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EVOLUTION AND OPTIMIZATION OF MUSTARD CULTIVATION IN HARYANA: A COMPREHENSIVE STUDY

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ABSTRACT

Haryana, located in northern India, cultivates a diverse range of crops due to its fertile soil, favorable climate, and well-developed irrigation infrastructure. This research paper presents a comprehensive analysis of mustard cultivation in Haryana, India, from 1966 to 2021, examining the trends in area under cultivation, production output, and yield efficiency. Utilizing historical data, the study identifies significant growth patterns, evaluates the impact of agricultural practices, and explores the role of technological advancements and policy interventions in shaping the mustard cultivation landscape in the region. By analyzing district-level variations, the paper sheds light on the heterogeneous nature of agricultural development across Haryana. The research employs statistical methods to forecast future trends and offers recommendations for sustainable cultivation practices to enhance productivity, profitability, and environmental sustainability in mustard farming.

Keywords: Mustard, Cultivation, Productivity, Cultivation, Landscape, Interventions

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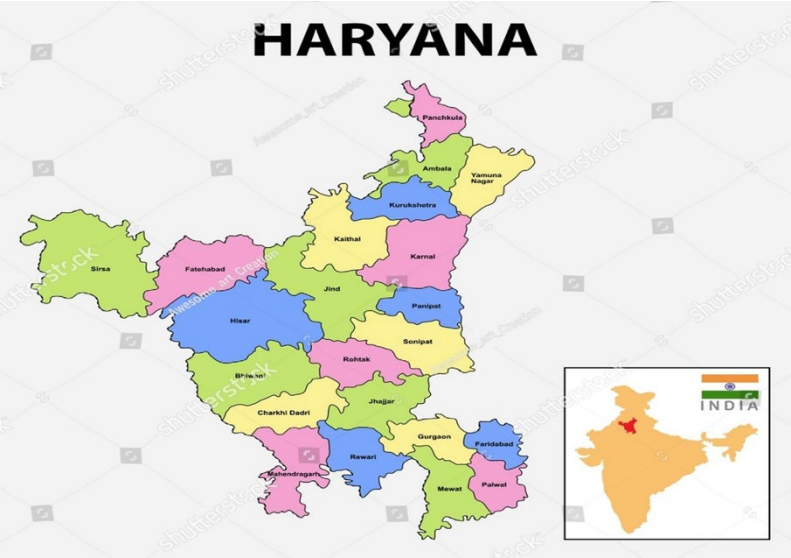
1. INTRODUCTION

Mustard, a crucial oilseed crop, plays a vital role in the agricultural and economic landscape of Haryana, a state renowned for its significant contributions to India's agrarian economy. The cultivation of mustard in Haryana has a rich history, characterized by evolving practices that have adapted to changing climatic conditions, technological advancements, and market demands. This research paper embarks on an in-depth exploration of the evolution of mustard cultivation in Haryana from 1966 to 2022, providing a detailed analysis of the trends in area under cultivation, production levels, and yield efficiencies. The significance of mustard cultivation extends beyond its economic value, touching upon aspects of food security, employment, and the socio-economic development of rural communities. Considering this, our study aims to map the trajectory of mustard

cultivation, highlighting the impact of various factors, such as technological innovations, government policies, and environmental challenges, on its growth patterns. Through a comprehensive examination of historical data and district-level variations, this paper seeks to uncover the dynamics that have shaped mustard cultivation in Haryana, offering insights into the successes achieved and the hurdles the farming community faces. This study delves into the implications of these trends for future agricultural practices, the sustainability of mustard cultivation, and the overall well-being of the agrarian society in Haryana. By analyzing past and present trends, the research aims to forecast future developments and propose strategies to optimize mustard cultivation in the state.

