**Spatio-Temporal Dynamics of ODOP Agricultural Products in Uttar Pradesh, India**

ABSTRACT

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| **Aims:** The One District One Product (ODOP) initiative under the PM Formalisation of Micro Food Processing Enterprises (PMFME) Scheme in Uttar Pradesh aims to foster localized agricultural specialization, enhance value chains, and promote rural economic growth. The study evaluates the Spatio-temporal dynamics of five ODOP-identified crops, garlic, potato, onion, chilly, and turmeric across selected districts.  **Duration of Study:** The study covers the time period from 2018-19 to 2022-23.  **Methodology:** Using secondary data from government sources, the research applies Compound Annual Growth Rate (CAGR) to assess long-term trends, Coefficient of Variation (CV) to examine year-on-year change in metrics and capture short-term fluctuations in area and productivity.  **Results:** The findings of the study shows that onion and potato from Bhadohi and Farrukhabad district respectively,show strong yield growth paired with high variability, indicating dynamic but unstable trends. However, the declining productivity and high volatility of chilli in the Deoria region highlight the need for urgent intervention.  **Conclusion:** The study underscores the necessity for further investment in infrastructure, technological access, and market networks to optimize the ODOP initiative’s impact, particularly in addressing the high variability and declining trends observed in certain crops and regions to ensure equitable regional development and sustainable agricultural practices. |

*Keywords: ODOP, Acreage trends, productivity, agricultural products, Spatio-temporal.*

1. INTRODUCTION

Uttar Pradesh stands as a leading force in India's growth story, driving transformation across multiple sectors. The state is rich in diverse crafts, skills, and resources and has long strived for balanced regional development. Recognising persistent economic disparities across its various districts, the Government of Uttar Pradesh has strategically leveraged targeted initiatives to foster inclusive growth. Among these, the 'One District-One Product' (ODOP) scheme stands out as a pivotal program designed to capitalise on the unique strengths of each region.

To unlock the true economic potential of rural India and support the Prime Minister’s vision for ‘Aatmanirbhar Bharat,’ the Ministry of Commerce and Industry has established a structured framework to promote the initiative as a nationwide movement. The One District One Product (ODOP) initiative in Uttar Pradesh aims to foster localised agricultural specialisation, enhance value chains, and promote rural economic growth.

* 1. **HISTORY OF ONE DISTRICT ONE PRODUCT SCHEME**

The One District One Product initiative in India was inspired by Japan’s One Village One Product (OVOP) movement, which began in the 1970s. OVOP helped rural communities in Japan develop unique local products, fostering entrepreneurship and self-sufficiency.

The ODOP concept was first introduced in Uttar Pradesh in 2018 to promote traditional crafts and industries unique to each district. Seeing its success, the central government expanded it nationwide. ODOP aims to boost local economies by identifying and promoting district-specific products, creating employment, and enhancing exports. The initiative is supported by various ministries, including the Ministry of Commerce and Industry, Ministry of Food Processing Industries, and Ministry of Textiles. ODOP has helped artisans, farmers, and small businesses by providing better market access, skill development, and financial support.

1. **LITERATURE REVIEW**

**Sharma, M., & Kulkarni, R. (2025),** The paper critically examines India’s ODOP initiative through a qualitative study of turmeric entrepreneurs in Sangli District, revealing that social capital particularly kin-centric networks play a decisive role in entrepreneurial success. While ODOP aims to foster inclusive development, the research shows that its benefits disproportionately favor established businesses with strong local networks, allowing them greater access to finance, market reach, and policy support. In contrast, newer enterprises with limited social capital face systemic barriers, despite equal formal entitlements. The researchers argue that this dynamic undermines the policy's inclusivity goals address social capital disparities to ensure equitable regional development.

**Kanujiya, P. K., et al. (2025),** The study assesses the impact of the ODOP initiative on economic empowerment of an aspirational district of Uttar Pradesh. The three primary aspects covered under the study are economic opportunities, skill development, and cultural heritage promotion. The findings suggest that ODOP has been instrumental in transforming lives by integrating economic development with cultural sustainability. However, the study highlights the necessity of further investment in infrastructure, technological access, and market networks to optimize the initiative’s impact. Moreover, ODOP serves as a valuable mechanism for regional growth, supporting the vision of an economically self-sufficient and culturally enriched India.

