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Declining trends and instability in safflower cultivation in Maharashtra

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Abstract
In the study of status of Safflower cultivation in Maharashtra state, growth and instability was estimated in area, production and yield. The growth rate was estimated by exponential model fitted in regression model. Instability was estimated by CDVI. The secondary time series data was collected for 30 years from the year 1994-95 to 2023-2024 and data was sub divided into 2 sub-periods period-I, period-II of 15 years each and overall period of 30 years. The results revealed there was negative growth in area and production and positive growth in yield. There was highest instability in area and production but least in yield. Technological and extension efforts are needed at state level to bring more area under the cultivation of Safflower.

Keywords: Safflower, growth, instability, area, yield

Introduction

Safflower is a significant winter crop grown in India; it is among the major 9 oilseeds cultivated in India. Maharashtra, Telangana and Karnataka are the leading states in cultivation of this crop (Sanghavi and Ekale, 2021) [8]. Safflower, also known as kusum or kardi,) has been cultivated in India for its brightly colored flowers and the orange-red dye (carthamin) extracted from them and their seeds (Kumar and Malik, 2024) [5]. The seeds contain 24-36% oil. The cold-pressed oil is golden yellow and is mainly used for cooking. This oil is comparable to sunflower oil and contains a good amount of linoleic acid (78%), which helps reduce blood cholesterol levels. The unsaturated fatty acids in safflower oil also lower serum cholesterol (Sanghavi and Ekale, 2021) [8]. Flowers of Safflower are used for dying and painting industry, it has also pharmaceutical use. The major districts cultivating Safflower crop include Latur, Nanded, Parbhani, Dharashiv and some parts of Ahmednagar and Solapur.

Materials and Methods

The study covered a period of 30 years 1994-95 to 2023-2024. The time series data on area, production and yield of Safflower in Maharashtra collected from department of agriculture and farmers welfare India and was divided into 2 sub periods (15 years each) and overall period 30 years. The sub-periods were framed as Period I: 1994-95 to 2008-09. Period II: 2009-10 to 2023-24. Overall Period: 1994-95 2023-24.

Growth Rate

Growth rates refer to the percentage change of a specific variable within a specific time period. Growth rates can be beneficial in assessing a variables performance and predicting future performance. The CAGR calculation assumes that growth is steady over a specified period of time. CAGR is a widely used metric due to its simplicity and flexibility.

The functional form is

- Yt = abt …(1)
- Where,
- Yt = area, production and productivity of safflower in the year t
- a = intercept

- b = regression coefficient
- t = time variable

The equation (1) was transformed into log-linear and written as

- Log Y = loga + t logb …(2)
- Equation (2) was estimated by using Ordinary Least Square (OLS) technique. The compound growth rate (r) was then estimated by using the equation (3)
- r = (antilog b - 1) 100 …(3)

Where;

- r = Estimated compound growth rate per annum in percentage.
- b = Antilog of regression coefficient value
- To measure the instability, Cuddy-Della Valle index (Cuddy and Valle, 1978) [9] was used. This index overcomes the problems associated with coefficient of variation when there is a time trend in the data series. The Instability Index is given by,
- Instability Index = CV*$\sqrt{1-R^2}$

Where, CV is the Coefficient of Variation and is equal to standard deviation/mean R^2 is the coefficient of determination from time trend regression.

Descriptive statistics

Before estimation, the data were analyzed using descriptive statistics to understand the Mean, Standard Deviation and Coefficient of Variation. These statistics provide a preliminary idea about of the stability and variability of the time series. A higher coefficient of variation indicates greater fluctuations over the study period, whereas a lower coefficient of variation implies stability in the variable.

Results and Discussion

Overall Period (1994-95 to 2023-24): A Story of Decline

Table 1: Growth & instability in area, production & productivity of safflower in Maharashtra

Overall 30 Years 1994-95 to 2023-2024					
Area	(Ha)	Production	(Tons)	Productivity	(kg/ha.)
Mean	200366.7	Mean	101386.6	Mean	535.1
SD	150573.3	SD	81430.39	SD	141.0496
CV	75.15%	CV	80.31%	CV	26.35%
CDVI	23.53%	CDVI	40.54%	CDVI	25.04%
CAGR	-10.43%***	CAGR	-9.24%***	CAGR	1.33%*
Period I- 1994-95 to 2008-09					
Area	(Ha)	Production	(Tons)	Productivity	(kg/ha.)
Mean	324613	Mean	161133	Mean	502.73
SD	104139	SD	71634.3	SD	136.40
CV	32.08%	CV	44.45%	CV	27.13%
CDVI	12.29%	CDVI	40.94%	CDVI	26.27%
CAGR	-6.10%***	CAGR	-3.87%	CAGR	2.37%
Period II- 2009-10 to 2023-24					
Area	(Ha)	Production	(Tons)	Productivity	(kg/ha.)
Mean	761200	Mean	41640	Mean	567.46
SD	55129.5	SD	30897.9	SD	142.687
CV	72.42%	CV	74.20%	CV	25.14%
CDVI	32.68%	CDVI	49.30%	CDVI	23.45%
CAGR	-14.11%***	CAGR	-11.92%***	CAGR	2.55%

