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Growth and Instability of Major Crops Area in Wardha District of Maharashtra State

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Abstract

Policy decisions are often made based on the growth rates of area which depend on the nature and structure of the data and instability of area in farm production. The present investigation was undertaken to study the growth and instability of major crops area in selected tahsils of Wardha district for the period of 10 years from 2005-06 to 2014-15 for Arvi, Ashti, Devali and Samudrapur tahsils of Wardha diatrict. Compound growth rates of major crops were computed to study their growth of area under selected crops in selected tahsils. Coefficient of variation and Coppocks instability index were calculated to analyzed instability of major crops area. Growth rates under area of kharif jowar, soybean declined significantly and that of cotton, wheat increased area significantly. Area of kharif jowar, soybean, and cotton showed high instability while wheat, gram, tur, mung and udid area showed stagnancy in all the selected tahsils of Wardha district. Over a period of study cropping pattern has changed in selected tahsils of Wardha district.

Keywords: Growth Rate, Instability, Coefficient of Variation, Coppocks Instability Index, Cropping Pattern.

Introduction

Understanding the regional pattern of agricultural growth and development helps to evolve strategic decentralized development strategies to ensure inclusive growth in the country in the long-run. However, cropping pattern is defined as a combination of agricultural crops that are grown in a particular geographical area. Growth and instability of crops area or changes in cropping pattern can be seen as the changes in proportion of acreage or the value of production under different crops to total agricultural area or production. The cropping pattern usually changes over time with the development of agriculture, as evident in the case of agriculture in India. Changes in cropping pattern in terms of acreage allocation among different crops have been the integral part of agricultural development of a region, which further depends on the money invested, production, available time, etc. It is a well noted fact that the growth of agricultural production depends on both acreage and productivity growth. The Indian agriculture is known for fluctuations and instability in its performance. The instability in productivity has a cascading effect on the farm economy and has serious implications for food security. The estimation of instabilities at district level will be helpful in devising strategies for more vulnerable districts. The pattern of instability in crop area across different districts was examined and the distribution of districts based on the instability index in the result. So the present study was under taken to study growth and instability of major crops area and changes in cropping pattern in selected tahsils of Wardha district.

Aim of the Study

1. To study growth and instability of major crops and
2. To worked out the changes in cropping pattern in selected tahsils of Wardha district

Review of Literature

Anuradha Narala and A.R. Reddy (2010) the study depicted that growth and instability of cotton during pre introduction (1993-94-2001-02) and post- introduction of Bt cotton periods (2002-03-2010-11) was also analyzed. For this purpose compound growth rates were estimated by fitting the exponential function and coefficient of variation was worked out to find out instability associated. It was found that growth of cotton area and production was significant during 1950s, 1990s and 2001-10. Instability analysis indicated that cotton area was more stable than production and

productivity. Thus, policies should be made to reduce the risk in cotton production and to make it profitable so as to sustain the high growth rate experienced during the past few years. Alagh (2007) studied the growth and changes of Indian agriculture since the eighties. The study revealed that agricultural sector was traditionally regarded as having low price responses. Cropping patterns were different in different area because of economic reasons or technological reasons but the change was slower. Soumitra Chatterjee et al. (2013) evaluated the temporal analysis of district wise agricultural crop performance scenario in West Bengal, India: They concluded that there is a subsequent contraction in area under *aus* cultivation in West Bengal with the progress of time. *Aman* is still considered as the major rice grown in predominant rice belt of Bengal features stagnancy in acreage and production over time. This might be due to improved fertility status of soil with a large number of progressive growers operating in terms of a better knowledge gaining, a better education and extension.

Materials and Methods

For the present study four tahsils of Wardha district viz., Arvi, Ashti, Deavli and Samudrapur were selected purposively. The study was based on secondary data collected from various Government publications for a period of 10 years i.e. from 2005-06 to 2014-15. Kharif crops viz., kharif jowar, mung, tur, cotton, soybean and other crops were selected for present study.

Analysis of Growth and Instability of Major Crops

Exponential Model

For examining the performance of different crops growth rates of area of major crops were estimated using exponential model.

