# GROWTH OF AREA, PRODUCTION AND PRODUCTIVITY OF TURMERIC IN INDIA DURING PRE AND POST-LIBERALISATION ERA

Dr.N.Krishnan* & Dr.M.Thirumathi**

**Abstract**

Turmeric is growing in India since ancient times mainly for its culinary and medicinal properties, particularly in Ayurveda. Various property of this spice has extended its use as a component of food additive and other natural dies, also as a clinical component in the cosmetic and pharmaceutical industries and many other uses. A recent pandemic, COVID-19, also further valued the health benefits in the form of an immunity booster. The USA is the largest consumer of Indian turmeric, imported 22 percent of the total exported value, and followed by Bangladesh (18%), Iran (6%), and UAE (5%) in the last year. Some of the other importing countries are Malaysia, UK, Morocco, Germany and Japan. This opportunity can be utilized further by introducing some new innovative products and recipes. Secondary data used in the present study. Objectives: To study the growth of area, production and productivity of Turmeric in India, To analyse the growth of area, production and productivity of Turmeric in India during pre and post-liberalisation period viz. Pre- Economic liberalization (1950-51 to 1990-91) and Post- Economic liberalization (1991-92 to 2021-22). From the study analysis, Annual growth of area is estimated that -4.03 in 1990-91. The positive AGR value of turmeric showed that 20 in 1961-62. The minimum production of turmeric found that -32 (In ' 000 MT) in the year 1972-73 and the maximum of turmeric production is 51(In ' 000 MT) in 1978-79 period respectively. The mean value of turmeric production analysed with 3.83 during the study. Standard deviation of production valuation showed 19.64 and the CV value is estimated that 512.99. The minimum of turmeric productivity showed 2 (In MT/Hectare) from 1961-62 to 1983-84 and maximum is 4 (In MT/Hectare) in 1989-90 respectively. The mean value of productivity is 2.30. Post-liberalisation period better growth in production of turmeric form 1950 to 2021-22. The productivity of turmeric AGR revealed that -21.62 in 1990-91 and 0 .00 level in 2021-22. Productivity of turmeric showed not good better level during the study periods.

**Key words:** Turmeric, Growth, Production, Productivity, Export, Market Trends and Policy

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## Introduction

Turmeric (Curcuma longa) (Family: Zingiberaceae) is used as condiment, dye, drug and cosmetic in addition to its use in religious ceremonies. India is a leading producer and exporter of turmeric in the world. Andhra Pradesh, Tamil Nadu, Orissa, Karnataka, West Bengal, Gujarat, Meghalaya, Maharashtra, Assam are some of the important states cultivates turmeric, of which, Andhra Pradesh alone occupies 35.0% of area and 47.0% of production. As an important spice, turmeric is growing in India since ancient times mainly for its culinary and medicinal properties, particularly in Ayurveda. Various property of this spice has extended its use as a component of food additive and other natural dies, also as a clinical component in the cosmetic and pharmaceutical industries and many other uses.

A recent pandemic, COVID-19, also further valued the health benefits in the form of an immunity booster. For India, this gives immense benefit as one of the important producers and also a major global exporter to not only benefit economically also to serve the globe in a better way. Additionally, the greatest diversity of this spice in the form of a number of species (around 40 to 45) is a great advantage to bring new innovations and its derivatives. The COVID-19 pandemic particularly elevated turmeric sales, both in the form of fresh and dried. Also, turmeric is used as one of the common ingredients in daily uses grocery for example as turmeric jaggery. The sale has been also appreciable in the international market i.e. the exported value of the turmeric jumped to 20 % in the last year as compared with 6% growth in 2016-20.

## Market Trends

India being one of the major producers of turmeric, contributes 80% to global production. In the year 2018-19, turmeric production was 389 thousand tonnes, with area and productivity 246 thousand hectares and 5646.34 kg per hectare respectively. The growth pattern of the area, production, and productivity of turmeric over the period of time indicate the growing contribution of production over the area expansion to the increased yield.

