CROP EXEMPLAR OF ERANDOL TALUKA JALGAON DISTRICT MAHARASHTRA

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Abstract : The current research considers the spatio-temporal change in the cropping patterns of the Erandol taluka, Jalgaon district, Maharashtra, between the years 2018-19 to 2025-26 based on the secondary agricultural statistics and graphical analysis. To evaluate the structural changes and seasonality, data on crop-wise sown area was classified into food grains, oilseeds and cash crops. The findings indicate very dynamic and season-based cropping, with strong inter- annual shifts between food grain and cash crop dominance. The structurally important crops are the cash crops especially cotton and the foodgrains increase or decrease as a result of variability of rainfall, availability of irrigation and market demand. Oilseeds take perpetually a secondary position meaning that it is not diversified. The paper outlines the susceptibility of the current cropping pattern to both climatic and economic stresses and provides the rationale behind planning of crops and the role of better irrigation systems and diversification efforts. The results are resourceful in terms of taluka-level agricultural planning and policy interventions to increase semi-arid region sustainability and resilience.

Keywords:

Cropping pattern, Spatio-temporal analysis, Agricultural land use, Monsoon variability, Irrigation dynamics.

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Introduction:

Agriculture comprises an important and basic economy of the Indian economy, which provides the backbone of food security, rural livelihoods, and industrialization. It makes use of a large percentage of the population and generates a lot of national income besides being sources of raw materials to the agro based industries like textiles, sugar and food processing. The presence of varied agro- climatic regions across India allows the production of a great variety of crops on an annual-round basis, with the major annual-round cropping seasons being Kharif, Rabi and Zaid. Even though agriculture in India is highly reliant on the southwest monsoon the rainfall susceptibility in most areas has been alleviated with the increase in irrigation infrastructure, such as canals, tube wells and modern micro-irrigation systems. Small and marginal farmers form the largest part of the sector and they apply both the traditional production methods and the modern inputs which includes high-yielding varieties, fertilisers, mechanisation and improved farming methods. However, structural and environmental issues, such as divided landholding, decreasing soil fertility, water scarcity, climate-change effects, price fluctuations, and low agricultural incomes still affect Indian agriculture. All these concerns are why sustainable practices, technological innovation, and favourable policy interventions are needed. It is a measure of the relative distribution of the area to various crops and distribution of these crops on the basis of the crop cycles like Kharif, Rabi and Zaid. Climatic conditions, rainfall, soil type, availability of irrigation, available agricultural technology and market demand are those factors that determine the cropping pattern of a region. To achieve increased productivity, reduce risk and to maintain soil fertility, farmers are resorting to mixing, multiple and crop rotation. An organized arrangement of the crop pattern ensures efficient use of land and water, food security and increases the income of the farmers.

Study Area:

