

Economic Roller Coaster Of East Godavari Dt Banana Market 2019-24

Ms. N. Sridevi Parvathi^{1*}, Dr Ganga Vidya²

^{1*}Lecturer, SKBR College, Amalapuram, East Godavari – AP

²Visiting Professor, Humanities Dept NIT Trichy – TN,

Citation: Ms. N. Sridevi Parvathi, et.al, (2024), Economic Roller Coaster Of East Godavari Dt Banana Market 2019-24 , *Educational Administration: Theory and Practice*, 30(6), 4408- 4419
Doi: 10.53555/kuey.v30i6.7080

ARTICLE INFO

ABSTRACT

Banana is a vital horticultural crop grown in over 120 countries. India is the world's largest banana producer, but faces challenges in profitability and marketing. In India, banana cultivation occupies a significant area, with an average national yield of 33 million tonnes/hectare. Banana cultivation is crucial for socioeconomic development, contributing to food security, income generation, and job creation. Research suggests opportunities to improve production practices and address constraints faced by farmers. Also, Marketing presents additional hurdles due to perishability, middlemen, and limited infrastructure. The chosen research period (2019-2022) presents unique challenges that haven't been previously explored. However, there are challenges faced by farmers, including traditional varieties, limited profitability, improper spacing, and short replanting cycles.

Introduction - Bananas: A Global Fruit Powerhouse

Bananas are the world's most popular fruit, with massive production and trade volumes. As the fourth most important food crop, they contribute significantly to global food security and economies. India is the leading producer, while Asia-Pacific dominates consumption. Despite challenges like weather and disease, the banana market continues to grow, driven by increasing global demand. Bananas offer significant economic and nutritional value. They are a versatile crop with multiple commercial uses, from the fruit itself to its stems, leaves, and even waste products.

Fig 1. Banana Retail



Nutritional Benefits:

Rich in potassium, vitamins, fiber, calcium, and iron.

- Provides instant energy due to natural sugars.
- Low in fat and cholesterol.
- Helps prevent heart disease, high blood pressure, arthritis, and other health issues.

Economic Importance:

- High-profit crop with low investment.
- Diverse product range: fresh fruit, processed products (chips, puree, jam, etc.), and even animal feed.
- Growing consumer demand for healthy and nutritious foods boosts market potential.

Medicinal Uses of Banana

Copyright © 2024 by Author/s and Licensed by Kuey. This is an open access article distributed under the Creative Commons Attribution License which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited

- **All parts of the banana plant** have medicinal properties.
- **Rich in nutrients** like iron, potassium, vitamins, and fibre.
- **Treats various ailments:** anaemia, blood pressure, depression, gastric ulcers, diarrhoea, hangovers, heartburn, memory loss, morning sickness, and mosquito bites.
- **Prevents serious diseases** like cancer and heart disease.

Non-Edible Commercial Uses of Banana

- **Banana plant complete**, has commercial value.
- **Leaves** used for thatching, packing, and as plates.
- **Pseudo stem** for fibre, rope, paper, and handicrafts.
- **Banana tree** for decoration in ceremonies.
- **Banana peel** for leather tanning and soap making.
- **Animal feed:** ripe bananas, dehydrated banana pulp, and banana silage.

India Dominates Global Banana Production

India is the world's top banana producer, contributing over 30% of global output. China is the second-largest producer, together accounting for nearly 42% of total production. India is the world's leading banana producer, with an average yield of 14.31 tonnes per acre over the past 11 years. However, despite its dominant position, India's share of the global export market remains small.

Production Trends

- India, Angola, and Tanzania saw production increases from 2012-2022.
- Brazil, Philippines, and Colombia experienced production declines.
- Colombia had the highest production variation, while Brazil had the lowest.

India produces over 30% of the world banana production for the last 10 years. Out of the 32,453 metric tonnes around 25,000 metric tonnes are used for in-house consumption; the only remaining is exported. Around 5 lakh metric tonnes of banana are lost every year due to perishability. Therefore, key findings are

- **Stagnant production:** No significant increase in yield or cultivation area.
- **Low exports:** India exports a minimal portion of its banana production.
- **Major export markets:** Iran, UAE, Iraq, and Oman.

• State	Banana Production Districts
Andhra Pradesh	YSR.Kadapa, East Godavari, Ananthapur, Guntur, West Godavari, Kurnool, Krishna, Prakasam, Vizianagaram, Vishakhapatnam
Assam	Barpeta, Kamrup, Nalbari, Nagaon, Sonitpur
Gujarat	Surat, Anand, Bharuch, Narmada, Vadodara
Karnataka	Shimoga, Dakshin Kannada, Tumkur, Bangalore.Udupi, Uttara Kannada, Belgaum Chickmangalur, Hassan, Mandya
Madhya Pradesh	Khandwa, Badwani, Khargone, Dhar
Maharashtra	Jaigaon Dhule Buldhana
Tamilnadu	Tiruchirapalli, Coimbatore, Pudukottai, North Arcot, Ambedkar, Theni Periyar, Karur, Dindigul Anna, Thanjavur, Nammakal, Madurai

Source: National horticulture board/ <https://nhb.gov.in>

India's Banana Export Challenge

Despite being the world's largest banana producer, India has a minuscule 0.6% share in global banana exports, ranking 20th. This is due to factors like reliance on air freight and limited market diversification.

