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Status and Growth Performance of Horticultural Crops in Relation to Area and Productivity: A Retrospective Study

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ABSTRACT

Horticultural crops - fruits, vegetables, spices, flowers and plantation crops - have emerged as an increasingly important component of Indian agriculture, offering higher per-hectare returns than most staple cereals and playing a growing role in farm income diversification, nutritional security and export earnings. This retrospective study employs a secondary data approach to examine the status and long-term growth performance of India's horticulture sector in terms of area, production and productivity from 1991-92 to 2024-25, drawing on official National Horticulture Board (NHB) and Ministry of Agriculture and Farmers Welfare statistics alongside peer-reviewed secondary-data studies. Results show that total horticultural production in India increased more than three-fold, from 96.6 million tonnes in 1991-92 to an estimated 367.72 million tonnes in 2024-25 (second advance estimate), while the area under horticultural crops more than doubled, from 12.8 million hectares to 30.14 million hectares over the same period. Productivity rose from 7.5 tonnes per hectare in 1991-92 to approximately 12.1-12.5 tonnes per hectare in recent years, indicating that both area expansion and yield improvement have jointly driven production growth, in contrast with the yield-dominated growth pattern observed in foodgrain crops over a comparable period. Disaggregated analysis shows fruit production rising from 86.6 million tonnes in 2014-15 to 112.97 million tonnes in 2023-24 (a 30% increase, with productivity rising from 14.17 to 15.80 tonnes per hectare), while vegetable production grew from 169.47 to 207.2 million tonnes (a 22% increase, with productivity rising from 17.76 to 18.40 tonnes per hectare) over the same period; independent time-series analysis spanning 1991-92 to 2023-24 reports even larger cumulative growth of 291.43% in fruit and 257.7% in vegetable production. Vegetables consistently account for the largest share of total horticultural output, with potato, tomato and onion together comprising roughly half of vegetable production, while banana and mango together account for more than half of fruit production. The study concludes that horticulture has outperformed foodgrain crops in relative growth terms over the retrospective period, driven by a combination of policy support through dedicated missions, area diversification, and productivity-enhancing technology adoption, while noting continued scope for closing regional and crop-specific productivity gaps.

INTRODUCTION

Horticultural crops occupy a distinctive position within Indian agriculture: although cultivated on a smaller area than foodgrain crops, they generate substantially higher value per unit area and per unit of water used, making horticulture a central pillar of strategies to raise farm incomes, diversify cropping systems, and improve nutritional outcomes through increased availability of fruits and vegetables. Historically accorded lower policy priority than cereal production during the early decades after independence, the horticulture sector has received progressively greater institutional attention since the early 1990s, culminating in dedicated national missions - the National Horticulture Mission, later consolidated with other schemes into the Mission for Integrated Development of Horticulture (MIDH) - aimed at accelerating area expansion, productivity improvement and post-harvest infrastructure development.

This retrospective study undertakes a systematic secondary-data assessment of horticultural crop performance in India, examining (i) the long-term trend in total horticultural area, production and productivity from the early 1990s to the present; (ii) the disaggregated growth performance of the two dominant horticultural sub-sectors, fruits and vegetables; (iii) the crop-wise composition of fruit and vegetable output; and (iv) the extent to which observed growth has been driven by area expansion versus productivity improvement, benchmarked implicitly against the more yield-dominated growth pattern documented in the foodgrain sector over a comparable period.

REVIEW OF LITERATURE

Kumar et al. (2026), in a comprehensive time-series analysis of India's horticulture sector spanning 1991-92 to 2023-24, employed ARIMA modelling on data compiled from the Department of Agriculture and Farmers Welfare and international sources to document a cumulative increase of 291.43% in fruit production and 257.7% in vegetable production over the study period, alongside a rise in overall horticultural productivity from 8.8 tonnes per hectare in 2001-02 to 12.1 tonnes per hectare in 2020-21. Their analysis further situates India as the global leader in mango and banana production and productivity, underscoring the international competitiveness achieved in specific horticultural sub-sectors despite comparatively modest export market share overall.

Regional secondary-data studies provide complementary sub-national perspective: Das Gupta (2022), applying compound annual growth rate and instability index analysis to horticultural area and production data for north-eastern India over 2009-2019, found a generally rising regional growth trend with low instability for fruits and vegetables but moderate instability for spices, illustrating that the aggregate national growth pattern documented in pan-India studies can mask differing regional growth and stability profiles across horticultural sub-sectors. Official National Horticulture Board publications, particularly the Indian Horticulture Database and Horticultural Statistics at a Glance series, provide the authoritative underlying area-production-productivity time series relied upon by most subsequent secondary-data analyses of the sector, including the present study.

