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Fruit Frenzy: Evolving Consumption and Demand Trends in South India

K. Thomas Felix and K.B. Ramappa*

ABSTRACT

This study explores the evolving consumption patterns and demand trends for fruits in South India, driven by socio-economic factors like urbanization, rising incomes, and health consciousness. The traditional reliance on locally produced and seasonal fruits is gradually shifting towards a more diverse year-round consumption due to improvements in supply chains, processing technologies, and logistics. Despite growing demand, significant challenges persist, particularly related to inadequate storage facilities and inefficient logistics, often resulting in mismatches between supply and demand. The study highlights regional variations, with fruits like bananas and mangoes highly preferred in states like Tamil Nadu due to their cultural significance. Using data from the Directorate of Economics and Statistics (1991-2021), the paper estimates the compound growth rates for area, production, and productivity, revealing significant growth, particularly in Andhra Pradesh and Tamil Nadu. A comparative analysis of fruit consumption in rural and urban India, drawn from the NSSO rounds, reveals that urban households consume more fruits and spend significantly more on them than their rural counterparts, reflecting disparities in income and access to diverse fruit varieties. The paper concludes that addressing supply-side challenges and improving infrastructure is crucial to meeting the rising fruit demand in South India.

Keywords: **Fruit consumption, demand trends, supply chain, agricultural growth, urbanization**

JEL codes: Q11, Q13, Q18, O13

I

INTRODUCTION

The consumption patterns and demand for fruits in South Indian states have experienced significant shifts over the years, influenced by various socio-economic factors and evolving consumer preferences. Traditionally, fruit consumption in the region was driven mainly by locally produced and seasonal availability. However, with improvements in supply chains, processing technologies, and logistics, there has been a noticeable change towards more diverse and year-round fruit consumption (Roy, 2007). These changes reflect broader national trends, where urbanization, rising incomes, and increased health consciousness among consumers have led to growing demand for fresh and processed fruits (Sah, Johar, & Karthi, 2022). This shift is further supported by enhanced marketing and distribution networks that ensure better availability and accessibility of a wider variety of fruits, including both indigenous and exotic options.

Despite the positive demand trends, significant supply-side challenges persist. Issues such as inadequate storage facilities, inefficient logistics, and the perishability of fruits contribute to frequent mismatches between supply and demand. Studies from

*Agricultural Development and Rural Transformation Centre (ADRTC), Institute for Social and Economic Change, Bengaluru-560 072 (Karnataka).

states like Karnataka highlight these constraints and stress the need for infrastructural improvements to bridge the gap (Chandrashekar, Ganesamoorthi, & Nirmala, 2015). Regional preferences and dietary habits also shape fruit demand in South India. For example, in Tamil Nadu, bananas and mangoes are highly preferred due to their integral role in local cuisine and cultural practices (Revathy & Paramasivam, 2018). This regional specificity necessitates tailored production and marketing strategies to meet each area's unique consumer demands.

Economic factors also play a critical role in shaping fruit demand. Price fluctuations and income levels are key determinants across regions. Although Bihar lies outside South India, similar economic patterns have been observed, indicating that economic considerations influence fruit demand across the country (Kumari & Singh, 2016; Kumari & Panda, 2020). The trend of increasing fruit demand in South India reflects a complex interaction between socio-economic factors, consumer preferences, and supply chain dynamics. Addressing these challenges and seizing opportunities in the sector requires a comprehensive approach involving all stakeholders in the value chain. Continuous research, policy interventions, and improvements in agricultural practices and supply chain infrastructure are crucial for meeting the growing demand and ensuring sustainable growth in the region (Kumar, 2016; Viswanathan & Satyasai, 1997; Sikka & Azad, 1989; Kumar, 1995). This study, therefore, aims to analyze changing fruit consumption and demand trends in South India, driven by socio-economic factors like urbanization and rising incomes. It examines growth in fruit production, regional disparities, and the urban-rural divide, offering insights for policy interventions to improve production, distribution, and equitable access.

II

METHODOLOGY

The data on the area, production, and productivity of fruits were collected from the Directorate of Economics and Statistics from 1991-92 to 2020-21, and compound growth rates were estimated.

Model Specification of Demand for Millet Consumption

The specific functional form of the Quadratic Almost Ideal Demand System (QUAIDS) for the i[th] commodity is given below:

$$w_{ih} = \Phi(\hat{z}_{ih}\hat{\theta}_i)\left\{\alpha_i + \sum_{j=1}^{n}\gamma_{ij}\ln p_j + \beta_i \ln\left[\frac{x_h}{a(p)}\right] + \frac{\lambda_i}{b(p)}\left\{\ln\left[\frac{x_h}{a(p)}\right]\right\}^2 + \tau_i \hat{e}_h\right\} + \delta_i\phi(z'_{ih}\hat{\theta}_i) + \xi_{ih} \quad (1)$$

$w_{ih} = \frac{P_{in}q_{in}}{x}$= i[th] food product expenditure share for consumer h; p_j= Price of good i; q_i= Quantity of good i; x =Monthly household income; $\hat{e}_h$ is the residual from the total

expenditure regression; $\Phi(\hat{z_{ih}}\,\hat{\theta}_i)$ and $\delta_i\phi(z'_{ih}\,\hat{\theta}_i)$ were obtained from the first stage probit regression. The parameters of the QUAIDS model were estimated using Poi's STATA routine (Poi, 2008). Adjustments were made to the original routine to include additional control variables to capture endogeneity and selectivity problems as appropriate.

Parameters were estimated separately using seemingly unrelated regression methods with symmetry and homogeneity imposed simultaneously. The budget-share equation for beverages was dropped to accommodate adding up. The eleven equations were estimated by iterated, feasible, generalized non-linear least squares equivalent to the maximum likelihood (Poi 2008). All the analyses were done by using the statistical software STATA 17 version.

Estimation of Elasticities

Using the method adopted by Green and Alston (1990), the expenditure elasticity was estimated as:

$$\varepsilon_{i,x} = \frac{x}{q_i}\frac{\partial q_i}{\partial x} = \frac{1}{w_i}\left\{\beta_i + \frac{2\lambda_i}{b(p)}\ln x - lxa(p)\right\} + 1 \qquad \ldots. \ (2)$$

The uncompensated own price and the cross-price elasticities were estimated as follows:

$$\varepsilon_{i,p} = \frac{1}{w_i}\left\{\gamma_{ii} - \left\langle\left(\alpha_i + \sum_{k=1}^{n}\gamma_{kj}\ln p_k\right)\left[\beta_i + \frac{2\lambda_i}{b(p)}(\ln x - \ln a(p))\right] + \frac{\beta_i}{b(p)}\lambda_i\left[\ln x - \ln a(p)\right]^2\right\rangle\right\} - 1$$

… (3)

$$\varepsilon_{i,p_j} = \frac{1}{w_i}\frac{p_i}{p_j}\left\{\gamma_{ii} - \left\langle\left(\alpha_i + \sum_{k=1}^{n}\gamma_{kj}\ln p_k\right)\left[\beta_i + \frac{2\lambda_i}{b(p)}(\ln x - \ln a(p))\right] + \frac{\beta_i}{b(p)}\lambda_i\left[\ln x - \ln a(p)\right]^2\right\rangle\right\}$$

… (4)

Corresponding Compensated own price and cross-price elasticities are given below as

$$\tilde{\varepsilon}_{i,p_i} = \varepsilon_{i,p_i} + \varepsilon_{i,x}w_i \qquad (5)$$

$$\tilde{\varepsilon}_{i,p_j} = \varepsilon_{i,p_j} + \varepsilon_{i,x}w_i \qquad (6)$$

To estimate the demand for fresh and dry fruits in India, the data were collected from the NSSO 68th round.