Erandol is a local government and a sub-district in Maharashtra, Jalgaon district, India. The Coordinate extend of taluka is approximately 20^0 55 N and 21^0 05 N and 75^0 15 E and 75^0 40 E. It is located in the north-western portion of the state, and is included in the Khandesh region. The town is located on the banks of the Anjani River an affluent of the Tapi, about forty kilometres to the southwest of the administrative nucleus of the district, Jalgaon city. The agricultural activities at Erandol taluka resemble the traditional mode of cropping that is found in the north Maharashtra region due to the presence of black soil, semi-arid climate and accessibility of irrigation facilities within the area. The majority of crop portfolios during the monsoon (Kharif) season include sorghum (jowar), pearl millet (bajra), cotton, a combination of pulses, and oilseeds, since these species are strong in rain-fed agriculture, and they do not demand too much water. The use of cotton, especially, makes it one of the most important cash crops, which can be explained by the fertility of black soil and the market demand. During the post-monsoon (Rabi) season, wheat, gram (chickpea) and various pulses are grown and they cash in on the available soil moisture. In addition, horticultural and vegetable crops such as onion, chilli, banana and other vegetables form a significant percentage of crop combination in regions that have access to irrigation sources and mostly where wells are located or close to the canal system. The agricultural schema therefore incorporates cereals, legumes, cash crops and vegetables hence absorbing the conventional agronomic habits; it is at the same time responsive to the needs of the market.
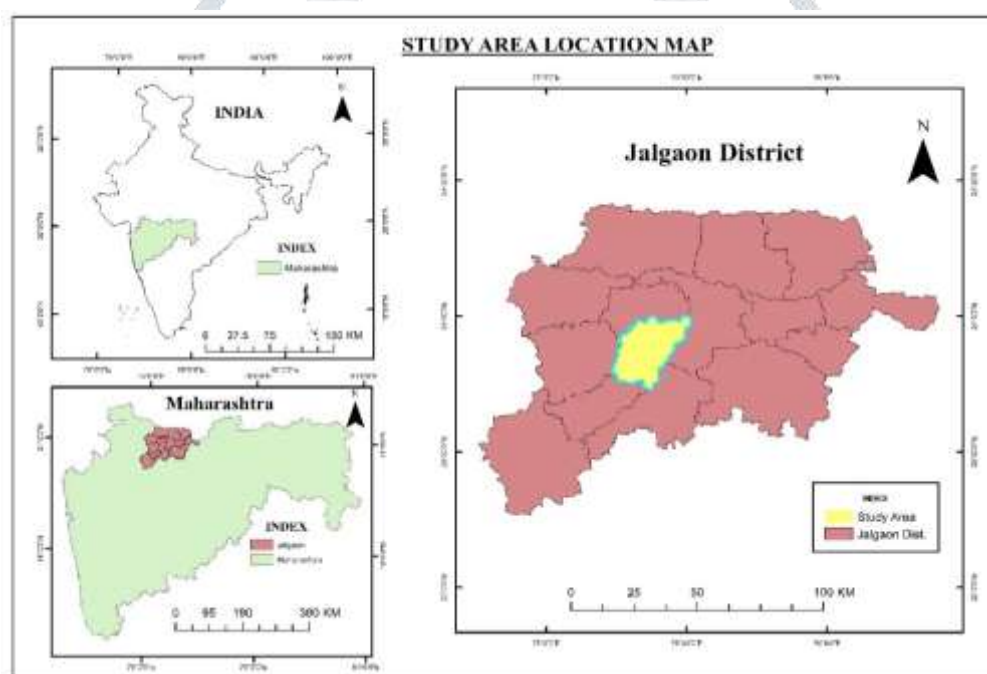

Fig. no. 1: Location map of study area

Methodology:

The present study analyses the cropping pattern of Erandol taluka for the agricultural year 2018–19 to 2025-26 using secondary agricultural statistical data. Crop-wise sowing area data were collected from Taluka Agricultural Officer, Erandol and district statistical handbooks. The crop sowing data separated in 3 seasons Kharif, Rabbi and Zaid for analysis. Then crops divided into three types Foodgrains, Oilseeds, Cash Crops. In foodgrains crops included Jowar, Bajra, Mazie, Wheat, Tur, Moong, Urad, Gram, other cereals and pulses. In Oilseeds crops included Sesame, Soyabean, Groundnut, Sunflower and other oilseeds. In Cash crops included Sugarcane and Cotton. The total sown area under each category was calculated and expressed as a percentage of the gross cropped area to understand their relative dominance. These proportional values were visually represented using a pie diagram in Microsoft excel, which facilitates easy comparison of crop categories and highlights the prevailing cropping structure.

| Secondary Data Collected from Taluka agricultural office | → | Categoried as per season | → | Then Divided in 3 Domains : Foodgrains Oilseeds Cash Crops | → | Calculated sown area as per 3 Domain | → | Then Prepared Pie- Diagram from analysis |

Fig. no. 2: Methodology flowchart

Interpretation:

Conspicuous changes in the structure of agricultural production of Erandol taluka over years 2018-19 to 2025-26, particularly the proportionate share of foodgrains, oilseeds, and cash crops are illustrated by year-by-year pie charts in based on crop statistics on Excel.

Table no.1: Cropping Pattern data 2018-19

CROPS	NET SOWN AREA			ACTUAL SOWN AREA			Total Sown area in Hectare
	KHARIF	RABBI	ZAID	KHARIF	RABBI	ZAID	
JOWAR	1447.88	2132.47	0	941	1028	0	1969
BAJRA	820.05	0	0	552	0	0	552
MAIZE	6778.78	6048.73	0	4026	1100	0	5126
WHEAT	0	3332.35	0	0	1256	0	1256
OTHER CEREALS							0
TUR	605.94	0	0	487	0	0	487
MOONG	2853.17	0	0	1664	0	0	1664
URAD	1502.82	0	0	845	0	0	845
GRAM	0	3897.73	0	0	1219	0	1219
OTHER PULSES	30.5	0	0	0	0	0	0
TOTAL FOODGRAINS	14039.14	15411.28	0	8515	4603	0	13118
SEASEME	28.68	0	0	0	0	0	0
SOYABEAN	1983.18	0	0	1324	0	0	1324
GROUNDNUT		0	0	0	0	0	0
SUNFLOWER	0	0	0	0	0	0	0
OTHER OIL SEEDS							0
TOTAL OIL SEEDS	2011.86	0	0	2017	0	0	2017
COTTON	21410.19	0	0	23492	0	0	23492
SUGARCANE	726	726	0	0	0	0	0
TOTAL CASH CROP	22136.19	726	0	23492	0	0	23492