$Y = ab^t$

Where,

Y = area under particular crop

a & b = parameters to be estimated from exponential model

CGR = $[Antilog(\log b) - 1] \times 100$

Coefficient of Variation (C.V)

Coefficient of variation of area were calculated by using the following formula

$c.v. = \frac{\text{S.D.}}{\text{Mean}} \times 100$

Coppocks Instability Index

To measure the coefficient of instability, Coppocks Instability index were estimated as below

$$m = \frac{\sum[\log(X_{i+1}) - \log(X_i)]}{(N-1)}$$

Where-

X_t = area of crop year't'

N = number of year minus 1

M = The arithmetic mean of the difference between the log of X1 and xt -2 etc.

$$V\,Log = \frac{\sum\{[\log(X_{i+1}) - \log(X_i)] - m\}}{(N-1)}$$

V log = Log arithmetic variances of the series

$$Coppocks\,Index = [Anti\log(\sqrt{V\,Log}) - 1] * 100$$

Analysis of Changes in Cropping Pattern

Simple Tabular Analysis

Cropping pattern of selected tahsils of Wardha district were studied by simple tabular analysis for major crops. Cropping pattern in terms of percentage share of individual crops in gross cropped area were work out at different points of time.

Results and Discussion

Growth Rates of Area of Major Crops

The compound growth rates of area of major crops for Arvi, Ashti, Devali and Samudrapur tahsils of Wardha district are presented in Table 1.

Table 1 Compound Growth Rates of Area of Major Crops in Selected Tahsils of Wardha District

Sr. No.	Crops/Tahsils	Arvi	Ashti	Devali	Samudrapur
1	KhJowar	-13.99***	-26.73**	-16.16*	-31.52***
2	Wheat	3.76	-2.64	1.26	-8.62
3	Gram	-9.69	-0.75	-2.29	12.82
4	Tur	2.79***	-0.91	4.66***	-4.04**
5	Mung	-24.82***	-1.78	-25.62**	5.24
6	Udid	-22.68**	12.61	-29.58***	26.21**
7	Cotton	11.11**	5.70	7.45***	22.57***
8	Soybean	-8.02***	-9.83**	-4.67**	-6.44**
9	Other Crops	-25.19***	-24.75***	-18.67**	0.18

***, **, * denotes statistical significance at 1, 5 and 10 per cent level respectively.

The compound growth rates of area of major crops are calculated for the period of 2005-06 to 2014-15. In case of Arvi tahsil, the growth rates of area of tur was increased significantly by 2.79 per cent and for kharif jowar it was declined significantly by 13.66 per cent. The growth rates of wheat and gram showed stagnancy during the study period. The growth rates of cotton increased significantly by 11.11 per cent. The growth rates of area under mung, udid, soybean and other crops declined significantly by 24.82 per cent, 22.68 per cent, 8.02 per cent and 25.19 per cent respectively.In case of Ashti tahsil, the growth rates of area of kharif jowar declined significantly by 26.73 per cent. The growth rates of wheat and all pulses viz. gram, tur, mung and udid and cotton showed stagnancy during study period. The growth rates of area under soybean and other crops declined significantly by 9.83 per cent and 24.75 per cent respectively.

In case of Devali tahsil, the growth rates of area of tur was increased significantly by 4.66 per cent and declined significantly by 16.16 per cent. The growth rates of wheat and gram showed stagnancy during study period. The growth rates of mung and udid declined significantly by 25.62 per cent and 29.58 per cent respectively and it was increased

significantly in case of cotton by 7.45 per cent. The growth rates of soybean and other crops also declined significantly by 4.67 per cent and 18.67 per cent. In case of samudrapur tahsil, the growth rates of kharif jowar and tur declined significantly by 31.52 per cent and 4.04 per cent. The growth rates of wheat, gram and mung showed stagnancy during study period. The growth rates of udid and cotton increased significantly by 26.21 per cent and 22.57 per cent respectively. The growth rate of soybean declined significantly by 6.44 per cent and it was stagnant in case of other crops.

Coefficient of Variation and Coppocks Instability Index

Coefficient of variation and Coppocks instability index of area of crops in Arvi, Ashti, Devali and Samudrapur tahsil of Wardha were presented in Table 2.