III

RESULTS AND DISCUSSION

Growth of Fruits in South India and India during 1991-92 to 2020-21

Table 1 presents the Compound Annual Growth Rate (CAGR) of fruit area, production, and productivity in South India and across India from 1991-92 to 2020-21. The area under fruit cultivation in India shows a CAGR of 3.36 per cent, indicating a substantial increase. Andhra Pradesh and Tamil Nadu have notable growth rates of 2.32

per cent and 2.29 per cent, respectively, signifying significant expansion in fruit-growing regions. Karnataka's growth rate is moderate at 1.58 per cent, while Kerala's is minimal at 0.14 per cent, reflecting almost no change in the area under cultivation. Regarding production, the all-India CAGR stands at 4.55 per cent, highlighting a strong nationwide increase in fruit production. Andhra Pradesh leads with a 4.86 per cent growth rate, indicating significant improvements. Tamil Nadu follows with 2.74 per cent, and Karnataka shows moderate growth at 2.24 per cent. Kerala's production growth is relatively low at 1.08 per cent, signaling modest gains. In terms of productivity, the all-India CAGR is 1.14 per cent. Andhra Pradesh tops the chart with a 2.48 per cent growth in yield efficiency, while Kerala and Karnataka lag with rates of 0.94 per cent and 0.65 per cent, respectively. Tamil Nadu shows the least improvement at 0.44 per cent.

Overall, the data reveals robust growth in fruit cultivation and production, with Andhra Pradesh performing especially well, while Kerala trails behind in both area expansion and productivity improvements.

TABLE 1: COMPOUND ANNUAL GROWTH RATE (CAGR) OF FRUITS IN SOUTH INDIA AND INDIA FROM 1991-92 TO 2020-21

(per cent)

Particulars	All-India	Andhra Pradesh	Karnataka	Kerala	Tamil Nadu
(1)	(2)	(3)	(4)	(5)	(6)
Area	3.36*	2.32*	1.58*	0.14*	2.29*
Production	4.55*	4.86*	2.24*	1.08*	2.74*
Productivity	1.14*	2.48*	0.65*	0.94*	0.44*

Note: * indicates 1 per cent level of significance.

Comparison of Fruit Consumption in India

The comparison between the 66th (2009-10) and 68th (2011-12) rounds of data reveals significant changes in fruit consumption patterns across rural and urban India. These changes are evident in the monthly per capita consumption of various fruits, reflecting broader economic and social shifts. In rural India, the consumption of bananas increased from 3.861 to 4.181 units per month, accompanied by a rise in expenditure from 5.88 to 8.12 rupees. Jackfruit consumption nearly doubled from 0.014 to 0.027 kg, with associated spending increasing from 0.07 to 0.21 rupees. Watermelon consumption also experienced a modest increase from 0.072 to 0.081 kg, while the cost rose from 0.58 to 0.81 rupees. Coconut consumption rose from 0.456 to 0.488 units, and expenditure jumped from 2.79 to 4.38 rupees. Guava consumption increased from 0.070 to 0.088 kg, with spending rising from 1.00 to 1.44 rupees. Overall, the expenditure on fresh fruits in rural areas increased significantly, from 20.36 to 32.16 rupees. Dry fruit consumption also grew, with dates rising slightly from 0.005 to 0.006 kg, and associated spending increased from 0.29 to 0.51 rupees. The overall expenditure on dry fruits in rural India increased from 5.21 to 8.36 rupees (Table 2).

TABLE 2: MONTHLY PER CAPITA CONSUMPTION QUANTITY AND VALUE OF FRUITS IN RURAL AND URBAN INDIA FROM 2009-10 (66TH ROUND) AND 2011-12 (68TH ROUND)

	Rural				Urban			
	2009-10 (66th round)		2011-12 (68th round)		2009-10 (66th round)		2011-12 (68th round)	
	quantity per 30 days	value	quantity per 30 days	value	quantity per 30 days	value	quantity per 30 days	value
India	(kg*)	(Rs)	(kg*)	(Rs)	(kg*)	(Rs)	(kg*)	(Rs)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
banana (no.)	3.861	5.88	4.181	8.12	6.647	12.18	6.694	15.31
jackfruit	0.014	0.07	0.027	0.21	0.007	0.05	0.008	0.11
watermelon	0.072	0.58	0.081	0.81	0.094	1.05	0.094	1.34
pineapple (no.)	0.012	0.12	0.012	0.17	0.025	0.41	0.027	0.50
coconut (no.)	0.456	2.79	0.488	4.38	0.628	4.15	0.614	5.97
coconut green (no.)	0.057	0.41	0.063	0.63	0.110	1.07	0.141	2.00
guava	0.070	1.00	0.088	1.44	0.087	1.62	0.091	1.90
singara	0.007	0.10	0.008	0.13	0.007	0.13	0.011	0.22
orange, mausami(no.)	0.364	1.05	0.401	1.51	0.860	3.20	1.021	4.48
papaya	0.027	0.38	0.053	0.91	0.079	1.55	0.081	1.76
mango	0.108	2.54	0.160	4.79	0.158	5.52	0.202	8.33
kharbooza	0.023	0.21	0.025	0.33	0.032	0.57	0.025	0.46
pears/naspati	0.003	0.07	0.002	0.05	0.006	0.23	0.004	0.20
berries	0.005	0.07	0.006	0.09	0.004	0.08	0.003	0.09
leechi	0.002	0.06	0.003	0.18	0.004	0.25	0.008	0.48
apple	0.045	2.73	0.058	4.74	0.158	12.09	0.191	18.10
grapes	0.026	1.23	0.038	1.97	0.073	3.51	0.084	4.84
other fresh fruits	-	1.05	-	1.69	-	2.67	-	3.42
fruits (fresh): sub-total	-	20.36	-	32.16	-	50.33	-	69.51
coconut: copra	0.012	0.80	0.016	1.48	0.020	1.41	0.026	2.54
groundnut	0.050	2.52	0.063	4.31	0.067	3.72	0.087	6.45
dates	0.005	0.29	0.006	0.51	0.012	1.00	0.015	1.50
cashew nut	0.001	0.33	0.001	0.63	0.007	2.41	0.008	3.84
walnut	0.001	0.07	0.000	0.08	0.001	0.38	0.001	0.53
other nuts	0.000	0.06	0.001	0.21	0.002	0.52	0.003	1.17
raisin, kishmish, monacca, etc.	0.004	0.63	0.003	0.63	0.008	1.54	0.009	2.46
other dry fruits	0.003	0.51	0.002	0.50	0.007	1.47	0.006	2.13
fruits (dry): sub-total	0.074	5.21	0.093	8.36	0.123	12.43	0.156	20.61

A similar trend was observed in urban India, with a notable rise in fruit consumption and expenditure. Banana consumption increased slightly from 6.647 to 6.694 units per month, while expenditure rose from 12.18 to 15.31 rupees. Jackfruit consumption showed a marginal increase from 0.007 to 0.008 kg, with spending rising from 0.05 to 0.11 rupees. Watermelon consumption remained stable at 0.094 kg, though the associated cost increased from 1.05 to 1.34 rupees. Coconut consumption decreased slightly from 0.628 to 0.614 units, but expenditure rose from 4.15 to 5.97

rupees. Guava consumption increased marginally from 0.087 to 0.091 kg, with associated spending rising from 1.62 to 1.90 rupees. Expenditure on fresh fruits overall rose substantially in urban areas, from 50.33 to 69.51 rupees. Dry fruit consumption also grew, with date consumption increasing from 0.012 to 0.015 kg and expenditure rising from 1.00 to 1.50 rupees. The overall spending on dry fruits in urban India increased significantly from 12.43 to 20.61 rupees.

