



International Journal of Research in Agronomy

E-ISSN: 2618-0618
P-ISSN: 2618-060X
© Agronomy
NAAS Rating (2026): 5.20
www.agronomyjournals.com
2026; SP-9(1): 244-248
Received: 21-11-2025
Accepted: 27-12-2025

Gulgul Singh
Krishi Vigyan Kendra, S.A.S. Nagar,
Guru Angad Dev Veterinary and
Animal Sciences University,
Ludhiana, Punjab, India

Balbair Singh Khadda
Krishi Vigyan Kendra, S.A.S. Nagar,
Guru Angad Dev Veterinary and
Animal Sciences University,
Ludhiana, Punjab, India

Sukhveer Kaur
Krishi Vigyan Kendra, S.A.S. Nagar,
Guru Angad Dev Veterinary and
Animal Sciences University,
Ludhiana, Punjab, India

Harmeet Kaur
Krishi Vigyan Kendra, S.A.S. Nagar,
Guru Angad Dev Veterinary and
Animal Sciences University,
Ludhiana, Punjab, India

Navjot Singh Brar
Krishi Vigyan Kendra, S.A.S. Nagar,
Guru Angad Dev Veterinary and
Animal Sciences University,
Ludhiana, Punjab, India

Parul Gupta
Krishi Vigyan Kendra, S.A.S. Nagar,
Guru Angad Dev Veterinary and
Animal Sciences University,
Ludhiana, Punjab, India

Munish Sharma
Krishi Vigyan Kendra, S.A.S. Nagar,
Guru Angad Dev Veterinary and
Animal Sciences University,
Ludhiana, Punjab, India

Komal
Krishi Vigyan Kendra, S.A.S. Nagar,
Guru Angad Dev Veterinary and
Animal Sciences University,
Ludhiana, Punjab, India

Corresponding Author:

Harmeet Kaur
Krishi Vigyan Kendra, S.A.S. Nagar,
Guru Angad Dev Veterinary and
Animal Sciences University,
Ludhiana, Punjab, India

Changing dynamics in crop area distribution in S.A.S. Nagar over a decade

Gulgul Singh, Balbir Singh Khadda, Sukhveer Kaur, Harmeet Kaur, Navjot Singh Brar, Parul Gupta, Munish Sharma and Komal

DOI: <https://www.doi.org/10.33545/2618060X.2026.v9.i1Sd.4693>

Abstract

India plays a significant role in the global agricultural sector. About 55% of the population depends on agriculture as their primary source of income, making it one of the world's leading agricultural nations. The present study was designed to examine the trends of area under various *rabi* and *kharif* crops from 2013-14 to 2023-24 in S.A.S. Nagar district of Punjab. The collected data was analysed and their study revealed that wheat and paddy crops have highest area under cultivation among the other crops grown during *rabi* and *kharif* seasons respectively. The area under paddy, wheat, *rabi* oilseeds and sugarcane crop has been increasing consistently however the maize crop cultivation area shows the declining trend of 25% over the observed period. The highest expansion in area is observed, nearly two-fold in sugarcane and three-fold in *rabi* oilseeds over the last 5-6 years, with only negligible changes during the initial years.

Keywords: Area, maize, paddy, sugarcane, trend, wheat

Introduction

India is one of the world's leading countries in the agriculture sector and about 55% of Indian population rely on agriculture as a primary source of their livelihood (Agriculture and Allied Industries Industry Report, 2025). In India, Punjab is a major agricultural state due to its major share in supply of food grains to the central pool of India. Throughout the previous two decades, Punjab is referred as "Granary of India" and also known as "Food basket of country" as its contribution is 40% in rice and 50-70% in wheat (Kaur *et al* 2023) [3]. In the state, total 85% of geographical area comes under cultivation and its cropping intensity has reached up to 185% (Singh *et al* 2013) [14].

