Economic Effectiveness of Mango Cultivation Compared to other Agro-Based Products Cultivation – A Nationwide Study across India

Navamani. C[1], Dr. A.V. Chinnasamy[2]
[1] *Research Scholar in Economics, Mother Teresa Women's University, Kodaikanal*
[2] *Associate Professor & Head, Govt. Arts College for Women, Nilakkottai*

Abstract- This study evaluates the economic effectiveness of mango cultivation compared to the cultivation of other major agro-based products across India. Using secondary data from government reports, agricultural surveys, and market bulletins, the research analyzes cost of cultivation, yield, market prices, net returns, and benefit-cost ratios for mango and selected crops such as banana, tomato, sugarcane, wheat, and soybean. Results indicate that while mango cultivation offers moderate profitability and long-term economic stability due to its perennial nature, certain annual crops like sugarcane and soybean demonstrate higher short-term returns and benefit-cost ratios. The study further explores the role of integrated farming systems in enhancing overall farm income, highlighting mango's potential for diversification with allied agro-products. Regional disparities in productivity and profitability are discussed to provide insights for policymakers and farmers seeking optimized cropping patterns and sustainable income generation.

Key Words: Secondary Data, profitability, benefit-cost ratio, allied agro-products.

INTRODUCTION

Agriculture remains the backbone of the Indian economy, providing livelihood to a significant portion of the population. Among various horticultural crops, mango holds a special place due to its cultural significance, nutritional value, and export potential. India is the largest producer of mangoes globally, cultivating this fruit over approximately 2.26 million hectares with an annual production exceeding 17 million metric tons. Despite this scale, the economic returns from mango cultivation vary considerably across regions and are influenced by factors such as agro-climatic conditions, cultivation practices, and market access.

In parallel, India's agricultural landscape includes a diverse range of agro-based products—such as banana, tomato, sugarcane, wheat, and soybean—that contribute substantially to farm incomes and national food security. Each crop presents unique cost structures, productivity levels, and market dynamics, making comparative economic analysis essential for informed decision-making by farmers and policymakers.

This study aims to compare the economic effectiveness of mango cultivation against other major agro-based crops nationwide by analyzing costs, returns, and benefit-cost ratios. Additionally, it examines the potential of integrating mango orchards with allied agro-based products to enhance farm profitability and resilience. The findings intend to support optimized cropping strategies and promote sustainable agricultural growth in India.

Objectives:

- To analyze the State-wise Area and Production of Mango in India in the year 2021–2022.
- To compare mango with other fruit and plantation crops
- To evaluate the average Benefit-Cost Ratio (BCR) for mango cultivation in India

State-Wise Area and Production and Productivity of Mango in India in 2021 – 2022:

This data provides a comprehensive overview of mango cultivation across India, highlighting variations in area, production, and productivity among states. Such information is crucial for assessing the economic effectiveness of integrated mango farming systems, as it allows for the identification of regions with higher productivity and potential for diversification with allied agro-based products.

State	Area (000 ha)	Production (000 MT)	Productivity (MT/ha)
Uttar Pradesh	264.93	4,807.83	18.2
Andhra Pradesh	332.97	4,676.06	14.0
Karnataka	192.61	1,745.57	9.1
Bihar	150.64	1,549.97	10.3
Telangana	180.62	1,157.73	6.4
Gujarat	153.18	997.83	6.5
Tamil Nadu	160.94	639.64	4.0
West Bengal	97.93	889.69	9.1
Odisha	199.30	847.81	4.3
Maharashtra	157.07	514.87	3.3
Madhya Pradesh	40.08	526.23	13.1
Chhattisgarh	73.99	437.58	5.9
Jharkhand	52.24	430.22	8.2
Kerala	69.11	382.38	5.5
Uttarakhand	35.93	149.76	4.2
Punjab	6.85	115.35	16.8
Haryana	9.42	109.74	11.6
Rajasthan	5.00	82.50	16.5
Assam	5.58	58.49	10.5
Tripura	11.64	58.47	5.0
Himachal Pradesh	41.52	47.40	1.1
Jammu & Kashmir	12.67	23.74	1.9
Nagaland	0.64	4.19	6.5
Mizoram	0.89	4.18	4.7
Arunachal Pradesh	0.05	0.03	0.6
Others	6.98	28.87	4.1
Total	2,262.77	17,838.36	7.9

