

Review Article

Rapeseed-Mustard Cultivation in India: National Overview and Regional Insights with Reference to Madhya Pradesh

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Abstract

India stands as the third-largest global producer of rapeseed-mustard, contributing over 13% to worldwide output from 2020-21 to 2024-25, yet its average yield of 1,461 kg/ha in 2024-25 lags at 60.7% of the global average of 2,070 kg/ha. As a pivotal oilseed crop, rapeseed-mustard ranks second in India's agricultural landscape, trailing only soybean, and accounts for 36% of the nation's edible oil production. Cultivated across 24 states, its adaptability, short growth cycle, and versatility underscore its economic significance, particularly for marginal farmers in rain-fed regions. Over the past two decades, collaborative efforts by the Government of India, ICAR, and state governments have propelled production from 6.8 million tons in 2015-16 to 12.61 million tons in 2024-25, with a 66% production surge (CAGR 2.7%) and 41% productivity increase (CAGR 1.8%), driven by technological advancements and improved agronomic practices.

Madhya Pradesh, the second-largest producer, contributes over 13% to national output, with an average area of 1.08 million hectares, production of 1.666 million tons, and productivity of 1,530 kg/ha from 2020-21 to 2024-25. The state's decadal CAGR of 4.9% (area), 6.8% (production), and 1.8% (yield) reflects robust growth, despite challenges like weather variability. Key districts such as Bhind and Morena dominate production, while low-yield regions like Rewa require targeted interventions. Despite progress, a persistent yield gap and limited farmer awareness of modern technologies hinder potential. This study advocates for enhanced extension services, high-yielding varieties, and input access to bridge disparities, ensuring rapeseed-mustard sustains India's edible oil security and farmer livelihoods.

Key words: Rapeseed-Mustard, Oilseed Production, Agricultural Productivity, Yield Gap, Technological Intervention

Introduction

India ranks third globally in rapeseed-mustard production, following Canada and China, contributing over 13% to the world's total output from 2020-21 to 2024-25 (Figure 1). However, India's average yield of 1,461 kg/ha in 2024-25 is approximately 60.7% of the global average of 2,070 kg/ha, as detailed in Tables 1 & Table 2. In Indian agriculture, oilseeds are the second most significant crop group in terms of area and production, surpassed only by food grains. India's diverse agro-ecological conditions support the cultivation of nine annual oilseed crops, including groundnut, rapeseed-mustard, soybean, sunflower, sesame, safflower, nigerseed, castor, and linseed (Patel *et al.*, 2024). Among these, rapeseed-

mustard is a key crop, grown across 24 states. It ranks second in both area and production among the seven edible oilseed crops, following soybean. Notably, rapeseed-mustard oil constitutes about 36% of India's total edible oil production, making it the leading contributor to the nation's oil basket.

Data Collection and analysis

Secondary data for rapeseed-mustard production, collected from diverse sources like government agencies, research institutions, academic publications, and previous studies, would be analyzed using statistical techniques such as calculating growth rates and trends to understand production dynamics over time and in different regions particularly Madhya Pradesh.

Through coordinated efforts by the Government of India, the Indian Council of Agricultural Research (ICAR), state

Table 1: Rapeseed-Mustard production Scenario World during last ten years

Year	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25
Area (mha)	33.83	36.07	36.26	35.33	35.57	38.72	42.44	42.99	42.43	43.35
Production (mt)	70.31	75.80	73.69	70.94	75.44	76.65	89.86	89.72	85.26	89.77
Yield (Kg/ha)	2080	2100	2030	2010	2120	1980	2120	2090	2010	2070