Global Banana Market Disruptions:

The Russia-Ukraine conflict has significantly impacted the global banana market:

- **Russia:** A major importer facing sanctions and fertilizer shortages.
- **Netherlands:** Oversupply due to Russian market loss.
- **France:** Increased competition from Eastern European suppliers.
- **North America:** Supply shortages due to increased costs & reliance on specific suppliers.
- **Italy:** Higher prices due to shipping costs and inflation.
- **China:** Rising domestic prices and import challenges due to customs delays.
- **Germany:** Dollar appreciation and increased costs impacting profitability.
- **Spain:** Increased imports due to low domestic production caused by adverse weather.

Review of Literature

The Review Studies highlight various aspects:

- ✓ Factors affecting production (land, fertilizer, education) and profitability (cost-benefit analysis).

- ✓ Constraints faced by farmers (limited access to resources, lack of knowledge of new technologies).
- ✓ Importance of post-harvest management practices for reducing losses.
- ✓ The role of government support in providing infrastructure, training, and market access.

Kenya JM Maingi, O Ombori, CN Wahome, and JM Kimiti (2021) studied banana production in Kenya, focusing on cultivar diversity and tissue culture adoption. Bananas are a staple crop grown primarily by smallholders. Tissue culture offers disease-free planting material but has low adoption due to limited access to seedlings. Key challenges to banana production include limited inputs, lack of knowledge, and pest/disease issues.

Benin (2021) identified key constraints in Benin's banana and plantain value chain: production challenges (wind damage, lack of irrigation, climate change, land scarcity, low rainfall) and market challenges (low prices, poor market access). Many farmers already use organic practices, suggesting potential for organic conversion. Addressing these constraints through better knowledge and practices can improve sustainability, productivity, and profitability.

Kumar et al (2018) stated that Banana cultivation in India is dominated by the small farmers with average acreage less than three (3) acres, whereas in other nations it is mainly under the control of large farmers. He stated that farmers in Bihar are cultivating only the traditional varieties of banana. The profitability of the banana products has not been quite substantial.

Raj Kumar Adhikari, Ujjal Tiwari, Manoj Sharma, and Shiva Chandra Dhakal | (2017) analyzed banana profitability, productivity, and resource efficiency in Nepal's Hetauda-Dumkibas corridor. Bananas are a significant summer crop with high profitability (BCR 1.5-4). Despite being Nepal's second most important summer fruit, production falls short of meeting demand due to low yields, post-harvest losses, and limited market focus.

Noor et al. (2015) assessed the economics of banana contract farming in Sindh, Pakistan. Their findings revealed average costs of INR 21334 per farm for marketing, including loading, transportation, and unloading. Total production costs were INR 158581, comprising fixed expenses, labor, capital inputs, and marketing.

Mukul and Rahman's 2013 study analyzed the profitability of banana production and distribution in Bangladesh. They examined costs, profits, and efficiency for producers, wholesalers, and retailers. They found that **Profitability:** Producers earned Tk. 55002.8 per hectare, wholesalers Tk. 59.08 per chari, and retailers Tk. 122.67 per chari. **Efficiency:** Benefit-cost ratios were 1.40 for producers, 1.30 for wholesalers, and 1.41 for retailers, indicating overall profitability in the banana supply chain.

Reviews of the Indian Banana Market Scenario

N Selvaraj (2021) studied marketable banana surplus in Dindigul, Tamil Nadu. Farmers were found to underutilize fertilizers and pesticides due to high costs. Small farmers had a higher marketable surplus (92.26%) compared to large farmers (87.61%). The study recommends government support, including crop insurance, water security, fair prices, and subsidies, to boost banana cultivation and farmer income.

Kumari et al. (2018) found that inadequate marketing, transportation, and storage facilities, along with a lack of processing industries, led to unstable banana prices and poor economic conditions for small-scale farmers. The study recommended government support in providing uninterrupted power for drip irrigation, investing in training programs, and promoting processing industries to improve the banana sector's performance.

Mahalakshmi et al. (2016) studied banana farming in Theni district, Tamil Nadu. Key factors affecting banana productivity included water storage, weeds, price fluctuations, and insufficient cash and credit.

Mohapatra et al. (2010) highlighted bananas as a globally popular fruit. They emphasized the importance of post-harvest management to prevent economic losses in banana-producing regions. Techniques to extend shelf life include delaying ripening, reducing respiration, and controlling diseases during storage and transportation.