Urban regions consistently show higher fruit consumption and expenditure levels when comparing rural and urban areas. Urban consumers consumed more fruits and spent significantly more on them, likely reflecting higher income levels and better access to diverse fruit varieties. The gap between rural and urban consumption patterns is further evident in the higher expenditure growth on fresh and dry fruits in urban areas. This highlights disparities in economic capabilities and access to fruits between the two regions.

Comparison of Fruit Consumption in Andhra Pradesh

The comparison for Andhra Pradesh highlights significant shifts in rural and urban fruit consumption patterns, with notable changes in expenditure as well. These changes reflect broader socio-economic trends and provide insights into how consumption patterns have evolved in this period. In rural Andhra Pradesh, banana consumption grew substantially, rising from 5.398 to 7.125 units per month. Corresponding expenditure also rose significantly, from 8.59 to 14.49 rupees. Jackfruit consumption increased from 0.002 to 0.006 kg, while spending grew from 0.02 to 0.07 rupees. Watermelon consumption slightly increased from 0.051 to 0.052 kg, with an increase in expenditure from 0.49 to 0.71 rupees. Coconut consumption rose from 0.487 to 0.604 units, and the associated expenditure jumped from 3.16 to 5.55 rupees. Consumption of green coconuts showed a marked increase from 0.164 to 0.306 units, with a significant rise in spending from 1.26 to 2.94 rupees. The total expenditure on fresh fruits in rural areas increased substantially, from 25.19 to 44.87 rupees. Dry fruits also saw a rise in both consumption and expenditure, with groundnut consumption increasing from 0.081 to 0.115 kg and spending rising from 3.83 to 7.72 rupees. Overall expenditure on dry fruits in rural Andhra Pradesh rose from 7.63 to 13.32 rupees (Table 3).

In urban Andhra Pradesh, the trends were somewhat different. Banana consumption slightly decreased from 8.380 to 8.240 units, but expenditure rose from 14.51 to 17.87 rupees, reflecting the price increase. Jackfruit consumption decreased from 0.013 to 0.003 kg, but expenditure increased from 0.02 to 0.15 rupees, highlighting a shift in the cost. Watermelon consumption decreased from 0.091 to 0.071 kg, but expenditure increased slightly from 1.06 to 1.09 rupees. Coconut consumption slightly declined from 0.505 to 0.541 units, but expenditure increased from 3.85 to 5.21 rupees. Green coconut consumption, however, increased significantly, rising from 0.257 to 0.450 units, with a notable rise in spending from 2.45 to 4.97 rupees. The total expenditure on fresh fruits in urban areas grew from

53.69 to 71.71 rupees. Dry fruit consumption in urban areas also grew, with groundnut consumption increasing from 0.100 to 0.130 kg, while expenditure rose from 5.36 to 9.15 rupees. The overall spending on dry fruits increased significantly from 13.59 to 22.75 rupees.

TABLE 3: MONTHLY PER CAPITA CONSUMPTION QUANTITY AND VALUE OF FRUITS IN RURAL AND URBAN ANDHRA PRADESH FROM 2009-10 (66TH ROUND) AND 2011-12 (68TH ROUND)

	Rural				Urban			
	2009-10 (66th round)		2011-12 (68th round)		2009-10 (66th round)		2011-12 (68th round)	
AP	quantity per 30 days (kg*)	value (Rs)	quantity per 30 days (kg*)	value (Rs)	quantity per 30 days (kg*)	value (Rs)	quantity per 30 days (kg*)	value (Rs)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
banana (no.)	5.398	8.59	7.125	14.49	8.380	14.51	8.240	17.87
jackfruit	0.002	0.02	0.006	0.07	0.013	0.02	0.003	0.15
watermelon	0.051	0.49	0.052	0.71	0.091	1.06	0.071	1.09
pineapple (no.)	0.013	0.12	0.008	0.09	0.014	0.21	0.105	1.62
coconut (no.)	0.487	3.16	0.604	5.55	0.505	3.85	0.541	5.21
coconut green (no.)	0.164	1.26	0.306	2.94	0.257	2.45	0.450	4.97
guava	0.078	1.14	0.093	1.42	0.083	1.37	0.120	2.19
singara	0.000	0.00	0.004	0.03	0.002	0.06	0.000	0.00
orange, mausami(no.)	0.363	1.31	0.581	2.03	1.121	4.16	1.289	5.02
papaya	0.008	0.09	0.015	0.24	0.028	0.42	0.034	0.76
mango	0.106	3.36	0.227	7.20	0.167	5.89	0.252	9.33
kharbooza	0.010	0.09	0.014	0.19	0.010	0.17	0.006	0.12
pears/naspati	0.000	0.00	0.000	0.00	0.000	0.02	0.000	0.00
berries	0.004	0.05	0.000	0.00	0.004	0.14	0.000	0.00
leechi	0.000	0.01	0.000	0.01	0.000	0.01	0.000	0.01
apple	0.019	1.54	0.046	4.08	0.127	11.01	0.148	14.66
grapes	0.044	2.16	0.070	3.69	0.124	5.94	0.123	6.50
other fresh fruits	-	1.81	-	2.11	-	2.40	-	2.21
fruits (fresh): sub-total	-	25.19	-	44.87	-	53.69	-	71.71
coconut: copra	0.035	2.27	0.052	4.39	0.044	3.02	0.057	5.16
groundnut	0.081	3.83	0.115	7.72	0.100	5.36	0.130	9.15
dates	0.003	0.20	0.003	0.20	0.010	0.80	0.028	2.32
cashew nut	0.002	0.44	0.001	0.47	0.007	2.54	0.006	2.35
walnut	0.000	0.03	0.000	0.04	0.001	0.19	0.002	0.68
other nuts	0.000	0.03	0.000	0.04	0.001	0.14	0.002	0.79
raisin, kishmish, monacca, etc.	0.003	0.56	0.002	0.28	0.005	1.15	0.007	1.59
other dry fruits	0.002	0.28	0.001	0.16	0.002	0.39	0.004	0.70
fruits (dry): sub-total	0.128	7.63	0.174	13.32	0.170	13.59	0.236	22.75

When comparing rural and urban consumption patterns, urban areas consistently showed higher fruit expenditure despite slight differences in quantities consumed. For example, urban areas had higher banana consumption and spending than rural areas. Although coconut consumption was slightly higher in rural areas, urban areas spent more. This reflects the higher income levels and greater access to fruits in urban areas. Additionally, urban areas had a much larger increase in expenditure on both fresh and dry fruits, reflecting economic disparities between rural and urban consumers. Overall, while rural and urban areas experienced growth in fruit consumption and expenditure, urban consumers consistently spent more on fruits, highlighting disparities in income and access to fruit varieties.

Comparison of Fruit Consumption in Karnataka

The analysis for Karnataka reveals notable changes in rural and urban fruit consumption patterns, alongside significant shifts in expenditure, reflecting broader economic and social developments in the region. In rural Karnataka, banana consumption increased from 6.029 to 7.179 units per month, while the associated expenditure rose from 9.38 to 13.50 rupees. Jackfruit consumption, previously absent, emerged at 0.040 kg, with an expenditure of 0.40 rupees. Watermelon consumption slightly decreased from 0.029 to 0.028 kg, but the expenditure increased from 0.27 to 0.36 rupees. Coconut consumption increased from 1.861 to 2.052 units, with the corresponding expenditure rising significantly from 11.53 to 18.15 rupees. Green coconut consumption also grew substantially, increasing from 0.108 to 0.262 units, with expenditure soaring from 0.74 to 2.73 rupees. Overall, the total expenditure on fresh fruits in rural areas increased markedly, from 31.43 to 51.93 rupees. Dry fruits, too, saw an increase in both consumption and expenditure. Groundnut consumption remained relatively stable, rising slightly from 0.121 to 0.122 kg, but the expenditure increased from 6.00 to 8.64 rupees. The overall expenditure on dry fruits in rural Karnataka grew from 8.13 to 15.36 rupees (Table 4).