In Arvi tahsil, kharif jowar showed high coefficient of variation value of 71.88 per cent than Coppocks instability index 37.78 per cent. This indicates that there was acceleration in area expansion with high instability. For tur Coppocks instability index value 5.07 per cent coupled with high coefficient of variation value 9.21 per cent indicated that there was high instability. For wheat, gram, mung and udid coefficient of variation is less than the Coppocks instability index which indicated least consistency in area and stagnation in area expansion. Coefficient of variation for cotton, soybean and other crops is 40.93 per cent, 28.76 per cent and 98.46 per cent respectively coupled with low Coppocks instability index of 38.68 per cent, 19.22 per cent and 61.51 per cent for cotton, soybean and other crops. This shows high instability of cotton, soybean and other crops.

Table 2
Coefficient of Variation and Coppocks Instability Index of Area of Major Crops in Selected Tahsils of Wardha District

S. No	Crops/ Tahsils	Arvi		Ashti		Devali		Samudrapur	
		CV	CII	CV	CII	CV	CII	CV	CII
1	Kh Jowar	71.88	37.78	126.74	203.96	90.24	127.08	145.70	140.49
2	Wheat	20.50	23.66	32.34	46.45	18.82	27.23	36.27	87.58
3	Gram	46.55	164.19	43.28	75.21	40.40	57.96	50.23	161.61
4	Tur	9.21	5.07	39.45	58.22	15.87	8.92	18.72	18.28
5	Mung	59.18	72.12	60.77	82.96	88.20	212.78	82.31	110.60
6	Udid	89.44	221.87	78.20	129.39	104.43	104.87	115.55	115.06
7	Cotton	40.93	38.68	33.82	72.05	25.34	27.41	58.25	34.77
8	Soybean	28.76	19.22	46.48	45.19	20.66	18.24	26.72	27.01
9	Other crops	98.46	61.51	106.87	153.88	86.30	202.39	53.07	123.06

Note: Coefficient of variation and Coppocks instability index of major crops are calculated for the period of 2005-06 to 2014-15 for growth and instability.

From Table 2 it was observed that in Ashti Tahsil, kharif jowar, wheat, gram, tur, mung, udid, cotton and soybean shows high Coppocks instability index with low coefficient of variation. This indicates least consistency in area of these crops in Ashti tahsil with stagnation in area expansion. Only soybean shows high coefficient of variation value of 46.48 per cent coupled with low Coppocks instability index of 45.19 per cent which indicates high area instability of this crop in tahsil.

In Devali tahsil, Coppocks instability index for kharif jowar, wheat, and gram was 127.08 per cent, 27.23 per cent and 57.96 per cent respectively with low coefficient of variation value of 90.24 per cent, 18.82 per cent and 40.40 per cent for kharif jowar, wheat and gram. This shows stagnation in area of these crops. Tur and soybean experienced high coefficient of variation value of 15.87 per cent and 20.66 per cent with low coppocks instability index value of 8.92 per cent and 18.24 per cent. This indicated that there was acceleration in area expansion of these crops with high instability. Mung, udid, cotton and other crops shows low coefficient of variation value coupled with high Coppocks instability index value which indicates least consistency of area under these crops.

In Samudrapur tahsil, coefficient of variation value for kharif jowar and cotton was 145.7 per cent and 58.25 per cent with low Coppocks instability index value of 140.49 per cent and 34.77 per cent for kharif jowar and cotton. This shows high instability of these crops in Samudrapur tahsil. Coefficient of variation value for tur and udid was 18.72 per cent and 115.55 per cent with Coppocks instability index value of 18.28 per cent and 115.06 per cent for tur and udid. This indicated less instability. Wheat, gram, mung, soybean and other crops shows low coefficient of variation value with high Coppocks instability index value. This shows least consistency in area of these crops and stagnation in area expansion.

Changes in Cropping Pattern

Changes in Cropping Pattern in Arvi Tahsil of Wardha District

The changes in cropping pattern in Arvi tahsil of Wardha district during 2005-06 to 2014-15 are presented in Table 3.

