

**RESEARCH PAPER**

Delineating the dynamics of growth and instability of different Non-Timber Forest Products (NTFP's) in Gujarat

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Abstract : The importance of Non-Timber Forest Products (NTFPs) and its contribution to rural livelihoods and alleviating rural poverty is well known in Gujarat and emerging as the source of income for the rural poor. Therefore, promotion of Non-Timber Forest Products (NTFP) species, therefore, the present study aimed at to examine the growth rates and instability of different forest products. The secondary data on quantity and value of different wood and non-wood products from the year 1996-97 to 2017-18 were compiled from published sources. The results revealed that quantity of Mahuda flowers and Honey increased significantly while majority of NTFPs found to be decreased but it is statistically non-significant during overall period. Instability indices of both quantity as well as value of NTFPs found to be higher during overall period. The quantity of teak timber significantly increased in Valsad circle but it significantly decreased in Ahmedabad circle, while change in value found to be non-significant in all circles during overall period because of irregular and timely non-availability of NTFPs.

Key Words : Growth, Non-timber forest products

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INTRODUCTION

Forest produce can be categorized into three types; Timber, Non Timber and Minor minerals. Non-timber forest produce (NTFPs) are also known as minor forest products (MFP) or non-wood forest produce (NWFP). The importance of Non-Timber Forest Products (NTFPs) and its contribution to rural livelihoods and alleviating rural poverty is well known in Gujarat and emerging as

the source of income for the rural poor. With the increasing population growth, the forest resources throughout the developing countries in the tropics are under severe pressure. The situation in India is even more serious as with only 2 per cent of the world's forests, the country has to serve about 15 per cent of the world population. A large number of plant species are under severe threat, facing extinction. With drastic reduction

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in the income from minor forest produce, unemployed local people are indulging in illicit felling of trees to sustain their livelihood. Therefore, promotion of Non-Timber Forest Products (NTFP) species, through productivity improvement and value addition is necessary to reverse this trend and to sustain the livelihood of the rural families, who have been dependent on NTFP since ages (Modi and Trivedi, 2013).

NTFPs exhibit considerable variations in their uses. Some of them are consumed immediately after harvest (fruits, fodder, wild root) or after primary processing (edible nuts, bamboo, cane products, etc.). Many NTFPs go through a series of downstream processing and add value to the products all along the way. NTFPs support village level artisanry and craft activity and provide raw materials to support processing enterprises. Small scale units of these are amenable to being linked to central refining and further processing units. Several plant species provide a range of products and services too (Mallik, 2000). This study explores growth and its stability in quantity and value of timber, NTFPs, fuel wood and other timbers.

A time based analysis of growth and instability of NTFP's on the basis of secondary data collected is vital for understanding the pattern of their quantity collection and future prediction indispensable for formulating future policies for their conservation and commercialization.

Objective:

To study the growth and instability of different Non-Timber Forest Products in Gujarat.

MATERIAL AND METHODS

The study was carried at the Gujarat state as the University of Research is located in the former state. For carrying out the data analysis the secondary data on different non-timber forest products were collected and value of that collected produce in Gujarat state. The secondary data were used and analyzed for the study. The secondary data on quantity and value of different non-wood products from 1997-98 to 2017-18 was compiled from different annual reports of Gujarat State Forest Department Corporation (GSFDC).

The statistical tools and techniques used in the present study are briefly explained under the following headings:

Growth rate analysis:

The compound growth rate is obtained by fitting a straight line to the logarithms of the data and estimating the slope of the line (Acharya *et al.*, 2012). In the present study Compound Growth Rate was estimated as under:

Compound growth rate:

$$Y_t = ab^t u_t \quad (1)$$

where,

Y_t = Dependent variable (quantity and value of NTFPs in the year 't')

T = Time variable in years taking the value of 1, 2, 3, ..., n

A = Intercept

B = Regression co-efficient (1+r)

R = Compound growth rate

u_t = Error term

For the purpose of estimation, the equation was expressed in logarithmic form.

$$\text{Log } Y_t = \text{Log } a + t \text{ log } b + u_t \quad (2)$$

The value of log b in eq. (2) was computed using the formula :

$$\text{Log } b = \frac{[\sum t \text{ Log } Y - (\sum t \sum \text{Log } Y/N)]}{\sum t^2 - \left(\frac{\sum t^2}{N}\right)} \quad (3)$$

where,

N = Number of years.

