

Instability in Agricultural production

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ABSTRACT

The production of rice in Ratnagiri district has increased with significant productivity of rice by 46.80 kg/ha (2.26%). This has resulted into significant increase in productivity of total foodgrains by 41.84kg(2.57%) in Ratnagiri district. During the same period productivity of total foodgrains was increased by 33.17kg/ha (1.94%) in Konkan region 15.81kg/ha (1.98%)in Maharashtra State. In this period area under rice has increased significantly for the state 6214ha (0.39%),while area under fruits & Vegetables showed significant increase by 1383ha(6.69%)in Ratnagiri District, 3579ha(6.40%)in Konkan region and 166663ha (4.25%) in Maharashtra State.In Ratnagiri district regarding instability index for area under different crops revealed that instability for total foodgrains was 8.96% and area under total cereals was 13.58%. The productivity of total foodgrains was 7.63% which was comparatively stable. The productivity of rice and total cereals was comparatively stable (i.e. 10.43% and 10.93% respectively) except productivity of total oilseed (25.94%). In Maharashtra State area under total cereals, rice and total pulses was stable as compared to area under total oilseeds. The production of rice, total cereals and total foodgrains was stable as compared to total oilseeds. The productivity of total cereals and total foodgrains was comparatively stable (13.64%and 13.68%)as compared to total pulses (17.67%)and total oilseeds(17.55%).Productivity of total food grains was stable for Ratnagiri district (7.63%) and Konkan region (7.51%) while it was unstable(13.68%) for Maharashtra state. This has indicated better signs for agricultural development in Ratnagiri district over Maharashtra state.

Key words: Area, Production, Productivity, Instability.

INTRODUCTION

Development of the nation lies in the development of the villages; some attempts have been made to study the evaluation of level of development in agriculture sector, infrastructure service sector and overall socio-economic sector. It would be quite interesting and useful to evaluate the level of development of district, since there has been a growing consensus about the need of district level planning in the country. Moreover, knowledge of the level of development at district level will help in identifying where it stands in relation to others. The present study highlights the growth performance of agricultural production in Ratnagiri district.

MATERIALS AND METHODS

The secondary data of area, production and productivity for Ratnagiri district, Konkan region and Maharashtra state was compiled from various Report of Government of Maharashtra for the period from 1980-81 to 1998-99 and it was analysed to study the growth and instability in agricultural production

Compound growth rate :

Compound growth rates were estimated to study the percentage increase or decrease in the selected parameters. The following exponential growth function

was used.

$$y = ab^x e$$

Where,

y = Dependent variable for which growth is stimulated

a = Intercept or constant

b = Regression / Trend coefficient

x = Period (in years)

e = Error term with zero mean and constant variance

b = 1 + r where, 'r' is compound growth rate

C.G.R. (%) = (b-1)× 100

Instability:

$$C.V.(%) = \frac{S.D.}{Mean} \times 100$$

The linear trend was fitted using the equation,

$$Y = a + bX + e$$

$$C.V.(%) = \frac{S.D.}{Mean} \times 100 \times \sqrt{1 - r^2}$$

Where, r^2 = Coefficient of multiple determination

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RESULTS AND DISCUSSION

Growth rates of area under principal crops :

The growth rates in the area under principal crops in Ratnagiri district, Konkan region and Maharashtra State is calculated and given in Table 1.

(1.96%) in Ratnagiri district, 2796 ha. (0.45%) in Konkan region and 162516 ha. (0.92%) in Maharashtra State.

Total condiments and spices :

In Ratnagiri district, during period 1981-99, area

Table 1 : Growth rates of area under different crops (1980-81 to 1998-99).

Particulars	Ratnagiri district		Konkan region		Maharashtra State	
	Linear growth rate (00 ha.)	Compound growth rate (%)	Linear growth rate (00 ha.)	Compound growth rate (%)	Linear growth rate (00 ha.)	Compound growth rate (%)
Rice	-8.63	-0.72	-5.28	-0.11	62.14*	0.39*
Ragi	-9.33**	-3.20**	-13.89**	-1.81**	-37.09**	-2.01**
Total cereals	-28.75**	-2.03**	-29.09**	-0.51**	-0.82**	-0.69**
Total pulses	-0.260	-0.43	2.73	1.07	557.00**	1.77**
Total foodgrains	-29.03**	-1.96**	-27.96*	-0.45*	-1625.16	-0.92*
Total condiments and spices	0.006	0.12	2.73**	4.93**	45.72**	2.10**
Total fruits and vegetables	13.83**	6.69**	35.79**	6.40**	166.63**	4.25**
Total food crops	-16.78	-0.87	29.26**	0.44**	503.86**	0.33**
Total oilseeds	-1.61	-2.90	2.76	1.85	989.96**	3.67**
Total non-food crops	9.21	0.73	53.18**	2.05**	752.29**	1.31**

* Significant at 5% level

** Significant at 1% level

Rice and ragi :

In Ratnagiri district and Konkan region, the growth rates of area under rice showed a non-significant results for area under rice. But in Maharashtra State, there was significant increase of 6214 ha. (0.39%) in area under rice. The growth rates of area under ragi showed a significant decrease of 933 ha. (3.20%) in Ratnagiri district. In Konkan region, there was a significant decrease of 1389 ha. (1.81%) while it was 3709 ha. (2.01%) in Maharashtra State.

