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Change in Instability of Area and Production of Major Fruits and Vegetables Crops Stored in Cold Storages

Archana Meena[1], R.L. Meena[2], N.K. Meena[3]*, S. Chiphang[3]

[1]Department of Agriculture Economics & ABM, SHIATH- Allahabad, India
[2]Department of Extension Education, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi, UP, India
[3]College of Post Graduate Studies CAU (I), Umiam, Meghalaya, India

**Corresponding author*

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A B S T R A C T

The present study was conducted in Jaipur district of Rajasthan. To check the instability of major fruits and vegetable crops stored in cold storage moving average and coefficient of variations methods were used. Instability is one of the important decision parameter in development dynamics and moreover in the context of horticultural crop production. Coefficients of quadratic function estimated for instability in area and production of important fruit crops over time. Estimations were made for important eight fruit crops as well as for all fruit crops. Instability in the area under lemon, aonla, and pomegranate was shown decreasing over time at decreasing rate while instability in case of area of orange, sapota, mango, mosambi, and all fruits taken together were increasing at decreasing rate. Instability in the production of vegetable crops show decreasing in tomato, pea and sweet potato, whereas it was found to be increasing in carrot, onion, potato and all vegetables. Instability index in the area under fruit crops varied from 2.5 to 545.65. Maximum index in the area under fruit crops in only 545.65 and lowest one was observed in mango that is only 2.52. It shows that area under the fruit crops does not fluctuate as fluctuation is very low. The instability index varied from 54.08 in all vegetables to 2407.87 in the area of carrot. This shows that even highest instability in the area under vegetables is just half of highest Instability in the production of fruits or vegetables. In six cases instability index was less than one thousand and all the cases were less than 2500. In the case of vegetable production as well as instability index was less than 1000 in five out of seven cases and 1295.71 in one case that is sweet potato and 5326.94 in case of carrot. Pondering of the data shows that instability index was highest in production of fruits followed production of vegetables, area under vegetables and area under the fruit crops.

Introduction

The fruits and vegetable crops are the important source of nutrients. The living standard of the people can be judged by the per capita production and consumption of fruits and vegetables. The India is second largest producer of fruits in the world. India has a number of verities of fruits and vegetables (Bairwa *et al.*, 2012). The coefficient of variation in the production and productivity of banana during the study period

from 1965-66 to 1978-79 in India observed that at all India level the variation in production and productivity was almost equal, being hardly 8 per cent. High variation was noticed in MP and Andaman and Nicobar Island, which had high growth rate of 11.73 per cent and 7.4 per cent respectively. Minimum variation in area was observed in the state of Karla along with minimum growth in area. The maximum variation in production was once again noticed in case of MP, which had significant positive growth rate of 9.42 per cent per annum and the minimum in case of Assam. Though at all India level, the variation in productivity was small than individual state levels. There was considerable variation in productivity at state levels. Mizoram, which registered the highest coefficient of variation, also reported the highest negative growth rate of 16 per cent in productivity followed by Uttar Pradesh (Subramanian, 1982).

The instability in area, production and productivity of groundnut in case of Andhra Pradesh during 1949-50 to 1990-91 has shown that the extent of variability in area was relatively higher during the post-green revolution period compare to pre-green revolution period in Andhra Pradesh showing wide fluctuation in area under groundnut. The instability in production and productivity was also found to be high in the state in the post-green revolution period as compared to pre-green revolution period (Upender, 1993). Factors responsible for the instability in ginger production in Maharashtra state during 1970-71 to 1989-90 concluded that yield instability was dominant factor affecting production instability. Area, yield and their interaction effect was 32.51, 36.65 and 30.84 per cent respectively on variability in production of the crop (Gaikwad *et al.*, 1998). The coefficient of variation (CV) of rapeseed and mustard Production in Rajasthan state and in all the major growing districts has decreased during 1986-87 to 1997-98 over the period 1970-71 to 1985-86. During pre-TMO period coefficient of variations for the production, area and yield of rapeseed mustard were 74 per cent, 53 per cent and 31 per cent, respectively in Rajasthan (Kumar *et al.*, 2001). Studied on cultivation of potato for true seed production in Tripura from 1984-85 to 1999-2000 has shown that the magnitude of area and production of potato has significantly increased from 2625 hectare and 38400 million tons production in 1984-85 to 5575 hectare and 96650 million tons in 1999-2000 respectively. However the increase in productivity from 14628 kg per ha in 1984-85 to 17336 kg per ha in 1999-2000 was not significant. The farmer's share in consumer rupee was evaluated for pre and post cold storage potato under Sub room subdivision of south Tripura district (Majumadar *et al.*, 2002).