Subsequently, the compound growth rate (%) was computed as under:

$$\text{Compound growth rate (r)} = [(\text{Antilog of log } b) - 1] * 100 \quad (4)$$

Instability index:

Instability is the one of the important decision parameter in development dynamics. Wide fluctuations in crop output not only affect prices and bring about sharp fluctuations in them but also result in wide variation in the disposable income. Cuddy-Della Valle index is most commonly used measures of instability of time series data and is universally acceptable. The original formulation of the index is given as follows:

$$I_x = CV \sqrt{1 - R^2} \quad (5)$$

$$CV (\%) = \frac{\text{Standard deviation}}{\text{Mean}} * 100 \quad (6)$$

where,

I_x = Instability index;

CV = Co-efficient of variation;

\bar{R}^2 = Adjusted co-efficient of multiple determination;

\bar{X} = Mean value.

RESULTS AND DISCUSSION

The NTFPs are collected from forests by tribal population and then sold to the Gujarat State Forest Development Corporation (GSFDC) which then sells collected produce in the national and international markets with or without value addition, depending upon the type of product. GSFDC has classified NTFPs into five broad categories: Timru leaves; Mahua flowers; Mahua seeds or Doli (as called in local parlance); Gums and Other NTFPs. The first four categories contribute some 85 to 95 per cent of the total value of NTFPs handled by the GSFDC. In the present study the

compound growth rate and instability is computed based on the secondary data on quantity and value of different non-wood products from 1997-98 to 2017-18 compiled from different annual reports of Gujarat State Forest Department Corporation (GSFDC).

Growth rates in quantity and value of NTFP :

In this section, compound annual rates of growth in quantity collected and value of out-turn of different non-timber forest products were measured. The results of estimated growth rates of quantity and value of different NTFPs are presented in Table 1 for the Period-I (1996-97 to 2006-07), Period-II (2007-08 to 2017-18) and overall Period (1996-97 to 2017-18) in Gujarat state.

During overall period (1996-97 to 2017-18) the quantity of Honey recorded the highest growth (15.09 % /annum) which was positive and significant at 1 per

Table 1 : Compound growth rates of quantity and value of non-timber forest products (NTFPs) in Gujarat state