Total cereals :

During 1980-81 to 1998-99, the growth rates of area under total cereals showed a significant decrease of 2875 ha. (2.03%) in Ratnagiri district, 2709 ha. (0.51%) in Konkan region and 8200 ha. (0.69%) in Maharashtra State.

Total pulses :

During period 1980-81 to 1998-99, the growth rates of area under total pulses showed non-significant results in Ratnagiri district and Konkan region. There was significant increase of 55700 ha. (1.77%) in area under total pulses in Maharashtra State.

Total foodgrains :

During 1981-1999, the growth rates of area under total foodgrains showed significant decrease of 2903 ha.

under total condiments and spices showed non-significant results. In Konkan region and Maharashtra State, there was significant increase of 273 ha. (4.93%) and 4572 (2.10%) respectively.

Total fruits and vegetables :

During period 1980-81 to 1998-99, the growth rates of area under total fruits and vegetables showed significant increase of 1383 ha. (6.69%) in Ratnagiri district, 3579 ha. (6.40%) in Konkan region and 166663 (4.25%) in Maharashtra State.

Total food crops :

Growth rates in area under total food crops showed a non-significant results in Ratnagiri district. A significant increase of 2926 ha. (0.44%) and 50386 ha. (0.33%) in area under total food crops in Konkan region and Maharashtra State, respectively.

Total oilseeds :

The growth rates of area under total oilseeds showed non-significant results in Ratnagiri district and Konkan region. In Maharashtra State, there was a significant increase of 98996 ha. (3.67%) in area of total oilseed

In Ratnagiri district, non-significant results were seen for area under non-food crops. A significant increase

of 5318 ha. (2.05%) and 75229 ha. (1.31%) was observed in Konkan region and Maharashtra State, respectively.

Growth rates in production of principal crops :

Growth rates in production of principal crops were calculated and presented in Table 2

showed non-significant results in Ratnagiri district, while in Konkan region, it was significantly increased by 14210 M.T. (1.40%) and in Maharashtra State increased by 128306 M.T. (1.35%).

The production of total pulses was significantly increased by 107 M.T. (5.92%) and 85900 M.T. (5.75%)

Table 2 : Growth rates of production of principle crops(1980-81 to 1998-99).

Particulars	Ratnagiri district		Konkan region		Maharashtra State	
	Linear growth rate (00 ha.)	Compound growth rate (%)	Linear growth rate (00 ha.)	Compound growth rate (%)	Linear growth rate (00 ha.)	Compound growth rate (%)
Rice	20.03	1.39	160.44**	1.75**	228.15*	1.03*
Total cereals	10.60	0.73	142.10**	1.40**	1283.06*	1.35*
Total pulses	1.07**	5.92**	8.59**	5.75**	-66.90	2.68
Total foodgrains	10.57	0.72	138.56**	1.36**	1634.17*	1.52*
Kharif groundnut	0.42	-1.55	0.71**	7.87**	21.23	0.47
Summer groundnut	0.60**	10.42**	4.12**	8.96**	-0.30	0.82
Total oilseeds	1.08**	5.47**	6.41**	8.70**	772.54	5.71

* Significant at 5% level

** Significant at 1% level

Rice :

Growth rates in production of rice showed non-significant results in Ratnagiri district. Also the growth rate of production of rice in Konkan region was statistically significant i.e. 16044 M.T. (1.75%) and in Maharashtra State, it was 22815 M.T. (1.03%). It is seen from the table that production of rice was significantly increasing in Konkan region and Maharashtra State except Ratnagiri district. There is need of further increase in production of rice in Ratnagiri district.

in Ratnagiri district and Konkan region. But in Maharashtra State, linear growth rates of production of total pulses showed non-significant results and compound growth rates showed significant increase by 2.68 per cent.

It is seen from the table that production of total cereals showed non-significant results in Ratnagiri district. There is need to increase production of total cereals in Ratnagiri district.

The productivity of total cereals showed significant increase of 4084 kg.(2.44%), 3533 kg. (1.94%) and 1933 kg. (2.17%) in Ratnagiri district, Konkan region and Maharashtra State, respectively.

Total cereals and total pulses :

The growth rates of production of total cereals

Table 3 : Growth rates of productivity of different crops (19890-81 to 1998-99).

