-10 months, however, for rest, they depend on the forest. At least for 4 months, they are to depend on forest resources for their food. Mostly their diet comprises variety of unconventional foods, viz., roots, tubers, rhizomes, leaves, wild mushrooms and fruits derived from wild plants (Saxena 1996). These plants are consumed in different ways depending upon the conditions of locality and community. Forest floristic resources provide a wider variety of food types and supplement the daily diet especially micronutrients that are available easily to the forest fringe communities. Forest foods often provide essential vitamins, minerals, carbohydrates and proteins. These were found to provide 4% of energy, 20% of total protein intake (but 73% of total animal protein), 40% of calcium (small fish provide the main source of calcium), 25% of iron, 40% of vitamin A and vitamin C (4% and 17% of the RDA), respectively (Clendon 2001).

Besides direct nutritional contributions, they provide variety of taste. People add certain items to foods for the dual purpose of improving taste and adding health tonic properties (Arnold 1995). The improved varieties of different agricultural crops that human beings cultivate today are derived naturally or artificially from the wild plants. Thus, these wild plants play an important role in providing the human diets and have been the basis for technological innovation (DMP 1982).

Economics of forest NTFPs.

Forest phytodiversity provides a large variety of non-timber products that are used by millions of people around the world (Manna 2010). Wild floristic components are often common property resources, like fuel wood, fodder, charcoal, fencing, poles, medicinal plants, and a variety of foodstuffs, such as gum, fruits and nuts, mushrooms, underground tuber crops, and fibers (Arnold 1995). Rural people utilized wild plants for their livelihood realized importance of such plants in rural economy (Sawain et al. 2007). Since late 1980, studies on use of wild plants in tropical forests have been central of interest for many scientists through out the world (Plotkin and Famolare 1992). The easy access to widely dispersed rural markets is key factors enabling rural people to generate income from NTFPs especially in the developing countries (Wickramasinghe 1996). Adger et al. (1995) demonstrated the economic techniques for estimating the total economic value of forests and applies it to Mexico's forest estate. They coined out that a proportion of this economic value can feasibly be "captured" within Mexico: much of the benefit of Mexico's forests falls outside the country's borders, and is therefore not considered by forest users or national policymakers. They also calculated that the total economic value of Mexico's forests at some US$4 billion a year. Bishop (1999) reviewed the method and the application in valuing forests in developing countries. Barbier (1991) postulated some methods for cost benefit analysis of comparing the economic values associated with forest preservation, conservation and sustainable management. His work also concludes that calculating the different components of the total economic value of forests is essential for applying cost benefit analysis to different forest land used option. Based on data collected on market prices, and analysis of quantities of wild floristic resources harvested and sold, Peters (1989) estimated US$ 6,800 per hector of Amazonian rain forest which was far higher than the returns from timber harvesting or from subsequent plantation or cattle ranching. NTFP markets in the Congo basin exhibit multiple routes from production to consumption. Five products; honey, *Gnetum* spp., *Irvingia* spp., *Dacryodes edulis* and *Prunus africana* have a combined annual turnover of at least $US 45 million, providing employment to some 250,000 people and connecting forest -based harvesters and producers with consumers nationally, in Central Africa, Europe and America (Ingram 2009) . In Cameroon and Democratic Republic of Congo, over 500 species are used as food, medicine and fuel. About 50% of these are traded, however, surprisingly little is known of the value, scale and circuits of commercialization, despite centuries of trade. Policy and regulatory attention has also focused largely on timber (Ingram 2009).

