

International Journal of Agriculture Extension and Social Development

Volume 9; Issue 6; June 2026; Page No. 996-1001

Received: 02-03-2026
Accepted: 08-04-2026

Indexed Journal
Peer Reviewed Journal

Socio-economic status of papaya growers and growth trends in area, production and productivity: Evidence from North-Eastern Karnataka

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DOI: <https://www.doi.org/10.33545/26180723.2026.v9.i6m.3802>

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Abstract

Papaya is an important commercial fruit crop in India, contributing significantly to the horticulture sector due to its high productivity, nutritional value, and income-generating potential. The present study was conducted to analyze the growth performance of papaya cultivation and to assess the socio-economic characteristics and cropping pattern of papaya growers in the North Eastern Karnataka (NEK) region. The results revealed significant growth in area, production, and productivity of papaya at the national, state, and regional levels. Karnataka and the NEK region recorded higher growth compared to the national average, indicating improved performance of papaya cultivation. The socio-economic analysis showed that 92.50 per cent of farmers were primarily dependent on agriculture as their main occupation. The majority of farmers belonged to the middle-income category, and papaya occupied an important position in their cropping pattern. The study highlights the growing importance of papaya cultivation and emphasizes the need for improved production practices, market support, and policy interventions to enhance the profitability and sustainability of papaya farming.

Keywords: CAGR, productivity, socio-economic, production

1. Introduction

India's diverse climatic condition ensures year-round availability of a wide range of fresh fruits and vegetables making it the second-largest producer in the world, after China. India achieved a remarkable production of 112.97 million metric tonnes of fruits, cultivated across 7.13 million hectares of land during 2023-24 (FAOSTAT, 2024)^[1]. According to the FAO (2024), India is leading country in the production of bananas (33%), mangoes (22%), citrus fruits (12-13%) and papayas (6%).

Papaya (*Carica papaya* L.), often celebrated for its nutritional value and vibrant appeal, plays a pivotal role in the agricultural economy of India. It is originated in tropical America and was introduced in India in the sixteenth century. Among the major fruits cultivated globally, papaya contributes approximately 14.65 million tonnes of production (FAOSTAT, 2024)^[1]. India with a diverse range of papaya varieties cultivated, some displaying vibrant colors, exceptional taste and numerous health benefits the fruit is often referred to as the "fruit of angels" and is cultivated in various regions of the country. Being highly perishable, papayas ripen swiftly, especially in warm climates and have a short shelf life. It is estimated that around 25-30 per cent of papaya production is lost during harvesting and post-harvest processes. Implementing proper handling procedures from harvest to market can significantly mitigate these losses and ensure that consumers' receive high-quality fruits, thereby helping farmers to fetch better prices for their produce.

Papaya is a significant tropical fruit cultivated in almost every country around the globe. Global papaya production

has grown significantly over the last few years, mainly as a result of increased production in India. Papaya has become an important agricultural export for developing countries, where in export revenues of the fruit provide a livelihood for thousands of people, especially in Asia and Latin America. The leading papaya-producing countries in the world include India (38.64%), Dominican Republic (9.27%), Mexico (8.24%), Brazil (8.01%), Indonesia (7.88%) and Nigeria (6.34%) (Papaya Production by Country, 2026). In India, the area under papaya cultivation spans 1.48 lakh hectares with a production volume of approximately 52.92 lakh tonnes, accounting for 38.64 per cent of the total world production (FAOSTAT, 2024)^[1]. The major papaya-producing states in India are Andhra Pradesh (21.91%), Gujarat (17.05%), Madhya Pradesh (10.37%), Maharashtra (10.30%), Karnataka (7.63%) and Chhattisgarh (6.23%). (<https://agriexchange.apeda.gov.in>) Understanding the socio-economic profile of papaya growers is essential for designing targeted developmental programmes and extension strategies suited to the specific needs of the farming community. Equally important is an analysis of the growth trends in area, production, and productivity of papaya, which provides valuable insights into the performance of the crop over time and helps identify the factors driving or constraining its expansion. Despite the growing importance of papaya cultivation in North-Eastern Karnataka, systematic empirical studies examining the socio-economic characteristics of growers and the growth dynamics of the crop in this region remain limited.

In view of the above, the present study was undertaken with

the objectives of examining the socio-economic status and cropping pattern of sample papaya growers and analyzing the growth trends in area, production, and productivity of papaya in North-Eastern Karnataka. The findings of the study are expected to provide a comprehensive understanding of the papaya crop in the region.