Figure 1: Haryana



This includes recommendations for sustainable farming practices, the integration of modern agricultural technologies, and the implementation of policies that support the economic and environmental sustainability of mustard cultivation. In doing so, the paper endeavors to contribute to the ongoing discourse on agricultural development in Haryana, providing a foundation for future research and policy formulation aimed at enhancing the productivity and sustainability of mustard cultivation in the region.

Figure 2: Mustard Farming in Haryana

1.1. OBJECTIVE

This study aims to analyze the trends and factors influencing mustard cultivation in Haryana.

2. RESEARCH METHODOLOGY

In this study, secondary data was used to analyze the objectives. The data was used from 1966-67 to 2021-22 to examine the mustard pattern in Haryana. The data has been taken from the statistical abstract of Haryana, Government of Haryana. Diagrams and tables have been used to analyze the data. The compound annual growth rate has been calculated to analyze the trend.

CAGR= ((End Value/ Beginning Value) ^ (1/t)) -1) *100

3. LITERATURE REVIEW

Walia et al. (2023) analyzed mustard crops cultivated in southern Haryana using sprinkler irrigation, which is the main subject of this work. For this study, we used a multistage random selection approach to choose farmers. The first phase focused on the Bhiwani and Rewari districts because of their high adoption rate of sprinkler irrigation systems. For each district, two blocks were chosen at random: Tosham and Loharu in Bhiwani and Khol and Nahar in Rewari. Furthermore, for the research, fifteen farmers from each village and two villages from each block were chosen. A total of 120 farmers were surveyed utilizing a tried-and-true interview routine. The net return was computed using data received from a group of farmers on the cost and returns of mustard crops for the year 2021-22. Both the Rewari and Bhiwani districts had total variable costs of ₹28767.98 and ₹33178.23, respectively, for mustard cultivation. A sum of ₹66243.33 was spent in the Rewari district, whilst ₹70321.22 was spent in the Bhiwani district. In Rewari district, farmers earned ₹22902.23 net, while in Bhiwani district, they earned ₹19364.07. In Rewari, the B: C ratio over total cost was 1.34; in Bhiwani, it was 1.27; and in the entire case, it was 1.30.

Kumar (2023) states that an important rabi oilseed crop grown in India is the rapeseed-mustard crop, which is emphasized in the article. Using a land area of 6.12 million hectares and a productivity of 1511 kg/ha, India produced 9.26 million tons of food during the 2018–19 harvest season. The United States Department of Agriculture reports that 19.8% of the world's total acreage and 9.8% of its total output come from India. On an area of 0.61 million hectares, mustard is cultivated in Haryana, yielding 1.25 million tons. Rajasthan, Uttar Pradesh, Madhya Pradesh, Haryana, and West Bengal are the main Indian states where mustard is grown. Much of the 2018– 19 total area (82.41%) and output (88.58%) came from these states. ("Directorate of Economics and Statistics," "DAC," and "FW"). The area of Faridabad in the state of Haryana was chosen for the research. A three-stage stratified random sampling approach was used to meticulously choose the block, village, and farmers for the data collection. To do this, the Ballabgarh block was selected. Data gathering relied on a deliberately selected sample unit. There were two strata of mustard crop producers in the chosen villages: those whose fields were less than one hectare and those whose fields were more than one hectare. Farmers in the lower stratum may expect to pay about Rs 40748.90 per hectare for mustard cultivation, while farmers in the higher strata can expect to pay around Rs 38672.28 per hectare, depending on the size of their farms. Cultivation costs an average of 39710.59 rupees. At the Cost-A level, the benefit-cost ratio for mustard cultivation was Rs 1:3.69; at the Cost-B level, it was Rs 1:3.91; and at the Cost-C level, it was Rs 1:3.69. Growing mustard was shown to be a profitable venture in the Faridabad area. There is a clear downward tendency from the break-even yield to the average yield when it comes to determining the break-even point and profitability of production.