Now-a-days with changing political economy of forest resources around the world, benefits of wild floristic resources is increasingly discussed in valuing tropical forests during last two decades (Tewari 2000). According to Anderson (1990) and Nepstad and Schwartzman (1992) several studies argued in favor of NTFP focused forest management to attain sustainability that can reconcile economic, cultural and ecological values of tropical forests. It was estimated that currently, some US$ 90 billion worth of NTFPs are reportedly extracted worldwide annually, and about one third of the same is consumed in the local economy without it entering the market (Pimental et al. 1997). The NTFP and other environmental benefit, for instance, could amount to 70% of the total returns from forests was reported from Mexican forests (Adger el al. 1995). However in tropical regions, the economic evaluation of forests has been hindered by lack of basic research and analysis of its NTFPs (Nepstadand and Schwartzman 1992). Up to 80 percent of the population in developing countries depends on NTFPs for subsistence, both economically and for nutrition. Wild forest products are especially important to women in developing countries from Latin America to Asia and Africa (Gbadebo et al. 1999). With the rise of extractive reserves in Brazil, Community Forestry in Nepal, Joint Forest Management in India and similar initiatives in many other countries, local people are gaining access to harvest and get significant benefits from NTFPs. In India, for example, an estimated 50 million people live in and along the periphery of forests. A large number of these people rely upon wild floristic resources for their subsistence and cash income (NCHSE 1987). Several works related to economic valuation of different wild forest products in different parts of the Indian and Sri Lankan forest areas were performed by many workers during nineties decayed. Godoy et al. (1993) tested a series of hypothesis related to the economic value and sustainable utilization of plants and animals formulating a more realistic assessment of the sustainability and economic value of extraction of non-timber products from tropical forests. Manna (2010) reported that a total of 22 species of lianas under 20 genera and 11 families utilized by two ethnic communities' viz. *Santal* and *Dhangar*. Among them 13 species are exclusively used as medicine, 4 as medicine & food and 5 are in use of making hand craft / house hold materials besides the medicinal properties. Chopra (1993) formulated different methods of valuation and employed to evaluate the non-timber products of India's tropical deciduous forests. Many undervalued resources found in these forests are described and monetary value ascribed to them to demonstrate the importance of the resources to the Indian economy. Appasamy (1993) discussed a proposed joint forestry project in South India as a case study to highlight some innovative approach to forest management by the local community as NTFPs inherent a significant role for the subsistence economy of them. Ganesan, (1993) worked on the extraction of NTFPs including fodder and fuel wood in Mudumalai, India. Gunatilleke et al. (1993) studied on the role of non wood forest produces in the economy of peripheral communities of Knucklies National Wilderness areas of Srilanka and reported 47 plant species used by the villagers for different purposes. Cardamum production and shifting cultivation contributes

significantly to the total income of the household of this locality, but the majority of households in the study area also depend upon forest resources to supply some portion of their income. They opined that monetary value of the annual income generated by NTFPs is much lower than income from either cardamum production or shifting cultivation, thus the cardamum production and shifting cultivation in the forest flore should be restricted or there could be an additional threat to NTFPs. The interdisciplinary studies towards the management of NTFPs in low land rain forest of Gunatilleke et al. (1993) reported that the forests supply was nearly half of the total wood requirement of the country. They have also mentioned that the rural people dependent on a range of non-timber forest resources for their subsistence and income generation. Campbell and Tewari (1995) suggest that up to 35% of the income of tribal households in India comes from the collection of unprocessed NTFPs. As irrigation is not available within the forest and the land is of rather poor quality, forest dwellers of western part of West Bengal cannot depend fully on farming for their subsistence. Thus, the collection of NTFPs has become an important activity for them. NTFP have an important role in socio-economic development of forest fringe dwellers living in the dry-deciduous forests of Purulia, Bankura and West Midnapur districts of West Bengal, India. Due to the lack of agricultural land and industrial activities, forest fringe people are to collect forest products in regular basis both for the commercial benefit as well as for their livelihoods (Ghosal 2011). It has been estimated that each year about 20 to 50% of household income comes from NTFPs harvesting in the districts of Purulia, Bankura and West Midnapur of West Bengal (Development and Planning Department, Government of West Bengal 2007). An economic analysis in West Bengal showed that the average household income per year from wild floristic resources was around US $74 (Rs. 2230/-), and the contribution of NTFPs to household income ranged between 13% and 22% (Malhotra 1992). Mahapatra and Tewari (2005) made a detailed account on commercially valuable forest products harvested from dry deciduous forest of India. They estimated that the net present value of revenues from NTFP was to be US$1016 ha_ 1 in the coastal area and US$ 1348/ha in the inland area, which was significantly higher than the returns from alternative land uses. They were also in opinion that values of NTFPs were more as compared to potential timber revenue.

