

Performance of Sorghum Crop in India - An Analytical Study

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Abstract: Agriculture, with its allied sectors, is the largest source of livelihoods in India. One third its rural households still depend primarily on agriculture for their livelihood, with 86 percent of farmers being small and marginal. Millets (sorghum, pearl millet and small millets) are the important food and fodder crops in semi-arid tropics. Millets are important cereals which play a significant role in the food and nutrition security of developing countries of Asia and Africa, especially in India, Nigeria. Sorghum (jowar) is one of the main coarse cereal crops of India. Sorghum is widely grown both for food and as a feed grain, while millets are produced almost entirely for food. The economic importance of the millets is increasing in terms of feed value, particularly that of sorghum though it is grown in contrasting situations in different parts of the world. The economic importance of the millets is increasing in terms of feed value, particularly that of sorghum though it is grown in contrasting situations in different parts of the world. Sorghum is the fourth most important food grain in India after Rice, Wheat, and Maize. During 1950-51, it was grown over 15.57 million hectares with a total production of 5.50 million Tones. Though the area under Sorghum in India has declined over time, production has remained more or less constant due to increase in yield. The present study is based on secondary data for the 60 years. The study examines growth rates of area, production and yield of Sorghum in India and as well as major Sorghum growing states. In order to examine the degree of relationship in area, production and yield, the statistical tools have been used. The study indicates that there will be deficit case of in the coming years which is a matter of concern. There is a scope for augmenting the production in the short run by improving the productivity without increasing the area through popularizing new varieties, expanding certified seed distribution, and improving crop management practices.

Keywords: Millets, Sorghum, Growth Rate, Production, Yield

I. INTRODUCTION

“Millets are one of the oldest crops known to humans and can grow in adverse weather conditions with marginal irrigation requirements. They were first domesticated in Asia and Africa and later spread across the globe as a cereal crop for the evolving civilizations.”

Agriculture in India has witnessed an impressive growth trajectory, taking the country from a food deficit one during the 1960s to a marginally food surplus one. Indian agriculture has registered impressive growth over last few decades. The food grain production has increased from 51 million Tones in 1950-51 to 298 million tones during 2019-20 highest ever since independence. Millets are primarily categorized as major millets, sorghum, bajra, and ragi, and minor millets, including foxtail, kodo, barnyard, proso, browntop, and little millet. India contributes about 16% of the world's sorghum production. It is the fourth most important cereal crop in the country. In India, this crop was one of the major cereal staples during 1950's and occupied an area of more than 18 million hectares but has come down to 6.23 million hectare in 2019. The decline has serious concern on the cropping systems and the food security of these dry land regions of the country.



II. METHODOLOGY

The present study is based on secondary data for the 60 years period from 1960 to 2020. The study examines growth rates of area, production and yield Sorghum in India and as well as major Sorghum growing states. The following formulae were used:

2.1 Projection

Least Square Technique has been applied for the following linear model:

$$Y = a + bX$$

Where Y is Soyabean production

a is constant

b is regression of Y on X,

X is year (X=1 for 1995-96 =2 for 2000-01 & so on)

2.2 Growth Rate

The moving averages have been used to estimate growth rates.

$$R_t = \frac{Y_1 - Y_0}{Y_0} * 100$$

Where R_t is the simple growth rate during two periods

Three Year Moving Average

$$Y_{t-1} = \frac{Y_t + Y_{t+1} + Y_{t+2}}{3}$$

Where Y_t is variable (area sown, production or productivity) and t is period, say, t = 0,1,2....