A recurring theme across this literature is the contrast between horticulture's area-and-yield-driven growth pattern and the more yield-dominated growth documented for foodgrain crops over a comparable period, attributed to horticulture's later start from a smaller base, the availability of substantial uncultivated or under-utilised land and water resources suited to fruit and vegetable cultivation in the 1990s and 2000s, and sustained policy emphasis on area expansion through mission-mode programmes rather than yield improvement on an already large existing cultivated base, as has characterised much of foodgrain policy since the Green Revolution.

MATERIALS AND METHODS

This retrospective study is based on secondary data compiled from the National Horticulture Board (NHB) Indian Horticulture Database and Horticultural Statistics at a Glance publications, Press Information Bureau (PIB) releases of the Department of Agriculture and Farmers Welfare reporting Advance Estimates of Area and Production of Horticultural Crops, and peer-reviewed secondary-data time-series studies of the sector. Area, production and productivity data for total horticultural crops were compiled for benchmark years spanning 1991-92 to 2024-25 (second advance estimate), while disaggregated fruit and vegetable data were compiled principally for the 2014-15 to 2023-24 period, corresponding to the most consistently reported recent sub-sectoral time series.

Growth was characterised through direct comparison of area, production and productivity values across benchmark years, expressed as absolute change and percentage change over the periods for which

Table 1: *All-India area, production and productivity of horticultural crops, selected years, 1991-92 to 2024-25 (AE = Advance Estimate; compiled from NHB, 2015; PIB, 2024, 2025).*

Year	Area (Million ha)	Production (Million Tonnes)	Productivity (t/ha)
1991-92	12.8	96.6	7.5
2001-02	16.6	145.8	8.8
2005-06	18.7	182.8	9.8
2010-11	21.8	240.5	11.0
2013-14	24.2	277.4	11.5
2016-17	25.1	299.85	~11.9
2021-22	28.04	347.18	~12.4
2022-23	28.44	355.48	~12.5
2023-24 (3rd AE)	28.98	353.19	~12.2
2024-25 (2nd AE)	30.14	367.72	~12.2

data were available; where independent secondary-data studies had already computed compound annual growth rates or cumulative percentage growth figures for the sector or sub-sectors, these are reported directly and attributed accordingly. Crop-wise composition of fruit and vegetable output was compiled from official Statistical Year Book and Horticultural Statistics reporting on the relative share of major individual crops (banana, mango, citrus for fruits; potato, tomato, onion for vegetables) within their respective sub-sectoral totals.

RESULTS AND DISCUSSION

This section presents the compiled secondary-data trends in total horticultural area, production and productivity, followed by disaggregated results for fruits and vegetables and their crop-wise composition.

Long-Term Trend in Horticultural Area, Production and Productivity

Total horticultural production in India rose from 96.6 million tonnes in 1991-92 to an estimated 367.72 million tonnes in 2024-25 (second advance estimate), an increase of approximately 281% over 33 years. Over the same period, the area under horticultural crops more than doubled, from 12.8 million hectares to 30.14 million hectares, while average productivity rose from 7.5 tonnes per hectare to approximately 12.1-12.5 tonnes per hectare in recent years. Both area and production have grown steadily across each successive benchmark period examined, with the most rapid absolute production gains occurring between 2005-06 and 2013-14, coinciding with the scaling up of the National Horticulture Mission following its 2005 launch.

Growth Performance of Fruits and Vegetables

Disaggregating total horticultural growth into its two dominant sub-sectors reveals that both fruits and vegetables have contributed substantially to overall sector growth, though vegetables consistently account for the larger absolute share of production. Between 2014-15 and 2023-24, fruit production rose from 86.6 million tonnes to 112.97 million tonnes, an increase of approximately 30%, while vegetable production rose from 169.47 million tonnes to 207.2 million tonnes, an increase of approximately 22% over the same nine-year period. Productivity gains accompanied this production growth in both sub-sectors: fruit productivity rose from 14.17 to 15.80 tonnes per hectare (an 11.5% increase), while vegetable productivity rose from 17.76 to 18.40 tonnes per hectare (a 3.6% increase), indicating that fruit cultivation has experienced somewhat more rapid productivity improvement than vegetable cultivation over the recent decade examined.

Independent time-series analysis spanning the longer 1991-92 to 2023-24 period reports considerably larger cumulative growth figures - 291.43% for fruit production and 257.7% for vegetable production - reflecting the compounding effect of consistent growth across a much longer time horizon than the nine-year sub-period highlighted above, and underscoring that horticultural growth has been sustained rather than a recent, short-term phenomenon.

