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Growth, Instability and Decomposition Analysis of Nutri Cereals in Tamil Nadu

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Aim: The study was undertaken to know the growth rate, instability, and contribution of area and yield on the production of Nutri cereals.
Place and Duration: The study was based on the secondary data for the period of 20 years (2001-2020) for Tamil Nadu. Data has been collected from Agricultural statistics at a glance (2020), Season and Crop report (2020).
Methodology: The growth rate of Nutri cereals can be estimated through compound annual growth rate, instability is measured using Coppock's instability index and contribution of area and yield on production is studied using decomposition analysis.
Results: Results revealed that Nutri cereals growth rate is found to be negative in first decade and positive in second decade Production of Nutri cereals in both the decades found positive in decline trend. The trend of productivity seems positive for both the decades at declining rate. Instability index is higher in terms of production than area and productivity. Area effect was most responsible for the production of Nutri cereals than yield and interaction effect.
Conclusion: The area effect is more responsible for production of Nutri cereals. Area effect on production of Nutri cereals is high, hence government should intervene in this regard to improve the area of Nutri cereals cultivation.

Keywords: Nutri cereals; Coppock's index; millets cultivation; food security.

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1. INTRODUCTION

Millets are rain fed crops and are grown in regions with low rainfall and thus resume greater importance for sustained agriculture and food security. Most of the millets are kharif season crops sown during May-June and come to maturity during September to October [1]. Millets require very less water as compared to rice and wheat and considered drought tolerant crops (Indian Institute of Millet research, 2018).

India is the largest producer of millets in the world. In India, millets are grown on about 36.25 million hectares, with an annual production of 62.49 million tonnes and an yield of 4349 kg/hectare (Directorate of Economics and Statistics (2019-20). Millets are grown majorly in Karnataka, Andhra Pradesh, Tamil Nadu, Kerala, Telangana, Uttarakhand, Jharkhand, Madhya Pradesh and Haryana. The total grain demand will increase from 201 million tonnes in 2000 to about 291 and 377 million tonnes by 2025 and 2050, respectively (Khatka et al., 2016). In the last two decades, the importance of millet as food staples, particularly in India, has been declining due to various factors, including rising incomes, growing urbanization, and government policies [2].

Hence this study was taken up with the following objectives: i) To find the growth rate in area, production and productivity of Nutri cereals in India and ii) To find out the instability and Decomposition analysis of Nutri cereals in India.

2. REVIEW OF LITERATURE

Malathi et al. [3] studied the growth rate of area, production and yield and to measure the contribution of different components to the growth rate of millets in India from 1950-51 to 2011-12. The production of total millets registered significant growth during overall study period due to increase in yield. Increase in production of sorghum, pearl millet, finger millet and total millets were contributed by their yields, whereas area and its interaction with yield have adversely affected the production. Decline in production of small millets was due to area effect and interaction effect. The main source of growth in production of millets has been the growth in yield per hectare during the period from 1950-51 to 2011-12.Narmadha and Kandeepan [4] study on Performance of Major Millet Crops in Tamil Nadu This study analyzed the growth rates, instability, and decomposition analysis of area, production, and productivity of major millets during the period from 1970 to 2015. The compound growth rate results showed that the growth rate in area and production for most of the millet crops, with the exception of maize, showed a negative growth rate. The instability indices revealed that the instability rate was high. The differentiation occurred in millet production due to the area for most of the millet crops, and area and productivity for some of the millet crops. Decomposition analysis showed that change in production occurred in millet production due to the area for most of the millet crops. Parvekar et al., (2017) studied growth and instability of sorghum in vidarbha region on area, production and productivity to identify the trend. The compound growth rate and coefficient of variation here analysed for period (1985-2015) for the major five districts of Vidarbha region. The compound growth rates for area, production and productivity were negative for almost all the Sorghum growing districts during the first period. But the growth rate was estimated positive during second period. The compound growth rate of area under crop that values are statistically significant at 1 percent level of probability, the coefficient of variation for area, production and productivity of first and second period was negative but other hand the growth rate of productivity for the sorghum was positive foe almost all the district of all period.

3. METHODOLOGY

The data used for this study which are collected from Agriculture statistics at a Glance 2020 (Area, Production and Productivity of Nutri cereals). Compound growth rate, Coppock's Instability Index and Decomposition analysis were the tools used for analyzing the data as follows:

3.1 Compound Growth Rate

It measures the growth performance of area, production, productivity and export for Nutri cereals over the years. The Compound growth rates were found very convenient for any comparison of growth between two period and it seems more appreciable to analyse the movement of agricultural crops in terms of compound rather than linear growth rate (Dandekar, 1980).The time series data has been collected for 20 years (2001 to 2020) and classified into First decade (2001 to 2010) and Second decade (2011 to 2020) for comparing decade performance. The growth rate was

estimated using exponential trend model as follows [5,6].

