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Exploring Regional Growth and Variations in Horticultural Production: The Case of Manipur

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Abstract:

Manipur is conducive for growing various crops due to its diverse soil and agro-climatic features, which support a wide range of tropical and sub-tropical horticulture crops. The current research has sought to look at the growth patterns and variations in the distribution of horticultural crops in the region of Manipur, particularly on crops such as fruits, vegetables, and spices. This paper evaluates the developed performance of horticultural crops in terms of area cultivated, level of production, growth performance, and crop production from 2012 to 2021. The study uses descriptive statistics analysis to evaluate the causes of the observed regional differences. This data also shows that some areas of the district have very high production of fruits while others have low production, and this demonstrates the potential for such interventions to enhance agricultural productivity. The findings show that in terms of fruit crop production, Tamenglong and Senapati stand out, while Imphal West and Bishnupur districts are leading in vegetable crop production. The study calls for specific measures to be put in place in these underperforming areas to increase productivity, including the use of innovative climate-resilient agriculture practices and improved and targeted government intervention strategies.

Keywords- **Horticultural production, Regional variations, Manipur, Agriculture, Sustainable development.**

I. INTRODUCTION

Horticulture is the science and art of cultivating, maintaining, and marketing plants. It is distinct from agriculture in that it involves smaller acreage, frequently containing a diverse array of plants. The term "horticulture" originates from two Latin words: "hortus," which translates to garden, and "cultus," which means culture or cultivation. Agriculture is the linchpin of the Indian economy. This sector supports the livelihood of more than 68% of the rural population, with one-fifth of total exports (Dar, 2017).

Despite agriculture's predominance in the primary sector, it has not achieved its full potential due to the reliance on archaic technology and the sluggish adoption of new, proven methods, which hampers production and results in a diminished quality of life for farmers in the area. Throughout history, humans have relied on the struggle for food to survive. Agriculture, or farming, has been the only principal source of survival for nomadic people as well as established or permanent groups or towns. Singh and Sharma (2020) describe how indigenous peoples live differently inside their unique borders, farming in their own style for socioeconomic development is seen as an inescapable component of indigenous peoples living around the globe. In reality, Indigenous farming is a way of life that incorporates social, economic, cultural, and political aspects.

The Northeast (NE) area of India has significant biodiversity and hosts a diverse array of flora and animals. The area, as part of the Indo-Myanmar biodiversity hotspot, constitutes one of the four hotspots in the nation

(Gupta, 2022). The region's varied climatic conditions allow the cultivation of several tropical and temperate horticultural crops, such as flowers, vegetables, fruits, and tubers, that possess great nutritional value (Yadav et al, 2004, Sarmah & Deka, 2012). The high-quality spices, particularly ginger and chilli, from the area possess significant internal demand and export potential, especially in South and Southeast Asian nations (Das, 2016). The recent expansion of the market for these products has led to the horticulture sector rapidly becoming a significant industry, generating substantial revenue and employment for the agricultural sector while supporting several agro-based enterprises (Nabi & Bagalkoti, 2017). Manipur state, which is a part of north-eastern states, has rich natural resources and suitable agro-climatic conditions for the growth of horticulture crops. Nearly 80% of the state's population is involved in agriculture and related activities, highlighting its social and economic significance in people's lives. This importance is expected to continue in the foreseeable future (Roy et al. 2018). The state has made progress in exporting agro and horticultural crops such as pineapple from Churachandpur, Thoubal, and Imphal East districts, ginger from Chandel district, aromatic black rice from Kakching district, and oranges from Tamenglong district, among others (Raleng & Singh, 2021).

However, even with the potential growth for horticultural products, there is a noticeable difference in the growth and production across different districts of Manipur. The variations in agricultural performance can be linked to several attributes, including regional climate differences, geographical landscape, access to agricultural inputs, soil fertility, and the degree of infrastructure advancement. The objective of the current research is focused on studying the growth trends and regional disparities of horticultural output in the state of Manipur, particularly focusing on horticultural crops like fruits, vegetables, and spices. Taking a dive into critical variables like area cultivated, production, and trends over years in different districts, this paper aims to identify the factors that explain such variations in agricultural performance. These regional aspects, once understood, will help the policymakers and other agricultural actors to design appropriate measures for encouraging horticultural development in a focused and sustainable manner in all regions of the state.

II. REVIEW OF LITERATURE

Chand et al. (2008) highlight the growing demand for fruits and vegetables, which has led to an increase in imports compared to export shares of horticultural products. The study emphasizes the need to enhance the efficiency of agricultural inputs and crop production to meet domestic demand. It also points out the significant opportunities for developing horticultural crops and emphasizes the importance of domestic markets.