Mohali district is situated in southeast region of Punjab and also known as Sahibzada Ajit Singh Nagar or Ajitgarh. Punjab has 6 distinct agro-climatic zones-sub-mountain undulating region, undulating plain region, central plain region, western plain region and flood plain region. S.A.S. Nagar is located in the undulating plain zone, which has cold, humid to sub-humid and semi-arid to humid temperatures (Chaba 2021) [1]. According to the 2011 census, approximately 45% of people reside in rural areas, which are either directly or indirectly dependent on agriculture for its livelihood. There is a total land area of 121000 hectares (ha) in district, out of which 86000 ha is net sown area (NSA) and there is 125,000 ha of gross cropped area (GCA) with 125,000 ha of gross irrigated land. Consequently, the cropping intensity (CI) found of district S.A.S. Nagar is 135%. (Potential Linked Credit Plan 2025-26).

After an era of green revolution, a major shift in the crop pattern of Punjab is seen to wheat-paddy cycle year around. This shift is purposefully due to advancement in technology and modernisation in farming practice such as high yielding variety seeds, fertilizers, pesticides, etc. making it favourable and productive. Furthermore, the green revolution also led to abundant food availability, decreased food prices, livelihood enhancement, poverty reduction and higher yields (McCullough *et al* 2012) [8]. But this switch from traditional to modern also brought forth problems like depletion of the water table, soil degradation, stagnation in agriculture growth and ecological imbalance (Sidhu *et al* 2010) [13]. These limitations and lack of knowledge resulted in

reduced land use for other crops like cotton, oilseeds, pulses, fruits and vegetables. The agricultural sector's growth rate observed to be stagnant since the 1990s (Kumar and Singh 2019) [6]. This stagnation is an alarming concern for Punjab being the major shareholder for feeding a substantial amount of nation's population. Likewise, this trend can hamper in sustainable use of agricultural resources leading to immense scarcity in coming future.

The present study is designed to analyse the trends in area under different crops in S.A.S. Nagar district, in order to compare the changes in area and recognise the crops which have had major gain or losses during the given period of study.

Methodology

A time series data from 2013-14 to 2023-24 (11 years) depicting trends in the area under different *rabi* and *kharif* crops in S.A.S. Nagar district of Punjab, were collected. This present analytical study is mainly compiled from the secondary data available from various published sources like journals, magazines and research articles and published records of agriculture census of Punjab. Data thus collected was examined and analysed with the help of various statistical tools and presented in the form of percentages, graphical representation with bar graphs and tabular form. The analysis is presented in the coherent frame of the study. The comparison had been done throughout the time frame to examine the trends in area under different crops in S.A.S. Nagar. The trend analysis was made to understand the progress of area under different crops viz. paddy, maize, wheat, *rabi* oilseeds and

sugarcane over a decade, starting from 2013-14 to 2023-24.

Results and Discussion

The present study analyzed the trends in area under different *kharif* and *rabi* crops in S.A.S. Nagar from 2013-14 to 2023-24. It is important to understand the trends in area under different crops of a region to ensure food security, for effective and strategic resource management and for monitoring cropping patterns and crop diversification of a region. This information is essential for the farmers, researchers and policy makers to make thoughtful decisions regarding crop planning and agricultural sustainability. So, this study is not only helpful in making agronomical decisions but it also reflects its influence on cropping pattern and policy making of a region. The following detailed discussion provides a closer look at the area trends under cultivation of major *kharif* and *rabi* crops in S.A.S. Nagar district.

1. Trends of major *kharif* crops in S.A.S. Nagar

Paddy is the major *kharif* crop of Punjab. Since the green revolution area, production and productivity of paddy increased significantly. A key factor behind this exponential growth has been the adoption of improved and high yielding varieties. Additionally, advancements in crop production and protection methods, along with the mechanization of farming activities, have also played a significant role. From the last four decades, Punjab has been contributing about 25% of paddy to the central pool of India (Kaur *et al* 2021) [4].

