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Growth and Potential of Floriculture (Marigold) in Madhya Pradesh

Lokesh Khawle[1] and Gyan Prakash[2]

Abstract

Abstract: *This research investigates the Growth and potential of the Marigold Flower industry in the Betul district of Madhya Pradesh. The study aims to provide insights into the current status of floriculture, identify critical factors influencing its Growth, evaluate the output potential, see the challenges the farmers face in the floriculture business faces, and propose strategies for floriculture growth in Madhya Pradesh. The results are based on Primary and Secondary Data collected through personal interviews and other authentic secondary sources. The Preliminary findings suggest a growing trend in the floriculture industry in Betul, with traditional practices prevailing. Challenges include limited awareness, market linkages, lack of export potential, access to credit, etc. Marigold floriculture offers the Betul district supplementary income and employment potential despite these challenges. The study recommends interventions such as modern training, improved market connections, awareness campaigns to enhance floriculture growth, Government support, sustainability considerations, community involvement, export promotion, etc are essential for maximising the industry's potential. Collaboration among stakeholders can foster a robust floriculture sector, contributing to local economic development and environmental sustainability.*

Introduction:

Floriculture, the art and science of cultivating and propagating ornamental and flowering plants, has blossomed into a vibrant and economically significant sector within the Indian agricultural landscape. Often considered a tapestry of colours, fragrances, and aesthetics, floriculture has transcended its traditional roots to become a

[1] Lokesh Khawle, Assistant Professor (Department of Economics), The Bhopal School of Social Sciences, Bhopal (M.P.).
2. Gyan Prakash, School of Economics, Devi Ahilya University, Indore.

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dynamic industry that adorns festivals, weddings, and ceremonies and significantly contributes to India's economy.

With its rich history dating back to ancient times when flowers held cultural and religious significance, India has nurtured a profound connection with floriculture. From the revered marigolds adorning temples to the fragrant roses symbolizing love, the floral tapestry of India reflects the nation's cultural diversity and deep-rooted traditions. In recent decades, floriculture in India has undergone a remarkable transformation, transitioning from a largely unorganized and subsistence-based activity to a commercial industry driven by technological advancements, international demand, and changing consumer preferences. Today, India ranks among the world's top flower producers, with many flower varieties cultivated across diverse agro-climatic zones, making it an exciting hub for flower enthusiasts, entrepreneurs, and investors. This introduction to the fascinating world of floriculture in India embarks on a journey to explore this industry's vibrant and evolving landscape. In order to achieve the objectives and to conduct the research properly, the Betul District of Madhya Pradesh has been studied. The state of Madhya Pradesh, known for its rich agricultural diversity, presents an interesting area for exploring the growth and potential of floriculture **(Gupta. A., 2003).**

The study discussed the historical origins, current status, and promising opportunities that characterize the Indian floriculture sector. Through a multidimensional lens, the study navigated the fragrant fields of flower cultivation, examined the economic underpinnings, and highlighted the cultural tapestry woven by floriculture in the fabric of Indian society. As embarked on this exploration, it became evident that floriculture in India is not just a pursuit of beauty and fragrance; it is a testament to the nation's resilience, innovation, and entrepreneurial spirit. This unravels the myriad facets of this blooming beauty, offering insights into the challenges and potential for growth and sustainability in the dynamic world of floriculture.

Literature Review:

The present study is supported by an extensive review of published literature on various floriculture aspects, encompassing national and international sources. This comprehensive review serves as a background for the study, emphasising its uniqueness and relevance within the evolving trends of the floriculture industry and business. The literature review is organised under distinct heads and aligned with the study's objectives.

1. **Growth of Floriculture:** This section explores the literature on the growth trends, patterns, and factors influencing the expansion of floriculture cultivation. It also

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investigates studies focusing on improving flower production and enhancing productivity through various techniques and practices.

2. **Production and Marketing Constraints:** This section examines the constraints and challenges floriculture producers, marketers, and exporters encounter. It includes studies that identified and analysed limitations in production processes, quality control issues, transportation logistics, regulatory frameworks, and barriers to accessing markets for floricultural products.

3. **Floriculture Potential:** This section reviews the literature on the floriculture potential, including studies that assess the economic viability of floriculture projects. It examines research on cost analysis, profitability, investment requirements, and available financing options for floriculture businesses.

1. Growth of Floriculture:

The growth of floriculture has been widely researched and documented in the literature. In this, some of the key findings and trends have been highlighted in the literature on the growth of floriculture. A study by **Mehta et al. (2018)** found that the floriculture sector in India generated approximately 2.7 million jobs and contributed around USD 7.5 billion to the country's GDP.

A study by **Rama Rao et al. (2008)** "A spatial and temporal analysis focusing on the performance of agriculture in Andhra Pradesh", indicated that the area dedicated to flower cultivation in Andhra Pradesh experienced an increase from 12,128 to 14,773 hectares between 1998 and 2006, with an annual growth rate of 12 per cent. Implementing initiatives such as the National Horticulture Mission (NHM) and the Andhra Pradesh Micro Irrigation Project (APMIP) played a beneficial role in promoting horticulture in the region. As a result, the demand for horticultural products increased due to improved incomes, leading to a stable flower market. However, the study also revealed that the overall growth of flower productivity at the state level in Andhra Pradesh experienced a decline.

Pavithra et al. (2016) focused on the production, changing patterns, and trade directions of Indian exports in floriculture products. Their findings revealed that India's area dedicated to flower cultivation experienced a growth rate of 9.96 per cent per annum. From 2004-05 to 2013-14, both loose flowers and cut flowers exhibited an upward trend in production, with growth rates of 10.79 per cent and 25.17 per cent, respectively. While the area and production of loose flowers remained relatively stable during the study period, the production of cut flowers showed fluctuations influenced by various climatic factors. Notably, the study highlighted significant growth in terms of area, production, and export value within India's floriculture sector throughout the study period.

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Sharma et al. (2017) investigated the " Impact of Floriculture Growth on Rural Development" and examined the floriculture increased income generation, employment opportunities, and overall rural development, highlighting its potential as a driver of economic growth in rural areas.

Patil et al. (2020); Kumar Ashish (2021) and **Reddy R (2021) in their studies** provided an overview of emerging trends in the floriculture industry. It covers topics such as the adoption of precision **agriculture techniques, vertical farming, niche markets, digital marketing, and sustainable practices**. The study highlighted the potential growth opportunities arising from these trends.

The above literature shows an increasing floriculture growth, production, and productivity trend. There is also a changing pattern in floriculture production tools and techniques. Now product and marketing difficulties have been reviewed below.

2. Production and Marketing Constraints:

Another area of research has been the impact of technology on the growth of floriculture. Technological advances, such as greenhouses and hydroponics, have led to significant improvements in productivity, quality, and yield. Several studies have shown that the use of technology can lead to higher profits for farmers and can help to promote sustainable production practices **(Adeoye et al., 2020; Garside et al., 2019).**

Research has also focused on the environmental impact of floriculture. The sector has been criticized for its high water and energy consumption and its use of pesticides and other chemicals. However, studies have shown that adopting sustainable production practices, such as integrated pest management and water-efficient irrigation systems, can help reduce floriculture's environmental impact **(Lutaladio and Castaldi, 2017).**

Regarding market trends, research has shown that the demand for cut flowers and ornamental plants is increasing globally. This is due to factors such as population growth, rising income levels, and changing consumer preferences. The market for floriculture is also becoming more diverse, with new markets emerging in Asia, Africa, and Latin America **(FAO, 2019).**

In conclusion, literature on floriculture's production and market potential has highlighted the economic, technological, environmental, and market trends associated with the sector. These findings can help to inform policy and practice and promote the sustainable growth of floriculture.

3. Potential of Marigold:

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Marigold is a popular flower species in the floriculture industry due to its bright colors, long vase life, and wide range of uses. Here is a literature review on the potential of floriculture of marigolds.

Marigold flowers have great economic potential, as they are widely used for ornamental purposes and in the pharmaceutical, cosmetic, and food industries. According to a study **(Lopa. M., 2016),** marigold cultivation can provide a significant source of income for farmers in developing countries, particularly in areas where other crops struggle to grow. Marigold flowers have been used traditionally for their medicinal properties, and recent studies have shown that they contain several bioactive compounds with potential health benefits. These compounds have been found to have anti-inflammatory, antioxidant, and antitumor properties.

In another study **(Marie. Cloe., 2007)** Marigold flowers have been found to have pest management potential due to their insecticidal properties. According to a study, marigold extract has been used to control various insect pests in crops, thereby reducing the need for chemical pesticides. Marigold flowers have also several environmental benefits, such as attracting beneficial insects and pollinators, reducing soil erosion, and improving soil fertility. Marigold cultivation can also contribute to climate change mitigation through carbon sequestration in the soil.

According to **(Mahajan. R., 2010)** Marigold flowers are relatively easy to grow and can be cultivated in a variety of climatic conditions, making them an attractive crop for small-scale farmers. Marigold cultivation can also be integrated with other crops, such as vegetables and fruits, to provide additional income and improve soil health.