Andhra Pradesh State Banana Market Reviews

Verma et al. (2021) found that while post-harvest practices are somewhat adopted in Barabanki District, Uttar Pradesh, improvements are needed in transportation, storage, packaging, and ripening facilities. Major post-harvest losses occur at the farm level (small fruits, sunburn, harvesting damage) and retail level (dryness, physical damage, over-ripeness). Addressing nutritional imbalances and careful harvesting can reduce losses.

Suneetha Ranjula et al. (2021) found that covering banana bunches with non-polypropylene skirt bags significantly reduced scarring beetle infestation, increased fruit and bunch weight, and shortened harvest time. The covered bananas also had fewer blemishes and better overall appearance. The study suggests that this method can improve banana quality and yield, particularly in challenging climates.

Krishna et al. (2017) analysed banana production in Kurnool District, India. The study examined 120 farmers categorized by farm size: marginal, small, and large. Costs were highest for marginal farms (INR 327,531.06/ha) and lowest for large farms (INR 247,989.47/ha). Gross returns were highest for large farms (INR 491,516.58/ha) and lowest for marginal farms (INR 447,592.71/ha), indicating a correlation between farm size and profitability.

Studies Specific to East Godavari district

Mehazabeen A., S. Radhakrishnan, and G. Srinivasan (2021)¹⁹ Bananas are Andhra Pradesh's third major fruit, covering 8% of fruit land. YSR district leads in cultivation. Perishability limits value-added products and quality.

Mehazabeen et al.'s (2021) study found that Andhra Pradesh banana farmers face challenges with electricity, price fluctuations, and lack of market infrastructure. The study recommends government support in providing reliable power, investing in processing industries, and improving market facilities to boost the banana industry.

Some studies in Andhra University

Ganga Raju et al. (2013) studied different banana cultivars in Andhra Pradesh. Grand Naine recorded the highest yield and better quality parameters compared to other cultivars. It is recommended for commercial cultivation in coastal Andhra Pradesh.

We found on reviewing the literature that there exists no study this far focusing on the period 2019 till 2022 where in India and AP faced issues, constraints, problems like COVID-19, US Elections, Ukraine War onwards, 7 Cyclones and the consequent floods all in one thesis.

Research Gap

The gap identified is the lack of research focusing on the period 2019-2022, which saw challenges like COVID-19, cyclones, and the Ukraine War impacting production and marketing. Existing researches lack a comprehensive analysis of the banana industry's response to the combined impacts of the pandemic, cyclones, and economic shocks during 2018-2022. This study fills this gap by examining production and marketing trends in East Godavari, a key banana-producing region in Andhra Pradesh.

Relevance of the Study

The banana industry faced unprecedented challenges from 2018-2022 due to the pandemic, cyclones, and global economic disruptions. While production increased, farmer profits plummeted. This study aims to understand how the local market in Andhra Pradesh, India's leading banana producer, navigated these challenges.

Research Methodology

The study employs both primary and secondary data from East Godavari district. Primary data was collected from 450 farmers and 150 market intermediaries using multistage random sampling. Secondary data provides broader context.

Objectives

- Analyze banana production trends in India and Andhra Pradesh.
- Assess the socio-economic conditions of banana farmers.
- Evaluate marketing costs and margins.
- Identify production and marketing challenges.
- Determine banana cultivation costs.

Hypotheses

- There is no significant difference in efficiency between marketing channels.
- There is no significant difference in marketing channels across different mandals.
- There is no significant difference in cultivation costs between different farmer sizes.

Table: 1.1 Study area and respondents' size

No	District	Block	Village	Households	Sample Size	Total
----	----------	-------	---------	------------	-------------	-------

			11000	Large	Small	450	
1	East Godavari	Atreyapuram	Atreyapuram	1813	24	33	57
2			Vaddiparru	909	16	27	43
3			Utchili	832	23	27	50
4		Ravulapalem	Ravulapalem	4300	15	34	49
5			Komarajulanka	1666	14	37	51
6			Devarapalli	2369	5	45	50
7		Prathipadu	Lampaklova	749	22	28	50
8			Peddipalem	1039	22	28	50
9			Rowtupalem	1133	12	38	50

Attempt has been made in study to examine the production and marketing aspect of banana. The current research was carried out in East Godavari district of state of Andhra Pradesh. Three blocks Athreyapuram, Ravulapalem & Prathipadu were selected for the study. 450 farmers were randomly selected from 9 villages based on their land holding size viz. small, medium and large farmers. In all

Mandal	Atreyapuram	Ravulapalem	Prathipadu	Grand Total
Large farmers >5	49	23	41	113
Small farmers 0-5	101	127	109	337
Total	150	150	150	450

- **Sample:** 450 banana farmers & 150 market intermediaries in East Godavari district, Andhra Pradesh.
- **Land Ownership:** 208 farmers own and cultivate their land plus leased land, 97 do not own land. Land sizes distributed as: <1 acre (24.2%), 1-2 acres (36.2%), 2-5 acres (36.7%), and >5 acres (2.9%).