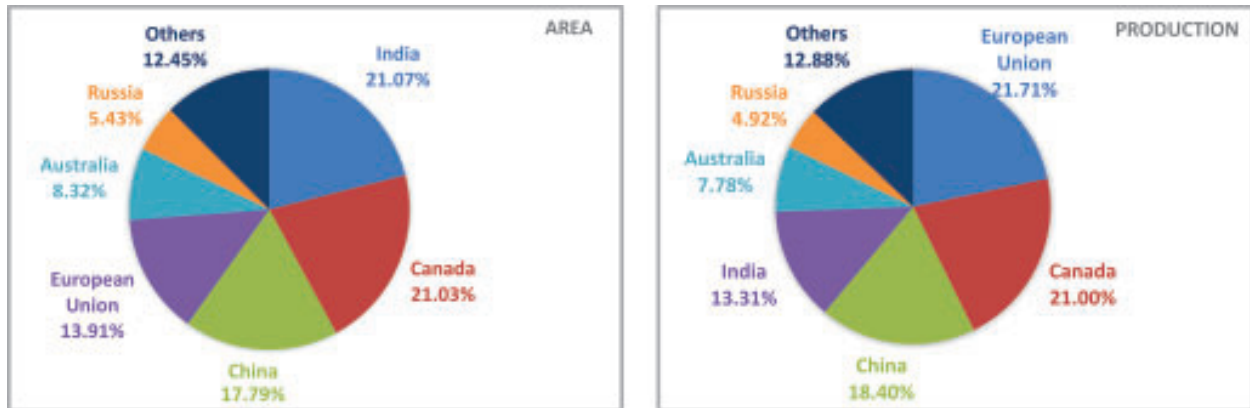


Fig1: Contribution in Area and Production of different rapeseed-mustard producing countries during 2020-21 to 2024-25

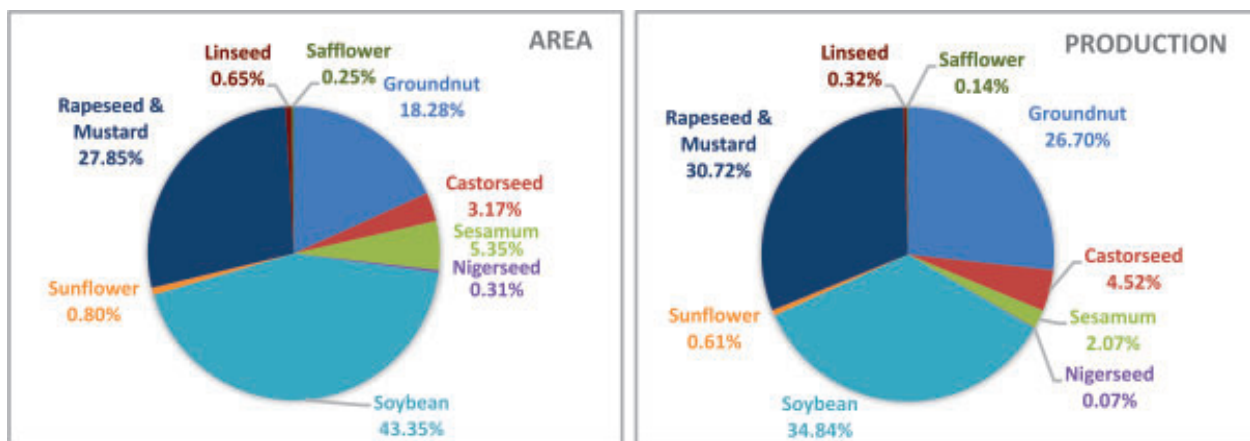
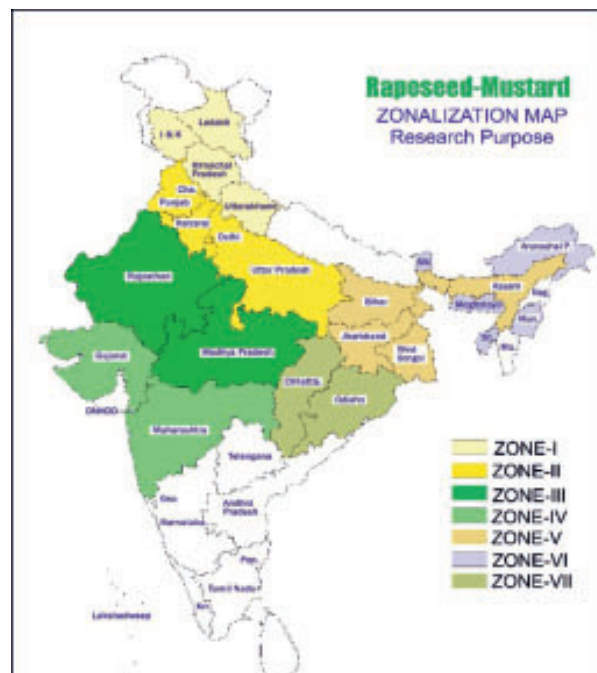


Fig 2 : Contribution different oilseed crops in total oilseed production in India (2020-21 to 2024-25)

Table 2: Rapeseed-Mustard production scenario in India during last ten years

India		
Area(mha)	Production (mt)	yield (Kg/ha)
5.75	6.80	1183
6.07	7.92	1304
5.98	8.43	1410
6.12	9.26	1511
6.86	9.12	1331
6.70	10.21	1524
7.99	11.96	1497
8.85	12.64	1428
9.18	13.26	1444
8.63	12.61	1461

governments, and farmers, rapeseed-mustard production has seen significant growth over the past two decades, reaching 12 million tons in 2024-25 (Rai, 2022). In 2023-24, production peaked at over 13 million tons, as noted in Table 2. Together, soybean, groundnut, and rapeseed-mustard play a critical role in India's



