ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 10, Issue, 08, pp.72131-72136, August, 2018

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

AN ECONOMIC ANALYSIS OF CHANGES IN THE CROPPING PATTERN IN CUDDALORE DISTRICT, TAMIL NADU

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ARTICLE INFO

Article History:
Received 29th May, 2018
Received in revised form
25th June, 2018
Accepted 5th July, 2018
Published online 30th August, 2018

Key Words:
Cropping Pattern,
Growth Rate.

ABSTRACT

The growth of agriculture depends on the efficiency of resource use and technological progress in the sector with an appropriate cropping pattern. The changes in cropping pattern in particular span of time clearly indicate the changes that have taken place in the agricultural development. These changes are brought about mostly by socio-economic influence and in most of the situations, the physical environment reduces the choice of certain crops altogether or by reducing their level. The adoption of better cropping pattern optimally suited to the technological changes is an important factor for augmenting growth in agriculture. Keeping this view, this study has been carried out with the specific objective of analysing the trend in cropping pattern changes in Cuddalore district of Tamil Nadu. The growth rate was worked out to estimate the changes in the cropping pattern in the district. The results clearly revealed that the share of major crop categories like cereals, oilseeds and millets has been decreased over the years in Cuddalore district. However, the share of pulses, plantation crops, fruits and sugarcane increased over the years, which shows the crop diversification in the study area.

Citation: ***Amirthalingam and Dr. Sita Devi.*** **2018.** "An economic analysis of changes in the cropping pattern in Cuddalore District, Tamil Nadu", *International Journal of Current Research*, 10, (08), 72131-72136.

INTRODUCTION

Agriculture continues to be the backbone of Indian economy, in spite of the concerted efforts towards industrialization in the recent decades. Agriculture sector contributes a high share of gross domestic product by sectors in India. India with only 2.3 per cent of world's total land area supports around 18 per cent of human and 15 per cent of livestock population in the world. The growth of agriculture depends on the efficiency of resource use and technological progress in the sector with an appropriate cropping pattern. Cropping pattern a dynamic concept as no cropping pattern can be said to be ideal for all times to a particular region. It changes in space and time with a view to meet requirements and is governed largely by the physical as well as cultural and technological factors. The changes in cropping pattern in particular span of time clearly indicate the changes that have taken place in the agricultural development. These changes are brought about mostly by socio-economic factors and in most of the situations, the physical environment reduces the choice of certain crops altogether or by reducing their level. Agriculture is an important sector in Tamil Nadu state economy.

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DOI: https://doi.org/10.24941/ijcr.31602.08.2018

Both land use pattern and cropping pattern have been changed considerably in Tamil Nadu state. Though it is an agrarian state, the share of net sown area to total geographical area had been continuously declined from 45 per cent in 1960-61 to around 36 per cent in 2013-14. Also, the gross cropped area had declined from 79.57 lakh ha in 1960-61 to 58.97 lakh ha in 2013-14, nearly 26 per cent of the area has been reduced over the five decades. Among the major crops, the area under rice has also registered a declining share to the gross cropped area in the state, as the crop occupies more than 30 per cent of total cropped area. It is assumed that both climatic and technological factors are crucial in determining land use pattern as well as cropping pattern. Many regions of Tamil Nadu, specifically delta region, have changed the cropping pattern due to inadequate rainfall and heavy downpour. Cuddalore, Villupuram, Nagapattinam, Thiruvarur and Thanjavur are the major delta districts which are frequently undergone many structural changes due to climatic and technological factors (Paramasivam *et al.,* 2017). Analytical studies related to agricultural growth would provide valuable information for future planning and projections of agricultural output. The adoption of better cropping pattern optimally suited to the technological changes is also an important factor for augmenting growth of agriculture (Gore *et al.,* 2015). With this background this study has been carried out with the specific objective of analysing the trends in cropping pattern changes in the study area.

MATERIALS AND METHODS

This study has been confined to Cuddalore district of Tamil Nadu. For the present study, the major crop categories namely cereals, millets, pulses, oil seeds, fibres, fruits, plantation crops, sugar and tapioca have been selected. The study was completely based on secondary data. Area under major crops in Cuddalore district for the last 46 years i.e. from 1970 to 2016 has been collected from the Government of Tamil Nadu publications.

