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Millet Revolution in Tamil Nadu: Ensuring a Healthy Future Generation

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Abstract

One of the earliest foods are millets, which are resistant crops with small seeds that do well in arid climates. The Indian Government has put forward a proposal to the United Nations, suggesting that 2023 should be recognized as the International Year of Millet, in order to encourage the cultivation and consumption of this nutritious grain. Because of their health benefits, millets have been referred to as "nutri-cereals". The majority of India's millets are produced as finger millet (Ragi), sorghum (Jowar), and pearl millet (Bajra).Tamil Nadu is eighth among the top ten states in India that produce millet, accounting for 4% of the nation's millet production in 2021–2022. Examining patterns and instabilities in the area, yield, and output of millets in Tamil Nadu from 2011–12 to 2021–22 is the goal of the current study. There was a significant increase in the area of Jowar with a compound annual growth rate of 7.09 percent, followed by Bajra at 3.00 percent. There was also a significant increase in the production of Jowar and Bajra at 6.15 percent and 5.87 percent, respectively, and a significant increase in the yield of Ragi and Bajra at 68.10 percent and 44.98 percent, respectively, according to the estimated trends in the area, production, and yield of millets using the semi-log function. The Cuddy-Della Valle index affords the best estimates, and instability was found more in the production of Jowar (32.28%), followed by Ragi (32.10%), and less in the area of small millets (9.32%). The decomposition analysis revealed that the yield effect was the principal factor for all varieties of millets; the area effect of Jowar and Ragi was insignificant; Bajra and Small Millets had additional roles to play in the increase of output in the study period.

Keywords: Area, Production and Yield, Growth, Instability, Millets.

Introduction

The Indian Government has put forth a proposal to the United Nations, suggesting that the year 2023 should be officially recognized as the International Year of the Millet. This initiative aims to raise awareness and promote the consumption of millets on a global scale. Millets have been termed "nutri-cereals" owing to their health benefits. Millets are one of the oldest foods; they are small-seeded hardy crops that can grow well in dry zones or rain-fed areas under marginal conditions of soil fertility and moisture. Jowar, bajra, maize, and ragi contributed 23% of Indians' grain requirements in 1983 but just 6% in 2011. India announced 2018 as the National Year of Millets to promote both the production and consumption of millets, commonly referred to as nutri-cereals, and to reverse the trend of declining millet consumption. Millet's production scrambled from 14.52 million tons in 2015–2016 to 17.96 million tons in 2020-21. Millets are cultivated in low-fertile land, tribal, rain-fed, and mountainous areas. They are Haryana, Uttar Pradesh, Chhattisgarh, Gujarat, Rajasthan, Madhya Pradesh, Maharashtra, Andhra Pradesh, Karnataka, Tamil Nadu, and Telangana. Tamil Nadu comes in at number eight with a contribution of 4% of the total millet production in India. Pearl millet (Bajra), Sorghum (Jowar), and Finger Millet (Ragi) establish the largest share of India's total production of millets.

Objectives of the Study

The Objectives of the Study are as Follows

1. To assess the area under cultivation, production, and yield of Millets in Tamil Nadu from 2011-12 to 2021-22 as well as their growth and instability.
2. To explore the effects of area and yield on increasing millet production.

Research Methodology

The data collected for this study is secondary data. The data has been collected from the Directorate of Millets Development, Jaipur, the Ministry of Agriculture and Farmers Welfare, and the Directorate of Economics and Statistics. The regression analysis is used to define the compound growth rate of millets, and the decomposition is used to govern the area, yield, and interacting effects on the progress of millets in Tamil Nadu. The instability in area, production and yield of millets is calculated in relative terms by the Cuddy-Della Valle index. A new initiative, Rainfed Area Development Programme (RADP) has been launched on a pilot basis as a sub-scheme of Rashtriya Krishi Vikas Yojana (RKVY) during 2011-12 in the states of Andhra Pradesh, Odisha, Tamil Nadu, Karnataka, Madhya Pradesh, Chhattisgarh, Maharashtra, Gujarat, Uttar Pradesh and Rajasthan with an outlay of Rs. 250.00 crores. The RADP targets refining the excellence of life of farmers', especially small and marginal farmers, by offering an ample platform of undertakings to maximisefarm earnings for pretty food and livelihood safety. Based on RADP, the study period covers a period of eleven years, from 2011–12 to 2021–22.

Table 1 Cultivated Area of Millets in Tamil Nadu (in Lakh Ha.)