Source: National Horticulture Board (NHB), 2021–22 (APEDA)

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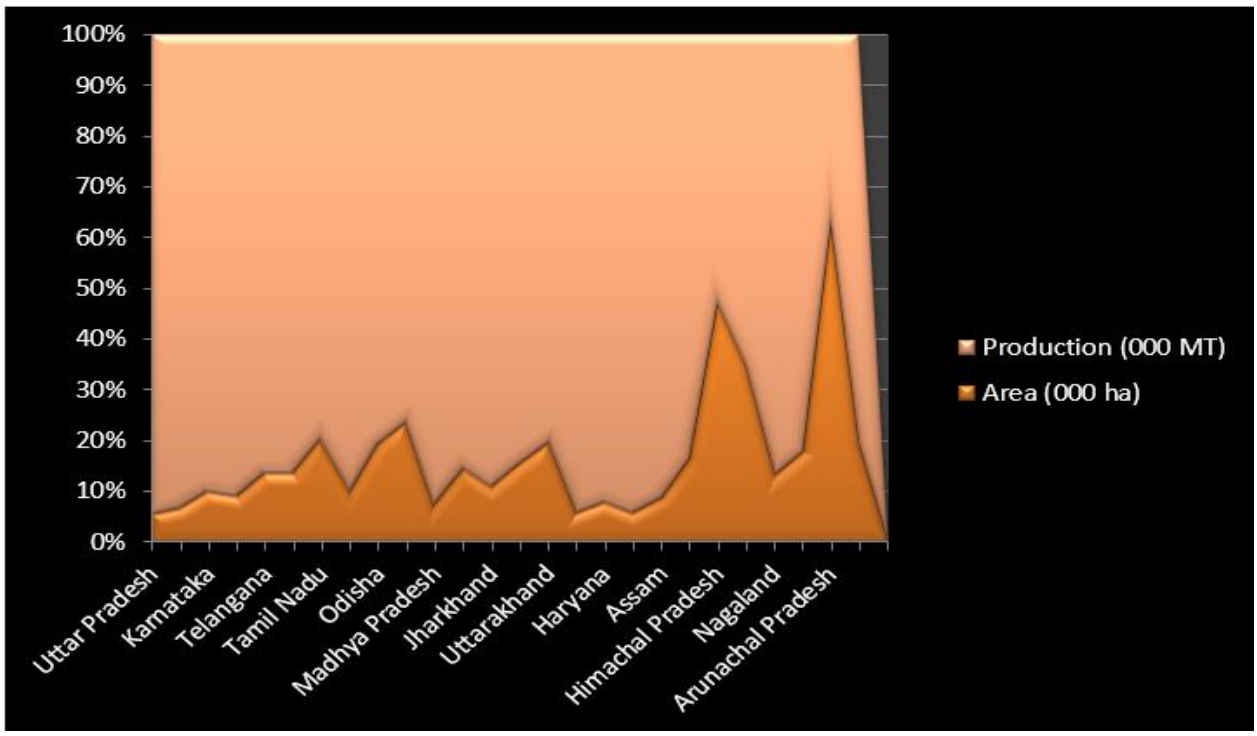

Data on State-wise Mango Cultivation in India:
The table presents the distribution of mango cultivation area, production, and productivity across various states of India during the 2021–2022.

Total Area and Production:
India cultivates mangoes on approximately 2.26 million hectares, producing nearly 17.84 million metric tons of mangoes, with an average productivity of 7.9 MT/ha.