2. Methodology

2.1 Sampling design

2.2.1 Selection of the districts

The study employed a multistage random sampling approach to design the sampling framework. Initially, four districts namely Ballari, Koppal, Raichur and Kalaburagi were chosen based on the highest area under papaya crop within the North –Eastern Karnataka region.

2.2.2 Selection of the taluks

Two taluks were chosen from each district considering

their substantial area under papaya cultivation and potential production, in consultation with the officials of Raitha Samparka Kendra, Krishi Vigyan Kendra and Agricultural Extension Education Centers of respective taluks.

In the third stage, ten farmers were randomly chosen from these selected taluks to ensure representation across different villages. The village selection within the chosen taluks was guided by the insights of horticulture officers and market intermediaries ensuring a thorough assessment of papaya cultivation potential and grower concentration. Thus, total sample size of papaya cultivators was 80 consisting 20 farmer respondents from each district along with 20 market intermediaries representing 5 respondents each from the selected districts were chosen for eliciting required marketing information. Thus, the total sample of 100 respondents constituting 80 papaya cultivators and 20 market intermediaries were chosen for the study.

Table 2.1: Distribution of samples respondents in the study area

Sl. No.	District	Taluks	No. of respondents	Total
A. Farmer-Producer				
1	Ballari	Harapanahalli	10	20
		Kudligi	10	
2	Koppal	Kustagi	10	20
		Kanakagiri	10	
3	Raichur	Lingasugur	10	20
		Maski	10	
4	Kalaburagi	Kalaburagi	10	20
		Afzalpur	10	
Sub-total				80
B. Market intermediaries				
Sl.No	District			Sample size
1	Ballari			5
2	Koppal			5
3	Raichur			5
4	Kalaburagi			5
Sub-total				20
Gross total				100

2.2 Analytical techniques employed

2.2.1 Tabular Presentation

The gathered data were organized into tables to facilitate easy and effective comparisons. Tabular analysis was carried out to study the general characteristics of sample farmers and also to examine the investment pattern, procurement expenses, inventory costs, other expenditures and returns. Statistical tools such as averages and percentages were employed to summarize the data to derive meaningful inferences.

2.2.2 Compound Annual Growth Rate analysis

For analyzing the growth trend in area in different crop groups across the study area, the Compound Annual Growth Rate (CAGR) analysis was used. Similarly, (Nadkarni and Deshpande, 1982) ^[18] used the CAGR to calculate the growth. It was calculated using the formula,

$$Y_t = ab^t U_t \quad \dots\dots\dots(1)$$

Where,

Y_t =Dependent variable for which the growth rate is estimated (area, production and productivity of papaya).

a = Intercept

b =Regression coefficient

t = Time in year 1,2,3,...,n.

U_t = Disturbance term for the years t .

The compound growth rate was obtained from the logarithmic form of the equation (1) as below

$$\ln Y = \ln a + t \ln b$$

The per cent compound growth rate was derived using the relationship

$$CAGR = (Anti \log of \ln b_{t-1}) \times 100$$

3. Results and Discussion

3.1 Socio-economic characteristics of papaya producing farmers

3.1.1 General characteristics of sample farmers

The analysis of the socio-economic characteristics of papaya farmers provides insights into their demographics, particularly in relation to papaya production and marketing. The general characteristics of the sample farmers presented

in Table 3.1 revealed that the majority of the farmers (53.75%) belonged to the age group of 35-55 years across the study districts, indicating that papaya farming is predominantly undertaken by middle-aged individuals. Young farmers below 35 years accounted for 20 per cent of the respondents, with Raichur recording the highest representation (25%), while farmers aged above 55 years comprised 26.25 per cent, with Kalaburagi having the highest proportion (35%). The overall average age of the sample farmers was 40.83 years, ranging from 37.26 years in Raichur to 45.14 years in Kalaburagi. These findings highlight the importance of farming experience in papaya cultivation and underscore the need to encourage younger

farmers to adopt modern technologies while learning from the experience of their older counterparts.

With respect to educational status, a significant proportion of farmers (38.75%) had pursued college-level education or higher, particularly in Ballari (45%), Kalaburagi (40%), and Koppal (40%). Farmers with high school education comprised 31.25 per cent of the sample, while 20 per cent had completed primary education. Illiteracy was relatively low at 10 per cent, though Raichur recorded a slightly higher proportion (15%). The relatively higher educational attainment among the sample farmers is expected to positively influence their ability to adopt modern and improved farming practices.

