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Dynamics of Horticultural Crops in Karnataka an Hozels Decomposition Analysis

KEYWORDS

Horticulture sector, Decomposition analysis Karnataka

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ABSTRACT *Karnataka is a progressive in the field of modern Horticulture in the country the diverse agro-eco logical conditions prevailing in Karnataka has made it possible to grow different types of horticultural crops such as fruits, vegetables, flowers, spices, plantation crops, root and tuber crops, medicinal and aromatic crops Karnataka is the 3d largest producer of fruits and stands 5th in area and production of vegetable crops state stands 1st in area and 3rd in production of flowers crops. It occupies 2nd and 3rd position with respect to area and production of plantation crops, Karnataka is the largest producer of spices Aromatic and medicinal crops Karnataka is one of the more progressive states with great potential for horticultural development the states is blessed with ten different agro-climatic regions suitable for growing variety of fruits and vegetables around the year. The horticultural crops grown in Karnataka are grouped into four brand categories viz (1) fruits (2) vegetables (3) spices / plantation crops and (4) commercial flowers a part from this cultivation of potential high value crops like aromatic and medicinal herbs have also been taken up in certain area. The secondary data was collected from the Directorate of Economics and Statistics, Government of Karnataka, Bengaluru for vegetable crops of Karnataka state ranging from 1995 to 2014.*

INTRODUCTION

Karnataka is a progressive state in the field of modern Horticulture in the country the diverse agro- ecological conditions prevailing in Karnataka has made in possible to grow different types of Horticultural crops such as fruits, vegetables, flowers, spices, plantation crops.

Instability in time data may be defined as the extent of fluctuations present in the observations. Instability between two or more time series data may be compared on this basis. Several authors in the past have tried to study the instability by dividing the whole period into two halves and made comparative study of variability in the two periods.

Sen (1967) and Swaminthan (1980) have examined the instability in Indian Agriculture for different time periods based on the number of peaks and troughs in the data. Sen has pointed out that certain amount of variation in food grain production was unavoidable due to weather hazards; hence he suggested that a variation up to the level of 5 per cent between a peak and a subsequent trough should be ignored for measurement of instability. It is an arbitrary and crude method of analysis and lacks further statistical manipulations. It is, therefore, suggested that the principle of control chart may be applied, i.e. a band around the mean value by taking upper and lower limits as mean ±3SD should be formed. Any peak point above the upper limit or any low point below the lower limit should be considered significant and conclusions may be based only such points, rather than on all peak and trough points.

The yield of any crop can be forecast from the general growth pattern of the crop and effect of biotic and a biotic factors. Prediction of yield has its short and long term benefits. Agriculture remains at the heart of the economy of every State. It also has a considerable weight in the composition of the State's Gross Domestic Product (GDP). On instability, while some have claimed a decline, others have shown an increase and have arrived at conclusion that "production instability is an inevitable consequence of rapid agricultural growth, and there is little that can effectively be done about it" (Hazell, 1982). Such conclusions are now increasingly gaining reduces in the context of the observation made by Sen (1967) on the historical pattern of growth and instability in India's food grain production since 1901. Analysis of the sources of growth and fluctuations in crop production were initially focused on decomposition of changes in aggregate output into the contribution of changes in area, crop pattern and yield per hectare (Minhas and Vaidyanathan, 1965).

A larger part of the increase has been attributed that the new technology had destabilizing effect on production and therefore, the production instability increased in India. This increasing instability leads to wide fluctuations in prices which in turn may lead to inefficiency in production and adverse income distribution. Hence, increased production instability is a matter of great concern to policy makers.

Decomposition Analysis to measure the Instability in Horticulture

the development of Horticulture ushered in by green revolution has not been an unmixed blessing while the introduction of new and improved verities of crops increasing irrigation potential coupled with other crucial inputs has given respected ability to Indian Horticulture it has also shown several grey areas of poor and asymmetrical growth and development this generally hard that the rise in the growth of cereal production is accompanied by increased variability over time the output of the crops fluctuates widely and in varying degrees between states between farms in the same state and between years due to fluctuation in the weather conditions such increased variability has far reaching economic implications to achieve higher growth with stability it is essential to Analyse the sources of growth and fluctuation in the output of the crops both at the macro as well as micro levels taking into accounts the appropriate statistical methods this research study on growth and instability in Horticulture is devoted towards this end and deals with in particular the methodological issue for measurement of growth and stability.

In the wake of increasing population pressures and mount-

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ing food shortage the Horticultural production has undergone a radical charge in most of the developing countries during the last two and a half decades the new Horticultural technology has introduced greater variability in crops output along with the upward shift in productivity and production year to year fluctuations in crops output generate instability which has far reaching economic implications. Particularly in under development and developing countries the problem of instability in Horticulture has engaged the attention of scientists and planners in the recent past and has led to the development of various statistical technologies for measurement of instability in crop output.