Therefore, the potential of floriculture of marigolds is significant, as it can provide economic, medicinal, pest management, environmental, and cultivation benefits. However, there is still a need for further research on various aspects, such as breeding and genetics, post-harvest management, marketing, agronomic practices, and value-added products, to fully unlock the potential of marigolds in the floriculture industry.

Research Gap:

Although a significant amount of literature is available on the cultivation and uses of marigold flowers, several research gaps still need to be addressed. Here are some of the research gaps in the floriculture of marigold flowers:

1. Breeding and Genetics:

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There is a need for further research on the breeding and genetics of marigold flowers, specifically in the development of new and improved varieties with enhanced characteristics such as yield, disease resistance, and color.

2. Marigold Potential:

The limited information available on the potential of marigold flowers, such as their storage and transportation, markets, e-commerce platforms, etc. This gap needs to be addressed to increase the shelf life of the flowers and reduce post-harvest losses.

3. Marketing:

There is a lack of marketing strategies for marigold flowers, specifically in identifying potential markets and developing marketing strategies. This research can help increase the demand for marigold flowers and expand their market reach.

4. Agronomic practices:

There is limited information available on agronomic practices for marigold cultivation, such as fertilizer management, water management, and pest control. Further research is needed to identify the optimal agronomic practices for marigold cultivation to improve yield and reduce input costs.

5. Value-added products:

Research is needed to develop value-added products from marigold flowers, such as essential oils, extracts, and bioactive compounds. This research can help increase the economic value of marigold flowers and expand their use in various industries.

Addressing these research gaps can help unlock the full potential of marigold flowers in the floriculture industry and increase their economic, social, and environmental benefits. Now, these gaps have been analyzed with the help of the following objectives.

Objectives:

The main objectives of this research are as follows:

1. To study the growth of Marigold flowers in Madhya Pradesh.
2. To analyse the factors influencing the growth of floriculture in Madhya Pradesh.
3. To evaluate the output potential of floriculture in Madhya Pradesh.
4. To study the challenges faced by the Betul floriculture farmers in the floriculture business.
5. To suggest the policies for the improvement of Marigold flowers.

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Methodology:

Data Collection: The study is mainly based on primary data which was collected through structured interviews and surveys with local floriculture farmers, traders, and consumers. Secondary data has been gathered from agricultural departments, research publications, and relevant government reports (Like the **Department of Horticulture and Food Processing, Statistics, Government of Madhya Pradesh).**

Data Tools: The collected data has been analysed using Qualitative and Quantitative techniques. The analysed data has been presented in the form of graphs and tables, while qualitative data has been categorized to extract the data for further analysis.

Results and Discussion:

The study's first objective is the growth of Marigold flowers in Madhya Pradesh. The area and production data have been analyzed from 2012 to 2022. The below table no. 1 below shows the general production of marigold flowers in India and Madhya Pradesh during the past decade.

Table 1. Area and Production of Marigolds (India and Madhya Pradesh)

Year	India Area (in Hectare)	India Production (in MT)	Madhya Pradesh Area (in Hectare)	Madhya Pradesh Production (in MT)
2012-13	53210	446070	9815.61	99647.3
2013-14	55890	511310	10422.7	101997.4
2014-15	56040	497590	12460.4	168052.81
2015-16	66090	603180	15865.82	176186.67
2016-17	70420	621780	18120.62	237083.95
2017-18	76080	767950	20339.29	264002.96
2018-19	72740	810830	18035.94	238109.08
2019-20	79700	881430	19586.22	256443.35
2020-21	73990	760960	20738.33	270794.8
2021-22	84090	916240	22472.49	289704.23

Source: Department of Horticulture and Food Processing, Statistics, Government of Madhya Pradesh

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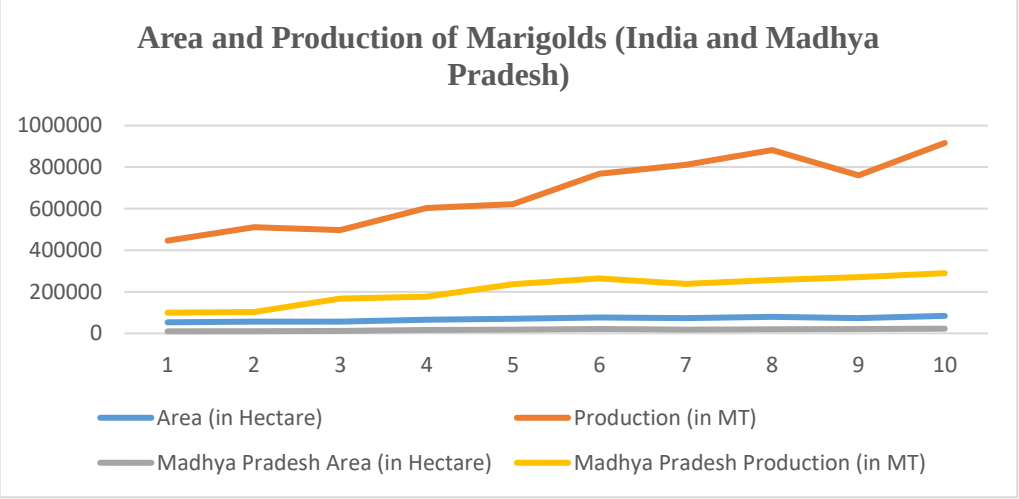
Graph 1. Area and Production of Marigolds (India and Madhya Pradesh)



Source: Department of Horticulture and Food Processing, Statistics, Government of Madhya Pradesh

The above Table and Graph 1 show the increasing trend in area and production in India and Madhya Pradesh. In India and Madhya Pradesh, there is a constant increase in area as compared to production. The production trend is increasing in India and Madhya Pradesh, except in 2020 covid phase production in India has declined. The overall floriculture production has flourished with increased area due to the increasing demand for different flowers in India and its states.

Table no. 2 has analysed the area, production, and productivity in all the districts of Madhya Pradesh. Thus the districts in ascending order to select one district among all the districts according to its area, production, and productivity.

Table 2 reveals that Betul is the only district among all the districts where the area, production, and productivity of flowers are aligned. Whereas other districts are having different areas, production, and productivity when arranged in ascending order.

Table 2 Madhya Pradesh Districts Ranking according to Area; Production and Productivity (2022)

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S. NO.	Districts	Area (Hac)	Districts	Production (MT)	Districts	Productivity (MT/Hac)
1	Rewa	0	Rewa	0	Rewa	0
2	Sheopur	26	Sidhi	203	Rajgarh	1.212
3	Balaghat	35	Rajgarh	206	Sidhi	2.570
4	Harda	35	Panna	255.72	Panna	2.973
5	Narsinghpur	37	Sheopur	260	Singrauli	3.1
6	Umaria	40	Balaghat	281	Agar Malwa	5.47
7	Tikamgarh	41	Tikamgarh	287	Anuppur	5.750
8	Dindori	50	Mandla	375.2	Damoh	6
9	Shahdol	60	Harda	376	Guna	6
10	Mandla	61.55	Dindori	391	Mandla	6.096
11	Bhind	65	Narsinghpur	416	Niwari	7
12	Ashoknagar	66	Anuppur	464.87	Tikamgarh	7
13	Raisen	78	Umaria	470	Dindori	7.82
14	Sidhi	79	Guna	570	Balaghat	8.029
15	Anuppur	80.85	Ashoknagar	654	Alirajpur	8.53
16	Panna	86	Bhind	715	Hoshangabad	8.914
17	Guna	95	Niwari	735	Shajapur	9.1
18	Khargone	96	Raisen	743	Seoni	9.177
19	Morena	102	Damoh	990	Dewas	9.200
20	Niwari	105	Singrauli	1023	Ratlam	9.243
21	Burhanpur	123	Morena	1130	Raisen	9.526
22	Hoshangabad	127	Hoshangabad	1132.12	Mandsaur	9.569
23	Barwani	137.5	Burhanpur	1230	Ashoknagar	9.909
24	Chhatarpur	147	Khargone	1248	Burhanpur	10
25	Datia	148	Shahdol	1253.4	Sheopur	10
26	Seoni	155	Seoni	1422.5	Vidisha	10.108
27	Damoh	165	Datia	1776	Harda	10.743
28	Neemuch	165	Mandsaur	1808.6	Katni	10.890
29	Rajgarh	170	Vidisha	1859.86	Sehore	10.899
30	Khandwa	179	Chhatarpur	1961.5	Bhind	11
31	Vidisha	184	Neemuch	1980	Gwalior	11
32	Mandsaur	189	Barwani	2090	Morena	11.078
33	Jhabua	193	Jhabua	2395	Chhindwara	11.125

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34	**Betul**	**216**	**Betul**	**2511**	**Betul**	**11.625**
35	Bhopal	250	Khandwa	2933	Narsinghpur	11.643
36	Jabalpur	329.84	Shajapur	3185	Umaria	11.75
37	Singrauli	330	Bhopal	3500	Satna	11.892
38	Shajapur	350	Alirajpur	3565.54	Datia	12
39	Gwalior	355	Agar Malwa	3582.85	Neemuch	12
40	Katni	385	Gwalior	3905	Ujjain	12.9
41	Alirajpur	418	Katni	4192.62	Khargone	13
42	Sagar	448	Jabalpur	4307.95	Jabalpur	13.061
43	Sehore	485	Sehore	5286	Chhatarpur	13.344
44	Shivpuri	490	Dewas	5796.3	Sagar	13.645
45	Dewas	630	Sagar	6113	Bhopal	14
46	Agar Malwa	655	Shivpuri	7310	Shivpuri	14.918
47	Satna	743	Satna	8836	Jhabua	15
48	Chhindwara	1144	Chhindwara	12726.5	Barwani	15.2
49	Dhar	1326.64	Ujjain	20188.5	Khandwa	16.385
50	Ujjain	1565	Dhar	36535	Indore	20
51	Indore	3690	Ratlam	37454.46	Shahdol	20.89
52	Ratlam	4052	Indore	73800	Dhar	27.539
TOTAL		**21183.38**		**276431.49**		**539.825**

Source: Department of Horticulture and Food Processing, Statistics, Government of Madhya Pradesh

In this study, Betul has been taken as the core research area in Madhya Pradesh. There are eight tehsils in the Betul district, out of which the top five tehsils have been selected based on their area and production (2013 to 2023). The below table 3 shows the top five tehsils of the Betul district.