Table 3.1: General features of papaya farmers in the study districts

Sl. No.	Particulars	Ballari (n=20)		Koppal (n=20)		Raichur (n=20)		Kalaburagi (n=20)		Overall (n = 80)	
		No.	%	No.	%	No.	%	No.	%	No.	%
1	Age (Years)										
	< 35	03	15.00	04	20.00	05	25.00	04	20.00	16	20.00
	35 - 55	11	55.00	12	60.00	11	55.00	09	45.00	43	53.75
	> 55	06	30.00	04	20.00	04	20.00	07	35.00	21	26.25
	Average age	38.51		42.38		37.26		45.14		40.83	
2	Education level										
	Illiterate	02	10.00	01	5.00	03	15.00	02	10.00	08	10.00
	Primary school	04	20.00	05	25.00	04	20.00	03	15.00	16	20.00
	High school	05	25.00	06	30.00	07	35.00	07	35.00	25	31.25
	College and above	09	45.00	08	40.00	06	30.00	08	40.00	31	38.75
3	Land holding										
	Small (< 2 ha)	14	70.00	11	55.00	13	65.00	12	60.00	50	62.50
	Medium (2-4 ha)	06	30.00	05	25.00	05	25.00	06	30.00	22	27.50
	Large (>4 ha)	06	30.00	04	20.00	02	10.00	02	10.00	14	17.50
	Average land holding (ha)	2.52		2.21		1.98		2.03		2.18	

Regarding land holdings, the majority of farmers (62.5%) possessed small holdings of less than 2 hectares, with Ballari recording the highest share (70%) and Koppal the lowest (55%). Farmers with medium-sized holdings (2-4 ha) accounted for 27.5 per cent, while those with large holdings (above 4 ha) comprised a relatively smaller proportion of 17.5 per cent. The average land holding size across the study districts was 2.18 hectares, with Ballari having the highest average (2.52 ha) and Raichur the lowest (1.98 ha), reflecting the predominantly small and marginal nature of papaya growers in the region.

3.1.2 Economic status and social composition of sample farmers

The occupational status of papaya growers is presented in Table 3.2. It indicates that the majority of farmers across the study districts were primarily engaged in agriculture as their main occupation. Overall, 92.50 per cent of the respondents were involved in agriculture, while a small proportion (7.50 per cent) had secondary occupations other than agriculture. The economic profile of papaya producers is also presented in Table 3.2. The findings revealed that the majority of farmers (57.50%) across the four districts had an annual income ranging from Rs. 2.01 to 4.00 lakh. About 10 per cent of farmers earned less than Rs. 2.00 lakh annually, whereas 18.75 per cent had annual incomes between Rs.

4.01 to 6.00 lakh, and 13.75 per cent earned more than Rs. 6.00 lakh annually.

The distribution of papaya-growing farmers across different social categories, as presented in the table, showed that the largest proportion (42.50%) belonged to the General category, followed by Other Backward Classes (30%). A smaller proportion of farmers belonged to Scheduled Caste (15%) and Scheduled Tribe (12.50%) categories, indicating variation in social representation across the study districts.

3.1.3 Cropping pattern of the sample farmers

The cropping pattern followed by the sample farmers across the study districts is presented in Table 3.3. The results of the study demonstrated distinct preferences for various crops among the farmers. In Ballari, field crops during the Kharif season occupied 52.50 per cent of the total cultivated area, with bajra being the most significant crop, covering 13.40 per cent, followed by cotton (10.50%). During the Rabi season, field crops accounted for 23.30 per cent of the cultivated area, with bengalgram and jowar being the major crops, covering 7.60 per cent and 8.70 per cent, respectively. Horticultural crops were dominant in Ballari, occupying 24.20 per cent of the total area, with papaya being the predominant crop, covering 9.80 per cent of the cultivated land, indicating farmers' preference for this high-value crop.