Need for decomposition model: Decomposition models are models that are helpful in the Horticultural and non Horticultural sectors where segregation of component elements is important in Horticultural research institutions of verities countries composition models have been applied to study the contribution of component elements in the charge of crops output and this research s limited to the components Analysis of crop research more importantly identification and measurements of component elements in the charge of crop production identification and quantification of sources of variance in crops production over space and time decomposition of output with the introduction of new technology in the farming system.

Production could logically be expanded either by putting more area under the crops (S) or by improving the productivity of the crop (S) or both various literatures also evidenced that the change in value of the crop (S) output over time have been attributed to change in area yield price and their interactions besides the internal factors of course of course the external factors like price of inputs, rainfall, soil conditions etc., could also attribute to the production increment but are not under the control of decision maker at the time of decision making investigation or research problem has been given attention for those endogenous and measurable factors the whole idea behind this research study therefore is to explain the metamorphic growth of decomposition models along with their mathematical produces and their area of application the various case studies are also included for demonstration expected in so far research works

Putting more area under crops enable increase in the production of crops at either farm or national levels expansion of production could also be possible by developing high yielding farmer preferred crop variety (ies) through Horticultural research normally the cumulative effect of both area and productivity is also expected to bring substantial increment in production over time. Hence quantification of the contribution of area productivity and their integration in numerical terms is of paramount importance for researchers planners policy makers, teachers, extension personnel farmers and soon the same may be achieved by using decomposition models.

Researchers could be able to know crops having productivity potential to plan their variety development program in case of other having less potential for increasing productivity per unit area researches come to know crops for which improvement method of production can increase their production in and included under research program crops which area highly influenced by yield instability may take priority compared to those influenced by area instability area instability is also an interesting signal for researchers in that the reasons and this instability help than to identity competitive crops to the crops under question to launcls research program in this manner the researchers get advantage of formation in setting of priority for their forth coming research activities to develop high yielding post tolerant in sustainable crop varieties to help and advance the production economy.

In any country, every activity, either financial or physical is to the knowledge of planners as they are dealing with arrangement of horticultural and non- horticultural activities in the order of their priority. The quality of development goes with the quality of priority setting, which could be made possible by utilizing more reliable information generated in the country by various entities. In this regard, research workers generate, beside others, information on the contribution of component elements in boosting the production of crops that might help planners to adjust their priority areas to launch resolutions.

MATERIAL AND METHODS

Description of study area

The study pertains to Karnataka state including all districts of the state. Karnataka is the eighth largest state in India with a population of 52.8 million. Karnataka is bounded by Maharashtra and Goa on north, Andhra Pradesh on east, Arabian Sea on west and Tamil Nadu and Kerala on South.

Source of Data

The Secondary data for the research study has been collected from the Directorate of Economics and Statistics, Government of Karnataka, Bangalore.

Nature of Data

For the illustration of Hazel method of Decomposition, the data was collected for cereal crops of Karnataka state (including all the major cereal growing districts) ranging from 1984 to 2005. The secondary data was obtained from the Department of Economics and Statistics, Bangalore.

Parameters included for the study area

The basic data comprise time-series information on area sown and annual production. Here, yield was estimated for each crop and year by dividing the relevant production figures by the area sown.

Decomposition Analysis

The credibility of the growth of decomposition model over years goes to the consistent dedication of horticultural scientists and statisticians in increasing the precision of component analysis. According to the past component studies, the components include area, yield, price, and their interactions or any others. On the other hand, component of change in production of crops at state or national level can be attributed to change in individual production by districts or states respectively. However, over years, the number of factors included in the model and the way they were interpreted varies leaving the limitations and amendments on successive stages. Finally, the decomposition methods commenced by Sastri and Sharma (1959) passed through various modifications and by 1982, Hazel gave the last version of variance decomposition model. Under this chapter, the researcher has made an effort to discuss the different decomposition models keeping the stages of development as a base.

Additive Models

Conventional Decomposition Methods

The conventional method of decomposing of crop output was introduced by Sastri and Sharma (1959).

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Let P_n, A_n and Y_n be the production, area and mean yield in the nth year and P_0, A_0 and $\bar{Y}_0$ for the base years.

The change in production can be given by $\Delta P = P_n - P_0$.

The change in area under certain crop is given by $\Delta A = A_n - A_0$

The change in mean yield is given by $\Delta Y = Y_n - Y_0$.