Particulars	Ratnagiri district		Konkan region		Maharashtra State	
	Linear growth rate (kg/ha)	Compound growth rate (%)	Linear growth rate (kg/ha)	Compound growth rate (%)	Linear growth rate (kg/ha)	Compound growth rate (%)
Rice	46.80**	2.26**	-2.51	0.35	-12.84	-0.13
Other cereals	-1.18	-0.40	0.79	0.089	27.89**	2.77**
Total cereals	40.84**	2.44**	35.33**	1.94**	19.33**	2.17**
Other pulses	11.41**	3.21**	14.19**	3.88**	10.82*	3.09*
Total pulses	13.65**	3.75**	17.02**	4.50**	12.76**	2.71**
Total foodgrains	41.84**	2.57**	33.17**	1.94**	15.81**	1.98**
Total oilseeds	27.49**	6.001**	79.89	8.52**	23.44**	3.39**

* Significant at 5% level

** Significant at 1% level

Total pulses :

Growth rates in productivity of total pulses showed significant increase of 1365 kg. (3.75%), 1702 kg. (4.50%) and 1276 kg. (2.71%) in Ratnagiri district, Konkan region and Maharashtra State, respectively.

Total foodgrains and total oilseeds :

Growth rates of productivity of total foodgrains was significantly increased by 4184 kg (2.57%), 3317 kg. (1.94%) and 1581 kg (1.98%) in Ratnagiri district, Konkan region and Maharashtra State, respectively.

Significant results were observed in growth rates of total oilseeds and increase of 2749 kg (6.00%), 7989 kg (8.52%) and 2344 kg. (3.39%) in Ratnagiri district, Konkan region and Maharashtra State, respectively

Instability indices of important crops in Ratnagiri district, Konkan region and Maharashtra State:

In order to study the variability in different crops in regard to area, production and productivity; an index of instability was calculated. The linear trend was fitted to data, wherever the regression coefficients were significant. The variation around the trend rather than variation around the mean was used as an index of instability. Cropwise instability for area, production and productivity is presented in Table 4

Total foodgrains Production of total foodgrains showed non-significant results in Ratnagiri district. It was significantly increased by 13856 M.T. (1.36%) in Konkan region and 163417 M.T. (1.52%) in Maharashtra State

Total oilseeds :

The growth rates in production of total oilseeds showed significant increase of 108 M.T. (5.47%) in Ratnagiri district and 641 M.T. (8.70%) in Konkan region, while in Maharashtra State, growth rates of production of total oilseeds showed significant increase of 77254 M.T. (5.71%).

Growth rates in productivity of principal crops :

Further Growth rates in productivity of principal crops were calculated and given in Table 3

Rice :

The productivity of rice showed significant increase of 4680 kg. (2.26%) in Ratnagiri district and productivity of rice showed non-significant results in Konkan region and Maharashtra State.

Other and total cereals :

Productivity of other pulses showed non-significant results in Ratnagiri district and in Konkan region and showed significant increase of 2789 kg. (2.77%) in the Maharashtra State.

It is observed from Table that, instability index for the area under different crops for total foodgrains was 8.96 per cent and area under total cereals was 13.58 per cent. The instability in case of production of total pulses and total oilseeds was 29.82 and 26.18 per cent, respectively. The productivity of total foodgrains was 7.63 per cent which was comparatively stable. The productivity

Table 4 : Instability indices of important crops.

Crop	Particulars	Instability indices		
		Ratnagiri district	Konkan region	Maharashtra State
Rice	Area	-	-	4.01
	Production	-	7.31	8.89
	Productivity	10.43	-	-
Total cereals	Area	13.58	2.93	2.82
	Production	-	7.06	14.94
	Productivity	10.93	7.52	13.64
Total pulses	Area	-	-	5.98
	Production	29.82	20.81	-
	Productivity	19.56	16.11	17.67
Total foodgrains	Area	8.96	-	-
	Production	-	6.95	14.63
	Productivity	7.63	7.51	13.68
Total oilseeds	Area	-	-	11.64
	Production	26.18	45.06	125.61
	Productivity	25.94	-	17.55

APPENDIX I: Instability indices of important crops in Ratnagiri district

Crop	Particulars	Reg. Coefficient	R ²	C.V. (%)	Instability indices
Rice	Area	-8.63	0.1034	19.01	-
	Production	20.03	0.1075	20.29	-
	Productivity	46.80**	0.608	16.66	10.43
Total cereals	Area	-28.75**	0.4813	18.86	13.58
	Production	10.60	0.24	17.90	-
Total pulses	Productivity	40.80**	0.6234	17.82	10.93
	Area	-0.260	0.0007	30.87	-
	Production	1.07**	0.5068	42.47	29.82
Total foodgrains	Productivity	13.65**	0.5279	28.48	19.56
	Area	-29.03**	0.7700	18.69	8.96
	Production	10.57	0.0243	17.78	-
Total oilseeds	Productivity	41.84**	0.8193	17.95	7.63
	Area	-1.61	0.083	54.10	-
	Production	1.08**	0.5158	37.63	26.18
	Productivity	27.49**	0.644	43.49	25.94

** Significant at 1% level

of rice and total cereals was comparatively stable (i.e. 10.43% and 10.93%, respectively) except productivity of total oilseeds (25.94%).

