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DEFORESTATION- A POTENTIAL THREAT TO NUTRITION

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ABSTRACT- Nutrition is essential for health and growth of humans. Different kinds of edible minor forest produce (MFP) are rich in nutrients. Particularly, micro-nutrients like vitamin A, iron and other minerals and vitamins are present mostly in forest based foods like nuts, honey, green leafy vegetables (GLV), fruits, roots and tubers. This article aims to find linkage between deforestation in India and potential threat to nutrition status of people, particularly urban poor. Based on the published data, primarily from FSI, FAO, CSO, NSSO and other regional level/ locale-specific case studies, the analysis pointed intricate relationship between forestation and nutrition. In India, the rate of deforestation is gradually increasing. Subsequently, harvest of MFPs registered a slow down. This could be one among many factors affecting steep rise in prices of edible MFPs including fruits, honey, nuts, and vegetables. Price rises could make nutrient foods unaffordable to poor people, thus denying them of availability of micro-nutrients. It is also observed that, expenditure pattern on fruits and vegetables by urban and rural people have significantly changed. The analysis concluded as deforestation could pose a potential threat to nutrition of urban poor.

Keywords: **Deforestation, Minor forest produce, Price rises, Nutrition deficiency, Poor people**

I. INTRODUCTION

Nutrition is essential for health and growth of humans. Different varieties of nutritious foods are by-products of forests. Particularly, micro-nutrients like vitamin A, iron, other essential vitamins and minerals are present mostly in forest based foods like green leafy vegetables (GLV), fruits, honey, roots, nuts and tubers. Vitamin A deficiency leads to night blindness and iron deficiency causes anaemia.

Animal foods like butter and ghee, whole milk, curd, egg yolk, liver etc contain vitamin A, iron and other micro-nutrients. But, prices of these products are prohibitively expensive for poor families for regular consumption. Hence people, particularly below poverty line (BPL) living in slums of urban areas, purchase green leafy vegetables (GLVs), which are affordable as compared to the above mentioned animal derived products. GLVs are rich in iron; and yellow and pink colour fruits and vegetables (mango, papaya, and carrot etc) are rich in β carotene (vitamin A).

Continuous deforestation could lead to shortage of minor forest produce (MFP), particularly fruits, vegetables, nuts, honey and other edible products, which are serving as the only source of micro nutrients for poor people living in urban and forest-peripheral areas. Therefore, the prices of these products could turn dearer and become unaffordable to the poor people, thus depriving them of micro nutrients. As a result, poor families are prone to ailments like night blindness due to vitamin A deficiency (VAD), iron deficiency anaemia (IDA) and other nutrient-deficiency disorders.

In India, prevalence of vitamin A deficiency (VAD) is five times more in poorest people compared to affluent. As per National Programme for Control of Blindness (NPCB), the prevalence of night blindness is 3/10000 in children of affluent societies to 15/10000 in the poorest communities.

Minor forest produce (MFP) or non-wood forest produce (NWFP) includes fruits, flowers, leave or roots of various species which are edible (Negi Mohita, 2015). Mango, bel, ber, jamun, khirni, phalsa, sitaphal, etc are important fruits obtained from the forests. Among the kernels cashewnut, akhrot or walnut, groundnut, achar, chilgoza and kimal are important. Amla, anar, imli, karaunda, muga, kachnar, kaith, mushroom, zimikand, guchchi, etc are important products used as pickles or vegetables. "Many nuts are rich in protein and constitute a valuable addition to staple diets. Almost all forests contain a proportion of nut-bearing trees and the species are endless" (FAO: A time to invest in forestry).

But, in recent years, minor forest produce (MFP), is fast depleting from a majority of the Agency shanties due to decreasing forest cover in most tribal belts (Times of India, 2014). According to Union Ministry of Environment and Forests (MoEF) sources, nearly 200 sq km of forest land could have been lost forever in Andhra Pradesh since 2008, with 800 hectares feared to have been totally denuded or encroached upon in Visakhapatnam circle alone.