Leading States in Area and Production:
- Andhra Pradesh (332.97k ha) and Uttar Pradesh (264.93k ha) hold the largest cultivation areas, contributing significantly to national mango production with 4.68 million MT and 4.81 million MT respectively.
- Together, these two states account for nearly 53% of the country's total mango production, showcasing their dominant role in the mango industry.

High Productivity States:
- States like Uttar Pradesh (18.2 MT/ha), Punjab (16.8 MT/ha), Rajasthan (16.5 MT/ha), and Madhya Pradesh (13.1 MT/ha) exhibit higher productivity levels, compared to the national average.
- This indicates the presence of favorable agro-climatic conditions, efficient farming practices, or better input use in these states.

Moderate Productivity Regions:
- States such as Bihar (10.3 MT/ha), Assam (10.5 MT/ha) and Karnataka (9.1 MT/ha) show moderate productivity, reflecting potential for improvement through better management or integration with allied farming.

Lower Productivity Areas:
- States such as Maharashtra (3.3 MT/ha), Tamil Nadu (4.0 MT/ha), Odisha (4.3 MT/ha), and Kerala (5.5 MT/ha) have relatively low productivity, possibly due to challenges like water scarcity, suboptimal farming practices, or poor soil conditions.

Smaller Cultivation but Notable Productivity:
- Some northeastern states like Nagaland (6.5 MT/ha) and Mizoram (4.7 MT/ha), despite smaller mango cultivation areas, demonstrate reasonable productivity.

Mango versus Other Fruit & Plantation Crops
India's diverse agro-climatic zones support a wide range of horticultural and plantation crops. Among these, mango cultivation holds a significant place due to its cultural importance, domestic demand, and export potential. However, the economic effectiveness of mango cultivation must be analyzed in comparison with other fruit and plantation crops to guide farmers, policymakers, and agribusiness stakeholders in crop planning and resource allocation.
This section presents a comparative analysis of mango cultivation—both traditional and high-density systems, against other popular fruit crops (like guava, banana, and amla) and long-term plantation crops (like coconut, areca nut) The comparison covers key parameters such as gestation period, average yield, net return per hectare. It highlights the relative strengths and limitations of mango cultivation within the broader context of Indian agriculture, providing a clear picture of its economic viability and competitiveness.

Comparative Table: Mango Versus other Fruit & Plantation Crops

Crop	Gestation Period	Annual Yield (t/ha)	Net Return (₹/ha/year)
Mango (traditional)	5–7 years	8–10	₹40,000–60,000
Mango (high-density)	3–4 years	16–19	₹100,000–130,000
Guava	2–3 years	20–25	₹80,000–120,000
Amla (Indian Gooseberry)	2–4 years	8–12	₹100,000–150,000
Banana	12–15 months	30–35	₹120,000–180,000
Pomegranate	2–3 years	10–12	₹90,000–140,000
Papaya	8–10 months	40–60	₹70,000–110,000
Coconut	6–7 years	8,000–10,000 nuts/ha	₹50,000–90,000
Areca nut	6–8 years	1.5–2.5 t/ha	₹60,000–100,000