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Table 3 Betul Tehsil's Area and Production (2013-2023)

Year	Chicholi		Shahpur		Multai		Ghoradongri	
	Area (Hac)	Production (M. Ton)	Area (Hac)	Production (M. Ton)	Area (Hac)	Production (M. Ton)	Area (Hac)	Production (M. Ton)
2013-14	1	13	9	117	10	110	13	169
2014-15	1	13	9	117	10	110	13	169
2015-16	3	39	9	117	15	165	15	195
2016-17	3	39	9	117	15	165	15	195
2017-18	3	39	9	117	15	165	15	195
2018-19	5	65	12	156	17	187	17	221
2019-20	5	65	12	156	17	187	17	221
2020-21	5	65	12	156	17	187	17	221
2021-22	5	65	12	156	17	187	17	221
2022-23	5	65	12	156	17	187	17	221

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Year	Bhainsdehi		Amla		Betul		Athner
	Area (Hac)	Production (M. Ton)	Area (Hac)	Production (M. Ton)	Area (Hac)	Production (M. Ton)	Area (Hac)
2013-14	19	247	25	143	28	336	26
2014-15	19	247	25	143	28	336	26
2015-16	19	247	27	154	28	336	26
2016-17	22	286	30	173	28	336	30
2017-18	22	286	30	173	28	336	30
2018-19	25	325	30	173	32	384	32
2019-20	25	325	30	173	32	384	32
2020-21	25	325	30	173	32	384	32
2021-22	25	325	30	173	32	384	32
2022-23	25	325	30	173	32	384	32

Source: Department of Horticulture and Food Processing, Statistics, Government of Madhya Pradesh

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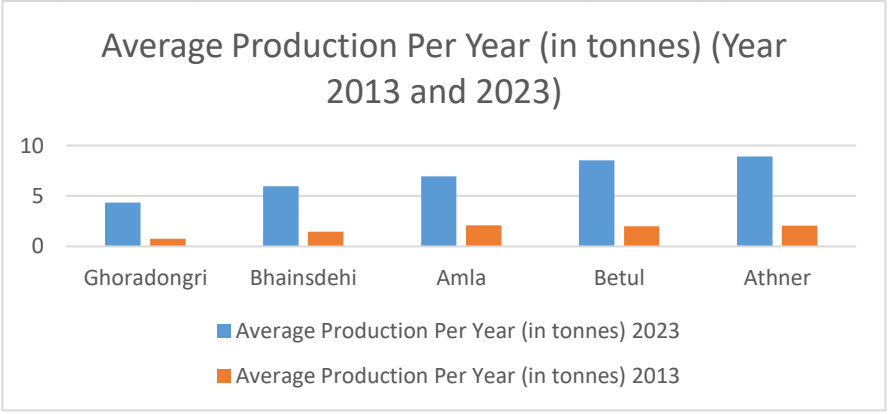
Now, the average production of flowers in these five tehsils has been analyzed in the below table and graph.

Table 4 Average Marigold Production Per Year (in tonnes) (Year 2013 and 2023)

Districts	Average Production Per Year (in tonnes) 2023	Average Production Per Year (in tonnes) 2013
Ghoradongri	4.35	0.75
Bhainsdehi	5.975	1.475
Amla	6.95	2.1
Betul	8.55	2
Athner	8.925	2.075

Source: Authors Elaboration

Graph 2 Average Marigold Production Per Year (in tonnes) (Year 2013&2023)



Source: Authors Elaboration

The above table 4 and graph 2 shows the average production per year in 2013 and 2023. There is a drastic decadal change from 2013 to 2023. The average production of flowers has increased in all the five tehsils of Betul. This shows that demand for Marigold flower has increased with time. Athner ranks first with highest marigold production followed by Betul, Amla, Bhainsdehi and Ghoradongri.

While analyzing the compound annual growth rate the Betul tehsil achieved the highest return from floriculture investment. Being a district, Betul gets more facilities

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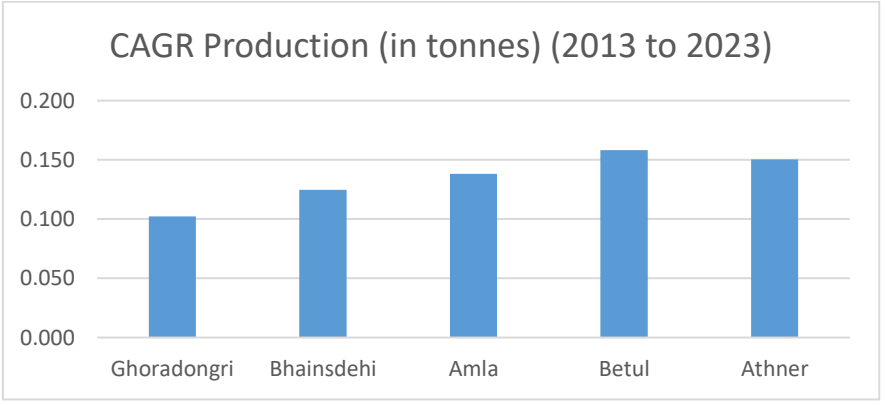
and benefits as compared to other tehsils. The below table shows the compound annual growth rate of five tehsils.

Table 5 CAGR (in percentage) of Flower Production (2013 to 2023)

Districts	CAGR (in %) of Flower Production (2013 to 2023)
Ghoradongri	0.102
Bhainsdehi	0.125
Amla	0.138
Betul	0.158
Athner	0.150

Source: Authors Elaboration

Graph 3 CAGR (in percentage) of Flower Production (2013 to 2023)



Source: Authors Elaboration

The second objective is to analyze the factors influencing the growth of floriculture in Madhya Pradesh. To achieve the objective multiple regression model has been used.

Multiple Regression Model (MRM)

$$Yi = \alpha + \beta Xi + \beta Xii + \beta Xiii + \beta Xiv + \beta Xv + \varepsilon i$$

In the model, the literal interpretation of the estimated coefficient $\beta\hat{}$ is that a one-unit increase in X will produce an expected increase in Y of $\beta\hat{}$ units.

Yi= Total production of flower

α = Constant

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β = beta coefficient is the degree of change in the outcome variable for every 1-unit of change in the predictor variable

Xi = Education

Xii = Gross sown area

Xiii = total sales

Xiv = cost of cultivation

Xv = types of seeds (coding according to frequency)

εi = error term

Hypothesis:

H0: The growth of floriculture is not influenced by the taken factors

H1: The growth of floriculture is influenced by the taken factors

Here are the results of the regression analysis:

Regression result of Ghoradongri:

Table 6 Regression Analysis (Ghoradongri)

Ghoradongri	Coefficients	t- Stat	P-value
Intercept (production in kgs)	0.14	1.170	0.250
Education	0.29	0.209	0.836
Gross sown area (square meter)	0.21	0.794	0.433
Total Sales (Per year in kgs)	1	0.341	0
Cost of cultivation (in Rs. yearly)	0.9	5.789	0.162
Type of seeds (Hybrid)	-1	-0.575	0.569
R Square = 0.78			

Source: Authors Elaboration

The R-squared value for this regression model is 0.78, indicating that approximately 78% of the variance in the dependent variable (production in kgs) can be explained by the independent variables in the model.

Discussion:

Intercept (production in kgs): The coefficient of the intercept is 0.14, and the P-value is 0.250. This suggests that the baseline production of marigold flowers in Ghoradongri Tehsil is 0.14 kgs when all other independent variables are zero. The P-

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value is greater than the conventional significance level of 0.05, indicating that the intercept may not be statistically significant in explaining the variation in production.

Education: The coefficient for education is 0.29, but the P-value is 0.836. This indicates that education is not statistically significant in explaining the variation in marigold production. Education level does not appear to significantly influence marigold production in the region.

Gross sown area (square meter): The coefficient for gross sown area is 0.21, and the P-value is 0.433. This suggests that the size of the sown area is not statistically significant in explaining the variation in marigold production. The positive coefficient implies a potential positive effect but is not statistically supported in this analysis.