Similarly, in Karnataka, the extraction of minor forest produce has declined from 57,065 tonnes to 5,847 tonnes between 1973-74 and 1990-91 (Arvind Kumar, 2005). Particularly, harvest of cashew nut, a nutrient-rich MFP has fallen from 123.85 MT in 2005-06 to 87.11 MT in 2008-09. Similar drop is witnessed in tamarind production from 1742.4 MT to 1255.53 MT during the same period (Manmohan and Kalpana, 2013).

The diminishing trend in minor forest produce could be one of the many factors for rise in prices of nuts, fruits, vegetables. The households with low incomes are highly price sensitive in food purchase decisions and may be adversely affected by increased food prices (Business Standard, 2014). Over 56% middle and low income group people in urban India have shifted to precooked and ready-to-eat food items to protect the kitchen budget from sharp increase due to costlier food and vegetables, an Assocham (2014) study said.

Deforestation indirectly causes price rises of raw food products *viz.* fruits, nuts, vegetables and other edible MFPs. Encroachment of forest lands for mining, quarrying, Expansion of settlements, dam construction and illegal logging can be well attributed to deforestation. Scant rainfall also leads to lesser production of fruits and vegetables and shortage of these products raises its prices. Hence, the increase in rate of deforestation is a cause of concern to food and nutrition scientists.

A. Global Decline of Tropical Forests

The FAO estimated the total area of the world's forests in 2005 to be 3.8 billion hectares or 30% of the global land area (FAO, 2012). According to FAO, the global rate of

deforestation is reported to be 0.7% per year from 1990 to 1995 (FAO, 1997). The net rate of forest loss in the tropics is 21 m ha, which means that about 1.2% of all remaining tropical forests were cleared annually (Myers N, 1993).

Nearly 1.8% of the forests are estimated to be degraded every year, the major cause being deforestation (Skole and Tucker, 1991). If the current rate of deforestation continues, the world's tropical forests will vanish within 100 years – causing unknown effects on global climate and eliminating majority of the species (NASA, 1998). Yet, the estimates are uncertain, that is why it is important to monitor and assess the forest resources with a more practical approach (Menon and Bawa, 1998).

A report estimates that the Earth's total forest area continues to decrease at about 13 m ha yr^{-1} (FAO, 2005). Overall, there was a net decrease in global forest area of 1.7% between 1990 and 2005, at an annual rate of change of 0.11%. The rate of forest loss was reported as 3 m ha per year between 1990 and 2000 and 6 m ha per year between 2000 and 2005 (FAO, 2005). In addition, the global gross forest cover loss was reported to be 0.6% per year during 2000–2005 (Hansen, Stehman and Potapov, 2010). A global level study for 198 of the protected forest areas indicated that nearly 70% of the surrounding buffers has shown decline, and 25% has experienced decline within its very own administrative boundaries (Defries, Hansen *et al*, 2005).

B. Deforestation In India

India is one of the mega-biodiversity nations and seventh largest in the world and second largest in Asia having an area of 328.72 m ha. It has about 17,000 species of flowering plants and about 5400 endemic species (Hajra and Mudgal, 1997). India is considered to be one of the 12 centres of origin and diversity of several plant species in the world. The country's rich vegetation wealth and diversity is undoubtedly due to the immense variety of climatic and altitudinal variations coupled with varied ecological habitats. Champion and Seth (1968) have recognized 16 major forest types comprising 221 minor types in India. The current estimate of gross deforestation in India is low (–0.43) for 2009–11 compared with the global average of –0.6% (Forest Survey of India, 2011).