III. FINDINGS AND DISCUSSION

Sorghum is the major millet grown globally constituting 65% of total millets. During 2010–2020, the Sorghum area is near stable between 42.16 million hectares to 40.98 million hectares while production between 60.18 million metric Tones to 58.70 million metric Tones. During the same decade, the area under other millets showed a declining trend from 36 million hectare during 2010 to 33.02 million hectare during 2020, while production decreased from 32.79 million metric Tons in 2010 to 30.46 million metric Tones in 2020. Table-1 shows the moving three yearly averages of area sown, production and yield for Sorghum. Growth rates have also been estimated. It is seen that there is negative trend in area sown. The area sown has decreased from 18.02 M hectare in 1959-60 to 4.38 M hectare during 2019-20. The production has been increased to 11.58 M Tones in 1989-90 from 9.14 M Tones in 1959-60 and decreased to 4.34 M Tones in 2019-20. Yield has positive trend. It has constantly increased from 507 kg per hectare in 1959-60 to 989 kg

per hectare in 2019-20. This table also shows annual growth rates during different periods. The highest growth rate was observed, in production (2.310%) and yield (3.67%) during 1979-80.

Table 1: Three years moving average of area, production and Yield of the Sorghum

| Year | Area Sown M hectare | Growth rate per annum | Production M Tones | Growth rate per annum | Yield Kg per hectare | Growth rate per annum |
|-----------|------------------------|-----------------------------|-----------------------|--------------------------|----------------------------|--------------------------|
| 1959-60 | 18.02 | | 9.14 | | 507 | |
| 1969-70 | 18.24 | 0.12 | 9.21 | 0.08 | 504 | -0.06 |
| 1979-80 | 16.21 | -1.11 | 11.17 | 2.13 | 689 | 3.67 |
| 1989-90 | 14.6 | -0.99 | 11.58 | 0.37 | 793 | 1.51 |
| 1999-2000 | 9.97 | -3.17 | 8.21 | -2.91 | 823 | 0.38 |
| 2009-10 | 7.57 | -2.41 | 6.98 | -1.50 | 924 | 1.23 |
| 2019-20 | 4.38 | -4.21 | 4.34 | -3.78 | 989 | 0.70 |

Table 2: Area, Production and Productivity of Sorghum for Major States (2020-21)

| | Area Sown M hectare | %age of Total Production | Production M Tones | %age of Total Area | Yield Kg per hectare |
|----------------|------------------------|-----------------------------|-----------------------|-----------------------|-------------------------|
| Maharashtra | 1.94 | 45.75 | 1.76 | 36.82 | 911 |
| Karnataka | 0.74 | 17.45 | 0.88 | 18.41 | 1187 |
| Rajasthan | 0.56 | 13.21 | 0.59 | 12.34 | 1055 |
| Tamil Nadu | 0.41 | 9.67 | 0.45 | 9.41 | 1096 |
| Andhra Pradesh | 0.12 | 2.83 | 0.37 | 7.74 | 3070 |
| Uttar Pradesh | 0.17 | 4.01 | 0.27 | 5.65 | 1578 |
| Telangana | 0.10 | 2.36 | 0.19 | 3.97 | 1855 |
| Madhya Pradesh | 0.11 | 2.59 | 0.18 | 3.77 | 1636 |
| Others | 0.09 | 2.12 | 0.09 | 1.88 | 998 |
| All India | 4.24 | 100 | 4.78 | 100 | 1128 |

The State-wise break up of area sown, production and yield of Sorghum is depicted in Table-2. It could be observed that Maharashtra is the highest Sorghum producing state with 45.75% of the total Sorghum production in the country. Maharashtra along with Karnataka, Rajasthan, Tamil Nadu and Andhra Pradesh produce about 89% production in the country. The highest yield has been recorded in Andhra Pradesh (3070 kg per hectare) followed by Telangana (1855 Kg per hectare and Madhya Pradesh (1636 Kg per hectare) and lowest 911 Kg per hectare in Maharashtra.