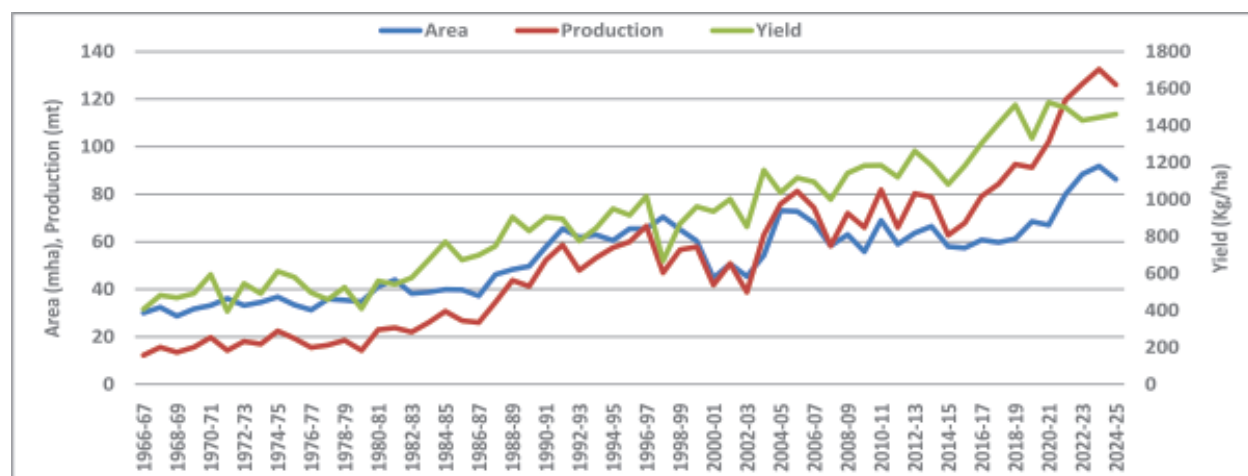


Fig 3: Trends in rapeseed-mustard area, production and productivity (1950-51 to 2014-15)

oilseed sector, with rapeseed-mustard being a major contributor to both acreage and output. This sustained increase in production highlights the crop's importance to India's agricultural economy and its role in meeting the country's edible oil demands.

Figure 1 illustrates the contribution of major rapeseed-mustard producing countries to global area and production from 2020-21 to 2024-25 (USDA 2025). The chart highlights the proportional share of countries, with India contributing over 13% to global production during this period. Rapeseed-mustard is India's second most significant edible oilseed crop, following soybean, and is vital to the nation's oilseed economy due to its

adaptability, short growth cycle, and versatile uses. In 2024-25, India cultivated rapeseed-mustard across 8.63 million hectares, yielding 12.61 million tons. Together, soybean, rapeseed-mustard, and groundnut account for

Table 3: Percent increase and CAGR of rapeseed-mustard during last two decades

Attributes	2004-05	2024-25	% CAGR	% Increase
Area (lakh ha)	73.16	86.29	0.87	17.95
Production (Lakh tonnes)	75.93	126.06	2.70	66.02
Yield (Kg/ha)	1038	1461	1.82	40.75

Table 4: Major rapeseed-mustard producing state average (2022-23 to 2024-25)

State	Area (Lakh ha)	Production (Lakh Tonnes)	Yield (Kg/ha)
Rajasthan	37.44	56.67	1514
Uttar Pradesh	12.56	18.57	1479
Madhya Pradesh	11.44	17.26	1509
Haryana	7.16	12.98	1814
West Bengal	6.42	8.00	1245
Jharkhand	4.16	3.37	811
Assam	3.09	2.43	786
Gujarat	2.81	5.35	1907
Bihar	0.88	1.05	1197
Punjab	0.49	0.81	1664
Jammu & Kashmir	0.39	0.38	977
Manipur	0.32	0.24	746
Chhattisgarh	0.30	0.15	484
Maharashtra	0.25	0.09	365
Uttarakhand	0.21	0.19	935
Odisha	0.17	0.06	333
Himachal Pradesh	0.08	0.07	840
Others	0.95	0.91	955
All India	88.88	128.36	1444

Data Source: DAC, Govt. of India

approximately 89% of India's oilseed acreage and 92% of its production, based on averages from 2020-21 to 2024-25 (Fig.2).