Deforestation was in the form of tree felling during the pre-colonial era in India, when tribal folks were more hunter-gatherers and who subsequently practised shifting cultivation for their living. This was followed by settled form of agriculture where forest lands were cleared for cultivation and later, gradually forests came to be cleared for commercial purposes, as raw material sources and use in forest-based industries (Gadgil, 1990). The major drivers of forest cover changes in India are shifting cultivation along with encroachment for agricultural land, mining, quarrying, expansion of settlements, dam construction and illegal logging (Reddy, Rao *et al*, 2009 and Lele and Joshi, 2009).

"For developing countries like India, the most obvious challenge within forestry sector is that to meet growing demand for forest products and enhance the quality of environment. The increased demand for forest products, fast population growth, urbanisation, higher rate of economic growth and trade liberalization are putting pressure on all resources including forests. The demand for food to feed to increasing population causing extension in agriculture and shifting cultivation resulted into decline in area under forests. During last two decades, India witnessed annual depletion of forest cover at rate of 253 square kilometres" (Forest survey of India, 1999).

In this context, previous studies have significantly observed a gradual declination in the contribution of forestry to India's Gross Domestic Product (GDP). Percentage of major and minor forest produce's contribution to India's GDP has decreased from 1.46 to 0.95 between 1993-94 and 2004-05 (Table 1).

Table-1. Contribution of forestry to India's GDP

Year	Contribution to GDP (%)	Year	Contribution to GDP (%)
1993-94	1.46	1999-2000	1.11
1994-95	1.40	2000-01	1.08
1995-96	1.30	2001-02	1.04
1996-97	1.22	2002-03	1.01
1997-98	1.19	2003-04	0.94
1998-99	1.13	2004-05	0.95

Source: Kala and Bipin Behari 2006).

C. 49% forest cover vanished from Andhra Pradesh

The overall forest cover in Andhra Pradesh, a south Indian state, is shrinking by almost 49% in a time span of eight decades (Deccan Chronicle, 2015). A study conducted by Scientists (Hari Krishna and Saranya *et al*,2014) of National Remote Sensing Centre, Hyderabad revealed that "the forest cover in Andhra Pradesh declined from 85,392 sq km to 43,523 sq km between 1930 and 2011. This indicates anthrogenic pressure on the forests. Anthrogenic pressures include expansion of human habitation resulting in encroachment of forests lands, chopping of trees, turning forests lands into agricultural land and other such issues".

The above study also found that, "forest cover loss has been very high in Rayalaseema (44.8 percent) followed by Coastal Andhra (40.6 percent). District-wise, Anantapur, Krishna, Guntur, Kurnool, Visakhapatnam showed the maximum loss of forest cover of all the districts in the present Andhra Pradesh".

In addition to the above reasons, from the last one decade, real estate boom in urban fringe (peripheral) areas has further reduced forest areas. The pace of real estate boom has swallowed cultivated lands in surroundings of urban areas in which mostly fruits and vegetables are grown. As a result, fruits and vegetables required to be transported from far-off places to urban areas causing rise in prices due to additional transportation costs.

Keeping all the above mentioned factors in view, this article aims to find (i.) linkage between deforestation in India and growth- rate trends of fruits and vegetables in major states of India and (ii.) changes in expenditure of rural and urban consumers on fruits and vegetables.

II. METHOD

The present article uses published information primarily from Forest Survey of India (FSI), Food and Agriculture Organisation (FAO) of United Nations, Central Statistics Office (CSO), National Sample Survey Organisation (NSSO) and other regional level/ locale-specific case studies. Forest area loss can be measured using spatial analysis. In order to analyse deforestation, the annual rate of change is calculated by comparing the area under forest cover in the same region at two different times. According to FAO, the annual rate of forest change is derived from the

compound interest formula due to its explicit biological meaning (FAO, 1995; Puyravaud, 2003). This is as follows $r = 1/(t2 - t1) \times \ln a2/a1$, where r is the annual rate of change (percentage per year), $a1$ and $a2$ are the forest cover estimates at time $t1$ and $t2$ respectively.