In the span of 10 years cropping pattern in Arvi tahsil has changed substantially. The proportion of area under wheat by 3.90 per cent, tur by 19.51 per cent and cotton by 39.50 per cent has been increased while kharif jowar by 2.86 per cent, gram by 0.65 per cent, mung by 0.02 per cent, udid by 0.01 per cent and soybean by 33.49 per cent have been reduced by the end of the year 2014-15. In case of cotton, its share over gross cropped area has increased to 39.50 per cent in 2014-15 from 17.26 per cent in 2005-06 which is emerged as the major crop in the Arvi tahsil. The proportion of area under other crops over gross cropped was highest in 2005-06 i.e. 0.46 per cent of

gross cropped area. Percent change over base period 2005-06 of cotton is 99.26 per cent which indicates increase of acreage under this crop. The area of kharif jowar, gram, mung, udid, soybean and other crops have been shifted to cotton. There is positive change in wheat by 51.23 per cent and tur by 29.01 per cent next to cotton over base period 2005-06. The gross cropped area has reduced by 12.93 per cent over base period 2005-06.

Table3 Changes in Cropping Patter in Arivi tahsil of Wardha District
(Area in Hectare)

S. No.	Crops	Years										Percentage Change over base period
		2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014- 15	
1	Kh Jowar	3957 (7.30)	2741 (4.62)	1615 (3.09)	1298 (2.55)	884 (1.72)	832 (1.51)	747 (1.28)	735 (1.27)	702 (1.38)	1348 (2.86)	-65.93
2	Wheat	1218 (2.25)	1775 (2.99)	1844 (3.53)	1546 (3.04)	1541 (3.00)	2270 (4.11)	2560 (4.40)	1912 (3.32)	1853 (3.66)	1842 (3.90)	51.23
3	Gram	3121 (5.76)	3601 (6.07)	3601 (6.88)	1680 (3.30)	979 (1.91)	2035 (3.69)	3140 (5.40)	37703 (6.54)	4659 (9.19)	307 (0.65)	-90.16
4	Tur	7136 (13.17)	7785 (13.12)	8418 (16.09)	8354 (16.42)	8608 (16.76)	9550 (17.29)	9391 (16.15)	9129 (15.83)	9509 (18.76)	9206 (19.51)	29.01
5	Mung	106 (0.20)	106 (0.20)	151 (0.29)	113 (0.22)	94 (0.18)	74 (0.13)	56 (0.10)	56 (0.10)	10 (0.02)	8 (0.02)	-92.45
6	Udid	96 (0.18)	30 (0.05)	64 (0.12)	21 (0.04)	14 (0.03)	17 (0.03)	35 (0.06)	80 (0.14)	4 (0.01)	3 (0.01)	-96.88
7	Cotton	9352 (17.26)	10488 (17.68)	10478 (20.03)	7904 (15.53)	16500 (32.12)	24414 (44.21)	24287 (41.76)	25334 (43.92)	16120 (31.80)	18635 (39.50)	99.26
8	Soybean	28948 (53.43)	32574 (54.90)	25997 (49.70)	29889 (58.73)	22700 (44.19)	16010 (28.99)	17900 (30.78)	16625 (28.82)	17817 (35.15)	15801 (33.49)	-45.42
9	Other crops	249 (0.46)	229 (0.39)	138 (0.26)	84 (0.17)	47 (0.09)	19 (0.03)	42 (0.07)	33 (0.06)	20 (0.04)	25 (0.05)	-89.96
	Gross cropped area	54183 (100.00)	59329 (100.00)	52306 (100.00)	50889 (100.00)	51367 (100.00)	55221 (100.00	58158 (100.00)	57677 (100.00)	50694 (100.00)	47175 (100.00)	-12.93

(Figures in the parenthesis indicates the percentage over gross cropped area)

Changes in Cropping Pattern in Ashti Tahsil of Wardha District

The changes in cropping pattern in Ashti tahsil of Wardha district during 2005-06 to 2014-15 are presented in Table 4.

