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An Empirical Study of the Nature and Causes of Sugarcane Growth and Instability in Uttar Pradesh Since 1991

Shoaib Ansari[1], Dr. Saghir Ahmad Ansari[2]

[1]Research Scholar, Department of Agricultural Economics & Business Management, Aligarh Muslim University, Aligarh, Uttar Pradesh, India
[2]Professor and Chairman, Department of Agricultural Economics & Business Management, Aligarh Muslim University, Aligarh, Uttar Pradesh, India

ABSTRACT

Agriculture production growth is dependent on various factors as policies, inputs, and the environment. It is imperative to compute growth rate for the formulation of plans, policies and strategies to boost production performance. This study examined the compound growth rate and instability index of Sugarcane production in Uttar Pradesh. The time-series data of 29 years from 1990/91 to 2018/19 was analysed by dividing the total time period into two sub-periods of three decades. The study is based on secondary data from 1990-91 to 2018-19 on sugarcane area, production, and yields in Uttar Pradesh, the state with the biggest sugarcane production. For the fiscal year 2018-19, the data collect from the government of India's Uttar Pradesh website, the directorate of economics and statistics, the ministry of agriculture, and the ministry of farmers' welfare. Compound growth rates, Cuddy-Della Valle instability indices, and other Sugarcane production and yield indicators increase at the state level over the research period. Similarly, a great and stimulating study was undertaken on sugarcane crop growth rates. Sugarcane agriculture has grown more profitable as a result of state government policies. Proper use of limited resources can increase productivity and profitability, therefore attaining the objective of double revenue and boosting farmers' living standards.

KEYWORDS: *Sugarcane, Growth, Instability, Cuddy Della Vella, Compound Growth Rate*

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INTRODUCTION

Low-income individuals who are malnourished face the burden of food supply variations. This is because a decrease in supply boosts costs, dramatically reducing the purchasing power of individuals with limited income who have spent a substantial percentage of their income on food. Of fact, new technologies that have expanded food production have benefitted the poor by increasing the overall food supply and decreasing or moderating the upward pressure on food costs induced by expanding population and wealth. However, it appears that not only has food production volatility risen during the era of fast deployment of new food production technologies compared to prior periods, but there may be a causative link. This discovery does not dismiss the most significant contribution of modern production technology. High-yielding crop types, inconsistent fertilizer usage, and irrigation have contributed to significant changes in India's agricultural landscape. Up to 2012, India's ultimate irrigation potential (UIP) increased 7.7 times, from 19.5 to 139.90 million hectares (Water-related data, 2013), while food grain output increased from 50 million tonnes to 252.22 million tonnes in 2015-16. We have paid a high price in water table depletion and rapid shifts in climatic conditions, posing a significant challenge to sustainability. Without a doubt, India has achieved self-sufficiency in food grain production due to the Green Revolution. (Ahmad et al. 2018)Agriculture is still the essential market in India.

The agricultural sector, in particular, represents 18% of the country's GDP and employs 50% of the workers. Sugarcane is India's most considerable commercial crop, covering 2.57 % of the nation's population cropped area. After only Brazil, India is the world's second-largest producer of sugarcane, accounting for about 25% of worldwide production. In the fiscal year 2010-11, it worked approximately 5 percent of the country's local population in sugarcane growing, providing 10% of agricultural GDP (Solomon, 2016). After textiles, The sugar industry in India is the country's second-largest agro-based sector and. It has significantly aided the country's employment and economic growth. (Ahmed and Rahman, 2014). Six million farmers and their families have been supported by the sugar business as a whole (Verma, 2015). Sugarcane is seen as a future crop due to its contribution to manufacturing sugar, jaggery, khandsari, and other by-products like molasses.

Uttar Pradesh is the biggest sugarcane supplier, with 145.39 million tonnes produced, representing 41.28 percent of all sugarcane produced in India. Sugarcane is grown on 2.17 million hectares in the state, representing 43.79 percent of total sugarcane farming in India.

Sugarcane (Saccharumofficinarum L.) is the most important cash crop in India. Sugarcane farming is significantly less dangerous than other crops since it pays farmers consistently even when unfavorable weather (Raju and Kumar, 219). Sugarcane farming was common in all tropical and subtropical areas. Sugarcane can be a lucrative resource for the sugar industry and other associated industries. Sugarcane has played an important part in the agricultural community's food security, nutrition, and social growth (Rahman and Bee, 2019). Sugarcane is a multipurpose crop that may produce food, fibre, fodder, fuel, and chemicals such as ethanol (Yadav et al., 2006). Sugarcane is an annual crop that matures between 10 and 18 months. In India, sugarcane is grown in tropical states like Andhra Pradesh, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Odisha, and Tamil Nadu well as subtropical ones like Bihar, Haryana, Punjab, and Uttar Pradesh. After Brazil, India is the world's second-largest producer of sugar, with output expected to grow gradually, supported in part by renewed government support for the sub-sector (FAO, 2019). Approximately 20% of the world's sugarcane was produced in India (Medar et al., 2019).Understanding past trends in the area, production, and yields, both aggregated at the state level and disaggregated at the regional level, facilitates the planner in evaluating the growth rate for different regions as well as the state as a whole as well as formulating proper approaches such as the type and degree of incentives to be offered and growers to attain the desired growth rate. In addition to the growth rate, scientists and planners have recently focused their attention on the issue of sugarcane production instability. Sugar production in Uttar Pradesh fluctuated dramatically throughout time as well. The fundamental cause of sugar production insecurity is the unpredictability of raw material availability, namely sugarcane, which has experienced significant fluctuations. The current study examines the Uttar Pradesh area, production, and sugarcane yield in terms of The Impact of Technology on Agricultural Production Growth and Instability. Policymakers concerned in sugarcane and related markets will consider the study beneficial