Bareliya et al. (2023) analyzed that among Indian states, Madhya Pradesh is the one most known for growing mustard. The highest area covered by mustard was found in the Gird agro-climatic zone. The vast mustard crop in the Behind area was a deciding factor in its selection. Mustard cultivation costs were not uniform across all farm sizes. The cost per hectare varied across different farm sizes, with the biggest farms having the highest at ₹ 654578.2, medium-sized farms at ₹ 59950.21, and tiny farms at ₹ 55861.53. Rapeseed mustard belongs to the genus Brassica and the family Cruciferae. Annual rapeseed plants, or Brassica campestris, are herbaceous and typically grow to a height of 45–150 cm, making them shorter than mustard plants or rai. From the selling of agricultural byproducts, average farmers were found to earn ₹ 4608.18/ha. Hence, by growing mustard, the average farmer garnered a gross profit of ₹ 100793.43/ha. A total of 41986.66 rupees per hectare was earned. His family's labor brought in ₹ 54769.36 per acre, while his farm business brought in 72198.77 and his farm investment brought in 59416.07 per hectare. This result held true with little change among farms of varying sizes. Addressing the technical limits might increase mustard production and raise its productivity, according to the research area.

Ramesh (2023) conducted a study performed in 2019 and 2020-21 by KVK in the Mahendragarh district of Haryana using the mustard variety RH-725, which showed a greater yield of 19.26 and 24.63 q ha−1 under demonstration plots compared to 17.10 and 21.10 q ha−1 under farmer's practices. The presentation, plot also showed higher gross and net returns 86975 and 108945 ha−1 and 52415 and 76050 ha−1 in the respective years than those in the local check plots. Additionally, the shown plot had a greater B:C ratio than the local check plot, with values of 2.16 and 3.31, respectively. The findings show that compared to the current methods, the use of better technology has a significant effect on mustard production.

Vahora et al. (2023) analysed the Banas kantha districts of North Gujarat, an area that has a considerable amount of mustard in the state. The talukas, villages, and farmers that participated in the sample were chosen using a multistage sampling procedure. Tharad and Dhanera are the two Talukas that we picked out from the Banas Kantha district. Each taluka has five villages picked at random. Twelve mustard-growing farmers from different villages were selected at random. Consequently, the research included 120 mustard-growing farmers from 2 talukas and 10 villages. Twenty market officials from the controlled markets of Dhanera and Lakhani were chosen at random for this investigation. Ten processors were selected from the Banas kantha area. For the Rabi season of 2021–2022, the main data was gathered using a well-designed and validated interview plan. The records of the Directorate of Horticulture, Government of Gujarat, Gandhinagar, and the Ministry of Agriculture and Farmers Welfare, Government of India, were consulted for the secondary data. On mustard fields in the Banaskantha district, the average total cultivation cost per hectare was ₹49275.18. On big farms, the price was 49590.16, while on small farms, it was 48917.86. Gross profits per hectare on mustard fields were ₹110983.56, while net returns per hectare were ₹61708.35. Irrigation, paid and unpaid labor, various expenditures, rental value of owned land, equipment and tractors, fertilizers, manure, seeds, interest on fixed capital, plant protection, working capital, and depreciation on farm tools are all part of the cost breakdown. With a production cost of ₹2593.43 per quintal, farmers made ₹2.25 for every rupee they put into mustard growing.

Singh et al. (2023) assessed from 2019–20 to 2021–22, researchers from Krishi Vigyan Kendra in Panipat, Haryana, examined irrigated agricultural conditions in farmers' fields. Cluster Frontline Demonstration (CFLD) was used to implement participatory interventions in the research. The purpose of the research was to compare the impact of Improved Practice (IP) with that of farmer's Practice (FP) on crop output. In all, 350 CFLDs were carried out across 140 ha of rice wheat and alternating cropping system during that time, involving 350 farmers from 19 communities. To pinpoint the missing pieces, we gathered farmers for meetings and group discussions. Under CFLDs, significant technical interventions were evaluated, such as better varieties (RH 749 & RH 725), seed treatment with carbendazim at a rate of 2 g/Kg seed, and seed inoculation with PSB and Azotobacter.