Similar trends were observed in urban Karnataka, with fruit consumption and expenditure increasing across most categories. Banana consumption increased from 8.731 to 9.186 units, with expenditure rising from 16.56 to 20.96 rupees. Jackfruit consumption rose from 0.001 to 0.017 kg, with associated spending increasing from 0.02 to 0.32 rupees. Watermelon consumption increased from 0.053 to 0.098 kg, with a significant rise in expenditure from 0.46 to 1.68 rupees. Coconut consumption increased from 1.674 to 1.762 units, while expenditure rose from 11.60 to 17.80 rupees. Green coconut consumption saw a notable rise, increasing from 0.170 to 0.389 units, with expenditure jumping from 1.53 to 5.16 rupees. The total spending on fresh fruits in urban areas increased significantly from 56.49 to 98.28 rupees. Dry fruit consumption in urban areas also showed growth. Groundnut consumption increased from 0.091 to 0.142 kg, while expenditure rose from 4.67 to 10.64 rupees. The spending on dry fruits in urban areas grew significantly from 9.88 to 26.20 rupees.

TABLE 4: MONTHLY PER CAPITA CONSUMPTION QUANTITY AND VALUE OF FRUITS IN RURAL AND URBAN KARNATAKA FROM 2009-10 (66TH ROUND) AND 2011-12 (68TH ROUND)

	Rural				Urban			
	2009-10 (66th round)		2011-12 (68th round)		2009-10 (66th round)		2011-12 (68th round)	
KA	quantity per 30 days (kg*)	value (Rs)	quantity per 30 days (kg*)	value (Rs)	quantity per 30 days (kg*)	value (Rs)	quantity per 30 days (kg*)	value (Rs)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
banana (no.)	6.029	9.38	7.179	13.50	8.731	16.56	9.186	20.96
jackfruit	0.000	0.00	0.040	0.40	0.001	0.02	0.017	0.32
watermelon	0.029	0.27	0.028	0.36	0.053	0.46	0.098	1.68
pineapple (no.)	0.008	0.07	0.030	0.36	0.031	0.36	0.047	0.62
coconut (no.)	1.861	11.53	2.052	18.15	1.674	11.60	1.762	17.80
coconut green (no.)	0.108	0.74	0.262	2.73	0.170	1.53	0.389	5.16
guava	0.018	0.24	0.023	0.52	0.011	0.19	0.022	0.61
singara	-	-	0.000	0.00	0.006	0.04	0.000	0.00
orange, mausami (no.)	0.293	0.97	0.373	1.58	0.966	4.58	1.036	5.98
papaya	0.036	0.26	0.028	0.42	0.027	0.39	0.052	1.00
mango	0.058	2.14	0.124	3.49	0.100	3.67	0.200	7.62
kharbooza	0.004	0.04	0.001	0.02	0.003	0.05	0.007	0.14
pears/naspati	-	-	0.000	0.00	-	-	0.004	0.45
berries	0.000	0.00	0.000	0.01	0.000	0.00	0.001	0.01
leechi	0.000	0.01	0.001	0.07	0.000	0.03	0.002	0.05
apple	0.043	3.29	0.059	6.11	0.132	11.86	0.217	25.07
grapes	0.025	1.09	0.047	2.49	0.057	2.69	0.118	7.79
other fresh fruits	-	1.39	-	1.72	-	2.45	-	3.05
fruits (fresh): sub-total	-	31.43	-	51.93	-	56.49	-	98.28
coconut: copra	0.020	1.23	0.050	4.38	0.020	1.25	0.057	4.94
groundnut	0.121	6.00	0.122	8.64	0.091	4.67	0.142	10.64
dates	0.000	0.01	0.002	0.15	0.002	0.21	0.015	1.60
cashew nut	0.001	0.35	0.002	0.85	0.007	2.03	0.009	4.14
walnut	0.000	0.03	0.000	0.01	0.001	0.11	0.001	0.43
other nuts	0.000	0.01	0.005	0.50	0.001	0.22	0.005	0.92
raisin, kishmish, monacca,etc.	0.002	0.23	0.003	0.67	0.006	0.88	0.009	2.57
other dry fruits	0.003	0.27	0.001	0.14	0.005	0.51	0.003	0.96
fruits (dry): sub-total	0.147	8.13	0.185	15.36	0.132	9.88	0.240	26.20

When comparing rural and urban consumption, urban areas consistently show higher fruit consumption expenditure despite slight differences in the quantities consumed. For instance, urban areas had higher banana consumption and spending than rural areas. In 2009-10, urban areas consumed 8.731 bananas compared to 6.029 in rural areas, with expenditures of 16.56 and 9.38 rupees, respectively. In 2011-12, urban banana consumption increased to 9.186 units, with expenditure rising to 20.96 rupees,

while rural consumption increased to 7.179 units, with expenditure rising to 13.50 rupees.

Karnataka's rural and urban areas experienced increased fruit consumption and expenditure between 2009-10 and 2011-12. However, urban areas consistently spent more on fruits, reflecting potentially higher incomes and better access to a wider variety of fruits.

Comparison of Fruit Consumption in Kerala

The comparison between the 66th (2009-10) and 68th (2011-12) rounds of data for Kerala reveals shifts in rural and urban fruit consumption patterns, along with significant changes in expenditure. In rural Kerala, banana consumption slightly decreased from 9.717 to 9.409 units, but the spending increased notably from 19.06 to 25.81 rupees. Jackfruit consumption increased from 0.138 to 0.207 kg, with expenditure rising from 0.58 to 1.36 rupees. Watermelon consumption decreased from 0.122 to 0.077 kg, with a slight drop in spending from 1.10 to 1.04 rupees. Coconut consumption increased from 5.055 to 5.397 units, and the corresponding expenditure rose significantly from 28.78 to 48.06 rupees. In contrast, green coconut consumption decreased from 0.556 to 0.169 units, dropping expenditure from 3.61 to 1.57 rupees. Overall, rural areas saw a substantial increase in fresh fruit expenditure, rising from 70.39 to 109.48 rupees. Dry fruits also grew, with groundnut consumption increasing from 0.017 to 0.021 kg and expenditure rising from 1.27 to 2.29 rupees. The total spending on dry fruits in rural Kerala grew from 4.44 to 9.10 rupees (Table 5).

In urban Kerala, similar trends emerged. Banana consumption increased from 9.551 to 10.338 units, with the expenditure rising from 23.35 to 31.62 rupees. Jackfruit consumption increased from 0.051 to 0.132 kg, with expenditure growing from 0.36 to 1.23 rupees. Watermelon consumption decreased from 0.236 to 0.140 kg, with a slight drop in spending from 2.52 to 2.09 rupees. Coconut consumption slightly increased from 5.050 to 5.180 units, and the corresponding expenditure rose significantly from 29.55 to 47.90 rupees. Green coconut consumption decreased from 0.441 to 0.218 units, with expenditure dropping from 2.81 to 2.24 rupees. Total fresh fruit expenditure in urban areas grew significantly from 91.83 to 134.01 rupees. Dry fruits also increased, though groundnut consumption slightly decreased from 0.026 to 0.018 kg, with a stable expenditure of around 1.85 rupees. The overall spending on dry fruits rose from 7.09 to 13.55 rupees. Overall, both rural and urban areas in Kerala saw increased fruit expenditure between 2009-10 and 2011-12, with urban areas consistently showing higher spending, likely reflecting higher income levels and better access to fruit varieties.