Fig 2. Cultivation

Cultivation Practices: Practice

- **Multiple Cropping:** Farmers plant crops like tapioca, turmeric, ginger, or garlic alongside bananas. They also grow tall crops (coconut) and short vegetables to maximize income.
- **Mono Cropping:** Growing only bananas results in higher yields compared to multiple cropping. Average yields are 929 bunches per acre for mono cropping and 916 bunches per acre for multiple cropping.

Regional Yield Differences:

- **Average Yield per Acre:** Atreyapuram Mandal (17.5 tons), Ravulapalem (16.35 tons), Prathipadu (15.20 tons). The overall average yield of 16.35 tons is near the national average.

Gender Participation:

- Female farmers are actively involved in banana cultivation despite higher wages in other sectors for men.

Area Under Cultivation:

- The area under banana cultivation increased from 13,620 hectares in 2012-13 to 17,445 hectares in 2021-22, with fluctuations and a peak increase of 27.13% in 2014-15.

Cost and Inputs:

- **Manure Usage:** Generally high, except for some farmers in Atreyapuram and Prathipadu.
- **Fertilizer Costs:** Average expenditure is highest in Ravulapalem (Rs. 19,300), followed by Atreyapuram (Rs. 17,470) and Prathipadu (Rs. 13,527).
- **Supporting Sticks:** Essential due to cyclonic conditions; cost is highest in Ravulapalem.

Fixed Costs:

- **Water Resources:** 194 farmers own wells and motors; others rely on canal or lift irrigation.
- **Land Lease Costs:** Vary by mandal; higher in Atreyapuram and Ravulapalem (Rs. 45,000-50,000 per acre) and lower in Prathipadu (below Rs. 20,000).

Production Costs and Profitability:

- **Total Production Cost per Acre:** Rs. 1,25,000.
- **Benefit-Cost Ratio:** 0.23 for small farmers, 0.25 for large farmers.
- **Total Revenue:** Rs. 3,22,04,388 with an average return of Rs. 1,55,545.6 per acre.
- **Net Profit:** Rs. 30,230 for small farmers and Rs. 30,795 for large farmers.

Marketing Channels and Efficiency:

- **Channel I:** Commission agents in Atreyapuram and Prathipadu; price fluctuations due to seasonality.
- **Channel II:** Predominant in Ravulapalem; farmers receive fair prices but lower during lean seasons.
- **Channel III:** Retailers directly purchase from farmers, providing higher farmer share in consumer price.

Marketing Efficiency:

- **Atreyapuram:** Channel III shows highest efficiency and producer share (67.3% of consumer price).
- **Ravulapalem:** Channel III performs best with the lowest price spread (Rs. 6,600 per 100 bunches).
- **Prathipadu:** Channel III offers the highest efficiency and producer share (68.35%).

Overall Findings:

- Marketing efficiency is highest in Channel III across all mandals due to lower marketing costs and better farmer shares.
- Large farmers generally have better profitability compared to small farmers, with significant differences in net returns and marketing margins.

The study highlights that mono cropping yields higher than multiple cropping, and Channel III is the most efficient marketing route, benefiting farmers with better returns and lower costs. The area under banana cultivation has grown, with variations in cost, yield, and profitability depending on land ownership, regional practices, and marketing channels.

Keeping the land element constant, the resources used in banana production can be broadly divided into five primary heads. These include labour (HL), suckers (SKR), and planting treatments like insecticides, fertilisers, and manures (FRT) (Fer)

Table 1.1 shows that the levels of inputs used in banana cultivation, the highest amount of expenditure, totalling Rs. 1,98,54,500 is incurred on human labour (HL), followed by fertilisers, totalling Rs. 1,90,16,274, and manures, totalling Rs. 5,27,34,563, which are major costs under variable cost. Land lease expenses totalling Rs. 3,58,78,610 and Well and motors expenses totalling Rs. 2,02,76,980 are key charges under fixed costs, followed by support sticks expenses totalling Rs. 6,47,77,730.

Since both large and small farmers use both hired and family labour, the cost of labour has doubled, making it the biggest cost element. Just 1.20 per cent of costs are associated with suckers (seedlings). In addition, plant protection accounts for 2.90 per cent of the overall variable cost, which also includes the expense of preparing the plot and employing pesticides to control diseases and pests. 13.41 per cent of the price of organic manures is made up of fertilisers in addition to 5.34 % for fertilisers. The figure also reveals that the total cost of bananas for an acre of land under cultivation is Rs. 56,717.31, with small farmers experiencing a BC ratio of 0.23 per acre and large farmers experiencing a BC ratio of 0.25 per acre.

This indicates that, in addition to the cost of inputs, every rupee invested in the production of bananas would return 0.23. The anticipated cost of cultivation at an average of Rs. 56,717.31 per acre, per acre makes up the total return of 1,59,365 rupees.