Kumar et al. (2023), this study aims to analyze the production of rapeseed mustard in the Meerut District of Uttar Pradesh, India, from an economic perspective. One hundred rapeseed-mustard farmers from two different blocks in the Meerut District provided the data. Using a basic random selection procedure that did not include replacement, villages were chosen from each block for this investigation. Every data block had its percentage area under mustard determined, and then they were sorted in decreasing order. The availability of favorable support prices, the broad acceptance of these technologies, the creation of high-yielding varieties, and better production methods are all factors that have contributed to this. There is still a gap between output potential and actual realization, even with these achievements. There is a need to fill the gap so that we can feed the growing human and animal populations, satisfy the demands of industry, and earned money from the sale of seed meal, oil, and other goods with added value. If we want to increase the supply, we should work on increasing the diversity of seeds and technologies and making sure they are packaged and used properly. To emphasize value addition and production quality while reaching underprivileged populations, it is essential to enhance funding for agricultural research, education, and extension. By extending their reach to the last step, the most sophisticated agricultural production technology may be used.

Bishnoi et al. (2023) evaluated Sri Ganganagar area of Rajasthan, this research set out to estimate the mustard production costs and returns structure, find marketing channels, examine mustard marketing price spreads, and identify restrictions in mustard production and marketing for the years 2021 and 2022. From four villages in the Anupgarh and Raisinghnagar blocks of the Sri Ganganagar district, 80 farmers (small, medium, and big) provided the data. To examine the marketing factors, data was gathered from several intermediaries in the Sriganganagar district's Gharsana and Jaitsar marketplaces. According to the results, average operating holding sizes were 3.99 acres for small farmers, 11.85 acres for medium farmers, and 29.50 acres for big farmers. Each of the types of farms had 0.94 acres, 2.97 acres, and 7.65 acres of mustardplanted, respectively. For small farms, the anticipated fixed expenses per acre were 7277.90, for medium

farms, 7312.94, and for big farms, 4974.27. The total variable costs per acre for the same farm sizes were 7,312.01, 7,312.01, and 7,138.11 rupees, respectively. Large farms had the greatest returns over variable expenses at Rs. 15545.05, followed by medium farms at Rs. 12951.18 and small farms at Rs. 11908.51. Big farms had the lowest overall costs per quintal of production, maybe due to economies of scale.

Bhatia et al. (2022) analyzed Between 2010 and 2016, before e-NAM, and between 2017 and 2021, after e-NAM, the research sought to examine the market arrival and pricing behavior of key mustard markets in Haryana. The deployment of e-NAM in Haryana occurred in 2016, and its effects were seen in 2017. In the two marketplaces that were studied, mustard was found to have arrived more often before e-NAM. Mustard also went up in price at the Sirsa market but down at the Rewari market. Both marketplaces have seen a dramatic decline in mustard arrivals and prices during the e-NAM era. In the Sirsa market, e NAM was more widely used and known than in the Rewari market. There was good connectivity between the Sirsa and Rewari marketplaces before and during the introduction of e-NAM. After e-NAM, the Granger causality test showed that mustard prices in Sirsa influenced Rewari prices, but only in one direction. Nonetheless, prior to e-NAM, there was no correlation between the two marketplaces' mustard pricing.