Statement of the problem& Research Gap

The most difficult task for sugarcane farmers who are at the whim of nature is striking a balance between input consumption and output, which affects the economics of their crop.

Another challenge for sugarcane producers is a lack of competent personnel. The price has risen to an abnormally high level. Sugarcane growing generates inadequate revenue to meet input costs. As a result, most sugarcane growers want to transition to shorter-lived crops. Because of the high expenditure of growing and maintaining the land over time, most sugarcane producers are not financially secure. They are unable to acquire or rent cutting-edge sugarcane machinery. Given this, it is critical to examine the macro-level growth trends of such main crops.

This research analyzes the An Empirical Study of the Nature and Causes of Sugarcane Growth and Instability in Uttar Pradesh, Since 1991. The nature and origins of increasing output and instability have been questioned since independence and the Green Revolution. An analysis has been made in this study to investigate the nature and sources of instability in the area, production, and yield of sugarcane in Uttar Pradesh. with defined and easily understood objectives. This is done with a goal in mind, so what is expected is clear. Some goals are listed. To ascertain the amount, yields, and sugarcane production area in Uttar Pradesh.

Resources and methods

Secondary data on sugarcane area production and yield in important sugarcane-growing states in Uttar Pradesh from 1990-91 to 2018-19 were used in the current study. in the current study. For the 2018-19 fiscal year, Directorate of Economics and Statistics, Ministry of Agriculture and Farmers Welfare, Government of India.

Compound Annual Growth Rate (CAGR)

Compound growth rates (CGRs) of sugarcane area, production, and yield were computed for the state using the following technique:

CGR= (antilog of b-1) ×100

Instability index

The deviation from the pattern is characterized as instability. Investigators use the coefficient of variation (CV percent) to measure instability in the literature. The level of instability in sugarcane area, production, and yield for the states. under consideration and the state as a whole was investigated to use an instability index. Since CV alone does not explain the appropriate trend component present in the time series data, the instability index was calculated using the Cuddy-Della Valle index The following is the computing formula:

$$\text{Instability index} = CV \times \sqrt{1 - R^2}$$

$$CV = \frac{\textit{Standard Deviation of Variable}}{\textit{Means of the variable}} \times 100$$

If the regression equation's estimated coefficient is insignificant, the CV is used as the instability index. Where CV stands for coefficient of variation and R^2 stands for coefficient of determination from a time series trend regression with the number of degrees of freedom adjusted.

Result & Discussion

Trends of Area Production & Yields in Sugarcane in Uttar Pradesh

Table 1.0

year	Particular		
	000 Area	000 Production	Average Yields
1990-91	1858	103562	558.10
1995-96	1994	12102	606.91
2000-01	1938	106068	549.19
2005-06	2070.58	120960.64	584.19
2010-11	2058.70	116877.56	567.72
2014-15	2215.55	145831.10	658.21
2015-16	2168.88	145384.79	670.32
2016-17	2159.84	156948.67	726.67
2017-18	2234.28	177056.41	792.45
2018-19	2223.80	179698.15	808.07

(Area in thousands Hect. Production thousand M.T.& Average Yield in QTLs / Hect)

Source: Directorate of Economics And Statistics Government Of Uttar Pradesh

CAGR explanation in terms of area production and yield

The total area under sugarcane in Uttar Pradesh increased from 1858 thousand hectares to 2223 thousand hectares between 1990-1991 and 2018-19. The entire growth trend shows a significant annual growth rate of 0.06 percent.

Uttar Pradesh's sugarcane production was 103562 thousand tonnes in 1990-91, but it has more than sevenfold increased to 179698 thousand tonnes in 2018-19. Sugarcane output climbed at a significant pace of 1.15 percent between 1990 and 2019. According to the sub-period growth trend study, the growth rate was positive in all sub-periods.

In 1990-91, Uttar Pradesh's sugarcane yield was 558.10 hect., but it has more than tripled to 808.07 hect. in 2018-19. Sugarcane yield rose at a significant rate of 1.17 percent between 1990 and 2019. According to the sub-period growth trend study, the growth rate was positive in all sub-periods.