The percentage change in area = $\frac{\Delta A}{A_0} = \times 100$

The percent change in mean yield = $\frac{\Delta \bar{Y}}{\bar{Y}_0} \times 100$

Minhas Decomposition Model

A more advanced decomposition model was suggested by Minhas (1964). The increase in production has been split into two component elements i.e.,

$$P_n - P_0 = (\bar{Y}n - \bar{Y}_0)\,A_n + (A_n - A_0)\,\bar{Y}_0$$

The first component when divided by the left-hand side has been taken as the contribution due to yield and the second component as contribution due to area. In a more understandable and simple way the relative contribution of yield has been computed as = $\frac{(\bar{Y}n - \bar{Y}_0)\,A_n}{P_n - P_0}$

$$\frac{(A - A_0)\bar{Y}_0}{P_n - P_0}$$

and the contribution of area to the stability is given as = .

Minhas and Vaidyanathan Decomposition Model

Minhas and Vaidyanathan (1965), who used for the first time an additive scheme of decomposition, pioneered the decomposition analysis of the growth of crop output in India. Both this scheme the growth of crop output was segregated into a set of physical factors, viz., area, yield rate and cropping pattern as well as an interaction term between the latter two.

Crop	Weight	Proportion of area in year		Yield in year	
		0	t	0	t
C_1	W_1	C_{10}	C_{1t}	Y_{10}	Y_{1t}
C_2	W_2	C_{20}	C_{2t}	Y_{20}	Y_{2t}
.	.	.	.	.	.
.	.	.	.	.	.
.	.	.	.	.	.
C_n	W_n	C_{n0}	C_{nt}	Y_{n0}	Y_{nt}

They confine their analysis to 28 crops, the *Ci*'s; *Wi*'s are constant price weights assigned to different crops and consists of three-year average all-India wholesale prices. C_{i0}'s and C_{it}'s are proportions of area occupied by different crops in years 0 and *t*, the representation of crop pattern which is a three-year average on either end. Y_{i0}'s and Y_{it}'s are base and final year yields-again these are three-year averages on each end.

They used the following symbols for output and area:

P0 = Crop output in year 0
Pt = Crop output in year t
A0 = Gross crop output in year 0
At = Gross crop output in year t

Definitions:

$$P_0 = A_0 \sum_i W_i C_0\ Y_0$$

Assuming that every new gross crop acre is as good as an average acre already under cultivation, we can split up the increases in crop production over the time period of our study into their component elements in the following man-

$$P_t - P_0 = (A_t - A_0)\Sigma W_i C_0\, Y_0 + A_t \Sigma W_i C_0\,(Y_t - Y_{i0}) + A_t \Sigma W_i Y_{i0}(C_t - C_{i0}) + A_t \Sigma W_i (Y_t - Y_{i0})(C_t - C_{i0})$$

ner Where,

W_i = constant price weights assigned to different crops and consists of three years average all India wholesale prices; C_i = crops; C_{io}, C_{it} = proportion of area occupied by different crops in year 0 and t, the representation of cropping pattern which is a three years average on either end;Y_{i0}, Y_{it} = proportion of area occupied by different crops in year 0 and t, Y_{10}, Y_{1t} = base and final year yields, again these are three years averages on either end; P_o, P_t = crop output in year 0 and t; A_0, A_t = gross cropped area in year 0 and t.

In this additive scheme of decomposition, the first element on right hand side of the equation is the area effect. That is, an increase in output of this magnitude could have taken place in the absence of any changes in per acre yields and the crop pattern. The second term in the equation is the effect of yield changes for a constant crop pattern. The third element portrays the effect of changes in crop patterns in the absence of any changes in per acre yields. The last element measures the effect on output which could be attributed to interaction between per acre yield changes and the changes in crop patterns. At the back of this arbitrary scheme of composition, there analytical design: component elements are so chosen that the contribution to output growth are determined by more or less independent sets of factors. Each of these sets of factors can be separately analyzed and these analyses should provide the building blocks for constructing output projections.

RESULTS AND DISCUSSION:

Decomposition Analysis: Earlier may researchers have attempted on decomposition of crop output or value of crop production into their component elements for the purpose of demonstration of the likely outputs from decomposition models the researcher has used Karnataka state data and tabulated results are presented under this chapter for the methods mentioned in the methodology chapter the researcher has organized the results in such a way that the reader could easily understood the metamorphic growth of various decomposition models.

The conventional method was applied by sastri and sharme (1959 and 1960) the model developed by minihast (1964) minhas and vaidyana than (1965) was however applied by narula and sagar (1973) for comparison with the alternative and least bias methods Hazell (1984) applied his variance composition procedure on cereal production in India and united states in comparison to conventional method the method of decomposition developed by minhas narula and sagar and Hazel have been adapted for demonstration.