Table no.2: Cropping Pattern data 2019-20

| CROPS	NET SOWN AREA			ACTUAL SOWN AREA			Total Sown area in Hectare
	KHARIF	RABBI	ZAID	KHARIF	RABBI	ZAID	
JOWAR	1447.88	2132.47	0	985	4244	0	5229
BAJRA	820.05	0	0	618	0	0	618
MAIZE	6778.78	6048.73	0	4966	8470	1600	15036
WHEAT	0	3332.35	0	0	9795	0	9795
OTHER CEREALS	0	0	0	0	0	0	0
TUR	605.34	0	0	425	0	0	425
MOONG	2853.17	0	0	2293	0	0	2293
URAD	1502.82	0	0	961	0	0	961
GRAM	0	3897.73	0	0	4887	0	4887
OTHER PULSES	30.5	0	0	0	0	0	0
TOTAL FOODGRAINS	14039.14	15411.28	0	10248	27396	1600	39244
SEASEME	28.68	0	0	0	0	0	0
SOYABEAN	1983.18	0	0	2017	0	0	2017
GROUNDNUT	0	0	0	0	0	383	383
SUNFLOWER	0	0	0	0	0	16	16
OTHER OIL SEEDS	0	0	0			0	0
TOTAL OIL SEEDS	2011.86	0	0	2017	0	1999	4016
COTTON	21410.19	0	0	22220	0	0	22220
SUGARCANE	726	726	0	0	0	0	0
TOTAL CASH CROP	22136.19	726	0	22220	0	0	22220
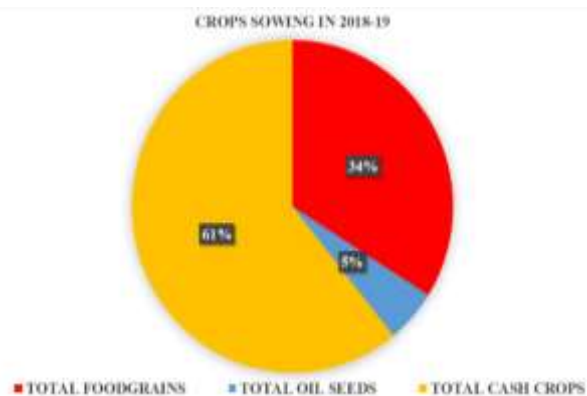
Fig. no. 3: Pie-chart 2018-19
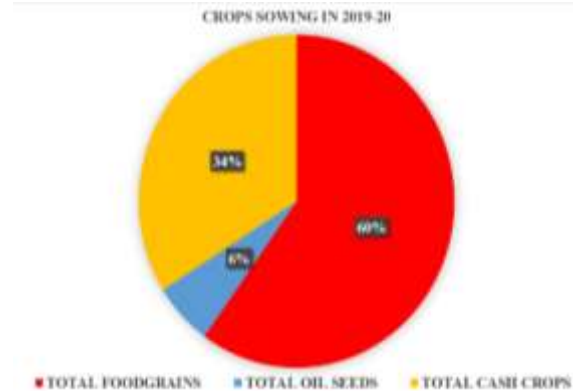
Fig. no. 4: Pie-chart 2019-20

As per *table no.1* in the 2018-19 season, the agricultural environment was dominated by cash crops, which constituted 61 per cent of total sown area, surpassing the foodgrains (34%) and oilseeds

 (5%). This finding is consistent with the Excel data set which reveals that there was a large area of cotton which way exceeded the combined total of area devoted to food grains.