Rapeseed-mustard is grown in nearly all Indian states, except those in the extreme south, with major production in Rajasthan, Uttar Pradesh, Madhya Pradesh, Haryana, Gujarat, West Bengal, Jharkhand, Assam, Bihar, and Punjab. Over the past two decades, both production and productivity of rapeseed-mustard have shown consistent growth. Data from Table 2 illustrates this trend, with yields increasing from 1,183 kg/ha in 2015-16 to 1,461 kg/ha in 2024-25, and production rising from 6.80 million tons to 12.61 million tons over the same period. Figure 3 further confirms this upward trend, showing productivity rising

from 1,038 kg/ha in 2004-05 to 1,461 kg/ha in 2024-25, while production grew from 7.6 million tons to 12.6 million tons.

Over the past 20 years, the area cultivated for rapeseed-mustard in India has grown modestly by 17%, with a Compound Annual Growth Rate (CAGR) of 0.87%, reflecting limited expansion in farmland. In contrast, production has surged by 66%, with a CAGR of 2.7%, driven primarily by significant improvements in crop yield rather than increased acreage. Productivity has risen by approximately 41%, with a CAGR of 1.8%, indicating that advancements in crop management, technology adoption, and efficient use of inputs have been the primary factors behind the increased output (Table 3).

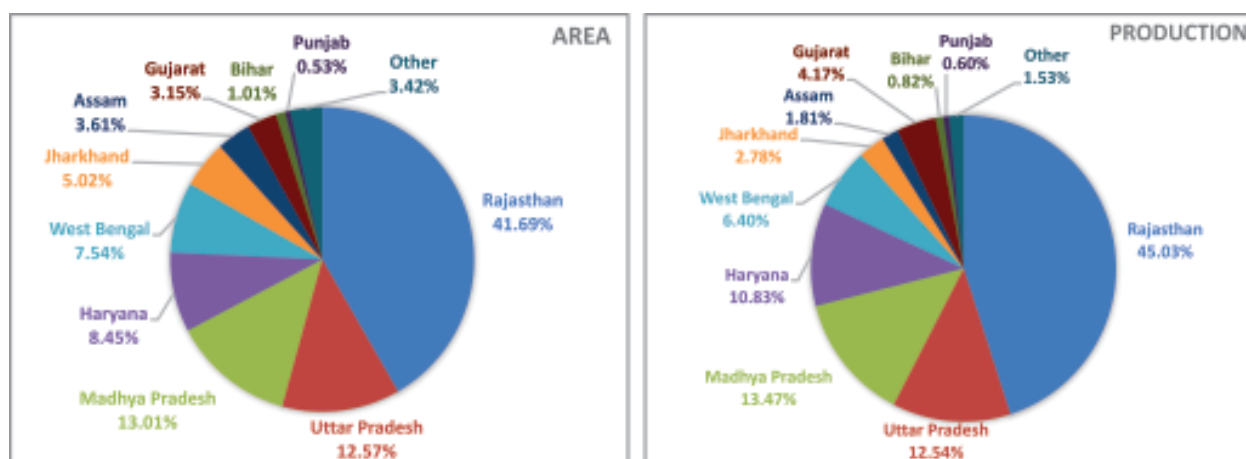


Fig 4: Contribution Major states in Rapeseed-Mustard in India during 2020-21 to 2024-25

Rapeseed-mustard is primarily grown in India's smallholder and marginal farming systems, often in rain-fed, low-input regions, making productivity and profitability improvements vital for inclusive agricultural growth and enhancing farmers' livelihoods. The crop group includes eight varieties: toria, brown sarson, yellow sarson, gobhisarson, raya (Indian mustard), karan rai, black mustard, and taramira. It is predominantly cultivated in states like Rajasthan, Uttar Pradesh, Madhya Pradesh, Haryana, West Bengal, Jharkhand, Assam, Gujarat, Bihar, Punjab, Jammu & Kashmir, Manipur, Chhattisgarh, Maharashtra, Uttarakhand, Odisha, and Himachal Pradesh (Table 4). Studies, such as Patel *et al.* (2024), emphasize that low-input, rain-fed systems limit yields, necessitating improved crop management and technology adoption. Rai (2022) highlights that targeted interventions in these regions have boosted productivity, aligning with the 41% yield increase over two decades, supporting sustainable farming and livelihood security.

Major states accounted for about 98 percent of the

production of rapeseed-mustard in the country during last five years 2020-21 to 2024-25 (Figure 4).