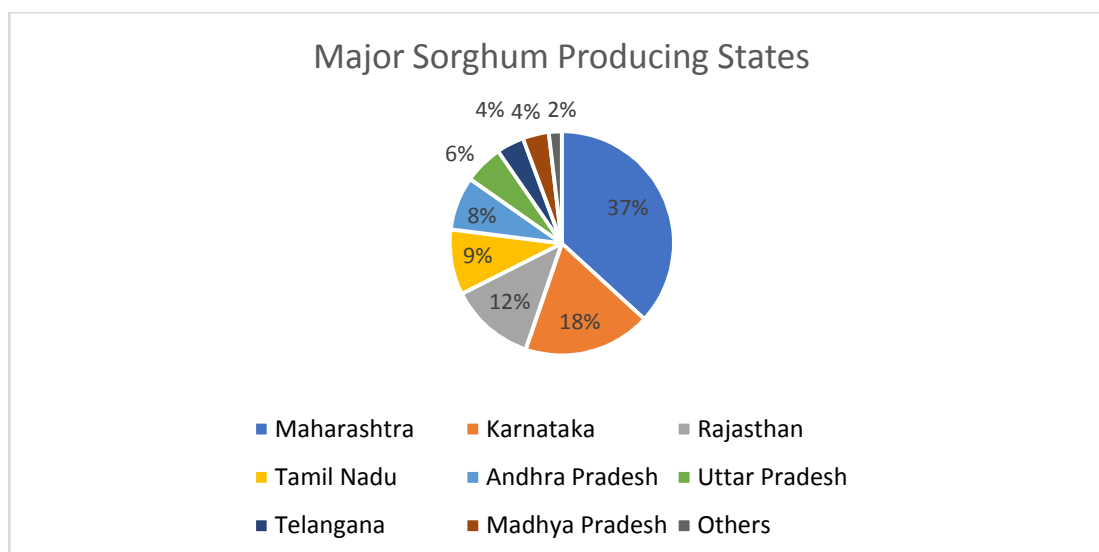


Table 3: Major Sorghum Producing Countries in the World (2020)

| Country | Production M Tones | Production %age | Cumulative Production %age |
|-----------------|--------------------|-----------------|----------------------------|
| United States | 9.47 | 15.27 | 15.27 |
| Nigeria | 6.90 | 11.13 | 26.39 |
| Ethiopia | 5.20 | 8.38 | 34.78 |
| Sudan | 5.00 | 8.06 | 42.84 |
| India | 4.74 | 7.64 | 50.48 |
| Mexico | 4.30 | 6.93 | 57.42 |
| China | 3.55 | 5.72 | 63.14 |
| Argentina | 3.20 | 5.16 | 68.30 |
| Other Countries | 19.66 | 31.70 | 100 |
| World | 62.02 | 100 | |

Table -3 presents the major Sorghum producing countries in the world. Sixteen (16) countries produced one million metric tons or more of sorghum in 2020 including Mali and Cameroon. It is seen, that United States is the highest producing country with 15.27% share. United States, Nigeria, Ethiopia, Sudan, India and Mexico produce together more than 57% of world's total Sorghum globally. India's contribution is 7.64%.