Comparison of Fruit Consumption in Tamil Nadu

The comparison for Tamil Nadu highlights significant changes in rural and urban fruit consumption patterns, accompanied by notable shifts in expenditure. In rural Tamil Nadu, banana consumption increased from 5.236 to 6.126 units, while the

corresponding spending rose from 9.63 to 13.16 rupees. Jackfruit consumption also grew, increasing from 0.004 to 0.011 kg, with expenditure rising from 0.03 to 0.16 rupees. Watermelon consumption experienced a slight increase, moving from 0.007 to 0.013 kg, while the spending grew from 0.11 to 0.19 rupees (Table 6).

TABLE 5: MONTHLY PER CAPITA CONSUMPTION QUANTITY AND VALUE OF FRUITS IN RURAL AND URBAN KERALA FROM 2009-10 (66TH ROUND) AND 2011-12 (68TH ROUND)

	Rural				Urban			
	2009-10 (66th round)		2011-12 (68th round)		2009-10 (66th round)		2011-12 (68th round)	
KL	quantity per 30 days (kg*)	value (Rs)	quantity per 30 days (kg*)	value (Rs)	quantity per 30 days (kg*)	value (Rs)	quantity per 30 days (kg*)	value (Rs)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
banana (no.)	9.717	19.06	9.409	25.81	9.551	23.35	10.338	31.62
jackfruit	0.138	0.58	0.207	1.36	0.051	0.36	0.132	1.23
watermelon	0.122	1.10	0.077	1.04	0.236	2.52	0.140	2.09
pineapple (no.)	0.085	0.80	0.066	1.13	0.080	1.22	0.076	1.08
coconut (no.)	5.055	28.78	5.397	48.06	5.050	29.55	5.180	47.90
coconut green (no.)	0.556	3.61	0.169	1.57	0.441	2.81	0.218	2.24
guava	0.016	0.25	0.023	0.46	0.014	0.28	0.017	0.42
singara	-	-	0.000	0.00	0.001	0.04	0.010	0.09
orange, mausami (no.)	0.812	3.87	1.367	7.06	1.244	5.98	2.169	11.69
papaya	0.034	0.27	0.072	0.66	0.033	0.29	0.066	1.07
mango	0.038	1.34	0.124	4.18	0.079	3.35	0.136	5.55
kharbooza	-	-	0.001	0.00	-	-	0.002	0.05
pears/naspati	0.001	0.01	0.000	0.00	-	-	0.000	0.02
berries	-	-	0.000	0.00	-	-	0.000	0.00
leechi	0.000	0.01	0.001	0.01	0.000	0.02	0.000	0.03
apple	0.048	4.17	0.093	9.33	0.135	12.01	0.167	17.36
grapes	0.095	3.92	0.103	5.35	0.155	6.79	0.142	7.81
other fresh fruits	-	2.60		3.45		3.27		3.75
fruits (fresh): sub-total	-	70.39		109.48		91.83		134.01
coconut: copra	0.000	0.01	0.000	0.02	0.000	0.01	0.000	0.02
groundnut	0.017	1.27	0.021	2.29	0.026	1.87	0.018	1.85
dates	0.012	1.08	0.018	2.81	0.019	1.71	0.022	3.50
cashew nut	0.004	1.31	0.007	2.70	0.008	2.27	0.012	5.05
walnut	-	-	0.000	0.15	0.000	0.18	0.001	0.70
other nuts	0.000	0.12	0.000	0.10	0.001	0.17	0.001	0.37
raisin, kishmish, monacca, etc.	0.003	0.46	0.003	0.55	0.003	0.48	0.004	1.02
other dry fruits	0.001	0.19	0.002	0.48	0.001	0.40	0.002	1.04
fruits (dry): sub-total	0.037	4.44	0.051	9.10	0.058	7.09	0.061	13.55

Coconut consumption slightly decreased from 2.075 to 1.982 units; however, the associated expenditure rose from 10.73 to 14.77 rupees. The consumption of green coconuts showed a marginal increase from 0.146 to 0.159 units, with expenditure rising significantly from 0.84 to 1.48 rupees. Total spending on fresh fruits in rural areas increased considerably, from 31.99 to 50.54 rupees.

TABLE 6: MONTHLY PER CAPITA CONSUMPTION QUANTITY AND VALUE OF FRUITS IN RURAL AND URBAN TAMIL NADU FROM 2009-10 (66TH ROUND) AND 2011-12 (68TH ROUND)

	Rural				Urban			
	2009-10 (66th round)		2011-12 (68th round)		2009-10 (66th round)		2011-12 (68th round)	
TN	quantity per 30 days (kg*)	value (Rs)	quantity per 30 days (kg*)	valu e (Rs)	quantity per 30 days (kg*)	valu e (Rs)	quantity per 30 days (kg*)	valu e (Rs)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
banana (no.)	5.236	9.63	6.126	13.16	7.351	14.30	8.905	22.27
jackfruit	0.004	0.03	0.011	0.16	0.001	0.06	0.004	0.05
watermelon	0.007	0.11	0.013	0.19	0.045	0.54	0.028	0.33
pineapple (no.)	0.023	0.18	0.008	0.08	0.020	0.26	0.022	0.28
coconut (no.)	2.075	10.73	1.982	14.77	2.256	12.80	2.070	17.36
coconut green (no.)	0.146	0.84	0.159	1.48	0.182	1.63	0.167	2.50
guava	0.053	0.85	0.042	0.94	0.043	0.83	0.046	1.18
singara	-	-	0.001	0.03	0.001	0.01	0.000	0.00
orange, mausami (no.)	0.231	1.15	0.285	1.67	0.608	3.39	0.665	4.47
papaya	0.016	0.12	0.007	0.12	0.007	0.16	0.018	0.33
mango	0.030	0.97	0.132	3.83	0.071	2.68	0.155	5.56
kharbooza	-	-	0.000	0.01	0.000	0.00	0.003	0.11
pears/naspati	-	-	0.000	0.00	0.000	0.00	0.000	0.00
berries	0.000	0.01	0.000	0.00	-	-	0.000	0.00
leechi	-	-	0.000	0.00	0.000	0.05	0.000	0.01
apple	0.032	2.81	0.075	8.73	0.115	11.63	0.165	19.15
grapes	0.047	2.28	0.046	2.62	0.098	5.09	0.090	5.22
other fresh fruits	-	2.28	-	2.75	-	2.61	-	2.81
fruits (fresh): sub-total	-	31.99	-	50.54	-	56.04	-	81.63
coconut: copra	0.001	0.01	0.000	0.00	0.000	0.00	0.000	0.03
groundnut	0.010	0.51	0.033	2.13	0.018	1.04	0.025	1.75
dates	0.008	0.77	0.015	1.75	0.025	2.52	0.028	3.32
cashew nut	0.001	0.29	0.002	0.64	0.004	1.29	0.005	2.16
walnut	0.000	0.00	0.000	0.05	0.000	0.04	0.001	0.26
other nuts	0.000	0.01	0.000	0.05	0.001	0.09	0.000	0.05
raisin, kishmish, monacca, etc.	0.001	0.13	0.001	0.20	0.002	0.42	0.002	0.38
other dry fruits	0.000	0.02	0.001	0.11	0.001	0.12	0.001	0.42
fruits (dry): sub-total	0.021	1.74	0.052	4.92	0.051	5.51	0.062	8.37

Dry fruit consumption also increased, with groundnut consumption rising from 0.010 to 0.033 kg, and the associated expenditure increased from 0.51 to 2.13 rupees. The total spending on dry fruits in rural Tamil Nadu saw a notable rise, growing from 1.74 to 4.92 rupees.