Tools of Analysis

Growth Rate Analysis: Compound growth rates of area under major crop categories were estimated to capture the changes in the cropping pattern in the district. The major crop categories considered for the analysis were cereals, millets, pulses, oil seeds, fibres, fruits, plantation crops, sugar and tapioca. Exponential function of the following form was used to estimate the growth rate for the area under major crops (Gujarati 2012).

$$Y_{it}=A_i (1+r_i)^t \quad (1)$$

Where,

Y_{it} - Area of i^{th} crop at time t (ha)
r - Compound growth rate of Y_i
A_i - Initial year area of i^{th} crop
t - time in years
By taking natural logarithm of (1),

$$In\ Y_{it} = In\ A_i + t\ In\ (1+r_i) \quad (2)$$

Now letting
$\alpha_i = In\ A_i$
$\beta_i = In(1+r_i)$

Equation (2) can be written as

$$In\ Y_{it} = \alpha_i + \beta_i t \quad (3)$$

Adding the disturbance term to (3), it can be written as

$$In\ Y_{it} = \alpha_i + \beta_i t + U_t$$

Y_{it} = Area of i^{th} crop at time t (ha)
t = time in years
α. = constant term
β = regression co-efficient

This log linear function was fitted by using ordinary least square (OLS) method. The compound growth rate (r) was obtained using the formula.

$$r_i = (Antilog\ \beta_i - 1) \times 100$$

Analysis of Changes in Cropping Pattern: Cropping pattern refers to the proportion of area under different crops at any given point of time in a unit area, or the yearly sequence or spatial arrangement of crops on a given area. In simple words, cropping pattern means the area under various crops at a point of time. The data on cropping pattern at different points of time was collected from the office of the Joint Directorate of Agriculture (JDA).

The entire study was split up in to six sub periods and is furnished below.

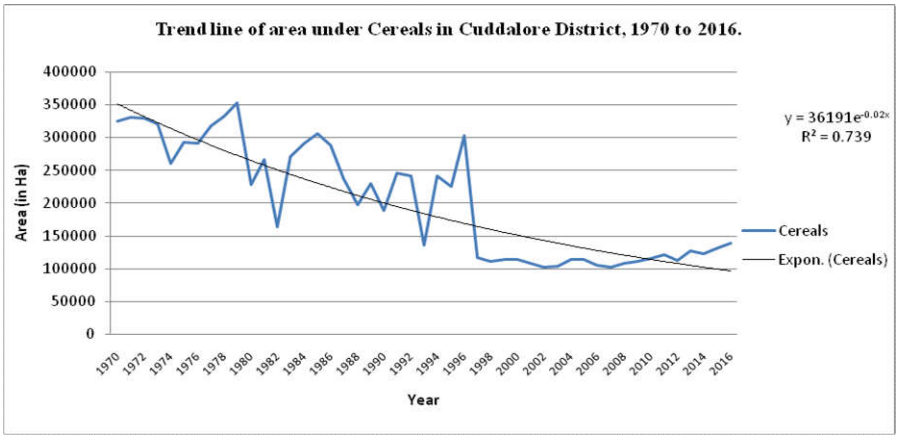
Period I: 1970 – 1971
Period II: 1980-1981
Period III: 1990 – 1991
Period IV: 2000 - 2001
Period V: 2010-2011
Period VI: 2015-2016