Source: JanVan Yojana plantation program reports

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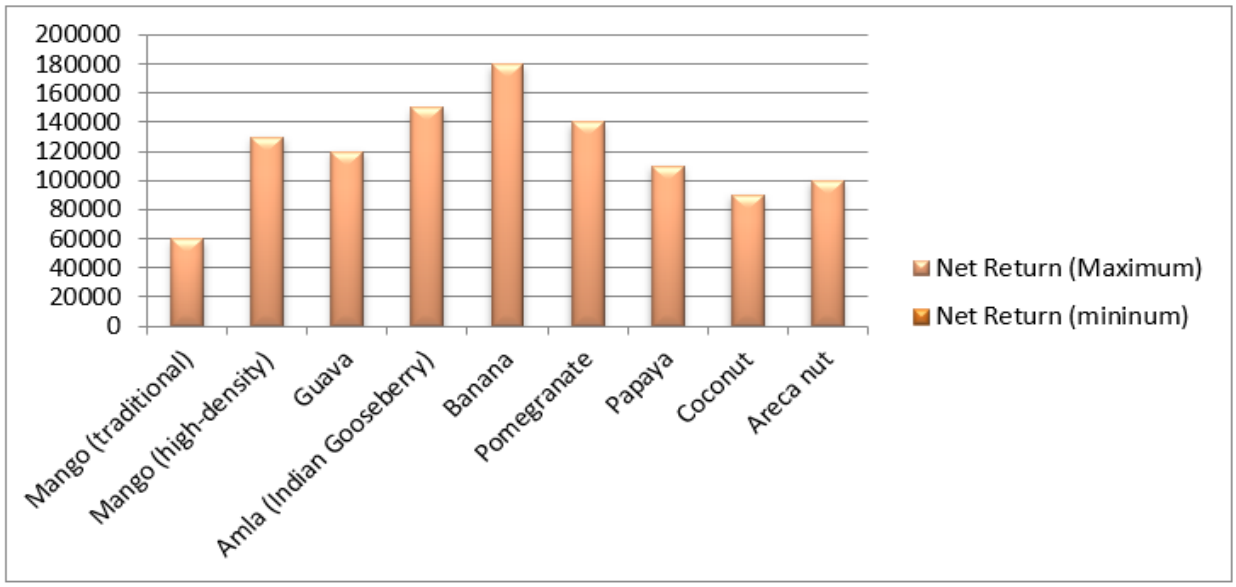

The comparative analysis of major fruit and plantation crops in India reveals significant variations in gestation periods, yield potential and economic returns, highlighting the diverse options available to farmers based on their regional conditions and investment capacities. Mango cultivation, a culturally and economically important crop in India, shows distinct differences between traditional and high-density systems. Traditional mango orchards have a longer gestation period of 5 to 7 years and moderate annual yields of 8 to 10 tons per hectare, resulting in net returns between ₹40,000 and ₹60,000 per hectare per year. In contrast, high-density mango cultivation reduces the gestation period to 3 to 4 years while nearly doubling the yield (16 to 19 tons/ha) and significantly increasing net returns to ₹100,000–130,000 per hectare annually. This shift underscores the economic advantage of adopting modern orchard management practices to achieve earlier and higher profitability.

Among the other fruit crops analyzed, banana and papaya demonstrate the shortest gestation periods—12 to 15 months and 8 to 10 months respectively—allowing for rapid revenue generation. Banana offers high yields (30 to 35 tons/ha) and the highest net returns ranging from ₹120,000 to ₹180,000 per hectare per year, making it a lucrative option for farmers seeking quick and substantial returns. Papaya also delivers impressive yields (40 to 60 tons/ha) and respectable net returns of ₹70,000 to ₹110,000.

Guava and pomegranate exhibit moderate gestation period of 2 to 3 years and good yield potentials, with guava offering net returns between ₹80,000 and ₹120,000 and pomegranate slightly higher at ₹90,000 to ₹140,000 per hectare. These crops provide viable alternatives in regions with suitable agro-climatic conditions.

The study also highlights Amla (Indian Gooseberry) as an economically effective crop with a gestation period of 2 to 4 years and net returns between ₹100,000 and ₹150,000 despite relatively lower yields. This points out the crop's potential profitability in marginal areas where drought tolerance and lower input requirements are advantageous.

Plantation crops like coconut and areca nut have longer gestation period (6 to 8 years) and comparatively lower yields; however, they provide steady and reliable income streams over the years, with net returns ranging from ₹50,000 to ₹100,000.