Urban Tamil Nadu showed similar trends, with significant fruit consumption and expenditure increases. Banana consumption grew from 7.351 to 8.905 units, with expenditure rising significantly from 14.30 to 22.27 rupees. Jackfruit consumption remained low, increasing slightly from 0.001 to 0.004 kg, while expenditure stayed minimal at around 0.05 to 0.06 rupees. Watermelon consumption decreased from 0.045 to 0.028 kg, with a decrease in expenditure from 0.54 to 0.33 rupees. Coconut consumption slightly reduced from 2.256 to 2.070 units, but the associated expenditure rose from 12.80 to 17.36 rupees. Green coconut consumption decreased from 0.182 to 0.167 units, but the expenditure rose from 1.63 to 2.50 rupees. The total expenditure on fresh fruits in urban areas increased significantly, from 56.04 to 81.63 rupees. Dry fruits in urban areas also grew, with groundnut consumption rising from 0.018 to 0.025 kg and the associated expenditure growing from 1.04 to 1.75 rupees. The total expenditure on dry fruits increased from 5.51 to 8.37 rupees. Overall, both rural and urban areas in Tamil Nadu saw increased fruit consumption and expenditure between 2009-10 and 2011-12, with urban areas consistently showing higher spending, reflecting potentially higher incomes and better access to various fruits.

IV

CONSUMPTION DEMAND OF FRUITS IN SOUTH INDIAN STATES AND INDIA

Income Elasticity for Different Fruit Groups in South India and India

Table 7 presents income elasticity values for fresh and dry fruits in South India and Indian households based on data from the 68th NSSO round. One of the study's key objectives is to evaluate the demand for fruit consumption in South India and India, and income elasticity helps understand how these fruits respond to changes in income. Income elasticity values between 0 and 1 indicate inelastic goods, considered necessities, while values above 1 suggest elastic goods, often considered luxury items. For fresh fruits in South India, bananas (0.559), coconuts (0.519), green coconuts (0.588), and oranges (0.645) are inelastic, similar to India's overall values of 0.352, 0.351, 0.508, and 0.446, respectively. This indicates that these fruits are considered necessities in both regions. However, fruits like watermelon, guava, papaya, mango, kharbooza, apple, and grapes have elasticity values above 1, categorizing them as luxury items. Notably, kharbooza shows extreme elasticity in South India (3.962) compared to India (1.983), suggesting it is a more significant luxury item in South India.

For dry fruits, items like coconut copra (1.052), dates (1.397), walnuts (7.431), other nuts (4.572), and other dry fruits (1.500) are elastic in South India, indicating they are luxury goods. India shows similar trends, although with different values. Cashew nuts are inelastic in South India (0.350) but elastic in India (0.966),

highlighting a regional difference. Interestingly, raisins show a negative elasticity in South India (-0.077), compared to India's positive but inelastic value of 0.134, indicating a decline in demand for raisins with rising income in South India. Overall, South India exhibits higher elasticity values for certain fruits, reflecting a greater tendency to consider these luxury goods than the rest of India.

TABLE 7: INCOME ELASTICITY FOR DIFFERENT FRUIT GROUPS IN SOUTH INDIA AND INDIA

Fruit category (1)	Particulars (2)	South India (3)	India (4)
	Banana	0.559	0.352
	Watermelon	1.490	1.577
	Coconut	0.519	0.351
	green coconut (no.)	0.588	0.508
	Guava	1.309	1.218
	Orange, Mausami	0.645	0.446
	Papaya	1.628	1.355
	Mango	1.367	1.342
	Kharbooza	3.962	1.983
	Apple	1.316	1.285
Fresh fruits	Grapes	1.227	1.210
	Coconut: Copra	1.052	0.818
	Groundnut	0.961	0.844
	Dates	1.397	1.673
	Cashewnut	0.350	0.966
	Walnut	7.431	5.582
	Other Nuts	4.572	3.075
	Raisin, Kishmish, Monacca	-0.077	0.134
Dry fruits	Other Dry Fruits	1.500	1.222

V

COMPENSATED (HICKSIAN) OWN-PRICE AND CROSS-PRICE ELASTICITY OF DEMAND FOR FRUITS IN SOUTH INDIA AND INDIA

Table 8 presents compensated own-price and cross-price elasticity values for various fruit groups in South India and India. These elasticity values help to understand how fruit consumption patterns and preferences differ between the two regions. The diagonal values in the table represent own-price elasticity, while the above and below diagonal values represent cross-price elasticity. Own-price elasticity measures how the demand for a commodity responds to changes in its price, and cross-price elasticity indicates whether goods are substitutes or complements. Negative own-price elasticity suggests the commodity is a non-Giffen good (demand decreases as price increases). In contrast, positive own-price elasticity indicates a Giffen good (demand increases as price increases). For cross-price elasticity, positive values signify substitute goods, while negative values indicate complementary goods.

The own-price elasticity values for various fruit groups reveal critical differences between South India and India. Most values in South India are negative for fresh fruits, suggesting they are non-Giffen goods.

TABLE 8: COMPENSATED OWN-AND-CROSS PRICE ELASTICITY OF FRUIT GROUP (FRESH FRUIT AND DRY) IN SOUTH INDIA AND INDIA

Fresh fruits – South India	Banana	Water melon	Coconut	green coconut (no.)	Guava	Orange, Mausami	Papaya	Mango	Kharbooza	Apple	Grapes
Banana	-0.203	0.016	0.078	0.000	-0.028	-0.016	-0.013	0.065	-0.007	0.082	0.002
Watermelon	0.252	-0.734	1.052	-0.214	0.094	-0.168	0.056	-0.060	-0.271	-0.355	0.283
Coconut	0.094	0.080	-0.095	0.008	-0.040	-0.022	-0.031	0.019	-0.030	0.032	-0.038
green coconut (no.)	0.011	-0.229	0.124	3.383	-0.876	-0.577	-0.689	-0.269	-0.490	0.119	-0.533
Guava	-0.124	0.026	-0.148	-0.223	3.282	-0.119	-0.435	-0.797	-0.249	-0.678	-0.592
Orange, Mausami	-0.205	-0.143	-0.249	-0.458	-0.372	2.663	-0.375	0.381	-0.320	-0.409	-0.541
Papaya	-0.135	0.034	-0.256	-0.388	-0.965	-0.266	6.145	-1.526	-0.427	-1.418	-0.868
Mango	0.087	-0.005	0.016	-0.024	-0.275	0.042	-0.238	1.720	-0.151	-0.765	-0.466
Kharbooza	-0.574	-1.187	-1.771	-2.006	-4.012	-1.650	-3.099	-7.024	30.493	-5.469	-3.872
Apple	0.082	-0.025	0.023	0.007	-0.173	-0.034	-0.163	-0.565	-0.087	1.405	-0.529
Grapes	-0.003	0.027	-0.052	-0.047	-0.207	-0.061	-0.137	-0.472	-0.084	-0.724	1.705

Fresh fruits – India	Bana na	Water-melon	Cocon ut	green cocon ut (no.)	Gua va	Orange , Mausa mi	Papa ya	Mango	Khar b-ooza	Apple	Grapes
Banana	0.055	-0.008	-0.056	0.001	-0.091	-0.074	-0.033	0.112	-0.011	0.072	-0.031
Watermelon	-0.197	-0.523	0.819	-0.012	0.134	-0.177	0.107	0.083	-0.066	-0.561	0.107
Coconut	-0.166	0.129	1.282	-0.116	-0.180	-0.601	-0.071	0.056	-0.173	0.139	-0.362
green coconut (no.)	0.020	-0.018	-1.320	6.315	-0.878	-1.557	-0.366	-0.398	-1.088	0.110	-0.912
Guava	-0.236	0.016	-0.145	-0.059	2.691	-0.191	-0.433	-0.614	-0.247	-0.709	-0.294
Orange, Mausami	-0.365	-0.044	-1.007	-0.230	-0.418	2.298	-0.182	0.392	-0.203	0.220	-0.541
Papaya	-0.158	0.020	-0.096	-0.039	-0.679	-0.134	3.737	-0.971	-0.341	-1.030	-0.556
Mango	0.104	0.006	0.011	-0.016	-0.351	0.094	-0.353	1.774	-0.294	-0.802	-0.418
Kharbooza	-0.260	-0.046	-0.842	-0.451	-1.541	-0.580	-1.355	-3.216	11.164	-1.780	-1.453
Apple	0.031	-0.026	0.031	0.002	-0.286	0.035	-0.265	-0.567	-0.115	1.304	-0.378
Grapes	-0.088	0.011	-0.237	-0.051	-0.246	-0.206	-0.296	-0.612	-0.195	-0.782	2.482