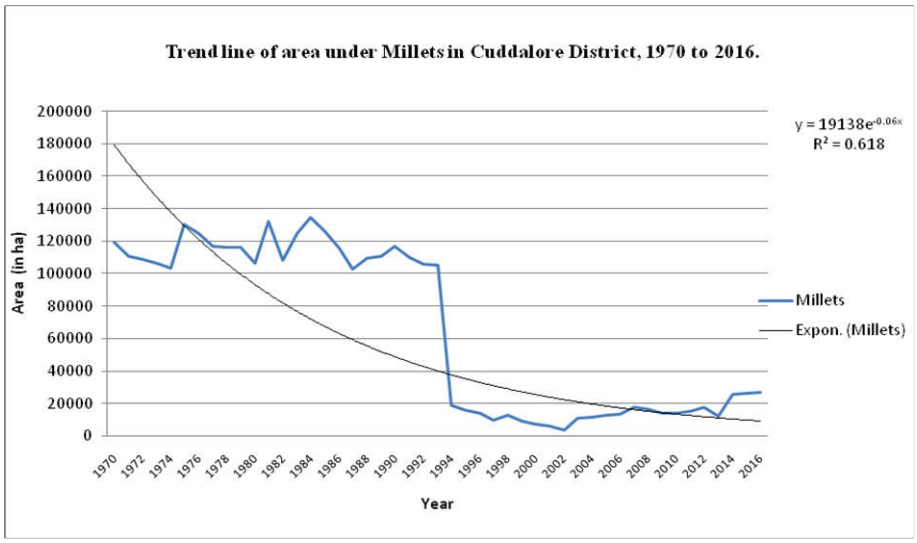
RESULTS AND DISCUSSION

Growth rate of area under major crops in Cuddalore district: Cropping pattern of major crops in Cuddalore district can be ascertained through studying the growth rate of area under different crops. Hence, the compound growth rate of area under major crop categories in Cuddalore District were worked out for the period from 1970 to 2016 and the results are presented in Table 1. It could be seen from Table 1 that the area under Pulses (1.81), Fruits (3.04), Plantation Crops (8.98) and Sugar (0.70) had a positive growth rate, while the area under Cereals (-1.98), Millets (-6.12), Oil Seeds (-5.82) and Fibres (-1.98) had a negative growth rate. The area under Tapioca (0.00) had neutral growth rate. The results would indicate the shift in the cropping pattern towards the high remunerative crops from the traditional crops in Cuddalore district.

Changes in Cropping Pattern in Cuddalore district: The area under selected major crop categories and the relative share of each crop category in the gross cropped area at different points of time have been used to study the changes in cropping pattern. The changes in cropping pattern in Cuddalore district were estimated for the period 1970-2016 and are presented in Table 2. It could be seen from Table 2 that the share of cereals in the total cropped area accounted for 48.09 per cent in 1970-71, and it has been reduced to 40.39 per cent in 2015-16. The percentage change over for area under cereal crops from 1970-71 to 1980-81 was -29.41 per cent, the percentage change over from 1970-71 to 1990-91 was -41.79 per cent, the percentage change over from 1970-71 to 2000-01 was -64.76 per cent, the percentage change over from 1970-71 to 2010-11 was -64.30 per cent, the percentage change over from 1970-71 to 2015-16 was -59.26 per cent, respectively.

The proportion of millets area accounted for 17.73 per cent in 1970-71 and has been reduced to 8.11 per cent in 2015-16. The percentage change over for the area under millets from 1970-71, to the periods 1980-81, 1990-91, 2000-01, 2010-11 and 2015-16, were -10.71, -2.12, -93.87, -88.18 and 77.81 per cent, respectively. The share of pulses area was 2.45 per cent in 1970-71, which has been increased to 20.11 per cent in 2015-16. The percentage change over from 1970-71 to 1980-81 was 138.75 per cent, the percentage change over from 1970-71 to 1990-91 was 228.83 per cent, the percentage change over from 1970-71 to 2000-01 was 145.05 per cent, the percentage change over from 1970-71 to 2010-11 was 221.88 per cent, the percentage change over from 1970-71 to 2015-16 was 298.42 per cent, respectively. The proportion of area under oil seeds accounted for 27.45 per cent in 1970-71 and has been reduced to 9.56 per cent in 2015-16. The percentage change over for the area under oilseeds from 1970-71, to the periods 1980-81, 1990-91, 2000-01, 2010-11 and 2015-16, were -10.56, -1.32, -79.88, -92.82 and -83.11 per cent, respectively.