Years	Sorghum (Jowar)	Pearl Millet (Bajra)	Finger Millet (Ragi)	Small Millets	Total
2011-12	1.98 (55.31)	0.47 (13.13)	0.83 (23.018)	0.30 (8.38)	3.58 (100)
2012-13	1.94 (59.46)	0.43 (12.91)	0.70 (21.02)	0.26 (7.81)	3.33 (100)
2013-14	3.47 (35.87)	0.54 (9.78)	1.19 (21.55)	0.32 (5.80)	5.52 (100)
2014-15	3.48 (36.80)	0.58 (10.78)	1.04 (19.32)	0.28 (5.20)	5.38 (100)
2015-16	3.39 (38.67)	0.52 (10.15)	0.90 (17.57)	0.31 (6.01)	5.12 (100)
2016-17	2.68 (49.13)	0.50 (12.41)	0.61 (15.13)	0.24 (5.93)	4.03 (100)
2017-18	3.86 (36.13)	0.50 (11.45)	0.87 (14.36)	0.25 (4.00)	5.48 (100)
2018-19	3.86 (36.00)	0.63 (11.45)	0.79 (14.36)	0.22 (4.00)	5.5 (100)
2019-20	4.50 (32.19)	0.47 (7.73)	0.85 (13.98)	0.26 (4.27)	6.08 (100)
2020-21	4.05 (34.19)	0.67 (11.57)	0.83 (14.33)	0.24 (4.14)	5.79 (100)
2021-22	3.97 (35.29)	0.67 (11.94)	0.74 (13.19)	0.23 (4.09)	5.61 (100)
Average	3.38	0.54	0.85	0.26	5.03

Source: Directorate of Millets Development, Jaipur 2023.

Table 1 reveals the cultivated area of millets in Tamil Nadu during the study period. The cultivated area of Jowar was 1.98 lakh hectares in 2011–12; it has been increased to 3.97 lakh hectares in 2021–22. The area of Bajra has increased from 0.47 lakh hectares in 2011–12 to 0.67 lakh hectares in 2021–22. There were some fluctuations in the area of Ragi; it was the highest at 1.19 lakh hectares in the year 2013-14. In the case of small millets, it shows a decreasing tendency in their cultivated area during the study period. It was 0.32 in the year 2013-14. The average cultivated area of Jowar is 3.38 lakh hectares, followed by Ragi 0.85 lakh hectares, Bajra is 0.54 lakh hectares and small millets is 0.26 Ragi 0.85 lakh hectares. It indicates that Jowar has been cultivated more than the other millets on the basis of cultivated area and the least is minor millet.

Chart-1

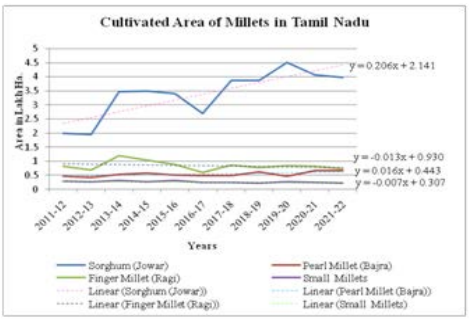

Table 2 Production of Millets in Tamil Nadu (in Lakh Tonnes)

Years	Sorghum (Jowar)	Pearl Millet (Bajra)	Finger Millet (Ragi)	Small Millets	Total
2011-12	2.53 (40.22)	1.14 (18.12)	2.25 (35.78)	0.37 (5.88)	6.29 (100)
2012-13	1.65 (42.63)	0.57 (14.73)	1.38 (35.66)	0.27 (6.98)	3.87 (100)
2013-14	4.50 (46.68)	1.17 (12.14)	3.62 (37.55)	0.35 (3.63)	9.64 (100)
2014-15	5.13 (47.67)	1.78 (16.54)	3.50 (32.54)	0.35 (3.25)	10.76 (100)
2015-16	4.68 (51.04)	1.42 (15.48)	2.71 (29.56)	0.36 (3.92)	9.17 (100)
2016-17	1.54 (39.38)	1.02 (26.09)	1.14 (29.16)	0.21 (5.37)	3.91 (100)
2017-18	4.31 (46.49)	1.44 (15.54)	3.21 (34.63)	0.31 (3.34)	9.27 (100)
2018-19	4.64 (53.15)	1.18 (13.51)	2.56 (29.32)	0.35 (4.02)	8.73 (100)
2019-20	5.20 (51.14)	1.85 (18.19)	2.75 (27.04)	0.37 (3.63)	10.17 (100)
2020-21	4.27 (47.13)	1.59 (17.55)	2.89 (31.89)	0.31 (3.43)	9.06 (100)
2021-22	4.27 (51.32)	1.57 (18.88)	2.21 (26.56)	0.27 (3.24)	8.32 (100)
Average	3.88	1.33	2.56	0.32	8.10