Economics of wild mushrooms

Ethnomycology in its simplest definition is the study of the relationship between people and fungi. From the prehistoric times, mycophily has been customary in the human society and the wild edible mushrooms (WEM) are regarded as the epitome of gastronomy. Their beauty, aesthetic, medicinal (anticancer, antidiabetic, immunoenhancing and hypolipidemic properties) and nutritional and economic value and the ecosystem services provided by wild edible mushroom have earned themselves a repute as gifts of god and are used in the ritualistic performances in many tribal populations around the world.

Macro fungi such as mushrooms, puffballs and morels are important dietary components in many countries of the world. In Nigeria, edible mushrooms are used for medicinal purposes and these fungi also serve as important article of food (Oso 1977; Alofe et al. 1998; Fasidi 1996 and Gbolagade et al. 2006). Mushrooms growing in the wild have been found to be nutritious and important for medicinal purposes (Fasidi et al. 1993; Manzi et al. 1999; Manzi et al. 2001; Sanmee et al. 2003 and Jonathan and Fasidi 2005). A number of 12 common wild edible Nigerian mushrooms were collected from different locations at the southern part of Nigeria and were analyzed for proximate and mineral elements compositions (Gbolagade et al. 2006). In India, 30 species of wild macro fungi were reported to be used by the tribals of lateritic region of West Bengal (Pradhan et al. 2010). Mushrooms have been considered as rich food because they contain protein, sugars, glycogen, lipids, vitamins amino acids and crude fibers. They also contain mineral nutrients, which are required for normal functioning of the body (Fasidi 1996; Ogundana and Fagade 1982; Kuforiji et al. 2003 and Agrahar-Mueugkar and Subbulakshmi 2005). Infact, Bono (1976) suggested that food value of mushrooms lies between meat and vegetables. Wild fungi are grouped into four categories according to their value for food, medicine, and nutraceuticals (deGeus 1995; Wills and Lipsey 1999). Tribals of many countries usually wake up early in the morning to look for wild edible mushrooms. The mushroom hunting and gathering activities is always an interesting, competitive, rewarding and profitable venture especially among the women. The collected edible species are usually cooked for consumption or sold in the local market (Jonathan 2002 and Fasola 2006). A number wild fungal species are known to occur in British Columbia. Approximately 50 species are reportedly purchased by mushroom buyers in British Columbia (Berch and Cocksedge 2003). Food mushrooms currently account for the largest volume and value of NTFP mushroom harvests (Ehlers et al. 2003). Some complex chain of supplying of wild edible mushroom from mushroom collectors to the consumers through market both in fresh and dried form in Mexico was studied by Marshall et al. (2006). Average sale price of WEM in nearest marker from the villages Dhenkanal and Keonjhar in Orissa of India was 15 rupees per Kg. and it varies from summer to winter within rupees 15-22 per Kg. (Mahapatra and Tewari 2005).

Economics of wild edible minor fruits

Millions of people in many developing countries do not have enough food to meet their daily requirements and a further more are deficient in one or more nutrients (FAO, 2004). Wild edible fruit plants have played an important role in human life since time immemorial. In India most rural aboriginal people depend on the wild edible fruit to meet a part their additional food requirements (Tiwari et al. 2010). Today, most human plant food is based on rather limited number of crops and fruits, but it is clear that in many parts of the world the use of wild fruit plants is not negligible (Prescott-Allen and Prescott-Allen 1990; Scherrer et al. 2005; Bussmann et al. 2006; Bussmann and Sharon 2006; Kunwar et al. 2006; Cavender 2006; Pieroni et al. 2007).

Sometimes the nutritional value of traditional wild fruit plants is higher than several known common fruits available in the market (Nordeide et al. 1996; Sundriyal and Sundriyal, 2001; Orech et al. 2007).