Table 1.1 Cost of Banana Cultivation (Rs/Per acre)

S No	Variable particulars	Cost	Average cost per Acre (Small farmer)	Average cost Per acre (Large farmer)
1	Suckers cost		1,461.50	1,538.50
			0.52	0.68
2	Manure cost		8,020.00	5,329.00

		2.93	2.4
3	Fertilizers cost	20,426.10	13,103.90
		7.31	6.1
4	Plant protection cost	4,018.50	3,236.00
		1.46	1.44
5	Labour cost	21,503.10	19,297.08
		7.67	8.65
6	Irrigation	1,288.10	1,112.15
		0.45	0.51
	Total Variable cost	56717.31	43616.63
7	Support sticks	5,238.10	6,672.10
		1.77	2.99
8	Well and Motors	22,264.23	25,560.00
		7.83	11.3
9	Spades & Khurpi	1,348.15	1,678.13
		0.46	0.75
10	Land lease	39,420.00	40,980.00
		13.86	18.3
11	Sprayers	3,018.12	3,488.23
		1.09	1.51
12	Total Fixed cost	71,824.21	77,844.32
13	Grand total V+F	128541.21	121460.11
14	*Total Returns	1,59,365	1,52,551
15	Profit (13-14)	30824.21	31,090.89
16	B:C Ratio	0.23	0.25

This provides additional proof that small farmers spend a greater percentage of their income on manures and fertilisers than large farmers. The cost of suckers, irrigation, and labour for large growers is greater than all other costs combined. Large farms spend more money than small farmers on the fixed cost items. Namely, a land lease, support sticks a well, motors, and khurpis and spades. Because a major portion of large farmers cultivate their own land, they have access to all fixed cost-related equipment to suit their daily cultivation needs.

Table 1.2 Revenue/Income from Banana cultivation (per acre)

Sl. No	Particulars	Small farmers Amount INR	Large farmers -Amount INR
1	Gross Revenue	1,59,365	1,52,551
2	Less: Variable	56,717	43,616
3	Net Return	1,02,648	1,08,935
4	Less: Fixed Cost	71,824	77,844
5	Net Profit	30,824	31,091

Source: Primary Data.

Table 1.2 reveals that the income from cultivation overall income, net returns, and net profit from a single acre of banana farming of small and large farmers, respectively, the gross income was Rs. 1,59,365 and Rs. 1,52,551. For the small and large farms, the net profit was respectively Rs. 30,824 and Rs. 31,091 after subtracting the variable cost, the gross returns were calculated. It demonstrates how the net return earned per acre of banana production in the research area varied greatly between small and large farmers.

Marketing Channels:

Sl. No	Channels	Atreyapuram	Prathipadu	Ravulapalem	Total	Total Percentage
1	I	40	45	35	120	26.6
2	II	50	55	60	165	36.7
3	III	60	50	55	165	36.7
		150	150	150	450	100.0

Table 1.3 Marketing Channels

Source: Primary Data

From the table 1.3 indicate about 26.6 per cent of banana units sell their banana products through marketing channel I, 36.7 per cent of banana units sell the banana products through marketing channel II, 36.7 per cent of the respondents dispose their products through marketing channel III.

Fig 3. Marker Channel Participant



Marketing of banana products between different banana units or sellers and different marketing channels is tested by using ANOVA Test. The table value of F for $V_1=4$ and $V_2=2$ at 5 per cent level of significance is 9.16. The calculated value is less than the table value, the hypothesis is accepted, hence, there is no significance difference among different Mandals as far as the marketing channels ($F= 0.0625$). The table value of F for $V_1=4$ and $V_2=3$ at 5 per cent level of significance is 9.16. The calculated value is less than the table value, the hypothesis is accepted and hence there is no significance difference in the marketing channels ($F=6.9443$).

Cobb Douglas Function

Any production process will be having profitability depending upon input costs for its production. The Cobb-Douglas functional form of production functions is widely used to represent relationships of output to input. To assess the resource productivity of inputs used in the study area, the Cobb - Douglas Production Function employed modified for banana cultivation

$$As, Y=\alpha X + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \epsilon$$

Y is gross revenue from Banana Production, X_1 is suckers cost, X_2 is labor cost, X_3 is manure cost, X_4 is fertilizer cost, X_5 is plant protection cost, X_6 is total fixed cost, ϵ is error term, and, $\beta_1 \dots \beta_6$ are coefficients to be estimated. The above production function is worked out using Ordinary Least Square (OLS) technique after converting it into log linear form.

$$Q_i = A (HL_i)^{\alpha_1} (SKR_i)^{\alpha_2} (PLT_i)^{\alpha_3} (FRT_i)^{\alpha_4} (MS_i)^{\alpha_5} \mu$$

Where, Q_i = total output in rupees., HL_i =Hired Labour, SKR_i =Value of Suckers (seedling), LT_i =Expenditure for Planting Treatment, FRT_i =Value of Fertilizers (chemical & organic), MS_i = Miscellaneous expenditures incurred, μ =Random error. If $RTS > 1$, it indicates the increasing returns to scale; $RTS =1$ it indicates the constant return to scale and if, $RTS < 1$, it indicates the decreasing returns to scale.