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In the international market, India is a net exporter of turmeric and earned 201,152 Thousand US Dollars in 2020. The USA is the largest consumer of Indian turmeric, imported 22 percent of the total exported value, and followed by Bangladesh (18%), Iran (6%), and UAE (5%) in the last year. Some of the other importing countries are Malaysia, UK, Morocco, Germany and Japan. This opportunity can be utilized further by introducing some new innovative products and recipes. In this way, northeastern states can also benefit large that we discuss briefly below.

Opportunity for north-eastern states to prosper by turmeric cultivation and marketing North-eastern states, particularly Mizoram and Sikkim are recognized as abnormally high productivity states in turmeric cultivation because of their higher yield. Also, they have the advantage of recognition for organic production. In addition, under the National Mission for Sustainable Agriculture (NMSA), the Ministry of Agriculture and Farmers Welfare launched Central Sector Scheme, Mission Organic Value Chain Development for North East Region (MOVCD-NER) to support the development of value chain starting from input supply, certification, to the creation of facilities for aggregation and processing of the product. There are 33 clusters in Manipur operating under MOVCD-NER; also Assam and Sikkim have better geographic coverage of FPOs (Farmer Producer Organizations). By promoting such practices in other north-eastern states, they can exploit this niche market in near future.

Another important policy strep i.e. “One District One Product” under Centrally Sponsored Scheme PMFME (PM Formalization of Micro food processing Enterprises Scheme), Turmeric is listed in the selected product in all of the North-eastern states, this is an additional scope under which states can be encouraged to adopt cluster approach and group approaches such as FPOs, SHGs (Self Help Groups) and producer cooperatives. This will help to bring the win-win situation to both farmers and the microenterprises. Also, except Assam, the spread of formal/organized food processing units are scanty, the innovation center for developing value-added products from the traditional knowledge can be encouraged so that in the long run the product can be easily scaled up.

The institutional sector in the West buys ground turmeric and oleoresins, while dry turmeric is preferred by the industrial sector. Turmeric is available in two seasons in India i.e., February to May and August to October. The various varieties of turmeric that are traded in India are Allepey Finger ( Kerala), Erode Turmeric (Tamil Nadu), Salem Turmeric (Tamil Nadu), Rajapore Turmeric (Maharashtra), Sangli Turmeric (Maharashtra), Nizamabad Bulb (Andhra Pradesh) etc. The major trading centres of turmeric are Nizamabad, Dugirala in

Andhra Pradesn, Sangli in Maharshtra and Salem, Erode, Dharmapuri and Coimbatore in Tamil Nadu. The state government created a trading center exclusively for turmeric which was integrated with the e-national agriculture market (E-NAM). The major turmeric producing states are Telangana, Maharashtra, Tamil Nadu, Andhra Pradesh and Karnataka. Tamil Nadu shares 14.04 per cent of the total production. In Tamil Nadu, Erode district is the largest district in turmeric cultivation by contributing 24.14 per cent of the total area and 33.37 per cent of the total production. It is grown as a Kharif crop.

**Climate and soil**

Turmeric can be grown in diverse tropical conditions from sea level to 1500 m above sea level, at a temperature range of 20-35oC with an annual rainfall of 1500 mm or more, under rainfed or irrigated conditions. Though it can be grown on different types of soils, it thrives best in well-drained sandy or clay loam soils with a pH range of 4.5-7.5 with good organic status (vikaspedia).

**Objectives of the Present Study**

1. To study the characteristics of improved turmeric varieties.
2. To study about the growth of area, production and productivity of Turmeric in India.
3. To analyse the growth of area, production and productivity of Turmeric in India during pre and post-liberalisation era viz. Pre- Economic liberalization (1950-51 to 1990-91) and Post- Economic liberalization (1991-92 to 2021-22).
4. To give the findings, suggestions and conclusion of the study.