Ghosh (2010) discusses regional disparities in crop production among different districts, highlighting how these differences are affected by factors like the soil, climate, agricultural practices, and access to irrigation. Districts with superior infrastructure and equipment tend to achieve higher production levels. Additionally, farmers with better access to credit, markets, and government support experience significant impacts on crop production. The study emphasizes the need for enhanced support systems and infrastructure to promote equitable growth across districts.

Devi (2019) highlights the positive growth rate in both areas and the production of selected horticultural crops in Manipur state and Bishnupur district. There has been variability in production across different crops. The notable increase in production is due to the increase in the area of cultivation. It emphasizes the need to invest in high-quality seeds, irrigation, and production techniques to improve productivity and meet the increasing demand.

Jha et al. (2019) emphasize the significance of horticultural sectors in impacting its economy, livelihood, and security; the paper underlines some challenges regarding low production, undervalued and poor infrastructure. The study advocates for emphasizing in technology upgradation, policy intervention, and specific intervention for reaping its full potential.

Meetei et al. (2015) conducted a study to evaluate their investment returns, future prospects in horticultural activities, and their significance in the future development of the sector. It also mentioned that more than 74.2 percent of growers did not receive governmental supports, which hampers their development of this sector. The papers call for proper support and investment to enhance their capability with accessibility of resources for the growers.

Gupta (2022) In his paper, it highlights the various north-eastern states that grow horticultural crops, which are varying in crop types and annual growth rate along with instability indices. While some states areas of production in vegetables are increasing, states like Arunachal Pradesh are noted for sluggish expansion of cultivation areas. The paper identifies climate conditions, uses of high-quality seeds, and use of modern

equipment in cultivation, giving the differences in growth rate and productions. The paper calls for strategic intervention for the development of the horticultural sector.

III. OBJECTIVES

1. To study the growth performance of major horticultural crops grown in different districts of Manipur.
2. To examine the regional variations in total horticultural output in terms of area and production.
3. The period of the study is for ten years, i.e., 2012 to 2021.

IV. MATERIALS AND METHODS

The purpose of this paper is to examine the variations and growth of major horticultural products in various districts of Manipur over time. The study included the nine districts of Manipur, i.e. Imphal West, Imphal East, Bishnupur, Chandel, Senapati, Thoubal, Tamenglong, Ukhrul, and Canchipur (C.Cpur).

Source of data

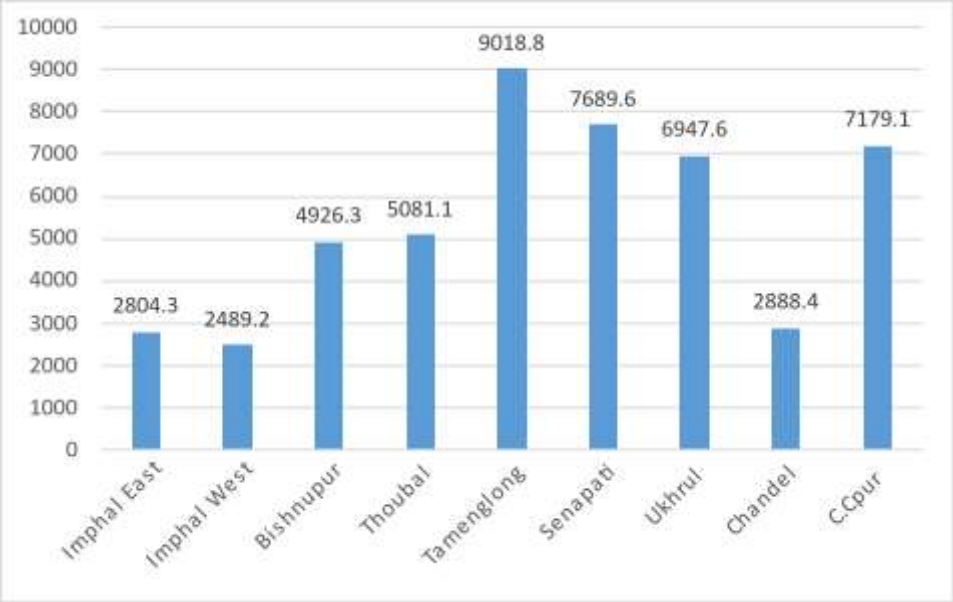
The study is secondary in nature and the data is collected from the Department of Horticulture & Soil Conservation, Government of Manipur. The study involves a descriptive analysis of horticultural data specifically focused on fruits, vegetables, and spices.