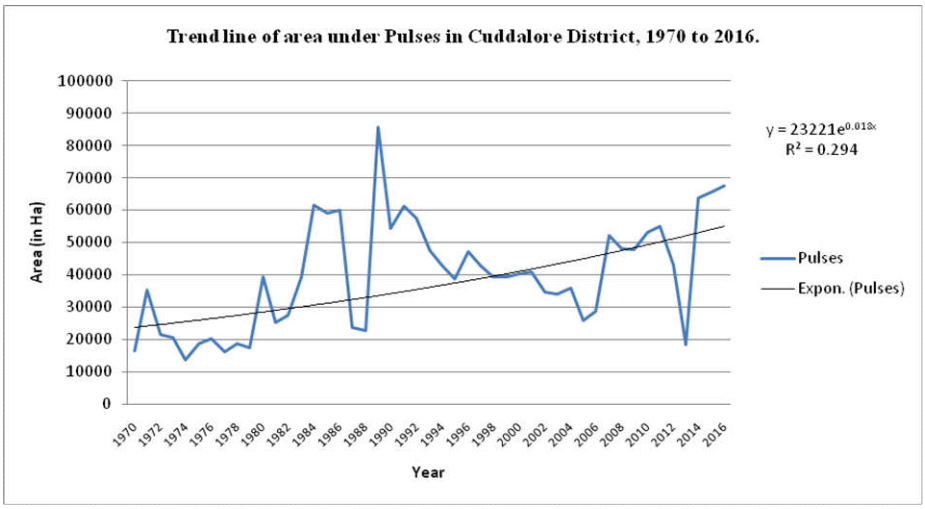
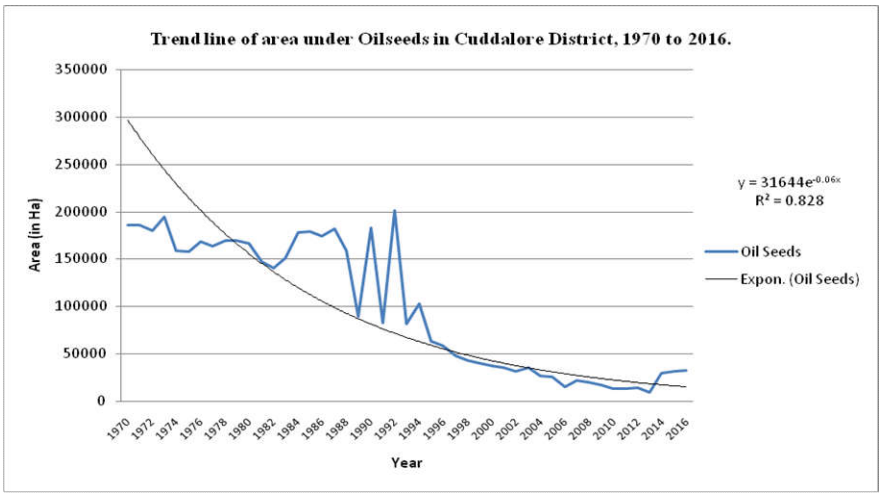
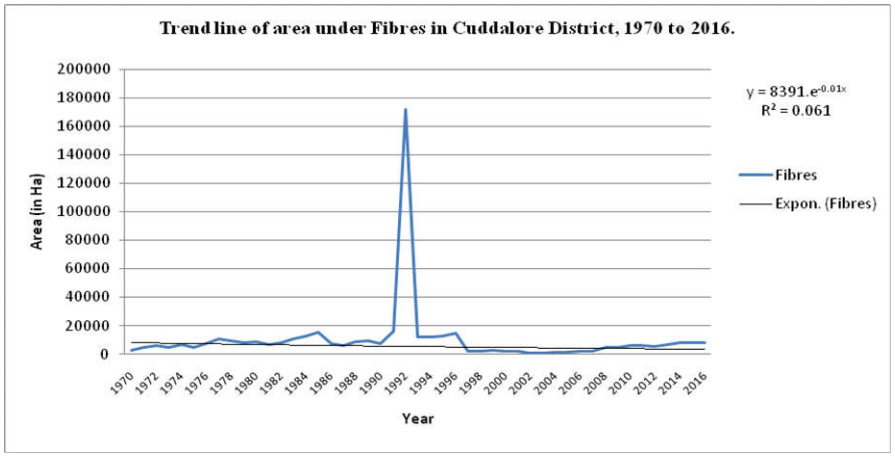