**Data and Methodology**

The study was mainly based on the secondary data from various sources, which included indiastat, Annual Reports, Yearbooks, Statistical Data publications of Spices Board, Indiastat.com, Ministry of Commerce and Industries and Arecanut and Spices Development Board. The study period was divided into two sub periods, viz. pre-liberalization (1950-51 to 1990-91) and post-liberalization (1991-92 to 2021-22).

The collected data is used to analyse with Annual Growth Rate (AGR), Standard Deviation (SD), and Co-efficient of variation (CV), Trend analysis, R-squared values and Mean value during the study period.

**Varieties**

A number of cultivars are available in the country and are known mostly by the name of locality where they are cultivated. Some of the popular cultivars are Duggirala, Tekurpeta, Sugandham, Amalapuram, Erode local, Alleppey, Moovattupuzha, and Lakadong. The improved varieties of turmeric and their salient features are given in the following table.

**TABLE 1: CHARACTERISTICS OF IMPROVED TURMERIC VARIETIES**

| Sl.No. | Variety | Mean yield (fresh)(t/ha) | Crop duration (days) | Dry recovery (%) | Curcumin (%) | Oleoresin (%) | Essential oil (%) |
|---|---|---|---|---|---|---|---|
| 1 | Suvarna | 17.4 | 200 | 20 | 4.3 | 13.5 | 7 |
| 2 | Suguna | 29.3 | 190 | 12 | 7.3 | 13.5 | 6 |
| 3 | Sudarsana | 28.8 | 190 | 12 | 5.3 | 15 | 7 |
| 4 | IISR Prabha | 37.5 | 195 | 19.5 | 6.5 | 15 | 6.5 |
| 5 | IISR Prathibha | 39.1 | 188 | 6.2 | 6.5 | 16.2 | 6.2 |
| 6 | Co-1 | 30 | 285 | 19.5 | 3.2 | 6.7 | 3.2 |
| 7 | BSR-1 | 30.7 | 285 | 20.5 | 4.2 | 4 | 3.7 |
| 8 | Krishna | 9.2 | 240 | 16.4 | 2.8 | 3.8 | 2 |
| 9 | Sugandham | 15 | 210 | 23.3 | 3.1 | 11 | 2.7 |
| 10 | Roma | 20.7 | 250 | 31 | 9.3 | 13.2 | 4.2 |
| 11 | Suroma | 20 | 255 | 26 | 9.3 | 13.1 | 4.4 |
| 12 | Ranga | 29 | 250 | 24.8 | 6.3 | 13.5 | 4.4 |
| 13 | Rasmi | 31.3 | 240 | 23 | 6.4 | 13.4 | 4.4 |
| 14 | Rajendra Sonia IISR Alleppey | 42 | 225 | 18 | 8.4 | - | 5 |
| 15 | Supreme | 35.4 | 210 | 19.3 | 6 | 16 | 4 |
| 16 | IISR Kedaram | 34.5 | 210 | 18.9 | 5.5 | 13.6 | 3 |

Source: Planting Material

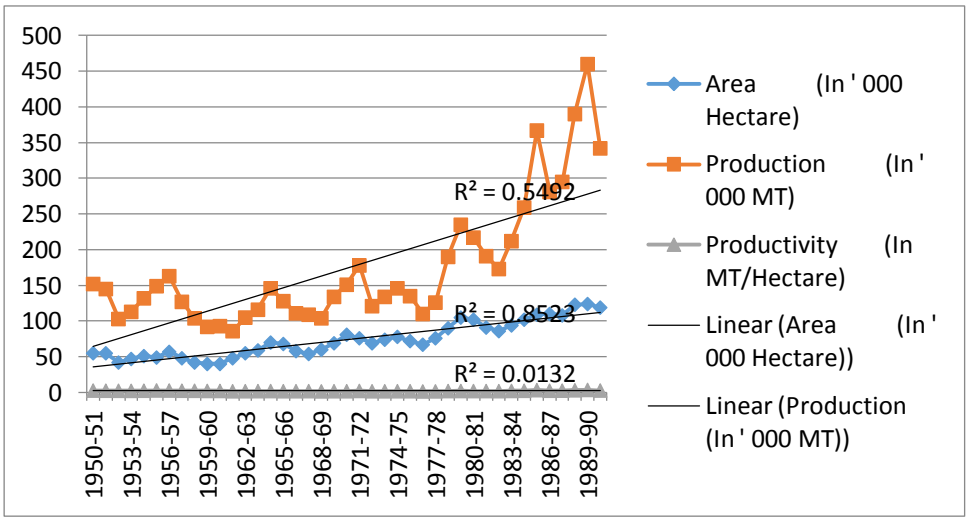
The above table1 shows that there are sixteen improved varieties turmeric and its charterers. The highest duration crops observed that 285 days for both crops of Co-1 and BSR-1 and the lowest duration crop is Suvarna variety with 17.4 days. The table also showing turmeric mean yield, dry recovery, Curcumin, Oleoresin and Essential Oil.