III. RESULTS

Various studies have identified the regions of higher to lower risk of deforestation in different parts of the country. Though consistent estimates of deforestation rates in India are lacking (Sudhakar Reddy, Dutta *et al*, 2013), the regional level/locale-specific studies on deforestation have been reviewed to analyse rates of deforestation. This study identified four major bio-geographic Indian states (Andhra Pradesh, Kerala, Tamilnadu and Maharashtra) of high conservation value for regional-level assessment based on the availability of the published literature.

The percentage of net rate of deforestation constantly shows negative values due to ongoing human-induced land-use changes for various economic purposes (Table-2). Kerala and Tamilnadu have witnessed the highest rate of deforestation between 1973 and 1995 compared to 1920 and 1990. This clearly indicates that deforestation accelerated only during the last two decades of the 20th century and the reasons attributed as dams, expansion of plantation and agriculture.

Forest cover change analysis carried out in Pranahita Wildlife Sanctuary of Andhra Pradesh for 11 years from 1993 to 2004 showed net deforestation rates to be –0.28 ascribing this loss to illegal logging and expansion of agricultural fields. Similarly, in Maharashtra the net rate of deforestation between 1987 and 2005 was registered as -0.15 and major reasons identified for this loss to Infrastructure development, dams and mining.

However, the deforestation studies carried out in various parts of India are found to be fragmentary and far from being comprehensive. From the regional analysis carried out, it can be seen that the overall net rate of deforestation was relatively high in the North East region (–0.90 to –5.29) and Deccan Peninsula (–0.19 to –3.2).

States	Period		t_2-t_1	Area in Sq. Kms		Net loss (Sq. Kms)	% of Deforest-ation	Major Reasons identified	Reference/ Source
	t_1	t_2		a_1	a_2		Net Rate *(r)*		
Kerala and Tamilnadu	1920	1990	70 years	1,626	1,423	-203	-0.19	Dams, expansion of plantations and agriculture	**Ramesh, Menon and Bawa, 1997**
Kerala and Tamilnadu	1973	1995	22 years	10,669	7,939	-2,730	-1.34	Dams, expansion of plantations and agriculture	**Jha, Dutt and Bawa, 2000**
Maharashtra	1987	2005	18 years	9,663	9,400	-263	-0.15	Infrastructure development, dams, mining	**Joseph, Blackburn *et al*, 2009**
Andhra Pradesh	1993	2004	11 years	82.7	80.2	-2.5	-0.28	Logging, encroachment for agriculture	**Giriraj, Babar and Reddy, 2008**
Andhra Pradesh	1988	2006	18 years	258.9	223.7	-35.2	-0.81	Shifting cultivation	**Reddy, Prachi *et al*, 2010**

Table-2. Summarised figures of net deforestation rates based on regional level/local-specific studies in India

A. Slow-down in value of output in farm-grown fruits and vegetables

Trends in growth rate in value of output from vegetables and fruits has witnessed a significant slowdown in major states of India during the 2000s (Vijay Paul Sharma and Dinesh Jain (2011). Karnataka state even had negative growth in value of output from fruits and vegetables (Table-3). Maharashtra and West Bengal, two important horticulture states, have seen significant deceleration in growth rate during 2000s which is a matter of concern. Tamilnadu and Uttar Pradesh also witnessed drastic low growth rates from fruits and vegetables.

Table-3. Trend growth rates (%) in value of output (current prices) from fruits and vegetables in major Indian states.

State	1980s	1990s	2000s	1991-92 to 2005-2006
Andhra Pradesh	9.3	16.3	13.1	12.4
Karnataka	25.7	13.0	-1.8	8.8
Kerala	14.4	14.4	10.2	9.0
Tamilnadu	16.1	14.5	7.6	7.9
Maharashtra	19.3	14.6	7.5	12.1
Uttar Pradesh	7.0	17.5	1.1	12.5
West Bengal	15.9	20.4	4.1	14.3

Source: Computed from CSO (2008)

In value of output from fruits and vegetables, not a single state under the study has achieved growth rate between 1990 and 2000. During the period between 1980 and 1990 the only states showed progress are Andhra Pradesh, Uttar Pradesh and West Bengal. This clearly indicates that, the value of output from fruits and vegetables has started showing downfall right from 1980's, which could be consequential to accelerated deforestation from 1973 to 1995 as already mentioned in Table-2.