Sr. No.	Name of NTFPs	Period-I (1996-97 to 2006-07)		Period-II (2007-08 to 2017-18)		Overall period (1996-97 to 2017-18)	
		% CGR (Qty)	%CGR (Value)	% CGR (Qty)	%CGR (Value)	% CGR (Qty)	%CGR (Value)
1.	Bamboos	16.06 (1.452)	31.18 (0.192)	-23.75 (-0.590)	26.61 (1.475)	-33.52*** (-3.384)	-1.39 (-0.210)
2.	Grass and Grazing	22.51 (1.444)	4.26 (1.441)	96.78** (2.747)	35.08 *** (6.337)	6.23 (-0.663)	7.75** (2.251)
3.	Kadaya gum	-12.34 (-0.943)	12.88 (-0.930)	-17.74 (-1.297)	28.01** (2.036)	-11.32** (-2.445)	-2.30 (-0.412)
4.	Other gum	-14.39** (-2.370)	-4.83** (-2.373)	-1.97 (-0.263)	9.81 (1.355)	-10.89 *** (-4.587)	5.44* (1.723)
5.	Asitra timber leaves	12.53 (0.378)	4.72 (0.372)	0.19 (0.023)	22.12** (2.512)	12.32 (-1.633)	15.20* (1.802)
6.	Aritha (barks)	-20.51* (-1.929)	22.73* (-1.921)	-20.17** (-2.256)	48.30** (2.706)	-9.12** (-2.365)	9.60 (1.511)
7.	Karanj seeds	-11.28 (-0.558)	10.77 (-0.554)	-16.58 (-1.596)	-2.74 (-0.285)	-16.67*** (-3.166)	-2.44 (-0.382)
8.	Mahuda fruits	-1.57 (0.178)	1.62 (0.172)	-2.81 (-0.598)	-6.69 (-0.479)	-9.20 (0.555)	13.75*** (3.025)
9.	Mahuda flowers	7.39 (1.749)	7.90 (1.741)	-7.06 (-1.417)	5.68 (0.132)	1.19*** (-4.404)	11.04*** (3.115)
10.	Honey	39.88*** (3.060)	20.44*** (3.062)	9.11 (0.687)	17.66 (0.872)	15.09*** (3.270)	27.40*** (3.452)
11.	Wax	-1.39 (0.170)	38.35 (-0.084)	-34.66** (-2.229)	-23.57* (-1.882)	-22.08*** (-3.847)	-6.74 (-1.003)
12.	Puvadial seeds	-23.42 (-0.930)	24.19 (-0.932)	-33.74*** (-3.508)	-30.69 (-1.342)	-2.30 (-0.276)	9.69 (1.102)
13.	Neem seeds	-10.00 (-0.451)	22.34 (-0.451)	-31.85 (-0.827)	-33.78** (-2.523)	-26.42** (-2.477)	2.27 (0.207)
14.	Rattan jot	68.09*** (3.831)	95.05*** (3.834)	-58.29*** (-6.827)	-53.87*** (-5.354)	-13.26 (-1.591)	-2.28 (-0.253)
15.	Fruits	-11.30 (-1.179)	11.60 (-1.172)	-35.37 (-0.966)	-3.83 (-0.114)	-26.43** (-2.767)	-7.10 (-0.864)
16.	Misc. others	-1.43 (-1.038)	58.28 (-1.031)	-17.32 (-0.695)	-16.35 (0.681)	-6.35 (0.868)	18.29* (1.920)

Figures in parentheses are calculated t-statistic.

Note: ***, ** and * indicate statistically significant at P=0.01, 0.05 and 0.10, respectively

cent level of significance, followed by Asitra timber leaves (12.32 % /annum) and Grass and grazing (6.23 % /annum) revealed positive, but non-significant growth rate. While, Mahuda flowers (1.19 % /annum) found significantly positive at 1 per cent level of significance. The results revealed that collection of all the NTFPs decreased during overall period, except the collection of Honey.

In case of value of NTFPs during overall period, value of Honey (27.40 % /annum) registered the highest growth followed by Misc. others (18.29 % /annum) which were positive and significant at 1 per cent and 10 per cent level of significance, respectively. It is observed that the compound growth of value of Grass and grazing (7.75 % /annum) were significant at 5 per cent level of significance. Mahuda fruits (13.75 % /annum) and Mahuda flowers (11.04 % /annum) also registered positive growth and significant at 1 per cent level of significance.

The result also revealed that growth of *Neem* seeds (2.27% /annum), Puvadia seeds (9.69 % /annum), Aritha (9.60 % /annum) shown positive but non-significant. Thus, decrease in value of few NTFPs was observed during overall period. It is due to decrease in quantity of collection of the products but it is really a matter of concern so far as livelihood of forest dependent people is concerned.

Instability in quantity and value of NTFPs in Gujarat state:

The co-efficient of variation (CV %) and instability indices were used to measure the instability. Co-efficient of variation and instability indices of quantity and value of different NTFPs for Period -I (1996-97 to 2006-07), Period-II (2007-08 to 2017-18) and overall period (1996-97 to 2017-18) in Gujarat state are given in Table 2 Non-significant value of Cuddy Della Valle index was calculated on the basis of significance of probability level of co-efficient of variation in model. Co-efficient of variation (CV %) give better measure of instability where the P value are non-significant but it over estimates the instability where P value are significant. This limitation is taken care by measuring Cuddy Della Valle indices along with its significance.

where,

P value = 0.00 – 0.01 significant at 1 per cent probability level,

P value = 0.012 – 0.05 significant at 5 per cent probability level,

P value = 0.051 – 0.100 significant at 10 per cent probability level.