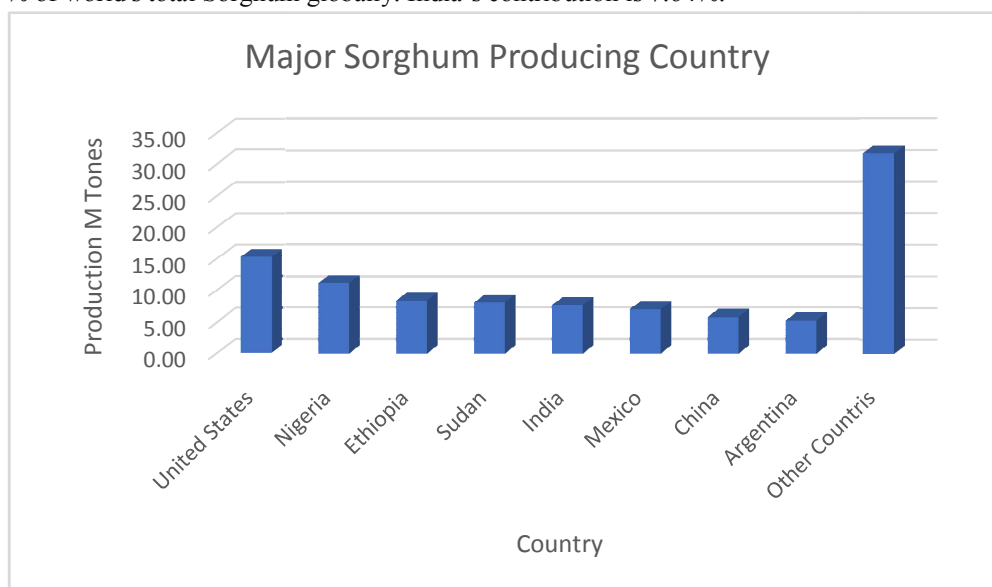


Table 4: Projected Production, Area and Yield for Sorghum

| | 2024-25 | 2029-30 |
|----------------------|---------|---------|
| Area M hectare | 3.57 | 2.22 |
| Production M Tones | 3.85 | 2.95 |
| Yield Kg per hectare | 982 | 1016 |

Table - 4 presents the projected area, production and Yield for Sorghum for 2024-25 and 2029-30. It is seen that the area sown has been estimated of the order of 3.57 M hectare and 2.22 M hectare in 2024-25 and 2029-30 respectively. The production will be 3.85 M Tones 2024-25 and 2.95 M Tones in 2029-30. The yield will be 982 Kg per hectare in 2024-25 and 1016 Kg per hectare 2029-30.

IV. CONCLUSION AND WAY FORWARD

From the results of the study, it is clear that area under millets has been declining over the years. It was mainly due to increase in area under cultivation of major cereals like rice and wheat after green revolution, increased cultivation of commercial crops like oilseeds, cotton, spices, fruits and vegetables during recent years due to globalization of

agriculture. With the current production and consumption trends in India, there will be a deficit in the supply of Sorghum the near future. Millet sector has been facing numerous challenges pertaining to production, processing, value addition, marketing and consumption which have hindered the process of advocating millets as the staple foods through the world. To overcome these challenges, there is a need for concerted efforts towards mainstreaming millets by diversifying production technologies, building forward and backward linkages, nurturing the start-up eco-system and bringing millets to the food plates of all. In this regard successive governments have taken series of steps to promote the millets in India and abroad.

REFERENCES

- [1]. Annual Report (2021), ICAR- Indian Institute of Millets Research, Hyderabad
- [2]. ICAR- Indian Institute of Millets Research, Hyderabad website, <https://millets.res.in>
- [3]. Vision 2025 - Indian Institute of Millets Research , Hyderabad
- [4]. Latest Millet Production and Processing Technologies (2020), Indian Institute of Millets Research, Hyderabad
- [5]. Agricultural Statistics at a Glance (2020), Ministry of Agriculture & Farmers Welfare, Department of Agriculture, Cooperation & Farmers Welfare, Directorate of Economics & Statistics, Govt of India.
- [6]. Annual Reports (2020), Ministry of Agriculture & Farmers Welfare, Department of Agriculture, Cooperation & Farmers Welfare, Govt of India
- [7]. Department of Agriculture, Cooperation & Farmers Welfare website, <https://agricoop.nic.in>
- [8]. Uma Gowri, M and Shivakumar, K.M. Millet Scenario in India, Economic Affairs, Vol. 65, No. 3, pp. 363-370, September 2020
- [9]. S. C. Gupta, V. K. Kapoor - Fundamentals of Mathematical Statistics, Seventh Revised Edition, Sultan
- [10]. Statistical Methods. Ed. S. P. Gupta, Sultan Chand & Sons Publishing Co. (PI Ltd., New Delhi. (1997)