Total Sales (Per year in kgs): The coefficient for total sales is 1 with a P-value of 0. This indicates that total sales have a strong and statistically significant positive effect on marigold production. For every unit increase in total sales, marigold production increases by 1 kg.

Cost of cultivation (in Rs. yearly): The coefficient for the cost of cultivation is 0.9, and the P-value is 0.162. This suggests that the cost of cultivation positively affects marigold production, but it is not statistically significant at the conventional significance level of 0.05.

Type of seeds (Hybrid): The coefficient for the type of seeds (Hybrid) is -1, and the P-value is 0.569. This indicates that the type of seeds used (Hybrid) is not statistically significant in explaining the variation in marigold production.

Hypothesis Testing:

Based on the given data and the regression results:

(H0): The growth of floriculture is not influenced by the taken factors.

(H1): The growth of floriculture is influenced by the taken factors.

In this analysis, the regression results do not provide strong evidence to reject the null hypothesis. Many of the independent variables, including education, gross sown area, and the type of seeds used (Hybrid), are not statistically significant in explaining the variation in marigold production. However, total sales appear to have a statistically significant positive effect on marigold production.

It is important to note that the R-squared value, while relatively high, does not necessarily imply causation or a strong relationship. Further investigation and potentially a larger dataset may be needed to draw more robust conclusions about the factors influencing marigold production in Ghoradongri Tehsil.

Regression result of Bhainsdehi:

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Table 7 Regression Analysis (Bhainsdehi)

Bhainsdehi	Coefficients	t- Stat	P-value
Intercept (production in kgs)	0.139	2.534	0.016
Education	-0.472	-0.957	0.344
Gross sown area (square meter)	0.146	3.917	0.041
Total Sales (Per year in kgs)	1	1.436	0
Cost of cultivation (in Rs. yearly)	-0.896	-2.106	0.043
Type of seeds (Hybrid)	-0.332	-0.439	0.664
R Square = 0.85			

Source: Authors Elaboration

The R-squared value for this regression model is 0.85, indicating that approximately 85% of the variance in the dependent variable (production in kgs) can be explained by the independent variables in the model.

Discussion:

Intercept (production in kgs): The coefficient of the intercept is 0.139, and the P-value is 0.016. This suggests that the baseline production of marigold flowers in Bhainsdehi Tehsil is 0.139 kgs when all other independent variables are zero. The P-value is less than the conventional significance level of 0.05, indicating that the intercept is statistically significant in explaining the variation in production.

Education: The coefficient for education is -0.472, but the P-value is 0.344. This indicates that education is not statistically significant in explaining the variation in marigold production. Education level does not appear to have a significant influence on marigold production in the region.

Gross sown area (square meter): The coefficient for gross sown area is 0.146 with a P-value of 0.041. This suggests that the size of the sown area has a positive and statistically significant effect on marigold production. For every unit increase in the gross sown area, marigold production increases by 0.146 kgs.

Total Sales (Per year in kgs): The coefficient for total sales is 1 with a P-value of 0. This indicates that total sales have a strong and statistically significant positive effect on marigold production. For every unit increase in total sales, marigold production increases by 1 kg.

Cost of cultivation (in Rs. yearly): The coefficient for the cost of cultivation is -0.896, and the P-value is 0.043. This suggests that the cost of cultivation has a negative

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and statistically significant effect on marigold production. For every unit increase in the cost of cultivation, marigold production decreases by 0.896 kgs.

Type of seeds (Hybrid): The coefficient for the type of seeds (Hybrid) is -0.332, and the P-value is 0.664. This indicates that the type of seeds used (Hybrid) is not statistically significant in explaining the variation in marigold production.

Hypothesis Testing:

Based on the given data and the regression results:

Null Hypothesis (H0): The growth of floriculture is not influenced by the taken factors.

Alternative Hypothesis (H1): The growth of floriculture is influenced by the taken factors.

In this analysis, the regression results provide evidence to reject the null hypothesis. Several independent variables, including gross sown area, total sales, and the cost of cultivation, are statistically significant in explaining the variation in marigold production. These factors are influencing the growth of floriculture in Bhainsdehi Tehsil, Madhya Pradesh. However, education level and the type of seeds used (Hybrid) do not appear to have a significant influence on marigold production in the region.

Regression result of Betul:

Table 8 Regression Analysis (Betul)

Betul	Coefficients	t- Stat	P-value
Intercept (production in kgs)	0.51	2.109	0.465
Education	0.78	2.943	0.832
Gross sown area (square meter)	0.82	1.564	0.751
Total Sales (Per year in kgs)	1	2.084	0.466
Cost of cultivation (in Rs. yearly)	0.9	2.571	0.594
Type of seeds (Hybrid)	0.43	-0.727	0.089
R Square = 1			

Source: Authors Elaboration

The R-squared value for this regression model is 1, indicating that 100% of the variance in the dependent variable (production in kgs) can be explained by the independent variables in the model. This high R-squared value suggests that the model may be overfitting the data, and further investigation is needed.

Discussion:

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Intercept (production in kgs): The coefficient of the intercept is 0.51, and the P-value is 0.465. This suggests that the baseline production of marigold flowers in Betul Tehsil is 0.51 kgs when all other independent variables are zero. However, the P-value is greater than the conventional significance level of 0.05, indicating that the intercept may not be statistically significant in explaining the variation in production.

Education: The coefficient for education is 0.78, but the P-value is 0.832, indicating that education is not statistically significant in explaining the variation in marigold production. This means that the level of education of floriculturists does not have a significant influence on marigold production in the region.

Gross sown area (square meter): The coefficient for gross sown area is 0.82 with a P-value of 0.751. This suggests that the size of the sown area may have a positive but statistically insignificant effect on marigold production.

Total Sales (Per year in kgs): The coefficient for total sales is 1 with a P-value of 0.466. This indicates that total sales have a strong positive effect on marigold production. For every unit increase in total sales, marigold production increases by 1 kg.

Cost of cultivation (in Rs. yearly): The coefficient for the cost of cultivation is 0.9, and the P-value is 0.594. This suggests that the cost of cultivation has a positive effect on marigold production, but it is not statistically significant at the conventional significance level of 0.05.

Type of seeds (Hybrid): The coefficient for the type of seeds (Hybrid) is 0.43, and the P-value is 0.089. This indicates that using hybrid seeds may have a positive effect on marigold production, but it is marginally statistically significant.

Hypothesis Testing:

Based on the given data and the regression results:

Null Hypothesis (H0): The growth of floriculture is not influenced by the taken factors.

Alternative Hypothesis (H1): The growth of floriculture is influenced by the taken factors.

In this analysis, the regression results do not provide strong evidence to reject the null hypothesis. Many of the independent variables, including education, gross sown area, cost of cultivation, and type of seeds, are not statistically significant in explaining the variation in marigold production. However, total sales appear to have a statistically significant positive effect on marigold production.

It is important to note that a high R-squared value of 1 suggests potential overfitting of the model to the data, and further investigation and validation may be necessary to draw definitive conclusions about the factors influencing marigold production in Betul

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Tehsil. Additionally, collecting more data and considering other potential factors may lead to more robust results.

Regression result of Amla:

Table 9 Regression Analysis (Amla)

Amla	Coefficients	t- Stat	P-value
Intercept (production in kgs)	0.473	2.458	0.497
Education	0.491	2.168	0.018
Gross sown area (square meter)	0.619	1.345	0.621
Total Sales (Per year in kgs)	1	2.497	0.038
Cost of cultivation (in Rs. yearly)	0.752	2.084	0.546
Type of seeds (Hybrid)	0.302	2.194	0.049
R Square = 0.93			

Source: Authors Elaboration

The R-squared value for this regression model is 0.93, indicating that approximately 93% of the variance in the dependent variable (production in kgs) can be explained by the independent variables in the model.

Discussion:

Intercept (production in kgs): The coefficient of the intercept is 0.473, and the P-value is 0.497. This suggests that the baseline production of marigold flowers in Amla Tehsil is 0.473 kgs when all other independent variables are zero. The P-value is greater than the conventional significance level of 0.05, indicating that the intercept may not be statistically significant in explaining the variation in production.

Education: The coefficient for education is 0.491, and the P-value is 0.018. This indicates that education is statistically significant in explaining the variation in marigold production. The positive coefficient suggests that higher education levels are associated with increased marigold production. Education may contribute to better farming practices, management, and innovation in floriculture.

Gross sown area (square meter): The coefficient for gross sown area is 0.619, and the P-value is 0.621. This suggests that the size of the sown area is not statistically significant in explaining the variation in marigold production. The positive coefficient implies a potential positive effect, but it is not statistically supported in this analysis.

Total Sales (Per year in kgs): The coefficient for total sales is 1, and the P-value is 0.038. This indicates that total sales have a strong and statistically significant positive

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effect on marigold production. For every unit increase in total sales, marigold production increases by 1 kg.

Cost of cultivation (in Rs. yearly): The coefficient for the cost of cultivation is 0.752, and the P-value is 0.546. This suggests that the cost of cultivation is not statistically significant in explaining the variation in marigold production. The positive coefficient implies a potential positive effect, but it is not statistically supported in this analysis.