Methodology

The collected data has been analyzed using descriptive statistics, such as the mean, to compare the horticultural crop output across the nine districts of Manipur. The study is both analytical and empirical in nature.

V. RESULTS AND DISCUSSION

Figure 1. There is a considerable difference across districts when the mean area under fruit cultivation is compared district by district. With an average area under agriculture of 9018.8 hectares, Tamenglong holds the top spot, followed by Senapati (7689.6 hectares) and Churachandpur (7179.1 hectares). A significant mean area of 6947.6 hectares is also shown by Ukhrul. In comparison, the areas used for fruit farming are less in districts like Imphal East (2804.3 hectares), Imphal West (2489.2 hectares), and Chandel (2888.4 hectares); in the middle are Bishnupur (4926.3 hectares) and Thoubal (5081.1 hectares). This shows that there is a considerable difference in the acreage used for fruit growing; districts in the Imphal region have much smaller areas than those in Tamenglong and Senapati. Geography, climate, and each district's emphasis on agriculture might all have an impact on these variations.

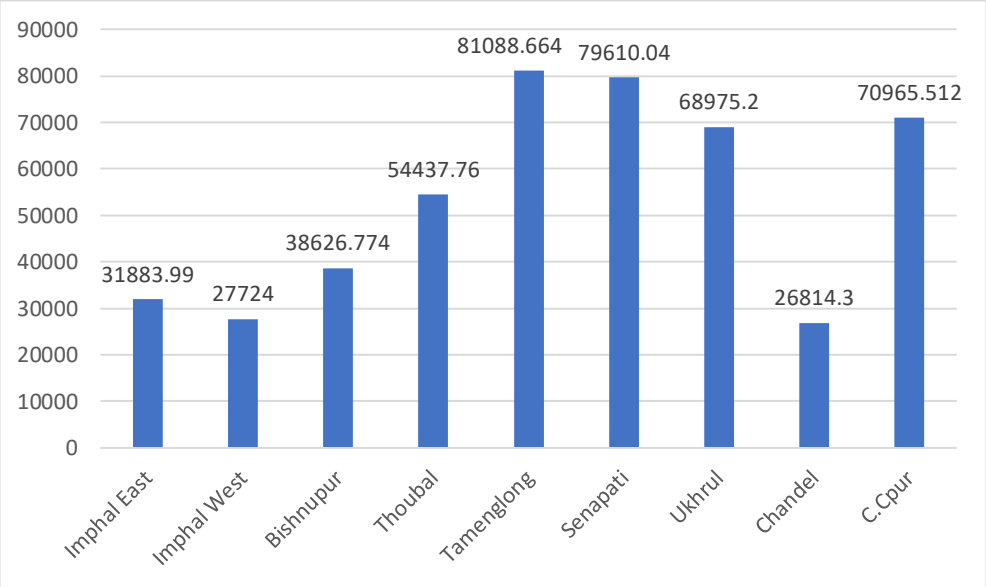


Source: Department of Horticulture & Soil Conservation, Govt. of Manipur.

Figure 1: Fruits Area Comparison with District wise

Figure 2. There are significant regional differences in fruit production when comparing districts. At 81,088.664 units, Tamenglong has the largest mean fruit output, closely followed by Senapati (79,610.04 units) and Churachandpur (C.Cpur) (70,965.512 units). With 68,975.2 units, Ukhrul has excellent productivity