**Chaturvedi, P., Rajput, A., Rathore, V., & Singh, A. (2024),** The study analyzes the long-term variation in the acreage of nine horticultural ODOP crops across spices, vegetables, and fruits in Madhya Pradesh for the period of 2000–2021. The findings of the study urge to crop diversification, risk mitigation, and enhanced extension services for sustainable agricultural development. The study is relevant in documenting trends in variability and growth, which helps farmers to take informed crop choices.

**Kaur, P., & Dharni, K. (2024),** The research aims to find out how basic financial skills can help farmers and small businessman under the ODOP scheme grow their businesses and become financially secure. The study reveals that financial knowledge has significantly enhances agripreneurs’ ability to manage cash flow, access credit, and make sound investment decisions, thereby fostering sustainable business practices and resilience against market shocks. However, challenges persist due to limited access to formal banking, bureaucratic bottlenecks, and uneven levels of financial awareness among ODOP entrepreneurs. Policy innovation and collaborative efforts can address these barriers and bolster the effectiveness of ODOP. This research is particularly relevant as it aligns with broader developmental goals by linking grassroots entrepreneurship, financial capability, and localized economic planning.

**Huang, Z., & Tan, M. (2023),** The research examines the spatial distribution of specialty agriculture in China’s mountainous areas, by data provided under the One Village, One Product initiative. The OVOP sites are characterized into specialty planting, breeding, food, culture, and new business ventures such as agritourism and e-commerce. The study recommends to enhance development in underutilized areas through improved infrastructure facilities, rural investment, and strategic use of land, to mitigate abandonment and address food security challenges. It also suggests expanding specialty agriculture in steeper regions while reserving gentler terrain for staple food production.

**Muchima, E. J., & Mwanza, J. (2023),** The study presents the One Village Two Products framework, a locally driven rural development model, tailored to the agrarian dynamics of Ikeleng’i district in Zambia. The research findings state that despite central government constant efforts towards top-down development strategies, they have failed to adequately address the localized needs, leaving the district with infrastructure deficits, weak governance, and minimal value addition. The OVTP model advocates repositioning villages as production centers, coordinated through cooperatives to strengthen market access and business networks. Influenced by Japan’s OVOP initiative, it promotes bottom-up planning, emphasizing endogenous strengths, community participation, and policy reorientation.

**Misra, R., Maurya, N. K., & Tewari, S. (2021)** The paper aims to understand the effectiveness of the ODOP scheme in selected Eastern Uttar Pradesh districts. Masoor Dal, the ODOP product of Balrampur and Kalanamak rice of Siddharthnagar. The study findings reveals that despite government support in Balrampur, sugarcane dominates due to improved profits and less risks, while Masoor Dal cultivation faces hurdles like low awareness, stray animals, and weak infrastructure. In Siddharthnagar, although Kalanamak rice has a Geographical Indication tag, challenges such as low milling capacity, poor branding, and traditional practices hinder its growth. The study comments due to lack of grassroots awareness, institutional coordination, and responsive policy adaptation hinges the overall success of the scheme.

**Al Mamun, M. A., et al. (2021),** The paper analyzes production trends of rice from 1969–70 to 2019–20 in Bangladesh, focusing on area, yield, and seasonal contributions across Aus, Aman, and Boro rice. The study finds out that Boro rice has major contribution in terms of area and yield due to its high-yielding variety (HYV) adoption, while Aus and Aman have declined in area and production share. However, regional disparities persist, with Mymensingh and Rangpur leading in output, and Rangamati lagging. The study recommends region-specific interventions and cluster-based planning to enhance rice security through targeted technology diffusion and policy support.

**Reddy, V. K., & Immanuelraj, K. T. (2017),** The paper explores the long-term performance of major oilseeds across different Indian states. It highlights that although oilseeds occupy around 19% of the global area, their contribution to global production is only 2.7%, signaling low productivity. The study findings states that over the years, the oilseed area and output have increased, but the growth is still modest compared to cereals like rice and wheat. Pointing to significant yield variability across states and identifies structural weaknesses in the oilseeds sector. Despite India being the world’s largest producer of certain oilseeds like groundnut and castor, the paper calls for state-specific strategies, technological interventions, and policy reforms to enhance productivity, reduce import dependency, and ensure sustainability in edible oil production.

**Akhter, S., et al. (2016),** The research study aimed to examine the agricultural performance of major crops of Bangladesh from 1969 to 2009 using semi-log models and compound growth rates. The study found that while rice production increased was significantly driven by yield improvements. Pulses, rape and mustard exhibited moderate but positive growth in all spheres, with yields rising marginally. However, jute experienced a sharp decline in area, production, and yield, indicating structural or policy-related issues. Altogether, the study explains that productivity gains, not just land expansion, were central to agricultural growth in Bangladesh, underscoring the importance of input efficiency and institutional support for sustainable crop development.