Type of seeds (Hybrid): The coefficient for the type of seeds (Hybrid) is 0.302, and the P-value is 0.049. This indicates that using hybrid seeds has a statistically significant positive effect on marigold production. The use of hybrid seeds may result in higher yields compared to other seed types.

Hypothesis Testing:

Based on the given data and the regression results:

Null Hypothesis (H0): The growth of floriculture is not influenced by the taken factors.

Alternative Hypothesis (H1): The growth of floriculture is influenced by the taken factors.

In this analysis, the regression results provide evidence to reject the null hypothesis. Several independent variables, including education, total sales, and the type of seeds used (Hybrid), are statistically significant in explaining the variation in marigold production in Amla Tehsil. These factors are influencing the growth of floriculture in the region. However, gross sown area and the cost of cultivation do not appear to have statistically significant effects on marigold production.

Regression result of Athner:

Table 10 Regression Analysis (Athner)

Athner	Coefficients	t- Stat	P-value
Intercept (production in kgs)	-0.441	-0.872	0.389
Education	-0.439	-0.629	0.534
Gross sown area (square meter)	0.862	0.627	0.535
Total Sales (Per year in kgs)	1	2.576	0
Cost of cultivation (in Rs. yearly)	-0.743	-2.429	0.021
Type of seeds (Hybrid)	-0.432	-0.636	0.529
R Square = 0.97			

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Source: Authors Elaboration

The R-squared value for this regression model is 0.97, indicating that approximately 97% of the variance in the dependent variable (production in kgs) can be explained by the independent variables in the model.

Discussion:

Intercept (production in kgs): The coefficient of the intercept is -0.441, and the P-value is 0.389. This suggests that the baseline production of marigold flowers in Athner Tehsil is -0.441 kgs when all other independent variables are zero. However, the P-value is greater than the conventional significance level of 0.05, indicating that the intercept may not be statistically significant in explaining the variation in production.

Education: The coefficient for education is -0.439, and the P-value is 0.534. This indicates that education is not statistically significant in explaining the variation in marigold production. Education level does not appear to have a significant influence on marigold production in the region.

Gross sown area (square meter): The coefficient for gross sown area is 0.862, and the P-value is 0.535. This suggests that the size of the sown area is not statistically significant in explaining the variation in marigold production. The positive coefficient implies a potential positive effect, but it is not statistically supported in this analysis.

Total Sales (Per year in kgs): The coefficient for total sales is 1, and the P-value is 0. This indicates that total sales have a strong and statistically significant positive effect on marigold production. For every unit increase in total sales, marigold production increases by 1 kg.

Cost of cultivation (in Rs. yearly): The coefficient for the cost of cultivation is -0.743, and the P-value is 0.021. This suggests that the cost of cultivation has a negative and statistically significant effect on marigold production. For every unit increase in the cost of cultivation, marigold production decreases by 0.743 kgs.

Type of seeds (Hybrid): The coefficient for the type of seeds (Hybrid) is -0.432, and the P-value is 0.529. This indicates that the type of seeds used (Hybrid) is not statistically significant in explaining the variation in marigold production.

Hypothesis Testing:

Based on the given data and the regression results:

(H0): The growth of floriculture is not influenced by the taken factors.
(H1): The growth of floriculture is influenced by the taken factors.

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In this analysis, the regression results provide evidence to reject the null hypothesis. Several independent variables, including total sales and the cost of cultivation, are statistically significant in explaining the variation in marigold production in Athner Tehsil. These factors are influencing the growth of floriculture in the region. However, education, gross sown area, and the type of seeds used (Hybrid) do not appear to have statistically significant effects on marigold production.

To achieve the third objective that is output potential of floriculture, Cobb-Douglas production function has been used to assess the productivity of floriculture of marigold flowers in five tehsils of Betul District, considering the natural logarithm of capital LN(K), the natural logarithm of labor LN(L), and the natural logarithm of total factor productivity LN(A) as key determinants of output.

Cobb-Douglas result of Athner tehsil:

ANOVA

	Coefficients
Intercept	-19.994508
LN (K)	0.39293858
LN (L)	3.26273661
LN (A)	3.6556752

The estimated coefficients for the production function are as follows:
Intercept: -19.99450768
LN(K) (Beta 1): 0.392938583
LN(L) (Beta 2): 3.262736615
LN(A) (Production Elasticity): 3.655675197

The coefficient of LN(K) (Beta 1) represents the elasticity of output with respect to capital, while the coefficient of LN(L) (Beta 2) represents the elasticity of output with respect to labor. The LN(A) coefficient (Production Elasticity) characterizes the overall productivity of marigold flower in Athner Tehsil, capturing the influence of technology, management practices, and other unaccounted factors.

Discussion:

Labor-Intensive Nature: The substantial and positive coefficient of LN(L) (Beta 2) indicates that labor is a major driver of productivity in the marigold flower in Athner Tehsil. This suggests that marigold cultivation and management require a significant labor force, particularly for activities such as planting, tending to the crops, harvesting, and quality control. A skilled and efficient workforce is essential for maximizing marigold production.

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Capital Investment: The coefficient of LN(K) (Beta 1) is positive but relatively smaller compared to LN(L), implying that while capital investment does have a positive impact on productivity, it may not be as influential as labor in this specific context. Nevertheless, investing in capital, such as greenhouses, irrigation systems, and post-harvest facilities, can support and enhance labor-intensive activities, especially during adverse weather conditions.

Total Factor Productivity (TFP): The LN(A) coefficient (Production Elasticity) is notably high (3.655675197), indicating that total factor productivity is a significant driver of the marigold flower in Athner Tehsil. This implies that technological advancements, innovative farming practices, efficient resource utilization, and perhaps unique local practices play a crucial role in increasing marigold output. Investments in research and development, sustainable cultivation practices, and modern technology can significantly boost total factor productivity.

Sustainability and Local Adaptations: Given the high Production Elasticity (LN(A)), there is substantial potential for growth through technological innovations and sustainability measures. Marigold growers in Athner Tehsil should focus on adopting eco-friendly practices, optimizing resource utilization, and exploring locally adapted techniques and technologies to maintain long-term viability while minimizing environmental impact.

Policy Implications: These results have important implications for policymakers, local authorities, and marigold growers in Athner Tehsil. Strategies should be devised to promote labor skill development, encourage capital investments in technology and infrastructure, and support research and development initiatives. Additionally, policies should incentivize environmentally sustainable practices in the marigold floriculture sector.

Balance between Labor and Technology: While labor plays a central role in marigold flower, the industry should strive for a balance between labor-intensive tasks and technological advancements to optimize productivity and efficiency. Leveraging modern practices and local knowledge can complement the workforce and enhance overall productivity.

In conclusion, the Cobb-Douglas production function reveals that labor, capital investment, and total factor productivity are significant factors driving marigold floriculture productivity in Athner Tehsil. Sustainable growth and increased productivity can be achieved through a combination of skilled labor, capital infusion, and technological innovation, while maintaining a focus on efficiency and sustainability. Further research could delve into specific factors that contribute to total factor productivity within the context of marigold floriculture in this region.

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Cobb-Douglas result of Amla tehsil:

ANOVA	
	Coefficients
Intercept	-2.6211018
LN (K)	0.70739928
LN (L)	0.62565976
LN (A)	1.33305904

The estimated coefficients for the production function are as follows:
Intercept: -2.621101839
LN(K) (Beta 1): 0.707399283
LN(L) (Beta 2): 0.625659761
LN(A) (Production Elasticity): 1.333059044

The coefficient of LN(K) (Beta 1) represents the elasticity of output with respect to capital, while the coefficient of LN(L) (Beta 2) represents the elasticity of output with respect to labor. The LN(A) coefficient (Production Elasticity) reflects the overall productivity of the floriculture industry, capturing the impact of technology, management practices, and other unaccounted factors.

Discussion:

Capital and Labor Contributions: The positive coefficient of LN(K) (Beta 1) indicates that capital investment positively impacts the productivity of the marigold flower in Amla. This suggests that increasing capital input, such as infrastructure, technology, and equipment investments, can lead to higher marigold flower production. Stakeholders in the floriculture sector need to consider strategic investments in capital to enhance overall productivity.

Labor Efficiency: The coefficient of LN(L) (Beta 2) is also positive, indicating that an increase in labor input positively influences marigold flowers productivity. This underscores the importance of skilled labor in cultivating and managing marigold flower farms. Labor-intensive tasks such as planting, harvesting, and tending to marigold flowers significantly contribute to the floriculture industry's output.

Total Factor Productivity (TFP): The coefficient of LN(A) (Production Elasticity) is greater than 1 (1.333059044), indicating increasing returns to scale in marigold flowers. This suggests that factors beyond capital and labor significantly influence production, such as technological advancements, innovative farming practices, and

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efficient resource utilization. Efforts to improve total factor productivity in marigold flowers, including research and development in floriculture technology, can lead to substantial gains in industry output.

Sustainability and Growth: The positive values of Beta 1 and Beta 2 indicate that the industry has the potential for growth through investments in both capital and labor. However, ensuring this growth is sustainable and environmentally responsible is crucial. Floriculture of marigold flower should be mindful of ecological impacts, such as water usage and pesticide management, to maintain long-term viability.