Exponential trend model: $Y= ab^te$

where,

Y =Area/production/productivity
a = Intercept
b = Regression co-efficient
t = Time variable.
e = Error term

Take the logarithm, it becomes log y = log a + t log b+ error

From the estimated function the compound growth rate was worked out

From the estimated function: CGR (r %) = (Antilog of log b - 1)* 100

3.2 Coppock's Instability Index (CII)

Instability analysis can be studied using three measures of instability such as Coefficient of Variation, Cuddy-Della Valle index, and Coppock's index. Kamalkar analyzed the instability using Coppock's index. Hence, in this study, To measure percentage variations from year to year, [7] CII can be calculated by

$$CII = \left[\text{Antilog}\left(\sqrt{\text{Vlog}}\right) - 1\right] * 100$$

$$\text{V log} = \frac{[\sum \log \frac{x_{t+1}}{x^t} - M]^2}{N}$$

Where,

X_t= Area/Production/Yield
T = number of years.
M = Mean of the difference between Logs of X_{t+1}, X_t.
V log = logarithmic variance of the series.

3.3 Decomposition Analysis

Decomposition model of area, production, and productivity of Nutri cereals estimated to examine the fluctuations. To measure the relative contribution of area and yield towards the total production changes, formula has been used as follows [8,9],

$$\mathbf{P} = \frac{\mathbf{A0\Delta Y}}{\mathbf{\Delta P}} \times 100 + \frac{\mathbf{Y0\Delta A}}{\mathbf{\Delta P}} \times 100 + \frac{\mathbf{\Delta Y\Delta A}}{\mathbf{\Delta P}} \times 100$$

A0 = Area in the base year
Y0 = Yield in the base year
ΔP = Current production minus base production
ΔA = Current area minus base area
ΔY = Current yield minus base yield

Production = yield effect + area effect + interaction effect

4. RESULTS AND DISCUSSION

4.1 Compound Growth Rate of Nutri Cereals Performance in India from 2001-2020

The compound growth rate of area, production and productivity of Nutri cereals were calculated and shown in the Table 1.

On comparing two decades performance of Nutri cereals from 2001-2020, growth of the area during second decade were found positive which was statistically significant at 1 per cent level and negative in first decade. The growth in production of Nutri cereals was also higher, i.e., 1.84 percent during the first period and again a steady decline to 0.21 percent during the second period and found to be not significant in both the decades. This is due to Productivity is higher (2.75) in first decade which was statistically significant at 5 per cent but it shows decline trend (1.71) in second decade. Production and productivity gets declined due to birds, it can inflict damage to the crops and a loss to the farmers in all the stages of crops right from sowing and planting till harvesting especially in the sorghum and pearl millet crops. Some other factors like Natural calamities and prevailing soil conditions [10].

4.2 Coppock's Instability Index of Area, Production and Productivity of Nutri Cereals

Higher growth in production accompanied by low level of instability for any crop is desired for sustainable development of agriculture [11]. To measure the instability level in Nutri cereals performance by using Coppock's instability index.

Table 2 presents the results of estimated instability measures of area, production and productivity Nutri cereals in India over the period of 2001-2020.It could be inferred that instability of area, production and productivity performance declined in second decade (2010-2020) and highest instability found in first decade (2001-

Table 1. Growth rates in area, production and productivity of Nutri cereals

Period	Area	Production	Productivity
2001-2010	-1.14**	1.84^{NS}	2.75**
2010-2020	2.28***	0.21^{NS}	1.71 **

**** significant at 1 per cent level, ** significant at 5 per cent level*

Table 2. Coppock's Instability Index of area, production and productivity of Nutri cereals

Period	Area	Production	Productivity
2001-2010	2.84	8.57	6.72
2010-2020	2.44	3.99	3.00

Table 3. Decomposition analysis of area, production, productivity of Nutri cereals

Period	Area effect	Yield effect	Interaction effect
2001-2010	350.29	-74.37	-32.4
2010-2020	619.78	-458.14	-77.75

2010). This instability occurs due to nature of crop production technology, its sensitivity to weather, economic environment, availability of material inputs and other factors.

4.3 Decomposition Analysis

Jamal [12] estimated the effect of area and yield on production using decomposition analysis. The contribution of area, yield and interaction of the two in total production, decomposition analysis as given below.

The yield effect and interaction effect were negative. Increase in Nutri cereals production was more brought about by increase in area as compared to the increase in yield. Decline in production of small millets was due to area effect and interaction effect [3].

5. CONCLUSION

The growth of the area is in a positive trend, but the production and productivity shows a declining trend in second decades. There is a high variability in second decade as well as the production of Nutri cereals in Tamil Nadu. The area effect is more responsible for production of Nutri cereals. Area effect on production of Nutri cereals is high, hence government should intervene in this regard to improve the area of Nutri cereals cultivation. Development of hybrids of seeds with better recovery capacity on reversal of dry spell for harsh environmental areas. Exploration of zero tillage for Nutri cereals under rice fallows particularly for southern States [13].

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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