**TABLE 2: GROWTH OF AREA, PRODUCTION AND PRODUCTIVITY OF TURMERIC IN INDIA DURING 1950-51 TO 1990-91**

| YEAR | Area (In ' 000 Hectare) | AGR | Production (In ' 000 MT) | AGR | Productivity (In MT/Hectare) | AGR |
|---|---|---|---|---|---|---|
| **1950-51** | 55 | **0** | 152 | **0** | 2.8 | **0** |
| **1951-52** | 55 | **0.00** | 145 | **-4.61** | 2.6 | **-7.14** |
| **1952-53** | 42 | **-23.64** | 103 | **-28.97** | 2.5 | **-3.85** |
| **1953-54** | 47 | **11.90** | 113 | **9.71** | 2.4 | **-4.00** |
| **1954-55** | 51 | **8.51** | 132 | **16.81** | 2.6 | **8.33** |
| **1955-56** | 49 | **-3.92** | 149 | **12.88** | 3 | **15.38** |
| **1956-57** | 57 | **16.33** | 163 | **9.40** | 2.9 | **-3.33** |
| **1957-58** | 48 | **-15.79** | 127 | **-22.09** | 2.6 | **-10.34** |
| **1958-59** | 42 | **-12.50** | 104 | **-18.11** | 2.5 | **-3.85** |
| **1959-60** | 40 | **-4.76** | 92 | **-11.54** | 2.3 | **-8.00** |
| **1960-61** | 40 | **0.00** | 93 | **1.09** | 2.3 | **0.00** |
| **1961-62** | 48 | **20.00** | 86 | **-7.53** | 1.8 | **-21.74** |
| **1962-63** | 55 | **14.58** | 105 | **22.09** | 1.9 | **5.56** |
| **1963-64** | 59 | **7.27** | 116 | **10.48** | 2 | **5.26** |
| **1964-65** | 70 | **18.64** | 146 | **25.86** | 2.1 | **5.00** |
| **1965-66** | 68 | **-2.86** | 128 | **-12.33** | 1.9 | **-9.52** |
| **1966-67** | 58 | **-14.71** | 111 | **-13.28** | 1.9 | **0.00** |
| **1967-68** | 54 | **-6.90** | 109 | **-1.80** | 2 | **5.26** |
| **1968-69** | 60 | **11.11** | 104 | **-4.59** | 1.7 | **-15.00** |
| **1969-70** | 69 | **15.00** | 134 | **28.85** | 1.9 | **11.76** |
| **1970-71** | 81 | **17.39** | 151 | **12.69** | 1.9 | **0.00** |
| **1971-72** | 76 | **-6.17** | 178 | **17.88** | 2.3 | **21.05** |
| **1972-73** | 69 | **-9.21** | 121 | **-32.02** | 1.8 | **-21.74** |
| **1973-74** | 74 | **7.25** | 134 | **10.74** | 1.8 | **0.00** |
| **1974-75** | 78 | **5.41** | 146 | **8.96** | 1.9 | **5.56** |
| **1975-76** | 72 | **-7.69** | 135 | **-7.53** | 1.9 | **0.00** |
| **1976-77** | 67 | **-6.94** | 110 | **-18.52** | 1.6 | **-15.79** |
| **1977-78** | 76 | **13.43** | 126 | **14.55** | 1.7 | **6.25** |
| **1978-79** | 90 | **18.42** | 190 | **50.79** | 2.1 | **23.53** |
| **1979-80** | 105 | **16.67** | 235 | **23.68** | 2.2 | **4.76** |
| **1980-81** | 102 | **-2.86** | 217 | **-7.66** | 2.1 | **-4.55** |
| **1981-82** | 91 | **-10.78** | 191 | **-11.98** | 2.1 | **0.00** |
| **1982-83** | 86 | **-5.49** | 173 | **-9.42** | 2 | **-4.76** |
| **1983-84** | 94 | **9.30** | 212 | **22.54** | 2.3 | **15.00** |
| **1984-85** | 102 | **8.51** | 259 | **22.17** | 2.5 | **8.70** |
| **1985-86** | 109 | **6.86** | 367 | **41.70** | 3.4 | **36.00** |
| **1986-87** | 110 | **0.92** | 281 | **-23.43** | 2.6 | **-23.53** |
| **1987-88** | 108 | **-1.82** | 295 | **4.98** | 2.7 | **3.85** |
| **1988-89** | 123 | **13.89** | 390 | **32.20** | 3.2 | **18.52** |
| **1989-90** | 124 | **0.81** | 460 | **17.95** | 3.7 | **15.63** |
| **1990-91** | 119 | **-4.03** | 342 | **-25.65** | 2.9 | **-21.62** |
| **MIN** | **40** | **-24** | **86** | **-32** | **2** | **-24** |
| **MAX** | **124** | **20** | **460** | **51** | **4** | **36** |
| **MEAN** | **73.73** | **2.49** | **173.78** | **3.83** | **2.30** | **0.89** |
| **SD** | **24.74** | **11.01** | **88.73** | **19.64** | **0.49** | **12.91** |
| **CV** | **33.56** | **441.97** | **51.06** | **512.99** | **21.29** | **1444.52** |