Source: Directorate of Millets development, Jaipur 2023

Table 2 shows the millet production in Tamil Nadu from 2011-12 to 2021-22. It is clearly observed that there were ups and downs in the production of all varieties of millets. The Jowar and Bajra productions were high in the year 2019-20 i.e 5.20and1.85lakhhectaresrespectively.Theproduction of Ragi has been reduced from 3.62 lakh hectares in 2013-14 to 1.14 lakh hectares in 2016-2017. The average production of millets in Tamil Nadu is as follows: Jowar 3.88 lakh hectares followed by Ragi 2.56 lakh hectares, Bajra 1.33 lakh hectares, and small millets 0.32 lakh hectares. It shows that the production of Jowar was the highest among millets produced in Tamil Nadu during the study period. The state produced 5.20 lakh hectares of Jowar, contributing 10.90 percent to the total Jowar production of India in 2023. The reason behind this is that farmers are adopting sustainable farming practices and modern technologies in the production process. Tamil Nadu is one of the leading jowar producers in the country. The state's assurance of agricultural modernism and its provision to farmers have boosted Jowar cultivation to new-fangled elevations.

Chart-2

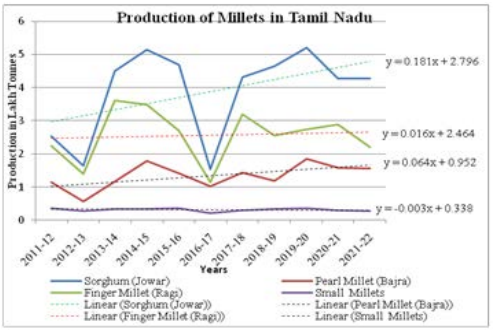

Table 3 Yield of Millets in Tamil Nadu (in Kg/ha)

Years	Sorghum (Jowar)	Pearl Millet (Bajra)	Finger Millet (Ragi)	Small Millets	Total
2011-12	1277 (16.68)	1277 (16.68)	2715 (35.47)	1210 (15.82)	7654 (100)
2012-13	851 (16.51)	1326 (25.74)	1967 (38.16)	1010 (19.59)	7654 (100)
2013-14	1295 (17.06)	2158 (28.43)	3053 (40.22)	1085 (14.29)	7654 (100)
2014-15	1475 (16.09)	3077 (33.59)	3348 (36.54)	1263 (13.78)	7654 (100)
2015-16	1380 (16.61)	2747 (33.08)	3013 (36.28)	1164 (14.01)	7654 (100)
2016-17	578 (10.70)	2059 (38.11)	1865 (34.51)	901 (16.67)	7654 (100)
2017-18	1117 (13.38)	2277 (27.28)	3714 (44.51)	1238 (14.83)	7654 (100)
2018-19	1204 (14.09)	2517 (29.44)	3257 (38.08)	1573 (18.39)	7654 (100)
2019-20	1156 (13.45)	2743 (31.94)	3247 (37.79)	1444 (16.82)	7654 (100)
2020-21	1054 (12.95)	2357 (28.95)	3481 (42.77)	1247 (15.33)	7654 (100)
2021-22	735 (9.79)	2616 (34.87)	2972 (39.62)	1179 (15.72)	1179 (15.72)
Average	1102	2393.54	2966.54	1210.36	7672.45

Source: Directorate of Millets development, Jaipur 2023.

Table 3 specifies the yield of millets in Tamil Nadu during the study period. The yields of Jowar and Bajra were high in 2014–15, i.e., 1475 and 3077 lakh hectares, respectively. The yield of Ragi has been reduced from 3714 lakh hectares in 2017-18 to 2972 lakh hectares in 2021-22. The yield of small millets has increased from 1210 lakh hectares in 2011-12 to 1573 lakh hectares in 2021-22. An average yield of millets in Tamil Nadu, such as Ragi, was 2966.54 lakh hectares followed by Bajra at 2393.54 lakh hectares, small millets at 1210.36 lakh hectares and Jowar at 1102 lakh hectares. It shows that the yield of Ragi was the highest among the yields of millets in Tamil Nadu from 2011-12 to 2021-22 because Ragi is not a time-bound crop and hence can be refined throughout the year if humidity is accessible. Tamil Nadu is the state with the highest yield of Bajra.