Table 3.2: Socio-economic status of sample respondents in the study districts

Sl. No.	Particulars	Ballari (n=20)		Koppal (n=20)		Raichur (n=20)		Kalaburagi (n=20)		Overall (n = 80)	
		No.	%	No.	%	No.	%	No.	%	No.	%
1	Occupation										
a	Agriculture (Main)	17	85.00	18	90.00	20	90.00	19	95.00	74	92.50
b	Other (Secondary)	03	15.00	02	10.00	-	10.00	01	5.00	06	07.50
2	Annual income (Rs.)										
	< 2 lakh	02	10.00	03	15.00	02	10.00	01	5.00	08	10.00
	2.01 – 4 lakh	08	40.00	12	60.00	12	60.00	14	70.00	46	57.50
	4.01 – 6 lakh	06	30.00	02	10.00	04	20.00	03	15.00	15	18.75
	>6 lakh	04	20.00	03	15.00	02	10.00	02	10.00	11	13.75
3	Social composition										
	Scheduled Caste (SC)	04	20.00	03	15.00	02	10.00	03	15.00	12	15.00
	Scheduled Tribe (ST)	01	5.00	02	10.00	03	15.00	04	20.00	10	12.50
	Other Backward Classes (OBC)	06	30.00	07	35.00	06	30.00	05	25.00	24	30.00
	General (GM)	09	45.00	08	40.00	09	45.00	08	40.00	34	42.50

In Koppal, a similar cropping pattern was observed, with field crops during the Kharif season covering 59.70 per cent of the total cultivated area. Greengram was the most prominent crop, occupying 11.20 per cent of the area, followed by cotton (11.20%). During the Rabi season, field crops accounted for 23.90 per cent of the area, with jowar being the leading crop (10.30%). Horticultural crops were also prominent in Koppal, occupying 16.40 per cent of the total area, with papaya being the dominant crop, accounting for 8.30 per cent of the cultivated area among the sample respondents.

Raichur exhibited a higher allocation of area under field crops, with Kharif crops covering 61.40 per cent of the total cultivated area. Cotton (14.80%) and redgram (11.70%) were the major crops during the Kharif season. During the Rabi season, field crops covered 21.60 per cent of the area, with jowar (10.50%) and groundnut (5.90%) being the primary crops. Horticultural crops covered 17.00 per cent of the cultivated area, with papaya being the major crop, accounting for 7.10 per cent of the area among the sample respondents.

Kalaburagi had the highest proportion of land allocated to field crops during the Kharif season, occupying 64.90 per cent of the total cultivated area. The major crops were redgram (14.60%) and greengram (11.70%). During the Rabi season, field crops occupied 20.40 per cent of the cultivated area, with jowar (11.70%) and bengalgram

(9.30%) being the major crops. Horticultural crops were comparatively less predominant in Kalaburagi, covering 14.60 per cent of the total area, with papaya being the leading crop, accounting for 8.40 per cent of the cultivated area among the sample respondents.

3.2 Growth in area, production and productivity of papaya

The growth in area, production, and productivity of papaya is presented in Table 3.4 and Fig. 1. At the national level, the area under papaya cultivation increased at a growth rate of 5.06 per cent, while production and productivity increased by 6.77 per cent and 1.63 per cent, respectively. The growth in area, production, and productivity was significant at the 5 per cent level. In Karnataka, the area under papaya cultivation increased by 8.04 per cent, with production registering a growth rate of 31.91 per cent, and both were significant at the 5 per cent level. However, productivity growth in the state was 22.11 per cent, which was significant at the 10 per cent level. Further, in the NEK region, the growth rates in area, production, and productivity were 28.11 per cent, 29.02 per cent, and 28.14 per cent, respectively, and all were significant at the 10 per cent level. The significant growth in productivity in the region indicated improved efficiency in papaya cultivation practices.

Table 3.3: Cropping pattern followed by the sample farmers in the study districts

Sl. No.	Particulars/Districts	Ballari (n=20)		Koppal (n=20)		Raichur (n=20)		Kalaburagi (n=20)	
		Area (acre)	% age	Area (acre)	% age	Area (acre)	% age	Area (acre)	% age
I.	Field crops								
A.	Kharif								
1.	Redgram	39.23	07.80	47.21	09.90	56.65	11.70	68.32	14.60
2.	Greengram	32.03	06.30	48.09	11.20	36.76	07.60	54.68	11.70
3.	Blackgram	33.76	06.70	36.34	07.60	32.04	06.60	39.67	08.50
4.	Cotton	52.86	10.50	56.56	11.20	71.43	14.80	49.8	10.60
5.	Bajra	67.86	13.40	53.32	10.80	58.85	11.10	44.01	09.40
6.	Sunflower	39.56	07.80	42.62	09.00	46.23	09.60	48.2	10.30
	Sub total	265.3	52.50	284.14	59.70	301.96	61.40	304.68	64.90
B.	Rabi								
1.	Groundnut	35.60	07.00	31.03	06.50	28.42	05.90	0.00	0.00
2.	Jowar	43.86	08.70	48.78	10.30	50.65	10.50	52.18	11.70
3.	Bengalgram	38.48	07.60	33.87	07.10	29.64	05.30	43.6	09.30
	Sub total	117.94	23.30	113.68	23.90	108.71	21.60	95.78	20.40