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Dry Fruits South - India	Coconut: Copra	Ground nut	Dates	Cashewnut	Walnut	Other Nuts	Raisin, Kishmish, Monacca	Other Dry Fruits
Coconut: Copra	2.211	-1.457	-0.368	-0.272	-0.087	-0.141	-0.166	-0.194
Groundnut	-0.382	0.631	-0.314	-0.146	-0.045	-0.074	-0.034	-0.067
Dates	-0.418	-1.389	2.878	-0.848	-0.112	-0.191	-0.260	-0.289
Cashewnut	-0.432	-0.808	-1.281	3.438	-0.064	-0.139	-0.608	-0.265
Walnut	-5.339	-11.355	-6.182	-2.558	32.246	-4.907	-1.548	-3.702
Other Nuts	-2.839	-6.184	-3.468	-1.758	-1.610	16.625	-1.154	-1.670
Raisin, Kishmish, Monacca	-0.636	-0.299	-0.909	-1.453	-0.097	-0.229	4.039	-0.383
Other Dry Fruits	-1.579	-2.167	-2.123	-1.302	-0.505	-0.690	-0.777	8.468

Dry Fruits -India	Coconut: Copra	Ground nut	Dates	Cashewnut	Walnut	Other Nuts	Raisin, Kishmish, Monacca	Other Dry Fruits
Coconut: Copra	3.545	-2.138	-0.430	-0.278	-0.246	-0.234	-0.324	-0.398
Groundnut	-0.497	1.173	-0.327	-0.207	-0.155	-0.180	-0.119	-0.206
Dates	-0.631	-2.121	5.192	-0.962	-0.418	-0.470	-0.836	-0.780
Cashewnut	-0.409	-1.320	-0.990	5.175	-0.316	-0.584	-1.276	-0.873
Walnut	-2.666	-7.746	-3.144	-2.354	20.169	-2.625	-2.316	-2.741
Other Nuts	-1.258	-4.312	-1.714	-2.039	-1.282	11.609	-1.232	-1.659
Raisin, Kishmish, Monacca	-0.378	-0.483	-0.717	-1.107	-0.257	-0.278	3.876	-0.739
Other Dry Fruits	-0.728	-1.684	-0.986	-1.083	-0.462	-0.579	-1.080	5.853

For example, bananas (-0.203), watermelon (-0.734), and coconut (-0.095) are non-Giffen goods, meaning demand decreases as prices increase. This is consistent with India's overall pattern, although bananas have a slightly positive elasticity (0.055), classifying them as Giffen goods. Other fruits in South India, like green coconut (3.383), guava (3.282), orange (2.663), papaya (6.145), mango (1.72), kharbooza (30.493), apple (1.405), and grapes (1.705), exhibit positive elasticity, indicating they are Giffen goods. In India, these fruits show similar trends: green coconut (6.315), guava (2.691), orange (2.298), papaya (3.737), mango (1.774), kharbooza (11.164), apple (1.304), and grapes (2.482) are all Giffen goods.

For dry fruits in South India, the picture is mixed. Coconut copra (2.211), dates (2.878), cashew nut (3.438), walnut (32.246), other nuts (16.625), raisins (4.039), and other dry fruits (8.468) all have positive own-price elasticity values, indicating they are Giffen goods. Groundnut (0.631), although positive, has a lower elasticity value than other dry fruits. In India, similar trends are observed for dry fruits, with copra (3.545),

dates (5.192), cashew nut (5.175), walnut (20.169), other nuts (11.609), raisins (3.876), and other dry fruits (5.853) classified as Giffen goods. Groundnut in India also has a positive elasticity value (1.173), indicating it is a Giffen good.

Cross-price elasticity values show whether goods are substitutes or complements. A positive value means that the goods are substitutes (an increase in the price of one leads to a rise in the demand for the other). In contrast, a negative value indicates complementary goods (an increase in the price of one leads to a decrease in the demand for the other). For fresh fruits, in South India, bananas, guavas, oranges, papayas, kharboozas, and grapes have negative cross-price elasticity values, indicating they are complements. On the other hand, watermelons, coconuts, green coconuts, mangoes, and apples have positive values, classifying them as substitutes. In India, bananas, green coconuts, mangoes, and apples are substitutes, while watermelons, coconuts, guavas, oranges, papayas, kharboozas, and grapes are complements. This shows that while some fruits are consistently categorized, there are notable differences in how bananas, watermelons, and coconuts are perceived between the two regions.

For dry fruits, South India and India show similar patterns. Coconut copra is a substitute for other dry fruits, as indicated by its positive cross-price elasticity in both regions. Groundnuts, dates, cashew nuts, walnuts, other nuts, raisins, and other dry fruits are all complements, indicated by their negative cross-price elasticity values. The consistent behavior across both regions suggests that dry fruits are generally complements rather than substitutes in the consumer market.

VI

UNCOMPENSATED (MARSHALIAN) OWN-PRICE AND CROSS-PRICE ELASTICITY OF FRUIT GROUP (FRESH FRUIT AND DRY) IN SOUTH INDIA AND INDIA

Table 9 compares own-price and cross-price elasticity values for various fruit groups in South India and India. These elasticity values provide insights into how consumers respond to changes in the price of fruits, helping classify them as Giffen goods, normal goods, substitutes, or complements.

Own-price elasticity measures how the demand for a good changes in response to its price. Negative values indicate non-Giffen goods, where demand decreases as price increases, while positive values indicate Giffen goods, where demand increases. For fresh fruits, in South India, bananas (-0.319), watermelon (-0.754), and coconut (-0.185) are classified as non-Giffen goods, meaning that demand for these fruits decreases as prices go up. In India, bananas (-0.005) and watermelon (-0.537) are also non-Giffen goods, though coconut (1.262) behaves as a Giffen good, where demand rises with price. Other fruits, such as green coconut (3.376), guava (3.22), orange (2.653), papaya (6.11), mango (1.531), kharbooza (30.481), apple (1.158), and grapes (1.537) in South India, and green coconut (6.312), guava (2.599), and mango (1.597) in India, display positive elasticity values, indicating they are Giffen goods.