As per above *table no.2* severe change in structure can be seen in 2019-20, where the share of foodgrains is increasing rapidly by a factor of about 60 percent accompanied by a fall in cash crops to 34 percent and oil seeds is kept on the margins at 6 percent. The trend is indicative of a short-term shift to foodgrain-based production, which is perhaps due to the fluctuation in precipitation, market price changes, or an increase in risk aversion by the agrarian stakeholders.

Table no.3: Cropping Pattern data 2020-21

CROPS	2020-2021						Total Sown area in Hectare
	NET SOWN AREA			ACTUAL SOWN AREA			
	KHARIF	RABBI	ZAID	KHARIF	RABBI	ZAID	
JOWAR	1447.88	2132.47	0	1240	2914	0	4154
BAJRA	820.05	0	0	409	0	0	409
MAIZE	6778.78	6048.73	0	4802	5758	1369	11929
WHEAT	0	3332.35	0	0	10381	0	10381
OTHER CEREALS	0	0	0	6	0	1053	1059
TUR	605.94	0	0	207	0	0	207
MOONG	2853.17	0	0	1669	0	0	1669
URAD	1502.82	0	0	726	0	0	726
GRAM	0	3897.73	0	0	5353	0	5353
OTHER PULSES	30.5	0	0	0	0	98	98
TOTAL FOODGRAINS	14039.14	15411.28	0	9059	24406	2520	35985
SEASEME	28.68	0	0	0	0	392	392
SOYABEAN	1983.18	0	0	2997	0	0	2997
GROUNDNUT	0	0	0	4	0	741	745
SUNFLOWER	0	0	0	0	197.5	549	746.5
OTHER OIL SEEDS	0	0	0	90	323		413
TOTAL OIL SEEDS	2011.86	0	0	3091	520.5	1682	5293.5
COTTON	21410.19	0	0	26180	0	0	26180
SUGARCANE	726	726	0	1	0	0	1
TOTAL CASH CROP	22136.19	726	0	26181	0	0	26181

Table no.4: Cropping Pattern data 2021-22

| CROPS	2021-22						Total Sown area in Hectare
	NET SOWN AREA			ACTUAL SOWN AREA			
	KHARIF	RABBI	ZAID	KHARIF	RABBI	ZAID	
JOWAR	1447.88	2132.47	0	820	3526	0	4346
BAJRA	820.05	0	0	338	0	636	974
MAIZE	6778.78	6048.73	0	4230	9700	824	14754
WHEAT	0	3332.35	0	0	6263	0	6263
OTHER CEREALS	0	0	0	0	0	0	0
TUR	605.94	0	0	232	0	0	232
MOONG	2853.17	0	0	2990	0	227	3217
URAD	1502.82	0	0	653	0	0	653
GRAM	0	3897.73	0	0	4922	0	4922
OTHER PULSES	30.5	0	0	0	0	0	0
TOTAL FOODGRAINS	14039.14	15411.28	0	9263	24411	1687	35361
SEASEME	28.68	0	0	2	0	229	231
SOYABEAN	1983.18	0	0	2602	0	202	2804
GROUNDNUT	0	0	0	49	0	285	334
SUNFLOWER	0	0	0	0	1678	508	2186
OTHER OIL SEEDS	0	0	0	0	0	0	0
TOTAL OIL SEEDS	201.86	0	0	2653	1678	1224	5555
COTTON	21410.19	0	0	26492	0	0	26492
SUGARCANE	726	726	0	7	0	0	7
TOTAL CASH CROP	22136.19	726	0	26499	0	0	26499
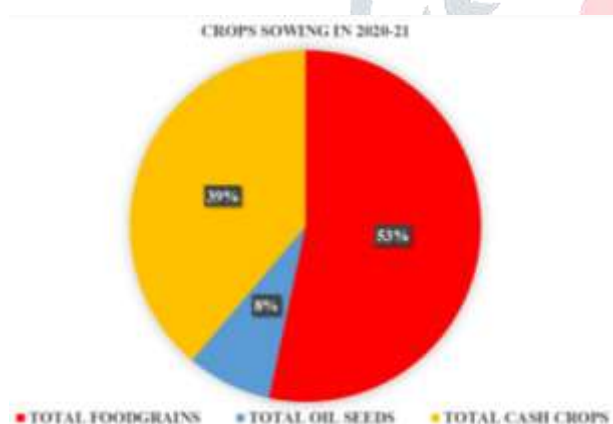
Fig. no. 5: Pie-chart 2020-21
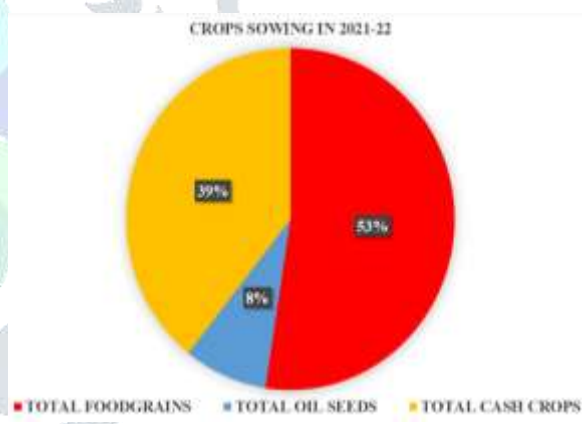
Fig. no. 6: Pie-chart 2021-22