Data from frontline demonstrations and research plots reveal a substantial yield gap between current rapeseed-mustard productivity and its potential. Achievable yields significantly exceed existing levels, indicating untapped potential. Additionally, there is notable variation in crop yields across Indian states, reflecting regional disparities. A key barrier to maximizing productivity is the lack of awareness among farmers about advanced technological options, such as improved crop management practices and high-yielding varieties. Addressing this knowledge gap through extension services and training, as supported by Patel *et al.*, (2024), could enhance yields and bridge regional differences. Rai (2022) emphasizes that targeted dissemination of technology has driven productivity gains in the past, suggesting that increased awareness and adoption of modern techniques could further elevate rapeseed-mustard output, supporting India's edible oil needs.

Table 5: Net Domestic availability, import and consumption of edible oil in India during 2019-20 to 2023-24 (Quantity in Lakh tonnes)

Particulars	2019-20	2020-21	2021-22	2022-23	2023-24	Average (2019-20 to 2023-24)
A. Primary Source						
Groundnut	28.28	31.37	22.99	23.35	23.34	25.87
Rapeseed & Mustard	17.97	20.66	37.11	39.22	40.83	31.16
Soybean	22.9	23.16	20.81	24.01	20.91	22.36
Sunflower	0.72	0.76	0.83	1.21	0.56	0.82
Sesamum	2.34	2.53	2.46	2.5	2.53	2.47
Nigerseed	0.12	0.11	0.09	0.08	0.08	0.10
Safflower	0.09	0.11	0.18	0.26	0.15	0.16
Castor	6.5	5.8	5.69	6.96	6.72	6.33
Linseed	0.28	0.28	0.32	0.42	0.3	0.32
Sub Total	79.2	84.78	90.48	98.01	95.42	89.58
B. Secondary Source						
Coconut	5.95	5.95	5.56	5.34	5.49	5.66
Palm Oil	2.77	2.77	3.58	3.9	3.9	3.38
Cottonseed	12.71	12.26	10.78	11.66	11.2	11.72
Ricebran	10.68	10.68	10.9	10.12	10.12	10.50
Solvent Extracted Oils	3.5	3.5	3.5	3.5	3.5	3.50
Tree & Forest Origin	1.5	1.5	1.5	1.5	1.5	1.50
Sub Total	37.11	36.66	35.82	36.02	35.71	36.26
Total (A+B)	116.31	121.44	126.3	134.03	131.13	125.84
C. Less : Exports & Industrial Use	9.76	9.80	9.80	9.80	9.80	9.79
D. Net Domestic availability of Edible Oils	106.55	111.64	116.5	124.23	121.33	116.05
E. Import of Edible Oils \$	134.16	134.52	141.94	165.00	156.55	146.43
F. Total availability/Consumption of Edible Oils	240.71	246.16	258.44	289.23	277.88	262.484

Edible oil production scenario in India

Oilseeds are a cornerstone of Indian agriculture, occupying 14.3% of the gross cropped area, contributing 12-13% to dietary energy, and accounting for approximately 8% of agricultural exports (Patel *et al.*, 2024). Among these, rapeseed-mustard stands out as the largest contributor to India's domestic edible oil production. Although it ranks second in oilseed production behind soybean, the higher oil content in rapeseed-mustard seeds makes it the primary source of domestically produced edible oil (Rai, 2022). During the 2024-25 seasons, rapeseed-mustard accounted for 31% of the total production from annual oilseeds and contributed nearly 36% to domestic edible oil availability from primary sources between 2019-20 and 2023-24, as detailed in Table 5. With India's increasing reliance on imported edible oils, which strains foreign exchange reserves and exposes the country to volatile international markets, enhancing self-sufficiency in edible oil production has become a priority. Rapeseed-mustard is viewed as a critical crop for achieving this goal through

productivity improvements driven by technological interventions and effective extension strategies. The consumption preferences of edible oil across India show that Mustard oil reigned supreme in India's north (61%) and east (35%) zones, followed by sunflower oil. In the west zone, soybean oil held a slight edge (28%) over mustard (25%) and sunflower (25%) oils. The south zone presented a different picture, with sunflower oil (44%) dominating, followed by groundnut oil (29%). The regional consumption patterns documented by Patel *et al.*, (2024), which noted mustard oil's dominance in northern and eastern India due to its flavor and cultural acceptance. These studies collectively suggest that increasing rapeseed-mustard production could cater to regional preferences while reducing import reliance. Import basket mostly consists of crude and refined palm oils, soybean, and sunflower oils. The existing rate of Total Factor Productivity (TFP) growth is less than 1.5%. Poor TFP demands a shift in production technology to meet the domestic demand of edible oils. (Balajiet al 2022 and Chandel 2007). However, challenges like climate variability and water scarcity in rain-fed regions require