Chart-3

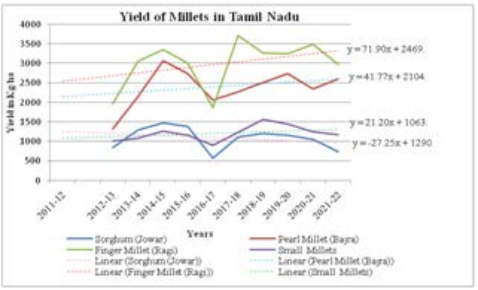

Table 4 Growth Rate of Millets in Tamil Nadu

Variables		Regression Coefficients		R^2	CAGR (%)
		a	b		
Area	Sorghum (Jowar)	0.772992 (6.589079)*	0.068539 (3.962499)*	0.64	7.09
	Pearl Millet (Bajra)	-0.79745 (-10.29661)*	0.029603 (2.592426)**	0.43	3.00
	Finger Millet (Ragi)	-0.09664 (-0.80702)	-0.01351 (-0.765)	0.06	-1.34
	Small Millets	-1.17496 (-19.7674)*	-0.02699 (-3.07983)*	0.51	-2.66
Production	Sorghum (Jowar)	0.922567 (3.387872)*	0.059736 (1.487791)	.20	6.15
	Pearl Millet (Bajra)	-0.09353 (-0.5063)	0.057 (2.092673)	0.33	5.87
	Finger Millet (Ragi)	0.801876 (3.244638)*	0.01442 (0.395732)	0.02	1.45
	Small Millets	-1.09799 (-9.20652)*	-0.00914 (-0.5199)	0.03	-199.09
Yield	Sorghum (Jowar)	30.0577 (1.176916)	-3.45136 (-0.94272)	0.89	-96.83
	Pearl Millet (Bajra)	5.171569 (3.296969)*	0.371396 (1.651699)	0.23	44.98
	Finger Millet (Ragi)	4.312696 (3.269827)*	0.525316 (2.778416)**	0.46	68.10
	Small Millets	4.900915 (4.890743)*	0.313761 (2.184228)**	0.35	36.86

Note: * Significant at one per cent level; ** Significant at five per cent level;
Figures in parentheses indicates 't' value

Source: Computed from collected data

The growth rate of millets in Tamil Nadu has been affirmative for the type of expenditure throughout the study period except few. The growth rate of area of Jowar showed a substantial growth rate of 7.09 percent per annum followed by Bajra, which was 3.00 per cent. The growth rate of area of Ragi and Small millets was adverse in the study period. The growth rate of Production of Jowar showed a significant growth rate of 6.15 percent per annum followed by Bajra, which was 5.87 per cent. The growth rate of production of Ragi and Small millets was negative in the study period. The growth rate of productivity of Jowar showed an insignificant growth rate of -96.83 percent per annum. But the growth rate of productivity of Ragi was 68.10 per cent followed by Bajra and small millets, which was 44.98 per cent and 36.86 per cent respectively. The CAGR is computed for the different varieties of Millets, which are significant at the 1 percent level and 5 percent level.

Table 5 Cuddy Della Valle Index Instability for Area, Production and Yield of Millets in Tamil Nadu

Particulars		Sorghum (Jowar)	Pearl Millet (Bajra)	Finger Millet (Ragi)	Small Millets
Area	Mean	3.38	0.543636	0.85	0.264545
	S.D	0.839881	0.082979	0.158493	0.033575
	CV	24.84855	15.26363	18.64622	12.69154
	AdR2	0.595165	0.363895	-0.04327	0.45903
	CDVI	15.7156	12.2109	19.01549	9.326336
Production	Mean	3.883636	1.339091	2.565455	0.32
	S.D	1.329167	0.370849	0.788941	0.051575
	CV	34.22481	27.6941	30.75247	16.11725
	AdR2	0.11	0.25	-0.09	-0.08
	CDVI	32.28762	23.98379	32.10652	16.74953
Yield	Mean	1102	2393.545	2966.545	1210.364
	S.D	277.9212	458.724	584.5775	185.9216
	CV	25.21971	19.16504	19.70567	15.36081
	AdR2	-0.01	0.15	0.4	0.27
	CDVI	25.3455	17.66929	15.26394	13.12428

Source: Computed from Collected data

The level of instability cannot be perceived by concentrating merely on growth rates. Growth rates will merelyex pound the rate of growth over time, whereas instability will define whether the growth performance for the variable under study was stable or unstable over time. In this study, the level of instability in the area,production, and yield of millets was determined by using Cuddy-Della Valle Index.