Policy Implications: These results can guide policymakers and industry stakeholders in formulating strategies to promote the growth of floriculture. Encouraging investments in technology, providing training and education for the workforce, and fostering an environment-friendly innovation can all contribute to the floriculture of the marigold flower industry's development.

So in conclusion, the application of the Cobb-Douglas production function to the floriculture industry has provided valuable insights into the factors affecting productivity and growth. Capital, labor, and total factor productivity all play essential roles, and optimizing their contributions can lead to a flourishing and sustainable floriculture marigold flower sector. Future research may focus on further exploring the specific drivers of total factor productivity to unlock the full potential floriculture of marigold flower in Amla.

Cobb-Douglas result of Betul tehsil:

ANOVA

	Coefficients
Intercept	-12.873584
LN (K)	0.56262383
LN (L)	2.15576569
LN(A)	2.71838952

The estimated coefficients for the production function are as follows:
Intercept: -12.87358366
LN(K) (Beta 1): 0.562623826
LN(L) (Beta 2): 2.155765695
LN(A) (Production Elasticity): 2.718389521

The coefficient of LN(K) (Beta 1) represents the elasticity of output with respect to capital, while the coefficient of LN(L) (Beta 2) represents the elasticity of output with respect to labor. The LN(A) coefficient (Production Elasticity) signifies the overall

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productivity of the floriculture industry, encompassing the impact of technology, management practices, and other unaccounted factors.

Discussion:

Capital Input: The positive coefficient of LN(K) (Beta 1) suggests that increased capital investment in the Marigold Flower leads to higher productivity. Capital investments might encompass modernizing facilities, acquiring advanced equipment, and improving infrastructure. This implies that strategic financial investments can enhance marigold flower production and the overall performance of the sector.

Labor Contribution: The coefficient of LN(L) (Beta 2) is significantly positive, indicating that labor plays a critical role in Marigold Flower productivity. Skilled labor is essential for various tasks in for doing marigold flowers, from planting and maintenance to harvesting and packaging. Ensuring a skilled and efficient workforce can result in increased marigold flower output.

Total Factor Productivity (TFP): The coefficient of LN(A) (Production Elasticity) is notably high (2.718389521), indicating a substantial influence of total factor productivity on Marigold Flower production. This implies that technological advancements, innovative practices, and efficient resource utilization are crucial drivers of industry growth. Investments in research and development, automation, and sustainable practices can significantly contribute to increasing total factor productivity.

Sustainability and Innovation: While focusing on growth, it is essential to consider sustainability. Floriculture of Marigold Flower must adopt eco-friendly practices, such as efficient water usage, reduced pesticide application, and environmentally responsible waste management, to ensure long-term viability and minimize ecological impact. Moreover, promoting innovation in marigold flower practices can further boost productivity while minimizing resource consumption.

Policy Implications: Policymakers and industry stakeholders can leverage these findings to formulate policies and strategies to foster the growth and sustainability of the marigold flower. Encouraging capital investment, promoting vocational training programs for the workforce, and supporting research and development initiatives are potential avenues for policy intervention.

We can say that, the application of the Cobb-Douglas production function in the production of Marigold Flower highlights the significance of capital, labor, and total factor productivity in driving productivity and growth. While investments in capital and labor are essential, it is the enhancement of total factor productivity that holds the key to unlocking the industry's full potential. Balancing growth with sustainability and innovation will be crucial for the continued success of the floriculture marigold flowers.

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Future research can delve deeper into the specific factors contributing to total factor productivity in floriculture of marigold flowers.

Cobb-Douglas result of Bhainsdehi tehsil:

ANOVA

	Coefficients
Intercept	0.38737105
LN (K)	0.63391555
LN (L)	0.28412125
LN(A)	0.9180368

The estimated coefficients for the production function are as follows:

Intercept: 0.387371052
LN(K) (Beta 1): 0.633915547
LN(L) (Beta 2): 0.284121254
LN(A) (Production Elasticity): 0.918036801

The coefficient of LN(K) (Beta 1) represents the elasticity of output with respect to capital, while the coefficient of LN(L) (Beta 2) represents the elasticity of output with respect to labor. The LN(A) coefficient (Production Elasticity) characterizes the overall productivity of the floriculture industry, encompassing the influence of technology, management practices, and other unaccounted factors.

Discussion:

Capital Input: The positive coefficient of LN(K) (Beta 1) suggests that increased capital investment in the marigold floriculture industry has a positive impact on productivity. Capital investments may involve upgrading infrastructure, acquiring advanced equipment, and improving logistics. Enhancing capital inputs can contribute to higher flower production and overall sector performance.

Labor Contribution: The coefficient of LN(L) (Beta 2) is also positive, indicating that labor plays a significant role in marigold floriculture productivity. Skilled labor is vital for various tasks, including planting, maintenance, harvesting, and packaging. Ensuring a skilled and efficient workforce can lead to increased marigold flower output.

Total Factor Productivity (TFP): The coefficient of LN(A) (Production Elasticity) is less than 1 (0.918036801), implying that total factor productivity is not the primary driver of marigold flowers production in this context. This suggests that improvements in technology, management practices, and resource utilization may have a somewhat

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limited impact compared to capital and labor investments. However, it is still essential to strive for continuous improvements in these areas.

Balancing Investment: While both capital and labor inputs positively influence marigold flower productivity, it is crucial to strike a balance between these factors. Overinvesting in one factor while neglecting the other can lead to suboptimal results. Therefore, industry stakeholders should consider a holistic approach to resource allocation and management.

Sustainability and Efficiency: The relatively low Production Elasticity (LN(A)) coefficient suggests that the industry may benefit from focusing on efficiency and sustainable practices rather than solely relying on technological advancements. Minimizing waste, optimizing resource utilization, and adopting eco-friendly practices can contribute to long-term growth while minimizing environmental impact.

Policy Considerations: Policymakers and industry players can utilize these findings to formulate strategies and policies that promote the growth and sustainability of marigold flower. Encouraging investment in both capital and labor, supporting skill development programs, and incentivizing eco-friendly practices are potential policy avenues.

So, the Cobb-Douglas production function reveals that capital and labor inputs are the primary drivers of floriculture of marigold flower productivity. While total factor productivity plays a role, it may not be the dominant factor. Balancing investments, optimizing resource use, and promoting sustainability are essential for the continued success of the marigold flower sector. Future research could delve deeper into understanding the specific factors influencing total factor productivity in the floriculture of marigold flowers in Bhaisdehi Tehsil under different circumstances.

Cobb-Douglas result of Ghoradongri tehsil:

ANOVA

	Coefficients
Intercept	14.7191386
LN (K)	0.94785452
LN (L)	0.1483147
LN(A)	1.09616922

The estimated coefficients for the production function are as follows:
Intercept: 14.71913865
LN(K) (Beta 1): 0.947854517
LN(L) (Beta 2): 0.148314701

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LN(A) (Production Elasticity): 1.096169218

The coefficient of LN(K) (Beta 1) represents the elasticity of output with respect to capital, while the coefficient of LN(L) (Beta 2) represents the elasticity of output with respect to labor. The LN(A) coefficient (Production Elasticity) characterizes the overall productivity of the floriculture of marigold flowers in Ghoradongri Tehsil, capturing the influence of technology, management practices, and other unaccounted factors.

Discussion:

Capital Investment: The positive and substantial coefficient of LN(K) (Beta 1) indicates that capital investment has a strong positive impact on marigold flower productivity in Ghoradongri Tehsil. This suggests that investments in capital assets such as greenhouses, irrigation systems, and modern farming equipment can significantly enhance marigold production. Capital investment is a critical factor in achieving higher yields and improving overall efficiency.

Labor Input: The coefficient of LN(L) (Beta 2) is positive but relatively smaller compared to LN(K), implying that while labour contributes positively to marigold flower production, its impact may not be as significant as capital in this specific context. However, labour remains essential for tasks such as planting, maintenance, and harvesting. Ensuring a skilled and efficient workforce is important to maximize marigold flowers output.

Total Factor Productivity (TFP): The LN(A) coefficient (Production Elasticity) is greater than 1 (1.096169218), indicating that total factor productivity is a significant driver of marigold flowers in Ghoradongri Tehsil. This suggests that technological advancements, innovative farming practices, efficient resource utilization, and perhaps localized agricultural knowledge play a crucial role in increasing marigold output. Investments in research and development, sustainable cultivation practices, and modern technology can further boost total factor productivity.

Sustainability and Local Knowledge: Given the high Production Elasticity (LN(A)), there is substantial potential for growth through technological innovations and sustainability measures. Marigold growers in Ghoradongri Tehsil should focus on adopting eco-friendly practices, optimizing resource utilization, and leveraging local agricultural knowledge to maintain long-term viability while minimizing environmental impact.

Policy Implications: These results have important implications for policymakers, local authorities, and marigold growers in Ghoradongri Tehsil. Strategies should be devised to encourage capital investment in technology and infrastructure, support

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research and development initiatives, and promote sustainable practices in the marigold floriculture sector.