The wild edible fruit plants with high diversity are widely distributed in mountain forests and are valuable source of food for domestic and commercial purposes (Sawain et al. 2007).A total of 28 wild edible minor fruits had been reported from Garhwal Himalaya (Tiwari et al. 2010). Sawain et al. (2007) estimated that a total of 249 wild edible plants are utilized by the tribal community of Meghalaya of north-east India. Out of these, fruits of 125 species have great economic value and are highly linked with socio-economic development of tribal community of the state. Sinha and Lakra (2004) reported about 46 species of wild edible fruits utilized by the tribal community of Orissa with their potential nutritive value. Out of this 46 identified fruits, 30 are popular among all 5 tribes and consumed frequently in different seasons. A total of 218 wild edible fruits play a significant role in the dietary requirements of the tribals and local communities of Kerala, India (Nazarudeen 2010).

Economics of wild underground crops

Many under ground plant parts are used by the many native people through out the world (Compton 1993). Though few of them are used for their medicinal properties but most of them are utilized as food by the tribals. Reliable quantitative data on the contributions of these foods to traditional diet are unavailable. Overall, they evidently played a relatively minor yet significant dietary role among the forest fringe people. Approximately two dozen species of underground crops are used as food by the indigenous Peoples of the Pacific North-west Coast (Compton 1993).

Mode of use of different wild under ground crops by the coastal indigenous people were reported by several workers (Boas 1921, 1966; Turner and Bell 1971, 1973; Turner and Efrat 1982; Turner et al. 1983; Young and Hall 1969). Sinha and Lacra (2004) reported 14 wild tuber producing plants, often used as food by the local tribal people from the tribal dominated district of Orissa. The different species of *Dioscorea* being the major tuber producing plant were studied for nutritional evaluation (Bhandari et al. 2003).

Economic valuation of NTFPs wills no more a futile exercise

Though southern Asia has a long history of human use of forest products (Bawa and Godoy 1993), the importance of wild floristic resources (real or perceived) for rural, forest based tribal populations, was not considered significantly. The production and marketing of non-timber goods and services gained potentiality in forest management as demand for, but due to lack of relevant informations on the level of output of NTFPs, its economic significance was seldom accounted for in the valuation of forests. Dry deciduous forests in India are one such typical case where forest valuation is yet to integrate the NTFP stock, widely used for subsistence and cash income (Mahapatra and Tewari 2005).

Valuation of tropical forests has been traditionally based on a financial appraisal of its timber stock. The assessment occasionally compared forest value vis-à-vis land conversion for agricultural or livestock production, it mostly overlooked the economic potential of 'non-timber benefits' including on-timber forest products (Dove 1983; Andersonand and Ioris 1992). This is partly due to the lack of knowledge about the quantity available and suitable inventory or survey methodologies to initially assess the status of the resource (Baker 2000; Thornber and Baker 2001; Wong 2003). It is also due to the lack of methods to value NTFP products on a local, national and regional scale, particularly when they are often non –cash contributions to household livelihoods (Angelsen and Wunder 2003 and Dorp et al. 1998). Evaluations that have been done tend to lack quantitative data (Jensen 2009) or focus predominantly on pure economic valuation, ignoring social-cultural, environmental or ecosystem costs and benefits (Ingram and Bongers 2009). An assessment of NTFP stocks in Africa and Asian region is therefore essential where different forest types, harvesting methods and economies ascribe different values to the products and services from forests (Anderson and Balick 1992).

Now-a-days, advances in economic valuation methods have meant that forest benefits can now be much better quantified and expressed in monetary terms. A useful, and growing, body of literature has been established that deals with forest environmental valuation, including many of the non-market values that were omitted from calculations in the past. It is comparatively easier to calculate the monetary value of NTFPs, which are marketed at the local market or by intermediaries. However, the products which are normally collected for domestic uses carry enough monetary value too, but it never calculated in a proper way. Though It is very difficult to get a proper information from forest villagers that which product how much each household collect annually as the production of NTFPs vary from one year to another but more intensive and long term research (for at least three to five years) on exploration of species which they are utilizing, how much they are growing in the forest and how much they are harvesting may solve this problem. Governments of tropical countries also can take some policies to make some fixed market price of these NTFPs which often are collected and stored from the tribals by the local NTFPs merchants in a relatively lower price and latter they sold it in the market at a higher price. Over all global interest in this field of research will definitely change it no more as a futile exercise.

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