TABLE 9: UNCOMPENSATED OWN-AND- CROSS PRICE ELASTICITY OF FRUIT GROUP (FRESH FRUIT AND DRY) IN SOUTH INDIA AND INDIA

Fresh fruits – South India	Banana	Water melon	Coconut	green coconut (no.)	Guava	Orange, Mausami	Papaya	Mango	Khar booza	Apple	Grapes
Banana	-0.319	0.009	-0.019	-0.006	-0.054	-0.024	-0.025	-0.013	-0.009	-0.023	-0.075
Watermelon	-0.056	-0.754	0.794	-0.232	0.022	-0.191	0.024	-0.266	-0.276	-0.635	0.079
Coconut	-0.013	0.073	-0.185	0.002	-0.065	-0.030	-0.042	-0.053	-0.031	-0.065	-0.109
green coconut (no.)	-0.110	-0.236	0.022	3.376	-0.904	-0.586	-0.702	-0.350	-0.492	0.009	-0.613
Guava	-0.395	0.008	-0.374	-0.239	3.220	-0.139	-0.464	-0.978	-0.253	-0.923	-0.771
Orange, Mausami	-0.338	-0.151	-0.360	-0.466	-0.403	2.653	-0.389	0.291	-0.322	-0.530	-0.629
Papaya	-0.472	0.013	-0.538	-0.408	-1.043	-0.291	6.110	-1.752	-0.432	-1.723	-1.091
Mango	-0.195	-0.023	-0.221	-0.041	-0.341	0.021	-0.267	1.531	-0.155	-1.021	-0.654
Kharbooza	-1.392	-1.239	-2.457	-2.054	-4.203	-1.710	-3.185	-7.574	30.481	-6.213	-4.416
Apple	-0.190	-0.042	-0.205	-0.009	-0.236	-0.054	-0.192	-0.748	-0.091	1.158	-0.709
Grapes	-0.256	0.011	-0.264	-0.062	-0.266	-0.079	-0.163	-0.642	-0.088	-0.954	1.537

Fresh fruits – India	Bana na	Watermel on	Coconut	green cocon ut (no.)	Guava	Orange, Mausami	Papaya	Mango	Kharb- ooza	Apple	Grapes
Banana	-0.005	-0.011	-0.076	-0.001	-0.117	-0.086	-0.050	0.066	-0.015	0.006	-0.063
Water melon	-0.465	-0.537	0.730	-0.020	0.015	-0.230	0.032	-0.126	-0.085	-0.856	-0.035
Coconut	-0.226	0.125	1.262	-0.118	-0.207	-0.613	-0.088	0.010	-0.177	0.074	-0.394
green coconut (no.)	-0.066	-0.023	-1.349	6.312	-0.916	-1.574	-0.391	-0.465	-1.094	0.015	-0.957
Guava	-0.443	0.005	-0.214	-0.065	2.599	-0.232	-0.491	-0.775	-0.261	-0.937	-0.404
Orange, Mausam i	-0.441	-0.048	-1.032	-0.232	-0.452	2.283	-0.204	0.333	-0.209	0.136	-0.581
Papaya	-0.388	0.008	-0.173	-0.046	-0.781	-0.179	3.672	-1.150	-0.357	-1.283	-0.678
Mango	-0.123	-0.006	-0.064	-0.023	-0.452	0.049	-0.418	1.597	-0.310	-1.053	-0.539
Kharboo za	-0.596	-0.063	-0.953	-0.461	-1.690	-0.647	-1.450	-3.479	11.140	-2.151	-1.632
Apple	-0.187	-0.037	-0.041	-0.004	-0.383	-0.009	-0.327	-0.737	-0.130	1.064	-0.493
Grapes	-0.294	0.000	-0.305	-0.057	-0.337	-0.247	-0.354	-0.772	-0.209	-1.008	2.373

TABLE 9 CONTD

TABLE 9 (CONCLD)

Dry fruits – South India	Coconut: Copra	Groundnut	Dates	Cashewnut	Walnut	Other Nuts	Raisin, Kishmish, Monacca	Other Dry Fruits
Coconut: Copra	2.125	-1.782	-0.448	-0.322	-0.089	-0.145	-0.187	-0.205
Groundnut	-0.461	0.334	-0.387	-0.192	-0.046	-0.079	-0.053	-0.077
Dates	-0.533	-1.821	2.772	-0.914	-0.114	-0.197	-0.288	-0.304
Cashewnut	-0.461	-0.916	-1.308	3.422	-0.064	-0.140	-0.615	-0.268
Walnut	-5.949	-13.651	-6.744	-2.911	32.235	-4.939	-1.694	-3.778
Other Nuts	-3.214	-7.596	-3.814	-1.975	-1.617	16.605	-1.244	-1.717
Raisin, Kishmish, Monacca	-0.630	-0.275	-0.903	-1.449	-0.096	-0.228	4.040	-0.382
Other Dry Fruits	-1.702	-2.630	-2.236	-1.373	-0.507	-0.697	-0.807	8.452

Dry fruits-India	Coconut: Copra	Groundnut	Dates	Cashewnut	Walnut	Other Nuts	Raisin, Kishmish, Monacca	Other Dry Fruits
Coconut: Copra	3.508	-2.301	-0.458	-0.304	-0.250	-0.242	-0.353	-0.419
Groundnut	-0.536	1.006	-0.356	-0.234	-0.159	-0.188	-0.149	-0.228
Dates	-0.708	-2.452	5.135	-1.016	-0.426	-0.486	-0.895	-0.824
Cashewnut	-0.454	-1.511	-1.023	5.144	-0.321	-0.593	-1.310	-0.898
Walnut	-2.923	-8.852	-3.335	-2.533	20.143	-2.679	-2.515	-2.887
Other Nuts	-1.399	-4.921	-1.820	-2.137	-1.296	11.579	-1.341	-1.739
Raisin, Kishmish, Monacca	-0.384	-0.509	-0.721	-1.111	-0.258	-0.279	3.871	-0.742
Other Dry Fruits	-0.784	-1.927	-1.028	-1.122	-0.468	-0.591	-1.123	5.821

For dry fruits in South India, most fruits such as copra (2.125), dates (2.772), cashew nut (3.422), walnut (32.235), and raisins (4.04) are Giffen goods. Groundnut (0.334) also has a positive value but is relatively low. India shows similar trends for dry fruits, with positive values for cashew nuts (5.144) and walnuts (20.143), also classifying them as Giffen goods.

Cross-price elasticity measures whether goods are substitutes or complements. Positive values indicate substitutes, while negative values suggest complements. For fresh fruits, in South India, bananas, watermelons, coconuts, guavas, oranges, and other fruits have negative cross-price elasticity values, suggesting they are complements. Similarly, in India, most fresh fruits are complements with negative elasticity values,

except for mangoes and apples, which show a more complex relationship. These fruits can act as substitutes in certain situations (positive values) and complements in others (negative values). Both South India and India show consistent behaviour for dry fruits, with groundnuts, dates, cashew nuts, walnuts, and other dry fruits having negative cross-price elasticity values, making them complements. The exception is coconut (copra), which acts as a substitute, as shown by its positive cross-price elasticity in both regions.

VII

CONCLUSION AND POLICY IMPLICATIONS

The study reveals that fruit cultivation in South India and the rest of India has grown significantly over the past three decades, with notable variations across states. Andhra Pradesh leads production and productivity, showcasing strong advancement in fruit cultivation practices. Tamil Nadu and Karnataka also demonstrate considerable growth, although their progress in yield efficiency is less pronounced. Kerala, however, lags, indicating minimal area expansion and moderate improvements in productivity. The disparities among the states highlight the uneven progress in fruit cultivation across the region. Urban areas consistently show higher fruit consumption rates and expenditure than rural regions. This suggests an urban-rural divide in access to fruits, likely driven by economic disparities and infrastructure gaps. The increasing demand for fruits in South India, influenced by rising incomes and health consciousness, underscores the need for better supply chain infrastructure and more targeted interventions to address these gaps.

Several policy interventions are recommended to enhance fruit production further and bridge the consumption gap between rural and urban areas. Focused investment in states like Kerala to improve irrigation, storage, and transport systems will help reduce post-harvest losses and increase market access. Encouraging research on high-yield fruit varieties, especially those suited to Kerala's climatic conditions, and disseminating findings through training programs aimed at farmers will help them adopt best practices. Subsequently, subsidized fruit programs and nutritional awareness campaigns should be implemented to reduce the consumption gap between urban and rural areas, allowing lower-income households access to more nutritious food options. Developing local fruit markets and improving transport links between rural and urban centers will enhance produce flow and provide farmers with greater market opportunities. By implementing these measures, policymakers can help increase fruit production, improve distribution, and ensure more equitable access to nutritious fruits across India.

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