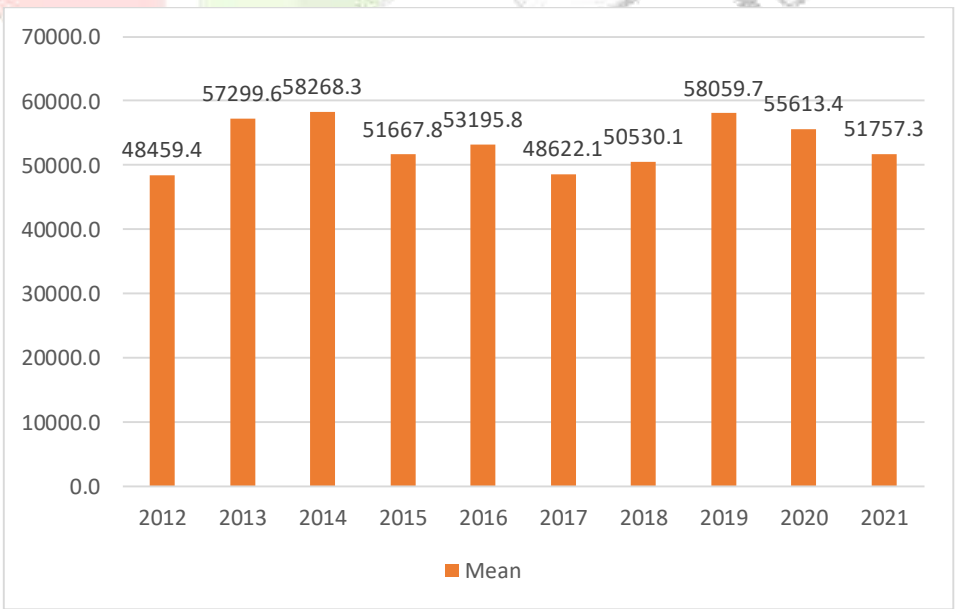
as well. Thoubal's mean output is 54,437.76 units, which is in the middle range; Bishnupur's mean production is 38,626.774 units. With 31,883.99 and 27,724 units produced, respectively, Imphal East and Imphal West show lower output levels. With a mean production of 26,814.3 units, Chandel has the lowest output. Finally, it is seen that there are notable regional differences in agricultural productivity: whereas Chandel and the districts of Imphal trail behind, districts like Tamenglong and Senapati lead in fruit production.



Source: Department of Horticulture & Soil Conservation, Govt. of Manipur.

Figure 2: Fruits Production Comparison with District wise

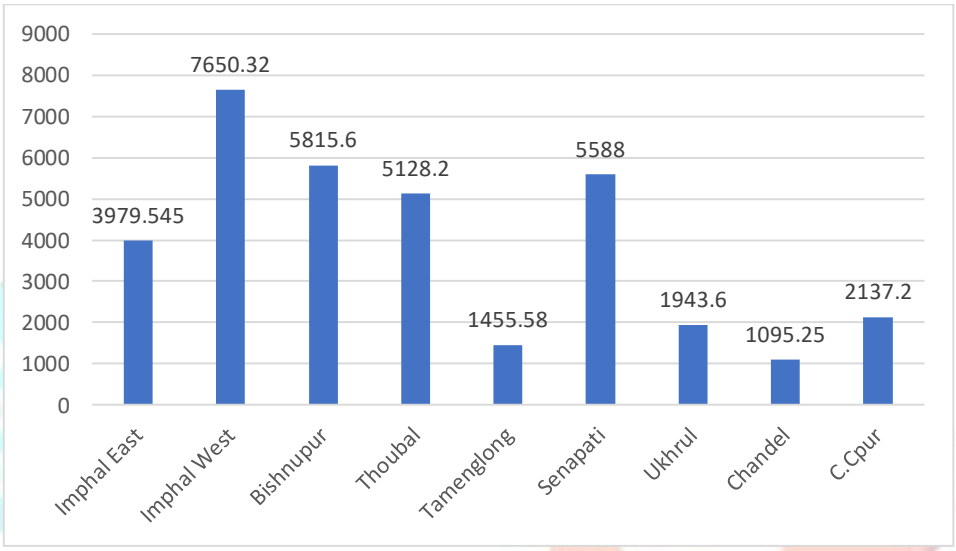
Figure 3. When you compare fruit production by year, you can see that the average production has changed a lot from 2012 to 2021. In 2012, production averaged 48,459.4. In 2013, it rose to 57,299.6, and it kept going up a little in 2014, hitting 58,268.3. But production dropped to 51,667.8 in 2015 and then slowly rose to 53,195.8 in 2016. In 2017, the mean went down to 48,622.1, but in 2018, production went up to 50,530.1. There was a big jump in 2019 to 58,059.7, then a small drop to 55,613.4 in 2020, and yet another drop to 51,757.3 in 2021. According to the data, production peaked in 2014 and will again in 2019. However, production has changed a lot over the years, showing the need for focused strategies to improve and maintain production levels in the future.



Source: Department of Horticulture & Soil Conservation, Govt. of Manipur.