Materials and Methods

The study was conducted in the Jaipur district of Rajasthan and out of 35 cold storages eight were selected for the present study. For the collection of primary and secondary data, a well-structured questionnaire was prepared and on the basis of record of cold storages, and interview with managerial staff or owner of cold storage, primary data were collected. While secondary data on area and production of major fruits (Lemon, Orange, Sapota, Mango, Mosambi, Aonla and Pomegranate) and vegetables crops (Carrot, Onion, Pea, Potato, Sweet Potao and Tomato) were collected from different sources like Krishi Bhavan Jaipur and different publications.

Analysis of data

Change in instability in area and production of fruits and vegetables

Change in instability over time

To estimate change in quantity of instability over time a three year moving average of data

in question, that is area and production of crops under study was taken. The absolute difference of moving average data with the observed was calculated.

This difference was denoted as quantity of instability for that particular year.

$$\text{Moving Average} = \frac{X11 + X12 + X13}{3}$$

Where,

X_1 = variable one
X_{11} = First year data for variable one
X_{12} = Second year data for variable one
X_{13} = Third year data for variable one

The MA thus received was deducted from the observed value of corresponding year.

$X_{12} - MA_1 = d_1$
$X_{13} - MA_2 = d_2$

Where,

d_1 is the absolute difference of moving average value from observed value. Now the absolute difference received were regressed overtime to see the effect of time on the quantity of instability.

Various functional forms will be tried for the purpose is linear, quadratic, cubic, exponential and inverse. Out of these functional forms the quadratic function was found to be best fit.

Magnitude of instability

The general method for the measurement of instability in the data is the coefficient of variation (CV) which is given by

$$CV = \frac{SD}{M} X100$$

Where,

SD = Standard deviation of the variable values in respect of which instability is measured

M = Mean of the variable values

Results and Discussion

Instability is one of the important decision parameter in development dynamics and more do in the context of horticultural crop production. An analysis of fluctuations in production of fruits and vegetables apart from area is of prime importance for understanding the nutritional status of mass consumption and its security.

Change in instability over time

Change of instability in fruit crops

Table 1 has shown that the coefficients of quadratic function estimated for instability in area and production of important fruit crops over time. Estimations were made for important eight fruit crops as well as for all fruit crops. Instability in the area under lemon, anola, and pomegranate was to be decreasing over time estimated through at decreasing rate in the other hand instability in area of orange, sapota, mango, mosami, and all fruits taken together were increasing at decreasing rate. In the case of production of fruits it was observed that instability found to be decreasing in case of mango, mosami, anola, Malta and all fruits whereas it was estimated to be increasing in lemon, orange, sapota and pomegranate.

Rate of increase in all the cases under study was found to be decreasing. Simultaneous pondering of area and production, coefficient shows that it was only aonla crop where instability moved in the same direction over time. In aonla instability was found decreasing in area as well as production. In rest of fruits under study instability in Area and production was found to be moving in opposite direction.

Table.1 Change of Instability in Fruits

Fruits	Area		Production	
	B_1 (β coefficient)	B_2 (β coefficient)	B_1 (β coefficient)	B_2 (β coefficient)
Lemon	- 24.203	1.2924	236.582	22.859
Orange	65.9237	-5.1199	2053.04	-150.55
Sapota	0.4772	-0.0333	10.8689	0.8298
Mango	8.5728	-0.4486	2511.8	206.839
Mosami	12.7939	-0.8861	-1236	77.8981
Amla	-7.5981	0.7219	-86.104	10.2766
Malta	3.9737	-0.5614	-405.11	31.6282
Pomegranate	-2.6858	0.1663	97.010	-7.8743
All fruits	284.481	-19.973	-10700	544.162