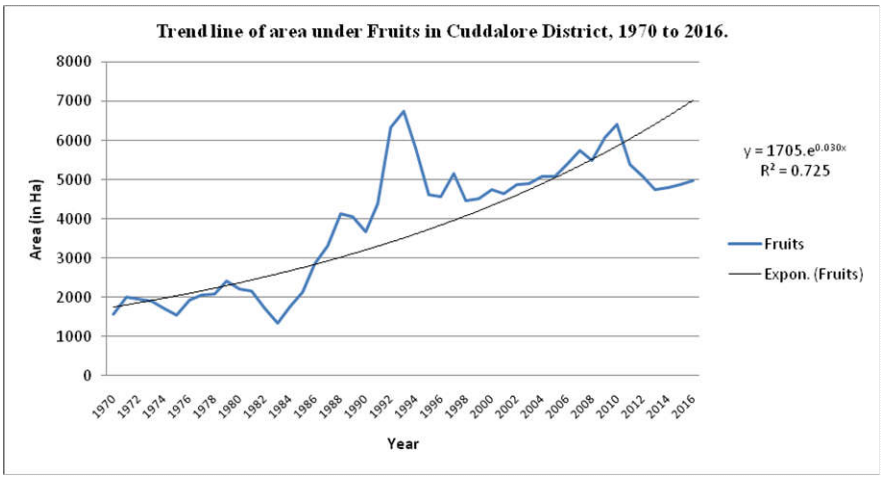
Table 1. The compound growth rates of area under major crops in Cuddalore district, 1970-2016.

S.No	Major Crop Categories	Area (in Ha)
1.	Cereals	-1.98*
2.	Millets	-6.12**
3.	Pulses	1.81*
4.	Oil Seeds	-5.82**
5.	Fibres	-1.98
6.	Fruits	3.04*
7.	Plantation Crops	8.98**
8.	Sugar	0.70
9.	Tapioca	0.00

*Significant at 1 per cent level.
* * Significant at 5 per cent level.


Trend line of area under Oilseeds in Cuddalore District, 1970 to 2016.
Area (in Ha)
Year
y = 31644e-0.06x
R² = 0.828
Oil Seeds
Expon. (Oil Seeds)


Trend line of area under Fibres in Cuddalore District, 1970 to 2016.
Area (in Ha)
Year
y = 8391.e-0.01x
R² = 0.061
Fibres
Expon. (Fibres)


Trend line of area under Fruits in Cuddalore District, 1970 to 2016.
Area (in Ha)
Year
y = 1705.e0.030x
R² = 0.725
Fruits
Expon. (Fruits)