Table 4 revealed that cotton and soybean were observed as major crops of the tahsil during 2005-06, constituting 77.11 per cent of the total cropping area. In the span of 10 years cropping pattern has changed substantially. The proportion of area under cotton was 23.48 per cent in the year 2005-06, has increased to 43.35 per cent on 2014-15. In case of soybean, its share in gross cropped area has fallen to the level of 33.41 per cent in 2014-15 from 53.63 per cent in 2005-06. The proportion of area under kharif jowar by 0.48 per cent, gram by 4.73 per cent and other crop has been reduced while wheat by 4.84 per cent, tur by 12.11 per cent, mung by 0.27 and udid by 0.45 per cent have been increased by the end of the year 2014-15. The constant proportion of area under other crops over gross cropped was highest in 2005-06 i.e. 0.98 per cent. Udid crop is being cultivated to the extent of 0.45 per cent of gross cropped area. The percentage change over base period 2005-06 of udid is 365.52 per cent which indicates increase of acreage under this crop. There is positive change in wheat by 8.95 per cent, tur by 16.15 per cent, mung 38.98 and cotton by 38.58 per cent next to soybean over base period 2005-06. The gross cropped area has reduced by 24.94 per cent over base period 2005-06.

Changes in Cropping Pattern in Devali Tahsil of Wardha District

The changes in cropping pattern in Devali tahsil of Wardha district during 2005-06 to 2014-15 are presented in Table 5.

In the span of 10 years cropping pattern has changed substantially. As evident from the Table 5 the proportion of area under kharif jowar, gram, mung, udid, soybean and other crops have been decreased, while wheat, tur and cotton have been increased during the study period. In case of cotton, its share over gross cropped area has increased to 37.27 per cent in 2014-15 from 22.45 per cent in 2005-06 which is emerged as the major crop in the tahsil. The proportion of area under kharif jowar over gross cropped has reduced from 4.77 per cent in 2005-06 to 0.68 per cent in 2014-15 and soybean has reduced from 51.33 per cent in 2005-06 to 36.33 per cent in 2014-15. Mung, udid and other crops contributed very negligible proportion i.e. 0.01 per cent, 0.01 per cent and 0.03 per cent respectively. The proportion of area under tur over gross cropped area has increased from 13.01 per cent in 2005-06 to 17.96 per cent in 2014-15. The percentage change over base period 2005-06 of cotton is 79.12 per cent which indicates increase of acreage under this crop. The area of kharif jowar, gram, mung, udid, soybean and other crops have been shifted to cotton. There is positive

change in tur by 48.99 per cent and wheat 26.95 per cent next to cotton over base period 2005-06. The gross cropped area has increased by 7.89 per cent over base period 2005-06.

Table 4 Changes in Cropping Pattern in Ashti Tahsil of Wardha District
(Area in hectare)

S. No	Crops	Years										Percentage Change Over Base Period
		2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	
1	Kh Jowar	1540 (3.93)	1140 (2.66)	1615 (3.07)	64 (0.21)	154 (0.51)	154 (0.47)	104 (0.32)	101 (0.31)	93 (0.28)	143 (0.48)	-90.71
2	Wheat	1307 (3.33)	2098 (4.89)	2239 (4.26)	1429 (4.76)	1818 (6.03)	3028 (9.24)	1500 (4.68)	1211 (3.77)	1411 (4.35)	1424 (4.84)	8.95
3	Gram	2571 (6.56)	3020 (7.05)	3261 (6.21)	1085 (3.61)	490 (1.62)	1246 (3.80)	2710 (8.46)	3287 (10.92)	3713 (11.46)	1391 (4.73)	-45.90
4	Tur	3065 (7.83)	2977 (6.95)	8418 (16.03)	3449 (11.49)	3837 (12.72)	3926 (11.98)	3780 (11.81)	3501 (10.92)	3543 (10.93)	3560 (12.11)	16.15
5	Mung	59 (0.15)	63 (0.14)	151 (0.28)	47 (0.15)	30 (0.09)	20 (0.06)	30 (0.09)	64 (0.19)	64 (0.19)	82 (0.27)	38.98
6	Udid	29 (0.07)	41 (0.09)	64 (0.12)	32 (0.11)	25 (0.08)	16 (0.04)	11 (0.03)	108 (0.33)	108 (0.33)	135 (0.45)	365.52
7	Cotton	9192 (23.48)	7201 (16.81)	10478 (19.96)	4547 (15.14)	16100 (53.40)	17215 (52.55)	12100 (37.81)	11444 (35.71)	10700 (33.02)	12738 (43.35)	38.58
8	Soybean	20994 (53.63)	25787 (60.21)	25997 (49.52)	19278 (64.22)	7630 (25.31)	7112 (21.71)	11700 (36.56)	12270 (38.28)	12753 (39.36)	9819 (33.41)	-53.23
9	Other Crops	387 (0.98)	500 (1.16)	267 (0.51)	84 (0.27)	65 (0.21)	39 (0.11)	61 (0.19)	63 (0.19)	14 (0.04)	90 (0.31)	-76.74
	Gross Cropped Area	39144 (100.00)	42827 (100.00)	52490 (100.00)	30015 (100.00)	30015 (100.00)	32756 (100.00)	31996 (100.00)	32049 (100.00)	32399 (100.00)	29382 (100.00)	-24.94