Table 1.4 a Computation for Cobb Douglas Production Function

Variables	Coefficient	Standard Error	T	P value
Log(Suckers cost)	.294	0.12	2.45	0.016
Log(Manure cost)	$\hat{\alpha}^{\cdot}.013$	0.014	$\hat{\alpha}^{\cdot}0.93$	0.354
Log(Fertilizers cost)	.160	0.076	2.1	0.038
Log(Plant protection cost)	$\hat{\alpha}^{\cdot}.002$	0.026	$\hat{\alpha}^{\cdot}0.08$	0.935
Log(Labour cost)	.992138	0.12	1.96	0.052
Log(Irrigation)	.364	0.101	3.59	0
Constant	.645	0.177	4.22	0
R ²	0.759	\hat{A}	\hat{A}	\hat{A}
Adjusted R square	0.752	\hat{A}	\hat{A}	\hat{A}
F (Y, =Y')	328.9474	\hat{A}	\hat{A}	\hat{A}
Returns to scale	0.994399	\hat{A}	\hat{A}	\hat{A}

Source: Computed Data

*Indicates that the co-efficient are statistically significant at the 5 per cent level.

** Indicates that the co-efficient are statistically significant at the 1 per cent level.

Here logarithm values of the variables mentioned above, and some of the coefficients is here 0.9943 which is equal to 1 indicates the constant returns to scale which reveals Cobb Douglas Production function which indicates the proportion of inputs and output are same.

Table 1.4 b

	Coefficients
Intercept	328.9474
Field Inputs	1.135965
Labour (Rs.)	0.992138
Irrigation	3.69897

Revenue = 328.9474 + 1.135965 * Field Inputs + 0.992138 * Labour + 3.69897 * Water + ϵ

As per Cobb Douglas Function we find that the existing trend of decreasing return to scale must be improved by

**Increasing Field Inputs by 1.14 times,
Increasing Water by 3.7 times and
Decreasing Labour by 0.99 times.**

From this equation it is obvious that during the study period the farmers have experience to heavy rains and floods (draught) and the farmers have not shifted to drip irrigation, for having increasing returns to scale, and reduce the cost of cultivation, drip irrigation and fustigation and mechanization of various labor-intensive activities are compulsory.

Other Findings

Loss of Produce: Andhra Pradesh faced significant agricultural challenges due to a series of natural calamities, including heat waves, cyclones, and floods, compounded by the COVID-19 pandemic. These events severely damaged banana crops, leading to a loss of ₹37 crore worth of banana produce between 2019 and 2022. On average, sample farmers experienced a 67% loss per household. However, the presence of livestock and poultry helped many farmers survive financially. Unfortunately, those reliant solely on banana farming faced complete financial ruin and job loss due to the lack of secondary income or financial planning.

Demand Fluctuations: The demand for bananas increased during the COVID lockdown, the Ukraine War, and other global events but at significantly reduced prices. Excess produce went to waste due to logistical issues, with bananas often sold at throwaway prices. Despite this, the use of organic waste to replenish soil led to an increase in banana production from 29 million metric tonnes to 33 million metric tonnes.

Irrigation Issues: Bananas require substantial water—1,800-2,000 mm per year—to thrive. During winter, irrigation occurs every 7-8 days and more frequently in summer. Excess irrigation in rainy seasons can harm plant growth. Current practices involve about 70-75 irrigations, but there is a need for 3.8 times more water efficiency to improve productivity.

Lack of Information: Farmers faced significant information gaps regarding market prices, credits, and subsidies due to disrupted communication channels during lockdowns and natural disasters. Despite having internet access via smartphones, the lack of timely and accurate information hindered their ability to make informed decisions. Issues included a lack of quality knowledge, standardization, grading, and best practices.

Falling and Failing Prices: Older farmers (above age 49) faced more delays and reductions in payments, with 73% experiencing payment issues. Malpractices in markets, delayed payments, and high transportation costs also affected farmers. During the pandemic and natural disasters, pre-harvest contractors reduced payments or rejected produce. NGOs and CSR units sought quality bananas at low prices, often shifting the financial burden to farmers. Additionally, the Andhra Pradesh government's support scheme provided inadequate financial assistance compared to the input costs, leaving farmers dependent on loans.

Conclusion:

The Andhra Pradesh government aims to improve agricultural performance by increasing productivity, mitigating drought impacts, and enhancing post-harvest management. Despite increased banana production, market challenges, including COVID-19 and environmental factors, have affected farmers' incomes. Transitioning to group farming and addressing market complications are crucial for sustainable farming. Also, very importantly as per Cobb Douglas Function we find that the existing trend of decreasing return to scale

must be improved by Increasing Field Inputs by 1.14 times, Increasing Water by 3.7 times and Decrease Labour by 0.99 times.