*** Significant at 01 per cent ** Significant at 05 per cent * Significant at 01 per cent

Over the entire 30-year period, safflower cultivation in the Maharashtra region has shown a worrying downward trend. On average, total cultivated area under safflower was about 2 lakh hectares of land, producing approximately 1 lakh tonnes with a productivity of 535 kg per hectare. However, the area under safflower cultivation shrank drastically at a rate of 10.43% per year, and production also fell by 9.24% annually. The only positive sign was a small improvement in productivity, which grew by 1.33% per year, suggesting that farmers who continued growing safflower became slightly more efficient. The cultivation showed high instability, with the area and production varying significantly from year to year (CV of 75% and 80% respectively). The CDVI values of 23.53% for area and 40.54% for production indicate considerable year-to-year fluctuations, making safflower a risky crop choice for farmers during this period. The findings of (Kumari and Malik, 2024) [5] also show the similar decline trend of safflower cultivation in Maharashtra.

Period I (1994-95 to 2008-09): Moderate Decline Phase

During the first period of 15 years, safflower cultivation was relatively better established compared to later years. The average area under cultivation was around 3.25 lakh hectares, producing about 1.61 lakh tonnes with productivity of 503 kg per hectare. The decline in this period was more moderate, with area decreasing at 6.10% per year and production falling at 3.87% annually. Productivity showed positive growth of 2.37% per year, indicating improvements in farming techniques and crop management. The instability was relatively lower during this phase, with area showing 32% variation and production showing 44% variation. The CDVI of 12.29% for area suggests that fluctuations were more manageable, though production instability remained high at 40.94%, indicating that yields were still unpredictable despite the larger area under cultivation.

Period II (2009-10 to 2023-24): Sharp Decline and High Instability: The second period witnessed a dramatic

collapse in safflower cultivation. The average area plummeted to just 76,120 hectares (less than one-fourth of Period I), and production crashed to only 41,640 tonnes (about one-fourth of the previous period). Despite this severe reduction, productivity improved to 567 kg per hectare, the highest among all periods. However, this improvement couldn't compensate for the massive loss in cultivated area. The decline accelerated sharply, with area shrinking at 14.11% per year and production falling at 11.92% annually. The instability reached alarming levels, with CV values of 72% for area and 74% for production, meaning safflower cultivation became extremely unpredictable. The CDVI values of 32.68% for area and 49.30% for production confirm that farmers faced severe year-to-year variations, making safflower an increasingly unattractive and risky crop choice during this period.

Conclusion

The overall study on area production and productivity of safflower shown that, there has been continuous decrease in the area and production hence the necessary efforts are needed to extend the crop area, such as technological advancements, knowledge regarding safflower cultivation, innovativeness to bring the more area under cultivation and prevent the diversion to different *Rabi* crops.

References

1. Bhadre TV, Metkari PM, Bante PK, Pawar AA, Mahadik KA. Studies on growth rates of area, production and productivity of major crops in Nanded district of Maharashtra. Pharma Innovation J. 2023;12(12 Special Issue):840-844.
2. Bhat S, Kumar H, Devraj, Kumar R. Analysis of growth, instability and time series decomposition of price indices of pulses in India. J Food Legumes. 2020;33(2):101-105.
3. Dash A, Hansdah R. Analytical study of growth and instability of rabi oilseed production in Odisha. J Pharmacogn Phytochem. 2020;9(2):2145-2149.
4. Khorne GW, Kakde SJ, Munde TB. Growth performance of selected oilseed commodities in Maharashtra. Int J Curr Sci. 2019;7(4):1900-1902.
5. Kumari N, Malik D. An economic analysis of growth performance of safflower crop in India. Int J Agric Environ Biotechnol. 2024;17(Special Issue):371-377. doi:10.30954/0974-1712.03.2024.23.
6. More SS, Singh N, Bhatt BK. Performance of pulses in Gujarat: A district level assessment. Curr Agric Res J. 2018;6(1):45-53.
7. Mulik SS, More SS, Shelke RD. Performance of oilseed crops in Marathwada region of Maharashtra state. Int J Curr Microbiol Appl Sci. 2018;7(8):3663-3669. doi:10.20546/ijcmas.2018.708.371.
8. Sanghavi E, Ekale JV. Technological gap in adoption of safflower cultivation. Pharma Innovation J. 2021;10(11 Special Issue):1061-1063.
9. Cuddy JDA, Della Valle PA. Measuring the instability of time series data. Oxford Bull Econ Stat. 1978;40(1):79-85.