4. CLASSIFICATION OF MUSTARD

Mustard - Rapeseed group of crops is among the oldest cultivated plants in human civilization. It is a group of oilseed crops that assumes significance in the Indian national economy by occupying the second position next to groundnut and is considered a 'cash crop.' Biologically, the rapeseed and mustard plants belong to the family Cruciferae and under the genus Brassica, with many species and subspecies cultivated in India. Being several Brassica genus, the rapeseed is closely related to mustard. The word "rape" comes from the Latin word "rapum", which means 'turnip'. On the other hand, the word 'mustard' is derived from the Latin word "museum" or "must," which denotes 'the expressed juice of grapes, and "ard ens" means "hot & burning." The mustard-rapeseed is a versatile group of plants used in various ways historically. The mustard and rapeseed are closely related and can share the same growing areas. However, the classification of mustard - rapeseed is summed up below to show its different characteristics:

Table 1 Classification of Mustard-Rapeseed

English name	**Vernacular name**	**Botanical name**	**Identification characteristics of seeds**
1) Indian mustard / Brown mustard	Rai, ryada, raya, laha, lahta, sasve, herbo	Brassica juncea (L.) Czern. & Coss.	Seeds are medium-sized, round, and dark brown or black in colour.
2) Indian rape / Rapeseed/ Toria	Toria, tori, lahi	Brassica rapa L. var. toria (syn. B..campestris L. var. toria.)	Seeds are dark brown, bold and large-sized.
3) Brown sarson /Rapeseed	Brown- Sarson, Bhoori- sarson	Brassica rapa L. var. brown sarson (syn. B. campestris L. var. brown sarson)	Seeds are light reddish in colour , bold, large sized.
4) Yellow sarson /Colza/Rapeseed	Yellow Sarson, Pilli sarson	Brassica rapa L.var. yellow sarson (syn. B. campestris L. var. yellow sarson)	Seeds are slightly smaller than Sarson, size is ovoid in shape, and yellow in

			colour.
5) Rapeseed	Gobhi sarson	Brassica napus L.	Seeds are brownish black and large-sized.
6) Abyssinian mustard/Ethiopian mustard	Karan rai	Brassica carinata A. Br.	Seeds are small, round, and reddish brown in colour.
7) Rocket Salad	Duan, tera, tara, saundh, taramira	Eruca sativa Mill	Seeds are light reddish brown coloured and distinctly ovoid shape.

Source National Research Centre on Rapeseed-Mustard, Sewar, Bharatpur (Rajasthan)

The historical progression and advancement of mustard-rapeseed farming, namely the transformation of canola, serves as a demonstration of agricultural ingenuity and worldwide commerce. Mustard-rapeseed has been a fundamental crop in sub-tropical and tropical climates since 2000 B.C. Currently, the production of this crop is widespread in prominent countries such as India, China, Canada, Germany, France, Australia, and the USA. Rapeseed has been used as a crop in Europe since the 13th century. The Brassica family of plants, such as rapeseed, is renowned for producing oils that are abundant in a long-chain fatty acid called "erucic acid." Prior to the 1960s, the presence of erucic acid was not regarded as a noteworthy determinant in evaluating the quality of oil. Nevertheless, studies conducted during that period uncovered the potential health hazards linked to the ingestion of erucic acid. This discovery led to the creation of rapeseed cultivars with low levels of erucic acid, with a special focus on Canada between the late 1960s and early 1970s. In 1978, the Canadian rapeseed industry set a new benchmark for low erucic acid and glucosinolate cultivars and introduced the term 'canola' to describe them. The primary sources of canola production are Brassica napus L. and Brassica rapa L., with additional contributions from Brassica juncea Coss. (Brown mustard) and Sinapsis alba L. (Yellow Mustard). During the last twenty years, there has been a significant increase in the worldwide output of mustard-rapeseed, resulting in canola/rapeseed becoming the second most abundant oilseed, surpassed only by soybean. Mustard- rapeseed is the second most significant oilseed crop in India, following peanuts, and contributes around 25% to the overall oilseed production. Indian mustard (Rai) dominates the farming region, including 85-90% of the Indo-Gangetic plains. Conventional Indian mustard-rapeseed varieties have elevated levels of erucic acid and glucosinolates, which fail to meet the global quality requirements for 'canola'. To comply with these regulations and encourage the production of a wider range of crops, government agencies in Punjab are currently promoting the growth of hybrid mustard-rapeseed types, such as the 'Hyola' variety.