The cropping structure in the successive crop years of 2020- 21 and 2021- 22 can be discerned through *table no.3 and table no.4* is relatively balanced, with food grains continuing to play a dominant role of approximately 53%, cash crops playing a smaller role at 39%, and oilseeds playing a minor role at 8%. This period denotes moderate diversification that is supported by the rabi growth of cereals and pulses which have been recorded in the excel entries.

Table no.5: Cropping Pattern data 2022-23

CROPS	2022-23						Total Sown area in Hectare
	NET SOWN AREA			ACTUAL SOWN AREA			
	KHARIF	RABBI	ZAID	KHARIF	RABBI	ZAID	
JOWAR	1136	2798.02	0	439	2052	0	2491
BAJRA	681	0	579	338	0	464	802
MAIZE	7273	7684.89	2568.67	3677	10706	809	15192
WHEAT	0	6255.27	0	0	6169	0	6169
OTHER CEREALS	6	0	3285.5	0	0	0	0
TUR	977	0	0	138	0	0	138
MOONG	2592	0	98	1504	0	73	1577
URAD	1620	0	0	288	0	0	288
GRAM	0	4446.48	0	0	4169	0	4169
OTHER PULSES	35	0	1459	0	0	0	0

TOTAL FOODGRAINS	14020	21184.86	7990.17	6181	23096	1346	30623
SEASEME	23	0	660	5	0	69.8	74.8
SOYABEAN	2277	0	0	2458	0	0	2458
GROUNDNUT	69	0	1050.5	2	0	172	174
SUNFLOWER	0	0	549	0	1459	351	1810
OTHER OIL SEEDS	90	323	0	0	0	0	0
TOTAL OIL SEEDS	2459	323	2259.5	2465	1459	592.8	4516.8
COTTON	21622	0	0	28901	0	0	28901
SUGARCANE	1738.33	1738.33	1738.33	14	0	0	14
TOTAL CASH CROP	23350.33	1738.33	1738.33	28915	0	0	28915