Table 2.0 Compound Annual Growth Rates of Area Production and Yield of Sugarcane in Uttar Pradesh

Particular	Periods1	Periods 11	Overall
Area	0.49	0.77	0.06
Production	0.58	4.40	1.15
Yields	0.08	3.59	1.17

Compound Annual Growth Rates of Area Production and Sugarcane Yield in Uttar Pradesh, Period by Period Discussion

Area

Discuss the compound annual growth rate (CAGR) Area from 1990 to 2011, i.e., following the reform. So we received 0.49 growth, i.e., not much but not that much since technology was not that sophisticated at the time, but we still got to see good growth rate now if you look at Periods 2 2011 to 2019, we got 1.14 growth but is this Period higher than 1. Whenever we look at entire periods from 1990 to 2019, they are less than two, but they are also less than one if we look at the entire state of Uttar Pradesh. 0.06 in a growth region

Production

Discuss the compound annual growth rate (CAGR) of production from 1990 to 2011, i.e., after the reform. So we received 0.58 growth, i.e., not much but not that much since technology was not that advanced at the time, but we still got to see strong growth rate now if you look at Periods 2 2011 to 2019, we got 4.40 growth but is this Period greater than 1. When we look at full periods from 1990 to 2019, they are less than two, but they are also less than one when we look at the entire state of Uttar Pradesh. 1.15 in a growing production

Yields

Examine the Yield compound annual growth rate (CAGR) from 1990 to 2011, i.e., following the reform. So we got 0.08 growth, which is not much but not that much since technology was not that sophisticated at the time, but we still got to witness a good growth rate now if you look at Periods 2 2011 to 2019, we got 3.59 growth but is this Period bigger than 1? They are less than two when we look at whole periods from 1990 to 2019, but they are also fewer than one when we look at the entire state of Uttar Pradesh. 1.17 in an increasing yield

Table 3.0 Sugarcane Area, Production & Average Yields, of instability in Uttar Pradesh

Particulars		Periods 1	Periods 11	Overall all
Area	Mean	1983.85	2176.84	2092.16
	SD	88.27	65.28	130.39
	CV%	4.44	2.99	6.23
	CDV	2.66	2.35	2.64
Production	Mean	91914.04	153632.78	126448.93
	SD	45201.91	23319.11	48530.87
	CV%	49.17	15.17	38.37
	CDV	56.91	3.39	10.85
Average Yields	Mean	573	703.90	652.18
	SD	22.86	90.52	96.12
	CV%	22.89	12.85	14.73
	CDV	4.59	2.89	5.51

Cuddy Della Vella Index of Area Production and Sugarcane Yield Instability in Uttar Pradesh, Period by Period Discussion

Area

CDVI is an acronym that stands for cuddy Della vela instability. In area 2.64, there is clear instability, although in its sub period one 2.66, and in the second 2.35, respectively.

Production

CDVI is an acronym that stands for cuddi Della vella instability. In Production 10.85, there is clear instability, but in its sub-period one, it is 56.91, and in the second, it is 3.39, respectively.

Yields

CDVI is an acronym that stands for cuddy Della vella instability. In yiel 5.51, there is clear instability, but in its subperiod one, it is 4.59, and in the second, it is 2.89, respectively

Because once we look at the overall picture, we notice that production is the most variable. And the yield has the least amount of instability.

Conclusion

Academics and policymakers are interested in the impact of technology and policy on agricultural development and volatility. While new technologies are said to have a positive impact on growth, they are said to have a negative impact on instability. The current study investigates these issues in depth using sugarcane as an example and convincingly establishes that the introduction of newer technologies invariably increased yield and instability in the early stages of technology adoption, due to the integration of the new technology into the previously established input control regime. In other words, if the technology can overcome the investment lumpiness while assuming no need for management or skill upgradation, it will be accessible to a large number of farmers, lowering instability. The research recommends making modern technologies more inexpensive and available to a larger number of farmers in order to achieve rapid growth with stability. This is significant given the dominance of the small-scale manufacturing sector and the lack of institutional mechanisms such as loan delivery. The study have previously discussed how a well-designed buffer stock. programme may be utilised to stabilise prices and farm incomes while also promoting agricultural growth. Buffer stock must not be utilised to be functional and economically useful to smooth out variations caused by controllable causes. Even then, one should acknowledge that buffer stock is an expensive unproductive investment that is, of course, required to address future contingencies that may develop owing to natural calamities. A more prudent plan would probably be to progressively redirect monies for stabilisation from buffer stocks to land infrastructure development programmes such as drainage and irrigation, water collection, and so on. These programmes may not stabilize production in a year or two, but they can significantly lessen the degree of production swings over time. Furthermore, they enable vertical extension of area for crop production, increased productivity, and improved agricultural job possibilities.

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