In Konkan region, regarding the instability index for area under different crops, it was stable for total cereals (2.93 per cent). The instability indices for production of rice, total cereals and total foodgrains were low (7.31%, 7.06% and 6.95%) whereas instability indices for production of total pulses and total oilseeds were higher (20.81% and 45.06%). This indicated that the production of rice, total cereals and total foodgrains was comparatively stable than production of total pulses, while production of total oilseeds was unstable. Productivity of total cereals and total foodgrains was comparatively stable, while productivity of total pulses was unstable (16.11%).

In Maharashtra State, instability indices for area under total cereals, rice and total pulses were observed to be less (2.82%, 4.01% and 5.98%, respectively) whereas instability indices for area under total oilseeds was high (11.64%). This revealed that area under total cereals, rice and total pulses was stable as compared to area under total oilseeds. The instability index for production of rice, total cereals and total foodgrains was

low (8.89%, 14.94% and 14.63%), while production of total oilseeds was more (125.61%). The production of rice, total cereals and total foodgrains was stable as compared to total oilseeds. The productivity of total cereals and total foodgrains was comparatively stable (13.64% and 13.68%) as compared to total pulses (17.67%) and total oilseeds (17.55%)

Conclusions:

In Ratnagiri district regarding instability index for area under different crops revealed that instability for total foodgrains was 8.96% and area under total cereals was 13.58%. The productivity of total foodgrains was 7.63% which was comparatively stable. The productivity of rice and total cereals was comparatively stable (i.e. 10.43% and 10.93% respectively) except productivity of total oilseed (25.94%).

In Maharashtra State area under total cereals, rice and total pulses was stable as compared to area under total oilseeds. The production of rice, total cereals and total foodgrains was stable as compared to total oilseeds. The productivity of total cereals and total foodgrains was comparatively stable (13.64% and 13.68%) as compared

APPENDIX II : Instability indices of important crops in Konkan region.

Crop	Particulars	Reg. Coefficient	R ²	C.V. (%)	Instability indices
Rice	Area	-5.28	0.1106	2.07	-
	Production	160.44**	0.66	12.54	7.31
	Productivity	-2.51	0.007	26.49	-
Total cereals	Area	-29.09**	0.5135	4.21	2.93
	Production	142.10**	0.57	10.77	7.06
Total pulses	Productivity	35.33**	0.700	13.74	7.52
	Area	2.73	0.028	23.33	-
	Production	8.59**	0.65	33.77	20.8
Total foodgrains	Productivity	17.02**	0.6859	28.75	16.11
	Area	-27.96	0.2830	5.12	-
	Production	138.56**	0.56	10.48	6.93
Total oilseeds	Productivity	33.17**	0.6982	13.66	7.51
	Area	2.76	0.086	31.52	-
	Production	6.41**	0.60	47.14	45.06
	Productivity	79.89	0.076	166.88	-

** Significant at 1% level

APPENDIX III : Instability indices of important crops in Maharashtra State.

Crop	Particulars	Reg. Coefficient	R ²	C.V. (%)	Instability indices
Rice	Area	62.14*	0.269	4.67	4.01
	Production	228.15*	0.2453	11.79	8.89
	Productivity	-12.84	0.016	33.69	-
Total cereals	Area	-0.82**	0.6801	4.99	2.82
	Production	1283.06*	0.2134	16.85	14.94
Total pulses	Productivity	19.33**	0.4629	18.62	13.64
	Area	557.00**	0.751	11.99	5.98
	Production	-66.90	0.52	113.18	-
Total foodgrains	Productivity	12.76**	0.4590	24.03	17.67
	Area	-1625.16	0.1857	15.49	-
	Production	1634.17*	0.2672	17.09	14.63
Total oilseeds	Productivity	15.81**	0.4209	17.98	13.68
	Area	989.96**	0.7830	25.00	11.64
	Production	772.54**	0.026	127.28	125.61
	Productivity	23.44**	0.5947	27.57	17.55

* Significant at 5% level

** Significant at 1% level

to total pulses (17.67%) and total oilseeds (17.55%).

Productivity of total food grains was stable for Ratnagiri district (7.63%) and Konkan region (7.51%) while it was unstable (13.68%) for Maharashtra state. This has indicated better signs for agricultural development in Ratnagiri district over Maharashtra state.

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Received : September, 2006; Accepted : June, 2007