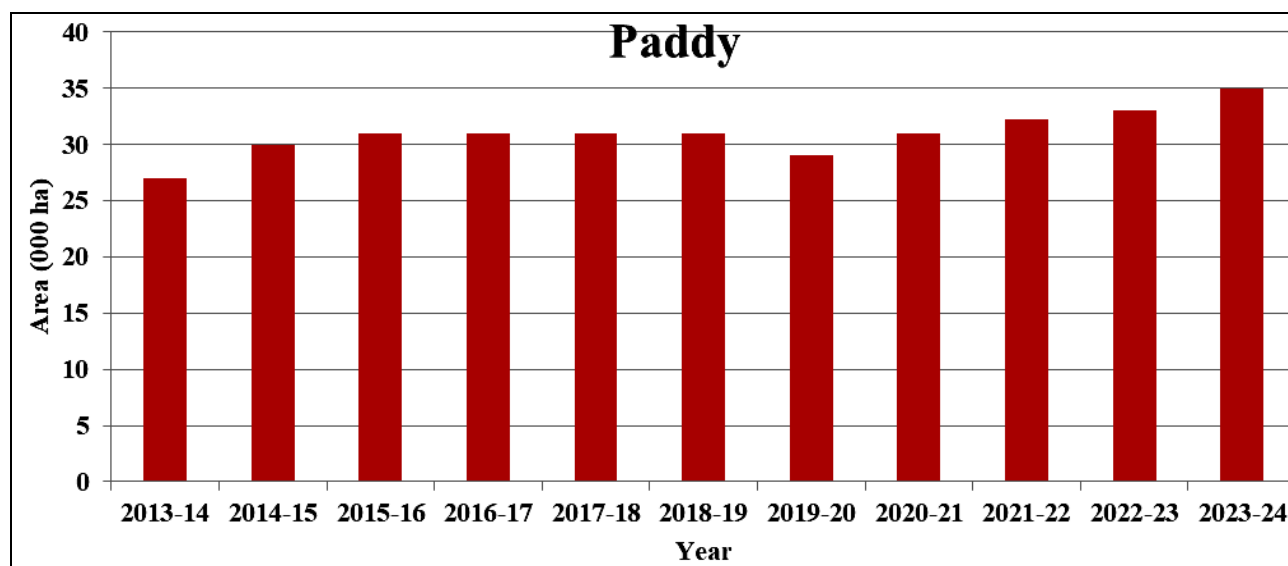


Fig 1: Area under paddy cultivation in district S.A.S. Nagar

In the district S.A.S. Nagar area (in 000 ha) dedicated to trend in paddy cultivation over the years, is displayed in fig. 1. The data reveals a general rising trend throughout the time frame. The total area under paddy in 2013-14 was slightly above 27,000 ha. Over the following few years, it grew steadily peaking around 2015-16 and 2016-17 at approximately 31,000 ha. A slight dip is observed in 2019-20, where the area decreased below 30,000 ha. However, after that, the trend started to rise once again, with significant growth in the last few years, reaching its largest recorded extent of almost 35,000 ha in 2023-24. Overall, there was 29.63% increase in area under paddy cultivation during the examined period in the district. With the slight variations, this trend indicated that the paddy has become highly preferred crop

in S.A.S. Nagar.

Around the world, maize is known as the “Queen of cereals” due to its highest genetic yield potential among all the cereals (Selvi *et al* 2015) [12]. Among the most extensively grown crops worldwide, maize acts as a food source in most of the developing countries. After wheat and rice, it is the third most important crop of India. It is utilized for human consumption, animal feed, production of corn starch and corn oil, as baby corn and in food processing industry. India ranks fifth in maize production in the world with 4.87% of global area and it contributes 2.5% in global maize production (Unjia *et al* 2021) [17].