Source: Spices Board, India. & Ministry of Agriculture and Farmers Welfare, Govt. of India (on 3019) & Past Issues

**CHART 1: GROWTH OF AREA, PRODUCTION AND PRODUCTIVITY OF TURMERIC IN INDIA DURING 1950-51 TO 1990-91**




The above table 2 shows that growth of area, production and productivity of turmeric in India during pre-economic liberalisation period i.e. 1950-51 to 1990-91. From the result analysis, the minimum of turmeric area recorded with 40 (in' 000 hectare) in the year 1959-61 and the maximum of turmeric area was 124 (in' 000 hectare) in 1989-90 respectively. The area of mean value analysed with 73.73. The standard deviation valuation is 24.74 and the co-variance value is 33.56 during the study period. Annual growth of area is estimated that -4.03 in 1990-91. The positive AGR value of turmeric showed that 20 in 1961-62. The minimum production of turmeric found that -32 (In ' 000 MT) in the year 1972-73 and the maximum of turmeric production is 51(In ' 000 MT) in 1978-79 period respectively. The mean value of turmeric production analysed with 3.83 during the study. Standard deviation of production valuation showed 19.64 and the CV value is estimated that 512.99.

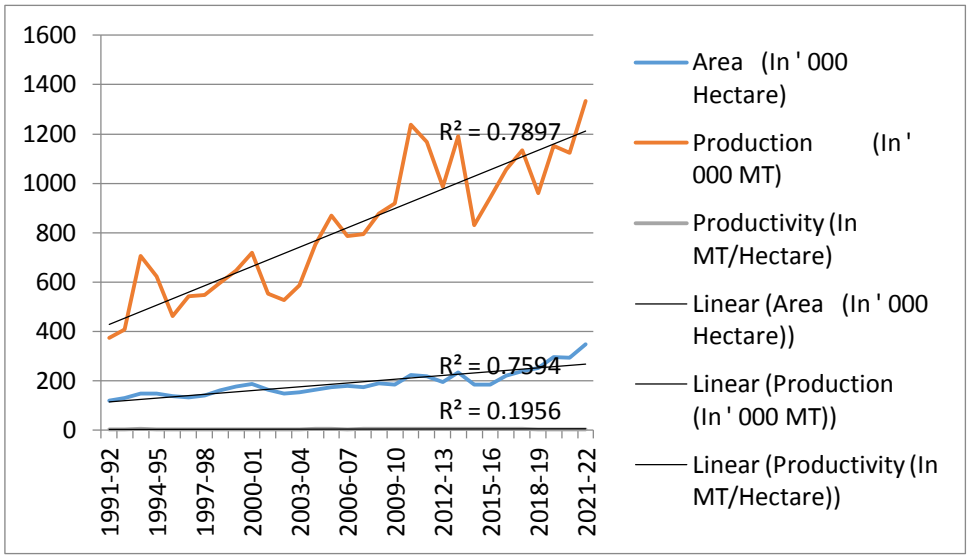
The minimum of turmeric productivity showed 2 (In MT/Hectare) from 1961-62 to 1983-84 and maximum is 4 (In MT/Hectare) in 1989-90 respectively. The mean value of productivity is 2.30. The co-efficient valuation of turmeric shows 21.29 and SD valuation observed with .49. AGR value of turmeric productivity is -21.62 in 1990-91. The highest turmeric productivity of positive AGR value was recorded with 18.52 in 1988-89. It could be observed from the above analysis, area, production and productivity of turmeric in India showed that negative growth (-4.03, -25.65 & -21.62) in the end of the pre-liberalisation period i.e. 1990-91. From the above diagram it can be seen that the trend lines and R-squared values (0.85, 0.5 & 0.001) for area, production and productivity of turmeric in India during pre-economic liberalisation period i.e. 1950-51 to 1990-91.