(Figures in the parenthesis indicates the percentage over gross cropped area)

Table 5 Changes in Cropping Pattern in Devali Tahsil of Wardha District
(Area in hectare)

S. No	Crops	Years										Percentage Change Over Base Period
		2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	
1	Kh Jowar	2764 (4.77)	2059 (3.22)	1747 (2.66)	345 (0.56)	345 (0.59)	308 (0.50)	197 (0.31)	1116 (1.80)	638 (1.02)	425 (0.68)	-84.62
2	Wheat	1792 (3.09)	2192 (3.43)	2788 (4.25)	1524 (2.50)	1524 (2.63)	1914 (3.11)	1950 (3.13)	2144 (3.46)	2281 (3.65)	2275 (3.64)	26.95
3	Gram	2845 (4.91)	3610 (5.65	3610 (5.51)	1190 (1.95)	118 (0.20)	1190 (1.93)	2250 (3.61)	1946 (3.14)	2872 (4.59)	2530 (4.05)	-11.07
4	Tur	7528 (13.01)	7872 (12.32)	8629 (13.16)	9139 (14.99)	10072 (17.43)	12382 (20.15)	11080 (17.8)	10505 (16.96)	10718 (17.15)	11216 (17.96)	48.99
5	Mung	64 (0.11)	38 (0.05)	38 (0.06)	38 (0.06)	4 (0.01)	6 (0.01)	40 (0.06)	10 (0.02)	3 (0.01)	4 (0.01)	-93.75
6	Udid	46 (0.08)	46 (0.07)	46 (0.07)	20 (0.03)	4 (0.01)	3 (0.01)	10 (0.02)	6 (0.01)	4 (0.01)	2 (0.01)	-95.65
7	Cotton	12994 (22.45)	15429 (24.15)	16138 (24.62)	11548 (18.95)	21480 (37.18)	25248 (41.10)	23146 (37.19)	23146 (37.37)	22280 (35.65)	23275 (37.27)	79.12
8	Soybean	29704 (51.33)	32486 (50.86)	32486 (49.56)	37086 (60.86)	24200 (41.88)	20371 (33.16)	23500 (37.75)	23040 (37.20)	23674 (37.88)	22686 (36.33)	-23.63
9	Other crops	129 (0.22)	139 (0.21)	60 (0.09)	45 (0.07)	26 (0.04)	5 (0.01)	63 (0.10)	22 (0.04)	25 (0.04)	21 (0.03)	-83.72
	Gross Cropped Area	57866 (100.00)	63871 (100.00)	65542 (100.00)	60935 (100.00)	57773 (100.00)	61427 (100.00)	62236 (100.00)	61935 (100.00)	62495 (100.00)	62434 (100.00)	7.89

(Figures in the parenthesis indicate the percentage over gross cropped area)

Changes in Cropping Pattern in Samudrapur Tahsil of Wardha District

The changes in cropping pattern in Samudrapur tahsil of Wardha district during 2005-06 to 2014-15 are presented in Table 6.

Figures shown in 2005-06 revealed that cotton contributed 15.41 per cent of gross cropped area. In the span of 10 years copping pattern has changed substantially. The proportion of soybean was 59.13 per cent in 2005-06 and increased to 66.87 per cent in 2008-09 but it has reduced to 26.57 per cent in 2014-15. In case of cotton its share over gross cropped area has increased to 51.72 per cent in 2014-15 from 15.14 per cent in 2005-06 which is emerged as the major crop of the tahsil. There is decrease in the area under kharif jowar, wheat, tur and soybean during the study period i.e. from 0.30 per cent in 2005-06 to 0.01 per cent in 2014-15 of kharif jowar and 5.01 per cent in 2005-06 to 0.83 per cent in 2014-15 of wheat and 12 per cent in 2005-06 to 8.71 per cent in 2014-15 of tur and 59.13 per cent in 2005-06 to 26.57 per cent in 2014-15. The per cent change over base period 20005-06 for cotton is 340.98 per cent which indicate increase of acreage under this crop. The area of kharif jowar, wheat, tur, mung and soybean has been shifted to cotton. There is positive change in udid by 266.67 per cent, gram by 172.97 per cent and other crops by 24.36 per cent next to cotton over base period 2005-06. The gross cropped area has increased by 31.41 per cent over base period 2005-06.