II.	Horticultural crops								
1.	Onion	14.35	02.80	11.90	02.50	9.93	02.10	8.50	01.80
2.	Pomegranate	29.82	05.90	26.73	05.60	37.88	07.80	20.87	04.40
3.	Arecanut	28.36	05.60	0.00	0.00	0.00	0.00	0.00	0.00
4.	Papaya	49.78	09.80	39.46	08.30	34.34	07.10	39.30	08.40
	Sub total	122.31	24.20	78.09	16.40	82.15	17.00	68.67	14.60
	Total (I+II)	505.55	100.00	475.77	100.00	483.82	100.00	469.13	100.00

Table 3.4: Growth in area, production and productivity of papaya during 1991-2021 (percent/ annum)

Sl. No.	Particulars	Area	Production	Productivity
1	Ballari	5.76**	30.75*	23.65**
2	Koppal	10.35**	33.84**	21.35*
3	Raichur	12.38*	41.28*	22.27**
4	Kalaburagi	9.32**	34.20**	22.78**
	NEK region	28.11*	29.02*	28.14*
	Karnataka	8.04**	31.91**	22.11*
	India	5.06**	6.77**	1.63**

Note: **Significant at 5 per cent level

*Significant at 10 per cent level

The district-wise growth in area, production, and productivity is presented in Table 3.4. Ballari district recorded growth rates of 5.76 per cent in area, 30.75 per cent in production, and 23.65 per cent in productivity. The growth in area and productivity was significant at the 5 per cent level, whereas production growth was significant at the 10 per cent level. Koppal district exhibited growth in area and production of 10.35 per cent and 33.84 per cent, respectively, and both were significant at the 5 per cent level. However, productivity growth was comparatively

lower (21.35 per cent) and significant at the 10 per cent level.

Similarly, Raichur district recorded the highest growth in area (12.38 per cent) and production (41.28 per cent), with both being significant at the 10 per cent level. Productivity growth in Raichur was 22.26 per cent and was significant at the 5 per cent level. The district stood out with the highest growth in area and production, indicating successful expansion of papaya cultivation along with improved productivity. Kalaburagi district also showed significant growth in area, production, and productivity of papaya, with growth rates of 9.32 per cent, 34.20 per cent, and 22.78 per cent, respectively, all significant at the 5 per cent probability level.

Overall, Ballari and Raichur demonstrated strong growth in both area and production, accompanied by significant improvements in productivity. Although Karnataka exhibited higher growth in area, production, and productivity, the national-level growth in papaya productivity was comparatively lower. This indicates that Karnataka, particularly districts such as Raichur, Kalaburagi, and Ballari, outperformed the national average in papaya production during the study period.

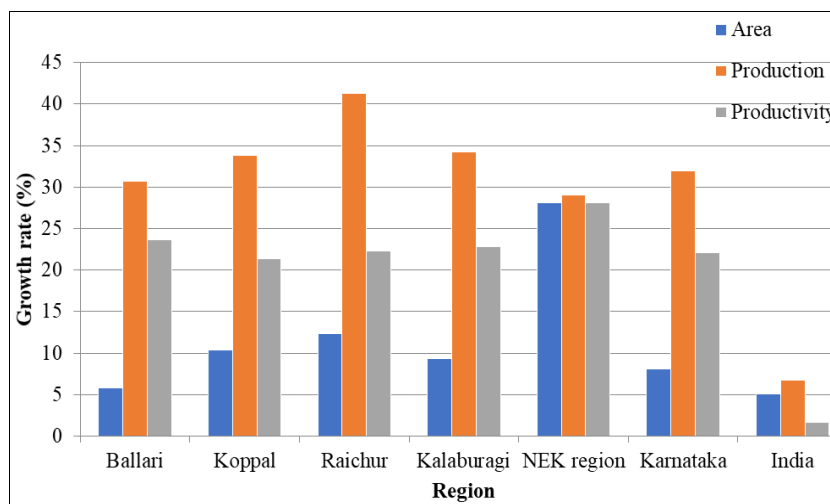


Fig 1: Growth in area, production and productivity of papaya in the study area

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