The Table 2 revealed that during Period-I quantity of all the NTFPs remained highly instable. The highest instability was observed in Grass and grazing (261.1 %) followed by Rattan jot (254.22 %), Puvadia seed (246.85 %) and Fruits (141.89 %). The results also revealed that instability indices for Honey and Rattan jot quantity were statistically significant at 10 per cent and 5 per cent probability level, respectively.

In case of value of NTFPs in Gujarat during Period-I (Table 2) value of all NTFPs recorded higher instability. Among different NTFPs, the highest instability was measured in Karanj seeds (230.72 %) followed Honey (218.91 %), Puvadia seeds (201.86 %) and Kadaya gum (191.36 %). The results also revealed that instability indices for Grass and grazing and Asitra timber leaves value were statistically significant at 1 per cent probability level of significance.

During Period-II, quantity of all the NTFPs observed to be highly instable. The highest instability was recorded in Wax (292.62 %) followed Rattan jot (284.22 %), Misc.other (220.80 %) and Fruit (187.65 %). The results also revealed that instability for Grass and grazing and Rattan jot were statistically significant at 5 per cent and 10 per cent probability level during Period-II. In case of value of NTFPs in Gujarat during Period-II shown in Table 2, higher instability was observed in different NTFPs like, Puvadia seeds (330.07 %) followed by Wax (292.62 %), Kadaya gum (284.54 %) and *Neem* seeds (183.00 %). While, Mahuda flowers (25.39 %) observed lowest instability in value of NTFPs. The results revealed that instability for Grass and grazing and Asitra timber leaves significant at 5 per cent probability level. While, Wax and Rattan jot were also statistically significant at 10 per cent probability level of significance during Period-II.

In overall period, among the different NTFPs, the highest instability in quantity was observed in Misc. other (318.24 %) followed by Karanj seeds (276.79 %), Fruits (274.87 %), and *Neem* seeds (244.43 %). The instability of quantity of NTFP of Grass and grazing, Mahuda flowers, Mahuda fruits and Honey found to be significant at 1 per cent probability level of significance during overall period.

The instability indices of value of different NTFPs found to remain higher during overall period which ranges from 117.32 to 443.46 per cent. The highest instability

Table 2 : Instability in quantity and value of non-timber forest products (NTFPs) of Gujarat state