Conclusions

Growth rates of kharif jowar, soybean declined significantly and that of cotton, wheat increased significantly. Kharif jowar, soybean, cotton showed high instability while wheat, gram, tur, mung and udid showed stagnancy in all the selected tahsils of Wardha district. Area growth rates of cotton were positively significant in Arvi, Ashti, Devali and Samudrapur tahsils of Wardha district at 1% level of significance. Over a period of study cropping pattern has changed in selected tahsils of Wardha district. Kharif jowar, soybean, cotton have high instability while wheat, gram, tur, mung and udid have stagnancy in area expansion in all the selected tahsils of Wardha district. Cotton is one of the major crops of all the selected tahsils of Wardha district. Tahsil wise proportions of area under cotton in 2014-15 were Arvi (39.50 per cent), Ashti (43.35 per cent), Devali (37.27 per cent) and Samudrapur (51.72 per cent). The area under soybean is found to be decreasing in selected tahsils (i.e. study area) of Wardha district.

Table 6 Changes in Cropping Pattern in Samudrapur Tahsil of Wardha District

S. No.	Crops	Years										Percen -tage Change Over Base Period
		2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	
1	Kh Jowar	207 (0.30)	81 (0.11)	31 (0.04)	10 (0.01)	58 (0.07)	15 (0.02)	11 (0.01)	9 (0.01)	7 (0.01)	3 (0.01)	-98.55
2	Wheat	3438 (5.01)	3868 (5.33)	4739 (5.84)	2010 (2.68)	4200 (5.65)	4723 (5.59)	3232 (3.80)	3236 (3.89)	3444 (3.78)	750 (0.83)	-78.18
3	Gram	3271 (4.77)	3659 (5.04)	6320 (7.79)	4050 (5.41)	998 (1.34)	11046 (13.09)	7500 (8.82)	7190 (8.65)	8594 (9.43)	8929 (9.91)	172.97
4	Tur	8902 (12.98)	10793 (14.87)	13165 (16.24)	9400 (12.55)	10167 (13.68)	10167 (12.05)	9241 (10.87)	7639 (9.19)	7135 (7.83)	7854 (8.71)	-11.77
5	Mung	20 (0.03)	16 (0.02)	16 (0.02)	16 (0.02)	16 (0.02)	12 (0.01)	80 (0.09)	27 (0.03)	22 (0.02)	18 (0.02)	-10.00
6	Udid	3 (0.01)	2 (0.01)	5 (0.01)	6 (0.01)	5 (0.01)	9 (0.01)	50 (0.05)	19 (0.02)	13 (0.02)	11 (0.01)	266.67
7	Cotton	10565 (15.41)	10605 (14.61)	9079 (11.20)	8900 (11.88)	19740 (26.56)	34995 (41.48)	36000 (42.07)	34941 (42.07)	36909 (40.51)	46590 (51.72)	340.98
8	Soybean	40539 (59.13)	42202 (58.16)	46338 (57.17)	50058 (66.87)	37980 (51.11)	22325 (26.46)	28480 (33.51)	29500 (35.53)	32769 (35.97)	23931 (26.57)	-40.97
9	Other crops	1605 (2.34)	1334 (1.83)	1347 (1.66)	408 (0.54)	1143 (1.54)	1064 (1.26)	418 (0.49)	475 (0.57)	2215 (2.43)	1996 (2.21)	24.36
	Gross Cropped Area	68550 (100.00)	72560 (100.00)	81040 (100.00)	74858 (100.00)	74307 (100.00)	84356 (100.00)	85012 (100.00)	83036 (100.00)	91108 (100.00)	90082 (100.00)	31.41

(Figures in the parenthesis indicate the percentage over gross cropped area)

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