B. Changes in expenditure of fruits and vegetables

Expenditure on fruits and vegetable consumption in urban areas has not increased as much as in rural areas (Table-4). In the year 1987-88, the percentage of expenditure on vegetables by rural consumers was 8.16, which was less than the urban consumers (9.39%) in the same year. By the year 2007-08, expenditure of rural consumers on vegetables has scaled up to 12.28 but, the corresponding growth in urban areas has slowed-down and registered as 11.20% only. This denotes that, despite the growth in urban population during the last 2-3 decades, vegetable consumption in urban consumers has diminished.

Table-4. In comparison with total food expenditure, changes in expenditure on fruits and vegetable consumption of rural and urban consumers in India, 1987-88 to 2007-08.

(Rs./capita/month at current prices)

Item groups	43rd Round 1987-88	5oth Round 1993-94	55th Round 1999-00	61st Round 2004-05	62nd Round 2005-06	63rd Round 2006-07	64th Round 2007-08
Rural							
Total food expenditure Rs.	100.82	177.80	288.80	307.60	333.15	363.42	395.04
%	100%	100%	100%	100%	100%	100%	100%
Fruits Rs.	2.57	4.90	8.36	10.42	11.75	12.47	13.56
%	2.55	2.75	2.89	3.38	3.52	3.43	3.43
Vegetables Rs.	8.23	17.00	28.98	34.07	37.88	43.06	48.53
%	8.16	9.56	10.03	11.07	11.37	11.84	12.28
Urban							
Total food expenditure Rs.	139.73	250.30	410.84	447.41	467.82	517.25	574.61
%	100%	100%	100%	100%	100%	100%	100%
Fruits Rs.	6.27	12.20	20.68	23.65	25.52	28.00	31.02
%	4.49	4.87	5.03	5.28	5.45	5.41	5.40
Vegetables Rs.	13.12	25.00	43.90	46.84	49.73	56.87	64.34
%	9.39	9.98	10.68	10.47	10.63	11.00	11.20

Source: Computed from NSSO (2010) Report No. 530: Household Consumer Expenditure in India, 2007-08.

Percentage of expenditure on vegetables by urban consumers has slowed down between 1987-88 and 2007-08. On the other hand, during the same period, rural consumers' expenditure on vegetables has registered significant increase. Of their total food expenditure in the year 1987-88, urban consumers used to spend 9.39% and rural people only 8.16% on vegetables. By the year 2007-08, these percentages of urban people increased to only 11.20%, whereas rural consumers' expenditure reached to 12.28%. The linear progression of rural consumers' expenditure on vegetables, over duration of two-decades, has steeply crossed expenditure of urbanites (figure-1). This steep increase in consumption of vegetables by rural consumers occurred between 55th and 61st rounds of NSS *viz.*, 1999-00 and 2004-05. During the same period, consumption of these products decelerated in urban areas. Changes in lifestyle of urbanites could also contributed to fall of vegetable consumption.