Table 6 : Districts wise production of in Madhya Pradesh during last 5 years

Year	Area (Lakh Ha)	Production (Lakh tonnes)	Yield (Kg/ha)
2015-16	6.17	6.66	1079
2016-17	7.08	9.20	1299
2017-18	7.48	9.76	1305
2018-19	7.07	10.40	1471
2019-20	6.75	10.38	1538
2020-21	7.49	13.07	1745
2021-22	12.26	16.91	1379
2022-23	12.73	19.61	1540
2023-24	13.35	19.62	1470
2024-25	10.89	16.66	1530

Table 7: Decadal Compound annual growth rate (CAGR) of Rapeseed-mustard In Madhya Pradesh

Period	% CAGR		
	Area	Production	Yield
1966-67 to 1975-76	10.69	22.80	11.11
1976-77 to 1985-86	7.25	16.23	8.42
1986-87 to 1995-96	8.61	12.18	3.30
1996-97 to 2005-06	1.07	2.60	1.51
2006-07 to 2015-16	-1.30	-0.44	0.86
2016-17 to 2024-25	4.90	6.82	1.84

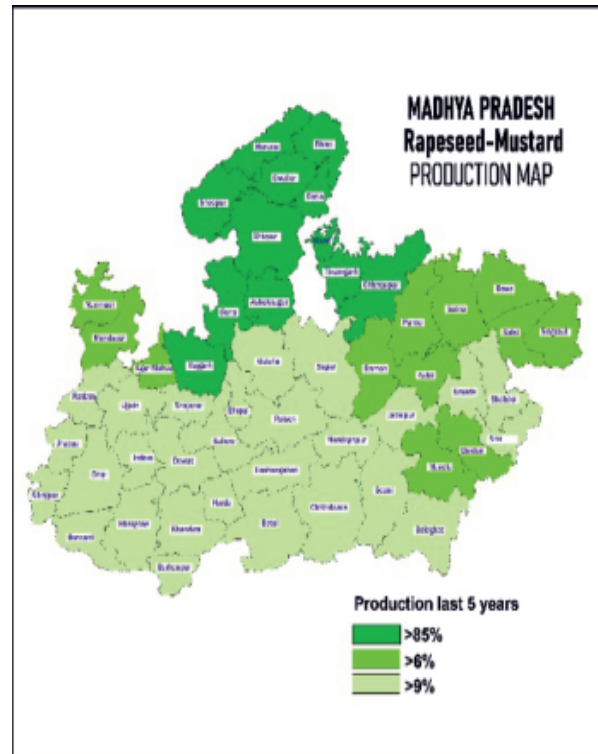


Fig. 5: Districts wise production of inMadhya Pradesh during last 5 years

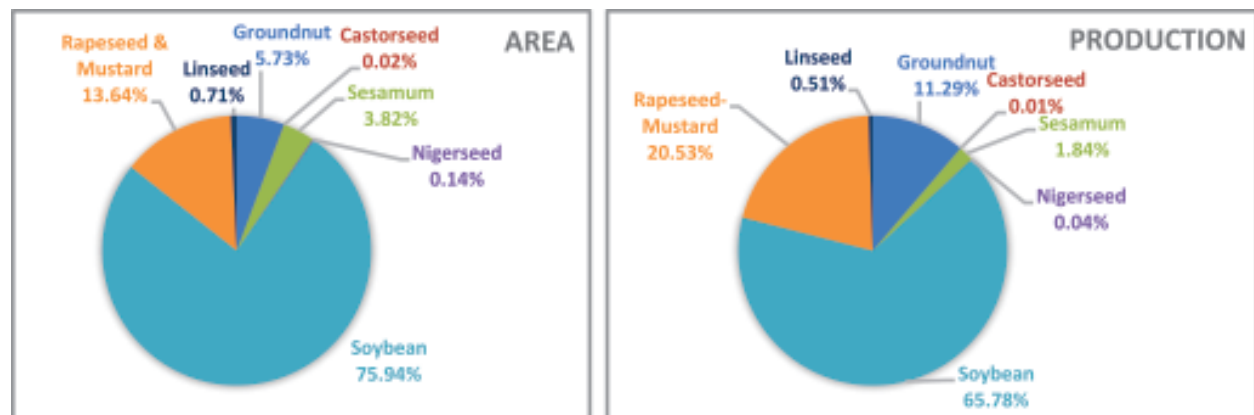


Fig 6 : Contribution different oilseed crops in total oilseed production in Madhya Pradesh during 2020-21 to 2024-25

resilient varieties and sustainable practices, as discussed by Singh *et al.* (2021).