5. FACTORS INFLUENCING MUSTARD CULTIVATION IN HARYANA

Mustard cultivation in Haryana is shaped by a complex interplay of factors that influence its overall productivity, sustainability, and economic viability. One of the primary determinants is the region's climatic conditions. Mustard, being a crop that flourishes in cooler weather, requires a delicate balance of cool temperatures and sufficient sunlight during its growth period. For example, a sudden rise in temperature close to the flowering stage can adversely affect seed formation, leading to lower yields. This sensitivity underscores the importance of selecting the right sowing period, a practice that can vary significantly across the diverse climatic zones within Haryana. The soil's health also plays a crucial role in determining the success of mustard cultivation. Ideally, mustard plants thrive in well-drained loamy to sandy-loam soils. In regions of Haryana where soil health has been degraded due to overuse of chemical fertilizers or improper crop rotation, farmers have seen a noticeable decline in yield. Recognizing this, many have begun incorporating organic

farming practices, such as the use of green manure and compost, to restore soil fertility and structure, thereby improving crop outcomes.

Water availability is another critical factor, especially in areas prone to water scarcity or irregular rainfall. Despite mustard's relatively low water requirement, strategic irrigation during dry spells can be the difference between a successful harvest and crop failure. Innovative water management practices, such as the adoption of drip irrigation systems in districts like Hisar, have demonstrated how efficient water use can lead to higher productivity even under constrained water conditions. Technological advancements have significantly influenced mustard farming in Haryana. The introduction of high-yielding and disease-resistant seed varieties has been a game-changer for many farmers. For instance, the use of such seeds in the Karnal district has led to increased yields and enhanced resilience to pests and diseases, illustrating the potential of technology to transform agricultural productivity.

Government policies and market dynamics are pivotal in shaping the economic landscape of mustard cultivation. Supportive government initiatives, such as subsidies for high-quality seeds and crop insurance schemes, provide a safety net for farmers, encouraging them to invest in mustard cultivation. Moreover, market demand for mustard oil, a staple in Indian cooking, directly impacts farmers' income. Fluctuations in market prices can influence farmers' decisions on whether to plant mustard or opt for alternative crops. An example of this dynamic is seen in the response to the government's announcement of a higher minimum support price (MSP) for mustard, which typically leads to an increase in the area under mustard cultivation in anticipation of better earnings. The management of pests and diseases is a critical aspect of mustard cultivation. Effective strategies, including crop rotation and the use of biopesticides, are essential for protecting mustard crops from common threats. The success story of integrated pest management (IPM) in controlling aphids in the Fatehabad district highlights how adopting environmentally friendly pest control methods can lead to healthier crops and higher yields. Mustard cultivation in Haryana is influenced by a myriad of factors, ranging from environmental conditions and agricultural practices to technological innovations and policy frameworks. The examples provided demonstrate the interconnectedness of these factors and their collective impact on the success of mustard cultivation in the region. Addressing these factors holistically is essential for enhancing the productivity, sustainability, and profitability of mustard farming in Haryana.

Table 2 Area, production, and average yield per hectare of Mustard Crop in Haryana

(Area in 000 ha.) (Production in 000 Tonne) (Yield in Kg. per ha.)

Year/District	Area (A)	Production (P)	Yield (Y)
1966-67	198	80	404
1970-71	129.8	89	685
1980-81	299.6	178	594
1990-91	473.8	634	1,340
2000-01	408.8	560	1,369
2010-11	509.7	953	1,869
2018-19	609.8	1,286.50	2112
2019-20	641.4	1,149.90	1792
2020-21	617.5	1,221.00	1978
2021-22	880.5	1684.9	1913
CAGR	18.03	40.29	18.86
Ambala	2.3	4.8	479.16
Bhiwani	**169.6**	**294.6**	**1737.02**
Charkhi Dadari	62.2	150.7	2422.82
Faridabad	0.6	1	1666.6
Fatehabad	20.1	36.4	1810.9
Gurugram	19.1	43.4	2272.25
Hisar	73.5	139.5	1897.95