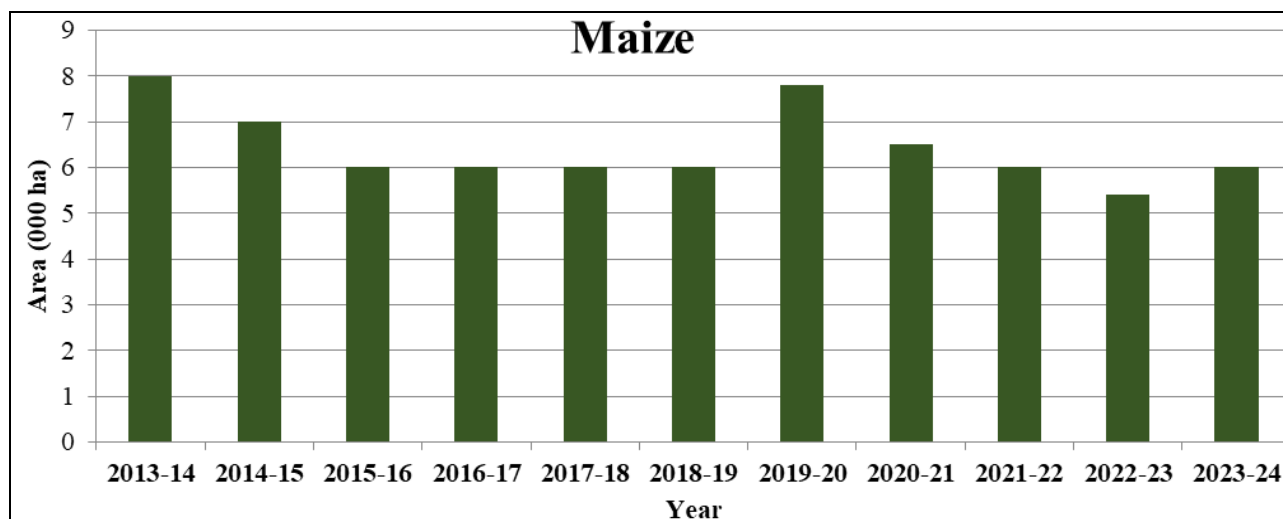


Fig 2: Area under maize cultivation in district S.A.S. Nagar

According to the study in district S.A.S. Nagar, the largest area planted under maize cultivation was around 8000 ha in 2013-14. This was followed by a notable decline in the subsequent years, with the area shrinking to about 6000 ha between 2015-16 and 2018-19. The area increased significantly about 30% once again in 2019-20, approaching 7800 ha, but the following years saw a drop. With a low point in 2022-23, the area continued to vary slightly but stayed below 7000 ha. In 2023-24, there was an increase of 9.09% compared to the previous year (Fig. 2).

From fig 2, it is clearly observed that a consistent increase in the area under paddy cultivation than maize, indicating that paddy has as a dominant crop among *kharif* crops in the region. In

contrast, the area under maize cultivation has declined steadily, suggesting a future prospects in agricultural preference and policy for shift in cultivation practices. Although a slight dip in paddy area in 2019-20 countered with rise in maize area around same period, which may indicates that farmers tried to grow maize instead of paddy in 2019-20, but due to more economic returns, they again shifted towards paddy cultivation. These graphs highlight a significant transformation in cropping patterns in S.A.S. Nagar, with a strong move away from maize towards paddy cultivation.