Grounded on existing literature, the following research questions has been framed: which ODOP-identified crops and districts exhibit significant instability or consistent growth in cultivation area and yield during the study period?

* 1. **RESEARCH GAP**

While the ODOP scheme is increasingly acknowledged for its role in fostering economic empowerment and promoting cultural heritage in Uttar Pradesh, there remains a considerable research gap in analyzing district-wise spatial distribution and temporal acreage shifts of ODOP crops in Uttar Pradesh.

* 1. **RESEARCH OBJECTIVE**

The main purpose of conducting this study are as follows:

* To examine trends and variability in area, and production across five ODOP-identified crops across selected districts from 2018-19 to 2022-23.
* To identify which ODOP-aligned crop is performing well in Uttar Pradesh.

4. METHODOLOGY

**4.1 RESEARCH DESIGN**

This study adopts a descriptive, quantitative research design, leveraging secondary time-series data to evaluate trends in acreage and productivity of ODOP-identified crops. The research is non-experimental in nature and relies on statistical modelling to extract temporal patterns across districts.

The selection of specific agricultural products for the study is directly informed by their designation under the One District One Product and the PMFME scheme in Uttar Pradesh. Each crop analysed corresponds to the officially notified ODOP product for its respective district, thereby ensuring policy alignment and contextual relevance.

**4.2 DATA COLLECTION METHOD**

**Data Type:** Secondary Data

**Period Covered:** 2018-19 to 2022-23

**Sources:** Directorate of Economics and Statistics, Government of India

**Variables Considered:** Area under cultivation (hectares) and Production (metric tonnes)

**4.3. TOOLS AND ANALYTICAL FRAMEWORK**

**4.3.1. COMPOUND ANNUAL GROWTH RATE (CAGR)**

CAGR is used to evaluate the long-term growth or decline in area and production over the five-year period. This helps to identify which crops are expanding or contracting in coverage or productivity over the time. It is calculated:

Where:

Vf = Final year value (2022–2023)

Vi = Initial year value (2018–2019)

n = Number of years (typically 5)

**4.3.1. COEFFICIENT OF VARIATION (CV)**

The coefficient of variation (CV) is a measure that shows the relative variability of data in relation to its mean. It tells how consistent or stable a dataset is.

To measure stability, the coefficient of variation is calculated for each crop and district:

Where:

σ = Standard deviation

μ = Mean

**4.3.2. ABSOLUTE AND RELATIVE CHANGE**

These indicators quantify annual fluctuations:

* Absolute Change: Difference between consecutive years
* Relative Change (%): This is especially useful in highlighting policy shocks, weather anomalies, or market disruptions

**5.0. Results and Discussion**

Table 1 details the agricultural products designated under the One District One Product (ODOP) scheme in Uttar Pradesh, along with their respective districts. As per the Council of Scientific & Industrial Research, Ministry of Science & Technology, Govt of India, specifically, garlic is associated with Firozabad and Mainpuri districts. Potato is an ODOP product in Kannauj and Farrukhabad. The identified districts for onions are Ghazipur, Bhadohi, and Ballia. Chilli is linked to Deoria and Ambedkar Nagar, while turmeric is an ODOP product in Kushinagar, Bahraich.

**Table 1. Agricultural products of Uttar Pradesh listed under ODOP scheme**

|  |  |  |
| --- | --- | --- |
| ****S.No**** | ****Crop**** | ****ODOP Districts In Uttar Pradesh**** |
|  | **Garlic** | *Firozabad, Mainpuri* |
|  | **Potato** | *Kannauj, Farrukhabad* |
|  | **Onion** | *Ghazipur, Bhadohi, Ballia* |
|  | **Chilli** | *Deoria, Ambedkar Nagar* |
|  | ***Turmeric*** | *Kushinagar, Bahraich* |

*Source: Council of Scientific & Industrial Research, Ministry of Science & Technology, Govt of India*

Table 2 presents the growth and variation of acreage of selected ODOP-identified crops under cultivation. The table represents the absolute and relative change along with the compounded annual growth rate and Coefficient of variation. The research findings states that the Area under the cultivation of garlic in Firozabad had increased slightly and the compounded annual growth rate is negligible 0.019%. There is a very low CV of 0.88%, indicating stable land allocation over time. However, there is a 0.95% CAGR in Mainpuri reflects area expansion with moderate variation of 2.02%, representing gradual and somewhat consistent growth.