Recommendations:

- Implement advanced irrigation techniques like drip irrigation and fertigation to enhance water use efficiency and yield.
- Adopt tissue culture saplings and polyclonal cultivation to improve banana production.
- Improve market information dissemination and financial planning for farmers.

Dry Tip Removal Process:

1. **Feeding:** A mixture of 7 gm Sodium Potash, 7.5 gm Urea, 500 gm cow dung, and 100 ml water is applied to banana bunches. The base is deflowered & immersed & the bunch is lowered into a polythene bag, allowing the mixture to be absorbed via capillary action.
2. **Ribbon Tagging:** Tag banana bunches with ribbons to indicate the correct harvesting age.
3. **Grading and Packing:** Ensure proper grading & packing at integrated packing houses for quality control.

Suggestions for Improving Banana Farming and Marketing:

1. **Training and Knowledge:** Farmers need training on new technologies and best practices from international experts, supported by online social media groups for efficient knowledge exchange.
2. **Input Supply:** Form farmer groups or producer companies to enhance the procurement of quality inputs and services.
3. **Price and Value Chain:** Establish fixed competitive prices through forward linkages. Develop strategies to use all parts of the banana plant and create a continuous value chain.
4. **Reduce Marketing Channels:** Shorten marketing channels by implementing buy-back arrangements and direct links with buyers to benefit small farmers.
5. **Infrastructure Improvements:** Address infrastructure issues, particularly poor road conditions, to prevent fruit damage during transport.
6. **Prompt Payment:** Ensure prompt payment through standardization at the farm gate and eliminate unnecessary charges.
7. **Transporting Perishables:** Utilize India's geographical advantage for quicker transit to Middle Eastern markets. Focus on improving branding and quality.



Fig 4 Marker Infrastructure

Farmer Recommendations:

- **Production Enhancements:** Adopt high-density planting, suitable intercrops, timely irrigation, and improved varieties.
- **Marketing Improvements:** Use harvesting techniques, banana bunch covers, direct procurement by government, establish processing plants, set minimum support prices, and encourage exports.

Limitations & Future Scope of Study:

- **Limitations:** The study faces challenges like reliance on sample surveys, incomplete data, and varying cultivation practices. Despite these, the findings are considered close to the realities of banana farming.
- **Future Scope:** Future research should explore diversified cultivation practices, socio-cultural impacts, and scientific studies to further understand and improve banana production and marketing.

References

1. Adhikari, R. K., Dhakal, S. C., Sharma, M., & Tiwari, U. Competitiveness of banana value chain along
2. Acharya, S.S. and N.L. Agarwal (2001): 'Integration, Efficiency, Costs and Price Spread', 'Agricultural Marketing in India' Oxford and IBH Publishing Co., New Delhi - 2. p- 299- 336.
3. Ali, A. (2000): Trends in Agricultural Development of Meghalaya; A Case Study of Resubelpara Development Block in the East Garo Hills District, a Thesis in the Department of Economics, G.U.
4. Dassou, A., Tovignan, S., Vodouhè, F., Vodouhè, G., Tokannou, R., Assogba, G., ... & Vodouhè, S. (2021).