Figure 3. Fruits Production Comparison Year Wise Trend

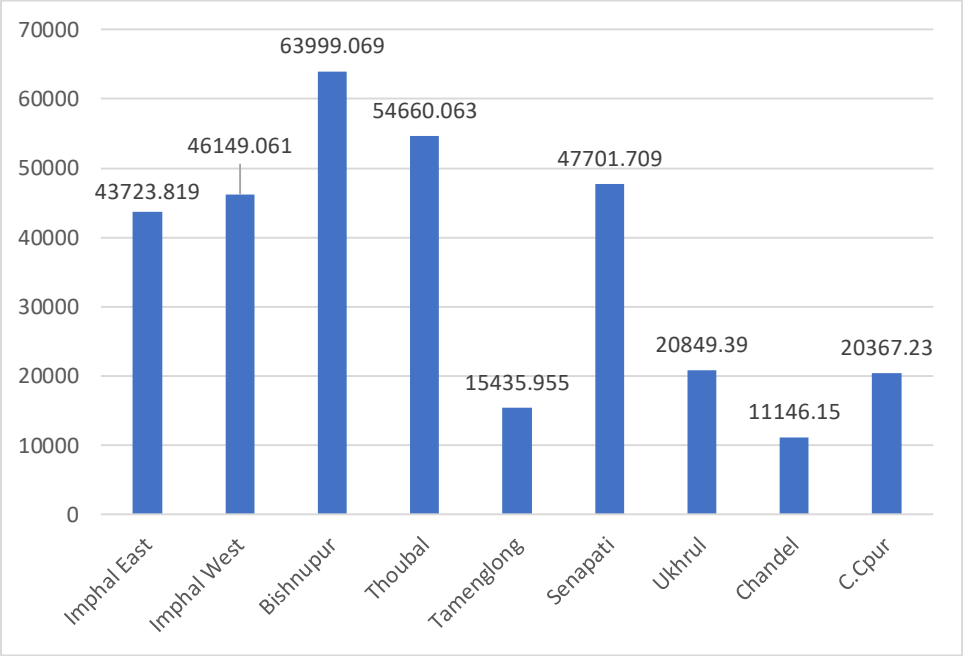
Figure 4. The comparison of vegetable acreage by district indicates notable differences between the areas. With a mean area of 7650.32, Imphal West stands out as having a strong commitment to vegetable farming. With mean areas of 5815.6 and 5588, respectively, Bishnupur and Senapati come next, indicating that these districts also have a significant agricultural presence. Additionally, Thoubal's remarkable mean area of 5128.2 emphasizes its role in the production of vegetables. On the other side, the mean areas of Tamenglong, Ukhrul, Chandel, and C.Cpur are much lower; Tamenglong has the lowest mean area at 1455.58, followed by Chandel at 1095.25. This suggests that there is not much vegetable agriculture going on in these districts. According to the data, some districts, such as Imphal West and Bishnupur, have a well-established framework for growing vegetables, but other districts have obstacles that could reduce agricultural productivity. This suggests that targeted interventions are necessary to improve vegetable production in the less productive districts.



Source: Department of Horticulture & Soil Conservation, Govt. of Manipur

Figure 4. Vegetable Area Comparison with District wise

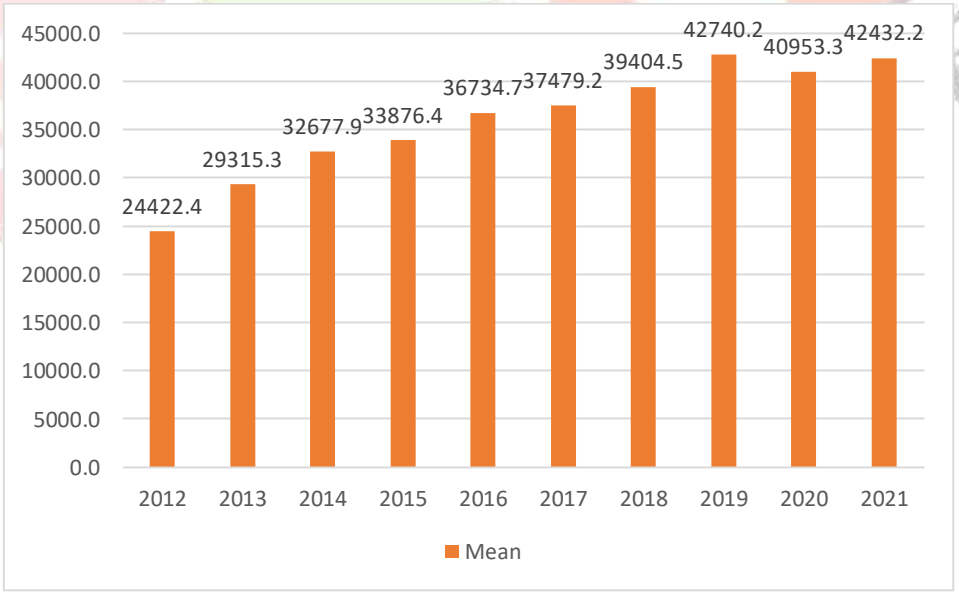
Figure 5. There are notable differences across the districts when comparing the vegetable production by district. With the greatest mean production of 63,999.069 units, Bishnupur stands out as having a strong agricultural output in that region. Thoubal and Imphal West, which come after Bishnupur, also show excellent output levels, with means of 54,660.063 and 46,149.061, respectively. On the other side, the production statistics of Tamenglong, Ukhrul, Chandel, and C.Cpur are much lower; the mean values in Chandel range from 11,146.15 to 15,435.955 in Tamenglong. Overall, the data points to the need for focused agricultural assistance and resources to increase output in the lower-performing districts. While certain districts, like Bishnupur and Thoubal, thrive in vegetable production, others have major hurdles.