Balancing Resources: While capital investment has a strong impact on marigold productivity, it is important to strike a balance between capital and labor inputs to optimize resource use and enhance overall efficiency. Additionally, the industry should continue to explore and adapt to technological advancements that align with local conditions.

Therefore, the Cobb-Douglas production function reveals that capital investment, total factor productivity, and, to a lesser extent, labor input are significant factors driving marigold flower productivity in Ghoradongri Tehsil. Sustainable growth and increased productivity can be achieved through a combination of capital infusion, technological innovation, and a focus on efficient resource utilization while maintaining a strong connection with local agricultural knowledge. Further research could delve into specific factors contributing to total factor productivity within the context of floriculture of marigold flowers in this region.

To study the last objective which is challenges faced in the floriculture business by the Betul floriculture farmers, the below points has been analysed theoretically, based on the answers given by the farmers during the survey interview.

Evaluating the challenges in the Indian floriculture industry was one of the study's primary goals, which was stated at the onset. This research satisfies this significant objective. To be more specific, the study will attempt a thorough analysis of the opportunities and problems facing according to what is referred to as the "SWOT" analysis, floriculture in India analysis of the strengths, weaknesses, opportunities, and threats.

After facing some initial challenges, India's floriculture sector has started growing. Due to several distinct advantages India has in comparison to other flower-growing regions, it has enormous expansion potential. For instance, it has affordable labor, appropriate aggro ones for flower cultivation, and a committed government that supports growers, traders, and others. However, because it is a relatively new industry, floriculture faces several obstacles and issues in the development of its industry. The sector is now dealing with a few significant issues, including poor logistics, excessive freight costs, inadequate infrastructure, natural disasters, financial difficulties, and an inadequate database. There are numerous chances in floriculture as well. It has developed into a successful business proposal **(Gupta, Ashok (1998)**.

It offers a lot of potential for foreign exchange revenue. It has a significant capacity to absorb employment and might significantly boost the rural economy. While India's

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floriculture business is growing quickly, it faces some significant risks from stiff and unhealthy conditions. The worldwide flower markets are competitive **(Paul, R. (2009)**. Therefore below are the Strengths, weaknesses, opportunities, and threats in floriculture faced by the farmers covered in the present study.

(A) Strength

India offers several benefits and strengths in the production of floriculture, including favourable climatic conditions, the availability of skilled and inexpensive labour, the availability of tissue culture production facilities that can replicate plant material at an affordable price, etc. The floriculture sector in India has been noted for having the following strengths as discussed with the farmers during the survey.

1. Appropriate Environment: India's varied topography and climatic circumstances allow for the growth of a variety of traditional and commercial flower varieties. The nation grows a wide variety of flowers, ferns, leaves, and grasses. India has a distinct biodiversity and a wealth of botanical resources. It is one of the world's 12 mega-biodiversity hotspots and is home to more than 47,000 blooming and non-flowering plant species. It contains 7.8% of the world's total biodiversity despite having only 2.4% of the world's land area. A significant portion of India has excellent potential for floriculture **(Sharma (2013).** There are enough winter and summer sunrays, and flowers can be cultivated throughout the entire year; a high degree of excellent soil quality; and water of high grade but different climate zones support various flower types.

In this study, the Betul district of Madhya Pradesh supports all the above-mentioned points as revealed by the farmers. The Betul district has the natural comparative advantages mentioned above, farmers have also easy access and affordability to seeds.

2. Financial Viability: Numerous field studies have now proved that growing and marketing floriculture products is significantly more lucrative than growing other crops. This has been effectively highlighted in the chapter before. With the accessibility of a variety of inputs, Betul has a natural edge because of the inexpensive labor and abundance in flower cultivation. Additionally, Floriculture is a good fit for Betul since it generates more revenue per unit of land. Wasteland may also be used for its growth **(Mehra, 2001).** It is easy to cultivate flowers and floriculture is size-neutral and appropriate for Betul small and marginal farmers. It has proven to be a different, viable business idea for the farmers. The necessity of the hour is to diversify Indian agriculture, and floriculture could become a key tool in that effort. Activities related to floriculture have a significant potential for creating jobs. It has a labor-intensive business, and the cost of paying employees makes up around one-third of production expenses

3. Vast Domestic and Global Market: Given the size and population of India, there is a significant market demand for floricultural products due to increased

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urbanization, rising incomes, and middle-class adoption of Western fashions. India is also prepared for global market expansion and total exports of floricultural goods are presently greatly rising, as more people are purchasing flowers. There is the sale of flowers throughout the year especially during festivals and marriage season. Additionally, it reaches its sale on Mother's Day, New Year's Day, and Valentine's Day **(Sahani, 2006).** These factors have led to a sharp increase in flower consumption worldwide in recent years. In addition, since flower consumption has been mostly centered on special events and institutional obligations, it has become more routine than in the past. Now, it has been seen in rural areas, small communities, and towns alike. Therefore, the floriculture production of the Betul district is also having a great opportunity within, outside, and at the global level.

4. Production Efficiency: Production efficiency in floriculture refers to the ability to produce flowers and ornamental plants cost-effectively while maintaining quality. Improving production efficiency can lead to higher profitability and a more sustainable operation. This can be done by choosing the type of flowers according to local climate and growing conditions; Irrigation facilities like drip irrigation, sprinkle water methods, etc.; Implementing a well-balanced fertilization plan based on soil and plant nutrient needs; Employ Integrated Pest Management strategies to control pests and diseases; Implement automation where feasible, such as automated irrigation systems, climate control, and even robotic systems for tasks like planting and harvesting; Develop a planting and harvesting schedule that aligns with market demand and seasonal peaks; Efficient timing can reduce energy and resource use while maximizing product availability; Skilled labor can lead to higher productivity and better-quality products; Adopt sustainable practices, such as recycling water, using organic fertilizers, and incorporating renewable energy sources. These practices can reduce costs and enhance the marketability of the products **(Gupta. D, 2004).**

5. Competition: In the context of the floriculture market, the term "competition" refers to the rivalry and interactions among businesses and individuals who are involved in the production, distribution, and sale of flowers, ornamental plants, and related products. The floriculture market includes a wide range of participants, such as flower growers, wholesalers, retailers, florists, and even online platforms that sell flowers and floral products. Competition in the floriculture market can manifest in several ways, below points were revealed by the farmers during the survey:

Product Quality and Variety: Businesses compete to offer high-quality flowers and plants that are healthy, vibrant, and have a longer shelf life. They may also differentiate themselves by providing unique or rare flower varieties that are not readily available elsewhere.

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Pricing Strategies: Competitors may use various pricing strategies to attract customers. Some may focus on offering competitive prices, while others may target premium markets by emphasizing the quality and uniqueness of their products.

Innovation in Floral Arrangements: Florists and floral designers often compete by coming up with innovative and attractive floral arrangements that cater to different occasions and customer preferences.

Distribution and Logistics: Competition can extend to efficient supply chain management and timely delivery of flowers, as customers often value prompt service, especially for events and special occasions.

Online Presence and E-commerce: With the growth of e-commerce, businesses in the floriculture market may compete to establish a strong online presence and provide user-friendly platforms for customers to order flowers and floral products online.

Customer Service and Experience: Providing exceptional customer service and a seamless buying experience can set businesses apart and create a competitive advantage. Sustainability and Environmental Practices: As consumers become more environmentally conscious, businesses that emphasize sustainable and eco-friendly practices can gain a competitive edge.

Marketing and Branding: Competitors differentiate themselves through effective marketing strategies, branding, and advertising efforts that resonate with their target customers.

Market Research and Trends: Staying ahead of market trends and consumer preferences is crucial. Competitors who can anticipate and adapt to changing preferences are better positioned to succeed.

Wholesale vs. Retail: There's competition not only between retailers but also between wholesale suppliers who provide flowers to retailers. Price, quality, and availability are key factors in this aspect of the market.

To succeed in the competitive floriculture market, businesses need to focus on understanding their target audience, offering high-quality products and services, staying updated on industry trends, and continuously innovating to meet customer demands.

(B) Weakness

India performs pitifully poorly in the international floriculture market despite favorable circumstances. India continued to hold a 0.40 percent market share worldwide. This is due to numerous factors such as insufficient information on

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floriculture, expensive marketing costs, money issues, a lack of experienced entrepreneurs, etc. Most people who entered the floricultural industry in the early years were traditional flower producers who lacked training in the production of high-quality flowers and had little to do with scientific flower culture. They were drawn to this company purely to take advantage of the support the government was offering through its promotional initiatives. These employees labored mechanically using expensive foreign equipment that was brought through exorbitantly expensive consultants and had no emotional connection to flower agriculture. Although the government has made some efforts at certain levels to promote floriculture in the nation, there are still some significant shortcomings that are impeding the development and export of this new "Sunrise" business.

Now, these weaknesses have been discussed below.

Inadequate Cold Chain Facilities: One of the foremost weaknesses in the floriculture industry is the lack of proper cold chain infrastructure. The absence of well-equipped storage and transportation facilities affects the shelf life and quality of flowers, resulting in significant post-harvest losses.

Limited Research and Development: The industry lags in innovation due to inadequate investments in research and development. A lack of advanced techniques and technologies negatively impacts the quality and variety of flowers produced.