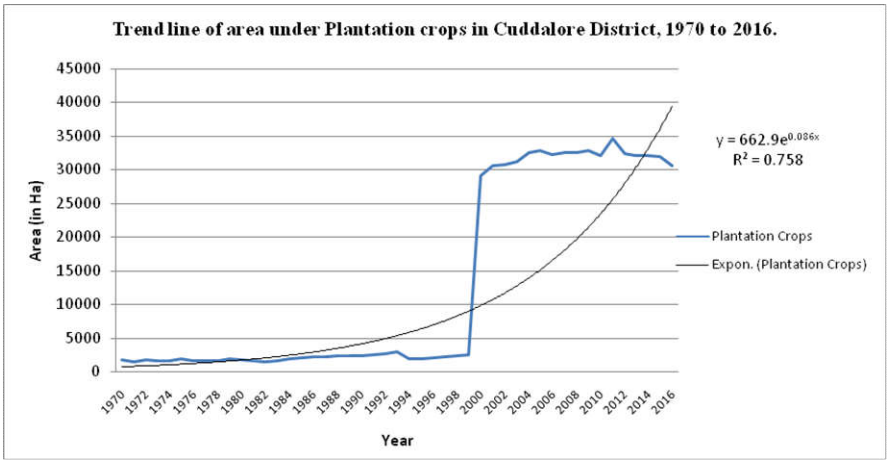
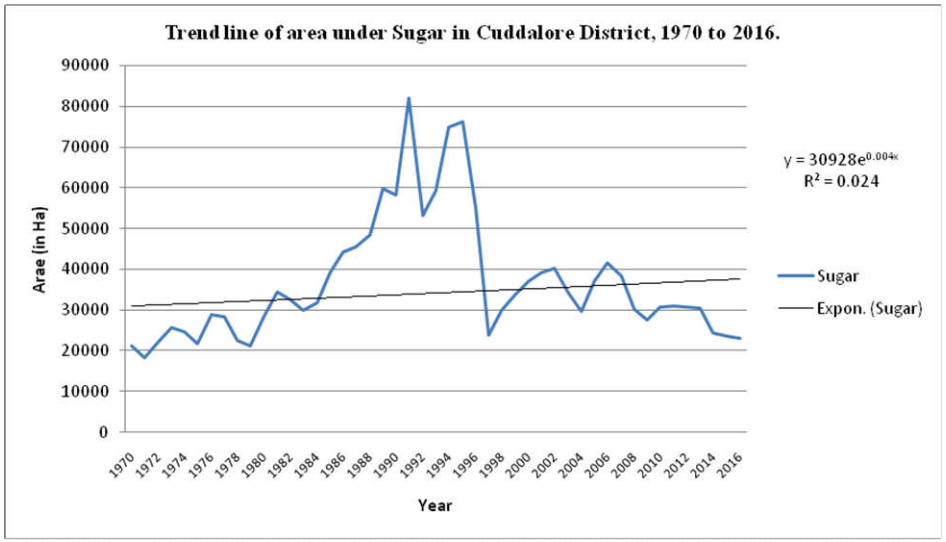
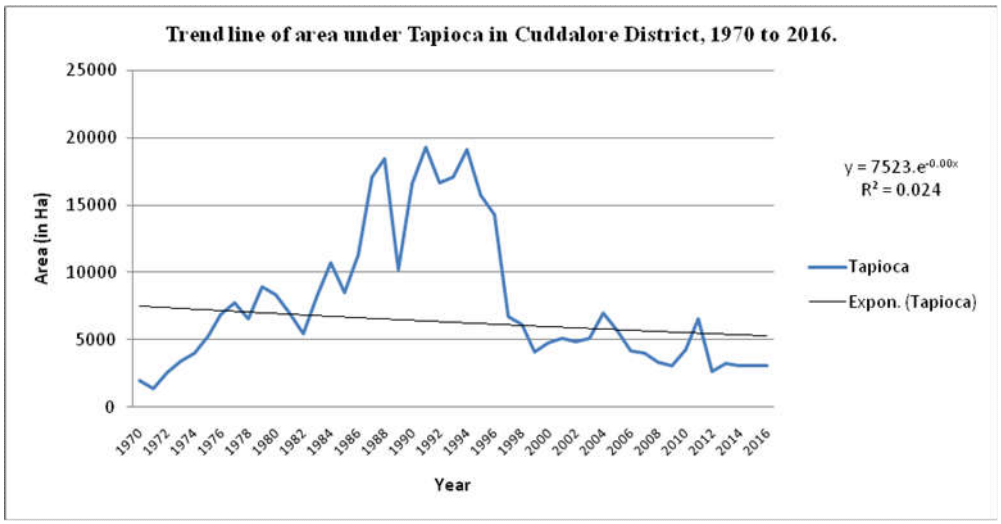

Trend line of area under Plantation crops in Cuddalore District, 1970 to 2016.
Area (in Ha)
Year
y = 662.9e0.086x
R² = 0.758
Plantation Crops
Expon. (Plantation Crops)