Source: Department of Horticulture & Soil Conservation, Govt. of Manipur.

Figure 5. Vegetable Production Comparison with District wise

Figure 6. Comparing vegetable production by year from 2012 to 2019 shows a general upward trend. Output went from an average of 24,422.4 tons in 2012 to 42,740.2 tons in 2019. In 2019, the production reached its highest point. It then went down slightly to 40,953.3 tons in 2020, but then it went back up to 42,432.2 tons in 2021. As shown by the statistics, veggie production has been steadily rising over the years, with especially big jumps in 2013, 2016, and 2018. Overall, the trend shows that even though there were changes in production levels, veggie production was generally going in the right direction. This shows that farming output could go up in the coming years if current practices and conditions are kept up or made better.

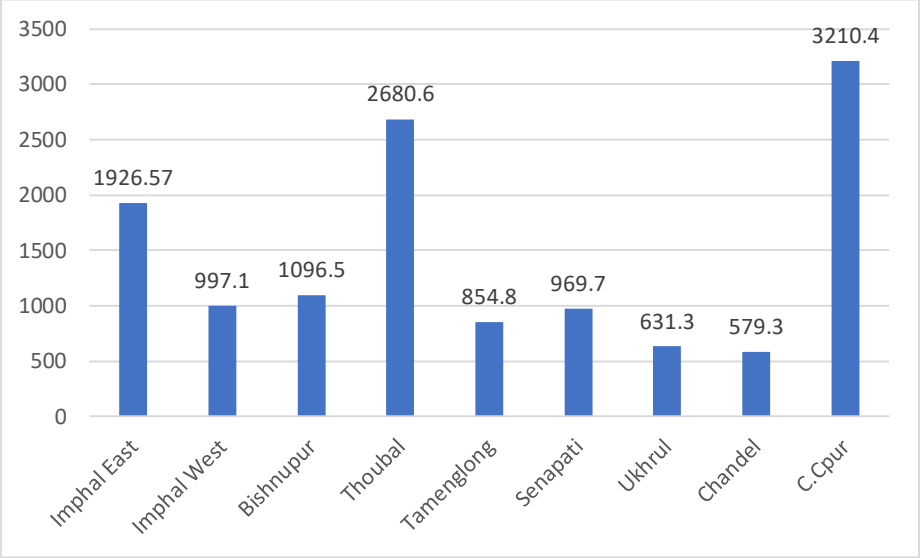


Source: Department of Horticulture & Soil Conservation, Govt. of Manipur.

Figure 6. Vegetable Production Comparison Year Wise

Figure 7. When you compare the mean spice area by district, you can see that there is a lot of variation between the areas. The average area used for growing spices in Churachandpur (C.Cpur) is 3210.4, which is higher than the next closest city, Thoubal, which has 2680.6. Ukhrul and Chandel, on the other hand, have the smallest mean sizes, at 631.3 and 579.3, respectively. The notable spice area is in Thoubal, which is the second highest at 2680.6, and next is Imphal East, which has a mean of 1926.57 and is one of the bigger producers. Imphal West, with a mean of 997.1, and Bishnupur, with 1096.5, both have modest amounts of spice farming. The mean areas of Tamenglong (854.8) and Senapati (969.7) are also smaller than those of the top districts. This comparison shows that some districts grow a lot of spices, while others only have a small area set aside