**TABLE 3: GROWTH OF AREA, PRODUCTION AND PRODUCTIVITY OF TURMERIC IN INDIA DURING 1991-92 TO 2021-22**

| YEAR | Area (In ' 000 Hectare) | AGR | Production (In ' 000 MT) | AGR | Productivity (In MT/Hectare) | AGR |
|---|---|---|---|---|---|---|
| **1991-92** | 120 | **0.00** | 373 | **0** | 3.1 | **0** |
| **1992-93** | 130 | **8.33** | 408 | **9.38** | 3.1 | **0.00** |
| **1993-94** | 148 | **13.85** | 707 | **73.28** | 4.8 | **54.84** |
| **1994-95** | 149 | **0.68** | 622 | **-12.02** | 4.2 | **-12.50** |
| **1995-96** | 139 | **-6.71** | 463 | **-25.56** | 3.3 | **-21.43** |
| **1996-97** | 134 | **-3.60** | 543 | **17.28** | 4.1 | **24.24** |
| **1997-98** | 140 | **4.48** | 549 | **1.10** | 3.9 | **-4.88** |
| **1998-99** | 161 | **15.00** | 598 | **8.93** | 3.7 | **-5.13** |
| **1999-00** | 176 | **9.32** | 646 | **8.03** | 3.7 | **0.00** |
| **2000-01** | 187 | **6.25** | 720 | **11.46** | 3.8 | **2.70** |
| **2001-02** | 163 | **-12.83** | 552 | **-23.33** | 3.4 | **-10.53** |
| **2002-03** | 149 | **-8.59** | 528 | **-4.35** | 3.5 | **2.94** |
| **2003-04** | 153 | **2.68** | 587 | **11.17** | 3.8 | **8.57** |
| **2004-05** | 164 | **7.19** | 752 | **28.11** | 4.6 | **21.05** |
| **2005-06** | 174 | **6.10** | 870 | **15.69** | 5 | **8.70** |
| **2006-07** | 179 | **2.87** | 787 | **-9.54** | 4.4 | **-12.00** |
| **2007-08** | 175 | **-2.23** | 794 | **0.89** | 4.5 | **2.27** |
| **2008-09** | 191 | **9.14** | 877 | **10.45** | 4.6 | **2.22** |
| **2009-10** | 184 | **-3.66** | 919 | **4.79** | 5 | **8.70** |
| **2010-11** | 223 | **21.20** | 1237 | **34.60** | 5.6 | **12.00** |
| **2011-12** | 219 | **-1.79** | 1167 | **-5.66** | 5.3 | **-5.36** |
| **2012-13** | 194 | **-11.42** | 987 | **-15.42** | 5.1 | **-3.77** |
| **2013-14** | 233 | **20.10** | 1190 | **20.57** | 5.1 | **0.00** |
| **2014-15** | 184 | **-21.03** | 830 | **-30.25** | 4.5 | **-11.76** |
| **2015-16** | 186 | **1.09** | 943 | **13.61** | 5.1 | **13.33** |
| **2015-17** | 222 | **19.35** | 1056 | **11.98** | 4.8 | **-5.88** |
| **2017-18** | 238 | **7.21** | 1133 | **7.29** | 4.8 | **0.00** |
| **2018-19** | 253 | **6.30** | 961 | **-15.18** | 3.8 | **-20.83** |
| **2019-20** | 296 | **17.00** | 1153 | **19.98** | 3.9 | **2.63** |
| **2020-21** | 293 | **-1.01** | 1124 | **-2.52** | 3.8 | **-2.56** |
| **2021-22** | 349 | **19.11** | 1334 | **18.68** | 3.8 | **0.00** |
| **MIN** | **120** | **-21** | **373** | **-30** | **3** | **-21** |
| **MAX** | **349** | **21** | **1334** | **73** | **6** | **55** |
| **MEAN** | **190.52** | **4.01** | **819.68** | **5.92** | **4.26** | **1.53** |