Table no.6: Cropping Pattern data 2023-24

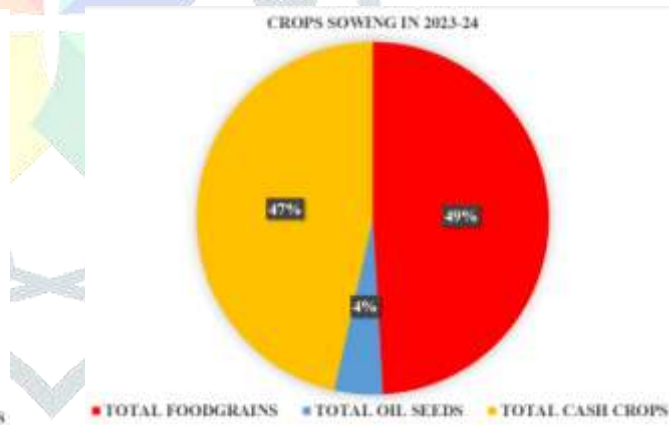| CROPS	2023-24						Total Sown area in Hectare
	NET SOWN AREA			ACTUAL SOWN AREA			
	KHARIF	RABBI	ZAID	KHARIF	RABBI	ZAID	
JOWAR	1136	2798.02	0	291	5324	0	5615
BAJRA	681	0	579	188	0	1113	1301
MAIZE	7273	7684.89	2568.67	4896	7070	1730	13696
WHEAT	0	6255.27	0	0	4571	0	4571
OTHER CEREALS	0	0	3285.5	0	0	0	0
TUR	677	0	0	79	0	0	79
MOONG	2592	0	98	1407	0	10	1417
URAD	1620	0	0	242	0	0	242
GRAM	0	4446.68	0	0	3617	0	3617
OTHER PULSES	35	0	1459	0	0	2	2
TOTAL FOODGRAINS	14020	21184.86	7990.17	7103	20582	2855	30540
SEASEME	23	0	660	3	0	87	90
SOYABEAN	2277	0	0	2141	0	0	2141
GROUNDNUT	69	0	1050.5	0	0	328	328
SUNFLOWER	0	0	549	0	128	51	179
OTHER OIL SEEDS	90	323	0	0	0	0	0
TOTAL OIL SEEDS	2459	323	2259.5	2144	128	499	2771
COTTON	23222	0	0	28898	0	0	28898
SUGARCANE	1738.33	1738.33	1738.33	5	5	5	15
TOTAL CASH CROP	24960.33	1738.33	1738.33	28903	5	5	28913
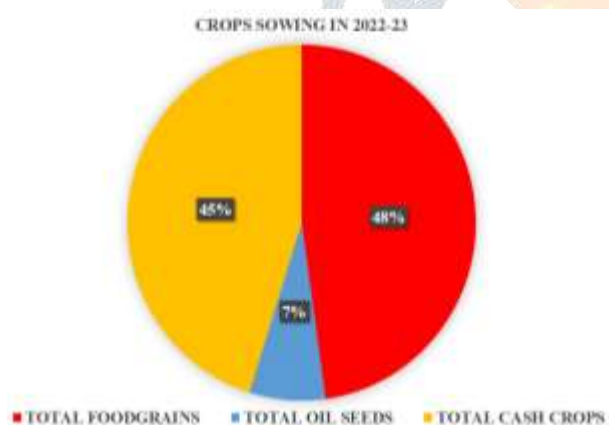
Fig. no. 7: Pie-chart 2022-23   *Fig. no. 8: Pie-chart 2023-24*

As per ***table no.5*** 2022-23, the cash crop share turns back to 45% and becomes nearly equal to that of food grains at 48% suggesting a revival of market-oriented crop focus. This trend continues to 2023-24 which can be observed through ***table no.6***, with the cash crops increasing further to 47%, foodgrains remaining more or less at 49% and oilseeds going down to 4%.

From the above ***table no.6,*** the cash crops dominate once again in the 2024-25 cycle (50%), ahead of foodgrains (45%) and this indicates a re-occurrence of commercial agriculture. However, the next 2025-26 year indicates a sharp change of foodgrains growth to 62% with a reduction of cash crop to 34 to oilseeds remaining low at 4% can be seen in ***table no.7***.

Table no.7: Cropping Pattern data 2024-25

CROPS	NET SOWN AREA			ACTUAL SOWN AREA			Total Sown area in Hectare
	KHARIF	RABBI	ZAID	KHARIF	RABBI	ZAID	
JOWAR	1136		0	211	2026	0	2237
BAJRA	681	579		209	0	0	209
MAIZE	7273		2568.67	6530	1024	0	7554
WHEAT	0	0	0	0	6789	0	6789
OTHER CEREALS	6	3285.5		0	0	0	0
TUR	677		0	384	0	0	384
MOONG	2592		98	1303	0	0	1303
URAD	1620		0	313	0	0	313
GRAM	0		0	0	4345	0	4345
OTHER PULSES	35		1459	0	0	0	0
TOTAL FOODGRAINS	14020		7990.17	8950	14184	0	23134
SEASEME	23		660	0	0	0	0
SOYABEAN	2277		0	2907	0		2907
GROUNDNUT	69		1050.5	0	0	0	0
SUNFLOWER	0		549	0	1	0	1
OTHER OIL SEEDS	90		0	0	0	0	0
TOTAL OIL SEEDS	2459		2259.5	2907	1	0	2908
COTTON	23222		0	25718	0	0	25718
SUGARCANE	1738.33		1738.33	7	0	7	14
TOTAL CASH CROP	24960.33		1738.33	25725	0	7	25732