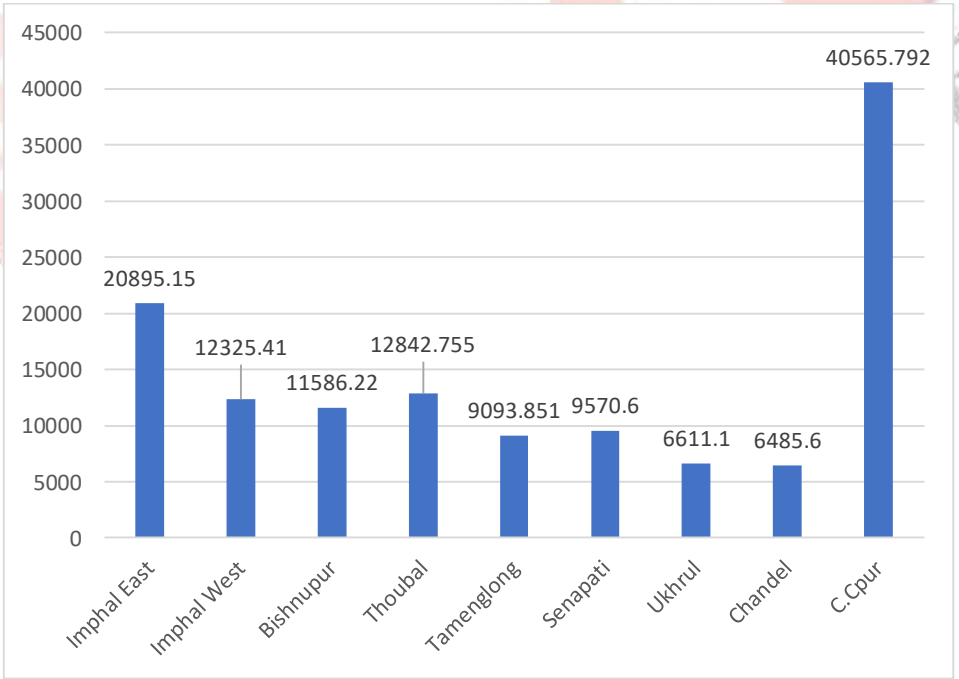
for them. This suggests that raising spice production in districts that aren't doing as well could help increase total farming output.



Source: Department of Horticulture & Soil Conservation, Govt. of Manipur.

Figure 7. Spices Area Comparison with District wise

Figure 8. When you compare the mean production by district, you can see that there is a lot of variation between the districts. The average production of spices in Churachandpur (C.Cpur) is 40565.792, which is higher than the next highest district, Imphal East, which has 20895.15. Ukhrul and Chandel, on the other hand, have the smallest mean sizes, at 6611.1 and 6485.6, respectively. Districts like Thoubal, Imphal West, and Bishnupur having a production of 12842.755, 12325.41, and 11586.22 respectively, are on the higher side as compared to other regions, which are in the lower level of production.

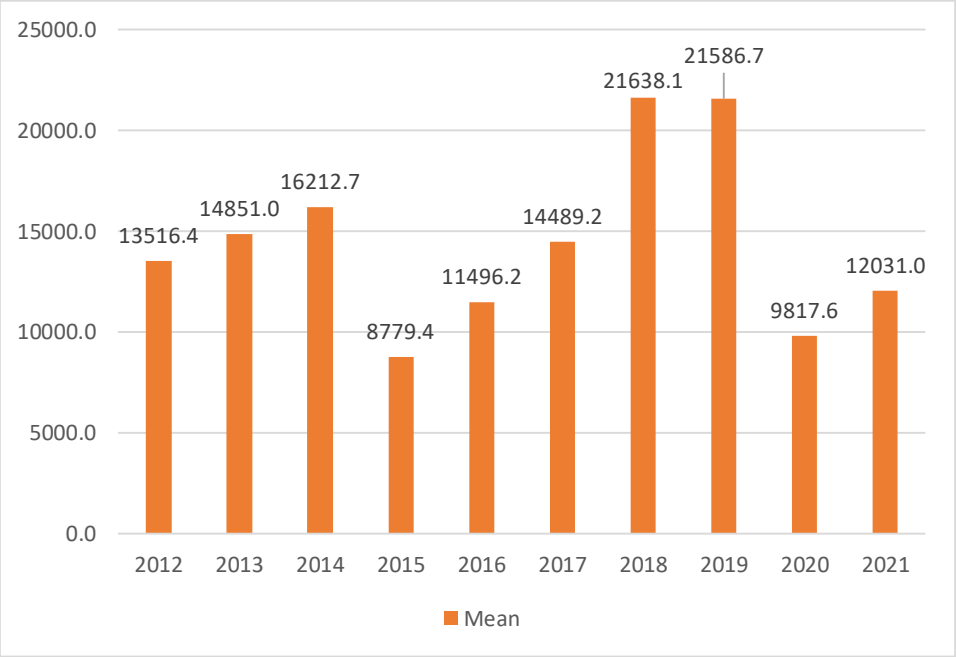


Source: Department of Horticulture & Soil Conservation, Govt. of Manipur.