Rapeseed-mustard production scenario in Madhya Pradesh

Madhya Pradesh ranks as India's second-largest producer of rapeseed-mustard, contributing over 13% to the nation's total production from 2020-21 to 2024-25. Despite

challenges such as yield fluctuations caused by variable weather and pest issues, the state has demonstrated steady growth in rapeseed-mustard production over the past decade. This consistent progress highlights Madhya Pradesh's increasing importance in supporting India's oilseed security, as illustrated in Figure 5.

Rapeseed-mustard is the second most important oilseed

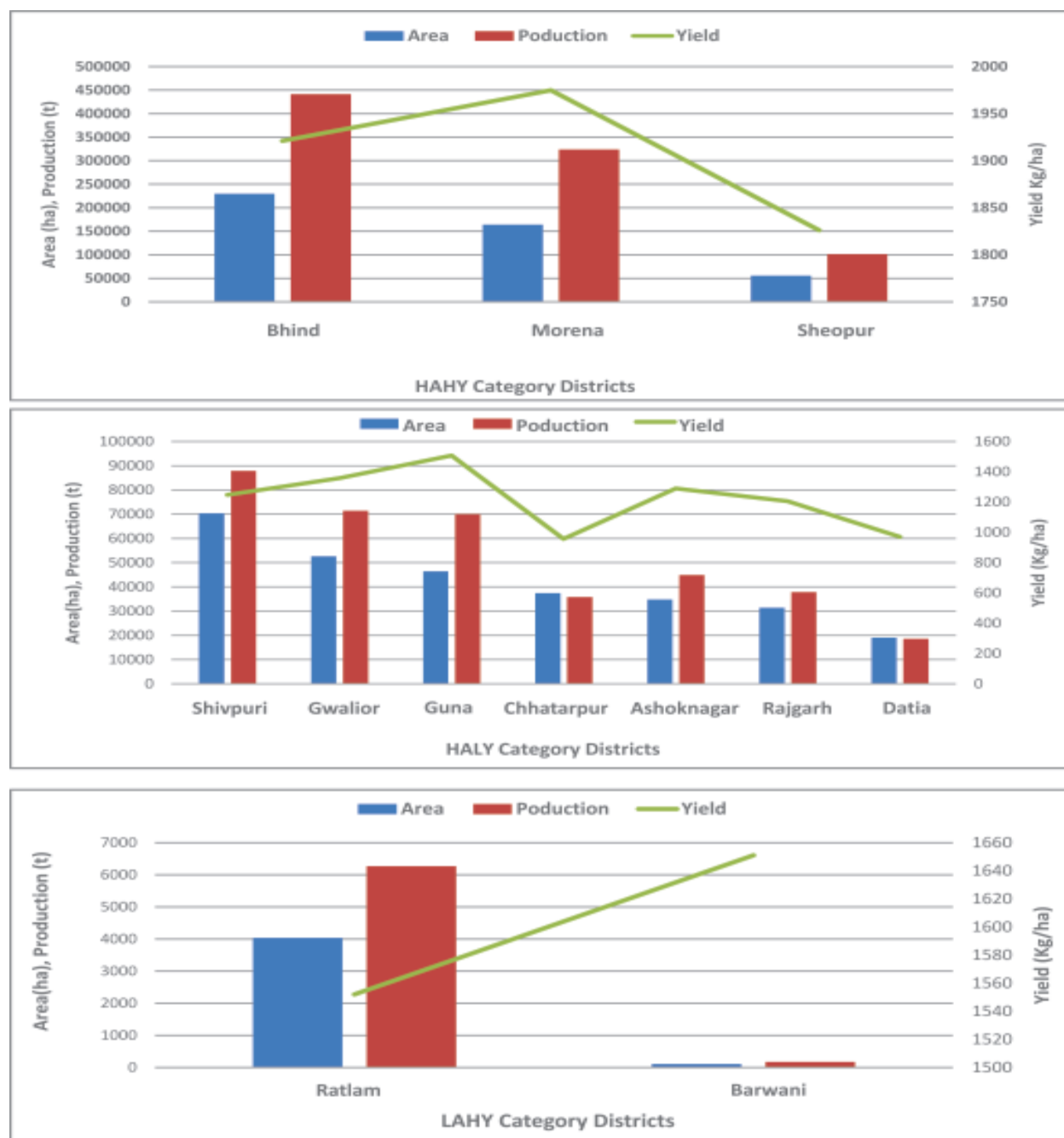


Fig 7: Categorization of different rapeseed-mustard producing districts HAHY, HALY and LAH

crop in Madhya Pradesh after soybean, contributing around 14% of the total oilseed area and 20% of total oilseed production in the state. (Figure 6). During the last decade, the compound annual growth rate (CAGR) of rapeseed-mustard in Madhya Pradesh has been 4.9% for area, 6.8% for production, and 1.8% for productivity. These figures reflect a positive trend, indicating not only an expansion in cultivated area but also improvements in yield levels, likely

driven by better agronomic practices, use of high-yielding varieties, and supportive policy interventions (Table 7).