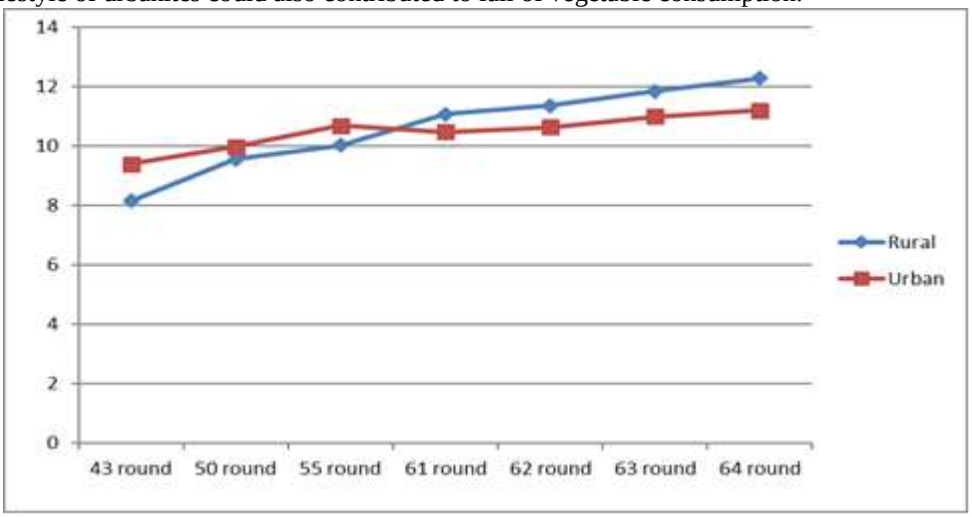

Figure-1. Percentage of expenditure on vegetables by urban and rural consumers from 1987-88 (43rd round) to 2007-08 (64th round) NSS.

But, there are no significant changes in consumption pattern of fruits in urban and rural areas except a steep increase between 55th and 61st rounds of NSS *viz.*, the years 1999-00 and 2004-05. Even during this period, it is significantly observed that, consumption of fruits by rural consumers has registered a sharp growth compared to urbanites (figure-2). Overall, the share of expenditure on fruits by rural and urban consumers remains proportionately steady.

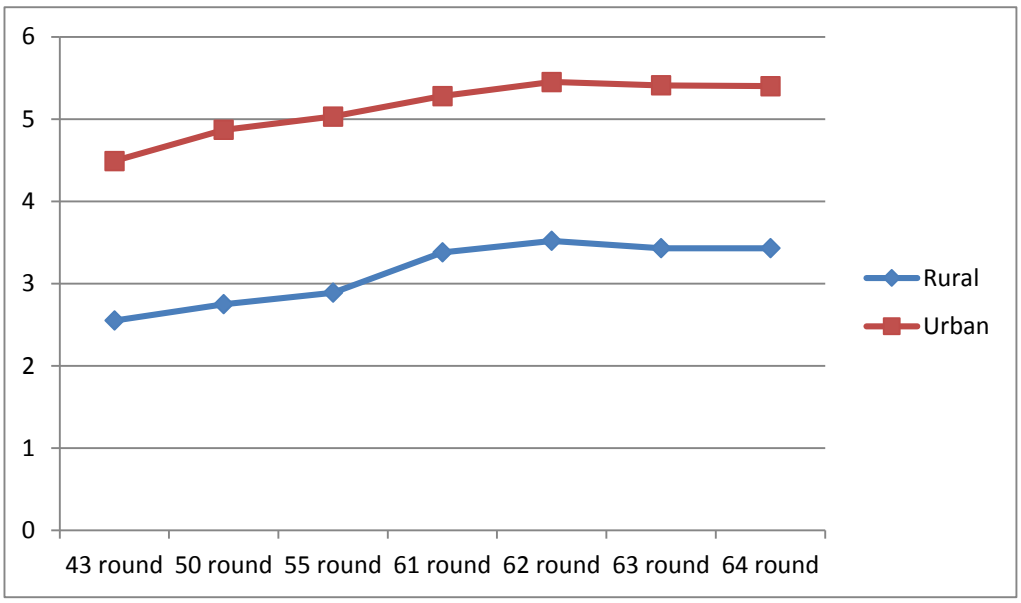

Figure-2. Percentage of expenditure on fruits by urban and rural consumers from (1987-88) 43rd round to (2007-08) 64th round NSS.