Table – 1 : percentage increase in area yield and production of Horticulture crops selected districts of Karnataka in 1999 to 2006 over 2007-2014

District	Area	Yield	Production
Bangalore-Urban	22.69	69.09	93.37

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Bangalore-Rural	26.28	19.96	16.65
Belgaum	176.87	102.69	81.15
Bellary	81.24	57.15	30.47
Bidar	207.45	120.68	8.46
Bijapur	44.71	69.25	57.99
Chickmagalur	86.87	78.98	61.57
Chitradurga	29.88	22.09	15.49
Dakshina Kannada	28.25	0.70	26.76
Dharwad	48.30	68.47	59.79
Gulbarga	24.77	50.59	87.80
Hassan	108.49	155.09	387.76
Kodagu	68.43	70.52	274.88
Kolar	43.03	50.52	42.38
Mandya	52.37	41.14	23.56
Mysore	28.79	50.18	20.25
Raichur	16.58	92.76	74.86
Shimoga	19.45	26.05	75.82
Tumkur	60.68	37.09	19.59
Uttara Kannada	92.82	58.78	37.27

Table 2: Growth rate and Relative Contribution of Component Elements by Using Minhas and Vaidyanathan Decomposition Model

Districts	Per cent increase attributed to					Overall rate of Growth
	Area	Yield	Crop Pattern	Interaction	Total	
Bangalore-Urban	69.93	7.98	22.38	-0.29	100	5.15
	(-3.59)	(-0.41)	(-1.15)	(-0.01)		
Bangalore-Rural	19.7	52.7	25	2.6	100	5.13
	(1.01)	(2.70)	(1.28)	(0.13)		
Belgaum	22.16	21.29	68.21	-11.66	100	4.56
	(1.00)	(0.96)	(3.09)	-(0.53)		
Bellary	37.29	48.71	11.32	2.68	100	4.38
	(1.63)	(2.12)	(0.49)	(0.12)		
Bidar	102	-18.37	6.9	9.47	100	4.5
	(4.28)	-(0.77)	(0.29)	(0.40)		
Bijapur	21.42	74.57	6.41	-2.4	100	4.09
	(0.87)	(3.04)	(0.26)	-(0.10)		
Chickmagalur	40.44	53.32	6.45	-0.21	100	4.08
	(1.65)	(2.17)	(0.26)	-(0.01)		
Chitradurga	31.92	42.6	46.43	-0.95	100	3.08
	(0.98)	(1.31)	(1.43)	-(0.03)		
Dakshina Kannada	9.74	48.75	36.61	4.9	100	3.70
	(0.30)	(1.49)	(1.12)	(0.15)		
Dharwad	17.73	76.51	16.72	-10.96	100	2.44
	(0.43)	(1.85)	(0.40)	-(0.27)		
Gulbarga	45.98	34.12	19.39	0.51	100	2.4
	(1.01)	(0.75)	(0.43)	(0.01)		
Hassan	99.27	15.89	-14.32	-0.93	100	1.26
	(1.23)	(0.20)	-(0.18)	-(0.01)		
Kodagu	32.34	61.87	7.33	-1.54	100	1.7
	(0.34)	(0.65)	(0.08)	-(0.02)		
Kolar	83.96	-54.02	74.92	-4.86	100	0.21
	(0.18)	-(0.11)	(0.16)	-(0.01)		
Mandya	45.38	45.83	8.16	0.63	100	3.58
	(1.62)	(1.64)	(0.29)	(0.02)		
Mysore	29.7	42.7	25	2.6	100	6.14
	(1.82)	(2.61)	(1.53)	(0.16)		
Raichur	12.16	31.29	59.31	-9.78	100	4.99
	(0.59)	(1.53)	(3.34)	-(0.57)		
Shimoga	47.29	38.71	11.32	2.68	100	4.38
	(2.06)	(1.69)	(0.49)	(0.12)		
Tumkur	92	-8.37	6.9	9.47	100	5.6
	(4.78)	-(0.45)	(0.36)	(0.49)		
Uttara Kannada	31.42	64.57	6.41	-2.4	100	5.09
	(1.60)	(3.28)	(0.33)	-(0.12)		
Karnataka	44.59	34.03	22.99	-0.62	100	3.8
	(1.65)	(1.26)	(0.85)	-(0.02)		

CONCLUSION

The present study has illustrated that, the yield per acre has contributed more than the area sown to the increase in production of vegetable in major vegetable growing districts in Sastri and Sharm's Conventional Decomposition Method. The results from Minhas Method revealed that, the contributions of area and average yield in increase in total production as both the components add up to 100. The percentage contribution of area has been decreasing in almost all the district for first three years and increasing in the last year. The percentage contribution of average yield has been positive in all the years but low in the last year. It was clear that the relative contribution of component elements vary a great deal from district to district. In 12 districts, the contribution due to improvements in yields was substantially higher than the state average.

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