Jhajjar	33.8	70.3	2079.88
Jind	5.9	11.8	2000
Kaithal	1.5	2.8	1866.66
Karnal	2.9	6.3	2172
Kurukshetra	3.9	5.5	1410.25
Mahendragarh	**100.3**	**210.4**	**2097.70**
Nuh	28.1	62.4	2220.64
Palwal	2.4	4.2	1750
Panchkula	1.2	1.1	916.6
Panipat	1.8	4.1	2277.77
Rewari	7.7	17.5	2272.72
Rohtak	10.6	19.2	1811.3
Sirsa	65.1	125.4	1926.26
Sonipat	2.7	5.6	2074.07
Yamuna Nagar	2.2	4	1818.18

Source: Statistical Abstract of Haryana

Table 2 shows a comprehensive overview of the area, production, and yield per hectare of mustard crop in Haryana over several years and across its districts. Initially, in 1966-67, mustard cultivation covered 198,000 hectares, with a production of 80,000 tonnes and an average yield of 404 kg/ha. Over the years, a significant increase in both area and production was observed. By 2010-11, the area under cultivation expanded to 509,700 hectares, and production reached 953,000 tonnes, with the yield increasing to 1,869 kg/ha. However, recent data from 2018-19 to 2021-22 show a further increase in area and production, with figures reaching up to 880000hectares and 1684000 tonnes, with productivity increasing to 1978 kg/ha.

The table also details mustard cultivation across various districts in Haryana, with the area measured in hectares and production in tonnes. District-wise, the area under mustard cultivation varies significantly, with Bhiwani at 169,600 hectares and Faridabad at only 600 hectares indicating the diverse agricultural landscape of Haryana. Notably, districts like Bhiwani and Mahendragarh shows substantial contributions to mustard production with 294,600 and 210,400 tonnes, respectively, showcasing the importance of the mustard crop within the agricultural sector of Haryana. The absence of yield data for recent years and districts suggests a focus on tracking the expansion and output of mustard cultivation rather than productivity metrics at these levels.

In the context of mustard crop cultivation in Haryana, both Bhiwani and Mahendragarh districts emerge as noteworthy contributors to the state's agricultural output. Bhiwani, with its extensive area of 169,600 hectares dedicated to mustard cultivation, and Mahendragarh, with a significant area of 100,300 hectares, showcase their vital roles within the agricultural framework of the region. The production figures are equally impressive, with Bhiwani producing a substantial 294,600 tonnes and Mahendragarh contributing 210,400 tonnes of mustard. These statistics underscore the importance of these districts not only in supporting Haryana's agricultural economy but also in bolstering mustard production at a state level. The substantial areas under cultivation and the impressive production volumes highlight the potential and efficiency of agricultural practices in Bhiwani and Mahendragarh, marking them as central to the state's mustard cultivation efforts.

6. CONCLUSION

The study of mustard cultivation in Haryana over the last five decades reveals a significant transformation in agricultural practices, leading to improved yield and production efficiency. Despite the fluctuations in area under cultivation, there has been a consistent increase in production and yield, attributed to the adoption of advanced agricultural technologies, improved seed varieties, and effective policy support. However, the research also highlights the disparities in growth across different districts, indicating the need for region-specific strategies to address local challenges. Oilseed production has increased from 5 million tonnes in 1950-51 to 41 million tonnes during 2021-2022. To sustain the upward trajectory in mustard cultivation, the study recommends a focus on innovative farming techniques, climate-resilient agriculture, and enhanced farmer education and support services. By adopting a holistic approach that combines traditional knowledge with scientific innovation, Haryana can continue to strengthen its position as a leading mustard-producing state in India, contributing significantly to the nation's agricultural economy and food security.

CONFLICT OF INTERESTS

None.

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