IV. DISCUSSION

Non-wood forest products (NWFP) have attracted considerable global interest in recent years due to an increasing recognition of their contribution to household economies and food security to some national economies, and to environmental objectives, including the conservation of biological diversity. They are of major significance primarily in households and local economies. An estimated 80 percent of the population of the developing world use NWFPs to meet some of their health and nutritional needs (FAO: State of the World's Forests). Several million households worldwide depend heavily on these products for subsistence consumption and /or income.

In this context, the rate of deforestation causes concern to food and nutrition scientists. At the same time, understanding of deforestation rates in various parts of India is far from complete due to selective studies across the country. However, the present study provides an apparent representation of the ongoing gross and net deforestation. The prime drivers of deforestation can be considered as shifting cultivation along with increasing demand for agricultural land, mining, quarrying, expansion of settlements, urbanization, dam construction, illegal logging, infrastructure development, forest fire and over-grazing. As a result, the development of non-wood food products (NWFP) has been limited. In addition to this, forest policy and management decisions have been driven to maximize revenue from timber production, thus limiting the development of NWFPs (FAO: State of the World's Forests).

India's food economy is directly dependant on domestic production and agricultural output, monsoons, and domestic policies (Prachi Priya, 2014). The wholesale price index (WPI) and consumer price index (CPI) are regularly tracked to gauge the rise of prices in India. While food accounts for one-third of the WPI, its percentage of the CPI is almost 50 percent. Monsoons do have a significant impact on food inflation, but can't solely be blamed for the persistent food inflation problem in India.

Agricultural output in India is largely dependent on monsoons. Monsoons in turn would be adequate only with abundant forest coverage. In India, monsoon failure or inadequate rainfall is witnessed often. Particularly, during the last 2-3 decades, inadequate rainfall in India is not uncommon. Hence, deforestation is a major obstacle to reap abundant output of MFP including nuts, roots, tubers, honey, fruits and vegetables. As a result, deforestation indirectly causes rise in prices and lower consumption of MFPs, particularly among poor people. The skyrocketing price of nuts, fruits, vegetables and edible products of minor forest produce have forced changes in the lifestyles of a majority of the middle and low income group people in urban India (Dilip Kumar Jha, 2013).

In a survey conducted by Assocham (2014), the findings revealed that over 88% of middle income group (MIG) and lower income group (LIG) find difficult to manage the household budget and squeezing families' finances to the low-level due to increase in vegetable prices. During the last three years, the salary of average common man has gone up by 10-15% but on the other side the prices of vegetables have also gone up by 250-300% (Sean Poulter, 2013).Assocham conducted the survey in major places like Delhi-NCR, Mumbai, Kolkata, Chennai, Ahmedabad, Hyderabad, Pune, Chandigarh, Dehradun, Bengaluru.

The maximum impact was felt in major cities like Delhi, Mumbai, Ahmedabad, Kolkata, Chennai, Hyderabad and Pune. Around 82% of lower middle class families have been forced to skip or squeezed their budgets for vegetables because of skyrocketing prices.

The increases of vegetables prices have seriously hit the common men mainly in the metro cities. The demand for tomato puree and ketchup are commonly-used commodities due to high fluctuations of market prices of fresh tomatoes. The main categories of packaged food are canned/dried

processed food, frozen processed food, meal replacement products and condiments.

The relatively affordable tomatoes, cabbage cauliflower, lady finger and potatoes basic ingredients in most Indian meals are moving away from the middle class family reach as prices continue to soar (Prachi Priya, 2014). Almost all vegetables in the city's markets have become costlier, with many becoming out of reach of the middle-class and poor families. Prices of brinjals, onions, cucumbers and tomatoes besides fruits have also gone up. Fruits have also become a luxury for the lower middle class; one spends less on buying a litre of fruit juice than a kilo of fresh fruits. Packed fruit juices appeared to be a better option for them (Prachi Priya, 2014).