2. Trends of major *rabi* crops in S.A.S. Nagar

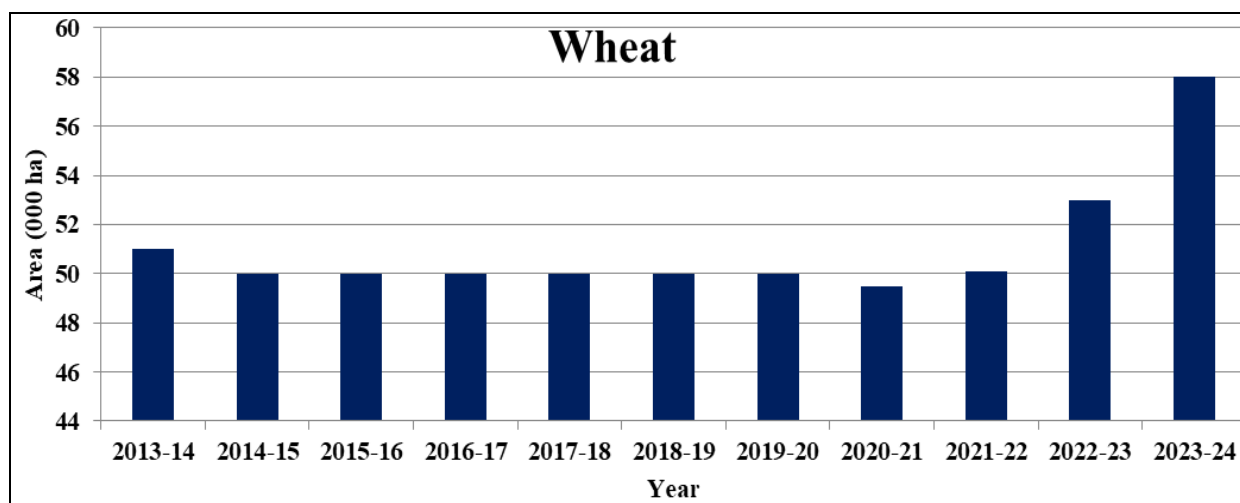


Fig 3: Area under wheat cultivation in district S.A.S. Nagar

Wheat is the extensively cultivated cereal crop in the world and the second most important food grain crop after paddy in India (Suryavanshi and Singh 2020) ^[15]. As a major staple food, wheat plays a significant role in human diet. Several factors contribute to wheat's dominance as a food like good yield potential with excellent storage properties, cost- effective cultivation and can be cultivated over a wide range of soil and climatic conditions (Kaur *et al* 2018) ^[5]. Apart from this, it occupies about 80% of agricultural land of Punjab, during *rabi* season (Kumar and Singh 2022) ^[6].

The study of trends of area cultivated under wheat crop over a period spanning from 2013-14 to 2023-24 represented in fig 3. For most of the period the area under wheat cultivation remained

relatively stable, fluctuating slightly around 50,000 ha in district. There was a slight decline observed in area under cultivation in 2020-21 which can be attributed to the covid pandemic. Corresponding report by Vatta *et al* 2022 ^[18] recorded that area under wheat cultivation declined slightly but statistically significant, on medium and large farms and this area was shifted under vegetables and minor crops. However, a noticeable upward trend begins in 2022-23, where the area significantly increases to approximately 53,000 ha. This growth accelerates further in 2023-24, with a sharp spike of 9.43% pushing the cultivated area to nearly 58,000 ha. Over the course of examined time period, total area under wheat cultivation is increased by 13.73% in district S.A.S. Nagar. This recent spike suggested a

renewed or increased emphasis on wheat production, possibly due to factors such as improved market demand, favourable

weather conditions or government incentives.