Sr. No.	Name of NTFPs		Period-I		Period-II		Overall period	
			CV%	CDVI	CV%	CDVI	CV%	CDVI
1.	Bamboos	Qty	85.13	85.13 [^]	149.53	142.08 [^]	112.38	112.15 [^]
		Value	107.02	104.76 [^]	132.13	131.65 [^]	171.34	142.39 ^{**}
2.	Grass and Grazi	Qty	285.30	261.17 [^]	108.76	72.59 ^{**}	192.24	185.54 [*]
		Value	104.31	60.74 ^{***}	91.73	36.75 ^{**}	161.63	117.32 ^{***}
3.	Kadaya gum	Qty	103.01	100.29 [^]	167.74	167.74 [^]	204.93	204.19 [^]
		Value	210.61	191.36 [^]	284.54	284.54 [^]	293.73	270.17 ^{**}
4.	Other gum	Qty	85.80	82.16 [^]	82.51	82.51 [^]	95.08	92.04 [^]
		Value	37.52	35.31 [^]	45.30	44.85 [^]	236.54	202.85 [*]
5.	Asitra timber leaves	Qty	58.55	58.27 [^]	51.41	51.41 [^]	71.32	67.58 [^]
		Value	152.89	120.90 ^{**}	142.57	120.64 ^{**}	224.93	189.11 ^{**}
6.	Aritha (barks)	Qty	154.20	139.20 [*]	79.89	78.76 [^]	122.79	120.45 [^]
		Value	116.86	80.69 ^{***}	105.40	105.40 [^]	162.58	129.88 ^{**}
7.	Karanj seeds	Qty	234.86	223.85 [^]	97.96	91.80 [^]	280.43	276.79 [^]
		Value	230.72	230.72 [^]	109.42	107.32 [^]	333.91	326.50 [^]
8.	Mahuda fruits	Qty	55.42	52.27 [^]	65.71	65.58 [^]	181.55	157.85 ^{***}
		Value	184.42	154.16 ^{**}	154.66	142.39 [^]	204.31	186.87 ^{**}
9.	Mahuda flowers	Qty	113.14	113.14 [^]	71.41	67.96 [^]	98.42	77.43 ^{***}
		Value	213.09	184.87 [*]	29.58	25.39 [^]	296.96	269.45 ^{**}
10.	Honey	Qty	110.06	95.15 [*]	101.68	96.60 [^]	159.96	141.40 ^{***}
		Value	225.34	218.91 [^]	72.92	72.92 [^]	231.81	225.53 [^]
11.	Wax	Qty	143.45	135.77 [^]	321.61	292.62 [^]	221.81	216.86 [^]
		Value	144.51	138.44 [^]	291.43	264.21 [*]	219.04	190.75 [^]
12.	Puvadial seeds	Qty	268.33	246.85 [^]	188.58	178.59 [^]	247.25	241.75 [^]
		Value	220.12	201.86 [^]	330.07	330.07 [^]	443.46	443.46 [^]
13.	Neem seeds	Qty	254.22	254.22 [^]	190.80	183.00 [^]	244.94	244.43 [^]
		Value	247.20	247.20 [^]	290.24	284.67 [^]	286.75	283.63 [^]
14.	Rattan jot	Qty	254.22	217.35 ^{**}	314.54	284.22 [*]	241.46	241.46 [^]
		Value	78.10	75.15 [^]	221.26	119.31 [*]	196.08	196.08 [^]
15.	Fruits	Qty	101.03	88.71 [*]	190.69	187.65 [^]	289.25	274.87 [^]
		Value	141.89	141.89 [^]	119.44	119.44 [^]	179.18	158.46 [^]
16.	Misc. others	Qty	39.12	36.63 [^]	232.54	220.80 [^]	321.59	318.24 [^]
		Value	163.94	160.61 [^]	153.00	151.23 [^]	159.78	159.02 [^]

Note: CV- Coefficient of Variation (%), CDVI- Cuddy Della Vella Index, [^]- Non significant.

***, **, and * indicate statistically significant at P=0.01, 0.05 and 0.10, probability level, respectively.

of value found in case of instability in Puvadial seeds (443.46 %) followed by Karanj seeds (326.50 %) and Neem seeds (283.63 %). The results revealed that instability for Bamboos, Asitra timber leaves, Aritha, Mahuda flowers and Mahuda fruits were statistically significant at 5 per cent probability level of significance.

Thus, results revealed that quantity and value of both showed more variation in all the study period, because of irregular and timely non availability of NTFPs. Moreover, as being a secondary occupation, collection of NTFPs also depends on employability of primary

occupation.

Summary and Conclusion :

The above discussion highlighted the fact that the growth of quantity and value of non-timber forest products (NTFPs) in Gujarat state revealed that the quantity and value of Honey and Mahuda flowers increased at the rate of 15.09 and 1.91 per cent per annum, respectively. The instability index for all the NTFPs was positive, thereby indicating the less riskiness for cultivation in the state. The study of Instability index

indicated that area variability has more influence of production fluctuation of the Gujarat NTFPs. Instability indices of value of different NTFPs found to remain higher during overall period which ranges from 117.32 per cent (Grass and Grazing) to 433.46 per cent (Puvadia seed). Thus, results revealed that quantity and value showed more variation in all the study periods, because of irregular and timely non-availability of NTFPs.

Hence, there is need for developing state specific strategy rather than old blanket strategy of Gujarat as a whole. So, there should be organized marketing infrastructure need to be developed with facilities of grading, packing, storage, processing and finance facilities with market intelligence. There should be proper

regular training programme for collection of NTFPs regarding the processing and value addition of NTFPs.

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