Table 2. Changes in Cropping Pattern in Cuddalore District, 1970-2016

S.No	Major Crops	Period I	Period II		Period III		Period IV		Period V		Period VI	
			1980-81		1990-91		2000-01		2010-11		2015-16	
		1970-71	1980-81	Percentage Change over 1970-71	1990-91	Percentage Change over 1970-71	2000-01	Percentage Change over 1970-71	2010-11	Percentage Change over 1970-71	2015-16	Percentage Change over 1970-71
1.	Cereals	324395 (48.09)	228990 (38.81)	-29.41	188836 (29.92)	-41.79	114315 (41.30)	-64.76	115815 (41.90)	-64.30	132145 (40.39)	-59.26
2.	Millets	119608 (17.73)	106795 (18.10)	-10.71	117070 (18.54)	-2.12	7332 (2.65)	-93.87	14143 (5.12)	-88.18	26541 (8.11)	-77.81
3.	Pulses	16511 (2.45)	39421 (6.68)	138.75	54293 (8.60)	228.83	40461 (14.62)	145.05	53146 (19.23)	221.88	65783 (20.11)	298.42
4.	Oil Seeds	185145 (27.45)	165579 (28.06)	-10.56	182698 (28.94)	-1.32	37237 (13.65)	-79.88	13288 (4.81)	-92.82	31276 (9.56)	-83.11
5.	Fibres	2352 (0.35)	8266 (1.40)	251.44	7587 (1.20)	222.58	1807 (0.65)	-23.17	6242 (2.26)	165.39	8028 (2.45)	241.33
6.	Fruits	1559 (0.23)	2218 (0.38)	42.27	3656 (0.58)	134.51	4729 (1.71)	203.33	6402 (2.32)	310.65	4875 (1.49)	212.70
7.	Plantation Crops	1669 (0.25)	1688 (0.29)	1.13	2360 (0.37)	41.40	29110 (10.52)	1644.15	31994 (11.58)	1816.96	31879 (9.74)	1810.07
8.	Sugar	21270 (3.15)	28681 (4.86)	34.84	58219 (9.22)	173.71	36995 (13.37)	73.93	31064 (11.24)	46.05	23567 (7.20)	10.80
9.	Tapioca	1985 (0.30)	8392 (1.42)	322.77	16560 (2.62)	734.26	4788 (1.73)	141.20	4282 (1.55)	115.72	3084 (0.94)	55.37
	Total (1to9)	674494 (100.00)	590030 (100.00)	-12.52	631279 (100.00)	-6.40	276774 (100.00)	-58.96	276376 (100.00)	-59.02	327178 (100.00)	-51.49





The share of fibre crops area was 0.35 per cent in 1970-71, which has been increased to a small extent, 2.45 per cent in 2015-16. The percentage change over from 1970-71 to 1980-81 was 251.44 per cent, the percentage change over from 1970-71 to 1990-91 was 222.58 per cent, the percentage change over from 1970-71 to 2000-01 was -23.17 per cent, the percentage change over from 1970-71 to 2010-11 was 165.39 per cent, the percentage change over from 1970-71 to 2015-16 was 241.33 per cent, respectively. The proportion of area under fruit crops accounted for 0.23 per cent in 1970-71 and has been increased to 1.49 per cent in 2015-16. The percentage change over for the area under fruit crops from 1970-71, to the periods 1980-81, 1990-91, 2000-01, 2010-11 and 2015-16, were 42.27, 134.51, 203.33, 310.65 and 212.70 per cent, respectively. The proportion of area under plantation crops was 0.25 per cent in 1970-71, which has been increased to a larger extent, 9.74 per cent in 2015-16. The percentage change over from 1970-71 to 1980-81 was 1.13 per cent, the percentage change over from 1970-71 to 1990-91 was 41.40 per cent, the percentage change over from 1970-71 to 2000-01 was 1644.15 per cent, the percentage change over from 1970-71 to 2010-11 was 1816.96 per cent, the percentage change over from 1970-71 to 2015-16 was 1810.07 per cent, respectively. The proportion of area under sugar crop accounted for 3.15 per cent in 1970-71 and has been to increased 7.20 per cent in 2015-16. The percentage change over for the area under sugar crop from 1970-71, to the periods 1980-81, 1990-91, 2000-01, 2010-11 and 2015-16, were 34.84, 173.71, 73.93, 46.05 and 10.80 per cent, respectively. The share of tapioca area was 0.30 per cent in 1970-71, which has been increased to 0.94 per cent in 2015-16. The percentage change over from 1970-71 to 1980-81 was 322.77 per cent, the percentage change over from 1970-71 to 1990-91 was 734.26 per cent, the percentage change over from 1970-71 to 2000-01 was 141.20 per cent, the percentage change over from 1970-71 to 2010-11 was 115.72 per cent, the percentage change over from 1970-71 to 2015-16 was 55.37 per cent, respectively.

Conclusion

The foregoing discussion clearly revealed that the share of major crop categories like cereals, oilseeds and millets has been decreased over the years in Cuddalore district. However, the share of pulses, plantation crops, fruits and sugarcane increased over the years. This shows that the district is moving towards the crop diversification by growing high remunerative crops rather than specialisation. For effective planning and implementation, agricultural development plans may be designed appropriately based on the nature and extent of crop diversification.

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