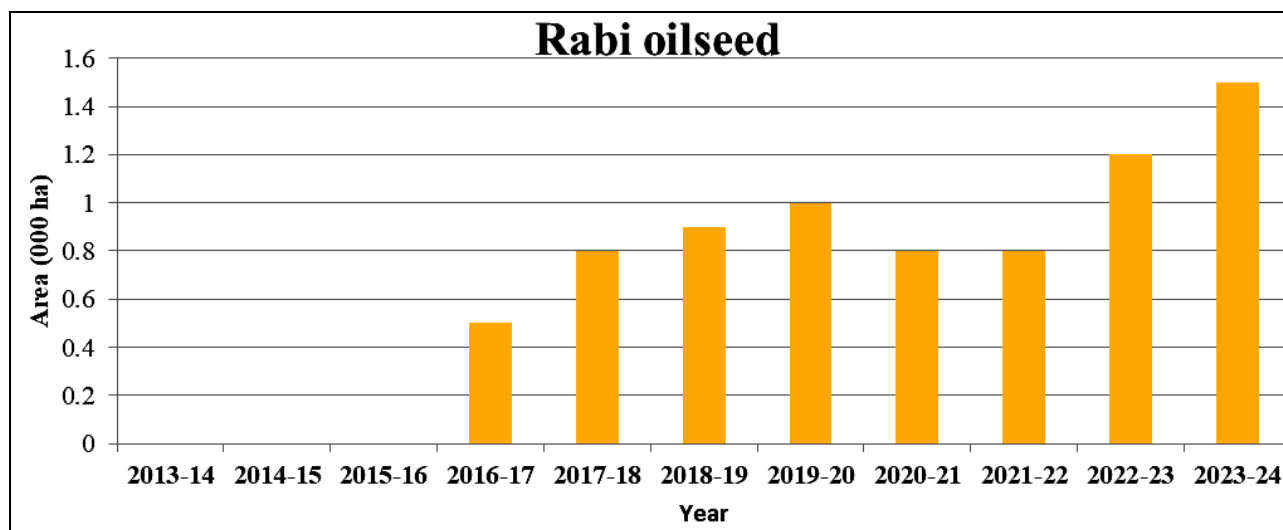


Fig 4: Area under oilseeds cultivation in district S.A.S. Nagar

Oilseeds play a significant role in India's agricultural economy. Globally, India ranks fourth in terms of oilseed production. After cereals, oilseeds are the second most important factor influencing agricultural economy of India, which occupy 19% of the global area and contributes around 2.7% of global production (Reddy and Immanuelraj 2017) ^[10]. Despite the nation's notable advancements in oilseed production since the yellow revolution, output has stagnated. The nation still imports more than half of its internal needs. This amount is set to undoubtedly rise in the days ahead, as the per capita consumption rises with the increasing population (Thapa *et al* 2019) ^[16], so it is the high time to support the oilseed production with research and development to take the country towards self-sufficiency.

The area utilized for *rabi* oilseeds cultivation in the district from 2013-14 to 2023-24 is depicted in fig. 4. It shows no significant

recorded cultivation in the beginning but there is a discernible rising trend from 2016-17. The cultivated area rose from around 0.5 thousand ha in 2016-17 to approximately 1.0 thousand ha by 2019-20. After that, there was a minor decline, eventually settling at about 0.8 thousand ha. However, the trend picked up again from 2022-23, culminating with a sharp increase of 50% and further with 25% rise in area in 2023-24, the total area under *rabi* oilseeds reached about 1.5 thousand ha, the highest in the district. This expanded area under oilseed cultivation from 2016-17 to 2023-24 in the district, can be attributed to the various government interventions and support promoting adoption of improved varieties, combined with positive farmer response and strategic shift towards cultivating oilseeds. These developments emphasize the district's potential for sustained growth in oilseed cultivation amid dynamic agronomic factors.