Crop-wise Composition of Fruit and Vegetable Production

Within the fruit sub-sector, banana and mango together have consistently accounted for more than half of total fruit production, with banana alone contributing approximately one-third of output in recent years; citrus fruits contribute a further significant share, with the remainder distributed across apple, grapes, guava, papaya, pineapple and a range of other fruit crops. Within

Table 2: *Stylised comparison of area, production and productivity growth patterns between foodgrain crops and horticultural crops over broadly comparable multi-decade periods (compiled from Ministry of Agriculture foodgrain statistics and NHB horticulture statistics; figures indicative given differing base years and periods).*

Growth Component	Foodgrains (approx., multi-decade)	Horticulture (1991-92 to 2024-25)
Area growth	~50% (1950-51 to 2010-11)	~135% (1991-92 to 2024-25)
Production growth	~600-700% (1950-51 to 2024-25)	~281% (1991-92 to 2024-25)
Productivity growth	~150%+ (yield-dominated)	~63% (area-and-yield co-driven)
Primary growth driver	Yield improvement	Combined area expansion and yield improvement

the vegetable sub-sector, potato comprises the single largest share of production, at approximately 26-29% depending on the year, with tomato and onion together contributing a further fifth to quarter of total vegetable output; the remaining share is distributed across cabbage, cauliflower, brinjal, okra and a wide range of other vegetable crops.

Area-versus-Yield Decomposition of Growth

A distinguishing feature of horticultural growth relative to foodgrain growth over a comparable multi-decade period is the substantially larger relative contribution of area expansion. Whereas foodgrain area grew only modestly over recent decades while production growth was driven overwhelmingly by yield improvement, horticultural area more than doubled between 1991-92 and 2024-25 (from 12.8 to 30.14 million hectares, a 135% increase), a rate of area expansion far exceeding that observed in foodgrain crops over any comparable period. This pattern reflects horticulture's later policy prioritisation and consequently greater availability of land not yet intensively allocated to fruit and vegetable cultivation at the start of the study period, as well as active government promotion of crop diversification from cereals toward higher-value horticultural crops in suitable agro-climatic zones through mission-mode area expansion incentives.

DISCUSSION: HORTICULTURE AS A RELATIVELY HIGHER-GROWTH SUB-SECTOR

The retrospective evidence compiled in this study indicates that horticulture has grown at a relatively faster pace, and through a distinctly different combination of area and yield drivers, than India's foodgrain sector over broadly comparable periods. While foodgrain production growth since the Green Revolution has relied overwhelmingly on yield improvement within a relatively stable cultivated area, horticultural growth has drawn substantially on both continued area expansion and productivity improvement, a pattern consistent with a sector that began its major policy-supported expansion phase considerably later and from a much smaller base than cereal cultivation.

This area-and-yield co-driven growth pattern carries both opportunities and constraints for future policy. On one hand, continued availability of land suitable for horticultural diversification, particularly in regions currently under lower-value field crops, suggests that further area-based growth remains plausible in specific agro-climatic contexts. On the other hand, as horticultural area growth naturally decelerates over time - a pattern already visible in the narrowing gap between area and production growth rates in the most recent years examined - future production growth will increasingly need to rely on productivity improvement, placing greater importance on high-density planting systems, protected cultivation, precision nutrient and water management, and improved post-harvest infrastructure to reduce the substantial harvest and post-harvest losses that continue to affect Indian fruit and vegetable value chains.

POLICY IMPLICATIONS

- As area-based growth potential in horticulture gradually diminishes, policy and research investment should increasingly emphasise productivity-enhancing technologies - improved varieties, high-density planting, protected cultivation and precision nutrient/water management - to sustain future production growth.
- Given the concentration of vegetable production in a small number of crops (potato, tomato, onion), targeted measures to reduce production and price volatility in these crops, including post-harvest storage and processing infrastructure, would have disproportionate stabilising benefit for overall vegetable sector performance.
- Regional heterogeneity in horticultural growth and instability, as documented in sub-national studies, suggests that national-level growth figures should be complemented by state- and crop-specific monitoring to guide differentiated regional investment priorities.
- Continued investment in mission-mode programmes such as MIDH remains justified given the

sector's demonstrated multi-decade growth performance, though programme design should evolve toward productivity-focused rather than primarily area-expansion-focused objectives as the sector matures.

- Given fruit productivity's somewhat faster recent growth relative to vegetables, cross-learning of successful fruit-sector productivity interventions (e.g., high-density orcharding) for adaptation to vegetable cultivation contexts may offer additional growth potential.