Rapeseed-mustard, a pivotal oilseed crop, is cultivated extensively across nearly all districts of Madhya Pradesh, significantly bolstering the state's agricultural economy. An analysis spanning 2020-21 to 2024-25 reveals that the state's average cultivation area for rapeseed-mustard is

1.08 million hectares, yielding 1.666 million tons with a productivity of 1,530 kg/ha. On a per-district basis, the average area is 17,000 hectares, and production is 27,000 tons. Predominant districts- Bhind, Morena, Sheopur, Shivpuri, Gwalior, Guna, Chhatarpur, Ashoknagar, Rajgarh, and Datia collectively account for approximately 80% of the state's cultivated area and 85% of its production. These districts consistently surpass the per-district average area. Districts exceeding the per-district average production include Bhind, Morena, Sheopur, Shivpuri, Gwalior, Guna, Chhatarpur, Ashoknagar, and Rajgarh, with cultivation areas ranging from 31,000 to 229,000 hectares, production from 229,000 to 441,000 tons, and yields from 1,205 to 1,941 kg/ha. However, Shivpuri, Gwalior, Guna, Chhatarpur, Ashoknagar, Rajgarh, and Datia exhibit productivity below the state average of 1,530 kg/ha. Bhind leads with the highest production at 441,000 tons and a yield of 1,921 kg/ha, while Morena boasts the highest yield at 1,975 kg/ha. Other notable contributors include Rewa, Mandsaur, Neemuch, and Ratlam. Conversely, districts such as Rewa, Mandsaur, Singrauli, Panna, Tikamgarh, Neemuch, Dindori, and Satna, despite significant cultivation areas, have yields below 60% of the state average, necessitating urgent interventions to enhance productivity. Yogi and co-workers (2023) opined the technological intervention through policy initiative might be inject a significant capital through backward linkages and forward linkages in the agrarian economy annually.

Based on five-year average area and productivity data, rapeseed-mustard districts are classified into three categories, as depicted in Figure 7. High Area High Yield (HAHY) districts feature both area and yield above state and per-district averages. High Area Low Yield (HALY) districts have larger cultivation areas but yields below the state average. Low Area High Yield (LAHY) districts have smaller areas but yields exceeding the state average. The outreach of the most modern technological and policy interventions may be facilitated up to the last frame for minimizing the productivity gaps (Yogi *et al.* 2024).

Conclusions

Rapeseed-mustard is a cornerstone of India's oilseed economy, ranking as the third most significant edible oilseed crop globally and contributing over 13% to world production from 2020-21 to 2024-25. In India, it is the second most important oilseed crop after soybean, accounting for 36% of domestic edible oil production due to its high oil content. Over the past three decades, India has seen a 66% increase in production (CAGR 2.7%) and a 41% rise in productivity (CAGR 1.8%), driven by technological advancements, improved crop

management, and coordinated efforts of key research and development organisations. Despite a modest 17% expansion in cultivated area (CAGR 0.87%), the substantial yield gains underscore the efficacy of modern agricultural practices in enhancing output. Madhya Pradesh, the second-largest rapeseed-mustard producer in India, contributes over 13% to national production, with an average area of 1.08 million hectares, production of 1.666 million tons, and productivity of 1,530 kg/ha from 2020-21 to 2024-25. The state's decadal CAGR of 4.9% for area, 6.8% for production, and 1.8% for productivity reflects robust growth despite challenges like weather variability and pest issues. Key districts such as Bhind, Morena, and Sheopur drive 80% of the state's area and 85% of production, with Bhind achieving the highest production and Morena the highest yield (1,975 kg/ha). However, districts like Rewa and Singrauli, with yields below 60% of the state average, require targeted interventions. Despite India's progress, a significant yield gap persists, with national productivity at 60.7% of the global average. Limited awareness of advanced technologies remains a barrier. Enhancing extension services, promoting high-yielding varieties, and improving input access can bridge this gap, ensuring rapeseed-mustard continues to bolster India's edible oil security and support smallholder farmers.

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