5. Debandya Mohapatra, Sabyasachi Mishra and Namrata Sutar (2010), Banana and its byproduct utilization: an overview, Journal of scientific and industrial research, vol. 69, 323- 329.
6. FAOSTAT. (2020). FAOSTAT database (2019). <http://www.fao.org/faostat/en/#data/QC>.
7. Gangaraju, K. & Kumar, P. Arun & Naidu, M. Mutyala. (2014). Path coefficient analysis and incidence of sigatoka leaf spot in banana cultivars under coastal region of Andhra Pradesh. Progressive research.
8. Hetauda-Dumkibas road corridor, Nepal: An eclectic approach. Archives of Agriculture and Environmental Science. Constraints, and Implications of Organic Farming in Bananas and Plantains Production Sustainability in Benin. Agricultural Sciences, 12, 645-665.
9. Irfana Noor, M., Sanaullah, N., & Barkat Ali, L. (2015). *Economic Efficiency of Banana Production under Contract Farming in Sindh* Pakistan. J Glob Econ, 3(166), 2.
10. Mukul, A.Z.A. & Rahman, M.A. (2013). *Production and Profitability of Banana in Bangladesh an Economic Analysis*. International Journal of Economics, Finance and Management Sciences, 1(3), 159-165
11. Kumari, P., Singh, K. M., & Atre, S. K. (2018). Problems and Constraints in Banana Cultivation: A Case Study in Bhagalpur District of Bihar, India. Int. J. Curr. Microbiol. App. Sci, 7(7), 1752-1759.
12. Yugandhar, V., Nagarjuna, V., Naik, G. S., Ranjula, S., & Srividhya Rani, N. (2021). Studies the effect of bunch management in yield and quality of banana Cv. Grand Naine (AAA).
13. Mehazabeen, A., Srinivasan, G., & Radhakrishnan, S. (2021). A constraint analysis on production and marketing of banana in Andhra Pradesh, India. Plant Arch, 21(Suppliment-1), 2215-2216.
14. Mahalakshmi, C., Kumar, S. V., Maneesh, P., & Fathima, J. S. A. (2016). An analysis of banana cultivation in Theni District, Tamil Nadu. *Indian J. Economics and Development*, 4(9).
15. Mohapatra, D., Mishra, S., & Sutar, N. (2010). Banana postharvest practices: Current status and future prospects-A review. *Agricultural Reviews*, 31(1).
16. Murasoli, M., & Jambulingam, S. (2016). A study on marketing of banana in manapparai and musuri taluks in Tiruchirappalli district of Tamilnadu. Int J Recent Sci Res, 7(10), 14040-44.
17. Murasoli, M., & Jambulingam, S. (2016). A study on marketing of banana in manapparai and musuri taluks in Tiruchirappalli district of Tamilnadu. *Int J Recent Sci Res*, 7(10), 14040-44.
18. Ramakrishna, M., Kumar, N. P., Rao, H. S., & Niveditha, K. Resource use Efficiency of Banana in Kurnool District of Andhra Pradesh.
19. Rao, C. K. (2014). Adoption of Tissue Culture in Horticulture: A Study of Banana-Growing Farmers from a South-Indian State. Cambridge Scholars Publishing.
20. Naidu, L, Srinivas, S., Subbi Reddy, G., Ramesh Kumar, C., & Reddy, R. S. (2009). Identification and delineation of suitable areas for mango, banana, citrus and Banana crops in Andhra Pradesh. *Agropedology*, 19(1), 30-40.
21. Selvaraj, N. (2021). Marketable Surplus of Banana in Dindigul District of Tamilnadu
22. Seenivasan, N., Prabhu, S., Makesh, S., & Sivakumar, M. (2012). Natural occurrence of entomopathogenic nematode species (Rhabditida: Steinernematidae and Heterorhabditidae) in cotton fields of Tamil Nadu, India. *Journal of Natural History*, 46(45-46), 2829-2843.
23. Tiwari, I., Verma, V. K., & Verma, M. (2021). To study the adoption rate of post-harvest management practices in banana cultivation. *Journal of Pharmacognosy and Phytochemistry*, 10(2), 757-759.
24. Todaro, M and Stephen C. Smith (2004): "Agricultural Transformation and Rural Development", Economic Development, Pearson Education Pvt. Ltd. Delhi 92, p- 447.
25. Velu, Sureshkumar (2014) Kalaiyarasu, M. *Production and Marketing of Banana in select Districts of Tamil Nadu*. Lulu. com.
26. Verma, A and K.P. Singh (2004): "Production and Export of Banana", Yojana, Vol. 48, No. 4, April, p- 35-38.
27. Vyas, V.S. (1996): "Diversification in Agriculture, Concept, Rationale and Approaches", Indian Journal of Agricultural Economics, Yol. 51, No. 4, p- 636-645.
28. Wahome, C. N., Maingi, J. M., Ombori, O., Kimiti, J. M., & Njeru, E. M. (2021). Banana production trends, cultivar diversity, and tissue culture technologies uptake in Kenya. *International Journal of Agronomy*, 2021.
29. Yadav, M. U., D. V., Nagure, K. D. Phukse, and B. M. Kalalbandi, 2005. A comparative study of resource productivities and resource use efficiencies of traditional and tissue culture banana cultivation in Parbhani district of Maharashtra state. *Karnataka J. Agric. Sci.*, 18: 735-739.

Weblinks

<https://www.newindianexpress.com/states/andhra-pradesh/2020/oct/19/rs-2770-crore-loss-to-agriculture-horticulture-crops-2212120.html>

<https://www.thehindu.com/news/national/andhra-pradesh/covid-19-takes-a-heavy-toll-on-banana-exports/article31075510.ece>

<https://www.freshplaza.com/article/9212823/heavy-rain-destroys-banana-crop-in-anantapur-hail-damage-in-nagarkurnool/>

<https://www.thehindu.com/news/national/andhra-pradesh/lockdown-severely-impacts-banana-farmers/article31251084.ece>
<https://www.thehansindia.com/hans/opinion/news-analysis/impact-of-covid-19-on-horticulture-food-security-620969>
<https://www.deccanchronicle.com/nation/current-affairs/060719/kadapa-research-centre-proposed-for-banana-farming.html>
http://nhb.gov.in/report_files/banana/BANANA.htm
[https://plantarchives.org/SPECIAL%20ISSUE%2021-1/365%20\(2215-2216\).pdf](https://plantarchives.org/SPECIAL%20ISSUE%2021-1/365%20(2215-2216).pdf)
https://www.researchgate.net/publication/292688142_Studies_on_growth_yield_and_quality_of_different_cultivars_of_banana_in_Andhra_Pradesh_India
<https://www.farmingportal.co.za/index.php/agri-index/68-crops/7602-global-overview-bananas-march-2022>