Table no.8: Cropping Pattern data 2025-26

| CROPS	NET SOWN AREA			ACTUAL SOWN AREA			Total Sown area in Hectare
	KHARIF	RABBI	ZAID	KHARIF	RABBI	ZAID	
JOWAR	600	3168.4		254	1508		1762
BAJRA	256	0		93	0		93
MAIZE	4827	8701.6		11289	11699		22988
WHEAT	0	0		0	0		0
OTHER CEREALS	1	0		0	0		0
TUR	208	0		391	0		391
MOONG	1775	0		1261	0		1261
URAD	444	0		352	0		352
GRAM	0	4481.2		0	3734		3734
OTHER PULSES	0	7.4		0	0		0
TOTAL FOODGRAINS	8111	23193.2		13640	25182		38822
SEASEME	2	0		0	0		0
SOYABEAN	2621	0		2726	0		2726
GROUNDNUT	11	0		0	0		0
SUNFLOWER	0	692.8		0	0		0
OTHER OIL SEEDS	18	64.6		0	0		0
TOTAL OIL SEEDS	2652	757.4		2726	0		2726
COTTON	27238	0		21643	0		21643
SUGARCANE	1.6	1738.33		4	4		8
TOTAL CASH CROPS	27239.6	1738.33		21647	4		21651
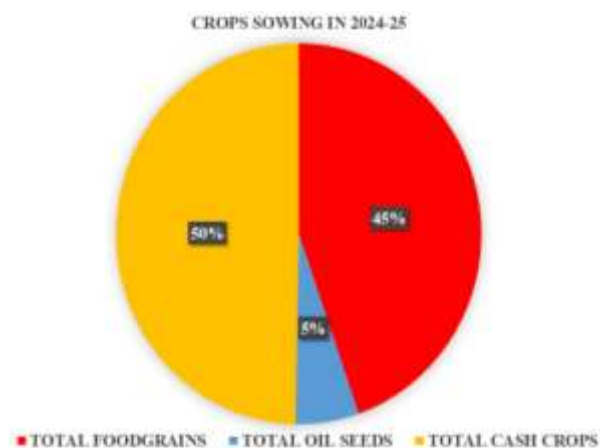
Fig. no. 9: Pie-chart 20224-25
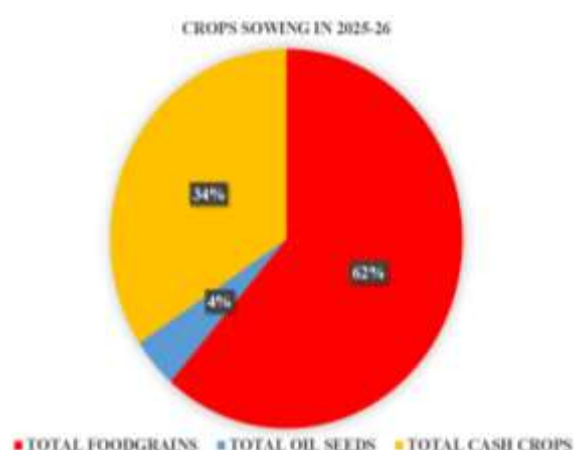
Fig. no. 10: Pie-chart 2025-26

Taken together, the visual and spreadsheet data synthesis proves that, although cotton-oriented cash cropping still does not lose its structural importance, the agricultural structure of the Erandol taluka is highly dynamic, which is manifested in significant yearly fluctuations in the prevalence of foodgrain and cash crop. There is an unstable position of oilseeds (4-8%), which highlights a