Cuddy Della Valle Index

It is evident in the above table that during the study period, the highest instability for area has been found in the Ragi (19.01 per cent) followed by Jowar (15.71 per cent). Low instability for the area (9.32 per cent) was recorded in small millets. Medium instability in the area has been found in Bajra (12.21 per cent). The instability varies from 9.32per cent to 19.01 percent for the area which is low to medium unstable in the study period.

The high instability for the production was recorded in Jowar (32.28 per cent) followed by Ragi (32.10per cent). Low instability for production was registered in small millets (16.74per cent) followed by Bajra (23.98per cent). The instability varies from 16.74per cent to 32.28 percent for the production which is in medium to the highly unstable range.

The high instability index for the yield registered in Jowar (25.34) followed by Bajra (17.66 per cent), Ragi (15.26per cent) and small millets(13.12 per cent) respectively. The instability for yield of millets varies from 13.12 per cent to 25.34per cent.

Table 6 Coppock's Instability index for Area, Production and Yield of Millets in Tamil Nadu

Particulars	Sorghum (Jowar)	Pearl Millet (Bajra)	Finger Millet (Ragi)	Small Millets
Area	48.92	42.75	44.10	41.68
Production	57.46	51.19	53.03	43.93
Yield	49.07	45.92	45.96	42.89

Source: Computed from Collected data

Table 6 represents the results of Coppock's instability analysis of the area, production, and yield of millets in Tamil Nadu. The instability analysis revealed that in the study period higher instability for the area was observed in Jowar (48.92) whereas production and yield were highly instable in Jowar (57.46 and 49.07 respectively). The lowest Instability was shown in Small millets for the area (41.68), whereas for production low instability was found in Small millets (43.93) followed by Bajra (51.19) and for yield, the millet observed was Small millets (42.89).

Table 7 The Effect of Area, Yield and Interaction of Millets in Tamil Nadu

Particulars	Sorghum (Jowar)	Pearl Millet (Bajra)	Finger Millet (Ragi)	Small Millets
Area effect	-61.67	17.92	-53.32	9.30
Yield effect	146.04	114.04	610.87	84.70
Interaction effect	-61.98	7.62	57.82	-2.17

Source: Computed from collected data.

The decomposition is aimed at determining the area, yield, and interacting effects on the improvement of millets production in Tamil Nadu from 2011-12 to 2021-22, The entire period analysis reveals that the area and yield effects of Jowar were -61.67 per cent and 146.04 per cent, respectively, while the interaction effect was -61.98 per cent. According to the study, yield effect of Jowar contributed to the state's increased millets production. The area and interaction effect of Jowar had a negative impact on millets production during the study period.

It is also found that the area, yield and interaction effect of Bajra were 17.92 per cent, 114.04 per cent and 7.62 per cent had positive impact on millets production in Tamil Nadu in the entire study period. According to the study, interaction effect of Bajra contributed major share to the state's increased millets production.

The increase in production of Ragi was mostly due to yield effects 610.87 per cent where the area contributed negatively during the study period and interaction had a positive impact 57.82. The results of the decomposition analysis clearly indicate that yield per hectare contributed majorly in increasing the total production of Bajra in Tamil Nadu over the study period from 2011-12 to 2021-22. In the case of small millets, there was a favorable effect of area and yield on millets production. The area and yield effect of small millets were 9.30 per cent and 84.70per cent had positive impact on millets production in Tamil Nadu in the entire study period. According to the study, yield effect of small millets contributed to the state's increased millets production.

Conclusion

The results specified that the area under millets has been decreasing over the years. It was principally due to escalation in the area of major cereals and the post effect of green revolution. In spite of all the surprising qualities and capacities that millet retains, the area under millet production has been decrease over the last three decades in Tamil Nadu. In India, between 1966 and 2006, 44 percent of millet cultivation areas were engaged by other crops. During the same period, wheat and rice which were cultivated in fewer areas than millets during Green Revolution have gradually increased to overtake millets. The augmented production in Small Millets originate during the period of analysis was due to acceptance of high yielding varieties in millets and cultivation performs. Implementation of short duration varieties released by Tamil Nadu Agricultural University, embracing of millet in mixed farming and inter cropping systems and present value of millet in markets and its demand in value addition sectors has essentially inspired the farmers to adopt millet farming in mixed cropping system or as a self-governing crop.

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