| **SD** | **53.10** | **10.31** | **266.92** | **19.89** | **0.69** | **14.28** |
| **CV** | **27.87** | **256.97** | **32.56** | **336.09** | **16.16** | **931.01** |

Source: Spices Board, India. & Ministry of Agriculture and Farmers Welfare, Govt. of India (on 3019) & Past Issues

**CHART 2: GROWTH OF AREA, PRODUCTION AND PRODUCTIVITY OF TURMERIC IN INDIA DURING 1991-92 TO 2021-22**




From the above table shows that growth of area, production and productivity of turmeric in India during post-economic liberalisation period i.e. 1990-91 to 2021-22. The study has found that the minimum level of area with 120 (In ' 000 Hectare) and the maximum of 349 (In ' 000 Hectare) turmeric area level were identified in 1990-91 to 2021-22 respectively. AGR value for area reveals that 19.11 in 2021-22. The mean value of turmeric is calculated that 190.52, The SD value is 53.10 and the co-efficient values analysed that 27.87 during the post liberalisation period. The minimum of 373 (In ' 000 MT) and the maximum of 1334 (In ' 000 MT) turmeric production were identified during the time period. AGR value of production increased from 9.38 to 18.68 during the study period. The mean value of production is 5.2, The SD value is 19.89 and the CV value is analysed that 336.09.

The minimum of 3 (In MT/Hectare) and maximum of 6 (In MT/Hectare) level of productivity of turmeric were identified from 1990-91 to 2021- 22. The mean value of productivity reveals that 4.26. The SD value shows .69 and the CV value of turmeric productivity computed about 16.16. AGR valuation analysed that 54.84 in 1991-92 and 0 level found in 2021-22. It could be seen that there is decreasing level of growth in productivity of turmeric in India during the pre and post liberalisation era. From the above pre and post liberalisation periods, it could be concluded that area-wise the turmeric post-liberalisation is better AGR with 19.11 in 2021-22 than pre-liberalisation period (-4.03). The production-wise, AGR of turmeric recorded with -25.65 in pre-liberalisation period and 18.68 in post-liberalisation period. It can be seen that post-liberalisation period better growth in production of turmeric form 1950 to 2021-22. From the above conclusion, the productivity of

turmeric AGR revealed that -21.62 in 1990-91 and 0 .00 level in 2021-22. It is concluded that productivity of turmeric showed not good better level during the study periods. It is clear from the chart 2 shows that the R-squared values of 0.7 for area, 0.7 for production and 0.2 for turmeric from the period 1991-92 to 2021-22.