**Table 2. Absolute & relative changes, Variability and Growth rate, of area of selected crops under ODOP**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| S.No | Crop | District | Absolute Change  (`000 Hectors) | Relative Change  (%) | Compounded Annual Growth Rate (%) | Coefficient of Variation  (%) |
|  | **Garlic** | Firozabad | 4 | 100.09 | 0.018593 | 0.8837 |
| Mainpuri | 379 | 104.84 | 0.950808 | 2.021 |
|  | **Potato** | Kannauj | 6562 | 131.94 | 2.632983 | 6.8755 |
| Farrukhabad | 10,467 | 113.87 | 5.700984 | 15.945 |
|  | **Onion** | Ghazipur | 618 | 234.64 | 70.71575 | 41.749 |
| Bhadohi | 81 | 1450 | 18.59888 | 161.38 |
| Ballia | 127 | 115.95 | 3.004862 | 27.197 |
|  | **Chilli** | Deoria | (1) | (50) | (15.9104) | 70.7 |
| Ambedkar Nagar | 1 | 102.7 | 0.687326 | 8.963851 |
|  | **Turmeric** | Kushinagar | 152 | 131.34 | 5.603798 | 0.26485 |
| Bahraich | (30) | (79.02) | (4.59998) | 61.56 |

*Source: Research Findings*

The Production of Potato in Kannauj shows a substantial area increase of 2.63% with moderate variability of 6.88%, indicating a reliable expansion. However, there is robust grow of 5.70% in Farrukhabad but also elevated variability of 15.95%, implying aggressive yet unstable land allocation trends. There is a massive surge of 70.72% in Ghazipur in the area of onion but also high CV of 41.75%, suggesting erratic adoption. In Bhadohi, the area under cultivation shot up 18.60%, yet the extremely high CV of 161.38%, highlighting major fluctuations and climatic disruptions. A balanced growth rate of 3.00% with moderate variation 27.20% in Ballia, maybe due to weather, market volatility.

Area declined (15.91%) in Deoria with high instability 70.7%, showing shrinking interest and possible agro-climatic challenges. In Ambedkar Nagar, the area had slightly increased with 0.69% and low variability of 8.96%, signaling consistent but marginal expansion. A Strong growth rate of 5.60% in Kushinagar with outstanding stability of 0.26%, representing a district for steady area development for Turmeric. The area for the production of turmeric in Bahraich has declined, showing a decline of (4.60%), and high variation of 61.56%, representing volatile cultivation trends possibly due to market constraints.

Table 3 presents the growth and variation of production of selected ODOP-identified crops under cultivation. The table represents the absolute and relative change along with the compounded annual growth rate and Coefficient of variation. The research findings states that the Garlic production in Firozabad reflects a negative CAGR (–2.17%), implies that there is a steady decline in productivity. Low Coefficient of Variation, i.e., 4.83%, suggests that despite the drop, the yield patterns have remained relatively stable. However, production of garlic in Mainpuri shows a negligible decline of (0.01%) with but low CV 3.96%, suggesting there is stagnant yet steady yields. Potato production in both Kannauj and Farrukhabad districts exhibit strong growth of 5.45% and 7.33% respectively, but face a high variability, i.e., CV > 20%, indicating a substantial yield gain accompanied by fluctuations.

**Table 3. Absolute & relative changes, Variability and Growth rate, of Production of selected crops under ODOP**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| S.No | Crop | District | Absolute Change  (`000 Tonnes) | Relative Change  (%) | Compounded Annual Growth Rate (%) | Coefficient of Variation  (%) |
|  | **Garlic** | Firozabad | (2396) | (91.59) | (2.172) | 4.835 |
| Mainpuri | (2104) | (95.94) | (0.01031) | 3.96 |
|  | **Potato** | Kannauj | 475444 | 130.37 | 5.447 | 20.64 |
| Farrukhabad | 475127 | 142.41 | 7.327 | 23.91 |
|  | **Onion** | Ghazipur | 3557 | 127.17 | 4.926098 | 22.08 |
| Bhadohi | 1217 | 1140.17 | 62.70241 | 158.43 |
| Ballia | 9359 | 291.11 | 23.82648 | 39.16 |
|  | **Chilli** | Deoria | (1) | (50) | (12.94494) | 70.17 |
| Ambedkar Nagar | 1 | 103.0303 | 0.59884521 | 9.38 |
|  | **Turmeric** | Kushinagar | 427 | 154.05 | 9.026657 | 24.08 |
| Bahraich | 23 | 111.91 | 2.277308 | 28.54 |

*Source: Research Findings*

Production of Onion in Ghazipur showed a mild growth of 4.93% with a high CV of 22.08%, indicates that the production of Onion in the district, promises gains with some variability. There is a remarkable growth of 62.70% in Bhadohi district, along with extremely high variation of 158.43% representing erratic productivity which is likely driven. A Balanced growth in the production of onion in Ballia region of 23.83%, with a manageable variability 39.16%.