Limitations of the Retrospective Secondary Data Approach

This retrospective study relies on official area, production and productivity statistics that are themselves subject to periodic revision across successive advance and final estimate releases, meaning that the most recent years examined (2023-24 and 2024-25) remain provisional and may be revised in subsequent official reporting. The area-versus-yield decomposition presented in Table 2 compares foodgrain and horticultural growth over periods that are not perfectly aligned in start and end year, given differing data availability, and should therefore be interpreted as an indicative rather than strictly matched statistical comparison. Crop-wise composition shares for fruits and vegetables are drawn from specific reference years within the broader study period and may not fully reflect year-to-year compositional shifts driven by price incentives, weather variability or policy changes. Finally, as with other secondary-data trend studies, the analysis is descriptive in nature and does not establish the specific causal contribution of individual policy interventions, such as MIDH, to the growth trends documented.

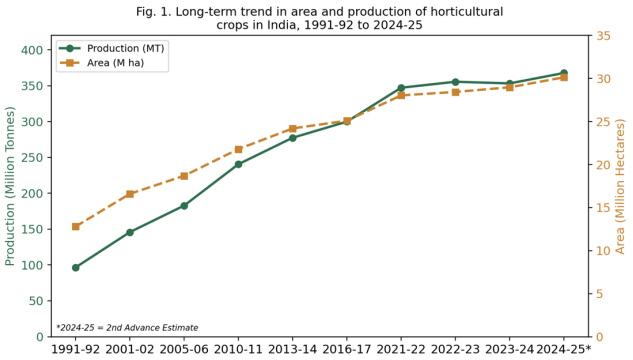

Figure 1: Long-term trend in area and production of horticultural crops in India, 1991-92 to 2024-25 (compiled from NHB Indian Horticulture Database, 2015; PIB Advance Estimates, 2024-25).

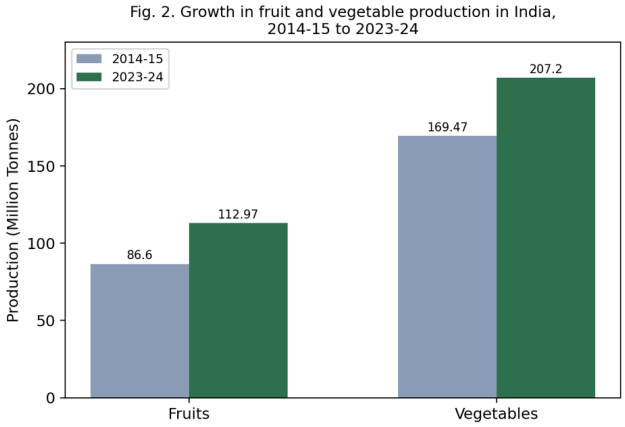

Figure 2: Growth in fruit and vegetable production in India, 2014-15 to 2023-24 (compiled from PIB Advance Estimates reporting, 2024).

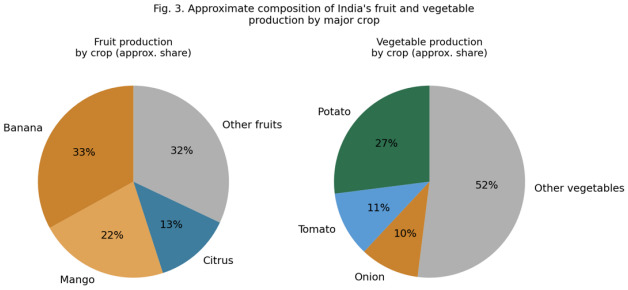

Figure 3: Approximate composition of India's fruit and vegetable production by major crop (compiled from MOSPI Statistical Year Book, Chapter 9 Horticulture; NHB reporting).

CONCLUSION

This retrospective secondary-data study confirms that India's horticulture sector has exhibited strong, sustained growth in area, production and productivity over more than three decades, with total production rising from 96.6 million tonnes in 1991-92 to an estimated 367.72 million tonnes in 2024-25 and area more than doubling over the same period. Both fruits and vegetables have contributed to this growth, with fruit production and productivity growing somewhat faster than vegetables over the most recent decade examined, though vegetables remain the larger sub-sector by absolute production volume. In contrast to the predominantly yield-driven growth pattern documented for Indian foodgrain crops, horticultural growth has been jointly driven by substantial area expansion and productivity improvement, a pattern reflecting the sector's later, mission-supported policy prioritisation. As the scope for further area-based growth gradually narrows,

sustaining India's horticultural growth trajectory will increasingly depend on productivity-enhancing technology adoption, reduced post-harvest losses, and continued, evolving policy support calibrated to the sector's maturing developmental stage.

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