In conclusion, this comparative economic evaluation emphasizes the importance of selecting crops not only based on yield potential but also gestation period and market returns. While short-duration crops like banana and papaya offer quick profitability, high-density mango and amla cultivation show promise for sustained income with medium gestation. Traditional mango and plantation crops remain relevant for long-term investment strategies. These insights can guide policymakers and farmers in optimizing cropping patterns and resource allocation to enhance

agricultural profitability across diverse Indian agro-ecologies.

Benefit-Cost Ratio (BCR)

BCR stands for Benefit-Cost Ratio—a key financial indicator used in agriculture and project economics to evaluate the profitability and efficiency of an investment.

$$BCR = \frac{Gross\ return\ (₹/ha)}{Cost\ of cultivation\ (₹/ha)}$$

Where:

- Gross Returns = Income from sale of produce + any by-products (₹/hectare)
- Cost of Cultivation = Total expenses (labor, fertilizer, irrigation, seeds, maintenance, etc.) per hectare

Example:

If a mango farmer spends ₹60,000 per hectare (cost) and earns ₹1,20,000 (gross return):

$$BCR = \frac{120000}{60000}$$

$$= 2$$

A BCR of 2.0 means that for every ₹1 invested in mango cultivation, the farmer earns ₹2 in return, indicating a profitable enterprise. To clearly understand this concept. The average Benefit-Cost Ratio (BCR) for mango cultivation in India generally falls between 1.7 and 2.0 for traditional orchards, while high-density mango orchards tend to have a higher average BCR ranging from 2.2 to 2.6.

Traditional Mango Orchards:

These have a longer gestation period (5–7 years) and moderate yields, resulting in average BCRs around 1.7 to 2.0. This means for every ₹1 invested, farmers typically earn ₹1.7 to ₹2.0 in returns.

High-Density Mango Orchards:

Due to earlier fruiting (3–4 years), higher planting density, and better management practices, these orchards yield better returns with average BCRs between 2.2 and 2.6.

This data given by Indian Council of Agricultural Research (ICAR) reports on horticulture Economics State Horticulture Boards and Agricultural Universities' studies (e.g., CCS Haryana Agricultural University, Kerala Agricultural University)

Suggestions:

Promote High-Density Plantation Techniques:

Government and agricultural extension agencies should encourage farmers to shift from traditional to high-density mango cultivation through technical training, input subsidies, and model orchards.

Invest in Post-Harvest Infrastructure:

Expanding cold storage, ripening chambers, and value-addition facilities can reduce post-harvest losses and stabilize farmer incomes.

Strengthen Export Support and Branding:

Mango has high export potential, especially varieties like Alphonso and Kesar. Streamlining export certification and promoting geographical indication (GI) branding can boost international demand.

Encourage Crop Diversification:

In regions where short-gestation crops like banana or papaya are not viable due to climatic or water constraints, mango (especially amla or guava as companion crops) offers a profitable alternative with sustainable returns.

Support Climate-Resilient Varieties:

R&D efforts should focus on developing mango cultivars with higher drought resistance, early bearing, and disease resistance to enhance adaptability across agro-climatic zones.

CONCLUSION

This study comprehensively examined the economic effectiveness of mango cultivation in comparison with other major agro-based products such as banana, guava, amla, papaya, wheat, and sugarcane. Using parameters like gestation period, annual yield, net returns, and benefit-cost ratio (BCR), the findings indicate that mango cultivation—especially under high-density plantation systems—offers significant economic advantages when managed effectively.

While traditional mango orchards yield moderate returns and have longer gestation periods, high-density mango plantations outperform many other fruit and field crops in terms of profitability, early returns, and yield efficiency. Crops like banana and papaya, though more profitable in the short term due to quick maturity, often face market volatility and higher input risks.

Moreover, mango's long productive life, demand in domestic and export markets, and potential for value-added products (e.g., pulp, juice, dried slices, pickle) enhance its long-term viability.

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