Figure 8. Spices Production Comparison with District wise

Figure 9. The year-by-year comparison of mean spice production demonstrates considerable changes across the investigated period. Starting with a mean of 13,516.4 tons in 2012, output rapidly grew to 16,212.7 tons in 2014. However, output fell sharply in 2015, decreasing to 8,779.4 tons, the dataset's lowest point. Recovery was shown in future years, with a high mean of 21,638.1 tons in 2018, closely followed by 21,586.7 tons in 2019. Nonetheless, the trend reversed again in 2020, with output falling to 9,817.6 tons before significantly recovering to 12,031.0 tons in 2021. Overall, the data show significant volatility in spice output, with peaks and troughs suggesting probable underlying reasons influencing production stability, such as environmental

conditions, market demand, or agricultural techniques. This discrepancy emphasizes the need for additional inquiry to identify and minimize the issues affecting spice manufacturing throughout the years.



Source: Department of Horticulture & Soil Conservation, Govt. of Manipur.

Figure 9. Spices Production Comparison Year Wise

VI. FINDINGS

The data finds significant differences among districts in the area under cultivation and the output of fruits, vegetables, and spices over the period of ten years (2012-2021). The results show a marked difference in the cultivation area and productions of major horticultural crops among the nine districts.

Tamenglong and Senapati have a substantially bigger mean area and output of fruits than districts in the Imphal region, such as Imphal East and Imphal West, due to the limited areas for cultivation, urbanization, and less focus on fruit cultivation. The year-wise trends show the peak in 2014 and 2019 due to the factor of geographic and meteorological conditions, as well as district-specific agricultural goals, which may all have an impact on these variances. The data also shows that although some areas have excellent fruit output, others fall behind, emphasizing the possibility for targeted interventions to improve agricultural efficiency.

Imphal West, Bishnupur, and Thoubal have significant levels of vegetable cultivation and production, whilst districts like Tamenglong and Chandel have less involvement in vegetable growing. The gap shows that regions with lower productivity need additional resources and help to increase agricultural production. The constant growth in vegetable output throughout the years demonstrates a favorable trend in agricultural development; however, there is still room for improvement in less productive regions.

The cultivation and production of spices varied significantly, with Churachandpur dominating in terms of both area and output, followed by Thoubal. However, places like Ukhrul and Chandel show little interest in spice production, highlighting the need for targeted agricultural policy to close the productivity gap. The year-by-year study demonstrates variations in spice output, with substantial peaks and troughs suggesting instability that might be related to environmental conditions, market demand, or agricultural techniques.

VII. CONCLUSION

There are considerable geographical differences in the cultivation and production of fruits, vegetables, and spices throughout districts, as the data demonstrates overall. Tamenglong and Senapati have emerged as the most important districts for the production of fruits, while Imphal West and Bishnupur are the most successful districts for the cultivation of vegetables. The manufacturing of spices is particularly notable in Churachandpur. Variable patterns in the production of fruits, vegetables, and spices throughout the year, on

the other hand, provide light on underlying difficulties that need to be addressed. The differences in the development of horticultural crops among districts can be contributed to several factors, including climatic conditions, location, infrastructure, and the level of emphasis by these districts. These challenges include environmental conditions and agricultural approaches.

Though there has been growth in all the sectors throughout the study period, an erratic pattern is witnessed regarding fruit and spice production. It highlights the need for adoption of more resilient and sustainable horticulture systems, such as adoption of climate-smart crops, use of advanced farming techniques, and control of pests. Besides, the government should develop a specific policy that tailored the needs of specific districts by providing resources, training, and infrastructure for efficient and productive agriculture.

To achieve balanced agricultural development throughout all districts, it is vital to place an emphasis on enhancing production in districts that are not doing as well as possible, as well as to implement sustainable farming methods and tailored agricultural policies.

Overall, the study highlights the needs for mapping out the strategic plan for agriculture and its allied sectors, investing in advanced agricultural technology, farming techniques, and designing policies that will bridge the gap between low and high-performing districts. This would contribute towards sustainable development and resilient growth of the horticultural industry within the state.

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