Table.2 Change of instability in Vegetable

Vegetables	Area		Production	
	B_1 (β coefficient)	B_2 (β coefficient)	B_1 (β coefficient)	B_2 (β coefficient)
Carrot	72.7779	-2.5914	32.2249	-0.3741
Onion	80.9311	-2.6876	7251.40	-436.92
Pea	781.154	-50.827	-177.91	5.6252
Potato	-12.056	2.3313	317.252	2.6773
Sweet Potato	-57.607	2.6284	-415.85	20.7329
Tomato	271.00	-4.3518	103.29	40.8213
All Vegetables	-498.33	68.6242	1937.96	82.4317

Table.3 Magnitude of Instability in Fruits

Fruits	Area	Production
Lemon	2.847	268.38
Orange	51.078	2875.17
Sapota	403.33	4973.73
Mango	2.517	663.49
Mosami	140.1	2255.76
Amla	545.65	1153.61
Malta	69.74	1337.52
Pomegranate	88.150	1637.43
All fruits	15.267	221.65

Table.4 Magnitude of Instability in Vegetables

Vegetables	Area	Production
Carrot	2407.9	5326.96
Onion	140.99	462.29
Pea	873.40	834.43
Potato	475.97	825.22
Sweet Potato	450.28	1295.72
Tomato	475.61	749.63
All Vegetables	54.08	200.28

Change of instability in vegetable crops

Change of instability in vegetable crops under study is presented in table 2. Important vegetable for study was carried out were carrot, onion, pea, potato, sweet potato, tomato and all vegetables taken together. Instability in area was observed to be decreasing in sweet potato, potato, and all vegetables whereas it was found increasing in carrot, onion, pea and tomato. Instability in the production of vegetable crops show decreasing in tomato, pea and sweet potato, whereas it was found to be increasing in carrot, onion, potato and all vegetables.

Magnitude of instability

Magnitude of instability in fruits

Measurement of instability in area as well as production is done through detruding the data. Deviation from the trend is taken as base for measurement of instability. The instability index, thus estimated usually varied from zero to ten thousand and gives comparable measurement of instability. Table 3 shows instability index in fruit crops under study like lemon, orange, sapot, mango, mosami, aonla, malta and pomegranate. Instability index in the area under fruit crops varied from 2.5 to 545.65. Maximum index in the area under fruit crops in only 545.65 and lowest one was observed in mango that is only 2.52. It shows that area under the fruit crops does not fluctuate as fluctuation is very low. On the other hand, fluctuation in the production of fruits was observed to be very high which ranged between 221.65 and 4973.74.

Magnitude of instability in vegetables

Instability index of area under vegetables was observed to be far more than instability index of area under fruit crops. The reason of high instability in the area under vegetables is due to the fact that growers have easy turn back option in case of vegetables than fruits. The instability index varied from 54.08 in all vegetables to 2407.87 in the area of carrot. This shows that even highest instability in the area under vegetables is just half of highest Instability in the production of fruits or vegetables. Out of seven cases of instability measurement in area under vegetables crops it is only carrot in which instability index was 2407.87. In six cases instability index was less than one thousand and all the cases were less than 2500. In the case of vegetable production as well as instability index was less than 1000 in five out of seven cases and 1295.71 in one case that is sweet potato and 5326.94 in case of carrot. Pondering of the data shows that instability index was highest in production of fruits followed production of vegetables, area under vegetables and area under the fruit crops.

The study concluded that Instability in the area under lemon, aonla, and pomegranate was shown decreasing over time at decreasing rate while instability in case of area of orange, sapota, mango, mosami, and all fruits taken together were increasing at decreasing rate. Instability in the production of vegetable crops show decreasing in tomato, pea and sweet potato, whereas it was found to be increasing in carrot, onion, potato and all vegetables. Instability index in the area under fruit crops varied from 2.5 to 545.65 while instability index varied from 54.08 in all vegetables to 240.87 in the area of carrot. This shows that even highest instability in the area under vegetables is just half of highest Instability in the production of fruits or vegetables. The study of instability in area, production and productivity cause the excessive demand and supply gap in the economy, which leads to the unstable income to the farmers. These fluctuations in production (year to year) induce price instability and inefficiency in production,

employment and income distribution. It is therefore, necessary to take the appropriate policy measures to stabilize the production. A prerequisite of policy action is the measurement of instability identification of its sources and means of control. In order to devise strategies for minimization of these fluctuations a clear cut idea about extent or degree of fluctuations in area and production of different crop in a particular area is necessary.

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