**Research Findings of the Study**

- The area of mean value analysed with 73.73. The standard deviation valuation is 24.74 and the co-variance value is 33.56. Annual growth of area is estimated that -4.03 in 1990-91.
- The positive AGR value of turmeric showed that 20 in 1961-62. The minimum production of turmeric found that -32 (In ' 000 MT) in the year 1972-73 and the maximum of turmeric production is 51(In ' 000 MT) in 1978-79 period respectively.
- The mean value of turmeric production analysed with 3.83 during the study. Standard deviation of production valuation showed 19.64 and the CV value is estimated that 512.99.
- The co-efficient valuation of turmeric shows 21.29 and SD valuation observed with .49. AGR value of turmeric productivity is -21.62 in 1990-91. The highest turmeric productivity of positive AGR value was recorded with 18.52 in 1988-89.
- It could be observed from the above analysis, area, production and productivity of turmeric in India showed that negative growth (-4.03, -25.65 & -21.62) in the end of the pre-liberalisation period i.e. 1990-91.
- The trend lines and R-squared values (0.85, 0.5 & 0.001) for area, production and productivity of turmeric in India during pre-economic liberalisation period i.e. 1950-51 to 1990-91.
- The mean value of productivity reveals that 4.26. The SD value shows .69 and the CV value of turmeric productivity computed about 16.16.
- It could be seen that there is decreasing level of growth in productivity of turmeric in India during the pre and post liberalisation era.
- It could be concluded that area-wise the turmeric post-liberalisation is better AGR with 19.11 in 2021-22 than pre-liberalisation period (-4.03).
- The production-wise, AGR of turmeric recorded with -25.65 in pre-liberalisation period and 18.68 in post-liberalisation period.
- Post-liberalisation period better growth in production of turmeric form 1950 to 2021-22.

- The productivity of turmeric AGR revealed that -21.62 in 1990-91 and 0 .00 level in 2021-22.
- Productivity of turmeric showed not good better level during the study periods. The R-squared values of 0.7 for area, 0.7 for production and 0.2 for turmeric from the period 1991-92 to 2021-22.

**Conclusion and Policy Implications**

Turmeric in India has revealed that the growth of turmeric export is satisfactory but the direction of trade gives a warning. The liberalization and globalization had a well-defined impact on the turmeric export and this gives a positive signal. The study has suggested that more importance should be given to the R&D on quality of turmeric. Looking into the importance of international demand, export earnings and domestic needs, government should increase and stabilize its outlay of funds for research on turmeric under the spice development programs. The government should be more conscious regarding the policies pertaining to the above aspects and also WTO implications to protect our farmers and to maintain our monopoly in international markets. Appropriate export promotion strategies and policies have to be evolved to maintain the market share of Indian turmeric.

**The policy implications emerging out of the study are outlined below:**

- There is a need to disseminate information on international markets, price behaviour and other trade matters to Indian farmers and institutions to reap the benefits. This calls for strengthening of information technology and providing forecasts in products and prices.
- The facilities such as stream boilers and mechanical driers need to be provided by the government and spice industries to marginal and small farmers.
- High priority has to be assigned to increase the production and productivity of turmeric. To maintain quality of turmeric, trainings should be organized for the farmers on the way to produce good quality turmeric.
- Our exports are likely to be concentrated in minor importing countries, Iran, UAE, and UK in the future. A high dependence on one or two export markets will increase the trade risk in the long-run.
- Appropriate steps and policies have to be evolved to maintain the market share of Indian turmeric.

- ❖ Therefore, more importance has to be given to the minor importing countries such Bangladesh, Sri Lanka, etc. and appropriate export promotion strategies have to be evolved to diversify the geographical concentration.

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