Market Challenges and Price Volatility: The floriculture market in India is highly susceptible to price fluctuations due to the perishable nature of flowers. This volatility affects the profitability of businesses and makes financial planning a challenging endeavor.

Dependence on Traditional Markets: Overreliance on traditional domestic markets limits the industry's exposure to international markets. Diversifying market reach is essential to reduce vulnerability to market fluctuations.

Logistical Issues: Inadequate transportation and infrastructure lead to delays and damages during the transit of flowers. Efficient transportation networks are crucial for maintaining the freshness and quality of flowers.

Lack of Uniform Grading Standards: The absence of uniform grading standards makes it difficult to meet international quality requirements. This hampers exports and restricts the industry's growth potential.

Environmental Concerns: Floriculture demands substantial water resources, which can lead to water scarcity in water-stressed regions. Implementing water-efficient practices is necessary to address this issue.

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Skilled Workforce Shortage: The shortage of skilled labor in the floriculture sector affects productivity and quality. Encouraging skill development programs can bridge this gap. Also, the absence of proper knowledge-sharing platforms inhibits the dissemination of best practices and innovative techniques among industry players.

(C) Opportunities

Floriculture, the cultivation of flowers and ornamental plants, offers various opportunities in India due to its diverse climate and growing demand for flowers for various purposes. Here are some opportunities and potential areas for investment and growth in the floriculture industry in India:

1. **Cut Flower Production:** Growing cut flowers like roses, marigolds, lilies, and orchids can be a profitable venture. These flowers are in high demand for religious ceremonies, weddings, and other cultural events.

2. **Export Market:** India has a significant potential for exporting flowers to countries with high demand, such as the Middle East, Europe, and the United States. Establishing relationships with international buyers and adhering to quality standards can open up export opportunities.

3. **Florist Shops and Retail:** Setting up florist shops in urban areas and online flower delivery services can be a lucrative business. Florists can source flowers from local growers or import exotic varieties.

4. **Nursery and Seedling Production:** Starting a nursery that specializes in producing high-quality flower seedlings and saplings can cater to both domestic and international markets.

5. **Landscaping and Garden Design:** There is a growing demand for professional landscaping and garden design services in urban and suburban areas. Offering services for residential and commercial properties can be a profitable venture.

6. **Floriculture Training and Consultancy:** If you have expertise in floriculture, you can offer training programs and consultancy services to aspiring flower growers and farmers looking to improve their techniques.

7. **Organic Flower Farming:** As the demand for organic products grows, consider organic flower farming to cater to eco-conscious consumers who prefer chemical-free and sustainable flowers.

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8. **Hybrid and Unique Varieties:** Investing in research and development to create new hybrid flower varieties or cultivate unique and exotic flowers can lead to a niche market with higher prices.

9. **Flower Preservation and Drying:** Dried flowers and preserved flower arrangements have gained popularity as long-lasting gifts and decorations. Exploring this niche can be a unique business opportunity.

10. **Floriculture Tourism:** Develop flower-themed tourism destinations, such as flower gardens, flower festivals, and eco-tourism ventures, to attract tourists interested in horticulture and nature.

11. **Value-Added Products:** Utilize flowers for making products like essential oils, perfumes, cosmetics, and herbal remedies, which can be marketed as natural and organic.

12. **Cold Chain Infrastructure:** Invest in cold storage and transportation facilities to ensure the freshness and quality of flowers during distribution.

13. **Government Initiatives:** Keep an eye on government schemes and subsidies related to agriculture and horticulture that can support the floriculture business.

Before venturing into floriculture, it is essential to conduct market research, assess the specific demands of your target market, and plan your operations accordingly. Additionally, understanding the local climate, soil conditions, and pest control measures is crucial for successful flower cultivation. Collaborating with agricultural experts and horticulturists can also provide valuable insights into the floriculture industry in India.

(D) Threats and Challenges

Floriculture in India, like any other agricultural sector, faces various threats and challenges that can impact production, profitability, and sustainability. It is essential to understand these threats to develop strategies for mitigating their impact. Here are some key threats in floriculture in India:

Climate Variability and Weather Extremes: India's diverse climate can be a double-edged sword. While it allows for year-round flower cultivation, it also exposes the industry to weather extremes, including unseasonal rains, storms, and temperature fluctuations, which can damage crops.

Disease and Pest Outbreaks: Flowers are susceptible to various diseases and pests.

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Inadequate pest management can lead to reduced yields and lower-quality flowers. The overuse of pesticides can also have negative environmental and health consequences.

Fluctuating Market Prices: The flower market can be volatile, with prices influenced by factors such as seasonal demand, festivals, and international market dynamics. This volatility can affect the profitability of flower growers.

Lack of Market Diversification: Overreliance on a limited number of flower varieties or markets can be risky. If there is a sudden drop in demand for specific flowers or an issue with export markets, growers may face significant losses.

Infrastructure and Transportation Challenges: Poor infrastructure, inadequate cold storage facilities, and inefficient transportation systems can result in post-harvest losses and reduced flower quality during transit.

Lack of Access to Finance: Small and medium-sized flower growers often struggle to access affordable credit and financing options for investments in technology, equipment, and infrastructure improvements.

Land Use Pressures: Urbanization and land-use changes can lead to the conversion of agricultural land into residential or commercial areas, reducing the availability of suitable land for floriculture.

Water Scarcity: Water is a critical resource for floriculture, and water scarcity or mismanagement can limit cultivation. Sustainable water management practices are essential to address this threat.

Government Policies and Regulations: Changing government policies related to agriculture, land use, and export regulations can impact the floriculture industry. It's essential for growers to stay informed and adapt to new policies.

Quality Control and Certification: Meeting international quality standards and certifications for export markets can be challenging for some growers, requiring investments in infrastructure and compliance measures.

Labor Shortages: The seasonal nature of floriculture often requires a significant labor force, and labor shortages can affect production schedules and increase labor costs.

Environmental Concerns: Increasing environmental awareness and regulations related to pesticide use, waste management, and water conservation can add complexity and costs to floriculture operations.

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Competition from Imported Flowers: Imported flowers can compete with domestically grown flowers, affecting prices and market share for local growers.

To thrive in the floriculture industry in India, growers and stakeholders should adopt sustainable practices, invest in modern technology, diversify markets, and develop resilience strategies to address these threats effectively. Collaboration with agricultural experts, research institutions, and industry associations can also help in tackling these challenges.

Conclusion

The Betul district of Madhya Pradesh presents ample opportunities for the growth and development of the marigold flowers. By addressing the challenges and implementing the suggested strategies, stakeholders can contribute to the economic prosperity of the region while promoting sustainable agricultural practices. The research has highlighted the available potential of marigold flower in the Betul district of Madhya Pradesh. By addressing challenges, leveraging available resources, and implementing well-targeted strategies, the marigold flowers can become a significant contributor to the region's economy and employment landscape. The positive social and environmental impact of a thriving floriculture sector further underscores the importance of take care of its growth. With proactive government support, stakeholder collaboration, and a focus on sustainable practices, the Betul district can open into a vibrant hub of marigold flowers.

Suggestions

The study indicates that while marigold flower in the Betul district is promising, there is a need for targeted interventions to enhance its growth and potential. The following suggestions are made based on the research findings:

1. Training and Capacity Building: Local farmers should be provided with training on modern cultivation techniques, pest management, and post-harvest practices to improve the quality and yield of flowers.

2. Access to Finance: If we provide an initiatives to improve farmers' access to credit and financial assistance can encourage investment in marigold flower infrastructure and technology.

3. Market Linkages: By establishing strong market linkages, both within the region and beyond, can ensure a steady demand for locally produced flowers. Which ultimately give empowerment to the small and medium farmers.

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4. Awareness Campaigns: By raising awareness about the economic and environmental benefits of floriculture among local communities can drive increased participation. It will increase there Per Capita and Living Standards.

Policy Recommendation

To fully tap into the growth & potential of floriculture marigold flower in the Betul district, policy-level interventions are essential. The government should consider the following recommendations:

1. **Subsidies and Incentives:** Providing subsidies on inputs such as seeds, fertilizers, and equipment can reduce the financial burden on farmers and encourage their participation in floriculture.
2. **Research and Development:** Establishing research centers and collaborations with agricultural universities can lead to the development of marigold flower varieties that are well-suited to the local climate and have improved aesthetic and market appeal.
3. **Infrastructure Development:** Investing in infrastructure such as cold storage facilities and transportation networks will ensure that the marigold flowers reach markets in a fresh and timely manner, minimizing post-harvest losses.
4. **Export Promotion:** Exploring national and international markets for marigold flower export can significantly boost the income of local floriculture farmers. The government can facilitate participation in international trade fairs and provide support in meeting export quality standards.

Sustainability and Environmental Considerations

As the marigold flower grows, it is crucial to ensure its sustainability and minimize its environmental impact. Practices such as integrated pest management, organic fertilization, and water conservation should be promoted to maintain ecological balance and safeguard natural resources.

Community Participation and Empowerment

Engaging local communities, especially women, in floriculture can be a powerful tool for social and economic empowerment. Self-help groups and cooperatives can be established to provide training, resources, and a platform for collective marketing, enhancing community cohesion and economic development.

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