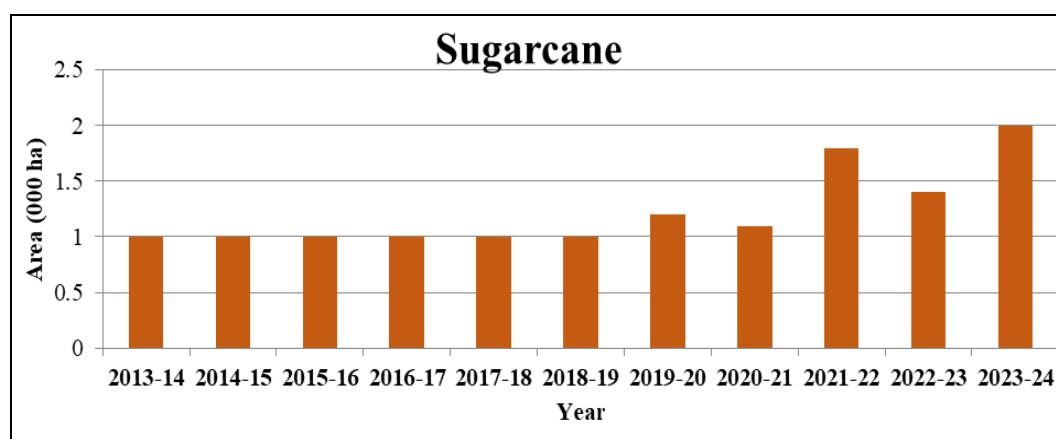


Fig 5: Area under sugarcane cultivation in district S.A.S. Nagar

Sugarcane is the most important agro-industrial crop in Punjab, next to cotton. It is the major sugar-producing crop grown in the subtropical region, which includes the states of Punjab, Haryana, Uttarakhand, Uttar Pradesh and Rajasthan. The sugar industry uses sugarcane as a raw material, its juice is used in the manufacture of gur, shaker, sugar and top portion of canes is used as fodder. Despite these uses, sugar industry provides a variety of byproducts, such as bagasse, molasses, press mud,

wax, etc. (Sanghera *et al* 2018) ^[11].

For the initial years, the area under sugarcane cultivation in S.A.S. Nagar remained steady at around 1.0 thousand ha. A slight increase of 20% is seen in 2019-20, followed by a small dip in 2020-21. Further there was a significant upward trend seen, with 63.64% spike in the area. Expanding sharply to around 1.8 thousand ha and reaching its peak at approximately 2.0 thousand ha in 2023-24, sugarcane showed 42.86% rise in

area as compared to 2022-23. Overall, the area is doubled under sugarcane crop from 1 thousand hectare to 2 thousand ha during the observed period of time, i.e. from 2013-14 to 2023-24 as illustrated in fig 5. The rise in sugarcane cultivation in recent years may indicate enhanced profitability, better support policies or increased demand for sugar and related products, promoting farmers to dedicate more land to this crop.

Table 1: Difference in area (%) occupied by different *rabi* and *kharif* crops from 2013-14 to 2023-24

S. No.	Crop	Difference in area (%)
1.	Paddy	+29.63
2.	Maize	-25
3.	Wheat	+13.73
4.	<i>Rabi</i> Oilseeds	+200
5.	Sugarcane	+100

The data presented in the Table 1, shows the percentage changes in the area under cultivation of major *rabi* and *kharif* crops in S.A.S. Nagar, Punjab, over the period from 2013-14 to 2023-24. This table depicts the both positive (increase) and negative (decrease) shifts in cropping patterns of the area. This data revealed that there is an upward trend in area allocated to paddy, wheat, *rabi* oilseeds and sugarcane crops while a downward trend is observed in the acreage of maize cultivation. During this long-term study, highest rise in area was recorded for *rabi* oilseeds, with a two-fold rise compared to the initial years of the study period. In contrast, lowest increase was observed in the wheat (13.73%) crop while the maize cultivation experienced a reduction of 25% in area. The observed trends suggest a gradual transition in cropping area in the district, likely reflecting economic, environmental and policy driven factors. Such insights are critical for planning cropping patterns, agricultural policies and extension services of a region.

Conclusion

The present study concluded that in the district S.A.S. Nagar various major crops are grown in *kharif* (paddy and maize) and *rabi* (wheat, *rabi* oilseeds and sugarcane) season. Farmers of this region similar to those of entire state, also adopted only one monocropping system, namely wheat- paddy. This cycle creates many problems like excessive use of inputs (fertilizers, pesticides, etc.), nutrient deficiencies, soil health degradation, residue burning and stagnation in productivity. The area under paddy cultivation in the region has shown a significant increase (29.63% over a decade), whereas area under maize cultivation declining (25%). Prolonged over-extraction and inadequate recharging have dropped the ground water levels in S.A.S. Nagar to the alarming situation. This problem can be mitigated with solution to switch to less water-intensive crops such as maize, pulses, millets, oilseeds, vegetables, etc. In the *rabi* season, wheat is the main crop of this region but the area under *rabi* oilseeds and sugarcane crop also showed spike from last 5-6 years. By adopting the new resource saving techniques such as laser land leveler, soil-testing, switching to modern cropping systems and diversification in crops can improve both productivity, sustainability and economic profitability of farmers.

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