reserved diversification despite the policy requirements. Such oscillations underline the fact that the system is sensitive to monsoon variability, access to irrigation, and market dynamics and therefore highlights the need to ensure balanced and resilient crop planning.
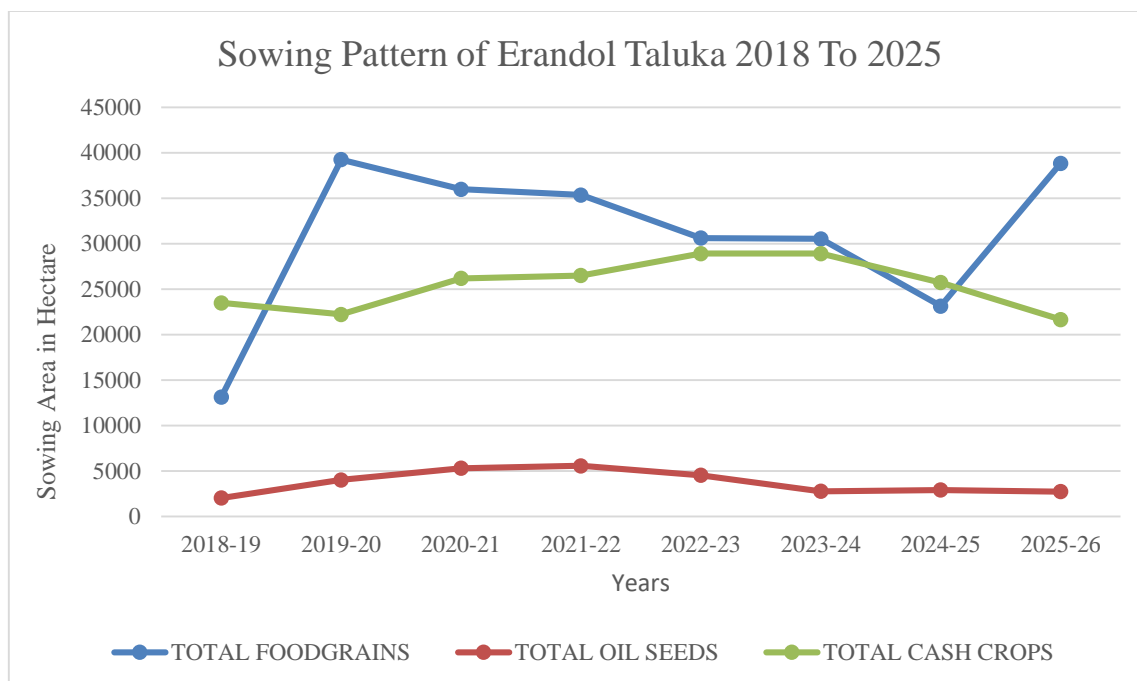

Fig. no. 11: Line Graph 2018-25

The *Fig. no. 11: Line Graph* shows that the total area of foodgrains sown has a considerable range with a sharp increase in 2018-19 to approximately 39000 ha in 2019-20, after which there is a slow decrease to 2024-25 and a sharp increase again in 2025-26. These oscillations indicate high sensitivity of foodgrain cultivation to variations of monsoon, availability of rabi irrigation and policy or price signals. Cash crops on the other hand represent comparatively moderate but steady variation, staying within the band of 22,000-29,000 ha through most years, which implies structural stability of commercial growing, specifically cotton. The oilseeds are the most stable and at the lower end of the study period with a range of about 2000 to 5500 ha indicating low preference by the farmers in spite of their agronomic value.

Results and Discussion:

The findings indicate the existence of a very dynamic and climate responsive cropping regime in Erandol taluka between the year 2018-19 and 2025-26. The considerable inter-annual changes in the foodgrain pre-eminence to the cash crop dominance and the reverse are evidence that the farmers are constantly changing their crop preferences with regards to monsoon variability and irrigation availability, market prices and perception of risk. Despite its structural significance, cotton-based cash cropping is occasionally minimized in years when the foodgrains grow implying the adaptive risk management in the years when there is uncertainty of rainfall. The reason why kharif prevails and zaid is hardly cultivated is due to the reliance on the monsoon-based rain and low use of the potential of summer irrigation. Although there has been moderate growth in rabi cultivation in some years, irrigation limits and reliance on ground water limits multi-season cultivation. The low proportion of oilseeds (4-8) is always a sign of a low diversification which could be attributed to the uncertainty concerning the yields, the lack of access to the market and relatively low profitability. The observed changes also suggest that the pattern that is being observed in the cropping is not moving towards a stable diversified system, but instead is swinging between subsistence-oriented and commercial orientations. This instability enhances susceptibility to climatic extremes and price fluctuations, which may have an impact on sustainability of income of farmers and regional food security.

Conclusion:

The current research paper establishes that the Erandol taluka in terms of its cropping pattern in the years 2018-19 to 2025-26, is very dynamic, monsoon-based and dominated by cash crops more especially cotton. Even though foodgrains are periodically growing and even exceeding cash crop in some years, the changes are mostly short-term and influenced by the fluctuation of rainfall, the presence of

irrigation, and the market. Oilseeds always hold a secondary position, which means that the crops are not diversified despite the agronomical and economic significance of the crops. The overall examination of statistical information and graphical data provides an understanding that the system of crop is not stable in its structure over time and still is susceptible to climatic unpredictability and price changes. To enhance sustainability, it is necessary to strengthen the irrigation infrastructure, facilitate diversified and climate-adaptive agricultural decisions, and incorporate geospatial instruments to monitor agriculture

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