There is a negative CAGR (12.94%) and high Coefficient of Variation of 70.17% in the production of Chillies in Deoria region, highlighting a concerning decline and instability. However, there is a marginal growth in CAGR: 0.59% in Ambedkar Nagar with the low CV 9.38%, suggesting consistency and reliable performance. Production of Turmeric in Kushinagar district exhibits healthy CAGR of 9.03% and high CV of 24.08%. Despite, Bahraich district shows moderate growth of 2.28% and a higher CV of 28.54%, indicates greater yield fluctuations.

**Figure 1: Area (hectare) Of Top Contributing State & Uttar Pradesh in 2022-23**

Source: Directorate of Economics and Statistics, Government of India

The figure 1 represents the area (in hectares) utilized for cultivation by the top contributing states and Uttar Pradesh for various crops in 2022-23. For garlic, the top contributing state used an area of 64,314 hectares, while Uttar Pradesh utilized 35,228 hectares. Potato cultivation shows an identical area for both, with the top contributing state and Uttar Pradesh each dedicating 6,94,100 hectares. In the case of onions, the top contributing state cultivated an area of 1,96,097 hectares, significantly more than Uttar Pradesh's 42,179 hectares. For chillies, the top contributing state had a substantial area of 2,58,204 hectares under cultivation, whereas Uttar Pradesh used 13,736 hectares. Finally, for turmeric, the top contributing state utilized 24,746 hectares, while Uttar Pradesh used a much smaller area of 1,566 hectares.

**Figure 2: Productivity (tonnes) Of Top Contributing State & Uttar Pradesh in 2022-23**

*Source: Directorate of Economics and Statistics, Government of India*

The figure 2 illustrates the productivity (in lakh tonnes) of Top contributing states and Uttar Pradesh for several crops in 2022-23. For garlic, the top contributing state produced 3.97 lakh tonnes, while Uttar Pradesh produced 2.135 lakh tonnes. Potato shows a significant contribution with Uttar Pradesh yielding 243 lakh tonnes and becoming the top contributing state in India. In the case of onion, the top contributing state produced 22.51 lakh tonnes, whereas Uttar Pradesh produced 6.74 lakh tonnes. In case of chillies, the top contributing state produced 14.58 lakh tonnes, but Uttar Pradesh had 0.12781 lakh tonnes production. For turmeric, the top contributing state produced 2 lakh tonnes, while Uttar Pradesh contributed a negligible 0.02994 lakh tonnes.

4. Conclusion

The One District One Product (ODOP) initiative in Uttar Pradesh aims to foster localised agricultural specialisation, enhance value chains, and promote rural economic growth. This study analysed the spatio-temporal dynamics of five ODOP-identified crops across selected districts from 2018-19 to 2022-23. The findings reveal a mixed landscape of success and challenge; potato production in both the Kannauj and Farrukhabad districts shows strong growth, with high variability, and Uttar Pradesh is the top contributing state for potato production in India. Onion production in Bhadohi also experienced remarkable growth but with extremely high variation, indicating erratic productivity. Conversely, chilli in Deoria exhibited a concerning decline in both area and productivity, coupled with high instability. While some crops like turmeric in Kushinagar showed strong, stable area development and healthy productivity growth, others like garlic in Firozabad experienced stable land allocation but a steady decline in productivity. The study underscores the necessity for further investment in infrastructure, technological access, and market networks to optimize the ODOP initiative’s impact, particularly in addressing the high variability and declining trends observed in certain crops and regions to ensure equitable regional development and sustainable agricultural practices.

**COMPETING INTERESTS DISCLAIMER**

Authors have declared that they have no known competing financial interests OR non-financial interests OR personal relationships that could have appeared to influence the work reported in this paper.

**DISCLAIMER (ARTIFICIAL INTELLIGENCE)**

Author(s) hereby declares that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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