Food prices are predicted to rise faster than incomes every year until 2018, with meat and fresh fruit and vegetables becoming only an occasional treat for some (Sean Poulter, 2013). Rising prices of fruits and vegetables have upset budgets of middle and lower class families, particularly affecting those below the poverty line (Prachi Priya, 2014). An increase in the price of fruits and vegetables in comparison to 'less healthy foods' could reduce consumers' incentives to purchase fruits and vegetables and result in 'less healthy diets' (Economic Research Service, 2012). Prices of desserts and snack foods have remained stable or increased very less compared to fruits and vegetables (Bureau of Labour Statistics, 2014).

In theory, it should be easy to compare food prices from a past-time to current prices and demonstrate whether relative prices of healthy and less healthy foods have changed. In practice, an increase in the relative prices of fresh fruits and vegetables is difficult to prove. Standard price comparisons using Consumer Price Index (CPI) numbers suggest that prices of fresh fruits and vegetables have increased relative to prices of other foods (Economic Research Service, 2012). This contributes to consumption of 'less healthy foods' in lieu of healthy fruits and vegetables among poor people. Consequently, the middle-class and poor families in India are forced to deny micro-nutrients, otherwise to be derived from MFPs including fruits and vegetables. Thus, deforestation poses a potential threat to nutrition of people, particularly among poor and middle-income families in urban areas.

The remarks made in the report of high-level committee (Subramanian, 2014) of MoE&F, are not out of the context to this article. "The failure to manage the sector (forest) is symbolised by the fact that till date the executive has not been able to define the term 'forest', despite attempting to do so for decades, leading to much vexatious litigation. The time has come requiring replacement of the present ad-hocism and piecemeal approach, by a systematic, comprehensive, non-arbitrary, transparent and accountable procedure for environmental conservation and management practices aimed at demonstratable and empirical enhancement in the quality of forest cover, air and water quality standards, through credible technology-aided mechanisms".

This article primarily focussed on linkage between forestation and nutrient-rich products of the forest. The harvest of most of forest products grew slightly at lower growth rate than their consumption rates. The requirement of forest products are growing and will continue to increase due to population growth and continuing economic growth. "Demand and supply projections reveals that there will be deficit of most of forest products if area under forest is not increased" (Malik and Sunil Dhanda, 2003).

For many minor forest products (MFPs), however, statistics of production, local usage and international trade are not available and it is not possible to provide a quantitative estimate of the total impact made by all such products on the world and Indian economy. For the purposes of the present article the subject is best covered in breadth rather than in depth within a narrow field, and qualitatively rather than quantitatively, although it is clear that there is room for more systematic research on the subject than has been accorded it in the past. It is perhaps not surprising that much of what has been written previously on such a broad subject has been of a very ad hoc nature geared to a particular product or products in a given forest environment.

V. CONCLUSIONS

Forestation and nutrition have an intricate relationship. Deterioration in per capita availability of minor forest produce surely affects nutrition balance of poor people. Complete and affordable nutrition to all sections of people is not possible without proper conservation of forests. Deforestation leads to shortage of nutrient foods and price rises affect nutrition status of poor people. Continuous deforestation indirectly causes nutrition deficiency disorders. There are a range of technical needs, and social and economic implications involved to tap the economic potential of non-wood forest produce (NWFP). Consistent policies and support to govern the management, harvesting and processing of NWFPs is required. In this direction, India and some countries (e.g., Indonesia and Turkey) have recently made some effort to redress this (FAO: State of the World's Forests). Overall, the development and implementation of national policy frameworks to support the growth of NWFPs remains a major challenge.

VI. LIMITATIONS OF THE STUDY

Lack of accurate data on production and trade of NWFPs is generally underestimated because much of the production and consumption is at subsistence level, and thus, data are rarely collected or published at a national level. When data on NWFPs are recorded- underreporting, double counting, grouping of NWFPs at different stages of processing or together with other products, and the use of unrealistic prices- are systematic shortcomings of such statistics. Clearly, improved statistical information will both clarify the economic significance of NWFPs and their trends, and provide essential information for accurate analysis.

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